Street Railway Journal

VOL. XXIX. NEW YORK, SATURDAY, JUNE 1, 1907. No 22

PUBLISHED EVERY SATURDAY BY THE

McGraw Publishing Company

MAIN OFFICE:
NEW YORK, ENGINEERING BUILDING, 114 LIBERTY STREET.

BRANCH OFFICES:
Chicago: Monadnock Block.
Philadelphia: Real Estate Trust Building.
Cleveland: Schofield Building.
San Francisco: Atlas Building.
London: Hastings House, Norfolk Street, Strand.

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

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

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

To Dominion of Canada

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

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Street Railway Journal (52 issues), postage prepaid..... $6.00
25 shillings. 25 marks. 31 francs.
Single copies ..... 20 cents
Remittances for foreign subscriptions may be made through our European office.

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Of this issue of the Street Railway Journal, 8300 *copies are printed. Total circulation for* 1907 *to date,* 180,050 *copies, an average of* 8184 *copies per week.*

The Development of New Shop Methods

The mechanic with ideas is always desired in a street railway repair shop, and it is probable there is no place which offers to the ingenious man a better opportunity to devise new and more economical methods of getting out work. But it is possible for a man to have too many ideas and not enough practical foresight, with the result that he may cause the loss of considerable time and money by experiments, which in the end prove failures. While successes are usually appreciated by the management of a railway company, it must always be remembered that in the minds of many one failure will be recorded against a man with more weight than can be offset by several successes. This may not be the proper attitude to take, but it is nevertheless that of many persons. A master mechanic with original ideas will often find it advantageous, therefore, to go slowly in introducing new practices in the shops of which he is in charge. He should weigh the amount of time and money that any improvement will cost and strike a balance between that amount and the saving if the invention proves successful, then get the necessary apparatus in working order with the least expense possible. After the device has shown what it will do and what it can be made to do with a further expenditure of money, its development to its final state and the expenditure of more money may be considered. It is a good thing to nurse an idea for some time before actual work on the apparatus necessary to carry it out is begun. When one carries such a thought in his mind for some time before working it out he will often be able to improve upon his original plan through some suggestion he may hear or run across in print that relates to his scheme. These chance remarks or bits of reading matter may help develop the idea, or they may possibly lead to the conclusion that it is impracticable. Thoughts are changed at less expense than an already constructed piece of apparatus, and it is, consequently, best to get them in very definite shape before any work entailing expense is begun.

The habit of weighing ideas well not only gives more assurance that the impracticable ones will be screened out before they have occasioned any expense, but it prevents one from having too many in hand at one time. There are so many processess about car repairing which can be improved that one is likely to begin too many at one time, and, consequently, will not be able to give any of them the attention it deserves. It is not the intention of these remarks to dampen the ardor of those who are not satisfied with out-of-date methods of doing things. Improvement would otherwise be impossible. But if some of those about car shops with more energy than the average would expend the greater portion of this force in thinking out ideas rather than pushing the construction of apparatus embodying them, fewer disheartening failures would result and possibly more progress would be made.

Abusing the Steam Boiler

The steam boiler is fundamentally the most important piece of apparatus in the majority of street railway power plants, and the increased attention now being given to economical methods of combustion is one of the most gratifying signs of the times. In the zeal which obtains to secure low fuel consumption, however, there is no little danger that boilers will suffer from the lack of proper care. Correct firing is the first essential of good boiler management, but there are

other points which ought not to be overlooked in the severe conditions of railway service. It is a question if there is any other piece of machinery which suffers from abuse as quickly as a steam boiler, or which returns such moderate maintenance charges for good treatment.

In street railway plants sudden increases in the load often call for more steam than is momentarily available, and the natural tendency is to rush cold boilers into service by starting a fierce fire on the grates. Unless the fire is permitted to come up gradually, so that all parts of the boiler and its setting may expand evenly, severe strains and injury to the metal are a probable result. The cost of fuel for keeping the fires banked in all extra boilers required for the peak-load is a small matter in consideration of the shortened life and dangers of excessive firing. It would scarcely seem necessary to point out the wisdom of lighting the fires two or three hours before the rush traffic comes on, so that the benefits of gradual heating may be had, if it was not for the practice often encountered of pushing the furnaces too hard at first. The street railway plant has much to learn from the battleship and the ocean liner in this respect.

The frequency with which a boiler should be cleaned depends upon the amount of water which is being evaporated and the quality of the feed-water supply. A chemical analysis of the feed-water and also one of its steam, condensed, should be made certainly once a year, for the purpose of getting a line upon the best methods of preventing scale formation. The analysis of the water is, if anything, more important than the determination of the calorific power of the fuel used. Measurements of the temperatures at water and steam inlets and outlets of feed-water heaters, and, if possible, meter readings of the volume of water passing through the heater in a given time, are useful supplements to the work of the chemist. In cleaning boilers with a hammer and chisel to remove the scale on the plates above the fire and around the stays and braces considerable damage is often done by careless cutting into the metal. An ample supply of light is vitally necessary, yet few boiler rooms are equipped with special plug sockets of sufficient capacity to enable a dozen 16-cp lamps to be used inside the boiler in such work. Another cause of burned sheets is the leaving of a tool or piece of oily waste inside the boiler after cleaning out.

When boilers are being rapidly cut into service there is generally a temptation to open the stop valves too quickly, with the result that the piping water-hammers on account of excessive expansion. Priming frequently occurs at such times with its possibilities of damaging the engines. Boilers operated in multiple should be equalized within at least 2 lbs. per square inch to prevent an excessive rush of steam from one boiler to the other. Anything which causes a sudden fluctuation of the water level is liable to result in excessive pressure and strain. The maintenance of a constant water level within close limits is probably the most important point to attain in the entire range of boiler practice.

Question of Rails

The present time, in which every rail is being taxed to its utmost capacity to carry the equipment which is placed on the track, is not a suitable one in which to quarrel with the product, nevertheless since experience in rails is but slowly gained, it is worth while to begin investigations now for use later on. Every superintendent knows that the rail question is getting more and more serious as traffic grows denser, cars grow heavier, and speeds increase. The general tendency is, of course, toward heavier, and especially deeper, sections and considerably increased hardness. The very deep girder is essentially a tramway rail and must be judged by tramway conditions, while in interurban service the rails are usually standard railroad sections laid on standard roadbed. Now the steam railroads of the country have been gradually finding out that in getting rails specially well fitted to resist the wear of heavy traffic, they have incurred a considerably increased risk of breakage, whether from changed composition or from change of physical structure due to the different proportions of the rails. The facts are brought out plainly in a recent report of the New York State Railroad Commission, as well as in a paper presented on rails at the last meeting of the American Railway Association. So far the troubles have been confined largely to steam railroad service; at all events, no serious complaints about breakages have been made public by the electric railway companies. But it is yet an unsolved problem to which we would earnestly direct the attention of our readers to determine the relation between high-speed electric railway service and heavy railroad service of the ordinary kind with respect to wear and strain on the rails. This much is clear, that for all kinds of service the light rails of twenty years ago have been replaced through dire necessity. There are, however, very few systematic data on the causes and nature of wear of rails on fast interurban lines. Something has been learned about urban conditions, and more is wanted.

The serious wear on the rails and special work of a subway or electric elevated line is naturally to be expected. The wear of the rail head surface into waves is a familiar phenomenon. On such lines, with very frequent trains, many driving wheels, and very frequent stopping and starting, all sorts of wear must be expected. It has not been properly determined, however, in how far sheer chemical hardness, so to speak, can be brought to resist such action without the risks that come from lack of homogeneity. In a general way, one may charge up the breakage of ordinary railroad rails to the bounding action of heavy locomotives, and electric roads are relatively free from it. A serious point to be determined is, how far one can follow purely railroad precedents to advantage in drawing rail specifications. It may well turn out that the relatively fast and light traffic of an interurban system is best met with a slightly different rail both in section and composition from that commonly used on railroads for traffic apparently of about the same magnitude. The life of a rail depends both on the rate at which metal is removed and the amount which can safely be spared, and it may turn out that in some cases sheer weight may have been overdone at the expense of intrinsic wearing properties. To determine this point a large amount of close observation and measurement of wear is necessary, hence these suggestions. Every one realizes that there is a considerable difference between the mechanical action of great weights at moderate speeds and moderate weights at great speed. That the strains un-

der the latter conditions are severe, the necessary reconstruction of the track during the Berlin-Zossen tests showed beyond a doubt. Temporary tests cannot show the results of continued strains, so that very little practical information as to the reaction between track and cars was gained, save with respect to the need of cars in adjusting the running balance of the trucks, a subject which had been hitherto neglected. As a preliminary to the heavy high-speed work soon to be attempted, a study, the more complete the better, of track for fast electric railway service is badly needed. The subject would be an excellent one for concurrent action among the interurban roads now so well organized, and an investigation would quite certainly be productive of much information of a high, practical value.

Electric Trunk Line Operation

Mr. Sprague's paper and the subsequent discussion, which we published last week, form a most interesting addition to the literature of a much mooted question. Mr. Sprague has a combination of varied experience and hard common sense that makes him always instructive, and there is, too, a spice about his remarks regarding alternating-current working and apparatus that gives a certain aroma to his discussion. Omitting details, the real broad necessity for successful operations on trunk line road is a voltage upon the working conductors very much greater than the customary 500 to 600 volts—at least ten times as great if possible, at all events as high as engineering skill permits. Until such high voltages are available heavy electric traction is a mere makeshift, conditioned upon local requirements. The character of the motors, provided they are capable of doing the required work economically and well, is altogether a secondary matter.

There are in existence four distinct schemes of working traction motors from high voltage conductors. These are: (1) the single-phase commutating system of the general type adopted by the New York, New Haven & Hartford Railroad; (2) the Ward-Leonard system, using synchronous converter, permutator, or the like, on the locomotive in conjunction with d. c. motors; (3) the three-phase system with induction motors; (4) a d. c. system either at 1200 or more volts, two-wire, or at twice as much in a self-balanced three-wire system. Until all these systems have really been properly threshed out, it is of little use to go into too great detail as to the theoretical advantages of each. At the present moment only one—the first—has been seriously considered in this country, and even this is nowhere yet actually running upon a scale sufficient to constitute a fair basis for judgment in connection with heavy traction. We had hoped long ere this to see the New Haven work carried out on a large scale as a valuable example, but many months of preparation have gone by without even an approximation, so far as published data are concerned, to practical results. On the other hand, all four systems have been tried practically on the Continent, and sufficiently good results have been obtained from each to show that each has serious claims for further consideration. In view of this, it is plain that any snap-judgment on the subject is unwise. Hence we heartily agree with Mr. Sprague that high-voltage d. c. motors are worthy of thorough trial, and that any attempt at the present time to settle upon single-phase a. c. motors as a finality is decidedly premature. This fact was indicated by the favorable testimony at the meeting in regard to the commutation both of the untried high-voltage d. c. motor and also of a new single-phase motor, showing that the possibilities of each are not yet definitely determined.

Mr. Sprague devotes his attention chiefly to a comparison between commutating a. c. motors and high-voltage d. c. motors. Since experimental data upon both of these are conspicuous by their absence, the discussion of their relative advantages is for the present chiefly academic in character. There are certain obvious objections to the former type, alleged by those most familiar with it to have little practical weight. On the other hand, there are no sufficient data on the type of d. c. motor advocated by Mr. Sprague to enable a fair opinion to be formed regarding it. It looks promising, albeit, as Mr. Stillwell showed in the discussion, comparisons of weight and efficiency made on theoretical grounds are not altogether trustworthy. When it comes to general railway work involving heavy freight haulage, small differences in weight of the locomotive will not count for much and the practical advantage may even rest with the heavier machine. And in freight haulage there are conditions so entirely different from those met in the electric traction hitherto attempted as possibly to invalidate all present conclusions. Certainly until much experience has been gained with high-voltage d. c. motors their capabilities in large-scale work will remain rather a matter of guesswork, like those of the commutating a. c. motor. And the three-phase system or the converter system may finally prove to be superior to either of the others.

Whatever system shall finally be decided upon as preferable for heavy electric traction, the chances seem to us to favor a voltage on the working conductors too high for third-rail distribution. The questions of insulation, which cannot be neglected even at 500 volts, become much more serious at 2000 or 2500 volts. When properly protected and insulated for such conditions, a third rail stands a good chance of being, to all intents and purposes, as costly, complex and troublesome as any overhead system would be. And voltages less than these are hardly to be taken seriously as a way out of the distribution difficulty which will always be uppermost in the electrification of trunk lines. From the work of Thury, it is clear that there has been far more fear of high-voltage d. c. machines than was justified by the facts. The motors of an electrical locomotive for trunk line service can operate under much more favorable conditions than those of a street car, and it does not seem impossible that single motors of 250 or 300 hp for use on 2000 to 2500 volts may be successfully developed, allowing the use of double these voltages in a self-contained, three-wire system. A really high voltage d. c. system with low distribution losses, coupled with the well-known good points of d. c. motors, is not to be sniffed at even by the most hardened advocate of a. c. working. Just now this country has little to show along this line. It is a subject upon which we sorely need light, as well as upon the practical working of large a. c. motors.

THE SYSTEM OF FIRE PROTECTION AT THE PLANK ROAD SHOPS OF THE PUBLIC SERVICE CORPORATION OF NEW JERSEY

BY MARTIN SCHREIBER, M. E.

Probably no equipment subject is more important to railway managements than the fire protection of structures, for while it would be an easy matter to design a building ideal in fulfilling the fire underwriters' requirements, the railway company, unfortunately, is compelled to operate with the means at hand in the most economical manner, to secure even ordinary returns on the investment. Insurance inspection departments frequently offer suggestions that if carried out would interfere with operation. However, there is a point of compromise at which it is feasible to get maximum protection without inconvenience and for minimum expenditure.

In this article the writer will describe how the management of the Public Service Corporation has attempted to attain the happy mean in the fire protection system installed for the Plank Roads shops at Newark. The subject of fire protection was mentioned in the former descriptions of this particular property which appeared in the Street Railway Journal of July 22 and Sept. 2, 1905, and reference may be made to them to understand fully the general layout of and operating conditions at this particular location. However, the plan shown in Fig. 1 is sufficient to give a clear idea of the relative location of the structures comprising the layout. As effective fire protection depends on other factors besides fire-fighting apparatus, it should be of interest to describe briefly the practice of the company with regard to handling and storing manufactured material and some features of the construction. The shops are of single-story type with concrete floors. The large swinging doors open outward, while the small doors are of the fire underwriters' sliding type with fusible link and chain. Where more than two cars are stored on a single track, as in the paint shop, there is, beside the transfer table, a special-work exit from the building to permit the rapid removal of cars. The paint shop, paint storage, carpenter shop, machine shop, storage house, boiler house, oil house and dry kiln are all separate buildings.

Since the paint department is a very important risk, every pains was taken to reduce the fire risk here to a minimum. Supplies such as oils, paints and varnishes must not be stored in the paint shop under any circumstances, a separate fireproof building being provided for that purpose. The inside view of the paint storehouse, shown in Fig. 3, gives an excellent idea of the orderly arrangement followed. All the material is in charge of one man who serves the men with the necessary amounts and takes care that all material not used in the course of the day is returned at night. This careful procedure makes the paint shop risk almost as low as that of an ordinary shop.

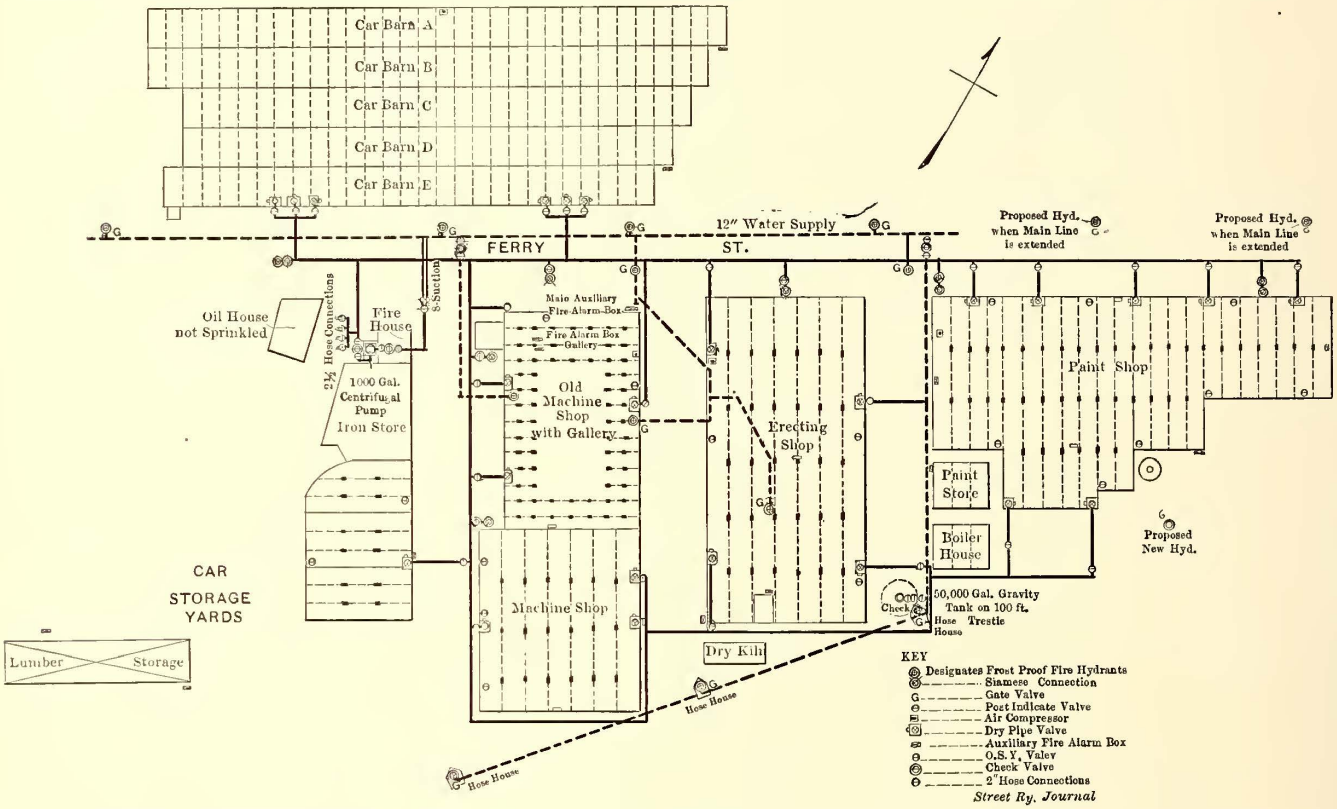


FIG. 1.—GENERAL LAYOUT OF THE PLANK ROAD SHOPS OF THE PUBLIC SERVICE CORPORATION OF NEW JERSEY, WITH KEY TO FIRE-PROTECTION EQUIPMENT

The erecting shop, where all woodworking is carried on, and the mill room create considerable highly inflammable material. The shavings and dust are quickly taken care of by means of a Buffalo forge exhauster that pulls the debris through galvanized iron piping, depositing it in the boiler house. No raw material is stored in these shops, the necessity for this being avoided by a separate building for lumber drying and isolated lumber storage.

Lubricants and oily waste are stored in a concrete fireproof oil house of the type illustrated in the article on the Dunellen terminal published in the March 16 issue of the Street Railway Journal. In line with the drastic shop rule that material of this character must not be thrown on

the floors or in corners, waste cans are liberally distributed throughout the different buildings on the grounds.

Danger from fires that originate from cast-off greasy clothing carelessly thrown in some obscure corner is obviated by prohibiting the men to store their clothing except in the regular expanded metal lockers supplied for the purpose. These lockers are constructed of expanded metal and stand 6 ins. off the floor, so that the contents are plainly visible and accessible to light and the free circulation of air. They were built by Merritt & Company, of Philadelphia, to the specifications of the company.

In the machine shop, the pits, so often a source of worry to the underwriters, are of the closed type. Despite the advantages claimed as to the cost and convenience of open pits, the closed pit seems more desirable for a truck shop, not only from the fire underwriters' point of view, but from an operating standpoint. Where open pits are used it is difficult to prevent the workmen from throwing pieces of oily waste and scrap under the floor, but with a closed pit such material could be readily detected even in a casual inspection. Open pits are used in the carpenter shop to get sufficient clearance in working on the car bodies or for inspection and final adjustment, but at this point there is little likelihood of danger from hidden oily waste.

FIG. 3.—INTERIOR OF PAINT STOREROOM

HEATING

The heat for the entire property is generated in an isolated boiler house. In the paint shop the required temperature is obtained by direct radiation. Pipe coils are used only on the roof trusses near the skylights, while the rest of the heating is accomplished through cast-iron floor radiators. These are considered preferable to the pipe coils, as each unit is absolutely isolated from the building and fixtures.

The carpenter and machine shops are kept at the desired temperature by the blower system, each having a separate set of heater coils. No air delivery pipes pass through the walls or are in contact with inflammable material in any way. The forges in the blacksmith shop are of the Buffalo down-draft type, so that there is little opportunity for fire to originate from this source. The oil for the Ferguson furnaces is stored in the isolated storage tank shown in Fig. 4.

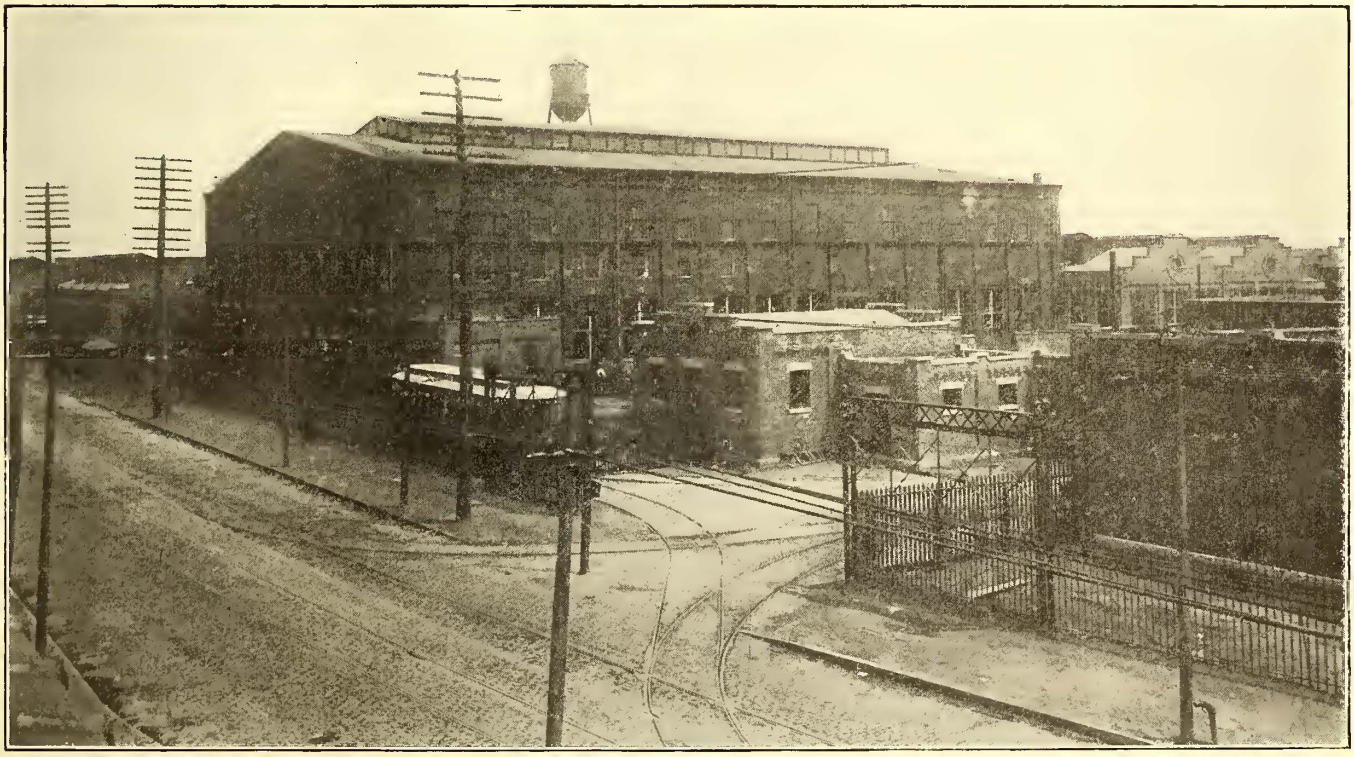


FIG. 2.—GENERAL VIEW OF THE PLANK ROAD SHOPS OF THE PUBLIC SERVICE CORPORATION OF NEW JERSEY, WITH THE FIRE HOUSE IN THE FOREGROUND

LIGHTING, POWER AND RAILWAY CIRCUITS

The general inside lighting is by enclosed arc lamps, but incandescent lamps are used around the machines, offices, etc. Both the power and light wiring is carried in metal conduits, following closely the latest rules of the underwriters. Particular attention was paid to the construction of the trolley wiring in all buildings. The trolley is carried on barn hangers properly insulated and bolted to a trough fastened to the bottom of the roof trusses. Circuit breakers are installed at all points where the wires enter or leave the buildings. Inside each building and attached to heavy bracket insulators is a feeder from which taps are made to each trolley wire. A switch or circuit breaker, placed on a pole outside of each building from which a feeder runs to outside lines, permits that particular building to be cut out at once in case of fire. Should a ground occur on a trolley inside a building, it will result in the immediate throwing of the corresponding circuit breaker. As transfer tables between buildings the trolley comes out of one structure and is snubbed or dead-ended at the opposite one, which makes it possible to keep the current away from a particular building and still have power on the wires over the transfer tables for shifting cars.

FIG. 4.—OUTDOOR STORAGE TANK FOR CRUDE OIL.

THE FIRE-ALARM SYSTEM

When a fire is discovered it is, of course, important to turn in an alarm to the city's fire department, besides taking immediate steps to extinguish the blaze with the local apparatus. Where the facilities for turning in an alarm quickly are combined with fire-fighting means, there is very little chance for a bad fire. The Gamewell auxiliary fire alarm system installed in these premises by the New York & New Jersey Fire Alarm Company seems to meet every requirement for which it is intended. Fig. 7, which shows a fire alarm box conveniently located on the wall of the paint shop, is typical of those over the entire property. The boxes have serial numbers corresponding to different parts of the grounds. There are twenty stations in all, or one fire alarm for every 11,000 sq. ft. of floor area. The apparatus is regularly inspected by the owning company, which is paid an annual fee for keeping the apparatus in working order. Records of tests and inspections are always accessible to those interested in its proper operation.

FIG. 5.—A VIEW ALONG AN AISLE, SHOWING A FIRE EXTINGUISHER, DRY VALVE BOXES, GONGS, ETC.

FIG. 6.—SOME OF THE FIREPROOF METAL LOCKERS FOR THE SHOPMEN

All of the alarm boxes are connected to a box on the outside wall of the main shop. This box will be removed to a street pole, the present location being only temporary. This box is wired in turn to the nearest fire station, which, fortunately, is only 3000 ft. distant. In reality, turning in

an alarm from any of the auxiliary boxes is equivalent to one from a regular city box. To make the apparatus more effective, a return signal is given the operator to assure him the desired result has been attained. Hence, if the alarm is not in working order, something very unlikely, he knows that he must go at once to the nearest city station. Repeated tests have demonstrated that an alarm can be turned in from any of these boxes to the city fire station within twenty seconds.

In the boiler house there is a cabinet containing batteries and two gongs, this arrangement being so designed that one gong rings when an auxiliary alarm box is pulled, while the other gong never rings unless there is a disarrangement of the apparatus, such as an open circuit. Night fires would be detected by any of the four watchmen and engineer on duty from 6 p. m. to 6 a. m. The watchmen operate Newman clocks at the respective stations.

HYDRANTS, HOSE CONNECTIONS AND FIRE PAILS

The system of outside hydrants for the use of the owners and the municipal fire departments is shown in the general layout of the building, Fig. 1. On Ferry Street there are seven frost-proof hydrants. Each has a connection for a 2½-in. standard fire hose and one steamer. Two more hydrants will be installed when the city main is extended at an early date. There are also three hydrants inside the buildings which were installed before the improvement of the property. All of these hydrants are of the Corey solid screen, frost-proof type, which seems to have many advantages for this class of service, as it is quickly opened, easily drained and has no sharp turns to cause material losses of pressure through friction. We have never known any of these hydrants to freeze, even in the coldest weather.

Three other hydrants of the same type placed inside the property line are covered with the underwriters' type of hydrant and hose house, views of which are shown in Fig. 20. Each house is supplied with a 50-ft. length of National 2½-in. cotton, rubber-lined fire hose. Two lengths of hose are connected directly to the hydrants and two are stored

FIG. 7.—FIRE EXTINGUISHER AND INSIDE ALARM BOX

FIG. 8.—THE SPRINKLER ARRANGEMENT IN THE PAINT SHOP FINISHING ROOM

on the upper shelf shown in the drawing. The other equipment includes a Dietz brass lantern, fire axes, two 30 in. x 1⅛-in. play pipes, four Tabor spanner wrenches, two ladder straps for holding hose on ladders, rubber washers and one crowbar.

Hose conections are also placed in each building. One of these, illustrated in Fig. 6, shows a reel of 2-in. linen hose with a hose pipe and stand secured to the wall. One 2-in hose connection is laid out for every 6000 sq. ft. of floor area. As the buildings are heated in cold weather, water can be kept on these connections at all times.

For every 2500 sq. ft. throughout the entire property there are apportioned two fire pails, one filled with water and the other with sand. The pails are painted red, with large black letters "Fire" stenciled on the side. They have round botoms and are kept covered.

CHEMICAL FIRE EXTINGUISHERS

As a safeguard against a fire in its early stages, nothing surpasses the judicious and timely use of chemical fire ex-

tinguishers. "A little fire is quickly trodden out, which, being suffered, rivers cannot quench." Although this particular protection is not very effective once the fire has gained great headway, it is surely to be commended for use at the start, because its mobility permits it to be brought to the fire in a very short time. In the writer's opinion, too much significance cannot be attached to the liberal adoption of this particular appliance. In this installation one 3-gal. extinguisher is provided for every 2000 sq. ft. of floor area in addition to a chemical engine of 50 gals. capacity in each building. A red glass incandescent lamp is installed near each extinguisher to point out its location more readily in case of a night fire. The fire extinguishers illustrated were furnished by the Tea Tray Company, of Newark, N. J., and the chemical engines by the Woodhouse Manufacturing Company, of New York.

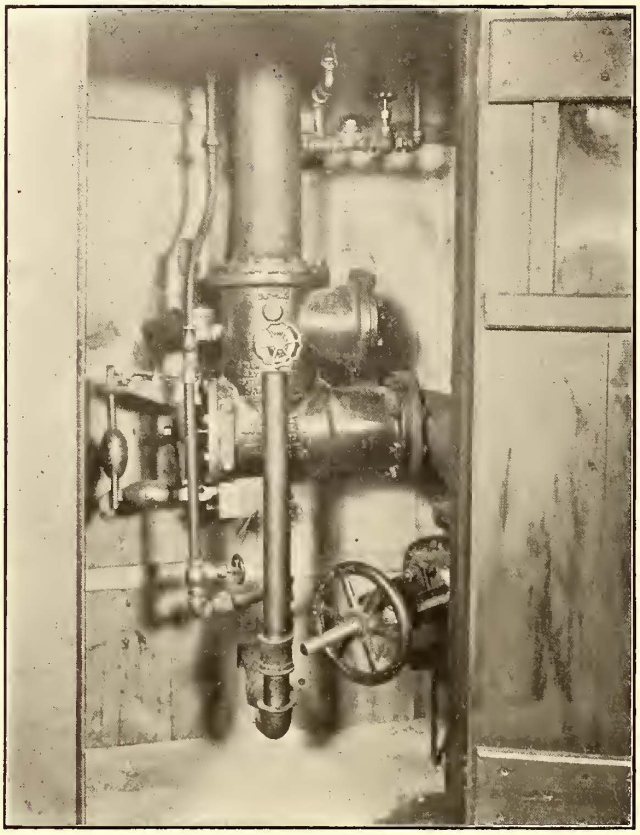


FIG. 10.—ONE OF THE DRY VALVES

THE SPRINKLER SYSTEM

The dry pipe sprinkler system installed throughout is of the non-corrosive type made by the Manufacturers' Automatic Sprinkler Company, of New York. All sprinkler heads are carried from the roof trusses, except in the car house, where aisle sprinklers are also used.

Aisle sprinklers were not required in the shops, owing to architectural conditions, and an approved ceiling equipment only was installed. Fig. 8, which shows the roof of the finishing room in the paint shop, clearly defines the arrangement of the sprinklers. The fittings are of the simplest character, and, where possible, the pipes are bent to avoid their use entirely. Hangers of a special graduated type are employed so that the pipes are easily adjusted for drainage. The horizontal piping is laid to a pitch not less than ½ in. in 10 ft. The arrangement of heads as shown in Fig. 11 follows what is known as the central side feed principle.

The general design of the buildings is very favorable to roof sprinkler protection, as all of the buildings are but one story high and the bottom chords of the roof trusses are only 16 ft. above the floor. Again, the spans are short and there is little waste room among the truss members. The roof proper is of 2-in. plank over 8-in. channel iron purlins, which permits an excellent arrangement for running the sprinkler pipes clear and free on the bottom of the planking between the purlin members. It may be of interest to add that the sprinkler heads over the oil furnaces in the blacksmith shop are the only ones having a high fusing point, as they are arranged for 300 degs. F. instead of the usual 165 degs. F.

Buildings.	Dry Valves.	Heads.	Heads per Dry Valve.	Sq. Feet of Floor Area per Head.
Paint shop	7—6-inch	1,330	233	36.2
Paint store	Included in paint shop.	66	...	30.3
Erecting shop	4—6-inch	671	168	59.6
Dry kiln	None.	14	...	68.1
Old machine shop	3—6-inch	560	187	40.4
New machine shop	2—6-inch	429	214	52.9
Store house	1—6-inch	193	193	68.
Car house roof system	2—5-inch 2—6-inch	1,285	322	...
Car house aisles	2—4-inch	666	333	42.4
Totals	23	5,214	Avg. 226	Avg. 44.5

FIG. 9.—CHEMICAL ENGINE AND FIRE HYDRANTS IN THE PLANK ROAD SHOPS

The sprinkler heads and apparatus used in connection with them are distributed in the different buildings, as shown in the preceding table and also as indicated on the general plan of the property, Fig. 1.

It will be seen from the foregoing table that the layout comes well within the requirements of the underwriters, namely, that no dry pipe valve should serve over 500 heads and that no more than 100 sq. ft. per sprinkler head should be allowed. The table also shows that the property is divided into twenty-three sections, each supplied by an automatic dry valve. As this valve was described quite fully in the STREET RAILWAY JOURNAL of Jan. 28, 1905, it will not be necessary to present another description, but Fig. 10 is interesting, as it gives an inside view of the valve as actually installed at the Plank Road shops. It will be noticed that the valves are housed in wooden boxes provided with a door. Fig. 10 also shows the outside screw and yoke flanged valve under the dry valve so the corresponding section may be cut off inside the building as well as by the post indicator valve outside. The small pipe in the upper right-hand corner has a sprinkler head for the protection of the enclosure. Since this pipe is also used for the air supply from the compressor, a check valve is necessary. The vertical pipe with angle valve that runs from the center of the dry valve is a 2-in. drip to provide for thorough drainage once the dry valve is started. The small pipe on the left is for determining the condition of the water supply, the gage on it enabling the inspector to determine the exact pressure necessary to keep back the water supply until the dry valve is tripped. It is un-

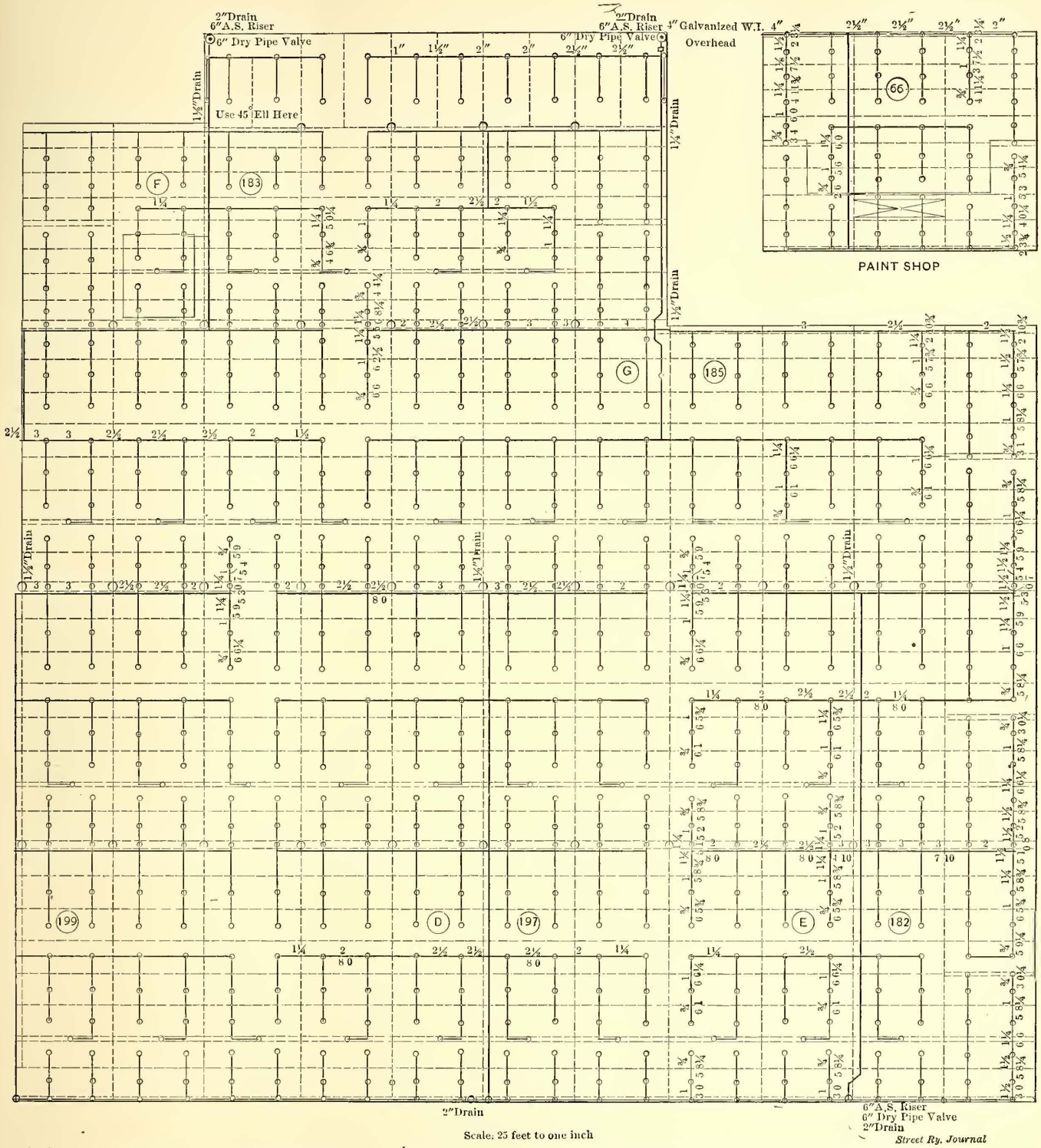


FIG. 11—SPRINKLER LAYOUT IN THE PAINT SHOP OF THE PUBLIC SERVICE CORPORATION OF NEW JERSEY AT NEWARK

derstood, of course, that when a sprinkler explodes the air is thus thrown out and the trip of the dry valve operates to permit water to flow into the proper sprinkler heads. The trip on the dry valve not only closes the circuit which starts the high-pressure pump, but also sounds a gong attached to the outside of the dry valve box, and will also be wired to sound the main alarm in the boiler house. An indicator in the boiler house will point to the number of the dry valve liberated for service, thus notifying the attendant of the exact location of the trouble. The four compressors used in connection with the dry valves are of the Christensen type and located as shown on the general plan, Fig. 1. Each is supplied with an automatic gate governor to insure the balance of the air and the water supply.

MAIN WATER SUPPLY AND HIGH-PRESSURE PUMP

The principal water supply of the system will depend upon the regular city mains in conjunction with the direct-connected, electrically-driven centrifugal fire pump, illustrated in Fig. 13. This pump is of particular interest, as it is one of the first of its kind to be installed in connection with a sprinkler system under the supervision and approval of the fire underwriters. Although the ability of centrifugal pumps to handle large quantities of fluid against low heads has been utilized for some time, manufacturers have only recently developed it to such a satisfactory stage that it has met with approval for discharging water at high pressure. If it can be shown that the centrifugal pump does the work at a reasonable efficiency, it deserves commendation for fire service on account of its simple construction and easy operation as compared with reciprocating engines. The Plank Road pump has a capacity of 1000 gals. per minute at a pressure of 100 lbs. per sq. in. It was manufactured by the International Pump Company after the specifications of the Associated Factory Mutual Fire Insurance Company, of Boston. It is driven at 920 r. p. m. by a General Electric direct-connected 85-hp, 500-

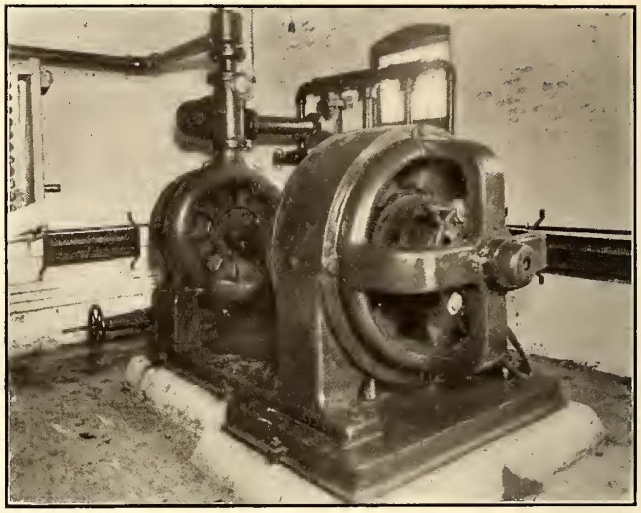


FIG. 13.—CENTRIFUGAL MOTOR-DRIVEN FIRE PUMP

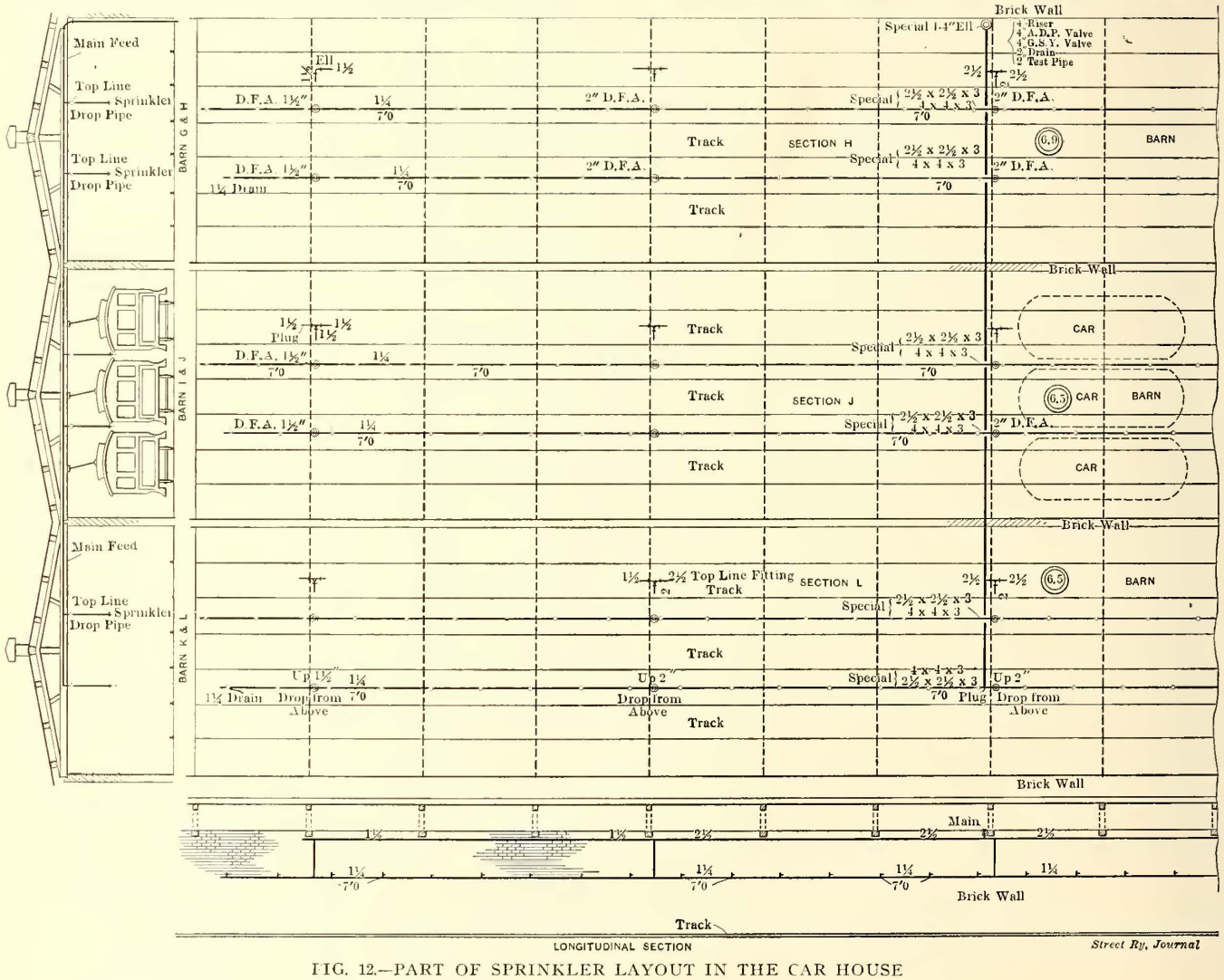


FIG. 12.—PART OF SPRINKLER LAYOUT IN THE CAR HOUSE

volt motor originally built for the standard speed of 800 r. p. m., but adapted for the higher speed required for the pump by the insertion of additional resistance in the field.

The value of this pump is evident from a comparison of the accompanying illustrations, Figs. 14 and 15, which show what happened during a test with four hose lines, first when the city pressure of 25 lbs. was applied, and second, when placing the pump in circuit brought the pressure up to 100 lbs. The difference in the character of the streams is too obvious to call for comment. The pump

FIG. 14.—A VIEW OF THE FIRE-HOSE STREAMS WITH THE CITY PRESSURE OF ONLY 25 LBS.

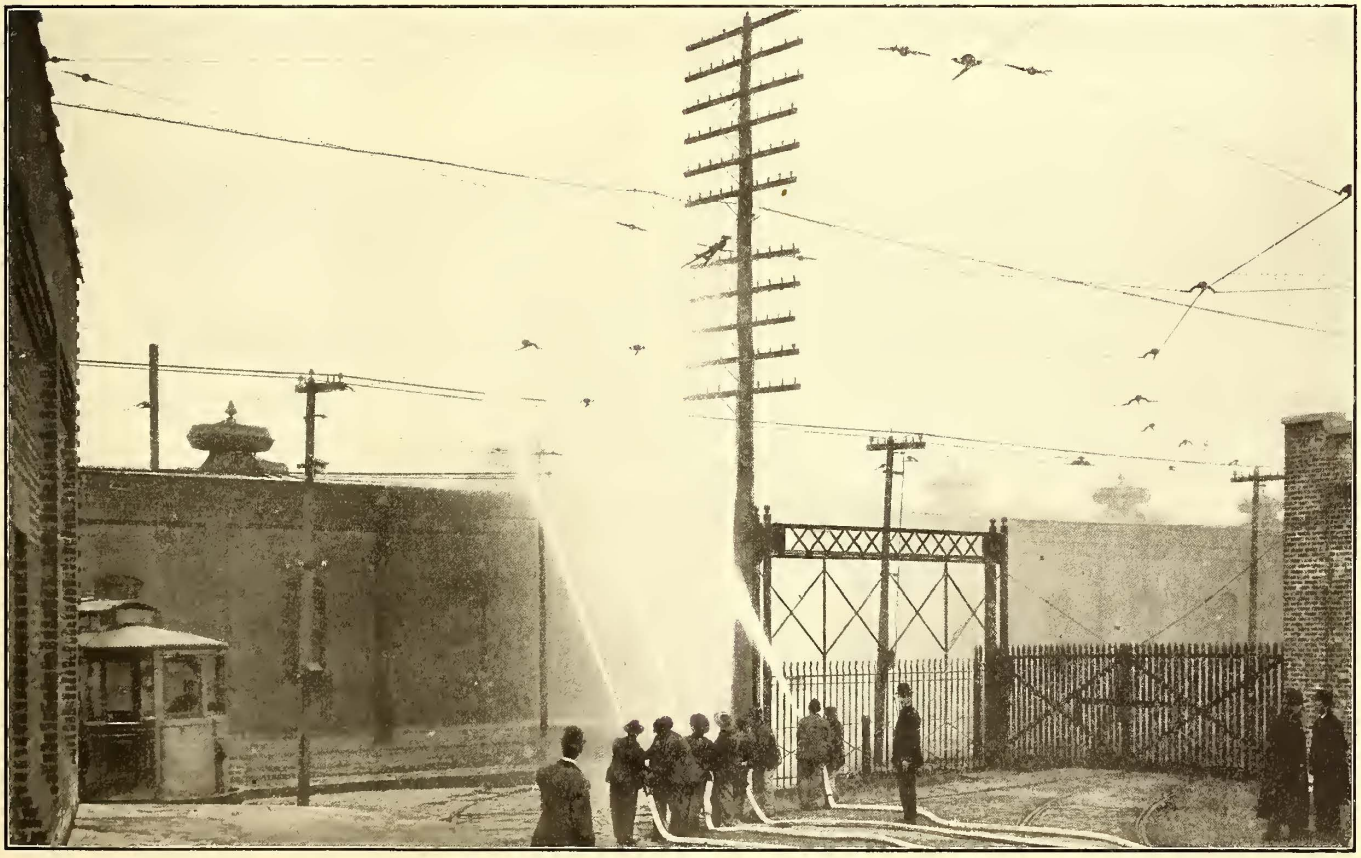


FIG. 15.—ANOTHER VIEW OF THE FIRE-HOSE STREAMS, SHOWING THE DECIDED DIFFERENCE WHEN THE PUMP HAD RAISED THE PRESSURE TO 100 LBS.

house contains a relief valve set at 100 lbs. pressure which has a connection that empties into a funnel-shaped pipe connected to the sewer. The purpose of this funnel pipe is to permit the determination of the quantity of waste water when the pump is operating.

FIG. 16.—ONE OF THE COMPRESSOR MOTORS FOR THE SPRINKLER SYSTEM

Originally it was planned that when a dry valve tripped the foreman in the boiler house would signal from the general alarm whistle and then go to the pump room to start the machine. To improve on this idea, a Cutler-Hammer automatic starting box will be installed and so connected that when a dry valve trips a solenoid armature will operate the starting box of the motor. Thus the pumping outfit will be placed on an entirely automatic basis.

AUXILIARY WATER SUPPLY

The auxiliary water supply will be stored in a 50,000-gal. round-bottom steel tank carried on a structural steel tower with its bottom 117 ft. above the ground. As the usual elevation of the sprinkler heads is about 30 ft., the water pressure on the highest sprinkler is about 40 lbs. The sprinkler heads in the roof of the old machine shop are elevated 50 ft., giving 16 lbs. pressure, the minimum allowed by the underwriters. It is evident, therefore, that the greater part of the shop is considerable in excess of the pressure required.

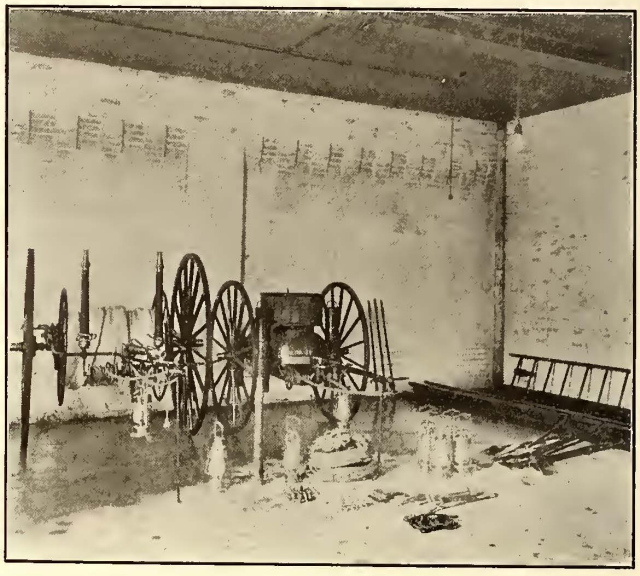


FIG. 19.—CHEMICAL ENGINE, HOSE CART AND OTHER FIRE EQUIPMENT IN THE FIRE HOUSE

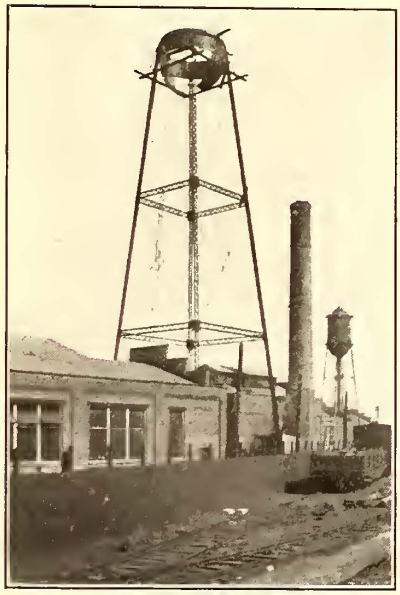


FIG. 17.—FRAMING OF THE NEW FIRE TANK

FIG. 18.—ONE OF THE HOSE CONNECTIONS ALONGSIDE THE SHOP BUILDING

From Fig. 1 it will be seen that the tank is connected in shunt with the regular water supply, an 8-in. pipe running from the bottom of the tank. In this pipe are placed two 8-in. post indicator valves with an 8-in. swing check

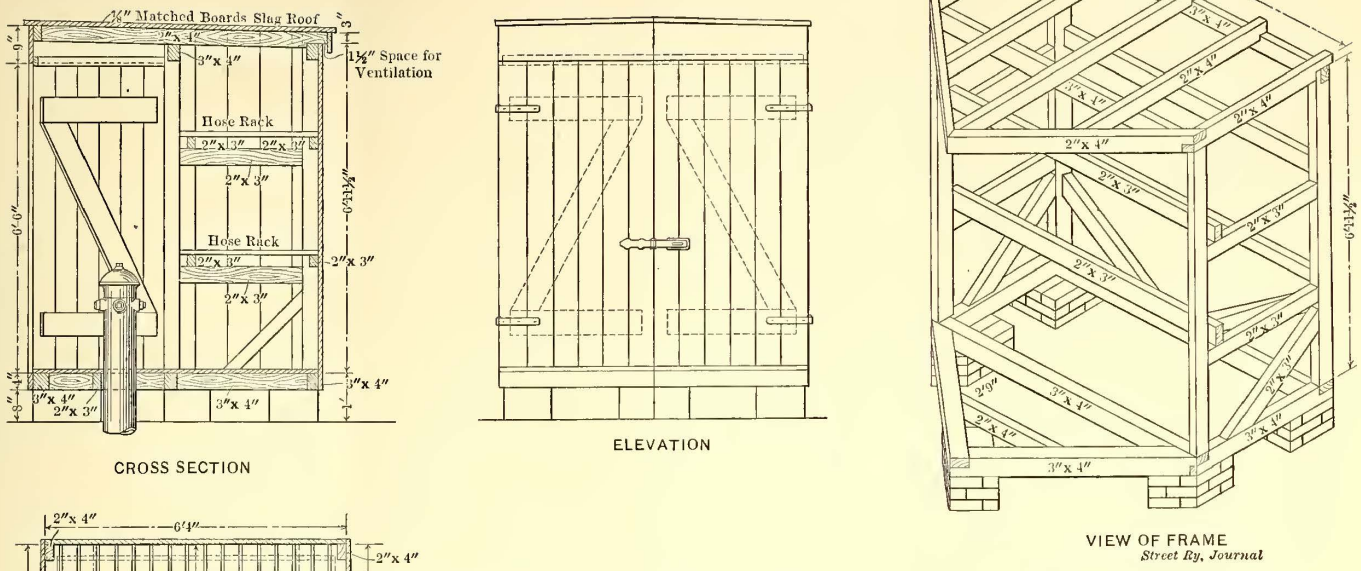


FIG. 20.—CONSTRUCTION DETAILS OF HYDRANT HOUSE

valve between them. This arrangement makes it impossible for the pressure pump to force water in the tank without using a by-pass, consisting of a 2½-in. pipe. There is also a 3-in. overflow pipe extending from near the top of the tank to the ground for carrying away water that rises above the required height in the process of filling. A tell-tale shows at all times the exact height of the water in the tank. To prevent freezing, a 1-in. steam pipe is carried from the boiler room to a coil of brass piping in the bottom of the tank. The other end of this coil terminates in a return pipe which brings the water of condensation back to the boiler house. All pipes to the tank will be thoroughly protected from the elements by a wood covering with air-gap insulation. This tank is simply an auxiliary held ready to furnish the required head of water for the sprinklers should there be a failure of the regular water supply. There is also a connection (not shown) between the point *G* in Fig. 1 to a hose house at the rear end of the machine shop.

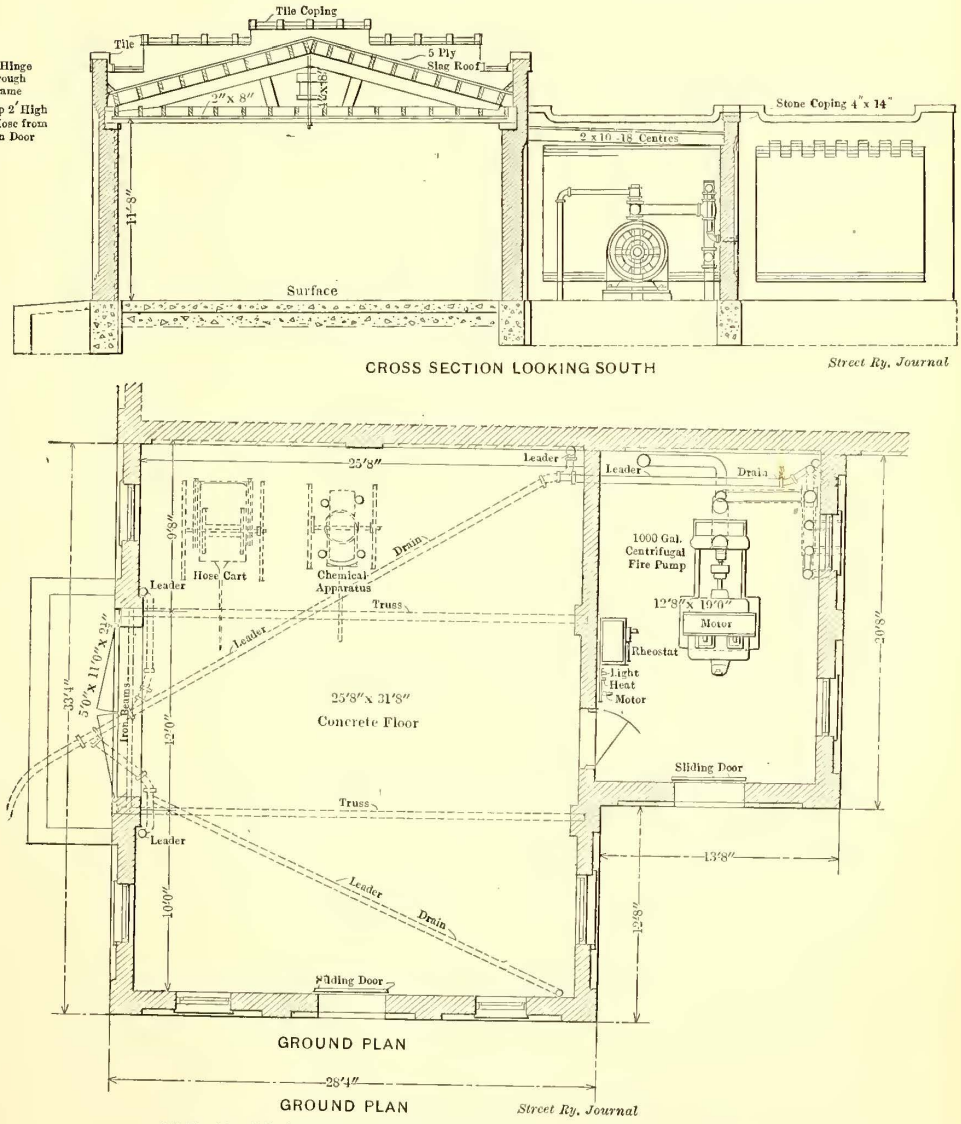


FIG. 21.—PLAN AND CROSS-SECTION OF FIRE HOUSE

THE FIRE HOUSE

The fire house is a brick building with concrete floors, constructed as shown in the accompanying plan and section, Fig. 21. The building is divided by a brick wall and fire door into two portions, one of which contains the electrically-driven centrifugal pump previously described

and the other the fire-fighting apparatus of the hose and chemical companies making their headquarters in this structure. The building is entirely isolated from the others, to reduce to a minimum its possibility of destruction by fire. The floor space is ample, being 25 ft. x 31 ft. The large double doors open outward as soon as the latch is released. Fig. 19 is a view of the section devoted to the fire-fighting equipment, which consists of the following: One Woodhouse fire hose cart, including all of the usual appurtenances, and 400 ft. of National standard 2½-in. cotton, rubber-lined fire hose; one No. 6 55-gal. chemical engine made by the Woodhouse Manufacturing Company, of New York, and including 100 ft. of ¾-in. hose, acid receptacle and soda bags; fire axes; crowbars; monkey and hydrant wrenches; Tabor spanner wrenches; extension ladders; ladder straps; fire hooks; Dietz fire lanterns; coils of ½-in. rope, and, in fact, almost everything required for effective fire fighting.

PRIVATE FIRE DEPARTMENT AND MAINTENANCE OF EQUIPMENT

A general plan of the sprinkler system and the other fire protection apparatus will be placed in glass-covered frames mounted on the walls throughout the buildings. A list of general rules recently adopted by the management covering all the different properties operated by the company is submitted below and will be used at the shops:

INSTRUCTIONS TO EMPLOYEES IN RELATION TO FIRE PROTECTION

(1) IT IS THE PARTICULAR DUTY of all employees of this company to use every precaution to prevent the origin of a fire on this property.

(2) IN CASE OF FIRE turn in city alarm at once. Properties with auxiliary alarm systems should have the same in good working order at all times. To operate an auxiliary alarm box which has precisely the same effect as turning in an alarm from the regular city station, break glass and pull down ring. When you hear the box buzz it is an indication that the signal is operated. If you do not know where the city fire alarm box is located look at placard defining its location. In case there is no auxiliary or city alarm box on the property, go to the box located as indicated on this card.

(3) CHEMICAL FIRE EXTINGUISHERS should be placed judiciously and conveniently about the property. The extinguishers must be kept charged and a record of same written on card attached. When not in actual service for nine months, they are to be recharged. In freezing weather extinguishers must be kept in a warm place and returned to their original location just as soon as weather permits.

(4) FIRE PAILS that are placed in pairs. In freezing season salt is to be added to water pail or water is to be substituted with sand. It is imperative that pails are not used for any other purpose than for fire. Pails are to be painted red and be careful that the side upon which the word "Fire" is stenciled in black letters is in sight. In extreme weather, when there is any danger of the salt water freezing, sand should be substituted and the water replaced as soon as weather conditions permit. In exposed places a permanent box for the protection of sand pails will be provided.

(5) FROST PROOF FIRE HYDRANTS are to have wrenches always in place and hose and nozzle attached to hydrant. Hose to be neatly stored on rack or reel. Hydrants are to be clear from all encumbrances, so that it is possible to put them in use at any moment. A wheel may be substituted for a wrench, but if wrenches are attached it should be in some method so that they cannot be removed.

(6) INSIDE STANDPIPES AND CONNECTIONS are to be guarded against freezing by turning off water below the ground line and whenever water is thus stopped a placard is to be placed at connection with these words, "Turn on valve at ————————" Standpipes are also to be connected up with hose line and nozzle, which is to be stored on reel fastened to the wall. All hose and hydrant equipment should be tested at least every two weeks, after which equipment is to be carefully drained and restored to its usual position.

(7) OILS AND OILY WASTE or similar inflammable material should be stored in fire-proof oil house, oily waste being placed in strainer tank. No oils, grease or similar inflammable material allowed on property except in small quantities that are to be immediately put into service.

(8) CLOTHING, especially greasy garments of employees, must not be stored about the building, but retained in regular lockers provided for that purpose, and even in lockers clothing should not be retained there for a long period, and only such articles of wearing apparel as are regularly in use.

(9) ASH CANS—Floors on all property must be kept reasonably neat and clean. Ash cans should be emptied daily. Oily particles of waste, scraps, car sweepings, etc., are to be promptly placed in the regular can provided for that purpose, so that none of the debris is lying promiscuously about the premises.

(10) BOILER PLANTS to be carefully inspected, and it is important to keep the boiler room clean and tidy in appearance, so that ashes do not accumulate. Ashes should not be left under grate until the burnt fuel comes in contact with bottom of grate bars. Ashes should be removed from under boilers once every twelve hours.

(11) WIRING. The wiring for trolley and lights should be systematically examined so that no live circuits are uninsulated or in contact with inflammable material. Portable lights are not to be used, except in special instances, extension incandescent lamps that have well insulated cords and globe protected with guards may be in service.

(12) TROLLEY POLE must be pulled down as soon as the car is placed in the house.

(13) CAR FIRES must be started outside of house. When a car is coming into a house it is to have fire extinguished before entering building and the refuse placed in ash cans. Cars having hot water heaters are to have fires banked before entering car house.

(14) SPRINKLING SYSTEMS to be systematically inspected daily, records made of air and water pressure of dry valves, height of water in tank, temperature, etc., so that the arrangement is properly maintained.

(15) WATCHMAN'S CLOCKS are to be carefully examined each morning, taking special notice to see that the cards have been properly punched at the respective stations.

(16) OFFICIAL HEAD in charge of property will conduct a regularly outlined fire drill at least once a month.

GENERAL PROCEDURE IN CASE OF FIRE

Should a fire be discovered before a sprinkler opens, an alarm will be turned in from a fire box. This will give an automatic signal to the boiler house engineer, who will immediately sound an alarm on the large air whistle. The number of whistle blasts will indicate the building where the fire has been discovered. Should a sprinkler open first, the tripping of the corresponding dry valve will send a similar signal to the boiler house. Electrical push buttons will be installed also in each building and other points about the premises, from any of which a person discovering a fire can operate the alarm whistle by closing the circuit.

One man will be in direct charge of all the fire apparatus, his duties being confined strictly to this feature of the installation. He will register daily the water pressures, air pressures, and make similar records on appropriate blanks. He will also make repairs, but should he discover defects which he cannot correct alone, arrangements will be made to secure the proper means at once.

PRIVATE FIRE DEPARTMENT

Charles E. Remelius, superintendent of rolling equipment, who has charge of the Plank Road shops, is now organizing a private fire department, consisting of six companies in all. There will be three local companies for the paint, erecting and machine shop buildings, respectively, with headquarters at the hose house, shown in rear of

property as laid out on the drawing; also a general hose and chemical company, with headquarters at the main fire house. The two general companies respond to all alarms, while the local companies respond only to alarms that designate the particular building to which they are assigned.

In accordance with the suggestion of the fire underwriters, the private fire department will be drilled at regular intervals and also unexpectedly to test its readiness. This department will be headed by the general foreman as acting chief, and the respective foremen as captains.

DESIGN OF THE FIRE-PROTECTION SYSTEM

Bruce E. Loomis, manager of the Underwriters' Electrical Inspection Bureau of New York, represented the underwriters in co-operating with the company in arranging the protection of the property, and the complete installation was subject to his approval.

NEW ENGLAND STREET RAILWAY CLUB

The last New England Street Railway Club meeting of the season was held at the American House, Boston, on the evening of May 23, President Henry C. Page, of Springfield, being in the chair. The speaker was P. F. Sullivan, president of the Boston & Northern and the Old Colony Street Railway Companies, his subject being the Public Relations and Investment Sides of the Street Railway Business.

Mr. Sullivan pointed out that good operation, important as it is, is not enough to insure business success in street railway work. The broader obligations of the company to the public and the invested capital must also be fully considered. He discussed the history of charter legislation in Massachusetts from 1864 to the present year, emphasized the efforts of local boards of aldermen and selectmen to coerce the companies into making all sorts of unprofitable concessions, and dwelt upon the advantages of the later laws which place the final jurisdiction in regard to locations and alterations of locations in the hands of the Massachusetts Railroad Commission, calling attention, however, to the great burdens of the excise tax which was imposed in the legislation of 1898. Last year the Massachusetts street railways paid $3,550,000 in dividends and $1,923,000 in taxes, or over $1 in taxes for every $2 paid in dividends. The public clamors for additional street railway taxation, yet in the last year street railway companies were taxed at the rate of $14.87 per thousand par value of stocks and bonds, and the average tax rate of the State on all property was $16.10. This shows that the street railway is in no danger of escaping the tax gatherer. The public is entitled to everything fair and reasonable, but unfortunately the public does not stop here. It makes many companies pay for the privilege of losing money. Franchises in Massachusetts are, in a sense, perpetual; but they are not exclusive, and there is a broad difference between such a franchise and a limited franchise which is exclusive.

Touching upon the large development of street railways in Massachusetts, Mr. Sullivan stated that there is now in the State 1 mile of trolley track for less than each 3 square miles of territory, against 17 square miles in New York State and 15 in Pennsylvania. There is in Massachusetts 1 mile of track for each 1200 inhabitants. What this development means in invested capital may be appreciated by the following figures:

In 1865 there were 137 miles of street railway in Massachusetts; in 1885, 376 miles, or an increase of 174 per cent. During this period the income increased 233 per cent, showing better earnings per track mile, and the investment increased 200 per cent. Between 1885 and 1905 came the development of electric traction. Trackage increased 640 per cent, or from 376 to 2777 miles; income increased only 420 per cent, showing a reduction in earnings per track mile, and the investment increased 900 per cent. The ratio of capital to income, expressed in terms of the investment needed to take in $1 of income, was as $3 to $1 in the period between 1865 and 1885, but between 1895 and 1905 it rose to a ratio of $5.50 to $1. Mr. Sullivan paid a strong tribute to the courage of Henry M. Whitney and his associates in the West End Street Railway Company in 1888-9, when that company changed from horse to electric traction on a large scale, stating that if the great risks which capital then took had proved failures, it would probably have retarded the growth of electric traction by twenty years.

Operating men pointed out that the operating ratio was 80 per cent with horses and 60 to 65 per cent with electricity, but they often overlooked the investment necessary to produce this result. Of the leading ten companies in Massachusetts, that do 90 per cent of the whole trolley business, one of the best companies has very low car-mile earnings. Income per car-mile is not the only point, but capital must be considered as well. Higher speed operation means higher running expenses, except in wages of car men, and there is no escape from this conclusion. For purposes of comparison merely, Mr. Sullivan cited two large companies in the State, showing the results of an analysis of their operating figures. Company 1 has an investment of $55,000 per car operated, and Company 2, $236,000. There is no water in either company. No. 1 has a power station investment of $8,400 per car operated, and No. 2, $37,000. The operating ratio of No. 1 is 71 per cent, of No. 2, 51 per cent. No. 1 earned from 7 to 8 per cent dividends, and No. 2 made a showing of 6 per cent; but while No. 1 expended 22 per cent of its income in maintenance and of this 14 per cent in track maintenance, No. 2 spent but 13 per cent of its income in maintenance and but 3 per cent on track upkeep. The ratio of capital to income was as 4 to 1 with Company 1 and as 7.5 to 1 with Company 2.

Speaking of high-speed operation, Mr. Sullivan stated that faster running saves car men's wages, but other expenses tend to increase about in proportion to the speed. Power increases and the investment to produce that power rises. Car maintenance also goes up. The mere cost of power in the case of Company 2 was 2.5 times that of Company 1, and yet coal was about the same in price per ton for each one. The ratio of capital to income is strongly illustrated by the figures of last year in Massachusetts. Of the total track mileage 46 companies owned and operated 760 miles, and these companies registered a total deficit of $122,500. The ratio of capital to income was as $8.35 to $1. When this ratio reaches $20 to $1, and even higher, as it sometimes does, receiverships will come. No State in the Union, no country in the world, has such frequent transportation service as Massachusetts. Interurban roads must take care not to fall into the same pitfalls which have beset some of the surface street car lines. The operating conditions mean heavy capital as compared with the open country and less frequent service of the West.

THE STREET RAILWAYS OF BUENOS-AIRES, ARGENTINA

(FROM OUR SOUTH AMERICAN CORRESPONDENT)

The conversion of the old horse tramway lines of Buenos-Aires to systems of modern electric railways has taken place, and is taking place with such rapid strides in this great city of the south that information on the subject soon becomes obsolete. This article, therefore, is written to keep the readers of the Street Railway Journal up to date in this matter, giving them the most recent statistics as to the great volume of business the street railways are doing here, the way their business is conducted, the style of cars in use, the various types of construction employed, and such other data as may prove of interest.

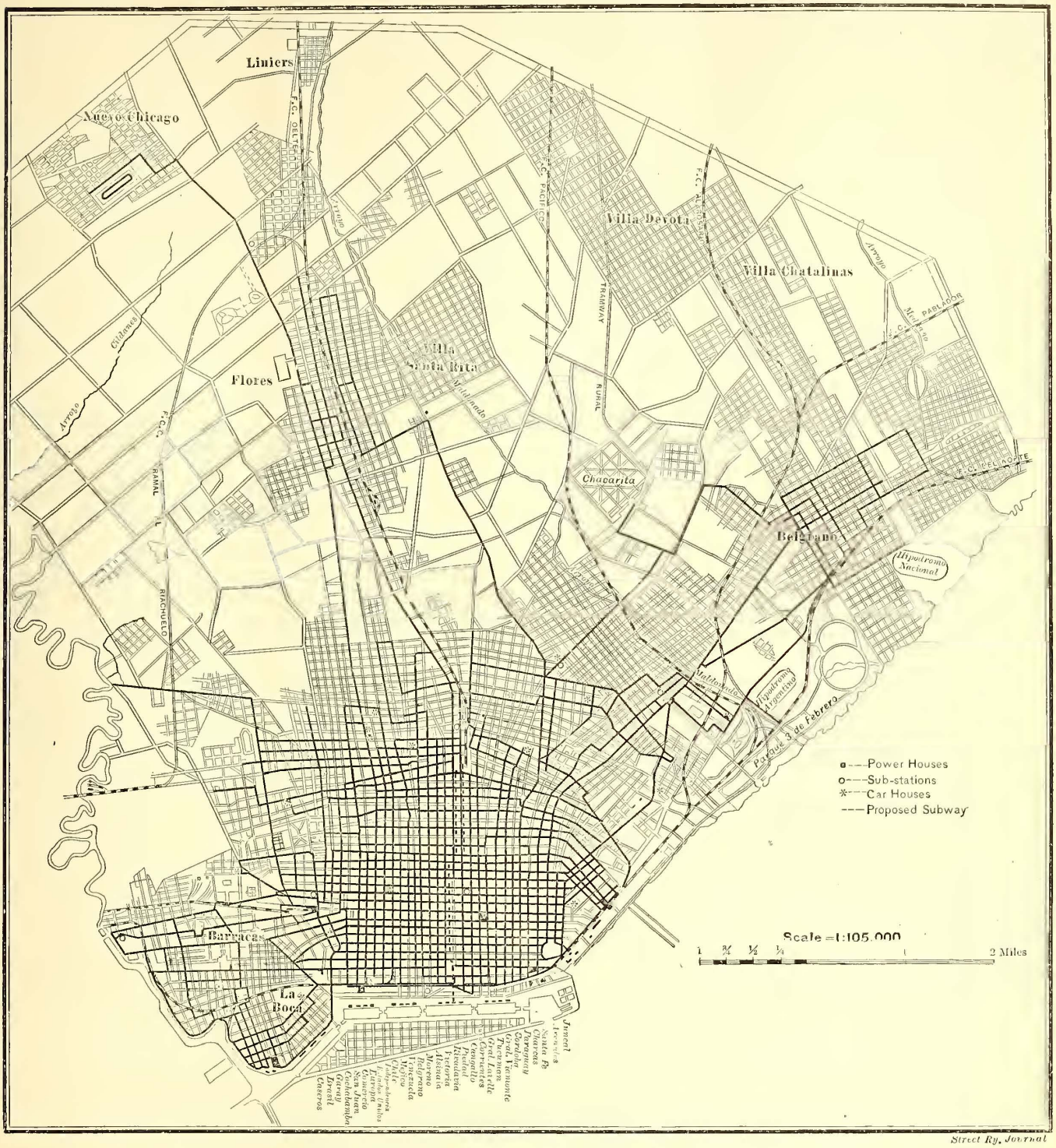
By far the great majority of people in the United States have no idea that some 1200 miles below the equator there is a large, busy city, exceeded in population by only three cities in their own country, namely, New York, Chicago and Philadelphia. Buenos-Aires has passed the million mark, the latest municipal statistics showing it to have a population of about 1,084,113. Keeping pace with the population, the volume of business done, not only in the city but also throughout the entire country, has so increased from year to year that to-day it has entirely outdistanced the improvements and extensions in railways, port works, warehouses and all other devices for controlling it to such an extent that we find the steam railroads of the country utterly inadequate to handle the work through shortage of locomotives and rolling stock. Recently some lines have been so congested as to call for the intervention of the national government, prohibiting the further shipment of goods over these routes until the freight blockades were cleared.

At the port works we find the spacious and splendidly designed docks completed but a few years ago, and then thought large enough to handle the business for many years to come, already far too small. They are so crowded with shipping that many steamers are compelled to anchor for weeks at a time in the Roads (as the outer harbor is called), awaiting an opportunity to enter the docks to discharge their cargoes. This is true not only of Buenos-Aires, but of the other three great ports, at Rosario, Bahia Blanca and La Plata.

What is true of the general mercantile situation is also true of the street railway lines. Crowded though the center of the city is to-day with trolley and horse cars following each other in rapid succession, yet they are totally insufficient to carry the people. Perhaps this is due in a great measure to the use of the "Completo" sign, displayed by the motorman of a car when all the seats are occupied,

PLAZA MAYO, BUENOS-AIRES. VIEW TAKEN FROM GOVERNMENT HOUSE

no standing or strap-hanging being permitted. At the present moment there is an agitation on foot to abolish this relic of horse car days, humane and proper at that time, but out of place with up-to-date electric cars. If this succeeds, it should increase the carrying capacity of the present system by at least 20 per cent. Even this change in practice would not suffice, and it is almost impossible and unsafe to run cars on a shorter headway than is now done in the business district. As can be seen by the map, every street is taken up with a car line, the only exceptions being Calle Florida and the Avenida de Mayo, in the center or business part. Buenos-Aires is to-day confronted with the same problem that New York has had to solve. It has not enough streets or surface cars to handle its population properly, and there is much talk of having to build subways such as exist in New York, London and Paris. The nature of the soil is such that this can be easily done, as far as excavation is concerned, and the probabilities are that it will be done in the near future. The dotted lines on the map show the proposed route of one of these subways under the principal avenue of the city. It would connect one of the large railway stations with the port, making it easy for passengers coming in from the country to reach the steamers, and vice-versa, besides bringing the suburban towns of Flores, Liniers, Merlo, Ituzaingó, and many others, into close communication with



MAP OF BUENOS-AIRES, SHOWING ALL TRAMWAY SYSTEMS, ALSO PROPOSED SUBWAY

the city. As another wide centrally located avenue has been suggested to cross the present one at right angles with a crosstown subway its entire length, travel to almost any quarter of the city would be made comfortable and expeditious.

The narrowness of the streets generally prevents double-tracking them, except in some of the wide ones, such as Callao, Entre Rios, Las Heras, Santa Fé, Almirante Brown, Paseo de Julio, Paseo Colon, Montes de Oca, and perhaps one or two more. All cars in passing through streets keep to the left-hand curb in conformity with the municipal regulations. Some are still running in the wrong direction, but these will be changed as quickly as convenient. The changing of these car routes and direction of running has led to a great amount of confusion, even to the every-day rider, and all will be glad when the thing is finally settled. These car routes are designated by colored signs with numbers painted on them placed over the front and rear hoods, plainly visible from a long distance by day and illuminated electrically at night. Though these cars also carry dash signs, giving the names of the streets through which they pass, few, if any, of the regular riders read these, as they know by the roof number just where it goes. The stranger inquiring which car to take to reach a given destination is, therefore, told to take No. 10, or No. 17, or No. 5, and so on, instead of the street car going west, east, north or south. More than half the time he will not know anything about the points of the compass. Little pocketbooks are printed by the companies, giving a map of each route, showing the streets covered by it, and arrows point the direction the car goes in the various streets. These pocketbooks also contain the time table of the various routes, rate of fare, color of the night signals and other useful information.

The cars are of different types, such as closed, semi-convertible, open and double-deck cars. All are equipped with Consolidated fenders. Illustrations of these types, with their hood numbers in position, and data as to the motor equipment, are contained in this article. The contrast between the old-time horse car and the modern trolley is most marked. Some of the former are still running, though they will soon be a thing of the past, and we will no longer hear the ear-piercing shrieks which the driver of a horse car makes on a "corneta," or cow's horn made into a trumpet, as he approaches a corner. The visitors to Buenos-Aires, particularly those who have known the city in former days, will miss these quaint old sounds, for, ear-piercing as they generally are, there are some "cocheros" who are veritable artists in the handling of these horns and capable of producing some very tuneful melodies.

VIEW LOOKING WEST FROM THE PRENSA BUILDING ALONG THE AVENIDA DE MAYO

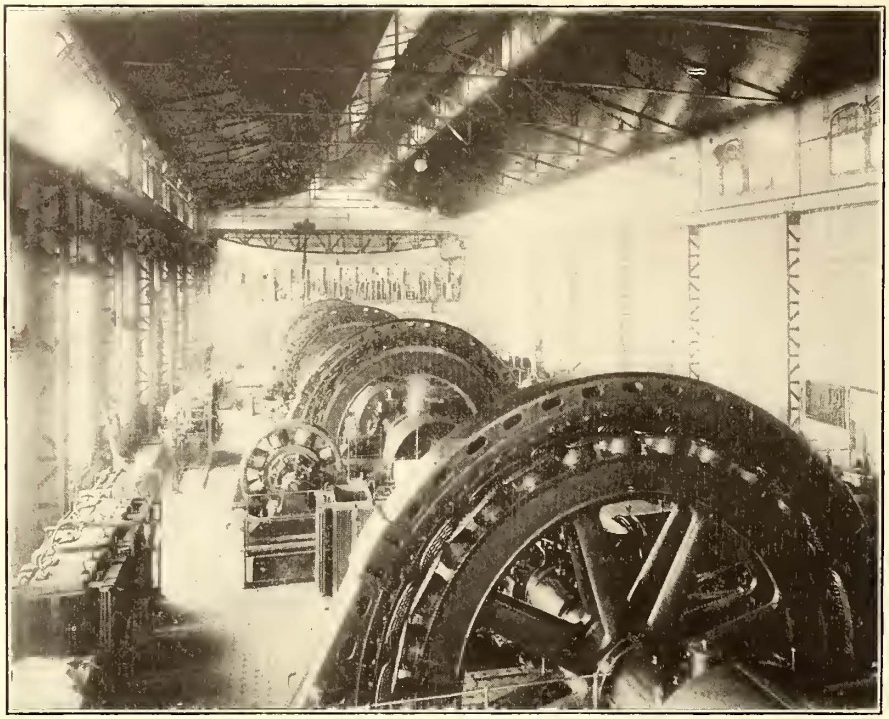
With their exit will go a relic of old Buenos-Aires and a lot of the quaintness and romance one is apt to associate with South American countries.

There are no separate power stations in Buenos-Aires to-day, the entire supply of electric current for railway and lighting work being in the hands of one company, the Compañia Alemana Transatlantica de Electricidad, which, as the name implies, is a German concern. The distribution of the railway current is divided among five power stations at present, though there will soon be a sixth in operation, as the company is to erect a large station in the Darsena Sud. This station will be of 100,000 hp to 120,000 hp, and will be equipped with turbines. All plans and specifications are prepared, and orders already closed for some of the machinery. From this station current at high potential will be carried to the suburban plants now operated by steam power, making sub-stations of them in future. As coal costs close to $10 gold per ton at these suburban plants, the centralizing of the coal-consuming devices under one roof and near the seaboard should effect a great economy. In addition, the Rural Tramways are building a station of 2250 kw output for handling their lines when completed. This station will not have any connection with those of the German company. Some views of these power houses are shown in the accompanying illustrations.

THE SOUTH SIDE OF BUENOS-AIRES AS SEEN FROM THE TOP OF THE PRENSA BUILDING

A CAR ON THE LA CAPITAL LINE PASSING THE GOVERNMENT HOUSE

The output of these stations for January, 1907, which,



INTERIOR OF THE BOCA STATION OF THE GERMAN TRANSATLANTIC ELECTRICITY COMPANY, BUENOS-AIRES

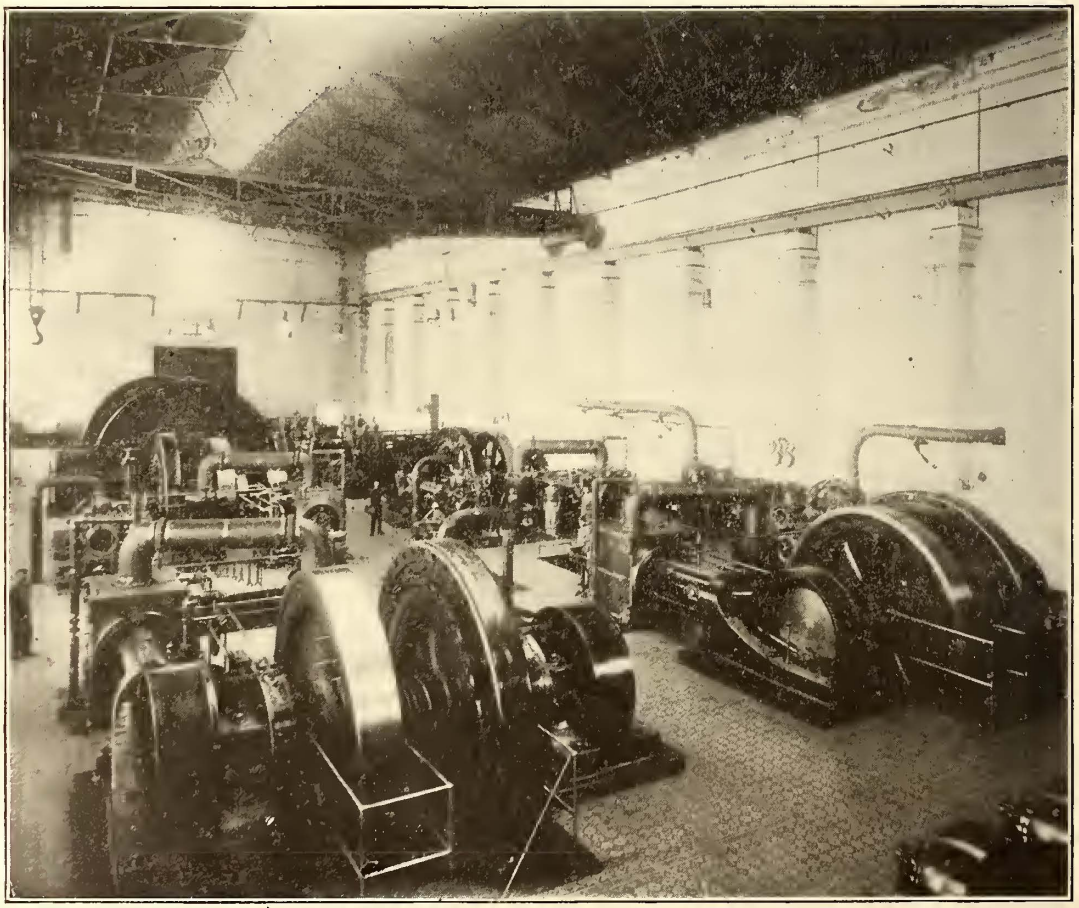
of course, does not include the Rural station, was 1,225,820 kw for lighting and 708,448 kw for power, exclusive of tramways and public lighting work. The tramway consumption of power for the same month amounted to 3,788,244 kw. The cost of current for lighting is 13¼ cents per kw-hour, and for power 7 cents per kw-hour, all in gold. All of these power stations are steam driven, some with turbines, but the great majority with reciprocating engines.

It may be that some day in the near future, when the economical transmission of power to distances up to 1000 miles can be counted an assured and tried fact, Buenos-Aires, as well as Rosario and other cities of the Argentine, will be obtaining their power for lighting and tramways from the famous Falls of Iguazú, situated in the northeast corner of the Republic. These falls are much larger than Niagara, having a width of 2 km and a depth of 70 m., with an abundant supply of water all the year.

For the overhead construction, iron poles are used wherever possible, while in the center or business section span wire with rosettes in the building walls is the only method possible in the narrow streets. On most of the wide streets ornamental center pole construction is employed, while on some others it is both span and bracket work. Guard wires are compulsory. The average weight of rail used, which is all of the grooved type, is about 87 lbs. per yard, though there is some heavier. It is all laid on concrete foundations, bonded, as a rule, with compressed or pin-driven copper bonds, though some lines have plastic bonds and others cast and thermit welded joints. Pavements vary, some being granite blocks, some asphalt, but the majority consist of wooden blocks on edge.

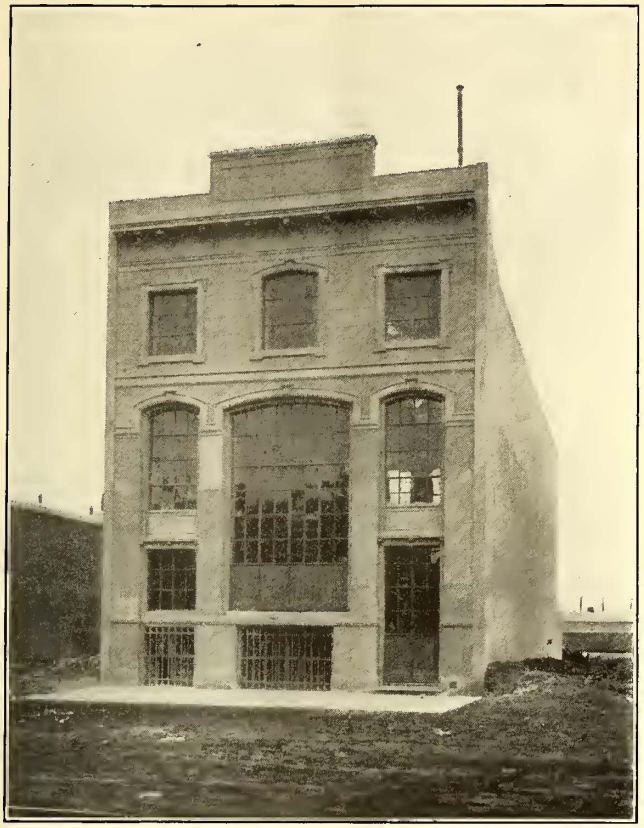
Nearly all feeders in the center of the city are underground. Some of the original installations, however, still maintain the overhead system, which is anything but ornamental.

In track work there is a tendency to drift away from the manganese steel centered frogs and switches, using instead built-up pieces made of regular rail sections, which seem to be giving good results. Many of the lines use trailers, the trailer generally being a workman's car. The space between the trailer and motor car is guarded by a fender of special design to prevent the people who alight from the motor car being hit by the trailer. No registers are used, as the conductor sells tickets. The

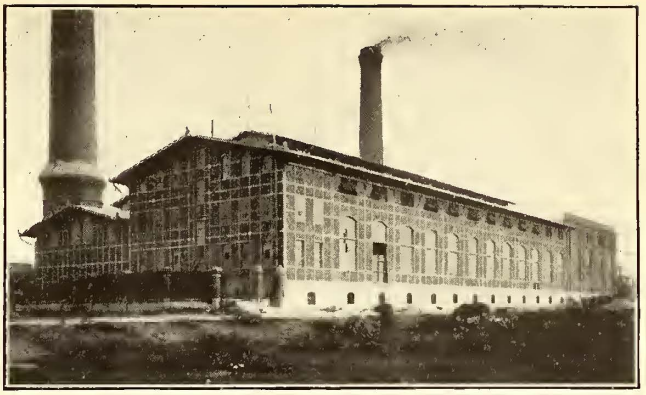


INTERIOR VIEW OF THREE-PHASE STATION, CORNER MONTEVIDEO AND PASEO DE JULIO, OPERATED BY THE GERMAN TRANSATLANTIC ELECTRICITY COMPANY

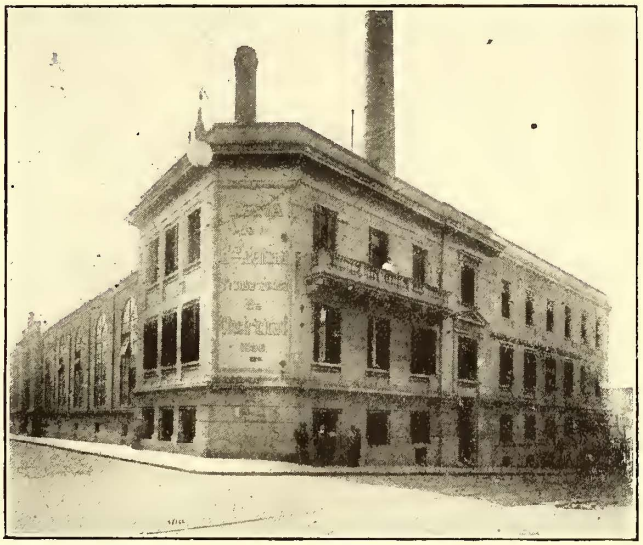
average fare is 10 cents paper (4.2 cents U. S.) for distances in the city proper, whereas higher rates are charged to the outlying sections and suburban towns, in which case transfers are given. Cars, as a rule, are equipped with cane seats and backs, of the throw-over type, and are clean and neat.



TYPE OF RECENTLY CONSTRUCTED SUB-STATION ON THE PASEO COLON, BUILT BY THE GERMAN TRANSATLANTIC ELECTRICITY COMPANY



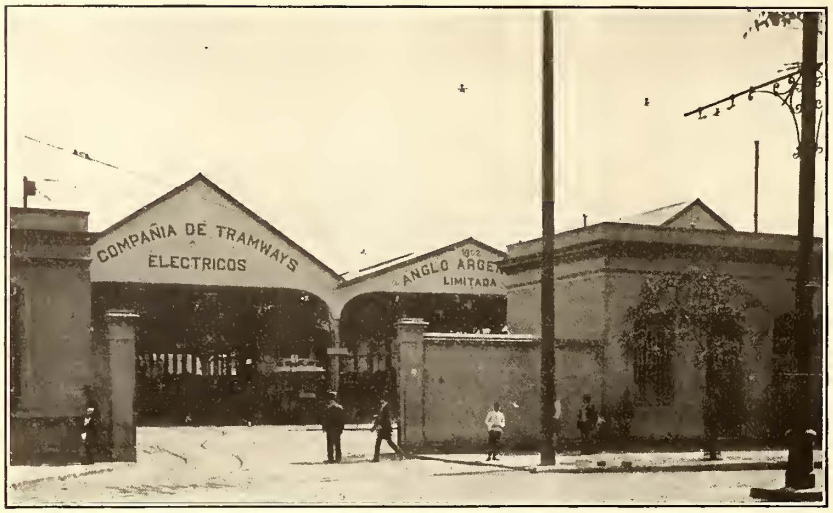
EXTERIOR VIEW OF THE A. C. STATION OF THE GERMAN TRANSATLANTIC ELECTRICITY COMPANY



EXTERIOR VIEW OF THE GERMAN TRANSATLANTIC ELECTRICITY COMPANY'S DIRECT-CURRENT STATION

EXTERIOR VIEW OF THE THREE-PHASE STATION, CORNER MONTEVIDEO AND PASEO DE JULIO, OPERATED BY THE GERMAN TRANSATLANTIC ELECTRICITY COMPANY, BUENOS-AIRES

In the table of statistics attached to this article only the principal lines now in operation in the heart of Buenos-Aires are given. There are a number of others either in course of construction or projected, some of which will operate in the city proper and others run to the suburbs. The most important of the former is the Tramway Rural, whose name is mentioned in the table as a horse road, the statistics being those of horse operation. This system has been almost completely changed over to electric, the first branch having been opened to public travel on March 11 of



CENTRAL CAR HOUSE OF ANGLO-ARGENTINE COMPANY

this year. With the completion of this company's lines, the old horse traction will disappear forever from this city's streets, with the exception of a few non-important short branches of other companies, none of which is in the business center.

The Lacroze (Rural) Tramways will use Westinghouse motors on their cars, while the power house apparatus is all of the General Electric Company's make. These Westinghouse motors will be the first to be used on any of the city tramways, all the others being of European or General Electric manufacture. Experience with the European versus the American motor during the past ten years—for it is just ten years ago since the first electric railway was installed in Buenos-Aires—has pretty well demonstrated the fact that there is not a line in this city to-day costing less for maintenance of motive power, giving all-round better satisfaction, having fewer breakdowns, than the General Electric equipments originally installed on the Bright and La Capital lines, respectively the first two to be built. Many of the original parts of these first motors are still doing daily service, and, from all appearances, will continue to do so for some time to come. What is true of the motors is also true of the cars furnished these original lines, for after ten years of wear and tear carrying a population that is not of the elite, as the city lines are accustomed to carry, they are in far better condition to-day, both as regards looks and durability, than many of the more recent ones and cost much less for maintenance.

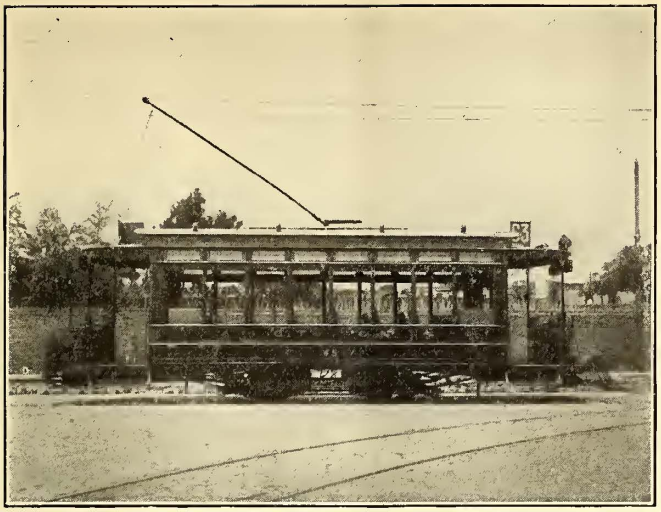
Of these lines not mentioned in the table, there is the Quilmes Brewery line, a private

THE FLORES CAR HOUSE OF THE ANGLO-ARGENTINE TRAMWAY COMPANY

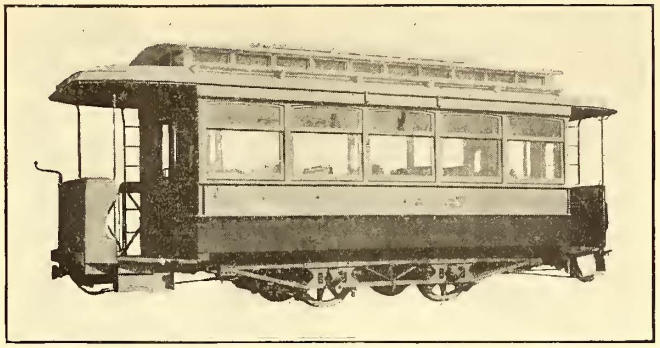
LAS HERAS CAR HOUSE OF GRAND NATIONAL COMPANY

electric railway running from the city to the brewery at Quilmes, and owned by the brewery people. Entering the city by the Barracas Bridge, it runs over leased city lines to various distributing stations in Buenos-Aires.

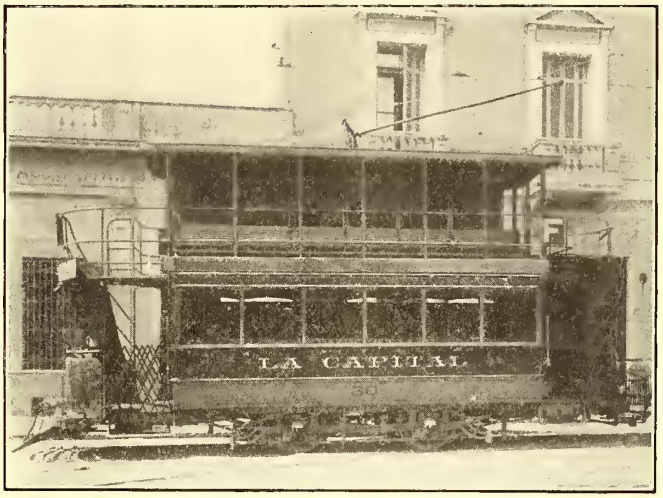
Another line in course of construction is the Tramways Electricos del Sud, which is destined to run from the Plaza de Mayo, in the center of the city, to Barracas, Lanús, Banfield, Lomas, Temperly and Adrogué, the last named being about 12 to 14 miles south of Buenos-Aires. All of these points are on the main line of the Great Southern Railway, except Adrogué, which is about 1½ miles from Temperly. As the Great Southern is the Pennsylvania of the South, as far as size is concerned, and as this proposed



CAR OF GRAND NATIONAL COMPANY

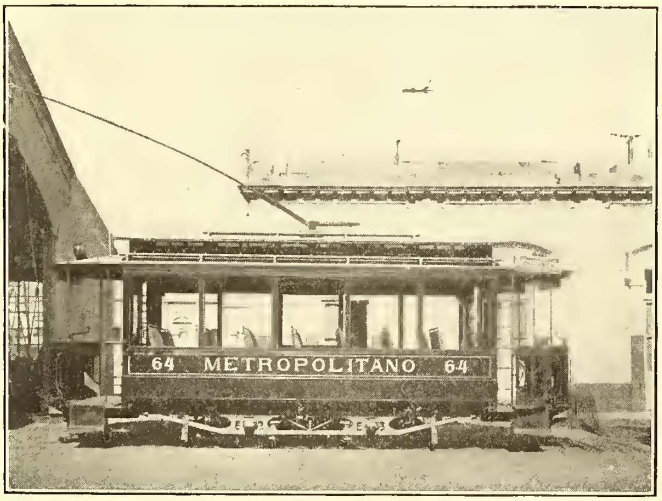


ANGLO-ARGENTINE AMERICAN SINGLE-TRUCK CAR

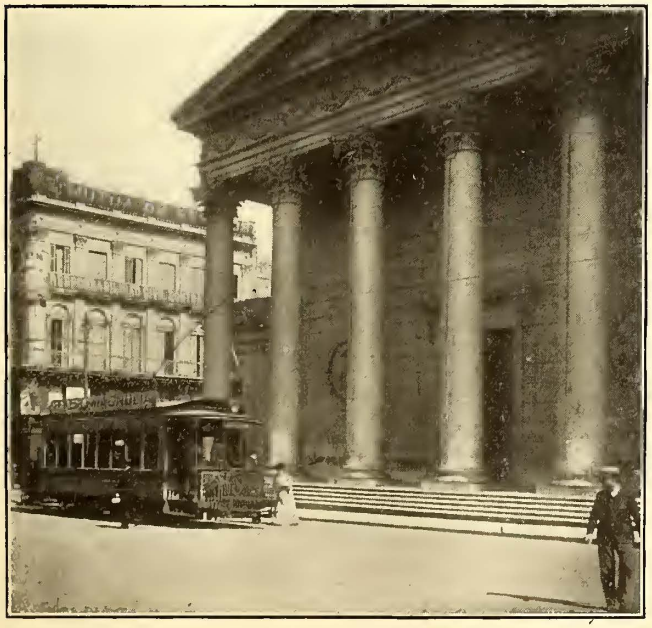


CAR OF LA CAPITAL COMPANY

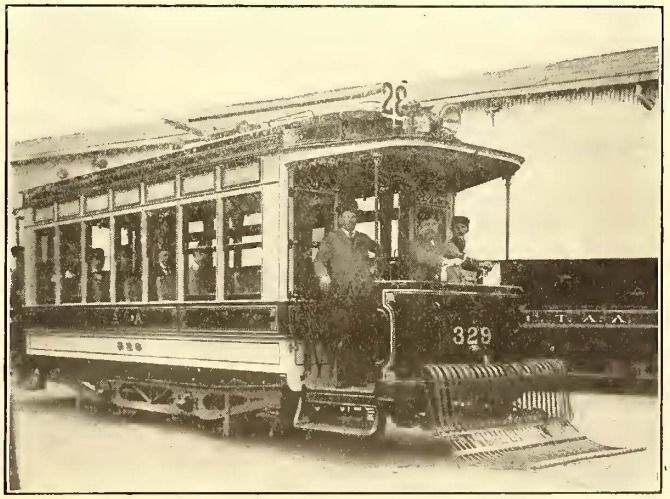
CAR OF BUENOS-AIRES ELECTRIC TRAMWAY COMPANY AT CORNER OF CORDOBA AND RIO BAMBA STREETS



CAR OF METROPOLITANO COMPANY



CAR OF BUENOS-AIRES & BELGRANO COMPANY AT CORNER OF RIVADARIA AND SAN MARTIN STREETS



ANGLO-ARGENTINE SINGLE-TRUCK CAR

TABLE OF STATISTICS

	Anglo Argentine	La Capital	Gran Nacional	La Neuva.	Metropolitano	Buenos-Aires and Belgrano.	Tramway Electrico de Buenos-Aires.	Tramway Rural.	F. C. C. Argentine.	Total.
Kilometers electric..	157.944	55.514	81.666	Included in Gran Nat'l.	32.900	57.758	35.933	.....	.....	421.715
Kilometers, horse....	8.034	2.899	8.000	.....	.....	.....	.....	42.094	1.300	62.327
Number of cars.....	Elec.....707	Elec..... 93	Elec.....342	.....	Elec..... 90	Elec.....184	Elec..... 85	.....	.....	Elec....1,501
	Horse... 85	Horse... 40	Horse... 70	.....	.....	.....	.....	Horse...177	Horse.....2	Horse....374
Cars in daily service..	Elec.....535	Elec..... 66	Elec.....145	.....	Elec..... 55	Elec.....107	Elec..... 58	.....	.....	Elec.....966
	Horse... 2	Horse... 2	Horse... 15	.....	.....	.....	.....	Horse...100	Horse... 2	Horse....121
Make of cars.....	St. Louis and Dick Kerr.	Brill & Dick Kerr.	Dick Kerr & Co.	.....	German....	Brill, Barney & Smith, Dick Kerr.	Jackson & Sharp, Dick Kerr.	.....	.....	.....
Style of cars.....	Closed.....	Double deck and closed.	Closed.....	.....	Closed.....	Closed and open.	Closed and open.	Closed and open.	Closed.....	.....
Motor equipments...	A. E. G and Dick Kerr	G. E.....	G E and Dick Kerr	.....	A. E. G....	G. E. and Dick Kerr	G. E. and Dick Kerr.	.....	This line belongs to the Central Argentine Railway. No data obtainable.	.....
Brakes.....	Rheostatic.. Paper.	Hand..... Paper.	Hand..... Paper.	.....	Rheostatic.. Paper.	Electric disc. Paper.	Electric disc. Paper	..... Paper.		Gold.
Gross earnings, 1906.	$9,161,812	$2,017,449	$3,526,175	.....	$1,171,432	$2,194,378	$852,830	$1,628,386		$9,014,210
Net earnings.....				Not obtainable.						
Car miles run, 1906..	.....	.....	.....	.....	.....	.....	.....	.....		
Pass'grs carried, 1906.	.....	.....	.....	.....	.....	.....	.....	.....		200,689,354
Passengers carried in January, 1907.....	7,556,630 Paper.	2,061,969 Paper.	3,139,913 Paper.	.....	962,595 Paper.	1,600,931 Paper.	729,538 Paper.	1,302,771 Paper.	17,365,878 Paper.	Gold.
Gross earnings for January, 1907.....	$745,028.65	$193,863.88	$317,557.41	.....	$97,539, 19	$187,102.98	$79,975.76	$140,768.50	$563.05	$747,138.60
Authorized capital...	£2,900,035	£1,400,000	£625,000	£415,000	.....	£850,000	£250,000	£875,000	.....	

trolley will parallel it almost all the way, a keen competition can be looked for, for a while at least, the result of which will be watched with interest. Was this line being equipped with the long, well-furnished, high-speed interurban cars so common in the United States, instead of short 28-ft., comparatively slow-speed cars, like those in use on the city lines, it would have a much better chance of accomplishing its aim. To compete for suburban business with this large steam system a trolley system must, first of all, be cheaper, give a more frequent service, and make the distance in about the same or better time. This cannot be done with small cars or the use of low potential current as a motive power.

CAR OF ANGLO-ARGENTINE COMPANY

A high-speed, up-to-date line is projected from Buenos-Aires to La Plata, the capital of the Province of Buenos-Aires, and distant from this city about 30 miles. It is proposed to run these cars at 100 km (62 miles) an hour.

Still another high-speed line is projected from Belgrano (now a part of Buenos-Aires) to the Tigre, a well-known summer resort on the Lujan River, that would also parallel a steam road and pass through a number of well-populated towns. It would be naturally a summer road and should count on a good business from November to April.

At the time this article is written, a large fire has just occurred in the erecting and repair shops of Boeker & Company, of this city, who do most of the assembling of new and repair old cars for the various tramway lines. Among the cars in these works at the time were a large number of new Lacroze electric cars that had not yet been put in service, some erected, some partially so, and a number still unboxed. In all, they lose about thirty-seven new cars. The Quilmes Brewery line also loses some cars.

Advertising signs are frequently used on the outside of the cars, as is done in London, Berlin and Paris, but which are seldom seen in the United States. In addition, the interior of the car is generally used for this

TRAIN OF ANGLO-ARGENTINE COMPANY

purpose, as it is in cars of American electric railways.

In the United States, when cars get bunched on a double track system, the inspectors are accustomed to turn some back, using the first convenient cross-over for that purpose to cover the road and keep up something of the regular schedule. This is not practiced in the streets of Buenos-Aires, because of the excessive red tape necessary to accomplish it and the interference of the municipal authorities. The result sometimes is that great numbers of cars belonging to the same line are going in the same direction more than half of them empty, while the return part of the system is uncovered, greatly to the disgust and loss of patience on the part of the traveling public and the frequent missing of train connections.

If the present plans are consummated, the existence of a large part of it, if not all of the independent lines in Buenos-Aires, will soon be a matter of history. This will be brought about by the organization of the General Buenos-Aires Tramway Company (Compania General de los Tranvias de Buenos-Aires), a Belgian corporation, whose announced purpose is to consolidate all of the street railways in Buenos-Aires. The ample financial backing announced of the company insures the consummation of its plans. The headquarters of the company are in Brussels, and its capital stock is 65,000,000 francs. Of this 65,000,000 capital stock 45,000,000 have already been subscribed. The remaining 20,000,000 are reserved to retire the 100,000 francs common stock of the Anglo-Argentine Company. The directors are J. Allard, of Brussels; Eugene Baelde, of Brussels; Chevalier de Bauer, president of the Bank of Paris and the Netherlands, Brussels; R. Boulvin, director of the Parisian Street Railway Company; L. Cassel, banker, Brussels; Ch. Cicogna, president of the General Belgian Company of Electrical Enterprises; Viscount de Jonghe, director of the General Company of Light Railways; V. Fris, Senator and president of the International Bank of Brussels; J. Hamspohn, director of the Allgemeine Electricitäts Gesellschaft, of Berlin; D. Heinemann, manager of the Financial Company of Transportation and Industrial Enterprises, of Brussels; Leon Janssen, president of the Brussels Tramway Company; M. Lazarus, manager in London of the National Bank of Discount of Paris; J. Lowe, director of the Allgemeine Electricitäts Gesellschaft, of Berlin; H. Monnon, assistant manager of the Brussels Bank; W. Mueller, of Berlin; O. Oliven, of the Allgemeine Electricitäts Gesellschaft; Alfred Peltzer, of Verviers; Franz Phillipson,, of Brussels; A. Solomonsohn, manager of the Discount Bank, of Berlin; H. Stern, managing director of the Bank of Brussels; T. Frame Thomson, manager of the Grand National Company, of Buenos-Aires, and M. Wigand,

A PART VIEW OF IGUAZU FALLS, WHICH ARE 2.5 MILES WIDE AND 230 FT. HIGH. IT IS POSSIBLE THAT THESE FALLS WILL SOMETIME BE USED TO OPERATE THE TRAMWAY LINES IN BUENOS-AIRES

CAR OF GRAND NATIONAL COMPANY

STREET RAILWAY COMPETITION IN ENGLAND—ITS CRITICAL EFFECT UPON STEAM RAILROADS

BY ADAM G. WHYTE

Probably there are not many steam railroad men who are ready to follow President Tuttle, of the Boston & Maine Railroad, mentioned in your recent issue, when he suggests that short-distance traffic should be surrendered to the trolley lines. Where an interurban steam line is paralleled by an electric line there must, of course, be a certain amount of adjustment, but it is an adjustment which at least precedes, rather than follows, the hauling down of the flag. However, as the question of surrender is being debated, it is highly interesting to note the similar capitulation which is taking place in Great Britain. Practically all the big steam lines there admit that the suburban traffic no longer pays them, and many of them are accordingly taking steps to reduce the short-distance train service. In London, where the forces have been most active, the change is most conspicuous. The allied South-Eastern and Chatham railways, for instance, have abandoned the service which connects Plumstead, Blackheath and Greenwich across London with the Great Northern Railway. They have reduced the North Kent and Bexley Road services, and canceled many trains on the Crystal Palace and Catford loop-lines. The Ludgate Hill and Victoria services are also to be reduced. These changes are expected to result in the saving of several thousands of pounds yearly in wages and expenses. They are typical of what has already taken place, or is about to take place, both in London and in the Provinces. It may be stated confidently that all the steam railway companies engaged in suburban traffic are giving serious attention to the elimination of unremunerative trains on routes also served by electric street railways. In the course of the summer other reductions are expected to be announced by some of the London railroads. In one or two instances stations have actually been closed.

The situation is well summed up in the following passage from the London "Daily Telegraph":

> Local traffic has largely transferred itself from the railways to the road vehicles. From their termini in London to six miles beyond in almost every direction there is but a small proportion of the former patronage of the railways. By particular trains on particular lines the change is really pathetic. Some six or seven years ago, for instance, the last suburban train leaving Victoria station, on the Metropolitan extension, was one of the busiest throughout the day. People from the theaters, late workers, and others bore it a loving affection. They crowded to it and filled it from end to end. What is the case now? All these crowds will be found climbing on to the cars beneath Big Ben and along the embankment, or mounting the motor 'buses anywhere between Westminster and Piccadilly, Charing Cross and Blackfriars. Victoria Station in that section is a comparatively deserted place; the train steams off with its compartments much less than half filled, and the people are conveyed homewards so rapidly and cheaply by the new ways that there is no likelihood of the old conditions being revived. Look at the map, and you will find that the line of the South Eastern Company runs almost parallel with the highway right to Maidstone, passing through many towns of considerable size. Once they had a large shopping traffic between all those towns, but now there are tramways nearly the whole distance running alongside the railways, stopping at countless places, and charging trivial fares. The transference of custom was inevitable and natural. And what has happened in London has happened throughout the Provinces. Short distance suburban railway traffic is becoming less and less an important part of the services; the trains cannot comply with the whims and choice of the people, but the trams and 'buses are accommodating.

It is necessary to recognize, however, a very important difference between the situations in America and England. American trolley lines are practically all under private control and their competition with the steam railroads is the rivalry of one business undertaking with another. But British tramways are, in the majority of cases, municipally owned and municipally worked. They pay nothing for their right of way; any road widenings which they involve are charged, for the most part, against the general district rate and not to the tramways account. They are managed by committees of politicians who are less concerned with organization on a business basis than with the securing of popularity by concessions to the public. The scale of fares has been determined by promises made at election times, with the result that it has been forced lower than prudent business considerations would permit. The facility with which losses may be met out of the rates or concealed by the confusion of municipal accounts, or by inadequate allocations to reserve, maintenance and depreciation, enables local authorities to continue making concessions which no undertaking worked on ordinary business lines could attempt. An artificially low standard of fares has thus been set for municipal tramway services, and the tramway companies are obliged, by pressure from the local authorities who control their franchises, to adopt the same standard. The steam railway companies, which have to compete with the subsidized tramways, are compelled to follow in the same direction or lose the business. In many cases they followed as far as they dared, and hoped to recoup themselves with increased traffic. But the result has been such that they now prefer to lose the traffic. And the irony of the situation is revealed in the fact that the railway companies are among the largest taxpayers and have to provide, out of their profits, the money to meet the losses on the tramway undertakings which are filching their business by unfair competition.

The situation has grown so serious that Sir George Gibb, deputy-chairman of the Underground Electric Railways Company, of London (the company associated with the name of the late Mr. Yerkes), publicly stated recently that none of the passenger transportation companies in London was doing business at a profit. There is a definite movement among the companies towards an increase in fares to a remunerative level, and they are all pressing for the appointment of the London Traffic Board in order that the question may be referred to a permanent and responsible body of experts. Now that the London County Council, which has hitherto been the great anti-business force in London, has passed from the control of the progressives into the hands of the municipal reformers, who are pledged for efficiency against sentimental socialism, it may be possible to bring about some reform. But the steam railroads are not awaiting the problematic outcome of an unpopular agitation. They are meeting the situation in two ways, the first of which has already been described. They are reducing suburban business to a minimum along the routes where tramway competition is keenest, and they are also making most strenuous efforts to develop the longer-distance traffic. Hitherto the bulk of the daily business traffic to the London termini has been from suburbs which have gradually been absorbed into London itself. Beyond a 10-mile radius or even a 6-mile radius the bulk of "bread-winners traffic" has been comparatively small. The train service from outlying districts was infrequent and slow, owing to the congestion of suburban trains at termini where the accommodation at rush hours was quite inadequate. It was the

ambition of the late Mr. Yerkes to get over this difficulty by the combination of tube and tramway, which, with a low, uniform fare, would enable the bread-winner to live much further out of London than he does at present. But the realization is likely to come from the railroads themselves. They are relieving the congestion of the terminal lines by reducing the short-distance suburban service, and they are putting on fast trains for business men even from places up to 50 miles from London. By means of these trains and reduced season ticket rates they hope to develop a large daily traffic which is quite independent of the socialistic vagaries of Town Councils.

The new train arrangements between London and Brighton may be taken as typical of how the companies are going to work. Brighton is 50 miles from London, and the special business trains will do the journey in one hour and ten minutes. Second-class season tickets are offered at £25 per annum, which works out at about 1/7d. per business day, or ¼d. per mile. The rates are so low that some critics have imagined that the Brighton Company is jumping from the municipal devil into a deep sea of its own contriving; but as the South-Eastern, Great Northern, South-Western and Great Eastern Railways are making similar concessions, the economic aspect has evidently been carefully studied by a sufficient number of experts. The point is, of course, that the daily business trains are to be regarded from the railroad managers' point of view as special excursion trains, where the volume of traffic is closely pre-determined. Such traffic can be carried profitably at a very low rate. Probably the companies are also calculating upon an increase in general traffic, both passenger and freight, as a collateral to increased bread-winners' traffic to such places as Brighton.

As matters are still in the experimental state, it is impossible to do more than indulge in forecasts. But the railway companies are confident that the low rates, rents, and taxes, the cheaper cost of living and the healthier conditions of regions beyond the 20-mile radius will make the country or seaside home quite a feasible and attractive proposition to the London business man of moderate means. It is quite possible that a great revolution in the conditions of living will be brought about by the cheap business express train. But perhaps the chief point of interest to the American railroad manager is the virtual confession, which this new departure involves, that short-distance suburban business has lost its attraction to the British railway. It is an exhausted field, rendered barren by the depredations of municipal invaders acting in the name of the public. Full compensation for this loss may ultimately be secured by the growth of the long-distance traffic, which in any case is more readily worked at a profit by a steam railroad. The attempt is not without heroic qualities or lacking in particular interest to American railroad men, but in view of the difference in circumstances President Tuttle must not regard it as a confirmation of his pessimistic views about the necessity of surrender to the competing trolley.

LOS ANGELES ANNUAL FLOWER FESTIVAL ATTRACTS GREAT CROWDS

It is officially estimated that the interurban electric railways carried to Los Angeles from Southern California points more than 100,000 passengers to see the floral parade of La Fiesta de las Flores on May 10. Cars were operated every five minutes between the hours of 8 a. m. and 11 a. m. Pasadena sent more than 20,000 people.

DISCUSSION ON SINGLE-PHASE TRACTION

Apropos of the discussion on single-phase traction at the meeting of the American Institute of Electrical Engineers last week, that occurring at the March meeting of the Chicago branch of the Institute will be of interest. It followed the presentation of a paper on the subject of electric railway systems by W. J. Davis, of Schenectady.

James Hessin, general manager of the Bloomington, Pontiac & Joliet Railway, said that the single-phase system managed by him had proven a success from an operating standpoint. Records show that a car mileage of from 75,000 to 85,000 miles is made with one turning of the commutator and that one set of carbon brushes usually lasted 5000 or 6000 miles. The cars, he said, weighed 35 tons and were geared to 42 miles an hour. Trailers were frequently hauled.

In reply to a question from E. F. Gould, electrical engineer of the Aurora, Elgin & Chicago Railway, as to the relative cost of maintenance of d. c. and a. c. overhead systems, Mr. Davis replied that the line material had in the past been the weakest part of the a. c. system, but good overhead material was now being gotten out. The a. c. system had not been in service long enough to get actual figures on the maintenance of its overhead, but the speaker did not think the catenary construction would entail as great expense as ordinary d. c. overhead construction.

William A. Blanck, electrical engineer, Chicago, thought that by putting sub-stations 32 miles apart, as mentioned in Mr. Davis' paper, the liability to interruption of service would be increased because of the extent of line depending on one sub-station. He wondered if for this reason alone it would not be advisable to place the sub-stations closer together. Mr. Davis did not think this a sufficient reason for increasing the number of sub-stations, but said it might be well to put cut-out switches on poles at frequent intervals, so as to cut out a section of the trolley for repairs in case of break-down. Mr. Davis added that instead of having sub-stations close together, he expected to see the time when sub-stations would be eliminated entirely.

To the additional question of Mr. Blanck as to whether or not the necessity of running the alternating-current cars over portions of direct-current systems in order to get into terminal cities was not a point against the a. c. system, Mr. Davis said that the a. c. motor was built to operate as well with direct current as with alternating current. He said that sometimes a 600-volt, direct-current system and a 6600-volt alternating-current system could be combined advantageously. He mentioned one instance where on a road about 70 miles long it was desired to operate two or three-car trains under fifteen-minute headway on about 15 miles of the line and to send single cars at intervals of an hour over the remainder of the line. If the single-phase system were used throughout the length of the line all of the cars, about twenty-five or thirty, would have to be supplied with single-phase equipment, and the expense would be considerable. By using direct-current on the short portion of the line with the heavy schedule and alternating current on the remainder, it would be possible to operate the system with all but about five of the cars equipped with direct-current apparatus. This, of course, would lessen the investment. Mr. Davis added that at full speed the alternating-current motor has a 2 per cent to 3 per cent better efficiency when operating on direct current than when supplied with alternating current, chiefly because the core losses are smaller. As the number of stops per mile is in-

creased, however, the rheostat losses with direct current offset the better efficiency, so that with stops about 1 mile apart the motor efficiency when operating on either of the two systems is about equal.

As to telephone and telegraphic interference, Mr. Davis said that there was considerable trouble in the early days, but that in the last year it had been found that with proper transposition and sometimes by putting transformers in the telephone lines all trouble was avoided. He said that a current of 150 amps. in the trolley was found sufficient to operate telegraph instruments when the telegraph lines were 12 ft. or 15 ft. distant.

Mr. Blanck wanted to know if with the alternating-current system, it was necessary to bond both tracks. He wondered if one track could not be reserved for use in connection with a signal system. Mr. Davis said that usually both the tracks were bonded, but on account of the smaller current this was not absolutely necessary, especially if the bonded rail was connected to a ground wire. He thought that it would be perfectly safe to use one rail in connection with the signal service operated with a frequency different from that of the trolley current if the bonded rail had connections with a ground wire.

H. R. King asked concerning the character of the generating equipment in the 1200-volt, direct-current system. Mr. Davis said that two 600-volt rotary converters were connected in series to obtain the desired voltage. This was considered advisable because of the difficulty of obtaining good commutation and the danger of flashing over with a high-voltage, direct-current machine. When operating on the 1200-volt system, the four motors of a car are connected in two sets of two motors in series.

A GRAPHIC METHOD OF DETERMINING TIE-ROD SPACING IN TRACK LAYOUTS

CLAUDE W. L. FILKINS, M. C. E.
(With Wm. Wharton, Jr., & Company, Inc., Philadelphia, Pa.)

The following graphic method of determining tie-rod spacing is rapid, gives results within a sixteenth of an inch, and requires no knowledge of advanced mathematics. The mechanical manipulation is stated briefly on the two-page supplement in this issue, but the underlying principles require a more detailed description.

In two concentric circles, two arcs included between two radii bear a fixed relation to each other. If r = inner radius, R = outer radius, g = radial distance between the curves, I = inner arc, E = exterior or outer arc and D = difference in length of inner and outer arcs; then

$$Er = IR$$
$$D = E - I = Ig \div r = Eg \div R.$$

Hence to find the difference between the two arcs, divide either arc by its radius and multiply by the radial distance between the curves. Having one arc, the other is thus readily obtained.

Let d = difference in length for a unit length of arc of radius r (or R as the case may be) and for any fixed gage g. Then $d = g \div r$ or d varies directly as the reciprocal of the radius, g being constant. Referring to the supplement in this issue, lay off from O the reciprocals of r to scale, erect perpendiculars, to scale, equal to the corresponding values of d as derived from the equation above and connect the upper ends of the perpendiculars. The result will be an oblique straight line passing through O. For other values of g, other oblique lines are obtained. Produce these oblique lines to the line AB marking the intersections to correspond to the value of g used in each case. Hence to find d erect a perpendicular at the point indicated by the radius r, find its intersection with the oblique line drawn from O to the given value of g on AB and scale the perpendicular. But in order to obtain readings for 10 ft. of arc, the perpendicular has been divided into ten times as many divisions as would have been necessary for an arc of 1 ft. and marked along the vertical CD to correspond.

For an arc less than 10 ft. take the proportional part of the difference thus: Follow vertically downward from the value of the given arc, as indicated along the top of the chart, to meet the oblique line joining O with the point on CD indicating the difference for 10 ft. of arc; then follow horizontally to CD and read the required difference. For an arc greater than 10 ft., break up the arc into lengths of 10 ft. and a shorter one, find the differences for the 10-ft. lengths and the shorter one and add the results. If the radical distance g be greater than 6 ft., break it up into portions less than 6 ft., proceed separately for d, and add results.

Illustration. Given r = 60 ft., g = 4 ft. 8½ ins., I = 6 ft. 6 in.; required E. From r = 60 ft. (lower horizontal scale) follow vertically to a straight line from O to 4 ft. 8½ ins. on AB, and from its intersection follow horizontally to CD and read 9⅜ ins. +. This is the difference for 10 ft. of arc. Join this reading on CD to O by a straight line and find the point on it directly beneath 6 ft. 6 ins. (upper horizontal scale), follow horizontally to CD and read 6⅛ ins. Hence the outer arc E = the inner arc increased by the difference = 7 ft. 0⅛ in. Observe that for the same r and g any number of differences may now be read off without further manipulation of the chart. Sixteenths or smaller fractions of an inch may be accurately estimated.

The oblique straight lines through O may be obtained temporarily by means of a straight edge, by means of a fine straight line drawn upon a thin arm of celluloid, or by means of a fine thread fastened at O. A clamp or weight will hold any of these devices in place. If the chart be mounted, local distortions should not take place. Uniform shrinkage will not destroy the accuracy of the chart.

The above graphic method may be used to obtain the spacings of ties, tie-rods and yokes in track work, of radial members in arches and structures, and wherever similar arcs on concentric curves are employed.

Derrah's "Street Railway Guide" of New England for 1907 has been issued. This work was first published ten years ago, and has grown in size correspondingly with the extension of the electric railway lines from 26 to 128 pages. Briefly, all points reached by trolley from Boston are arranged in alphabetical order, points from Providence south of Boston and Worcester are similarly arranged, as are also places from Worcester west of Boston and north of Providence. A person in Providence, for instance, who wishes to travel by trolley to some point north of Boston, will find in his own schedule the data regarding the trip to Boston, and under the Boston schedule the route to the point he wishes to reach. The points that are covered are the essential ones of where to go, how to get there, how much it costs and how long it takes. The descriptive matter has all been thoroughly revised. The cover bears a very tasteful design and shows a party of people riding in an open trolley car.

Chart for Similar Spacing on Concentric Curves

Compiled by CLAUDE W. L. FILKINS, M.C.E.

Directions for Use

Given the inner radius, the radial distance between two arcs and the length of the inner arc, required the length of the corresponding outer arc.

(a) Set a straight edge or thread to pass through *O* and the proper division on *AB*.

(b) From its intersection with the vertical for the given radius, follow horizontally to *CD* and note the accurate reading for this point. This reading is the difference in length between the inner and outer arcs for 10 ft. of inner arc.

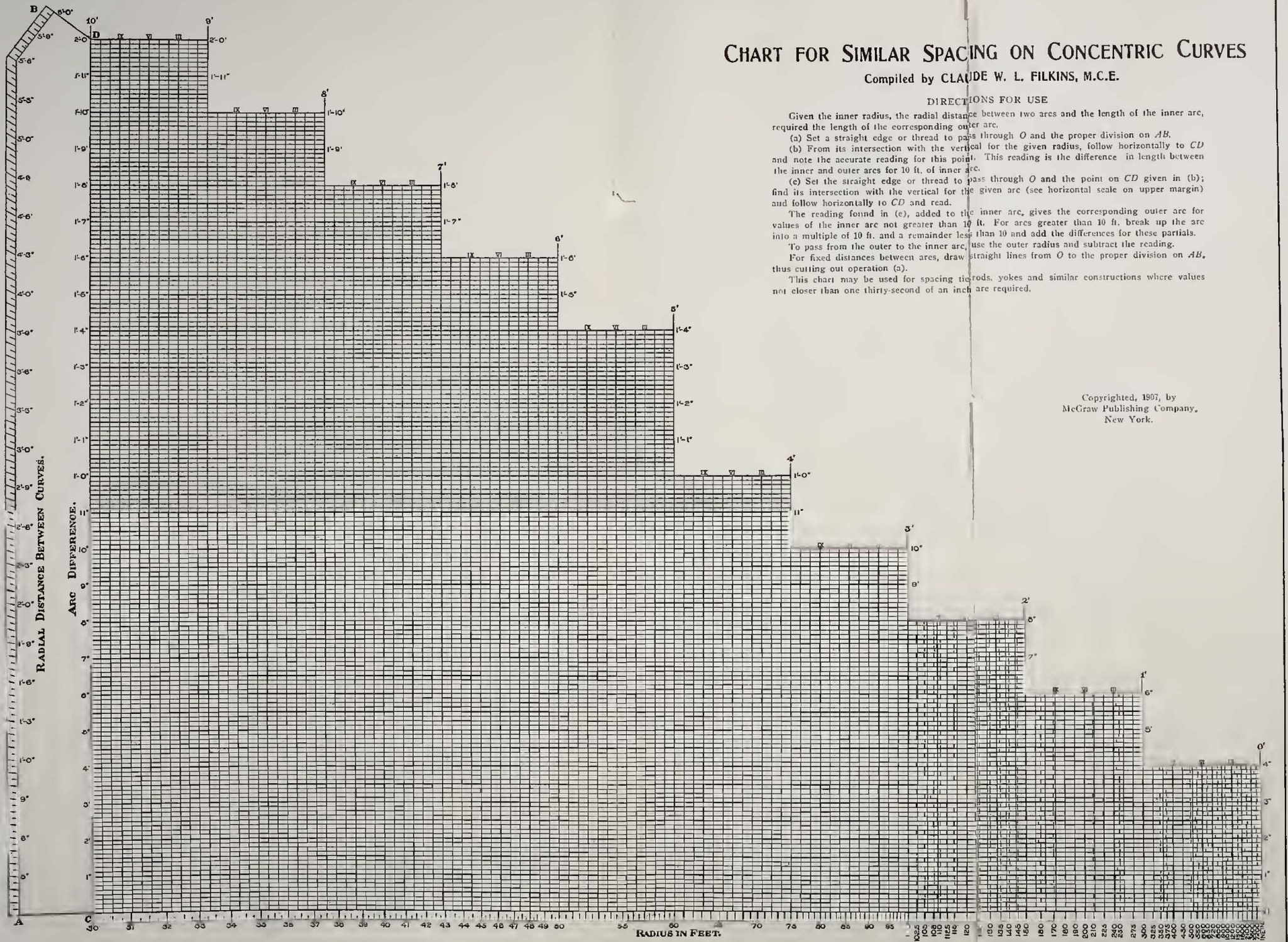
(c) Set the straight edge or thread to pass through *O* and the point on *CD* given in (b); find its intersection with the vertical for the given arc (see horizontal scale on upper margin) and follow horizontally to *CD* and read.

The reading found in (c), added to the inner arc, gives the corresponding outer arc for values of the inner arc not greater than 10 ft. For arcs greater than 10 ft. break up the arc into a multiple of 10 ft. and a remainder less than 10 and add the differences for these partials.

To pass from the outer to the inner arc, use the outer radius and subtract the reading.

For fixed distances between arcs, draw straight lines from *O* to the proper division on *AB*, thus cutting out operation (a).

This chart may be used for spacing tie rods, yokes and similar constructions where values not closer than one thirty-second of an inch are required.



ELECTRIC CAR BRAKING *

BY H. T. PLUMB
Assistant Professor of Electrical Engineering at Purdue University.

Every citizen living in a town where cars are operated on steep hills or at high schedule speeds has a right to say whether his life shall be jeopardized by the failure of one link that connects brake-staff and brake-shoe; but before he can talk intelligently he should know something of the theory and practice of car braking.

Fig. 1 shows an ordinary speed-time-distance curve. A careful examination of the distance curve *l*—*n* will show that the vital part of the braking process during an emergency stop is at the very beginning, from *c* to *d*. During the first ten seconds the distance passed over is about as great as that during all the remaining twenty-three seconds. It is, therefore, essential that an emergency brake should not only be capable of producing a high average rate of deceleration, but should be practically instantaneous in its action.

The braking curve *c*—*f* is not a straight line because it takes an interval of time *c*—*d* for the brake-shoe to grip the wheel, and because the coefficient of friction between the shoe and wheel increases somewhat at very low speeds *e*—*f*. From *d* to *e*, however, the deceleration is nearly constant at about 1.6 mile per hour per second. The average deceleration is 1.6 miles per hour per second, while the maximum is twice this value. In the foregoing the braking pressure has been assumed to remain constant. An experienced motorman would have reduced the pressure somewhat at *e* to avoid the sudden change in acceleration at the end.

The total time required to stop an electric car may be divided thus: The interval from the instant when the motorman first perceives the danger or the necessity for a stop

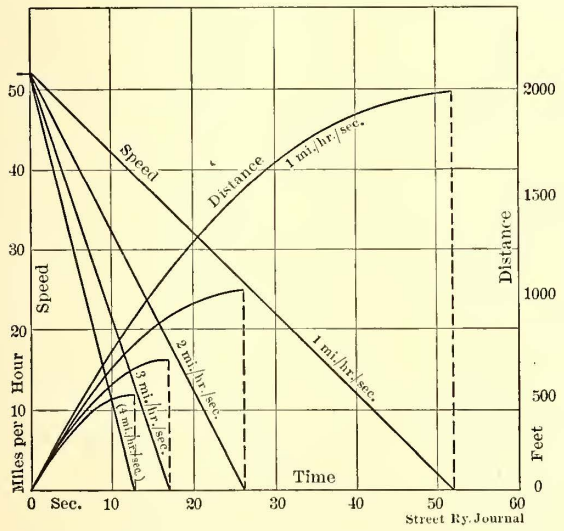


FIG. 2.—SPEED-TIME AND DISTANCE CURVES FOR BRAKING FROM 32 MILES AN HOUR

till his hand begins to turn off the power; the time to turn the controller to the "off" position, pull the sand lever and move the air brake handle; the time the air piston is taking up the slack in the brake rigging and setting the shoes against the wheels, and in which the brake-shoes "take hold" or "grip" the wheel surfaces; and the remaining time, during which the brakes are exerting their full force in stopping the car. Evidently the first three intervals are quite as important as the last, although they may not take as great a portion of the time.

In Fig. 1 the rate of deceleration is 1.6 miles per hour per second. Fig. 2 shows the result of braking the car at other rates. These theoretical speed-time and distance curves are similar to those shown at *c*—*f* and *l*—*n* in Fig. 1, and represent braking from the same speed. The curves show the importance of quick application in case of

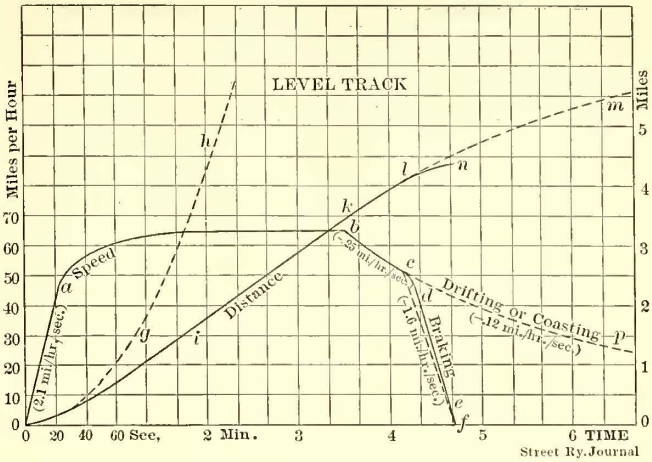


FIG. 1.—ORDINARY SPEED-DISTANCE CURVES

emergency braking. During the first half of the time required to stop, the car travels three-fourths of the total distance, while in the last half of the time the car travels only one-fourth of the total distance; hence any fault in the brake apparatus is more serious at the beginning than at the end of the braking period.

Fig. 3 shows the speed-distance curves corresponding to these several rates of deceleration. The curves are of considerable interest because they show at a glance the distance required to stop a car running at various speeds,

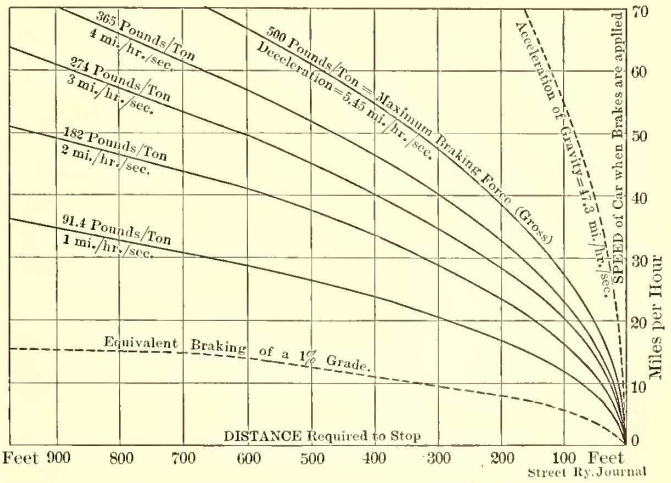


FIG. 3.—SPEED-DISTANCE CURVES CORRESPONDING TO SEVERAL RATES OF DECELERATION

with different rates of braking. Thus, the shortest possible distance in which a car could be stopped from a speed of 30 m. p. h. is 125 ft. With the ordinary hand brake, which does not have an average retardation much above 1 m. p. h. p. s., the distance required to stop the car from 30 m. p. h. is about 700 ft. This would be the "dangerous space" which such a car carries ahead of itself. It is important to shorten this danger space as much as possible.

The maximum deceleration is on the assumption that the maximum coefficient or friction between a rolling wheel

* Abstract of a paper presented at the Indianapolis meeting of the Indiana Engineering Society.

and the rail is 25 per cent. This corresponds to a gross braking force of 500 lbs. per ton weight of the car. As a matter of safety, the retardation must never reach this limit, for if the wheels slip they will lose their advantage because the coefficient of friction of a sliding wheel is only about half that of a rolling wheel.

There are other reasons why the braking force must never reach the theoretical limit. The coefficient may be reduced

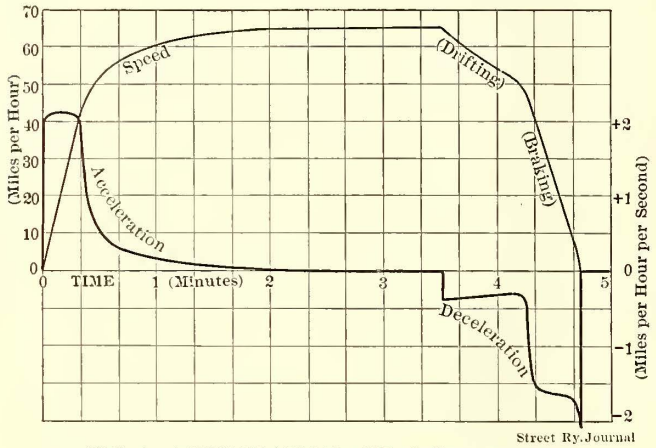


FIG. 4.—ACCELERATION AND SPEED CURVES

because of a slippery rail due to mud, wet leaves, etc. The effective weight on each wheel is changed at the time of braking because the car pitches forward onto the front axles. Thus the rear wheels might skid, although the average braking force was safely proportioned to the total weight of the car. The last objection can be partly overcome by a proper proportioning of brake levers.

Such speed-distance curves are most useful in answering questions after accidents have occurred: "What is the shortest possible distance in which the motorman might have stopped the car?" etc. Of course, it must be known

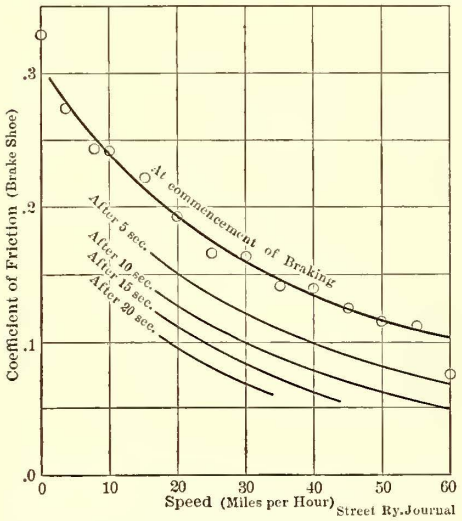


FIG. 5.—COEFFICIENT OF FRICTION AS AFFECTED BY SPEED AND TIME

approximately what braking force each kind of equipment is capable of exerting. Thus, for example, in case of emergency the ordinary hand brake might exert a retarding force of 90 to 100 lbs. per ton weight of the car and we would refer to the 1 m. p. h. p. s. curve. With an air brake the retardation might be somewhere between 1.6 and 2.3 m. p. h. p. s.

The acceleration (Fig. 4) is the rate the car changes its speed. This change may be positive when it is caused by the motors, or negative when it is due to train resistance and to braking. The acceleration at any time is the tangent of the speed-time curve. Hence the speed curve can be calculated by a point-by-point method. (See Mailloux, Trans. A. I. E. E., Vol. XIX., p. 1035.)

As soon as the car starts the acceleration rises almost instantly to a maximum value. It is approximately constant at this high value while the controlling resistance is being cut out. It then decreases in value, at first rapidly and then slowly. If the speed finally becomes constant then the acceleration is zero. At the instant the power is

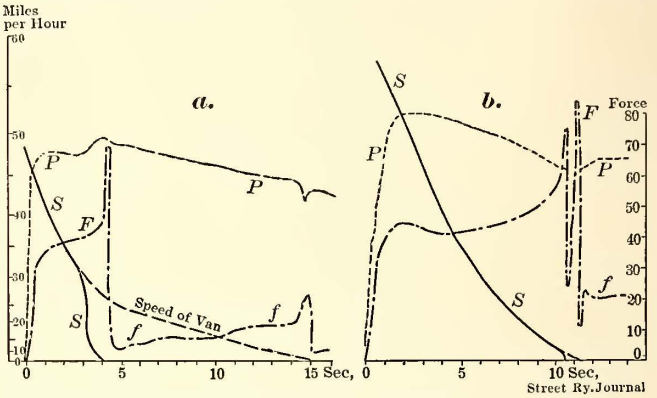


FIG. 6.—CURVES SHOWING THE EFFECT OF SKIDDING

shut off the acceleration becomes negative, the car slowing down because of train resistance. Notice that the deceleration is less as the speed diminishes. The motorman begins to apply the brakes at four minutes and ten seconds and soon afterwards the deceleration increases to a value of about 1.6. If the air pressure in the brake cylinders is constant we might now expect the deceleration to remain constant till the car stops. Notice, however, that it gradually increases as the speed decreases until just before the car stops the deceleration suddenly reaches a high maximum value (2.8) and then drops back to zero when the car has stopped. It is this last sudden increase which an experienced motorman will avoid by releasing the braking pressure somewhat just before the car settles to rest.

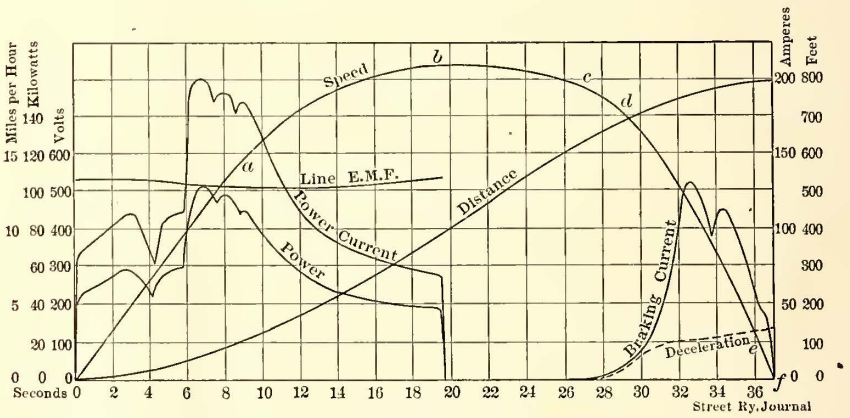


FIG. 7.—BRAKING TEST OF A SINGLE-TRUCK CITY CAR WITH MAGNETIC BRAKES

The reason for this peculiarly shaped deceleration is more evident from Fig. 5, which shows how the coefficient of friction is affected by the speed and the duration of braking. Each point is the average of from twenty to ninety separate observations. These are the famous tests made by Galton and Westinghouse in 1878. Notice how rapidly the coefficient diminishes with time and how much less it is at the higher speeds. These tests were made with cast-iron brake-shoes on steel tires.

Fig. 6 is also from the Galton-Westinghouse tests, and

shows clearly why the braking force should never approach too near the maximum limit. In these diagrams the line P represents the pressure applied to the brake blocks. The line F shows the retarding force of the brake blocks upon the wheels before the wheels slipped, and f shows the force while the wheels were sliding on the rails. The line SS represents the peripheral speed of the wheels in miles per hour, which, when there is no slipping, is equal to the velocity of the train. The abscissa shows the seconds duration of the test.

In test a the brake pressure P was kept approximately constant, but as the speed decreased the coefficient of friction increased so that the effective braking force F approached too near the limit. The wheels lost their "bite" on the rails, stopped revolving, and the braking force ff was reduced to less than one-third of the friction produced between the brake-shoes and the wheel when the brakes were applied to allow the wheel to continue revolving. It required fifteen seconds to stop the car, whereas it might have been stopped in half of that time if the pressure P had been reduced somewhat as the speed decreased or if the rail had been well sanded before slipping commenced. In test b the brake pressure P was reduced as the speed diminished, and as a result there was practically no skidding of the wheels.

There are two general classes of brakes, those which act on the track directly and those which act upon the rotating portions of the car. Some brakes combine both of these principles.

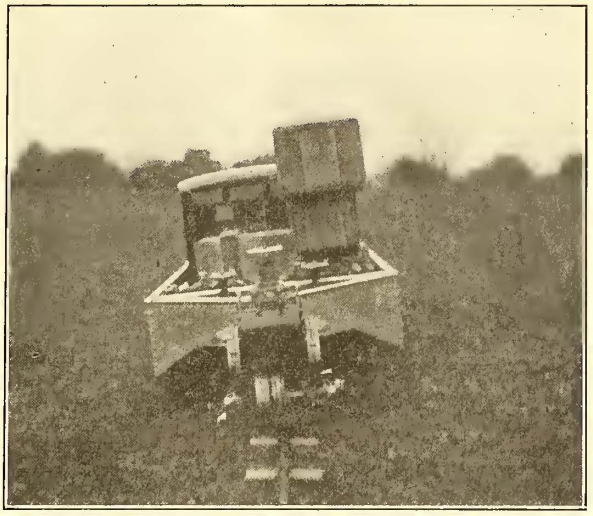
A powerful means of braking a car's speed is the torque of the motors themselves, either by attempting to run backward because of current reversal, or by acting as generators. One or both of these methods is commonly used by motormen in cases of emergency braking. Either may be very effective in the hands of an intelligent, self-controlled motorman, but is liable to fail when not skilfully used because too great a torque may cause the wheels to skid and lose the advantage of static friction between the wheel and rail.

The speaker then explained the construction of some typical wheel and track brakes and concluded with the presentation of Fig. 7. This gives the results of a braking test on a single-truck city car equipped with magnetic track brakes, and is reproduced from the report of the Electric Railway Test Commission. The speed during acceleration is represented by the curve o—a—b. The car was then allowed to drift from b to c. The brakes were applied from c to f, and the approximate deceleration during that time is shown by the broken line. The average retardation was about 2 miles per hour per second.

THE BRENNAN MONO-RAIL

In the last issue of the STREET RAILWAY JOURNAL a brief description was published of the Brennan mono-rail line, invented by Louis Brennan, C. B., and exhibited by him at the meeting of the Royal Society in London on Wednesday, May 8. Photographs and additional details of the experimental system have since been received. Pictures presented herewith show cars in operation. One picture, in fact, shows how the car rights itself when unevenly loaded.

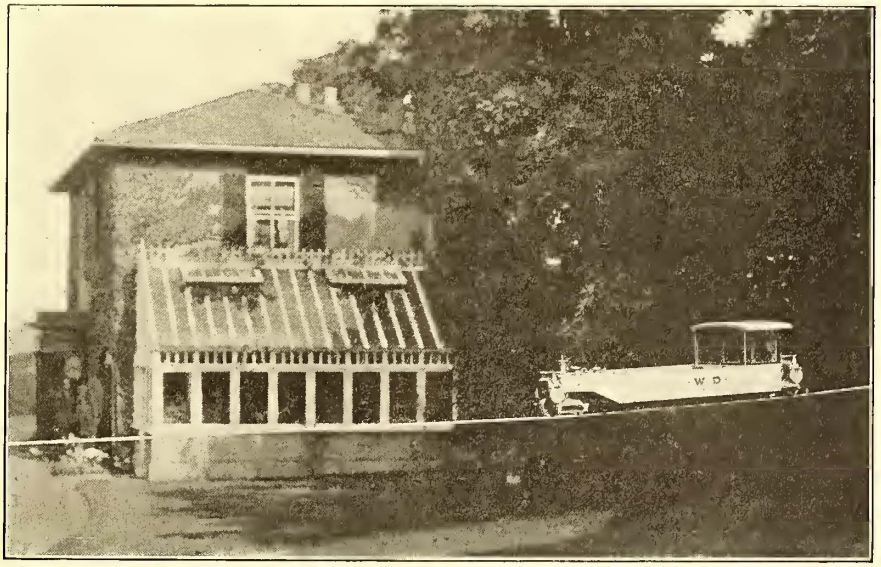
The feature of the system is that each vehicle is capable of maintaining its balance whether it is standing still or moving, notwithstanding that the center of gravity is several feet above the rail, and that wind pressures, shifting of load, and centrifugal action, or any combination of these forces may tend to upset the car. The mechanism consists essentially of two fly-wheels in vacuum, mounted so that they



EFFECT OF UNEQUAL LOADING ON MODEL

can be rotated in opposite directions by electric motors and their gyrostatic motion utilized. If the driving current is cut off, the wheels, it is said, will run for some time at sufficient velocity to impart stability to the vehicle.

The road wheels are placed in a single row beneath the



MODEL IN CENTER OF WIRE ROPE BRIDGE WITH 50-FT. SPAN

center of the vehicle, instead of in two rows near the sides as usual, and are carried on bogies or compound bogies, which are not only pivoted to provide for horizontal curves on the track, but for vertical ones also. By this means the vehicles can run upon curves of even less radius than the length of the vehicle itself, or on crooked rails or rails laid over uneven ground, without danger of derailment. Further particulars were published last week.

The motive power may be steam, petrol, oil, gas or electricity, as considered most suitable for local conditions. In order that the vehicle may be able to ascend steep inclines, the wheels are all power driven, and change gears are provided for use in hilly country.

MEETING OF THE CENTRAL ELECTRIC RAILWAY ASSOCIATION

The regular bi-monthly meeting of the Central Electric Railway Association, held May 23 at Indianapolis, was one of the most interesting and successful during the life of the association. The meeting was in the Claypool Hotel, where the Ohio and Indiana Associations amalgamated nearly two years ago. The attendance was fully up to the average, the interest and enthusiasm unsurpassed and the sessions held strictly to business by President Nichols.

President Nicholl called the meeting to order promptly at 10 a. m., and, after the usual introductory remarks, announced that the next meeting would be held at Columbus, Ohio, on the fourth Thursday of September. He stated that the financial affairs of the association were in a flourishing condition, but while the supply men are doing nobly, the finances are not coming in as rapidly as anticipated, due to the fact that several traction companies and members are delinquent.

Mr. Nicholl announced that three new companies had joined the association since the last meeting, viz.: Marion, Bluffton & Eastern, Chicago & Interurban Railway Company and the Fort Wayne & Springfield Traction Company. Six new members had also been added to the list. Mr. Spring said that inasmuch as the association had taken an active part and received favorable consideration at the national convention at Columbus, he moved that the association send a committee of two—one the president and one other selected by the president—to represent the association before the American Street & Interurban Railway Association at Atlantic City. The president said he would announce the committee later.

The first paper was the following, on "Modern Train Dispatching," read by J. K. Gray, train master of the Western Ohio Railway Company, Lima, Ohio.

MODERN TRAIN DISPATCHING

Not until recently have the managers of electric railways given very much attention to the most important part of train operation, the dispatching of trains. They have, however, lately come to realize that it is just as important to dispatch electric trains safely as steam trains. Both should be operated as nearly in the same manner as conditions will permit. There are still some electric roads that operate without a train dispatcher, but use the car house foreman or some centrally located, trusted employee, who does this as a kind of a side line along with his regular duties. This system seems to work very well where trains run slowly. When a train arrives at a given meeting point, in most cases the motorman calls up the car house or shops and says to the acting dispatcher, "This is Brown at Siding No. 4, Jones is not in sight"; the acting dispatcher will say, "Jones left Yorkville fifteen minutes late, stay there until he comes," which they do, making a collision impossible; or if the telephone is not in working order the crew just sits down and waits for the opposing train.

The modern dispatching system is handled by a trustworthy man, preferably taken from the train service, where he has been for a period of time long enough to acquaint himself with every inch of the property, and is thoroughly competent to hold a position where safety to both passengers and property must be assured regardless of cost and the speedy operation of trains.

The dispatcher's office should be in a large, well-ventilated room with plenty of light, and the door locked to all, for the presence of any person in the dispatcher's office is liable to distract his attention and cause him to make a mistake. His office should be centrally located as nearly as possible so he can communicate with the trainmen distinctly, directing the movement of trains in addition to the movements provided for in the rules and time card.

When the printed time tables, showing the meeting and passing points, the time of all scheduled trains and the rules directing how these trains are to proceed with relations to each other, are studied, thoroughly understood, and faithfully observed by all, collisions will not occur.

There should be a good desk set where the telephone line is on the same poles on which the high transmission

Form O—109. 40m C9-06.

THE WESTERN OHIO RAILWAY CO.—TRAIN ORDER.

Order No..... Date.....190....

To Motorman and Conductor.

No.....Motor.....at Siding.....

1 Meet No.....Motor.....at Siding.....
2 Meet No.....Motor.....at Siding.....
3 Meet No.....Motor.....at Siding.....
4 .....
.....
5 Report at Siding.....
6 Proceed to Siding.....against No.....and report.
7 No.....of this date is annulled between.....and.....
8 No.....will run ahead of No.....to.....
9 Run as.....Section No.....from.....to.....
10 Will run Extra from.....to.....and return to.....

Complete at.....M ..... Dispatcher.....

FORM OF TRAIN ORDER

line is carried, for it has happened that a live high-tension wire has fallen on the telephone line and had no bad effect whatever on a desk set; where the telephone line is on a separate line of poles, a cordless telephone board equipped with two-way cams and numbered drops will give excellent service, but a live high-voltage wire falling on a line connected with this box will render the same at once unfit for service.

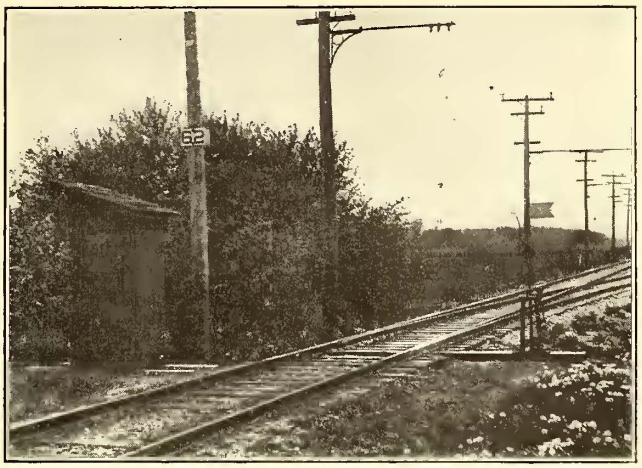
A regular train sheet must be kept and all train movements recorded just as soon as any train reports or is reported, and when one dispatcher relieves another all orders must be written on the prescribed form and placed in a conspicuous place so there will be no misunderstanding. There should be three dispatchers daily, each working an eight-hour shift, to produce good results.

To obtain good results from trainmen, they are first required to pass the examinations specified by the company, which include eye, ear and physical stripped. If they qualify, they are given a rule book and time card, with instructions to study carefully. The student is then placed on a train with a competent man, who teaches him everything possible pertaining to his division. After the recruit has learned a division, he is called to the office and examined thoroughly, especially on train orders; after he has become acquainted with all the divisions he is again subjected to an examination. If he understands the rules and train orders thoroughly, he is then permitted to operate a train with an old trainman, either motorman or conductor, as the case may be.

To obtain orders from the dispatcher on the road I represent, the motorman or the conductor, as the case may be, steps into a telephone booth, 3 ft. x 3 ft. x 8 ft., with a window in each side, 18 in. x 24 in. He gives one short ring which calls the dispatcher, then tells his train number and siding number to the dispatcher, who gives such or-

ders as are necessary; the trainman repeats the order as it is given and writes the same on the prescribed form, making two copies by the use of carbon paper. He then repeats the order to the dispatcher, who checks it from the original order transmitted, and if it is correct the dispatcher will complete the same by giving the time and his initials. The motorman retains one order and gives the other to the conductor, who reads the order over to the motorman before the train is allowed to proceed, thus causing a double check. The train order is then placed in a clip fastened on the window sash directly in front of the motorman, and the conductor places his copy in a clip in the rear end provided for him. Thus both orders are in plain sight until the same is fulfilled, superseded or annulled. We prefer the motorman, but permit either the motorman or conductor to receive orders from the dispatcher, for the purpose of avoiding the least possible delay. Our telephone booths are located at the switch point of sidings, so when the conductor opens the switch to allow his train to take a siding he is right at the telephone booth,

INTERIOR OF DISPATCHING OFFICE



TELEPHONE BOOTH ON LINE

THE WESTERN OHIO RAILWAY COMPANY

DISPATCHERS { .....from.....M. to.....M. / .....from.....M. to.....M. / .....from.....M. to.....M. / .....from.....M. to.....M.

TRAIN SHEET.

For.....the.....day of.....190....

POWER { On.....M. / Off.....M.

EXTRA TRAINS	SOUTH BOUND TRAINS	NORTH BOUND TRAINS	EXTRA TRAINS
Motorman	Motorman	Motorman	Motorman
Conductor	Conductor	Conductor	Conductor
Train No.	Train No.	Train No.	Train No.
Motor No.	Motor No.	Motor No.	Motor No.
Findlay	Findlay	Findlay	Findlay
2.3 Siding 121	2.3 Siding 121	2.3 Siding 121	2.3 Siding 121
4.8 Siding 119	4.8 Siding 119	4.8 Siding 119	4.8 Siding 119
7.5 Siding 117	7.5 Siding 117	7.5 Siding 117	7.5 Siding 117
Rawson	Rawson	Rawson	Rawson
9.7 Siding 113	9.7 Siding 113	9.7 Siding 113	9.7 Siding 113
Mt. Cory	Mt. Cory	Mt. Cory	Mt. Cory
13.2 Siding 109	13.2 Siding 109	13.2 Siding 109	13.2 Siding 109
15.9 Siding 107	15.9 Siding 107	15.9 Siding 107	15.9 Siding 107
16.3 Bluffton	16.3 Bluffton	16.3 Bluffton	16.3 Bluffton
19.2 Siding 105	19.2 Siding 105	19.2 Siding 105	19.2 Siding 105
22.3 Beaver Dam	22.3 Beaver Dam	22.3 Beaver Dam	22.3 Beaver Dam
25.7 Siding 103	25.7 Siding 103	25.7 Siding 103	25.7 Siding 103
28.9 Siding 101	28.9 Siding 101	28.9 Siding 101	28.9 Siding 101
31.0 Siding 99	31.0 Siding 99	31.0 Siding 99	31.0 Siding 99
32.3 Lima	32.3 Lima	32.3 Lima	32.3 Lima
Siding 4	Siding 4	Siding 4	Siding 4
34.4 Siding 5	34.4 Siding 5	34.4 Siding 5	34.4 Siding 5
35.0 Siding 8	39.0 Siding 8	35.0 Siding 8	35.0 Siding 8
35.3 Siding 10	35.3 Siding 10	35.3 Siding 10	35.3 Siding 10
35.9 Siding 11	35.9 Siding 11	35.9 Siding 11	35.9 Siding 11
39.8 Siding 14	36.8 Siding 14	36.8 Siding 14	36.8 Siding 14
40.5 Siding 17	40.5 Siding 17	40.5 Siding 17	40.5 Siding 17
Cridersville	Cridersville	Cridersville	Cridersville
41.7 Siding 20	41.7 Siding 20	41.7 Siding 20	41.7 Siding 20
46.5 Siding 26	46.5 Siding 26	46.5 Siding 26	46.5 Siding 26
47.9 Wapakoneta	47.9 Wapakoneta	47.9 Wapakoneta	47.9 Wapakoneta
Siding 27	Siding 27	Siding 27	Siding 27
50.8 Siding 32	50.8 Siding 32	50.8 Siding 32	50.8 Siding 32
53.9 Siding 35	53.9 Siding 35	53.9 Siding 35	53.9 Siding 35
56.9 Siding 38	56.9 Siding 38	56.9 Siding 38	56.9 Siding 38
57.9 St. Marys	57.9 St. Marys	57.9 St. Marys	57.9 St. Marys
58.0 Siding 41	58.0 Siding 41	58.0 Siding 41	58.0 Siding 41
59.9 Siding 53	59.9 Siding 53	59.9 Siding 53	59.9 Siding 53
62.7 Siding 57	62.7 Siding 57	62.7 Siding 57	62.7 Siding 57
65.4 Siding 59	65.4 Siding 59	65.4 Siding 59	65.4 Siding 59
67.8 Celina	67.8 Celina	67.8 Celina	67.8 Celina

while the motorman is on the car probably 100 ft. from the booth. Hence, by having the conductor report and receive the train order we save sometimes two to three minutes. In towns or cities the motorman invariably takes the orders, as the conductor is busy at the rear platform while at stations.

The telephone is used entirely for train dispatching on our road and excellent service is obtained. Eighty miles of the system consists of two No. 9 galvanized iron wires carried on cross-arms in the usual manner, on the same poles underneath the high transmission lines, and transposed every ten poles to prevent interference from parallel power and feeder lines; 32 miles consists of two No. 12 copper lines constructed the same as the iron line, with the exception of the transposition which is rolling every ten poles.

On this line all the dispatching and commercial conversations are carried, keeping the line very busy at times; but if proper attention is given to the telephones and telephone line, good results will be obtained. There are twenty-eight telephones on the line at all times and thirty-eight 'phones located in telephone booths that have cut-out switches. By connections, using just the ordinary one-way switch, the dispatcher can communicate with Dayton, a distance of 60 miles; with the Toledo city limits, a distance of 94 miles; with New Haven, Ind., a distance of 72 miles, and with Springfield, a distance of 70 miles.

This road is divided into three divisions, viz., Findlay-Celina Division, 68 miles, operating seventy-eight passenger trains and eight freight trains; the Wapak-Piqua Division, 32 miles, operating fifty passenger trains and four freight trains, and the St. Marys-Minster Division, 12 miles, operating twenty-four passenger trains and four freight trains. Besides the foregoing trains we operate a line car and work-train daily except Sunday.

DISCUSSION

In the discussion which followed, J. W. Moore, of the Indianapolis & Cincinnati Traction line, asked how Mr. Gray handles work trains. Mr. Gray replied that work trains are all run as "extras" on his road. Any time a train of any class is met a report must be sent to the dispatcher and if the crew cannot get him it must remain on the siding until the regular train comes along.

G. E. Burrows, of the Indiana Union Traction Company, wanted to know how the freight trains were operated. Mr. Gray replied that freight trains were also run "extra," coming in the same class as the work trains. They go on the siding and remain until communication is secured with the dispatcher and then are not permitted to move without orders. It is a standard rule that every train going into the switch must report it; everything is extra from there. When there is a special car, the aim is to run that on a second order like freight trains.

Mr. Burrows asked what method was pursued in furnishing trainmen with orders. Mr. Gray said they furnished the motorman and conductor each with a copy of the order. Both are held responsible for the movement of that train. It is impossible for them to get away from the responsibility, as both have orders to correspond with the order in the dispatcher's office.

F. D. Carpenter, general manager of the Western Ohio Railway, said that the subject under discussion was a very important one, and as the paper read outlined the manner in which a road is operated, he would naturally like to hear some criticism. If no criticism was aroused, he would begin to think they were all right. He wanted suggestions from the train dispatchers present, as he was endeavoring to avoid accidents, and if any one could offer something better than he has, his company would adopt it.

Mr. Spring said that a matter of great importance discussed about recently was whether it is better to deliver orders to the motorman, the conductor, or both. There is a diversity of opinion of this matter and he wished that the members could effect an agreement on this point, and one he would like particularly to have discussed by the dispatchers. Some operators say that the order should be given to both, and others that the conductor or motorman alone be held responsible.

President Nicholl said Mr. Spring's suggestion was a good one, and he believed it would be a good thing for the association to decide who should take the order.

Mr. Baldwin, of the Indiana Union Traction Company, was appealed to, and replied that his company's plan was for the motorman to take the order and give it to the conductor.

Mr. Golda, of the Indiana Union Traction Company, said their system is in excellent condition, but perhaps they could improve it. They get trains over the road in excellent shape, free from accident and with very little line trouble. Their way of handling extra trains continually is successful. They have two lines, and in case the dispatcher's line is in trouble, the general line is used. The dispatcher's boxes are used at the sidings, where the work trains receive their orders to use the main track. Any extra trains approaching in either direction are notified at points north and south of the position of the work train. That order affects all of them, unless it is very important that they give way to the extra or work train ordered against.

Mr. Gray was asked how trains were operated in case of total disability of the train dispatcher's line, and how the cars were handled. He said they could not be blocked. He was asked how far that extends and how far they can operate by signals when lines get out of order.

Mr. Gray replied that they had had some trouble with telephone lines because of being placed on the high-tension arms. They have located telephone booths every 5 miles. In case of trouble with the dispatcher's line they cut out that section and depend on the long-distance telephone. If the telephone is out of order, it is up to the crew of the regular car to protect the other cars by the correct display of green flags. He said they like to have trains on time, but they look to safety first.

President Nicholl asked Mr. Gray what he could do when both telephone lines and long-distance lines were down. He replied that he had never been up against that proposition. In such cases, however, when both lines come down there is nothing to do but stay there. They have never had to contend with that situation, and what they would do had never occurred to them.

Mr. Merrill said, as to whether the conductor or motorman should receive the order, there should be some law or system back of all that. The most important thing is a rule as plain as possible to tell what trainmen must do under circumstances. These are the fundamental principles of a satisfactory system. Time tables are helpful, but the question as to how the movement shall be governed is simple in connection with this whole matter. Nothing pertaining to electric railways to-day is of more importance than the question of train dispatching and the movement of trains, and nothing is likely to lead to standardization better than a uniform system of train dispatch-

ing. Therefore, he suggested the adoption of a standard system of train orders and train dispatching, with the rules adopted observed to the letter.

President Nicholl said the American Association had gone into the plan of rules, and also the New York Association had taken steps to adopt a system of rules and this association has a committee to adapt a book of rules. He thought it advisable to take up the matter and either adopt the American Association rules or change them to meet the conditions in this territory.

Mr. Spring said he fully concurred in what had been said, and suggested the appointment of a standardization committee to report at the next meeting so the report may be carried to the next national meeting. He said every man has a different method, but in case of standardization every one would know what to do in case of emergency. On motion of Mr. Spring, President Nicholl appointed the following standardization committee on rules for train dispatching: F. D. Carpenter, general manager of the Western Ohio Railway; C. N. Wilcoxon, general manager Cleveland & Southwestern Railway Company; C. D. Emmons, general manager Fort Wayne & Wabash Valley Traction Company; C. A. Baldwin, superintendent of transportation Indiana Union Traction Company, and F. J. J. Sloat, general manager Cincinnati Northern Traction Company.

Mr. Hutchinson, of the Westinghouse Company, said he was very much interested in Mr. Gray's report, as it occurred to him it is safer when the order goes to both the motorman and conductor, and the conductor is given a copy of same. He said the conductor's responsibility should not end at that point. Mr. Hutchinson related incidents of two bad accidents due to motormen forgetting their orders. If the conductor was compelled to go forward and consult with the motorman a half mile before the meeting place was reached, there would be less chance of going past the meeting point. He said he did not know that such a rule prevails on any of the roads, but thought it should. As far as the standard system of dispatching is concerned, he believes it is a matter that will have to emanate from the National Association. He thought that a committee appointed by this association would work up to great good, and would enable the committee to take its recommendations to the National Association. Doubtless they were aware that the American Association had adopted a standard code of rules, and he would like to have the conductor's responsibility increased. President Nicholl said it was his understanding that the National Association had passed upon such a system.

M. C. Stern, of the General Systems Company, of Dayton, Ohio, then read the following paper on "Modern Train Dispatching":

MODERN TRAIN DISPATCHING

Train dispatching is as important as the very rails over which your cars are run, and the more the system of dispatching is freed from unnecessary red tape, the better the service and the greater the results. There are many reasons why this subject is of prime importance. Let a wreck occur, and the press, seeking popular favor, in these strenuous days of public service animosity, sends broadcast a censuring report in glaring headlines. Then the legislator, striving to serve his constituents for further elevation in his political ambition, is also inclined to be hostile to the railroad company.

Since double-tracking is an expensive luxury, the dispatching of trains on single tracks should certainly be so well designed as to protect life and property and improve the schedule, for the greater number of daily trips a car can make, the greater is the earning power.

The people are not unjust when they demand safe travel, and there is not a single railway official, in my mind, who aims to refuse that demand, for all books of rules contain severe and pointed instructions regarding the safety of passengers and the protection of property; more especially when we consider the fact that, as carriers of passengers, the greatest responsibility rests upon the officials.

While I may say that no matter how perfect a system may be, man may err and ill consequences follow, I do claim—claim absolutely—that methods should be adopted, not only to improve conditions, but also to prevent such errors and increase the responsibility of those connected with the operating of trains, from the dispatcher to the crew. This will develop their mental powers to their proper capacity, thereby making them more reliable and hence more valuable.

A perfect dispatching system depends upon at least five factors: responsibility; elimination of verbal messages; convenient and frequent means of receiving messages; proper erection, correct installation and maintenance of signals, telephones and records; and judicious economy. Verbal messages are entirely void of any security, for it is an easy matter to shift blame from one to another when no evidence can be brought forward to place the blame on the right man. Written messages, singly or even duplicate, likewise fail in completeness, as it is surely an easy matter to destroy such orders and thereby darken the search for the cause or the party responsible. That course is likely to be followed in ninety-nine cases out of a hundred if an accident occurs or there is any other possibility of a call "on the carpet."

The triplicate secret method is the beacon light across the sea of controversy, and casts its rays clearly upon all the facts. Hence, I suggest the issuance of three distinct copies over autographic dispatching registers, which may be placed in booths, on cars or wherever else messages are received. These machines produce three full copies of each train order, one for the conductor, one for the motorman and the third is retained in a private receptacle under lock and key for audit and checking by the proper road official.

Messages are sent in the following manner: The dispatcher, having a machine at his desk, records in duplicate each message that he issues, one discharged from the machine, the other retained in a locked receptacle. As the message is given, the conductor writes the order as he receives it, repeating the same to obtain the dispatcher's "complete" when he signs his name to the order, thus declaring his full understanding thereof. A like course may be followed by the motorman reading and repeating the message, signing his name with a declaration like that one of the conductor. Thus we have the signature of the dispatcher, the conductor and the motorman constituting an unbroken chain of signatures which are indisputable, undeniable and absolutely certain, above all, stamping indelibly upon every man's memory the responsibility that rests upon him.

A majority of roads use the combined booth and station means of receiving orders, while some few employ the portable telephones on cars. For obtaining orders at booths, the conductor, as a rule, should call the dispatcher, who, in turn, will give such orders as are necessary, whereupon the conductor should write the same plainly, with-

out any abbreviation (which is quite important) on the dispatching register, reading and repeating the same as before mentioned. If the motorman should also read and repeat the same to the dispatcher, it can be done as stated. At stations the agent should call the dispatcher upon the approach of the car to ascertain if any orders are to be given; if so, the conductor is signaled, or the order may be taken by the agent, read and repeated to the dispatcher for his O. K., signing same in a space provided therefor, giving to the conductor upon his reading, repeating and signing same, both the original and duplicate—one for himself and the other for the motorman—taking a signature from the motorman on his (the conductor's) copy. If portable telephones are carried on cars, jack boxes are installed at proper points or turn-outs, switches, etc. In such cases the motorman usually calls the dispatcher, giving necessary information as to car number, time, etc., while the dispatcher gives the order, both the motorman and himself writing it as given over the register. The message is read and "completed," then re-read and repeated by the conductor.

The motorman's copy should be placed on a clip directly in front of him, serving thus as a notice and a most excellent reminder. The third or secret copy is beyond the crew's reach and ever ready for immediate inspection. Now this operation does not occupy unnecessary time, for it works with clock-like precision, and the men readily become accustomed to its operation, taking a single order under even heavy conditions in a time never over thirty to forty-five seconds.

The dispatcher's office should be entirely separate from all other offices. A strict forbiddance should be maintained relative to permitting any one to enter except on the most important business.

The switchboard that I find very highly recommended is of the cordless type, since the desk is entirely clear for the dispatcher's sheets, and overcomes the tendency of getting out of repair at critical times.

The telephone provides immediate and direct comunication, and consequently commends itself far in preference to the telegraph. The lines may be single or duplicate, the latter preferable, since in this manner the second line provides connection with agents, stations, power house and general headquarters, the first being exclusively for dispatching.

Many roads have, in addition to their private lines, either Bell or independent telephones, or both, thereby giving every available means of communication; yet the rules regarding the use of telephones should be clear, limiting it on the dispatch lines to strictly dispatching business. This will prevent cross talk or useless conversations regarding orders, thereby improving the schedule and creating discipline and respect.

The standard steam road train sheets seem exceedingly well adapted to interurbans for recording the movements of trains and meetings as they occur. The train order form should be arranged to avoid unnecessary rewriting and worded to be clearly understood by all. Keep your orders clear and simple and avoid all abbreviations.

It may be regarded as good, in the use of triplicate copies, to have a white sheet for the motorman and a yellow sheet for the conductor. The record copy should be white because it shows the carbon better, is retained as a basis of positive information about all dispatching matters and is carefully scrutinized by the proper authorized official.

The question of booths is solved in the octagonal shape covered with corrugated iron, with a peaked roof. This booth should be securely anchored by lag bolts into posts driven into the earth, making it perfectly secure and avoiding its being carried away by winds or mischievous youngsters. Furthermore, it should be well lighted, having a southern exposure for daylight, and the opening of the door should connect the light circuit.

Let your telephones be of the best type, fastened to the wall of the booth; place the dispatching register on a shelf in a position to write orders with perfect ease, the left hand holding the receiver while the right hand falls naturally on the dispatching machine to register the order.

The summary resolves itself into judicious economy. Let not the first cost of installation play any important part, for, once installed, the best always produces results—good seed means good product, and money well planted, well invested in a thorough dispatching system, yields immeasurable returns, bringing back, in satisfaction alone, far more than it cost, and giving a service that cannot help but receive the hearty endorsement of the public, since its demands will have been met to a far greater degree than anticipated.

DISCUSSION

Mr. Gray asked Mr. Stern if the train crew received the order all right would it not correspond with the order on the book? Mr. Stern replied that it would; that the orders were all numbered.

At this point, F. D. Norveil, of the Terre Haute, Indianapolis & Eastern, said he thought it would be of great interest to the association to hear Mr. Button, and the president introduced Mr. Button, general manager of the Telegraph Signal Company, Rochester, N. Y.

Mr. Button, as a representative of the Telegraph Signal Company, said they have a signal against danger operated by the dispatcher any time when occasion requires. For instance, when any cars are running under schedules and he wishes to communicate with it at the next station, this signal gives the dispatcher an opportunity at any time to call for any train crew in his district in a short period. When a company has its time table governing the movements of trains, it has gone a long way toward the solution of its system, but the dispatcher, unless he has ready support at every station, is constantly at a disadvantage. He said: "If you send an order to station C and A, wishing cars Nos. 1 and 2 to meet at station B, both stations receiving the order simultaneously, you think you have absolute safety, but you are still leaving the barn door open for the horse to be stolen if you do not provide against the fallibility of the man who holds the order for the operation of the trains and have their rights restricted. The moment you place an order for the operation of a train restricting its rights you know it. If the operator at station C neglects or fails to perform his duty, it is still possible to signal at station B, the meeting point of the danger. It is proven throughout the country by a very large number of cases that the failure of these operators in placing signals of danger for trains have resulted in our reading the next day of enormous property loss to the company and the loss of a great many valuable and innocent lives. But the operator is not wholly to blame, for, as a rule, he has a multitude of duties to perform aside from his train service. He is possibly the mayor and constable of the town with the important duties attaching to those offices, also an express agent, which adds another important duty. In an effort to perform all of this work, the railway interests are not safeguarded nor are those of the public."

Mr. Button explained what signal was displayed if an operator forgets to give an order. In case the train gets away from him he simply inserts a plug in the machine which corresponds with the number of the station and in a few seconds the signal at that station drops to danger and automatically informs the dispatcher within two seconds that the signal at that station has fallen to signal danger, giving him positive proof that what he wanted to do has been done. In case an operator does not answer his call promptly by reason of being asleep or at his home, the device rings an alarm bell at his particular station and also at the operator's home, as a command for him to come to the office. Thus his service is immediately obtained and the trains kept moving.

He also described how the system was relieved in case the operator leaves his key open and the circuit re-established. Mr. Button said he had been asked what they could do for the electric railways in their field. They tell them they can apply the signal device on telephone service so that any time communication can be had with stations or trains in a few seconds. Mr. Button related several instances where railroad officials had frankly told him that if they had had such a system of signaling in use, particular frightful disasters would not have occurred. Mr. Button said this is why they come before the interurban men to see whether or not they can be of service to the electric railway field. Mr. Button said they built the machines at their own expense and can install a number of them in one day. The rental charge is $1 a month at each station. He concluded his talk by inviting the members to his room in the hotel where he had installed his device. There he gave a most interesting demonstration of what his signal system will do. The interurban men were greatly pleased with the simplicity of the device, and generally admitted that it could be applied to an interurban system to great advantage.

AFTERNOON SESSION.

Upon calling the convention to order, President Nicholl read a telegram from F. J. Stout, general manager of the Lake Shore Electric Railway, regretting his inability to be present and incidentally announcing that he had appointed L. K. Burge general superintendent of the Lake Shore Electric Railway and all other properties controlled by that company.

The next paper was read by S. R. Dunbar, purchasing agent, Indiana Union Traction Company, Anderson, Ind., on "The Issuing of Supplies. How to Prevent Leaks."

THE ISSUING OF SUPPLIES. HOW TO PREVENT LEAKS

In presenting this subject, I shall try not to wander too far from the issue, and shall endeavor to guard the leaks closely. I have perhaps interpreted the title as being more comprehensive than was intended, but lack of the time which I should have liked to devote to it may explain that.

A railroad, more than any other concern, it seems to me, must trust a great deal of valuable property to the hands of its employees. It places as many safeguards as possible about the handling of its cash and its cars, but is everything done which could be done to insure a proper use, as well as a proper issuing of its material?

The cash is the heaviest problem, of course. What we do not get might pay for an accident or two, with a little material thrown in, but what fails to reach the treasury has to accomplish its disappearance before the eyes of at least a few people. When a car is put out on the road with its load of humanity or freight, a great deal of property and life is entrusted to the crew and the dispatcher. They cannot disappear with it, but they can cause great loss. Unlike either of the foregoing, material can disappear and no one know where.

The possibilities of loss do not stop with the issue of supplies from the storeroom by any means, and if the title of this paper does not limit me to consideration of leaks before and at issuance, I might suggest that one of the biggest problems is the care of material, tools and supplies after they leave the storeroom. The only ways to prevent leaks and waste after supplies are issued are continual vigilance on the part of the heads of departments and a policy of holding each employee strictly and individually responsible for all company property which may come into his hands.

Nowadays, the concern which does not know just what its product should and does cost will not live to bother its competitors long. That the cost may be known, some one must know just how much material and time are necessary to accomplish the work in hand. We know that a railroad, with many of its workers away from any possibility of strict supervision, is up against difficulties which are hard—some of them impossible—to overcome; but a system of reports can be devised which would prevent excessive waste or loss.

A lineman may be a tough proposition, but he is seldom responsible for the tearing down of a line, and may be required to report the material used to repair the break, and his work be checked by an inspector. So with an armature winder or any other employee.

Railroads generally supply most of the inhabitants in their territory with a complete set of tools before construction is over, but afterwards I believe that absolutely no tool should be issued until the old one has been turned in or additional tools are shown to be necessary.

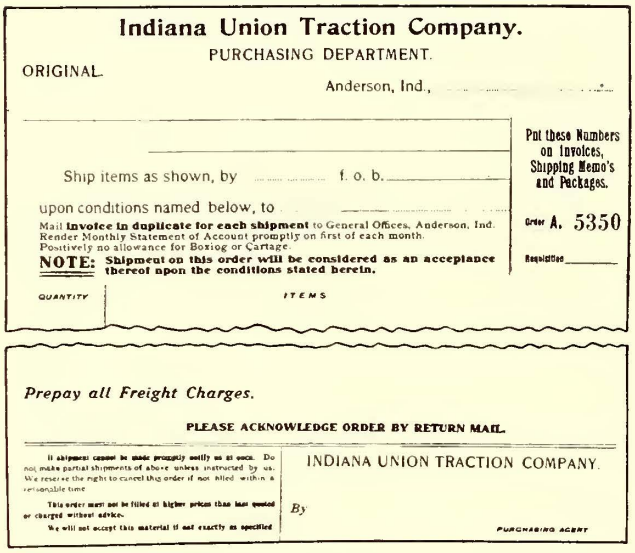
As has been implied, there are, in my opinion, fewer difficulties in the way of a proper issuing of supplies than there are in the way of a proper use and care of them. There is an impersonality about a railroad which has its effect upon all who are employed by it; what loyalty there is more often is felt toward the head of a department rather than toward the company itself. As the storeroom is concerned with all the departments, this "impersonality" has less effect, and, partly for that reason, the storeroom can be dealt with more strictly and exactly. The proper use and care of supplies will, I believe, always be more or less of an unsolved problem; but to my mind that is not the case with a storeroom. Leaks in the issuing of supplies can be prevented. The problem is solved by merely having a good system and sticking to that system. It is possible to do both, but, necessarily, as in all kinds of work, good tools (in this case a good system) should be in good hands. Good men are needed in the storeroom just as much as on any other part of the road. In fact, I would rather have enough good—that is, accurate and careful—men and a poor system than cheap help and a good system. That's No. 1 on "How to Prevent Leaks."

The storeroom serves two purposes, that is, the holding of material in stock for use as needed, and serving as a suspense account, so that charges are not made to the operating and other accounts until the material is actually used. Both are important, equally so as far as the storekeeper is concerned, although the auditor and the master mechanic may not agree as to which is the more important. I shall probably be unable to keep the stock and the accounting entirely separate, because what affects the one affects the

other; but that there are two objects to be served should, nevertheless, be borne in mind. And as the subject is partly "How to Prevent Leaks," I shall not try to describe the leaks, but possibilities of one or more leaks will be found lurking somewhere near each suggestion that follows.

The starting points—the very foundation of our system, and without which there can be no system at all, but everything left wide open for all kinds of leaks—should be a locked storeroom with big "Keep Out" signs over the inside gates, and well understood rules to the effect that nothing can be obtained from the storeroom without proper written authorization. The material and supplies in the storeroom represent cash to the company, are handled as cash in the accounting, and should be safeguarded the same as cash. No one would think of permitting Tom, Dick and Harry to have access to the cash drawer, or of issuing John Doe a voucher for money merely because he asked for it.

To go with a locked storeroom must be rules that only some one of the storeroom force can give or take out ma-



Indiana Union Traction Company.

PURCHASING DEPARTMENT.

ORIGINAL.

Anderson, Ind., ...

Ship items as shown, by ..... f. o. b. .....

upon conditions named below, to .....

Mail **invoice in duplicate for each shipment** to General Offices, Anderson, Ind.
Render Monthly Statement of Account promptly on first of each month.
Positively no allowance for Boxing or Cartage.

NOTE: Shipment on this order will be considered as an acceptance thereof upon the conditions stated herein.

Put these Numbers on Invoices, Shipping Memo's and Packages.

Order A. 5350

Requisition .....

QUANTITY | ITEMS

Prepay all Freight Charges.

PLEASE ACKNOWLEDGE ORDER BY RETURN MAIL.

If shipment cannot be made promptly notify us at once. Do not make partial shipments of above unless instructed by us. We reserve the right to cancel this order if not filled within a reasonable time.

This order must not be filled at higher prices than last quoted or charged without advice.

We will not accept this material if not exactly as specified

INDIANA UNION TRACTION COMPANY.

By .....

PURCHASING AGENT.

TRIPLICATE ORDER BLANK (ORIGINAL 8 INS. BY 10 INS.)

terial. The storekeeper cannot be held responsible unless he can prevent supplies from being stolen, or from being improperly issued or taken out.

The written authorization to obtain supplies should be on a specified form, generally known as a requisition, numbered if possible. As the requisition serves as the basis for the charges to the different accounts, as well as the authority on which the supplies are issued, the auditor should be at least concerned in getting up the form and in the instructions to be given in regard to its use.

The requisition is the corner-stone of any storeroom system. After the material has been issued on it, it takes the place of the material, so far as the accounts go, and must be treated as carefully as a voucher for a cash payment would be. If lost, or if misappropriated by the guardian of some source of expense because his accounts have been running high, no charge can be properly made, and the storeroom will be "short." It is important, therefore, that requisitions not only be kept in a safe place, protected from fire if possible, until charges and stock records have been made from them, but that no one outside the storekeeper and his stock or charge clerks should have access to them. One lost, mislaid or misappropriated requisition does not mean much, perhaps, but a few of them for big charges would make a large shortage at the next inventory, which would have to be charged against profit and loss.

The storekeeper must, of course, issue material whenever a properly signed requisition is presented. He cannot have any discretion in the matter except as between proper and improper requisitions. He should, therefore, receive definite instructions as to what and whose requisitions to honor at the same time that heads of departments are instructed as to how requisitions should be made and signed. There are many possibilities for leaks, or an improper issuing of material, if requisitions are allowed to be made without being approved, or at least being seen, by the heads of the different departments. If you don't believe it, ask the storekeeper.

The requisition should contain columns in which to enter the prices of the articles named and the accounts to which charges are to be made, as well as space for date, quantity of the article on hand, quantity required, quantity delivered, description, and purpose for which intended.

A good system does not stop with the locked storeroom and the requisition. The more complete the system the fewer chances there are for leaks. The requirements of the auditing department and the necessities which exist for keeping an ample stock of all supplies on hand at all times, as well as the amount of money the management is willing to allow for running the storeroom, determine the details of the system to be maintained. One of the first details to be affected by the considerations referred to is the stock record. This should be kept, preferably, on cards, arranged in the manner usual to a card index, or in loose-leaf ledgers, the sheets being large enough and arranged to accommodate several items of the same class. (It might be well to say that I shall not attempt to describe or make recommendations on all the forms, whether mentioned here or not, which may be necessary to an adequate storeroom system, as I do not understand that to be the purpose of this paper; but I shall be glad to show samples and to answer questions concerning them, either as they are referred to or later.)

On the stock record should be shown, by dates and in as much detail as desired, the quantities issued and received, as they are issued and received and deductions and additions made from day to day, so that the amount of a given article on hand may be ascertained at a glance. I shall refer to this feature again.

Leaks from an incomplete or ill-kept stock record may not show up very big until an inventory is taken, or there is a fire, when someone is likely to inquire, "What's the matter with the storeroom?" In case of fire, a complete stock record, if intact from having been properly protected, would enable the company to show clearly to the insurance adjusters just what its loss had been. That is, it could show just what had been in the storeroom when the fire occurred, and, after deducting the value of the mess that is left, the difference, or the loss, could not be questioned. It would be difficult to say what the saving might be in such a case.

An incomplete stock record, as well as incompetent men on the floor, means leaks in other directions; that is, outside of the storeroom. I refer to "low stock." One side of the leaks from low stock is the expense of express, telephones and telegrams, and the time of the purchasing agent consumed in getting material in a hurry; the other side is the expense, trouble and inconvenience of waiting for

material, or of making something else do, or of running risks with the equipment. I venture to assert that if the condition of "low stock" could have been avoided on almost any road in Ohio or Indiana during, say, the past year, a good extra stock record clerk would have been a minor expense.

The expense of maintaining a storeroom is borne for the purpose of keeping material and supplies on hand at all times, and the end in view is, therefore, partially defeated if there are frequent, or even infrequent, cases of "low stock." So, I claim, a complete stock record is necessary, because it is unfair to presume that the floorman can always remember when to report that a certain item, out of perhaps several thousands, is running low. There may be several men waiting with requisitions to be filled, or there may be any one of several circumstances to distract his mind and cause his failure to notice that the supply of a certain article should be replenished. Then, again, he may think there is ample stock, whereas it may take weeks, or even months, to replenish.

The stock record clerk should have before him on each of his cards, or sheets, the minimum amount of stock it is safe to carry; that is, the point at which the supply should be replenished, which should be determined by the time it takes to get delivery and the relative importance of the material in question. Only in this way can items be ordered in ample time. No one's memory is trusted. In making his entries, the stock clerk can easily get into the habit of referring to his "minimum," and the importance of showing the amount on hand after each entry, that the minimum may be recognized when it is reached, can readily be seen.

To prevent, so far as possible, any item so important as "low stock" being overlooked, a printed form called, say, "Memorandum of Stock Required," of an individual shape, should be used. In this way such items will not escape attention as they might if miscellaneous slips of paper were used. These forms should be used both by the stock clerk and by the man issuing the material. Two chances of catching low stock, therefore, are at hand; that is, from the records and from the stock itself, and it will frequently happen that the stock clerk and the floorman will make out slips on the same items at the same time.

The complete stock record may be made to serve still another purpose, namely, that of the "perpetual inventory." The annual inventory, with its attendant expense and confusion, is a nightmare to all concerned. Errors will creep in during a year's transactions, so that beside the actual work of an inventory, which may have to be made by a force already overcrowded, a difference will probably be found to exist between the actual value of the stock on hand and the book value, which means affecting an adjustment unwelcome to some one or every one.

The "perpetual inventory," as I understand the term, is a stock record so exact that it coincides strictly with the actual quantities of material on hand each day, and is, in fact, a complete inventory. The perpetual inventory is strongly advocated by a large number of accountants, and an approach to it is in vogue in numbers of establishments. I would not recommend, however, the theoretically perfect perpetual inventory, as it is expensive, but a near approach to it is practicable, and a complete count will be necessary only once in several years. With this system frequent counts are made of the different items as new stock is ordered, and these counts compared with the records. Where a discrepancy is found to exist, an apportionment of the charge or credit can be made to the accounts affected, after possible causes for the errors have been investigated. To help locate the errors and serve as an additional check, some systems go so far as to provide a card, kept in a rack at each bin, on which the store man enters the quantity, date and requisition number each time material is removed. This really makes two stock records.

Where these frequent counts are made, more time is required from day to day, but leaks and errors are discovered and adjusted more readily, and the extra clerical expense is distributed over the entire year, instead of at the time of the annual inventory. Besides, possible thefts are more easily detected.

Intimately concerned with the stock record are the methods of checking in material, entering bills, and otherwise handling the storeroom accounts so as to prevent leaks. In this era of advancing prices it is particularly important that the price record should be kept always up to date, whatever system, or lack of system, is pursued. This includes the prompt entering of bills as they are passed. Otherwise, the charges may be distributed to the various accounts at improper prices, and the stores account be the loser or the gainer, as the case may be—an undesirable situation.

Material should be checked in when it is received, and not after the bill comes in. This applies to all departments, as well as to the storeroom. If there is no record from which to approve bills, then they have to be approved from some one's memory, or by guess; either way furnishes chances for error. To approve bills properly, the department for which the material is ordered, say the storeroom, should have knowledge in advance of the receipt of material, as to just what is to be expected and from whom it is to come, and blanks should be provided for recording exactly what comes in. The most serviceable form for this purpose is a triplicate of the order placed by the purchasing department. It serves as a notice of the placing of the order, and can be arranged for recording the dates and quantities of material received on the order. If the record and the bills do not agree, there is a fair claim against or in favor of the shipper. A permanent record of material received at the storeroom each day is advisable for various reasons, which I shall not take the time to go into here.

A distinct phase of the issuing of supplies, and one which touches closely both parts of the title to this paper, is the distribution of supplies from headquarters to the various points on the road at which they are required. There are more opportunities for loss here, it seems to me, than in any other one direction. There are, of course, practically only two means of distribution—the regular freight and passenger cars or the supply car. If there are any objections to the supply car, some one else can urge them probably better than I, so, as the subject is "How to Prevent Leaks," I say, take the deadhead stuff off the regular service, so far as possible, and put it on a supply car, unless the freight business is very light and the road be altogether too short—in mileage, I mean.

It might be shown by investigation that a supply car would not be so much of an expense as an actual saving. No matter how much care is taken, or how many rules there may be, it seems to be almost impossible to have deadhead material handled with as much attention as it should be. Supplies are lost and never found; there are unavoidable delays in delivery; the freights must take time out to make special side trips to the company's property;

and, frequently, cars are so crowded that a choice has to be made as to whether to leave paid freight or deadhead stuff. One is as bad as the other, or a good deal worse, to readjust the Irishman's remark. Company shipments should be billed out the same as any other freight. This takes time on the part of the freight department force, and time is valuable there, as well as at the storeroom, where the billing, tagging, boxing, etc., all have to be carefully attended to. The boxing, wrapping, etc., are necessary on account of transfers, rough handling and misappropriations. So much for a few of the objections to the regular service.

The supply car can be loaded at or in the storeroom, and much time be saved that department from that circumstance, as well as others. The regular trips of the car can be utilized by the mechanical, roadway and electrical departments for the delivery of all kinds of supplies and material belonging to each, and, many times, a special trip of some work car could be saved. Especially valuable would be the return trips of the supply car, bringing into headquarters shipments which now burden the freights or make necessary the use of a separate car. Valuable scrap, for instance, and from which there are many leaks, could be better taken care of and classified. Last, and most important, supplies would be promptly, properly and surely delivered.

Briefly, in closing, I would recommend for the issuing of supplies, properly and with as few leaks as possible, a locked storeroom, governed by strict rules as to the taking out of material; a well-considered system; enough good men to carry out the system completely; facilities for the men to handle their work without confusion; that is, an adequate storeroom, both as to size and arrangement; the distribution of supplies through the medium of a supply car, and the inculcation in the minds of every one on the road of a wholesome respect for the storeroom and for company property.

DISCUSSION

W. H. Forse, Jr., assistant treasurer Indiana Union Traction Company, said that the paper covered the subject so well that there was little left to be said. However, he would like to ask Mr. Dunbar how he checked his material. As he understood Mr. Dunbar's paper, a triplicate copy is given to the floor man. It is a practice of some not to give a triplicate copy to the floor man. If he does not have it he is more apt to count the material correctly. He had found that if the floor man is in a hurry he might just O. K. material instead of counting it.

Mr. Dunbar replied that there might be a difference of opinion, but believed it works better to have the information before the man. If you are going to prove his account you will have to have him count it twice. If he counts it and then goes to his order and finds an error, he will count it several times.

Mr. Spring asked Mr. Dunbar what rule he adopted for replenishing stock when it got low; if he had any idea of how much stock he wants and how he handles it. Mr. Dunbar replied that materials are likely to be changed, and there would be a loss. The manager should instruct the storekeeper as to the minimum and maximum supply on hand. Then the quantity ordered depends upon how much stock is necessary to be carried. You can have a six months' supply if necessary.

Mr. Norveil asked Mr. Dunbar how he handled the scrap pile. Mr. Dunbar replied that he did not know what was done with that. He said if there is too much scrap it should be stopped. Disputed stock in the storeroom is charged from month to month, and, of course, in that case the auditor should be consulted, the credit be distributed and the difference in the cost ascertained.

S. D. Hutchinson said he thought that the discussions would be more elaborate if the papers were printed and sent to the members ten days before the meeting. The association had got to the point where that ought to be carried out. It is difficult for members to grasp the subject and think of all the ideas they want to express. Such a plan would make the discussions more practical and beneficial. President Nicholl replied that the proposition had been previously considered by the association, and while it was thought to be a good idea, it was deemed too expensive. He said the members had thought, inasmuch as the meetings were held only every two months, there would likely be sufficient discussion.

REPORTS OF COMMITTEES

Under this head, W. H. Evans, of the Indianapolis Traction & Terminal Company, and chairman of the committee on standardization, made the following report:

REPORT OF THE STANDARDIZATION COMMITTEE

Your committee appointed to investigate the subject and recommend standards for adoption of this association, as applied to traction railroads, held meetings at Indianapolis on April 25, 26 and 27, and investigated the subject of standards, principally on the line of the recommendations which were made by our association in convention assembled at Fort Wayne, under date of Sept. 27, 1906, with particular reference to the following subjects: Brake-Shoes, Axles, Journals and Journal Boxes, Tread and Flange of Wheels, and Rails for Street and Interurban Railways.

After carefully considering the various subjects, your committee deems it advisable to make a partial report at this time, in order that this can come before the association for consideration at the meeting to be held at Indianapolis on May 23, 1907.

In the discussion of the advisability of standards, it was evident that it would not be possible to arrive at any happy medium between the various types and classes of material now in use by the different traction companies serving the purpose for which we desire to adopt standards, but rather it would be necessary arbitrarily to select a standard and determine the dimensions which we consider advisable for these different parts, as any slight variation in the dimensions would necessarily interfere with the interchangeability of the parts and prevent, to a large extent, the object to be accomplished by standardization; that is, the selection of material and parts which would be of the same pattern and dimensions and common to the different roads forming this association.

BRAKE-SHOES

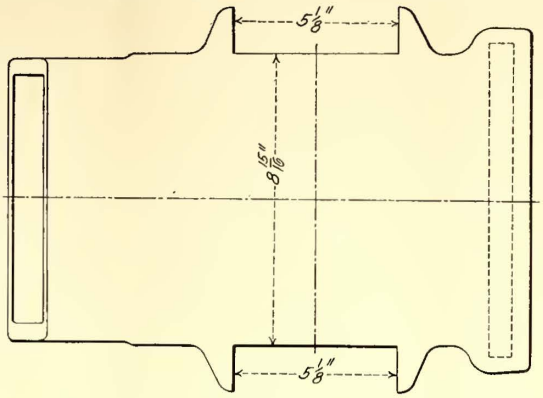
It was decided to recommend the use of a brake head and shoe similar to the one which is now standard on the steam railroads, but adapted to a wheel tread 3 ins. wide and consequently a shoe 2¾ ins. wide, as shown in the attached drawings. Your committee is decidedly in favor of the shoe without the flange where it is possible to use these shoes with trucks which permit the use of brake beams, as, in our opinion, much greater economy can be effected with the use of this type of shoe than with the flange shoe, and it is necessary to scrap a considerably smaller portion of the shoe. This shoe can also be reversed on the same wheel and requires but one pattern for all types of trucks,

and can also be used, should occasion require, on wheels with the steam railroad standard width of tread.

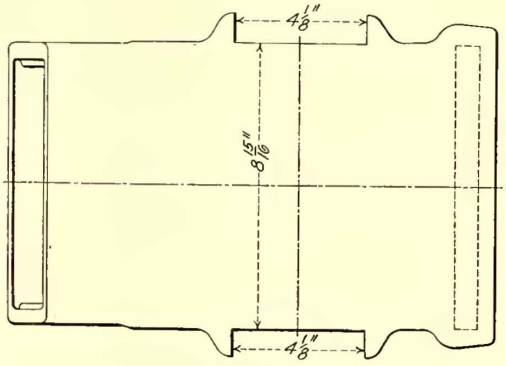
However, we consider it advisable to include in our recommendations a flange shoe which fits the brake head and can be used where desired in place of the shoe recommended.

Your committee makes no recommendations as to the attachment of brake head to the brake beam, as this portion of the head will necessarily take the form of the various types of beams to which it is to be attached. We would, however, recommend that with 3-in. tread wheels the center to center of brake heads on the same beam shall measure 59¼ ins.

The attached drawings, covering the brake heads and brake shoes, are respectfully submitted.

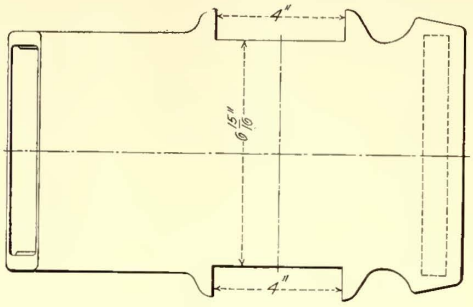


For 5½" x 10" Journal.



For 5"x9" Journal.

PEDESTAL DIMENSIONS FOR STANDARD JOURNALS, CENTRAL ELECTRIC RAILWAY ASSOCIATION

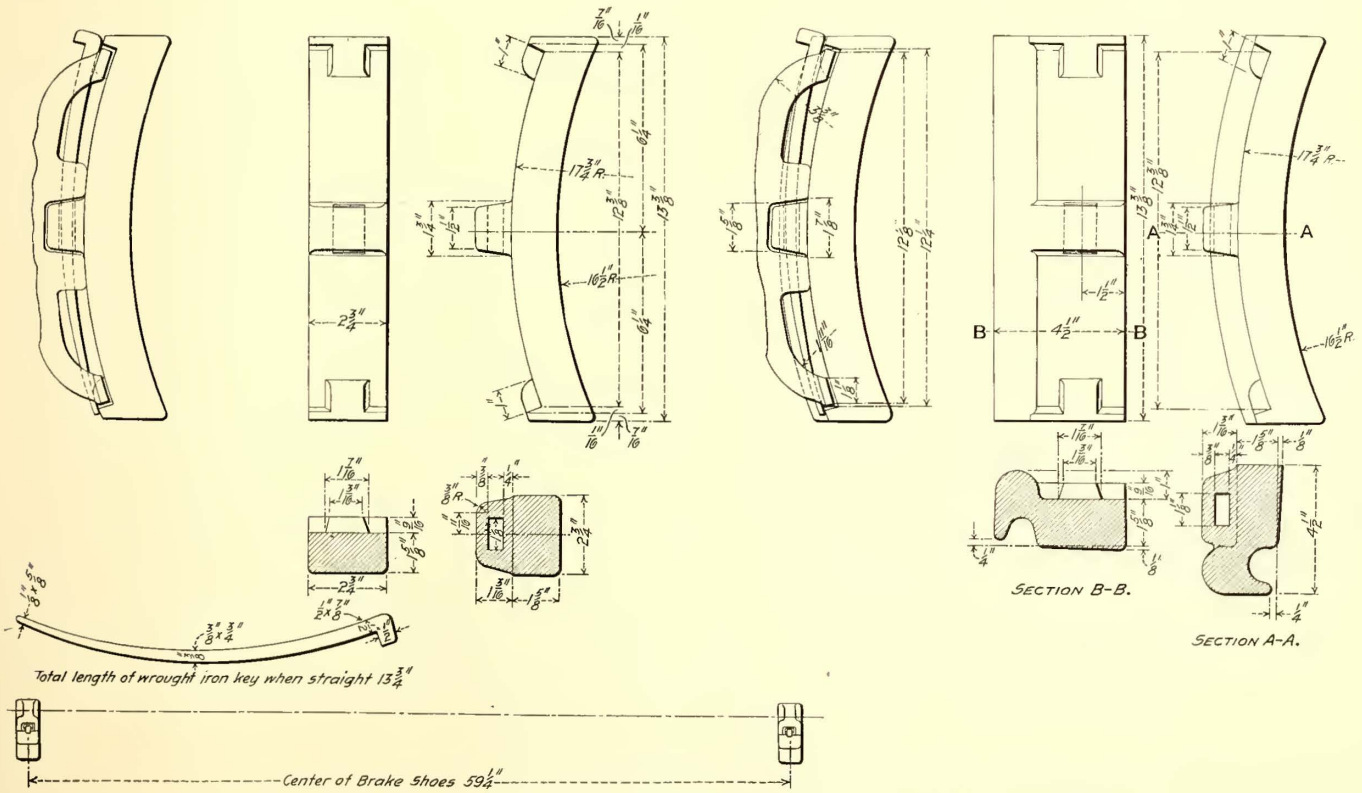


For 3¾"x7" and 4¼"x8" Journals.

capacity motors, reducing the variety of axles to four sizes, as indicated by the axle journals, viz., 3¾ ins. x 7 ins., 4¼ ins. x 8 ins., 5 ins. x 9 ins. and 5½ ins. x 10 ins.

The various dimensions as given on these axles were the subject of considerable discussion by your committee, and while these dimensions very nearly approach those of axles already in service on the various types of motor trucks, it is the opinion of your committee that these dimensions can be faithfully followed to advantage in remodeling or rebuilding trucks already in service and to cover all future orders for equipment.

We would particularly recommend the advisability of reducing the journals to these standards, and also consider it very desirable to inaugurate a standard for gear fits and also for motor axle bearings, and while it may be necessary to vary from the dimensions, as recommended, for some particular style of motors or trucks, if these particular dimensions referred to above are adhered to, a decided benefit will be obtained.



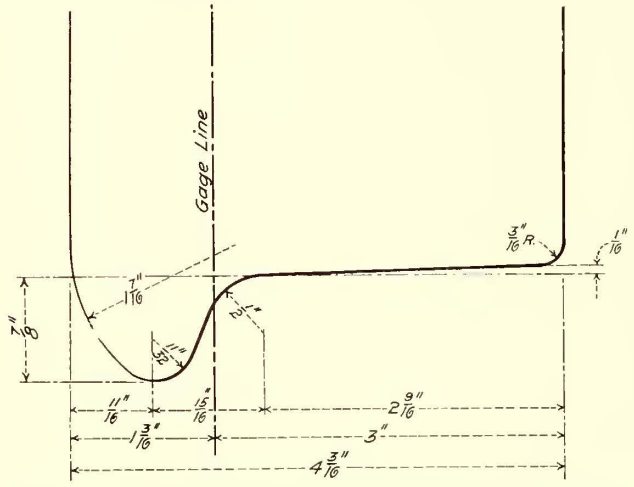
STANDARD BRAKE-HEAD AND SHOES, CENTRAL ELECTRIC RAILWAY ASSOCIATION

AXLES, JOURNALS AND JOURNAL BOXES

We would respectfully submit the attached drawings, covering axles for the various weight cars and different

JOURNAL BOXES

In connection with the axles already recommended, we recommend the adoption of journal boxes which conform in detail to the dimensions commonly used with axles with journals of the dimensions recommended and which have

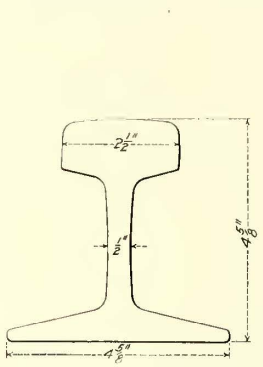


SECTION OF STANDARD TREAD AND FLANGE FOR CITY AND INTERURBAN WHEELS

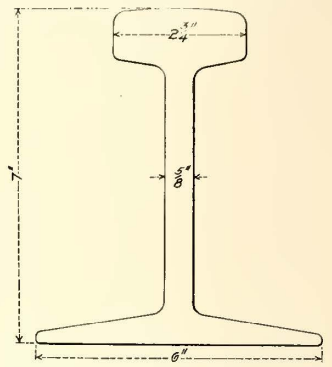
become standard on the various equipments on the steam roads. The dimensions of these various parts of journal boxes, journal bearings and bearing keys are generally familiar, and your committee has not considered it advisable at this time to prepare detail drawings, covering the dimensions of these parts. However, we desire to call particular attention to the dimensions of the boxes where they fit the pedestal jaws, as it is principally in this particular that the motor journal box differs from that commonly used in other trucks. We, therefore, submit the drawings attached, showing the dimensions where the journal boxes for the different axles fit the pedestal jaws. It will be noted that the dimensions of the boxes at the pedestal jaws are the same for the journal, 3¾ ins. x 7 ins., as for the 4¼ ins. x 8 ins., as it is found that this can very readily be accomplished, and it would, no doubt, be an advantage, as it frequently occurs that it is desirable to put in a 4¼-in. x 8-in. axle in place of one 3¾ ins. x 7 ins. These dimensions for the 5-in. x 9-in. and 5½-in. x 10-in. journal boxes are what have usually been the practice on trucks where these axles have already been used.

TREAD AND FLANGE OF WHEELS

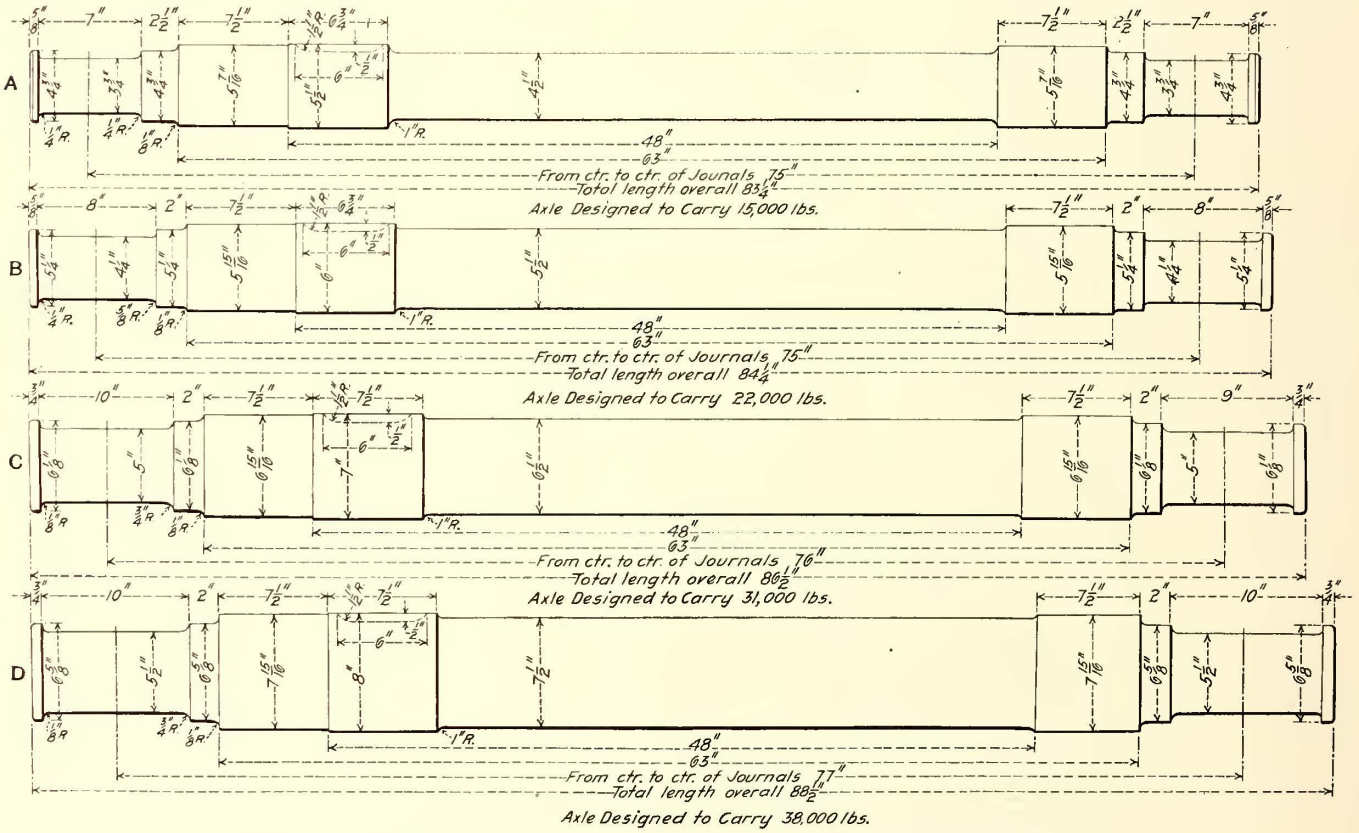
We would respectfully submit herewith a drawing of the tread and flange of wheels of dimensions which conform to recommendations made at Fort Wayne on Sept. 27, 1906. In the opinion of the committee, this tread and flange can be used equally well on city and interurban tracks, and was selected after a careful investigation of the types of wheels used by many of the largest traction companies in the country.



SECTION OF 70-LB. RAIL FOR INTERURBANS



SECTION OF 7-IN., 91-LB. T-RAIL FOR CITY USE



PROPOSED STANDARD MOTOR AXLES, CENTRAL ELECTRIC RAILWAY ASSOCIATION

RAILS FOR STREET AND INTERURBAN RAILWAY

We would recommend the adoption as standard of what is known as the T form section of rail, for both city and interurban work.

For city tracks we would recommend what is known as the 7-in. T-rail section, 91 lbs. to the yard, as shown in the attached drawings. This section of rail and others very similar to it have been used successfully on many of the large systems in the country, and, in our opinion, can well be adopted as standard.

For interurban tracks we would recommend the American Society Civil Engineer's standard section, 70 lbs. to the yard, as shown in the attached drawing. This rail is commonly used on interurban lines in the territory covered by our association, and, so far as we have any information, it has given very good satisfaction and appears to be of sufficient weight to amply take care of the interurban traction car requirements.

In submitting these recommendations, your committee would urge a full and free discussion by the members of the association, with the view of bringing out all points to be considered in the adoption of so important a matter as a standard for traction companies at this time, and in the end we feel that the recommendations here made will meet with your approval

Respectfully submitted,

W. H. EVANS, Chairman;
R. C. TAYLOR,
FRED HECKLER,
M. E. BAXTER,
W. A. GIBBS, Committee.

DISCUSSION

President Nicholl said the standardization committee had spent a good deal of time in consideration of this subject and formulating this report, and he thought considerable time should be taken in discussing whether or not it should be adopted.

Mr. Hutchinson asked the committee under what conditions they recommend the use of the groove shoe. Mr. Evans replied that they did not recommend the groove shoe at all.

Mr. Dunbar said as the subject was so important to the electric railway business, and was made after much consideration, it would be better to discuss the report at another meeting, and he made a motion accordingly.

Mr. Taylor, a member of the committee, said he would be glad to have the members examine the details of the report carefully and discuss it satisfactorily so the committee can get the matter in shape for presentation at the next national convention.

Fletcher Durbin suggested that inasmuch as they had no better talent than the committee having the subject under consideration, he thought it advisable to adopt the report as presented.

F. D. Carpenter said the matter was of great importance, and made a motion to have the report printed and distributed to each member of the association for study and future discussion. The committee had done most nobly and the thanks of the association were due the members for their arduous labor. The motion was adopted. The report of the committee on express contracts went over until the next meeting.

W. J. Woods and C. V. Adams, members of the Indiana Railroad Commission, were present and invited to address the meeting. Judge Woods said he was pleased to be present and thought it advisable for the interurban men and the members of the commission to become better acquainted. "Accidents on all railroads in this country are entirely too numerous. The public must be given more consideration." He said the interurbans, like the steam roads, should have a printed set of rules posted throughout their systems governing the operation of trains and the conduct of employees. The employees should be compelled to learn the rules and to strictly observe them. Judge Woods reminded the interurban men that their roads would, under the law, fall under the entire jurisdiction of the commission with reference to freight matters as soon as their freight business contributes 33 1/3 per cent of their income. He said, in his judgment, the interurban people made a mistake in opposing such jurisdiction. "No later than to-day," said he, "I was asked by an interurban man if the commission had power to compel one interurban line to enter into a freight traffic agreement with another or connecting interurban line, and I was compelled to answer in the negative."

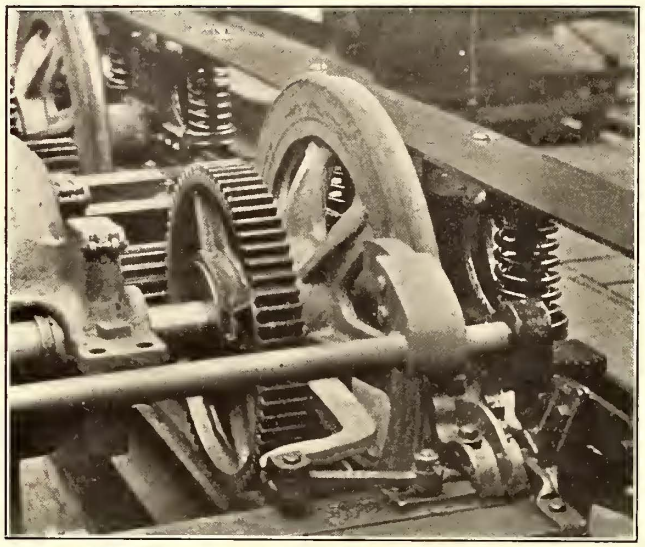
C. V. Adams was next introduced and explained the accident reports to be sent out in a few days. He said the commission proposed to establish a standard report for accidents along practically the same lines as those laid down by the Interstate Commerce Commission, which has rules that if an accident does not prevent the victim from working three days following the accident it need not be reported. In addition to accidents resulting in injuries to persons, all damages to the companies' property must be reported, but no account of damages to other property need be reported. The accident reports are not required of city lines, but only of interurban lines; but if an accident happens to an interurban train while operating over a city line, it must be reported.

STILLWELL PAPER IN BOOK FORM

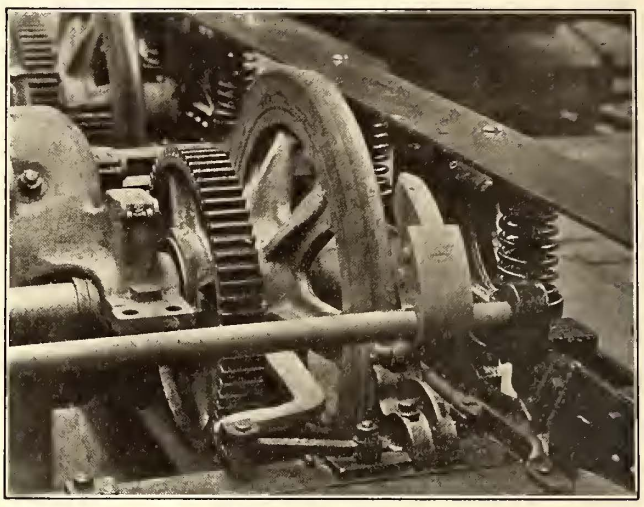
The American Institute of Electrical Engineers has just issued in book form, and bound in cloth, the paper on the "Substitution of the Electric Motor for the Steam Locomotive," by L. B. Stillwell and H. S. Putnam, published in abstract in this paper for March 16, 1907, with the resulting discussion both oral and written. The latter includes a number of interesting statements. Mr. Townley, of the New Haven Railroad, believes that the institute would lay itself open to serious criticism if it undertook to establish a standard frequency for electrically-equipped steam roads, when there is no single electrified steam road in the country operated by single-phase current. He does not believe that present evidence would warrant the general adoption of 15-cycle single-phase motors in view of the general wide use of 25-cycle apparatus. R. D. Mershon also believes it well to go slow with standardizing frequency. H. M. Brinckerhoff quotes some figures on cost of operation on the Metropolitan West Side Elevated Railway, which, after ten years of operation, are from 25 to 30 per cent below corresponding costs of similar steam locomotive operation. A. H. Babcock, of the Southern Pacific Railroad, quotes some figures in favor of high-voltage direct-current operation. He says, however, that the fact that motors of this type have been specified by him for a large suburban service should not be taken as a declaration in their favor as a substitute for single-phase in all cases. W. S. Murray, of the New Haven Railroad, contributes some extensive tables on the cost of steam operation, dividing it into express passenger service, local express passenger service and freight service. These are based on New Haven operation. The price of the book is $1, and it will be sold at that price by the McGraw Publishing Company.

VARIABLE GAGE TRUCK USED IN BRADFORD, ENGLAND

Although the tramway authorities of Bradford and Leeds, in Yorkshire, England, have long been desirous of running through cars over their adjoining systems, such connection appeared impracticable, as the gage of the Bradford tracks is only 4 ft., while Leeds uses the standard 4-ft. 8½ ins. It was first proposed to overcome this hindrance by laying a third rail, but as this would have meant an expenditure of nearly $100,000, it could not be seriously considered. As an alternative, C. J. Spencer, general manager, and J. W. Dawson, the assistant engineer, of the Bradford City Tramways, submitted to the joint tramways committee drawings of a car equipped with wheels adjusted to run on either gage. An experimental car was then built by the Thornbury Car Works, of the Bradford City Tramways. Since its installation this car has operated so successfully that it has been provisionally approved by the expert of the Board of Trade, the body which has very wide powers to regulate the operation of tramways and other public utilities.



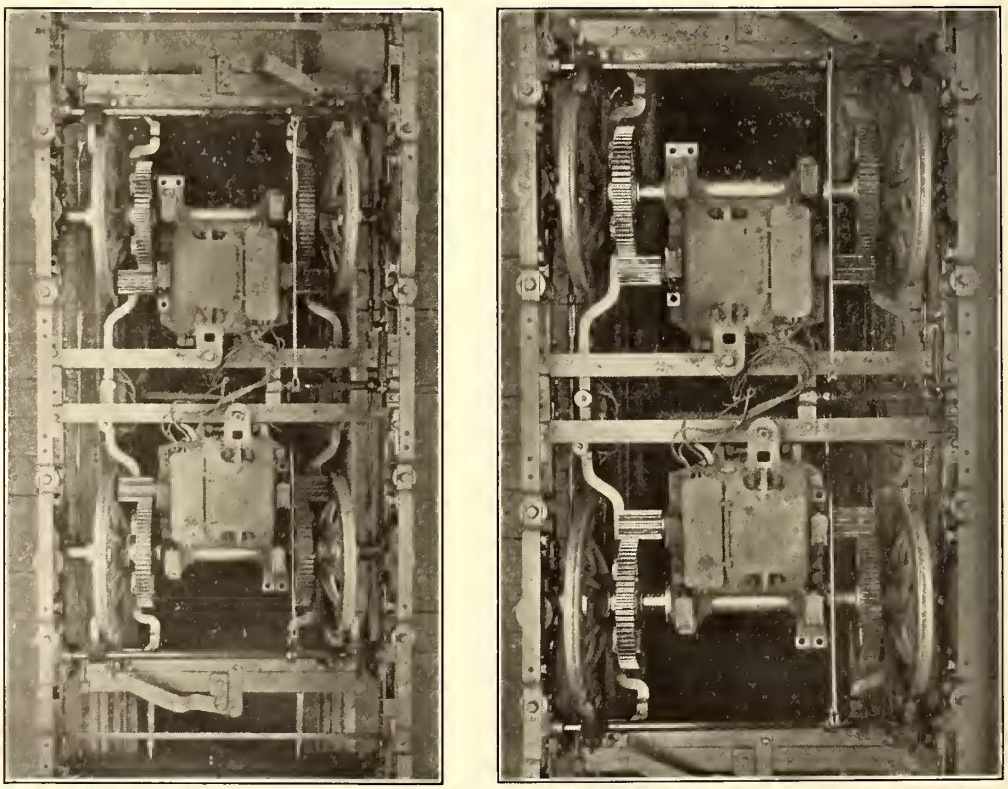
VIEW ON WIDE GAGE WITH DISTANCE BLOCK IN RUNNING POSITION



DISTANCE BLOCK RAISED PREPARATORY TO CHANGING GAGE

The general framing of this truck does not differ from the standard type, as the changes for different gages are made by the sliding of the car wheels to definite stops on the truck axles. The motor is carried in the ordinary manner, but has a broader pinion. The gear wheel and car wheel are mounted on a sleeve which can slide on the axle.

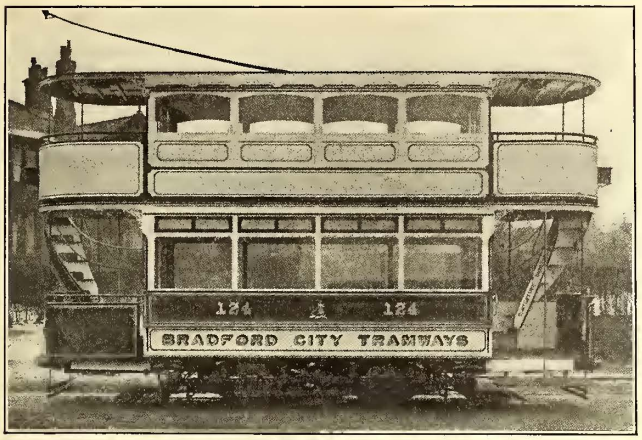
The gage-changing equipment consists essentially of an extra shaft behind each truck axle on which is carried a so-called distance block, to lock the wheel in the desired position. This shaft is turned by a lever mounted on the upper side frame of the truck, this causing the block to rise or fall from the side of the car wheels. Assuming that the vehicle is traveling on the 4-ft. gage, the axle sleeve with its wheel and gear is then at the innermost position with the gear engaging the motor pinion on its inner end; in this case the distance block is in contact with the outer face of the wheel. When the car reaches the point where the bridging rails taper outward to the wider rails, the block is lifted, and thus the entire gage-fixing mechanism slides along the axle through the motion imparted through the wheel flange and rail groove. On reaching the wider



PLAN VIEWS OF TRUCK ON 4-FT. AND 4-FT. 8½-IN. GAGE, WITH GEAR CASES REMOVED TO SHOW EXTRA WIDE PINIONS

gage the block is dropped to come in contact with the inner side of the wheel. When changing from the wide gage to the narrow one this process, of course, is reversed. The only part subject to rapid wear is the distance block, which, therefore, is made with a renewable tongue.

The important feature of braking is cared for by so



CAR EQUIPPED WITH GAGE-CHANGING MECHANISM

mounting the brake-shoes that they are free to slide along the brake operating bar and hence are moved along this bar by the portion of the brake block which engages with the wheel flange. The same result may be obtained by link connections to a bracket mounted around the axle sleeve whereby a longitudinal movement of the sleeve produces a corresponding movement of the brake shoes. Similarly, a track brake can be made to move in unison with the rest of the equipment.

STORAGE AIR STATION AUTOMATIC CONTROL

The accompanying diagram shows the connections of the devices used to automatically control the compressor motors in a storage air station, where compressed air is stored for charging cars equipped with storage air brakes. The three functions of such a control system are:

(1) The two compressor motors, of which only one unit is indicated in the diagram, must start and stop simultaneously between certain maximum and minimum air pressures, just as in the case of a car governor, except that the pressures handled are from 250 to 300 lbs. to the square inch.

(2) At starting, resistance is in circuit and the automatic must operate to reduce this resistance gradually to zero, just as a car controller does when properly handled.

(3) The automatic must operate to remove the air load just before the motors are started or stopped. If this feature is neglected, conditions are about the same as when operating a car with the brake applied.

In the diagram, A is a solenoid, with its plunger and contact plate g in the off position; if A is energized, g is pulled up into contact with g1 and g2, thereby closing the motor circuit. E, F and G are somewhat similar, but much smaller magnets for automatically cutting out the resistance. E and F carry special contacts, c and c', the function of which will be seen later. Aluminium disk i is carried on plunger i', terminating in a piston in dash pot D.P. containing oil. The dash pot regulates the rate at which i shall successively contact 1, 2, 3 and 4, and thereby controls the cutting out of resistance in the motor-circuit and the time of loading and unloading the compressor. X is the regulator, the contacts of which determine the pressures at which the automatic shall operate to start the motor and stop it. The blow-out coils of the main circuit magnet A are indicated at t-t'. M-M are magnets, the operation of which is effective in lifting the compressor valves in such a way that the compressor ceases to do work. L-L are three 32-cp lamps automatically cut into series with the magnets after they have operated, to decrease the amount of current that they take. This is possible because much less current is required to hold a plunger up than is required to pull it up from a distance. T is the source of trolley current.

In the diagram all devices are at the off position, the regulator-hand touches neither the starting nor stopping post, and the motor is at rest. Assuming the unit to start whenever the air pressure in the storage tank, hence in regulator X, may be 250 lbs. and stop when the pump has raised the pressure to 300 lbs. per square inch. The positions of the diagram may then be assumed to mean that the pressure has been stored to 300 lbs., that some of the air has been used, that the pressure is falling toward 250 lbs., and that, therefore, regulator hand h is moving toward starting post. In the diagram, then, all control circuits are open and the motor circuit is open.

The instant regulator hand h contacts the starting post on the left, trolley current takes path T-r-L-m''-m-m'-x-A-B-f'-v-h-starting post-f2-y-ground. The energizing of magnet A causes g to contact g1 and g2, thereby closing the motor circuit so that current can take path T-a-resistance-armature-field-g'-g-g''-ground and start the motor. Simultaneous operation of magnet B causes disc f to contact f' and f'', to short-circuit the path leading through hand h, so that when the pressure increases and h leaves the starting post it will draw no arc. Also simultaneously with the operation of magnets A and B, current from junction x takes path x-q-D-f'-v-ground, thereby energizing magnet D and causing its plunger and disc i to move upward slowly on account of the resistance of the oil in the dash pot. The result of h touching the starting post, then, is to close

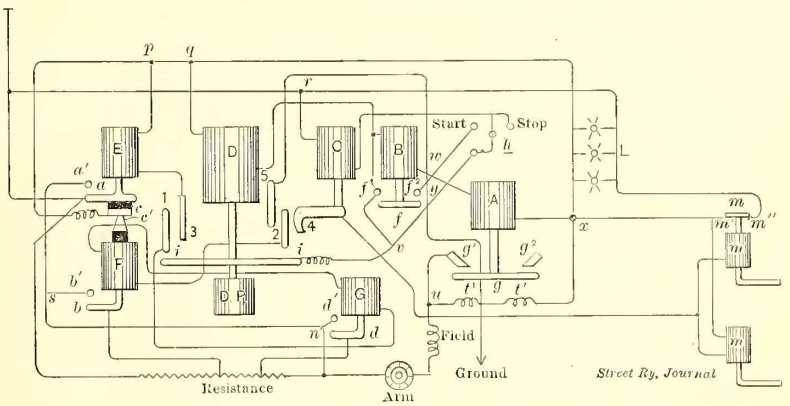


DIAGRAM OF AUTOMATIC ELECTRICAL CONTROL OF STORAGE AIR BRAKE SYSTEM

the motor circuit, short-circuit the regulator so that its contact hand cannot burn, and put in motion the automatic that is to cut out the main motor starting resistance. As soon as i in its upward motion contacts carbon rod 1, current from junction x takes path x-q-p-c-c'-G-1-i-v-f'-f-f''-y-ground, thereby operating magnet G, causing d to contact d' to cut out one section of the motor starting resistance.

On further movement i contacts carbon rod 2, thereby causing current to take path-x-q-p-c-c′-F-2-i-v-f′-f-f″-y-ground and operate magnet F, which causes b to contact b′, thereby cutting out a second section of the starting resistance in the motor circuit. Further upward movement causes i to contact 3; current from junction x then takes path x-q-p-E-3-i-v-f′-f-f″-y-ground and energize magnet E, so that a contacts a″ and at the same time contacts c and c′ separate. The operation of E results in cutting out the last section of the starting resistance, the main motor current path becoming T a-a′-O-armature-field-g′-g-g″-ground. The separation of contacts c and c′ opens the circuits of magnets F and G, so that they cease to take current, when such current becomes useless. All starting resistances having been cut out, the motor is now operating on full line voltage, but is doing no appreciable work, because the compressor is unloaded from the preceding shut-down. As soon as further upward travel causes i to contact 4, current takes path L-m″-m-m′-through unloading magnets M and M in parallel-4-i-v-f′-f-f″-y-ground. Both magnets operate to release their respective valves, so that the compressor can compress air. The operation of the upper magnet M also lifts disc m off contacts m′-m″, thereby removing the short-circuit across lamps L and cutting those lamps as a whole into series with the magnets now in operation; this effects a saving in current. The compressor is now storing air into the storage tanks, so that the pressure in those tanks and in regulator X slowly rises toward the maximum limit of 300 lbs. Simultaneously regulator hand h is slowly moving toward stopping post to the right. Assuming the regulator to be correctly adjusted, as soon as the pressure reaches 300 lbs. h will contact the stopping post. Magnet D has remained energized all the time, but could not pull i up any further, owing to the interference of hook-shaped contact 4. The contact of hand h with the stopping post causes a current to take path T-r-C-stopping post-y-f′-f-″-y-ground, thereby energizing magnet C, which then pulls up its plunger, rocks 4 out of inference with disk i, and allows it further upward movement. The instant 4 leaves contact with i the loading magnets M M lose their ground connection, become de-energized and assume their unloaded position where the compressor ceases to compress. A few seconds later i contacts carbon rod 5. Path w-5-i-v-f″ then acts as a short-circuit across the terminals of magnet B, thereby de-energizing it and causing disc f to drop, and with the result that all magnets are deprived of their ground connection, become de-energized and fall to the off positions. The dropping of f also insures that hand h will not drag an arc when the fall in pressure causes it to leave the stopping post.

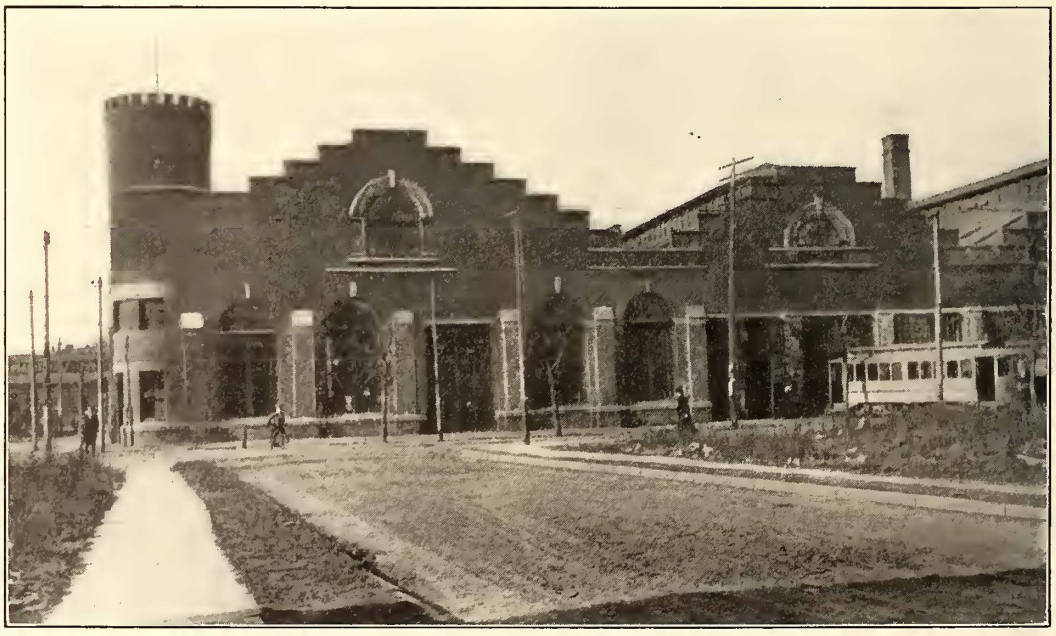
DEVICE FOR RECORDING TRANSVERSE MOVEMENTS OF TRUCKS ON TRACK

J. Sutherland Warner contributes a suggestion to the Tramway & Light Railway Association, contained in its last Proceedings, for a device for registering the transverse movement of cars on the track. The nearer the body of the car follows a straight line the greater will be the comfort in riding and the lower the work expended in travel. Mr. Warner, therefore, suggests a small reservoir containing whitewash attached to the front and the rear of the car and connected with a spout so that a line of whitewash will be run on the track to show the variations from a straight line, followed by the front and rear ends of the car. By measuring the distances of this line from the center of the track a measurement of the oscillations will be secured. Mr. Warner believes that these variations are due more to the suspension of the trucks than to variations in track level.

EMPLOYEES' ENTERTAINMENT AT HOBOKEN

The Street Railway Employees' Social and Athletic Club, of the West Hoboken Division of the Public Service Corporation, gave its third annual entertainment on the afternoon and evening of May 25. It took the form of an amateur minstrel performance in which twenty-five members participated, with six "end men." Following this performance was a vaudeville entertainment with moving pictures.

This organization is one of the most successful and prosperous of its kind in the neighborhood of New York, and has its headquarters in the West Hoboken car house. Here

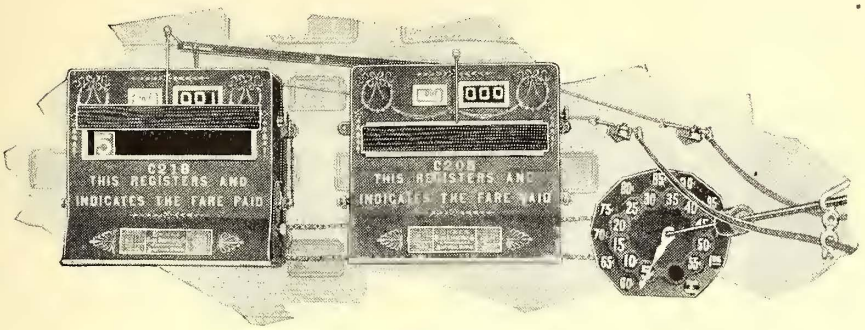


WEST HOBOKEN CAR HOUSE

the company has provided an auditorium, aproximately 35 ft. x 110 ft., with stage, curtain, etc. In an adjoining room are two pool tables. A smoker, dance or some other entertainment is given once a month in the winter time, and a more ambitious performance once a year. The success of the club has been largely due to the active efforts of George H. Duck, division superintendent, and president of the club last year. The president this year is Charles A. Bauman, assistant division superintendent. Newton W. Bolen is honorary president of the club.

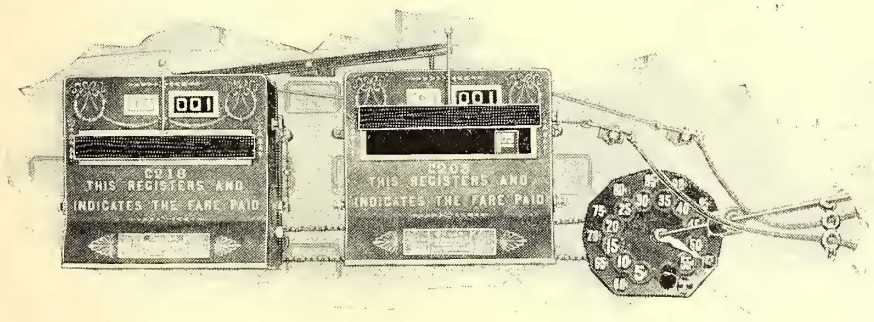
TWO REGISTERS OPERATED BY A ROD AND TWO CORDS

A new invention by the Ohmer Fare Register Company, of Dayton, Ohio, consists of an arrangement for operating two registers in either a city or interurban car by the use of one rod and two cords in such manner as to expose the denomination of fare registered in one machine and at the same time cover, by means of a winker, or small curtain so attached to the operating mechanism as to move automatically whenever a fare is recorded, the tablet aperture on the face of the other register. The amount recorded is shown on the face of the machine in operation, on the double dial, placed on either side of the registers, or between them; on corresponding double dials throughout the car, and on the back platform when desired. The aperture on the face of the other register, through which a tablet is visible when it is operated, is hidden from view by one of the curtains of the winker, the corresponding curtain being automatically raised to show the last fare registered in the operated machine.



FARE RUNG ON LOW-FARE REGISTER

In the accompanying illustrations, one of the machines is mounted for recording smaller fares and the other one for registering larger denominations. The mountings of the inner dials correspond to those within the register containing the smaller mountings, and the denominations on the outer dials are similar to those within the second machine. This arrangement tends to render the work of the conductor as easy and simple as though he were operating one machine. It also simplifies the duties of the auditing department.



FARE RUNG ON LARGE-DENOMINATION REGISTER

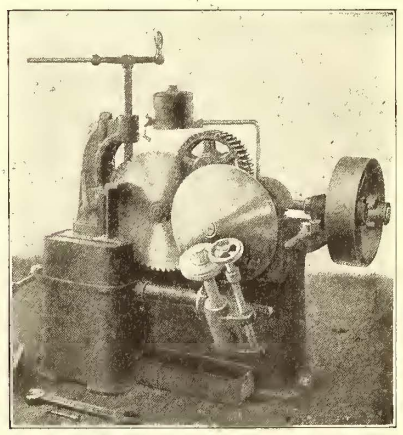
A sheet from Register No. C-218, for example, will show the record of fares collected from 5 cents up to 55 cents, and a sheet from Register No. C-205 from 55 cents to $1.05, and also tickets. It will also show the identification key number, or numbers, of the conductor, or conductors, who operated the machines, the numbers of the registers and other data.

The new apparatus is constructed along the lines that have become standard Ohmer practice, and all that is new in the device is protected by additional patents. It can be attached to two registers of any size or capacity; for example, where two fare registers, or counting machines, with permanent fare indications, are used in a car—one for counting cash, the other tickets or transfers—the winker can be attached and will reveal the denomination of the last fare registered, and at the same time will cover the tablet or figures on the face of the other register.

It is possible under the new method to register separately and print detail records of twenty-two different classes of fares on two No. 4 type machines. In all operations the last fare registered is the only one exposed to view, and is the only one indicated by the pointers on the several dials.

A NEW TYPE OF METAL SAW

A new type of metal saw has been designed by the Quincy, Manchester, Sargent Company, of New York and Chicago, to meet the demand for a somewhat smaller machine than the company has manufactured in the past, and though the new saw embodies the strength and wearing qualities of the company's regular machines, it is available for many small shops that would not be warranted in purchasing a larger and more expensive machine. The blade, as on the Bryant type of machine, is driven from the periphery, but instead of a sprocket drive, hardened steel rollers are used, which are ground and journaled in removable steel bushings held securely in the double driving gear. By this method of drive a much larger diameter of the blade is available for cutting than can be obtained from a blade of the same size arbor driven, where about one-third of the diameter of the blade is necessarily occupied by the driving collars. It also has an advantage of economy in repairs. The machine has a capacity for cutting rounds up to 6 ins. in diameter and I-beams in a vertical position up to 10 ins. at any angle up to 45 degs. The feed is of the variable friction type, adjustable with the machine in motion. It is said to be powerful and continuous in its action throughout its entire range and superior to a ratchet feed. When desired the machine can be arranged for direct connected motor drive.



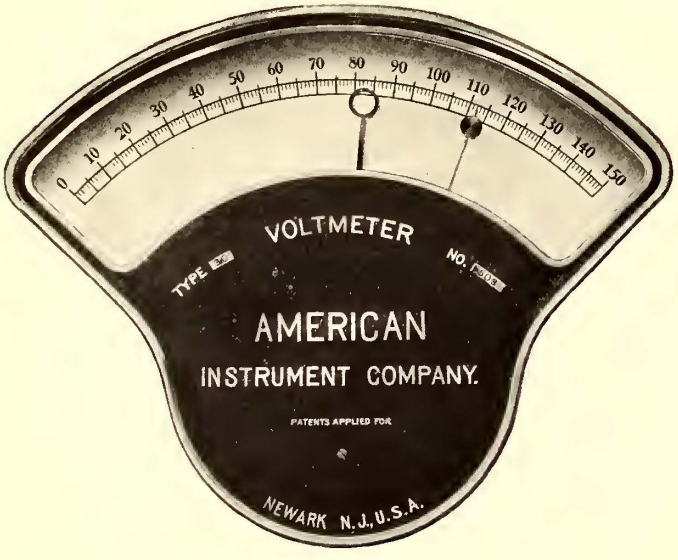
SAW USED FOR CUTTING RAIL

LONG-SCALE SWITCHBOARD INSTRUMENTS

Recognizing the need for switchboard instruments well suited for use with generators of large capacity and where readings must be made at a considerable distance from the switchboard, the American Instrument Company has recently designed a long-scale instrument of the type shown in the acompanying illustrations. These instruments are provided with scales approximately 14 ins. long, or twice the length of the usual large size round pattern instrument. This gives ample room for large divisions and large figures which, together with the unique method of marking the scales (shown in Fig. 1), make them extremely clear and legible.

Perhaps the most unique feature of these instruments is the method of mounting them on the switchboard. When an instrument with a long-scale, as described above, is mounted entirely on the front of the board, it projects a considerable distance and is more or less in the way, while if the same instrument is mounted flush it requires cutting a large irregular shaped hole, which weakens the panel very materially. The way this new instrument is constructed entirely obviates both of these difficulties. It projects less than 2 ins. from the front of the board, and yet requires a circular hole only 6⅝ ins. in diameter to be cut in it. Thus they are easy to mount, the panel is not unduly weakened, and all the advantages of the flush type instruments are offered. Very satisfactory illumination may be obtained by a lamp and bracket mounted over the instrument.

Fig. 2 shows the unique construction of the case to allow this unusual method of mounting. The instrument proper is mounted in a circular box which projects through the board while the shallow portion of the case contains the

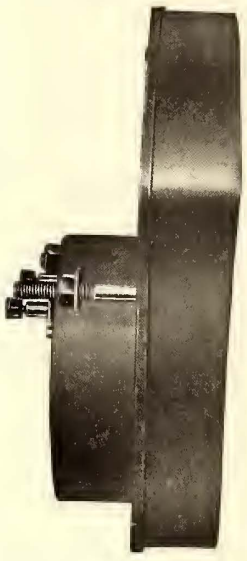


LONG-SCALE SWITCHBOARD VOLTMETER

scale and lies flat against the front of the switchboard.

The internal construction of these new Type 3 instruments is said to conform strictly to the usual excellence of this company's round pattern and portable instruments. The magnets are aged and magnetized according to the latest and most approved methods. The mechanical construction of the moving coil, its mounting, etc., are extremely simple and rugged, so that they are well adapted for the hard service, which is bound to come to any switchboard instrument.

Ammeters of this type are arranged to operate in connection with the standard interchangeable switchboard shunts regularly used with round pattern switchboard instruments. These shunts are adjusted to give a uniform drop of exactly 50 milli-volts on full load. The instrument, together with its leads, also is adjusted to have exactly one ohm resistance and to give full deflection on 50 milli-volts. Thus any shunt of any capacity can be used with any instrument and pair of leads, and correct results will be obtained. This feature is of great advantage, as it allows the use of any number of shunts of any capacity on one indicating instrument, the only requirement being that a suitable two-pole switch of negligible resistance be inserted in the leads between the instrument and shunts. Should an instrument be disabled through accident, it can be returned to the factory for repairs and properly adjusted without disturbing the shunt at all, and while it is out of commission another "American" ammeter, whether of the same or different type, may be used and correct readings obtained when the proper multiplier is used to make the scale values agree with the shunt capacity.



LONG-SCALE SWITCHBOARD VOLTMETER (SIDE VIEW)

These long-scale voltmeters have a uniform resistance of exactly 100 ohms per volt, so that a 150-volt instrument has just 15,000 ohms total resistance and a 300-volt instrument exactly 20,000 ohms resistance, and so on. This uniformity makes it possible to use multipliers interchangeably should they be required, and also adapts the instrument for measuring insulation resistance and grounds most satisfactorily.

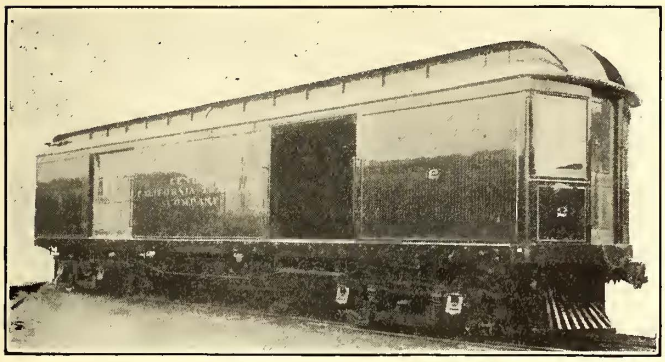
Where generators of large capacity are used there will naturally be large currents flowing in the bus-bars, which will set up magnetic influences affecting the readings of the ordinary instrument. This company's long-scale instruments, as well as its other switchboard round pattern instruments, however, are provided with soft-drawn sheet-iron cases, which provide a most efficient magnetic shield for the internal parts. As these cases are drawn into shape, the material must be of uniform softness throughout. In consequence of this there is practically no danger of their becoming permanently magnetized, as happens when cast iron is used. In addition to the shielding quality of these cases they are so designed that where parts come together there is ample bearing service to prevent effectively the entrance of dust.

The factory of the American Instrument Company is in Newark, N. J., but the general sales office is in Philadelphia, where James G. Biddle, president as well as sales agent of the company, makes his headquarters.

The strike situation in San Francisco is improving daily. More cars are in operation now than noted last week, and additional rolling stock is from time to time being placed in service. Acts of violence are infrequent. According to the representatives of the company in the East, the situation is well in hand.

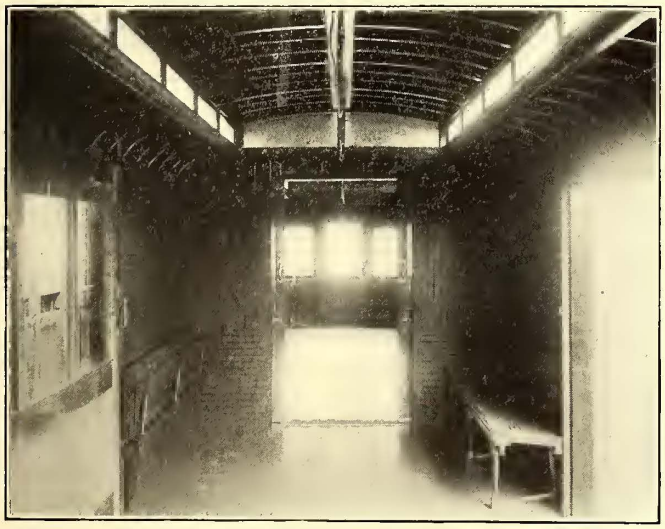
INTERESTING BAGGAGE CAR FOR CENTRAL CALIFORNIA TRACTION COMPANY

An interesting baggage car for interurban service has been furnished to the Central California Traction Company by the American Car Company. The car is divided into two equal compartments, mainly to assist in classifying the various kinds of freight. Each compartment has the regulation doors at the sides, and the partition between



EXTERIOR OF CALIFORNIA BAGGAGE CAR

compartments contains double folding doors. Side benches are arranged along the walls and can be folded up when not in use. The doors at the ends of the car are placed in the center because it is proposed to operate the car with the four 40-ft. interurban passenger cars supplied to the company by the same manufacturers. The trucks are equipped for third-rail operation, as the interurban cars on the system will be operated outside the city limits with 1200 volts d. c.



INTERIOR OF CALIFORNIA BAGGAGE CAR, SHOWING ARRANGEMENT OF COMPARTMENTS

taken from a protected under-running third rail. The principal dimensions of the baggage car are as follows: Length over all, 45 ft. 10 ins.; over body, 45 ft.; width over sill plates, 8 ft. 10 ins..; height from underneath sill to top of deck, 9 ft. 2 ins.

Construction work on the system of the Central California Traction Company commenced last summer in Stockton, and the city system, consisting of 11 miles of single track, is already in operation. The first interurban division, from Stockton to Lodi, has just been placed in operation. When completed, the entire system will be 235 miles in length.

STATISTICS OF ELECTRICAL DEVELOPMENT

According to Bulletin 73 of the U. S. Bureau of the Census, which is a report on the manufacture, according to the census of 1905, of electrical machinery, apparatus and supplies, there were, in 1905, 784 establishments engaged primarily in the manufacture of electrical machinery, apparatus and supplies. Their capital was $174,066,026; the average number of wage-earners employed, 60,466, and their wages, $31,841,521; the cost of materials used, $66,836,926, and the value of products, $140,809,369. The percentages of gain since 1900 are as follows: In establishments, 34.9 per cent; in capital, 108.1 per cent; in number of wage-earners, 43.9 per cent; in amount of wages paid, 54.7 per cent; in cost of materials, 35.1 per cent, and in value of products, 52.3 per cent. In addition to the products reported by these establishments, there was an output of electrical machinery and supplies, valued at $18,742,033, from 128 establishments engaged primarily in other lines of manufacture.

The distribution of electrical manufacturing throughout the States has remained the same in all essential respects at the two censuses. New York, Illinois, Ohio, Pennsylvania, Massachusetts, Connecticut, Indiana and New Jersey reported 631 of the 784 establishments making electrical apparatus at the census of 1905, and products valued at $126,807,804, or 90.1 per cent of the total for the country. In value of products, New York led, followed by Pennsylvania, Illinois, Massachusetts, New Jersey and Ohio in the order named. Their combined products constituted five-sixths (84.5 per cent) of the total value of products.

The increase in total capital was greatest in Pennsylvania, where capital increased from $20,967,587 to $58,393,011, or 178.5 per cent, although the value of products advanced only from $19,112,665 to $26,257,569, or 37.4 per cent. The capital and value of products of the other leading States were as follows: New York, capital $30,643,167, and products, $35,348,276; Illinois, capital, $21,644,783, and products, $16,700,027; Massachusetts, capital, $12,735,427, and products, $15,882,216; New Jersey, capital, $18,457,821, and products, $13,803,476; and Ohio, capital, $10,408,184, and products, $11,019,235.

A LIGHT-WEIGHT TROLLEY BASE

A trolley base, which is said to embody a number of distinctive features, is manufactured by the Milloy Electric Company, of Bucyrus, Ohio, by which it is now being placed on the market. It is built of charcoal malleable iron and weighs only 120 lbs. A consideration that governed in its design was the amount of space it was to occupy, and in this respect it has been kept in size down to a minimum. Its height is only 5 ins., with a bearing surface in keeping, which is said to insure good contact and to preclude the possibility of arcing. The base centers itself between two sets of taper roller bearings arranged so as to prevent oil from percolating through to the roof of the car and doing almost irreparable damage. With the Milloy base the tension is said always to be uniform. The advantages of this feature are readily apparent in the elimination of arcing at the wheel where the wire is especially high and of excessive pressure where the wire is low. Another feature claimed for the device is that the lateral swing which it has makes it possible for the wheel to follow curves without jumping the wire. As the cable connection is not exposed and no tape is required to insulate it, it is said to be impossible for water and dirt to injure the connection.

LONDON LETTER

(*From Our Regular Correspondent.*)

Louis Brennan, who is well known in connection with torpedoes, has just created somewhat of a sensation by a paper which he read before the Royal Society and the exhibition of a model of what he terms his "Gyroscopic Mono-Rail." Reference to this system is made in another column, but the presentation of his paper seems to have called for a little more than the usual press notice in England, as it is undoubtedly a system of extreme novelty and one which has aroused wide interest. Briefly, it consists of a car, operated by any motive power, which travels on a steel rope, or the top of any kind of steel structure, which may be erected over mountains, valleys, tops of houses, and, in fact, anywhere. The car appears to balance itself, as it were, on single wheels on this tight rope by means of swiftly revolving gyroscope. Mr. Brennan effectively employed the gyroscope for speeding torpedoes accurately in the direction in which they have been launched, and the same principle has been applied in his mono-rail system. The results are certainly extremely astonishing, for as long as the gyroscopes continue to revolve it would seem to be an impossibility to upset one of these cars from off the structure on which it may be running.

Last month this letter contained a note to the effect that a conference of tramway managers was decided to ask the Postmaster General to receive a deputation from them that they might make representation against the proposal which the post office was making to insert a new clause in the new tramway bills. These bills would enable the authorities of the post office department to attach telegraph wires to the poles or standards erected in the public routes for the tramways authorized by these bills. Such a deputation has now been received by the Postmaster General, and though the proceedings were private, it is understood that fifty municipalities were represented. They are said to have made strong representations that they considered such far-reaching proposals should not have been presented to them so late in the session, and that it would have been much better if a public bill had been brought in on the subject instead of a private bill dealing with certain localities. It was pointed out that the Board of Trade had made regulations for guarding against accidents by means of guard wires, and that the tramway authorities were generally of opinion that these guard wires only added to the danger instead of diminishing it. They were not so anxious to avoid such expense, but their true desire was to protect the public, and if the post office were to attach more wires it would simply increase the danger. No decision was reached, but the Postmaster General stated that his department would carefully consider the points and probably arrange for a further conference, when some arrangement would doubtless be made. It is not so long ago since Liverpool had a fatal accident by means of a telephone wire falling on the trolley wire and coming in contact with occupants of the top of a tramway car. It would appear that further erection of wires on the routes of tramways would be simply a step backward, and it is to be hoped that the results of the deputation will be such that the post office will abandon its proposed clause. A conference has since taken place at the General Post Office, London, between Sir Robert Hunter, solicitor; Major O'Meara, chief engineer, on behalf of the post office, and representatives of the Municipal Tramways conference, at which it was agreed that the post office would do its utmost to minimize the dangers arising from the adoption of such a system, and that the Postmaster General would accept responsibility for damage done as the result of placing telegraph and telephone wires on tramway standards.

London is a city of tubes, and among the many that are being opened from time to time the original electric tube of London is apt sometimes to be forgotten. This tube, the City and South London, is again to the front, however, by reason of the opening of its new extension from the Angel via King's Cross and St. Pancras to Euston, which took place a few days ago. This extension forms really the ultimate object of this railway and gives a very much needed connection from the whole city district to the large main-line railways situated in Euston Road. The ceremony was performed by H. Percy Harris, chairman of the London County Council, a special train conveying a large party of gentlemen over the new portion of the line from the Bank Station. The first stop was made at the Angel, which station itself was only opened a few years ago, when Mr. Harris switched on the current fitted in the carriage in which he traveled. At King's Cross another stop was made to inspect the platforms and on reaching Euston the company was entertained at luncheon by the railway company in the hall of the station. Among those present were C. B. Stuart Wortley, M. P., chairman of the company, Sir Benjamin Baker, consulting engineer, and many other influential gentlemen connected with railway enterprise. Mr. Harris, in proposing the toast of prosperity to the company, stated that the London County Council was deeply interested in the promotion of traffic facilities in the metropolis, and that the public would doubtless recognize the benefit bestowed by all promoters of transportation, whether on the surface or in tubes. He also mentioned that the City & South London Railway Company had carried since it commenced business two hundred million passengers without any serious accident. Sir Benjamin Baker, in replying to the toast of the engineers, contractors and officers, mentioned that the largest iron tunnel in the world had been placed at the Euston end of the new extension.

With regard to the London County Council electricity bill, which it will be remembered is a bill for providing the whole of the London area with cheap electric power by means of construction of large power houses, nothing has yet been actually decided, although the bill has now been up in Parliament. It was thought that when the Council was changed at the last election the Moderates might be inclined to drop the bill entirely. Such, however, appears not to be the case, as it was decided to proceed with the bill with clauses inserted giving the Council permission to make arrangements with private companies for operation, as the Council appears to be of opinion that it would not be wise to operate such plants itself. This indicates that the Council is working more in unison with one of the other bills in parliament, the administrative county and London bill, which is a bill working for powers to make agreements with the Council. At the meeting, therefore, of the London County Council, the motion was duly carried through, though strongly opposed by the Progressives, that the bill should be submitted for second reading in the House of Commons with a view to securing an arrangement under which private enterprise undertakes, subject to the control of the Council, the business of the supply of electrical energy, and on the understanding that such alterations as may be required in the bill to effect this object and to deal with any other matters of importance which may arise on the bill will be reported to the Council for its approval as soon as possible. The bill has now come up for second reading and on the first occasion it was practically talked out, or, technically speaking, adjourned till another day. McKinnin Wood, the Progressive leader, though defeated in the County Council vote, made an able speech in defense of the bill, making it quite clear that he had no love for the leasing proposal. Lloyd George was strongly in favor of the bill going to a committee, but in the meantime the discussion has been postponed.

Liverpool now has a proper home for its tramways and electric supply departments, as these have just moved into a new permanent building in Hatton Garden. For some time the staff of the tramways department has been divided between the head office in Sir Thomas Street and an office in Hatton Garden, while the electric supply staff has found quarters in Highfield Street. As has been apparent for a long time proper quarters for both departments were necessary, and a new building which has occupied about two years in completion is the result. It has a frontage to Hatton Garden of 184 ft., and the total area of the site on which it stands is 1982 square yards. It is a handsome six-story structure of Hall Dale stone and red Ruabon brick and has cost £48,650.

The work of the electrification of London's tramways is still proceeding satisfactorily, and the highways committee of the London County Council has recently reported that the electrification of the tramways in City Road, from the terminus at Finsbury Pavement as far as Old Street; in Old Street, from Great Eastern Street to Kingsland Road, and along High Street, Shoreditch, Whitechapel, High Street and Leman Street, with junction lines, comprising the remainder of the first section of the Council's northern tramways to be electrified, has been completed, with the exception of certain works at Whitechapel. The Board of Trade inspection of the new tram lines from the Clock Tower, Lewisham, to Lee Green has also taken place, and this service is now in daily operation. The speed limit is 16 miles an hour, no special restrictions being made at any point. The tramways bill of the London County Council has also been

before a select committee of the House of Commons. Counsel for the London County Council at that time made the statement that there were 127 miles of tramways in London, the London County Council owning 118 miles, and that in 1911 they would own the balance. Sixty miles of the tramways are now worked electrically, and 20 miles will be converted for electric traction this year.

The question was recently put to the Prime Minister in the House of Commons whether the Government would appoint a traffic board with powers to regulate and supervise the various transportation services of the metropolis, as recommended by the Royal Commission. Sir H. Campbell Bannerman replied that the subject was engaging the attention of the Government, but that he could hold out no hope of legislation during the present session. Allen Baker, who has been connected with the London tramways for so many years, on being interviewed, stated that he considered the solution of the problem consisted in the extension of the Council's tramways. Mr. Baker is evidently in favor of the construction of more shallow subways similar to the one now under Kingsway, and believes that in time the tramways will extend as far as the Bank in the heart of the city, but that these tramways will be operated in shallow subways. As to the motor-bus "bogey," Mr. Baker does not seem to have the slightest fear of it and makes the broad statement that none of the motor-bus companies is paying, operating now along the very best routes, and that if the London County Council could only get tramway facilities on the same routes the 'bus companies would be in a worse plight than ever.

The Parliamentary bills' committee of the Glasgow Corporation recommend that the Corporation should petition against the order of the Paisley District Tramway Company. Under the order power is sought to construct a new tramway from Barrhead to Thornliebank, and to run over the tramways to be constructed by the Corporation from the present terminus at Pollokshaws (west) to Rouken Glen Park via Thornliebank. The Renfrew County Council has also decided to oppose the order.

It is quite possible that some arrangement will be arrived at between the British Electric Traction Company and the Birmingham Corporation for the disposal by the former to the city authorities of the remaining lines in the city, which comprise the cable route. If such an offer is made, it is expected that the Corporation will look upon it with favor should the terms proposed be at all reasonable, and if the transference takes place the cable route will be electrified at once.

Progress has been made with the negotiations that are proceeding between the tramway committees of Manchaster and Salford for the running of an inter-change system of tramcars over the routes of both Corporations. The committees of the two Corporations will be asked to support the running of interchange through cars for a period of some months over one important route, through the borough and across the city, with a view to a practical demonstration of the utility of the scheme before it is more widely adopted.

A sub-committee of the tramways committee of the York City Council visited Lincoln recently, and, by the courtesy of the officials, inspected the Griffiths-Bedell system of electric tramways, established there about eighteen months ago. Wolverhampton was also visited by the same committee which inspected the Lorain surface contact system of tramways. The York sub-committee is inclined to favor the installation of a surface contact system at York, in which city at present the horse tram system is in use.

The first contract for tramway permanent way for Japan which has been placed in this country has just been secured by Edgar Allen & Company, of Sheffield. Hitherto orders of this kind for Japan have been placed with American firms. The contract provides for the supply and construction of the whole of the special track work, lay-outs, cross-overs, etc., required for the tramways to be constructed in Osaka.

At the annual meeting of the Elland District Council James Clarkson (clerk) reported that he had had an interview with the manager of the National Electric Construction Company with respect to the proposal to join Halifax and Huddersfield by tramway via Elland. He was asked to inform the Council that the company is prepared to carry the scheme through. The promoters have already spent about £10,000 upon the scheme, and it is not likely that they will drop it. Every line which the company promised has been completed.

The formation of the new cable tramway lines of the Edinburgh Corporation in Gilmore Place and Broughton is at once to be proceeded with. A meeting of the tramway committee of the Corporation was held recently, at which a report by Sir Alexander Kennedy, the Corporation's consulting engineer, on the work authorized by the Town Council was submitted. The report dealt chiefly with details in the carrying out of the work. It is understood that there is no question of providing further power. The power stations at Tollcross and Henderson Row can furnish ample additional power for the new sections. The Town Clerk was instructed to advertise for estimates for carrying out the construction of the new lines.

The tramway facilities between Croydon, Penge and the Crystal Palace are about to be greatly improved as a result of an agreement just arrived at between the Croydon Corporation and the South Metropolitan Tramways Company. At the present time all cars stop on the Croydon and Penge boundary at Shelby Road, and, though they may hold through tickets, passengers are compelled to change. This has led to so much complaining that the Croydon tramways committee felt compelled to seek a solution. The new arrangement provides for the interworking of cars, so that the public may travel between Croydon, Penge and the Crystal Palace without changing.

At a meeting of the Belfast tramways committee, Sir Robert Anderson presiding, the sub-committee appointed to consider the desirability of purchasing the Cavehill and Whitewell tramway system recommended the purchase of the entire tramway for the sum of £60,000. The recommendation was adopted subject to confirmation by the Council. The line runs from the terminus of the Belfast tramways at Fort William Park to a favorite suburb 6 miles distant.

The report of the past year's working of the Blackburn Corporation Tramways shows that for the first time since the undertaking was acquired by the Town Council in 1899 a net profit has been made, the amount being £511.

A deputation representing the blind people of Bradford recently waited upon the tramway committee of the Bradford Corporation and asked that passes should be granted to the blind, enabling them to travel on the city tramways without charge when going to their work or returning therefrom. The committee decided that they could not grant the whole of the request, but they agreed to issue instructions that blind people should be permitted, on production of a certificate, to travel at any time on the tramcars at half the ordinary fares.

George Craddock & Company, Wakefield, have received an order from the Glasgow & District Subway Company for a specially made tramway cable to work their line. This rope is 36,300 ft. long, 1½ ins. in diameter, and weighs approximately 57 to 60 tons. This is the heaviest rope in one piece that is working any cable tramway system in the world.

Cars are now running on the New Malden to Raynes Park section of the new tramway line laid down by the London United Tramway Company. The section, which is about 2½ miles in length, was finished about a year ago, but it has not hitherto been brought into use on account of the non-completion of the Wimbledon section, which is a continuation of it. An extension of the line from South Wimbledon to Tooting, where a junction will be effected with the London County Council tramways, is also well advanced and it is expected will be opened at an early date. South London residents will then be able to proceed by tramway to Hampton Court and other places in the Thames Valley.

After repeated experimental runs with the tramcar fitted with the new adjustable axle arrangement, illustrated elsewhere in these columns, for traveling upon both wide and narrow gages, a month's trial of a through service on the tramways between Leeds and Bradford has been commenced. At Stanningley, where through passengers have previously had to alight and change cars, they keep their seats, and by the simple movement of a lever the conductor alters the gearing so that the wheels readily accommodated themselves to the broader gage of the Leeds system. On the Leeds section there are several rather sharp curves, but these are successfully negotiated and the whole journey is accomplished with perfect smoothness. In Bradford the new car is by this time a tolerably familiar object in the streets, but in City Square and at the Corn Exchange, Leeds, it is sufficient of a novelty to arouse considerable curiosity. The special car is kept on throughout the day and is scheduled to complete a journey every 65 minutes. The question as to the permanent adoption of the invention and the extension of its application to a regular service of cars has not yet been decided upon by the two authorities, but it is understood that terms have provisionally been discussed. The through fare, as in case of the divided journey, is sixpence—a reduction of threepence upon the amount charged on the railway.

THE IMPETUS GIVEN ELECTRIC RAILWAY BUILDING IN PENNSYLVANIA BY THE PASSAGE OF FAVORABLE LEGISLATION

With the enactment of favorable legislation by the late sitting of the State Assembly, of Pennsylvania, electric railway interests throughout the State are becoming quite active, and a genuine boom in sections of the State now without trolley facilities is looked for during the balance of 1907 and in 1908. In the vicinity of Harrisburg particularly is this activity noticeable, largely owing to the close proximity of the McCall's ferry power plant now in course of construction. The company constructing this plant has already acquired the Lancaster County Railway & Light system, radiating in all directions from Lancaster and is said to be backing the project to build a double track, fast express system between Harrisburg and York, a distance of 27 miles. Governor Stuart has approved the application of the capitalists back of the company for authority to extend the chartered route of the Lewisbury & Strinestown Street Railway Company, which extension will begin near New Market, York County, pass through New Cumberland, where it will cross the Susquehanna River on a double-track steel bridge, to be built for wagon and foot travel, as well as electric railway travel, and have its terminus in South Harrisburg, covering certain streets in Steelton and South Harrisburg not now occupied by the tracks of the Central Pennsylvania Traction Company. The tracks of the Northern Central Railroad at New Cumberland and the Pennsylvania and Philadelphia & Reading Railroads in this city are to be crossed by overhead bridges. The line in this city will run from Cedar Street to Thirteenth and up Thirteenth to Sycamore, down Sycamore to Tenth, on Tenth to Paxton, thence on Paxton to Thirteenth and down Thirteenth to Sycamore, making a loop.

David Pepper, Jr., of 1233 Land Title Building, Philadelphia, is the president of the company which was chartered to build a line in the upper part of York County in 1905. J. DeW. Duncan, of Philadelphia, is the secretary. E. R. Sponsler, of Harrisburg, also is interested in the company. It is expected to make arrangements to carry out the project of extension and bridge building this year. Application will have to be made to the City Councils for rights on city streets and to New Cumberland for rights there. Mr. Sponsler is quoted as stating about the project: "This is the closing up of the link of the line which will connect York and Harrisburg. This company will connect below New Market with the York Traction Company and we will at once take steps to secure municipal rights. The surveys have been completed and the plans are for a fast line. The system will be built upon modern ideas and make quick trips."

Mr. Sponsler said that the steps to secure franchises for Harrisburg and New Cumberland would speedily be taken. It is not thought that the New York capitalists operating the McCall's ferry electric plant will stop with acquisition of this line and the Lancaster County system, but will eventually secure the systems in York.. The Central Pennsylvania Traction Company also figures largely in the early completion of a through system between Harrisburg and Philadelphia.

Among the charters issued at the State department last week were the following:

Philadelphia, Valley Forge & Suburban Railroad Company, to construct a line 6 miles long from the terminus of the Philadelphia Elevated Railway, at Darby, to a point toward the historic camping ground. L. Knowles Perot, of Bala, is president. This charter completes the last incorporation necessary for the companies of the Valley Forge system of trolley lines projected from the western terminus of the Philadelphia Elevated road to Valley Forge and Phoenixville. This system, financed by L. Knowles Perot, of Bala, and others, and included in a holding corporation, the Public Service Investment Company, has been surveyed all the way, but building operations have not yet been begun. The Philadelphia, Valley Forge & Suburban is capitalized at $60,000. Mr. Perot is president, and the other incorporators are: A. D. Whiting, David Rombold, Jr., and Edward W. Johnson, Philadelphia; James A. Bunting, Secane; Morris H. Wetherill, Haverford, and Robert C. Selden, Norristown.

A number of other charters had already been obtained for the system, which includes the Valley Forge, the Colonial Springs & Phoenixville, the Cynwyd, Fairview & Ardmore, the Fairview & Merion Square and the Merion Square & Barren Hill Railroads, and the Audubon, Lower Merion, Bala & Wynnefield Railways. Among the towns from which the system expects to draw traffic are Spring City, Royersford, Phoenixville, Port Kennedy, Wayne, St. David's, Radnor, Bridgeport, Norristown, Conshohocken, Spring Mill, Barren Hill, Bryn Mawr, Haverford, Ardmore, Cynwyd and Bala.

Waynesburg & Monongahela Street Railway Company, capital $84,000, to build a 14-mile line from the junction of the Waynesburg & Rogersville Railroad in Franklin Township, Greene County, with the Waynesburg & Washington Railroad, thence over the Waynesburg & Rogersville Railroad through West Waynesburg, Waynesburg, East Waynesburg, Morrisville, Jefferson, Clarksville, to Millsboro, Washington County. The line follows the bank of Ten-Mile Creek for some distance. The directors are: Jesse L. Ross, president; E. L. Denny, W. P. Ely, G. M. Scott, W. A. Titus, all of Waynesburg. Other incorporators are: H. C. Scott, L. M. Waddell, Harry Taylor, H. K. Coffrath, C. M. Scott, J. G. Rinehart, S. P. Bossert, John Lantz, and Thomas S. Crago. Other local companies which will soon receive charters are the Palmyra & Campbellstown Street Railway Company, from Campbellstown to Palmyra, and the Bismark & Lebanon Street Railway Company to build between Lebanon, Bismark and Mt. Ætna. George C. Unger, of Lebanon, has been awarded the contract for the overhead work on the new Palmyra-Campbellstown line.

It is stated that the building of the York-Hanover electric line, which is to be a part of the great Central and Southern Pennsylvania net-work of electric railways, will approximate $500,000. There will be nearly twenty large and small bridges. One of them, near Hanover, will cost in the neighborhood of $30,000, it is said. A large force of men is at work on the line, there being a camp of nearly 200 men in the vicinity of Spring Grove. The work of strengthening the Market Street bridge in York to accommodate the heavy cars to be used is in progress. This road is expected to be in operation by Dec. 1. A contract for the car equipment of this line will be awarded in a few days. Extra large cars are to be used on the line. Ten new cars are to be added to the present equipment of the York County Traction Company, of which five have arrived from the Wilmington works of the American Car & Foundry Company.

About 1500 men are now engaged on the building of the McCall's ferry power plant, which will be completed next year it is expected.

PROSECUTING THE DISHONEST EMPLOYEE

Peculations by conductors here and there have always been a source of considerable annoyance, especially as there seemed to be no way of dealing with the offender that meted out the proper punishment and carried a moral lesson showing clearly to the other men how dishonesty must work seriously to their detriment, not only in the company with which they are associated, but in the closely related way of increasing their difficulty in securing employment elsewhere through the inability of their last employer, as a result of their own actions, properly to recommend them. Isolated instances are on record where proceedings have been carried to court in prosecuting dishonest employees, and one such on the East St. Louis & Interurban Railway has recently come to notice and again brings up the whole subject, not only because of the methods employed by the company, but because of the effect this case is expected to have on the organization as a whole. Discharging dishonest men as soon as they are apprehended seems not to have just the right effect. This, the company in question, soon discovered. It was, therefore, decided to secure evidence against a suspect and arrest him while on duty. This was done after the man had finished his second trip for the day. He immediately asked to have his case tried as soon as possible. As a result of the court proceedings the man pleaded guilty and was fined $1 and costs and sentenced to jail for one day. The specific charge against this man was the embezzlement of $1.60. Although the sentence was a short one it establishes a precedent and is expected to have a permanent effect, especially as the company has publicly stated that hereafter all employees who are discovered to be dishonest will be prosecuted.

SYNOPSIS OF LAWS PASSED BY THE ASSEMBLY OF IOWA AFFECTING STREET AND INTERURBAN RAILWAYS

The thirty-second General Assembly of Iowa, which adjourned in April, passed a number of acts affecting interurban and street railways that are of considerable interest. The following is a brief synopsis of the important acts:

House file No. 281, which amends the present law and provides that companies shall, upon request, construct a cattle-guard on each side of private crossing, with necessary fences. The old law only required construction of cattle guard on one side of causeway.

House file No. 421, which repeals section 2026 of the code relating to street railways over highways and enacts a substitute therefor. The old act section applied to street railways alone. The new act affects interurban, as well as street railways, and provides that they may construct their lines upon any highway 100 ft. in width outside the limits of the city or town, provided they repair the road as soon as the line is constructed. In case the road is only 60 ft. in width, then the supervisors may grant the right for the use thereof by interurban or street railway company for a distance of 2 miles only, beyond the limits of a city or town. In either case, written consent from two-thirds of the property owners along the road must be obtained before the line can be constructed.

Senate file No. 240, which amends code section 2051, relating to conditional sale or lease of rolling stock and equipment of steam railroads by adding thereto a provision for the conditional sale or lease of power house, electric or other equipment of street or interurban railways, or of electric light and power companies, or of steam heating companies, such equipment including engines, boilers, generators, switch-boards, transformers, motors and other machinery and appliances.

House file No. 63, which repeals section 2057 and enacts a substitute therefor. This act provides that the company must construct and keep in repair a suitable fence of barb wire and posts, or woven wire, or both combined, or posts and boards, or any other fence which the fence viewers shall determine to be equivalent thereto, on each side of the track, so constructed with cattle guards at all public road crossings as to prevent cattle, horses, sheep, swine and other live stock from getting on the tracks.

House file No. 220, which provides for the classification of railroads into three classes, class "A," those with gross earnings in excess of $4,000 per mile; class "B," those with gross earnings at $3,000 per mile, but not over $4,000, and class "C," those with gross earnings under $3,000 per mile. The passenger rates on all class "A" roads shall not exceed 2 cents per mile; those on all class "B" roads shall not exceed 2½ cents per mile, and on all class "C" roads 3 cents per mile. Children twelve years of age or under one-half the regular rates above mentioned. The law also provides a minimum rate of 10 cents for all distances under 5 miles.

House file No. 65, which provides that it shall be unlawful for any railway to require or permit any employee engaged in movement of rolling stock, engine or train, to remain on duty for more than 16 consecutive hours, or to permit any such employee to perform further service without 10 hours of rest. Exceptions are made where work performed is in protection of life and property; in cases of accident, wrecks, etc., crews in charge of train loaded exclusively with live stock or perishable freight are to be allowed to take same to nearest division point on said railroad; also crews delayed by wrecks or accidents. The penalty is a fine of not less than $100 and not over $500 for each offense. The Railroad Commissioners are authorized to investigate and hear complaints.

House file No. 479, which provides that all street or interurban railway companies shall furnish terminal facilities, including power, to other interurban companies desiring entrance into such cities or towns as they operate in for a reasonable compensation. If no agreement can be reached as to compensation, then the matter is to be referred to the Railroad Commissioners, who are authorized to fix the rate. In case either company is not satisfied with the rate fixed by the Railroad Commissioners, then the right remains of appeal to the District Court, which appoints a commissioner to investigate and report.

House file No. 290, which provides that every railway company shall, on written notice from the owner of any land along the right of way, cut, burn or destroy once each year, in the month of July, all cockle burrs, burdock weeds, quack grass and thistles on the right of way adjacent to said land.

Senate file 11, which repeals section 2112 of the code and enacts a substitute therefor, defining the powers and duties of the Railroad Commissioners relative to examination and inspection of railroads, ordering repair of roadbed, fixing number of trains to be run, ordering location and construction of depots, etc., applies to interurban as well as steam roads.

Senate file 235, which gives the supervision over any and all wires for transmitting electric current or any other wire crossing under or over any track of a railroad in Iowa. All such wires must be at least 22 ft. above the top of the rails. The commissioners are empowered to examine wires already strung and order changes made where necessary. The object of the act is the protection of the employees of railroad and interurban and street railways.

House file No. 318, which provides that railway officials must report all accidents which result in personal injury or loss of life to the Railroad Commissioners. The commissioners are authorized to make investigation if they deem it necessary, and make report to the Governor. Such report is not to be used as evidence against the company.

House file No. 282, which repeals sections 2153 and 2155 of the code and enacts substitutes therefor. This act requires railroads, including interurbans, to transport freight within the State over connecting lines for a reasonable joint rate, and is intended to prohibit the present practice of the Iowa roads of charging separate local rates over each line. The act empowers the Board of Railroad Commissioners to make schedules of joint rates, which they may alter from time to time as they deem necessary.

Senate file 305, which amends section 2116 of code, which provides that it shall be the duty of railroads to furnish cars and transport freight as soon as possible, by adding thereto a provision, that in any suit or action brought against a company to enforce the rights arising under the provisions of said section, the burden of proving that the company has complied with its provisions, shall be upon the company.

Senate file No. 205, which provides that any railroad company, either steam or interurban, owning its own right of way in any city or town, shall be subject to all special assessments for sidewalk and street improvements for all such improvements constructed along said right of way.

ACTING ON THE BROOKLYN SUBWAY

Elsewhere in this issue mention is made of the meeting of the New York Rapid Transit Commission last week, at which the subject of the Brooklyn tunnel was discussed. On Tuesday, May 28, the committee on plans of the commission met and discussed the resolution offered by Controller Metz regarding the Brooklyn extension. The resolution, briefly, was that the city should proceed to advertise for bidders for the construction alone of that portion of the tri-borough route running through Brooklyn. The route is from Chrystie Street, Manhattan, over the new Manhattan Bridge and through the extension of Flatbush Avenue and Fourth Avenue to Coney Island, with a spur to Fort Hamilton. In consultation with Chief Engineer Rice, the committee ascertained that the estimated cost of the road, $30,000,000, could be materially cut down by the elimination of some of the tracks in certain sections where it is thought two tracks will be sufficient to carry the traffic. After discussing the whole question at length, the committee, which is composed of Commissioners Starin, Smith and Metz, decided to report the resolution out without recommendation. This will put it up to the board to discuss the matter and take action. Should the matter go through on Friday, as expected, the preparation of the form of contract will take about two weeks. A hearing on the form of contract must, under the law, be advertised for two weeks. By quick work the board can finally approve the form of contract and obtain the concurrence of the Board of Estimate a few days before the public utilities bill becomes operative. All the new commission will then have to do will be to advertise for bidders, as it is required under the terms of the bill, to take up the work of the present commission without review.

AFFAIRS IN CHICAGO

President Rawson, of the North and West Side Street Railway Companies, has announced that sufficient stock had been deposited with the Union Trust Company to insure the adoption of the plan of reorganization of the company and the acceptance of the ordinance. As soon as it was learned how much stock had been deposited, General Manager Roach and Receiver Sampsell, of the company, left for New York, to consult with Attorneys G. W. Wickersham, representing the North and West companies, and L. C. Krauthoff, working for the Union Traction, who have been busy for a long time fixing up the plan of reorganization of all the properties. Mr. Roach is to talk about the physical condition of the lines and the needed money to put them in shape, and Mr. Sampsell about the steps which will have to be taken to get them out of the hands of the United States Court and back into the possession of the stockholders. The first thing expected to be done in New York is the capitalization of the Chicago Railways Company at a figure which will enable it to take over all the properties of the North and West Chicago and the Union Traction Companies. The stock of this company will be prorated among the stockholders of the existing companies.

In a letter sent Wednesday, May 22, to Division 260 of the Street Railway Employees' Union, comprising employees of the Chicago City Railway Company, President T. E. Mitten, of the company, renewed the offer of the company to advance wages 2 cents an hour, but refused to grant concessions in the matter of working conditions.

Paving or repaving of about 15 miles of streets will be undertaken by the Chicago City Railway Company and the Chicago Union Traction Company immediately, as part of the conditions of the traction settlement ordinances. The Board of Supervising Engineers have decided that quick work must be done in this direction, as some of the streets have been torn up awaiting settlement of the traction question. The companies will be required to pave strips 8 ft. wide on single-track streets and 16 ft. wide where there are double-track lines.

RAPID TRANSIT AFFAIRS IN NEW YORK

The Rapid Transit Commission, at its meeting last week, awarded the contract for the construction of a section of the subway loop on Center Street between Canal and Broome Streets. The contract went to the Cranford Company, which was the lowest bidder, for $2,210,000.

A letter from F. B. Behr accepting the conditions imposed by the Commission and asking it to lay out a route for a monorail system to Coney Island from South Ferry was referred to counsel and the chief engineer.

William S. Hurley, the new member of the Commission, introduced a resolution to build a subway in Fourth Avenue, Brooklyn, from the Manhattan Bridge to Coney Island and Fort Hamilton. He said the subway could be built at once and would not cost more than $20,000,000. Chief Engineer Rice estimated, however, that the four-track road as proposed would cost $30,425,000, and after considerable discussion the matter was referred to a sub-committee. It is not believed definite action can be taken on this matter before the Commission's term of office expires on July 1.

THE NEW HAVEN'S POLICY

In connection with the plans reported of the purposes of the New York, New Haven & Hartford Railroad to merge its various properties it is pointed out that since President Mellen became the head of the New Haven, some four years ago, there have been between forty and fifty consolidations of various kinds in the system, including steam lines and electric railways in Connecticut and Massachusetts. To these will be added at the end of the present month the merger into the parent steam company of its holding company, the Consolidated Railway Company. The next step will be the progressive merging of the intricate system of corporations holding the street railways of Rhode Island, these ultimately being taken into the parent corporation, so it is said.

This consolidation policy of President Mellen as applied to Connecticut corporations indicates the final plan during his presidency of consolidation into one central and highly organized management of all properties under the New York, New Haven & Hartford Company's control, successively merging steam roads outlying in Rhode Island and Southern Massachusetts, including the Old Colony system, parts of which are the Boston & Providence and the Providence-Worcester Roads, and then the consolidation of the Boston & Maine system. The latter has a large part of its properties under lease, and payment of rentals constitutes a very large part of the fixed charges of the Boston & Maine system.

A final feature in the situation is the vesting in a Connecticut corporation of practically the entire railroad system and a large part of the street railways of New England, which will mean a considerably larger representation in the New Haven corporation of the local interests of five other New England States.

THE SITUATION IN CLEVELAND

Attorneys for the low-fare companies at Cleveland have decided not to accept the decision of Judge Phillips in the Isom injunction case barring them off Central Avenue, and will appeal the case to the Circuit Court. If the decision of the lower court is sustained by the higher tribunals, and the power of attorney clause in a majority of the consents is not ruled out, then the Cleveland Electric has absolute control on those two streets for the next six years. Under the decision, the City Council acted without authority in granting the Low Fare Railway Company a franchise in April.

The arguments in the injunction case to prevent the Low Fare Railway Company from operating on Euclid and Superior Avenues has been on hearing in Judge Chapman's court. The arguments were completed Friday, and a decision is expected some time this week.

A few days ago the Low Fare Railway Company made an offer to the city to furnish the material and put in the tracks on East Ninth Street, where the Cleveland Electric has taken up its tracks, with the understanding that the property shall belong to the city when it is completed. The city accepted this offer so far as the material is concerned, but put city employees to work building the track. The officials were served with notice that there is now an injunction against both the Low Fare Company and the city, preventing the construction of tracks in that street.

The Circuit Court has refused to give an immediate hearing on the Isom injunction case, which was appealed by the Low Fare Railway Company from Judge Phillips' court, and the statement was made that this court would hear no street railway litigation whatever. The litigants were advised to have their cases ready for as many final decrees as possible after June 10, when judges from other courts would be in Cleveland to hear them. This action was taken by the court so that there may be no grounds whatever for criticism, whatever the decisions may be.

The City Council laid over for one week the Hirstius ordinance granting the Cleveland Electric five-year franchises on Central Avenue and Quincy Street, in order that the company may file the consents of property owners. Whether the company will file consents or not remains to be seen. It is possible that it will contend for a longer franchise, to be valid if the courts finally decide that the franchises of the Low Fare Company are invalid, and to be void if the decisions favor the new companies.

RECKONING WITHOUT TAKING THE ELECTRIC RAILWAYS INTO CONSIDERATION

President Baer, of the Reading Railroad, announced during the recent session of the Pennsylvania Legislature that if the 2-cent fare bill was passed it would be followed by an increase in commutation rates. The bill was passed, and the Reading Company on May 23 announced that when the spring schedule went into effect on Sunday, May 28, there would be an increase in rates on lines out of Philadelphia averaging from 10 to 35 per cent. In a circular issued over the signature of Edson J. Weeks, general passenger agent, the company refers to the raise in rates as a "readjustment" only in order that there might be a "uniform system" adopted. In this notice is contained the very gracious statement that "to meet competition by trolley lines the Reading Railway in 1895 reduced the fares to a number of points in the Philadelphia district, such as Wayne Junction, Germantown and Chestnut Hill."

It is reported from Philadelphia that the patrons of the Read-

ing Company did not submit as willingly as Mr. Baer had anticipated, but that they nearly all had recourse to the trolley lines and stoutly proclaim that the Reading cannot hope again to have their patronage until it returns to the old schedule. An account in one of the daily papers of the effect of the new Reading rate says:

"All lines of the Philadelphia Rapid Transit Company traversing the northern section of the city and traversed by the Reading Railway were crowded with railroad commuters, who are using the traction lines as a boycott against the advance in the Reading suburban rates, put in effect on Saturday last. One Germantown car had 175 fares rung up on one suburban trip whereas twenty-five was always a good car full. The crowds have been so great on the traction lines which parallel the Reading during the last two days that it has been necessary to bring out closed cars put away for the summer."

ADDITIONS TO ST. LOUIS CAR COMPANY'S PLANT

The St. Louis Car Company has recently made several additions to its main plant in St. Louis, which will increase its capacity considerably. An erecting shop just completed, measures 225 ft. x 250 ft. This shop is located east of the transfer table runway and south of the machine shop. The dry-kiln capacity has been increased by the erection of a kiln measuring 342 ft. x 52 ft. In addition to the new erecting shop and the dry-kiln there has also been constructed a 63 ft. x 282 ft. extension to the storeroom.

AMERICAN MUSEUM OF SAFETY DEVICES

At a meeting a few days ago at the Player's Club in New York of the advisory committee of the American Museum of Safety Devices and Industrial Hygiene, announcement was made that the museum will open in the autumn in the Thirty-Ninth Street Building, which will also be occupied by the McGraw Publishing Company. A full line of safety devices will be shown. Dr. William H. Tolman, director of the museum, also announced that in response to the museum's appeal for funds, a check for $5,000 from an anonymous donor, living outside of New York, has been received.

PROGRESS ON THE NEWTON & NORTH WESTERN

H. H. Polk, president of the Interurban Railway Company, of Des Moines, has announced that his company has completed arrangements for the use of the tracks of the Newton & Northwestern Railway Company between Colfax and Newton, by which his company will be able to operate its cars into Newton. The Newton & Northwestern Company will electrify its line between Colfax and Newton just as soon as it can transfer the men who are now engaged in putting in wires, etc., on the Fort Dodge, Des Moines & Southern line. It is stated that the work will be completed by Aug. 1, and that the interurban will be able to operate its Colfax cars into Newton by that time. The Interurban Company planned several extensions this year, among them one to Carlisle and an extension of its Woodward branch to Boone, but has abandoned all plans for such work until the franchise cases against the Des Moines City Railway and the Interurban Railway Company have been settled in the courts. The Federal court sustained the contentions of the companies as to a perpetual franchise, but the cases have been appealed, and will no doubt be carried through State and United States courts to the court of last retort. These cases have embarrassed the companies somewhat, and the officials have announced that no extensions will be constructed until these cases are finally settled.

PROPOSED CHANGES IN THE PORTCHESTER ROUTE

Engineer Nichols, of the Board of Estimate and Apportionate, has presented to Chief Engineer Lewis, of the board, a report on the application of the New York & Port Chester Railroad Company to make changes in its route in Bronx Borough. Both the Port Chester company and the Westchester company received, some few years ago, when they were rivals, franchises in Bronx Borough. The Westchester company did some construction on its route, but little has been done on the Port Chester route. Both companies have now come under the control of the same interests.

The change requested by the Port Chester company is for part of the route already granted the Westchester company, the question of the terms for the franchise is now before the Board of Estimate and Apportionate.

RIVERBANK SUBWAY DEVELOPMENT IN BOSTON

The Boston Transit Commission has transmitted to the Legislature of Massachusetts a report answering a request of the committee on metropolitan affairs for information concerning the need of an east and west subway as compared with the need of the subway for surface cars east of Washington Street, provided for by the acts of 1902. The Commission quotes at length from the report on the transit situation which it submitted to the Legislature in 1906, pointing out that the needs of the present and immediate future require further considerable increase in facilities for traffic towards the west of the city, postulating an increase of population in the western suburbs within the 10-mile radius of the State House from 300,000 in 1905 to 384,000 by 1915. It appears probable to the Commission that the traffic on the street car lines in Boston will increase 60 per cent nominally in ten years, and will double in from fifteen to twenty years.

The Commission is of the opinion that under existing conditions the route defined by the present bill before the Legislature for a subway between Park Street Station beneath the Charles River Embankment to a point near the Back Bay Fens would be a desirable route for the accommodation of the present and future traffic from the west. It does not express an opinion as to the most desirable route, however, to be carried through the Back Bay, preferring to leave that matter to the Legislature. In view of the early completion of the Washington Street tunnel, with station accommodations for eight-car trains, the provision of additional facilities for traffic to the west is more urgently required than the construction of another subway running parallel to the Washington and Tremont Street underground routes.

LONG ISLAND RAILROAD REPORT

The annual report to the stockholders of the Long Island Railroad Company just issued, refers to the electrical equipment of the company, which now operates over about 100 miles of single track. The report says: "Its workings during the year have been very successful and the service has been reliable and efficient in every respect; and while it has not yet been economical, owing to the fact that your power is not fully employed, it has materially increased your passenger traffic."

Referring to extensions, the report says: "Plans are being prepared for the electrification of your lines from Long Island City to Port Washington and to Whitestone Landing, and as soon as the tunnels under the East River are completed, your lines will be electrified to Jamaica and to Woodhaven Junction, via the Glendale Cut-off, a connection between the main line of your company, the Montauk division and the Rockaway Beach division. Plans are also being made for an enlarged terminal at Jamaica where the change from steam to electric locomotives will be made. In the report for 1905, attention was called to the organization of the Long Island Consolidated Electrical Companies. That company has completed the acquisition of a one-half interest in the New York & Long Island Traction Company and in the Long Island Electric Railway Company, and has also purchased during the year the Babylon Railroad, a small line in the village of Babylon. The company has also planned the construction of a cross-island line from Huntington to Babylon via Farmingdale and Amityville, and the necessary franchises for this extension have been secured. It is proposed to obtain the funds for this purpose through the sale of the electrical companies' bonds, guaranteed by your company."

The cost of electric motive power plants and equipment is carried on the balance sheet at $3,034,913, which is a decrease of $1,122,362, as compared with Dec. 31, 1905.

EVANSVILLE STRIKE IS SETTLED

The strike of the employees of the Evansville & Southern Indiana Traction Company was settled Saturday, May 25, and the men returned to work on Sunday. By the terms of the settlement the men get platform time and an 11-hour day in place of 12-hour day, and get 16, 17 and 18 cents, according to length of service, instead of 15, 16, 17 and 18 cents. They have the right to appeal grievances either individually or by committee to the general manager or President Charles Murdock. Old men get preference of runs.

THE PHILADELPHIA & WESTERN OPENED

The Philadelphia & Western Railroad's new third-rail line from the Union Station, Sixty-Ninth and Market Streets, Philadelphia, to Strafford, in the Chester Valley, was formally opened Wednesday, May 22. The run to Strafford was made in 40 minutes, although the schedule time is 29 minutes. Officials of the railroad asserted this difference in time would be soon corrected and that within a few days the advertised time table would be in effect. Cars are being operated on a half-hour schedule, the last car leaving Union Station, where it connects with the elevated road, at 1 o'clock. It is promised that the line will soon be operated on a 15-minute schedule. Present Philadelphia & Western Railroad stations are located at Beechwood Park, Ardmore Junction, Ardmore, Haverford, Bryn Mawr, Rosemont, Garrett Hill, Villanova, Radnor, Ithan, St. David's, Wayne and Strafford.

AFFAIRS OF THE HAVANA COMPANY

The report from Havana that Frank Steinhart, former American Consul at Havana, has been selected as general manager of the Havana Electric Railway Company to succeed George F. Greenwood, resigned, could not be confirmed at the office of the company in New York, it being stated by Mr. Ashley, the secretary and treasurer of the company, that nothing was available at this time for publication concerning the affairs of the company. Mr. Ashley did admit, however, that Mr. F. W. Hild, who sailed for Havana a few days ago, had, as noted elsewhere in this issue, been appointed assistant general manager and chief engineer of the company. It will be remembered that at a meeting of the Havana Company in New York early in March, of which mention was made in the Street Railway Journal for March 16, a new board of directors and officers were elected as follows: Warren Bicknell, of Cleveland; David T. Davis and Robert Mather, of the Rock Island interests; Walter G. Oakman, of the Guarantee Trust Company; James Rattray, San Miguel; Henry Runken, Carlos Zaldo and Frank Steinhart, of Havana; Warren Bicknell, president; David T. Davis, vice-president, and Mr. Ashley, secretary and treasurer.

NEW HAVEN'S NOTICE OF STOCK INCREASE

The New York, New Haven & Hartford Railroad Company has notified the New York Stock Exchange that the company's capital stock has been increased from $100,000,000 to $130,000,000. Directors of the road on Jan. 12 authorized this increase in capital and voted to offer, in July, the right to stockholders to subscribe at $150 a share for additional stock to the extent of one share for every four shares of their respective holdings. Action was taken later to give the holders of the $30,000,000 convertible debentures, issued Jan. 1, 1906, the right to subscribe to the new stock to the amount of 25 per cent of their holdings. Charles S. Mellen, president of the company, afterward made the announcement that the new stock offering, which is to amount to about $30,000,000, will be made in July, on the basis of $150 a share. But intimations have been given of late that in all probability the stock issue would be postponed indefinitely on account of market conditions. The notification to the Stock Exchange of the increase is to take formal steps to provide for the exchange of Consolidated Railway debenture certificates. The total amount of stock previously authorized to be listed was $99,069,000. At 150 the $30,000,000 new stock would realize for the New Haven $45,000,000. It is an interesting coincidence that the present market value of the $28,265,570 of the Boston & Maine stock, which is ruling at about 162, is only a trifle more than $45,000,000.

PROVIDING FOR IMPROVEMENT TO MOHAWK VALLEY COMPANY'S LINES

The directors of the Mohawk Valley Company, which holds, in the interest of the New York Central & Hudson River Railroad Company and the Andrews-Stanley syndicate of Cleveland, the majority of the stock of several electric railway companies in New York State, have passed a resolution authorizing the company to advance a large amount of money to various subsidiary lines for improvements which have been planned for some time. The Mohawk Valley Company, it is announced, has sufficient funds on hand to enable it to continue these improvements. It is not announced what the improvements in contemplation are.

THE STRIKE AT BIRMINGHAM

Cars are in regular operation at Birmingham, and the strike of the employees of the Birmingham Railway, Light & Power Company is reported to be petering out. Only a small proportion of the men went out, and desertions are reported from them. There is little disorder.

NEW RAILROAD COMMISSIONERS FOR PENNSYLVANIA

Under the provisions of the Dunsmore bill, passed by the Pennsylvania Legislature prior to adjournment, the Governor is empowered to appoint three members of the "Pennsylvania State Railroad Commission" before the first Monday in January, 1908, who shall serve for three, four and five years, respectively. After first appointments members of the commission are to be learned in the law. Each Commissioner will receive a salary of $8,000 per year. The secretary of the commission is to receive $4,000, the attorney $4,000, and the marshal $2,500. The bill creating the commission appropriates $150,000 for this purpose. The headquarters of the commission will be in Harrisburg.

As a result of the firm stand taken by Governor Stuart the bill as finally passed contains many of the sections of the original measure.

While in conference committee the bill was amended to include telephone and telegraph companies among the corporations over which the commission shall have supervision. These were not mentioned in the original bill.

THE EASTERN OHIO TRYING TO DISPOSE OF ITS PROPERTY

The Eastern Ohio Traction Company is endeavoring to make some arrangement with the second mortgage bondholders of the Chagrin Falls line for disposing of the property as a reasonable price. The idea of the management is to divide the property into three sections as follows and sell them separately: The original Cleveland & Eastern, between Cleveland and Chardon by way of Gates' Mills; Cleveland & Chagrin Falls, and between Chagrin Falls and Garrettsville. The Northern Ohio Traction & Light Company would probably purchase all the properties if the right figure were placed on them, but the Cleveland-Chagrin Falls line is more desirable to this company than the Chardon line, because of the possibility of completing it through to a point where it would connect with the Mahoning & Shenango Valley lines. This company would, however, want to purchase the property from Chagrin Falls to Garrettsville at a price little in advance of junk, as the tracks would have to be taken up and built over a new route to make a direct line to the connection desired with the Youngstown lines. It is thought that the original Cleveland & Eastern might be operated with profit by the Eastern Ohio Traction Company, if the other two sections were sold, or if it should not be sold to the Northern Ohio it might eventually become a part of some other system or the local lines here.

ELECTRIFICATION AT THE BERN CONGRESS

The International Railway Association, which meets every five years, and which held its last convention in 1905, at Washington, D. C., will have its next meeting at Bern, Switzerland, in 1910. The program has just been issued. Among other topics to be considered is that of electric traction, to which three speakers have been appointed as follows: For America, George Gibbs, chief engineer of electric traction Long Island Railroad, New York City; for Germany, Dr. Gleichmann, chief inspector of motive power Royal State Railways of Bavaria, Munich; for other countries, Dr. Wyssling, professor at the State Polytechnic Institute of Zurich, and secretary of the Swiss Institute of Electrical Engineers, Zurich.

NEW YORK ELECTRICAL SOCIETY VISITS NEW YORK CENTRAL POWER HOUSE

On Saturday, May 25, the New York Electrical Society visited the power plant of the New York Central Railroad at Port Morris, on the Long Island Sound. About 300 members participated in this interesting trip. Before inspection of the plant, President Condict conducted a brief meeting at which E. B. Katte, chief engineer of electric traction, made a pithy address as to its leading features, and Secretary Guy presented nearly fifty names of candidates for membership. About 2 hours were then devoted to a thorough study of the plant, all details of which were open to view, and in regard to which a handy brochure full of data was distributed. The power house and switch house, which have already been described in these pages, are the latest work in the generating art, and comprise four 5000-kw General Electric turbo units.

MAYOR OF NEW YORK VETOES PUBLIC SERVICE BILL

Mayor McClellan, of New York, on Tuesday, May 28, vetoed the public utilities bill. In a long statement issued when he announced his action, the Mayor asserted as his principal ground for vetoing the bill that it was wholly against the home rule principle, and for that reason, in his view, was unsatisfactory to the city. Mayor McClellan said in part:

I see no force in the argument that because the general purpose of this act is good, I should overlook its manifest defects and approve it in its present form.

As I understand the law, this measure has been sent to me, not for an expression of my opinion as to its basic features, but because in several of its provisions it affects the powers of the city government. In other words, I am called upon to say whether or not, from the city's point of view, the bill is satisfactory in its present form. To this question there can be but one answer. It is not. If I were to decide otherwise and to accept this bill as it stands, it would imply an admission on my part that the principle of self-government for the city was no longer worth striving for.

I regret that I cannot agree with those who have urged that this measure extends, rather than curtails, the present powers of the local authorities. It is true, I admit, that in the past the Legislature has constantly failed to grant the city's demands for larger powers of supervision and control in respect to these matters than it possesses at present, but in my judgment this does not constitute any reason why the city should consent to a bill which empowers the Governor to appoint a local commission, and then compels the city to pay a large portion of its expenses.

The power conferred by this act is unprecedented, and, under normal conditions, many of those who are advocating the measure would be among its strongest critics.

For the first time in the history of our State there are to be created two administrative bodies vested with power heretofore exclusively exercised by the Legislature, of regulating rates and fares of steam railroad, street and elevated railroad, gas, electric light and power companies. The combined capitalization of these companies is $3,322,537,916. The gross earnings from operation last year were approximately $533,000,000, the number of employees upward of 300,000, and the number of security holders not less than 100,000.

The commissioners are to be appointed by the Governor, and, as they may be removed by him or his successors, they will become the direct representatives and agents of each succeeding Governor. There is no provision that the commissions shall be bi-partisan or non-partisan, and all members may be of the same political party. What may be, will be. And if this bill becomes a law we shall, in the near future, see these commissions composed entirely of political partisans, with great consequent injury to the State and the properties affected.

If the theory of bi-partisanship or non-partisanship ever rested upon a sound foundation, what possible excuse can there be for withholding the principle from such administrative commissions as are established by this bill?

It is no answer that the present Governor will not prostitute his office by the selection of men capable of such acts. It is no answer that he will appoint three Democrats on the commission for the overwhelming Democratic First District, and that two Democrats will be named on the commission for the Second District. The Governor's tenure of office is short, and it will not be long before we will have a Governor who will not hesitate to use this power.

With the general principles of this bill I am in accord, but I will never give my approval to a measure that places in the hands of a single political party such tremendous and limitless power.

GEORGE B. McCLELLAN, Mayor.

NEW PUBLICATIONS

Generellas Projekt der Zugspitz-bahn. By W. A. Müller, C. E. Dresden, 1907. 54 pages and 12 plates. Price, 8 marks.

This is an analysis of the engineering problems and cost of construction of a proposed mountain railway in the Bavarian Alps, not far from Ober-Ammergau. The line ascends to an elevation of 2800 meters, or about 9000 ft., and is 15,450 km, or about 9.65 miles in length. The author considers various types of road and finally recommends a trolley line for the first 7.4 miles of track and a cable incline for the remainder of the distance. The time required for the trip is ninety minutes, and the entire cost, including several tunnels, is estimated at $1,050,000. The book is accompanied by drawings of the proposed line and is a good example of the clearness with which an engineering proposal should be prepared.

The "Engineering and Electric Traction Pocketbook." By Philip Dawson. Fourth edition, 1906. New York City: John Wiley & Sons. 16 mo, xx + 1054 pages, profusely illustrated. Price, leather, $5.00.

The best practical evidence of the favor with which a book is considered by the clientele for which it is prepared is the number of editions which the publishers issue. It is satisfactory to know that from this standpoint Dawson's Pocketbook is successful because it deserves to be from the matter which it contains. The technical contents of the present edition has been thoroughly revised, although the bibliography which accompanies it needs some emendations. Some old matter has been expunged and some new matter has been added, such as the chapter on single-phase systems. Other data, on the new British standard grooved rails, the thermit joint and turbines show the book has been brought up to date.

STREET RAILWAY PATENTS

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

UNITED STATES PATENTS ISSUED MAY 14, 1907

853,209. Railway Rail; John N. Akarman, Newark, N. J. App. filed June 1, 1906. A girder rail made in two parts, the top portion of the upper girder forming the head of a railway rail, and the lower section forming the base of the rail.

853,210. Slack Adjuster; Charles O. Anderson, Omaha, Neb. App. filed June 11, 1906. Relates to automatically adjustable means for connecting the brake-shoe actuating mechanism at opposite ends of a truck.

853,221. Rail-Joint; William M. Brown, Johnstown, Pa. App. filed Aug. 6, 1906. The rails are provided with longitudinal ribs and fish-plates bear against the top of the base flange of the rail and the bottom of the longitudinal rib, and the bottom of the head of the rail and the top of the longitudinal rib.

853,223. Switch Tongue Operating and Retaining Device; Nicholas Burns, Johnstown, Pa. App. filed Dec. 21, 1906. A spring under tension at one end of two levers and a pair of toggle levers connecting the other ends of the levers with a rod from the tongue so that the switch will be held in either of its positions.

853,245. Walk-Over Car Seat; Peter M. Kling, Elizabeth, N. J. App. filed March 23, 1904. Details of construction of a reversible car seat.

853,270. Derailing Switch; Henry C. Stiff, Johnstown, Pa. App. filed Aug. 6, 1906. Comprises a continuous rail, a second rail having a parallel and an angular portion with relation to the first rail, and a movable switch point connected to a mechanically operated rod to hold the switch open, in combina-

tion with a switch lever and a slotted link connection between the rod and switch lever.

853,322. Trolley Harp; Edward D. Rockwell, Bristol, Conn. App. filed May 7, 1906. The harp is yieldingly mounted on the pole.

853,403. Electric Block System for Railways; Walter R. Fuller, Atlanta, Ga. App. filed Jan. 19, 1907. A circuit wire is fixed to the web of the track rails and is engaged by a depending shoe from the locomotive.

853,453. Trolley Retriever; Madison F. Hodge, Leavenworth, Kan. App. filed Dec. 18, 1905. Details of a spring drum and ratchet device for controlling the trolley cord.

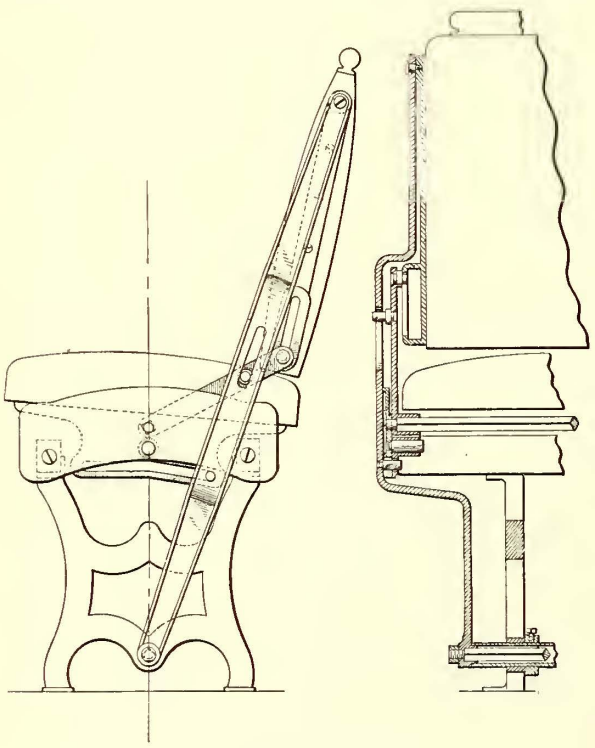
853,522. Cable Reel Apparatus for Mining Locomotives; Harry W. Shaver, Pocahontas, Va. App. filed June 7, 1906. Relates to that type of mining railways in which the flexible conductor is automatically paid out as the locomotive travels away from the fixed supply conductor, or is wound upon a reel as the locomotive travels back to the supply conductor. Provides means by which a torque is exerted on the reel in either direction of travel of the locomotive.

853,593. Railway Tie; James G. Parkerson, Jr., Lafayette, La. App. filed March 13, 1907. A metallic base having means for holding a block of wood at each end to which the rail is spiked.

853,618. Circuit-Closing Device; Rollin A. Baldwin, New Haven, Conn. App. filed July 19, 1906. A circuit-closing device for trolleys, adapted to complete a circuit through a magnet or other device when a trolley car passes a given point. Has two long, flexible strips which engage the side of the wheel in passing, whereby a good electrical circuit is made without any tendency to displace the wheel from the wire.

853,741. Metallic Tie and Rail Fastener; La Verne Simpson and Jacob Stein, Pittsburg, Pa. App. filed Feb. 11, 1907. Rail-engaging lugs are cut from the body of the tie and suitably bent.

853,886. Safety Device for Railways; Otto F. Kloetzer and William A. Borders, Washington, Ind. App. filed Nov. 9, 1906.



PATENT NO. 853,245

Comprises track rails divided into blocks, sectional conductor rails divided into blocks and connected to the track rails of adjacent blocks, and means carried by the train for delivering a current of electricity to the conductor rails and receiving a current from the track rails.

853,838. Current Collector; Samuel B. Stewart, Jr., Schenectady, N. Y. App. filed Aug. 1, 1906. An overhead trolley collector or shoe which is impelled upward vertically by a spring-impelled lazy-tongs device.

853,898. Amusement Device; Robert F. Rice, Bridgeport, Conn. App. filed Oct. 24, 1905. A circular track inclosed in a building, the inner side of which consists of a screen on which moving pictures may be reproduced.

PERSONAL MENTION

MR. WARREN S. HALL, general manager of the Lehigh Valley Transit Company, of Allentown, Pa., has been elected vice-president of the company.

MR. EDWARD W. MOORE, of the Everett-Moore syndicate, has been appointed president of the Cleveland, Painesville & Eastern Railway Company, of Cleveland, to succeed Mr. Charles Wason, resigned.

MR. R. T. LAFFIN, who went to Manila in 1903 as general manager of the Manila Electric Railway & Light Company, expects to return to this country in the fall. Mr. Laffin formerly was general manager of the Worcester Consolidated Railway Company, of Worcester, Mass.

MR. HUGH COOK has been appointed chief engineer and superintendent of construction of the lines being built on Long Island by the Stanley syndicate of Cleveland. Mr. Cook was formerly assistant engineer of the Youngstown & Ohio River Railroad, of Youngstown, Ohio.

MR. E. V. MALING, who has held the position of superintendent with the Shelburne Falls & Colrain Street Railway Company for the past two years, has resigned, his resignation to take effect June 10, and Mr. F. L. Reed, treasurer of the company, has been elected manager to succeed him.

MR. REESE DAVIS, formerly roadmaster of the Connecticut Railway & Lighting Company's lines at Bridgeport, and for the past three years roadmaster of the Mexico City Electric Tramway Company's lines in Mexico City, has been appointed roadmaster of the Consolidated Railway Company's lines in Hartford and its suburbs.

MR. C. F. BRYANT, whose resignation as auditor of the Connecticut Railway & Lighting Company was mentioned in the May 4 issue, has become connected with the general auditor's department of the Utica & Mohawk Valley Railway Company, and will make his headquarters at the New York office of that company, 527 Fifth Avenue. During the last few months Mr. Bryant has been engaged on special work for the American Street and Interurban Railway Association.

MR. FREDERICK W. HILD has been appointed assistant general manager and chief engineer of the Havana Electric Railway Company, of Havana, Cuba. Mr. Hild formerly was construction engineer for the General Electric Company, in charge of the installation of machinery on the Aurora, Elgin & Chicago Railway Company, and more recently has been chief engineer of the Southwestern Wisconsin Railway, with headquarters at Dubuque, Ia. Mr. Hild was married May 22 at Dunkirk, Ohio, to Miss Georgia Marion Halstead, of that city. Mr. and Mrs. Hild will be at home at Havana to their friends after June 15.

MR. CHARLES H. COPLEY has been appointed superintendent of the local division of the Consolidated Railway Company, at Norwalk, Conn., succeeding Mr. Everett F. Kyle, who is now located with the Sterling Salt Company, of New York. For six years Mr. Copley was manager, passenger agent and chief electrician of the Bellow's Falls & Saxton's River Street Railway, of Bellows Falls, Vt., and when appointed to Norwalk was employed on the construction by the Consolidated Railway Company of a new road between Rockville and Stafford Springs, Conn.

MR. W. N. STEVENS, mechanical engineer of the Southern properties which come under the control of Ford, Bacon & Davis, has just resigned his position with that firm to take effect June 1. Mr. Stevens has for the last twelve years been engaged in the design and construction of power houses, car houses, shops and other matters in connection with the development of railway and lighting properties. A considerable part of this time he was with the Manhattan and Interborough interests in New York, in both of which companies he occupied the position of chief assistant mechanical engineer. Mr. Stevens has not announced his plans for the future.

SEVERAL IMPORTANT CHANGES have been made in the Eastern personnel of the Electric Service Supply Company. Mr. Willis V. Sweeten, formerly of the Elmer P. Morris Com-

pany, of New York City, will travel through New York State for the Electric Service Supplies Company, and have headquarters at its New York City office. Mr. F. C. Peck, formerly real estate agent for the Delaware & Hudson Railroad Company, will cover the Philadelphia trade. Mr. T. F. McKenna, who for some years has been traveling for Machado & Roller, of New York City, will travel in Pennsylvania for the Electric Service Supplies Company, making his headquarters at the Mayer & Englund department in Philadelphia.

MR. GEO. F. CHAPMAN, vice president and general manager of the United Railways Company, of San Francisco, died in that city Thursday, May 23, after a short illness. Mr. Chapman had been connected with the United Railways since May, 1902, when he accepted the position of general manager of the company. Subsequently he was elected vice-president of the company, in addition to general manager. Before becoming connected with the United Company Mr. Chapman was general superintendent of the North Jersey Street Railway Company, of Newark, with which he was connected for twelve years. For eight years he was superintendent of the Union division of the company, and for the last four years of his connection with the company he was general superintendent, in charge of the entire system operating in Newark, Elizabeth, Jersey City and the Oranges. Mr. Chapman, who was an Englishman by birth, entered street railroading at Boston on the Charles River Street Railway under Mr. John N. Akarman, shortly after coming to this country in 1883. He had long taken an active interest in the affairs of the American Street and Interurban Railway Association, and was one of the committee that reported to the association on municipal ownership at the last convention. Mr. Chapman was about forty-seven years old.

GEO. F. CHAPMAN

MR. JOHN N. AKARMAN, who recently resigned from the position of general superintendent of the South Jersey division of the Public Service Corporation of New Jersey, is one of the oldest operating men in the business, having been a superintendent or manager of street railway properties for twenty-five years. Born March 4, 1854, he was educated in the public schools of Brooklyn and graduated in 1871, after taking a supplementary course in civil engineering and surveying. He then entered the office of Mr. George H. Day, city surveyor of Brooklyn, where he remained two years, leaving Mr. Day's service to engage with Mr. Henry Wilson, an engineer of Boston, Mass. In the latter part of 1873 Mr. Akarman began his railroad career by entering the service of the South Boston Railroad Company, and in 1877, leaving the employ of that company, he became one of the subordinate officials of the Middlesex Railroad Company, running between Boston and Charlestown, Mass. Six years' service, filling various positions with this company, qualified him to accept the position of superintendent of the Charles River Street Railway Company. Four years later, when this company was consolidated with the Cambridge Railroad, Mr. Akarman became general superintendent of the roads in Worcester, Mass., owned by the Seeleys. He then built the Biddeford & Saco Railroad, running from Biddeford to Old Orchard Beach, Me. Selling out his interest there within a year, he obtained an option on the roads in Newark and Elizabeth, N. J., and sold them to a syndicate of Philadelphia capitalists and became general superintendent. In 1892 he obtained an option from the Seeleys on their Worcester property, and sold this road to the same syndicate. Taking charge of this property as general manager, under his direction it was equipped electrically in seven months, and subsequently successfully operated until sold in 1901 for more than double what it cost. Mr. Akarman then returned to New Jersey, becoming general manager of the Elizabeth, Plainfield & Central Jersey Railway Company, and when this road was absorbed by the Public Service Corporation he became part of that organization, filling the positions of traffic superintendent, general passenger agent and general superintendent of the South Jersey division.

J. N. AKARMAN

MR. W. H. COLLINS, master mechanic of the Fonda, Johnstown & Gloversville Railroad, who, as noted in the STREET RAILWAY JOURNAL for May 25, has been appointed general superintendent of the company to succeed Mr. J. N. Shannahan, resigned, entered railway service in 1881 as timekeeper on the extension of the Delaware, Lackawanna & Western Railroad between Binghamton and Buffalo. From 1883 to 1888 Mr. Collins was successively in the employ of the Geneva, Ithaca & Sayre, Elmira, Cortland & Northern, Southern Central, and West Shore Railroads, as agent and operator. Jan. 1, 1888, he entered the motive power department of the West Shore Railroad, at the Frankfort shops, and served in various capacities until June 1, 1891, when he was sent to Buffalo as assistant to the master mechanic of the Western division where he remained until Jan. 1, 1898, when he entered the serivce of the Fonda, Johnstown & Gloversville Railroad in the same capacity. His appointment as master mechanic of the company dated from Jan. 1, 1903.

MR. L. C. BRADLEY has resigned as superintendent of the Scioto Valley Traction Company, at Columbus, Ohio, to become associated with J. G. White & Company, of New York. Mr. Bradley was formerly superintendent of the Seattle & Tacoma Interurban Railway, and came to the Scioto Valley three years ago. He is an engineer of wide experience and is especially well informed on third-rail operation, the Scioto Valley being one of the foremost roads of the kind in the country. In the new field Mr. Bradley will have a wide latitude for his ability, as White & Company have a number of properties under construction which will be under his supervision. By reason of the resignation of Mr. Bradley there will be a number of changes in the personnel of the Scioto Company. Mr. W. V. S. Robb, of the resignation of Mr. Bradley there will be a number of changes in the personnel of the company. Mr. W. V. S. Robb, formerly chief clerk to the superintendent, has been appointed purchasing agent and chief clerk to the general manager. Mr. Calvin Skinner, a steam railroad man of long experience, who was master mechanic of the Chicago & Alton before his appointment as master mechanic of the Scioto company, has been appointed superintendent in charge of the transportation, mechanical and roadway departments. Mr. G. A. Stiles, formerly day foreman in the mechanical department, has been promoted to be general shop foreman. Mr. J. O. Bradfield, formerly freight agent, has been appointed general freight agent. In addition to these changes the directors of the company organized by electing Mr. F. A. Davis, president and general manager; W. S. Courtright, vice-president, and E. R. Sharp, secretary and treasurer. In accepting the resignation of Mr. Bradley the following resolution was passed:

Whereas, Mr. L. C. Bradley, who has been the superintendent of this company since it began operation, has tendered his resignation to accept a position with J. G. White & Company,

Be it Resolved by the board of directors of this company, that the resignation of Mr. Bradley be accepted with regret, and that in accepting said resignation, this board takes the opportunity to express its appreciation of the careful, faithful and efficient service which Mr. Bradley has rendered to the company with notable ability and capacity.

Be it further Resolved that we extend to Mr. Bradley our best wishes for his future success, and commend him to his new employers as a capable and efficient operator of electric railways.

At the close of the directors' meeting, Mr. Davis, on behalf of the officers and employees of the company, presented Mr. Bradley with a Patek Phillips watch. In accepting the watch Mr. Bradley expressed his regret at leaving the company and spoke of the pleasant relations which had existed between the company, its officers and himself.

TABLE OF OPERATING STATISTICS

Notice.—These statistics will be carefully revised from month to month, upon information received from the companies direct, or from official sources. The table should be used in connection with our Financial Supplement, "American Street Railway Investments," which contains the annual operating reports to the ends of the various financial years. Similar statistics in regard to roads not reporting are solicited by the editors. * Including taxes. † Deficit. ‡ Including Rapid Railway system, Sandwich, Windsor & Amherstburg Railway, and Detroit, Monroe & Toledo Short Line Railway.

Company.	Period.	Total Gross Earnings.	Operating Expenses.	Net Earnings.	Deductions From Income.	Net Income, Amount Available for Dividends.
AKRON, O. Northern Ohio Tr. & Light Co.	1 m., Apr., '07	132,844	82,889	49,955	42,402	7,553
	1 " " '06	117,367	78,200	39,167	39,947	†780
	4 " " '07	508,727	318,396	190,331	166,431	23,899
	4 " " '06	451,975	302,573	149,402	159,788	†10,386
ALBANY, N. Y. United Traction Co.	3 m., Mar., '07	494,285	292,621	201,664	87,481	114,183
	3 " " '06	415,431	250,317	165,114	86,581	78,533
	9 " " '07	1,500,020	893,352	606,668	262,444	344,224
	9 " " '06	1,314,156	847,755	466,401	259,743	206,658
BINGHAMTON, N. Y. Binghamton Railway Co.	1 m., Apr., '07	20,240	13,377	6,844	8,128	†1,284
	1 " " '06	22,012	12,461	9,550	7,363	2,188
	10 " " '07	248,989	137,249	111,740	78,596	33,145
	10 " " '06	236,951	124,312	112,638	72,936	39,703
CHAMPAIGN, ILL. Illinois Traction Co.	1 m., Apr., '07	277,724	*160,101	117,624	.....	.....
	1 " " '06	225,083	*142,282	82,801	.....	.....
	4 " " '07	1,105,324	*630,019	475,305	.....	.....
	4 " " '06	893,385	*510,988	382,396	.....	.....
CHARLESTON, S. C. Charleston Consolidated Ry., Gas & Elec. Co.	1 m., Apr., '07	55,324	35,091	20,233	13,517	6,716
	1 " " '06	50,155	31,518	18,637	12,967	5,670
	2 " " '07	111,460	72,221	39,239	27,033	12,205
	2 " " '06	101,996	63,351	38,645	25,933	12,711
CHICAGO, ILL. Aurora Elgin & Chicago Ry. Co.	1 m., Apr., '07	101,198	58,594	42,605	27,588	15,017
	1 " " '06	89,981	51,749	38,232	24,939	13,293
	10 " " '07	1,079,633	590,054	489,579	264,897	224,681
	10 " " '06	960,133	529,619	430,514	244,140	186,374
Chicago & Milwaukee Elec. R.R. Co.	1 m., Apr., '07	68,711	31,829	36,882	.....	.....
	1 " " '06	57,015	24,131	32,884	.....	.....
	4 " " '07	248,234	127,269	120,966	.....	.....
	4 " " '06	177,505	90,093	87,411	.....	.....
CLEVELAND, O. Cleveland, Painesville & Eastern R.R. Co.	1 m., Apr., '07	19,470	*11,349	8,121	7,213	908
	1 " " '06	18,202	*12,118	6,084	6,789	†705
	4 " " '07	71,543	*41,489	30,053	28,851	1,203
	4 " " '06	63,440	*39,703	23,737	26,989	†3,251
Cleveland, Southwestern & Columbus Ry. Co.	1 m., Apr., '07	58,089	36,978	21,111	.....	.....
	1 " " '06	47,394	29,339	18,055	.....	.....
	4 " " '07	203,729	126,098	77,630	.....	.....
	4 " " '06	176,000	111,181	64,820	.....	.....
DALLAS, TEX. Dallas Elec. Corp'n.	1 m., Mar., '07	89,493	*69,013	20,480	16,858	3,622
	1 " " '06	80,384	*56,148	24,237	15,431	8,806
	12 " " '07	1,050,119	*744,723	305,396	190,457	114,940
	12 " " '06	970,985	*601,115	369,871	182,399	187,472
DETROIT, MICH. ‡Detroit United Ry. Co.	1 m., Apr., '07	511,445	321,992	189,453	115,460	73,993
	1 " " '06	470,434	280,154	190,280	105,654	84,626
	4 " " '07	1,962,796	1,263,535	699,261	448,138	251,123
	4 " " '06	1,716,883	1,040,238	676,645	393,968	282,677
DULUTH, MINN. Duluth St. Ry. Co.	1 m., Mar., '07	64,356	31,292	33,064	17,617	15,447
	1 " " '06	58,402	33,904	24,498	17,496	7,002
	3 " " '07	176,697	97,798	78,899	52,721	26,178
	3 " " '06	163,174	97,348	65,826	52,482	13,344
EAST LIVERPOOL, O. East Liverpool Tr. & Lt. Co.	1 m., Apr., '07	28,745	16,642	12,102	11,554	549
	18 " " '07	497,754	283,397	214.357	171,219	43,138
EAST ST. LOUIS, ILL. East St. Louis & Suburban Co.	1 m., Apr., '07	161,203	93,801	67,402	.....	.....
	1 " " '06	148,230	77,519	70,711	.....	.....
	10 " " '07	635,762	353,663	282,099	.....	.....
	10 " " '06	573,955	296,846	277,109	.....	.....
FT. WAYNE, IND. Ft. Wayne & Wabash Valley Tr. Co.	1 m., Mar., '07	92,500	58,844	33,656	.....	.....
	1 " " '06	79,991	51,472	28,519	.....	.....
	3 " " '07	267,018	165,909	101,109	.....	.....
	3 " " '06	232,088	143,733	88,355	.....	.....
FT. WORTH, TEX. Northern Texas Tr. Co.	1 m., Mar., '07	91,756	*52,551	39,205	10,313	28,893
	1 " " '06	64,738	*39,826	24,911	9,942	14,970
	12 " " '07	920,298	*580,020	340,278	120,508	219,771
	12 " " '06	694,654	*419,063	275,591	120,429	155,162
GALVESTON, TEX. Galveston Elec. Co.	1 m., Mar., '07	27,066	*16,909	10,157	4,167	5,990
	1 " " '06	19,308	*14,844	4,464	4,167	298
	12 " " '07	334,228	*197,815	136,413	50,000	86,413
	12 " " '06	272,561	*174,523	98,038	48,333	49,705
GLENS FALLS, N. Y. Hudson Valley Ry. Co.	3 m., Mar., '07	109,682	103,602	6,080	50,029	†43,949
	3 " " '06	99,362	73,453	25,909	64,178	†38,269
	9 " " '07	471,551	312,207	159,344	151,849	7,495
	9 " " '06	431,101	237,690	193,411	196,160	†2,749
HOUGHTON, MICH. Houghton County St. Ry. Co.	1 m., Mar., '07	20,415	*13,315	7,100	3,971	3,129
	1 " " '06	15,251	*11,751	3,500	3,937	†437
	12 " " '07	237,051	*150,677	86,373	47,123	39,250
	12 " " '06	182,550	*158,865	23,685	44,981	†21,296
HOUSTON, TEX. Houston Electric Co.	1 m., Mar., '07	55,226	*35,601	19,625	8,260	11,365
	1 " " '06	44,328	*30,503	13,824	7,692	6,133
	12 " " '07	615,275	*391,169	224,106	93,801	130,305
	12 " " '06	539,661	*331,941	205,720	103,568	102,153
KANSAS CITY, MO. Kansas City Ry. & Lt. Co.	1 m., Mar., '07	478,464	258,894	219,571	152,052	67,518
	1 " " '06	407,631	219,231	188,400	135,907	52,493
	10 " " '07	4,753,616	2,385,948	2,367,668	1,464,064	903,604
	10 " " '06	4,265,751	2,123,153	2,142,598	1,365,062	777,535
LEXINGTON, KY. Lexington & Interurban Rys. Co.	1 m., Mar., '07	41,739	25,476	16,262	.....	.....
	1 " " '06	31,542	24,769	6,773	.....	.....
	3 " " '07	116,719	78,002	38,717	.....	.....
	3 " " '06	97,559	72,502	25,057	.....	.....
MILWAUKEE, WIS. Milwaukee Elec. Ry. & Lt. Co.	1 m., Apr., '07	305,743	152,506	153,237	95,474	57,763
	1 " " '06	273,534	134,435	139,099	88,364	50,735
	4 " " '07	1,208,332	621,817	586,515	375,741	210,774
	4 " " '06	1,086,368	540,383	545,985	347,692	198,293
Milwaukee Lt. Ht. & Tr. Co.	1 m., Apr., '07	52,211	24,151	28,060	30,424	†2,363
	1 " " '06	46,682	19,208	27,475	24,306	3,168
	4 " " '07	208,695	102,606	106,089	120,570	†14,481
	4 " " '06	177,323	76,517	100,806	92,500	8,306
MONTREAL, CAN. Montreal St. Ry. Co.	1 m., Apr., '07	274,635	166,422	108,213	45,318	62,896
	1 " " '06	235,615	136,663	98,953	41,114	57,839
	7 " " '07	1,873,684	1,240,079	633,605	284,196	349,409
	7 " " '06	1,641,938	1,065,294	576,643	219,739	356,905
NEW ORLEANS, LA. New Orleans Ry. & Lt. Co.	1 m., Mar., '07	518,721	260,205	258,517	172,470	86,046
	1 " " '06	486,245	267,875	218,370	157,367	61,003
	3 " " '07	1,595,713	767,295	828,419	489,718	338,701
	3 " " '06	1,491,332	765,759	725,572	447,348	278,224
NEW YORK, N. Y. New York City Ry. Co.	3 m., Mar., '07	4,062,165	2,600,564	1,461,601	2,863,010	†1,401,409
	3 " " '06	4,261,815	2,398,458	1,863,357	2,789,724	†926,367
	9 " " '07	13,771,636	7,346,059	6,425,577	8,600,449	†2,174,872
	9 " " '06	13,878,672	7,162,178	6,716,494	8,404,774	†1,688,280
NORFOLK, VA. Norfolk & Portsmouth Tr. Co.	1 m., Mar., '07	163,135	106,030	57,106	.....	.....
	1 " " '06	123,173	81,035	42,138	.....	.....
	3 " " '07	447,204	293,971	153,233	.....	.....
	3 " " "06	366,966	237,405	129,561	.....	.....
PHILADELPHIA, PA. American Rys. Co.	1 m., Apr., '07	223,124	.....	.....	.....	.....
	1 " " '06	203,882	.....	.....	.....	.....
	10 " " '07	2,344,790	.....	.....	.....	.....
	10 " " '06	2,137,533	.....	.....	.....	.....
PLYMOUTH, MASS. Brockton & Plymouth St. Ry. Co.	1 m., Mar., '07	6,830	*5,827	1,002	1,820	†818
	1 " " '06	5,825	*5,526	299	1,863	†1,564
	12 " " '07	113,323	*71,541	41,781	21,731	20,051
	12 " " '06	103,419	*71,808	31,611	21,313	10,298
ROCHESTER, N. Y. Rochester Ry. Co.	3 m., Mar., '07	570,398	358,486	211,912	106,003	105,909
	3 " " '06	490,510	289,573	200,937	93,746	107,191
ST. LOUIS, MO. United Railways Co. of St. Louis	1 m., Apr., '07	884,923	*583,039	301,884	230,893	70,991
	1 " " '06	852,593	*532,306	320,287	231,704	88,583
	4 " " '07	3,379,085	*2,305,634	1,073,451	924,627	148,824
	4 " " '06	3,138,885	*2,008,044	1,130,841	927,226	203,615
SAVANNAH, GA. Savannah Electric Co.	1 m., Mar., '07	47,167	*31,098	16,069	11,775	4,294
	1 " " '06	47,300	*30,840	16,460	10,904	5,556
	12 " " '07	605,031	*377,029	228,002	136,545	91,457
	12 " " '06	603,590	*363,245	240,345	128,745	111,599
SYRACUSE, N. Y. Syracuse R. T. Co.	1 m., Apr., '07	98,109	55,004	43,105	25,471	17,634
	1 " " '06	86,864	49,285	37,579	22,907	14,672
	4 " " '07	387,910	217,257	170,653	100,376	70,277
	4 " " '06	340,497	193,590	146,907	89,144	57,763
TOLEDO, O. Toledo Rys. & Lt. Co.	1 m., Apr., '07	164,473	*99,031	65,442	46,982	18,460
	1 " " '06	156,396	*83,623	72,773	42,213	30,560
	4 " " '07	660,890	*384,754	276,136	181,714	94,422
	4 " " '06	616,543	*326,639	289,904	169,208	120,696
UTICA, N. Y. Utica & Mohawk Valley Ry. Co.	3 m., Mar., '07	231,591	148,581	83,010	77,079	5,931
	3 " " '06	199,844	123,901	75,943	44,964	30,979
	9 " " '07	770,177	467,060	303,117	168,416	134,701
	9 " " '06	662,770	378,651	284,119	134,727	149,392