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## The Electric Equipment of the N. Y., N. H. & H. R. R.

The article on the overhead construction of the New Haven Railroad published last week is followed in this issue by a discussion of the constructional features of the locomotive which were not available when the original plans were made public some sixteen months ago. This information and Mr. McHenry's presentation of the reasons for the adoption of electricity, are extremely interesting as evidence of the possibilities of single-phase traction for the larger railroad work of the future.

When the New York Central system was selected it was probably the wisest choice, not only because there was a

firm determination to push the work rapidly to completion, but on account of physical conditions in the Park Avenue tunnel, and legal conditions on the Park Avenue viaduct. The engineers of the company, however, have always been very careful to state clearly that their decision should not be construed as opposed to a. c. operation under different conditions. Undoubtedly the situation south of Woodlawn was a serious handicap to the subsequent work of the New Haven Railroad, requiring as it did the designing of a motor able to work well on either kind of current and fitted with controlling and collecting devices for both. The result has been, as appears when the locomotive of the New Haven system is examined, an amount of complication that looks at first sight formidable and which is in fact serious enough to be a cause of some anxiety. It is most unfortunate that it should be so since the apparent success of the commutating single-phase motor will hinge for the time being, not upon the real facts, but upon the successful working of a lot of things which are no part of the system and which will probably never again appear in electrical railway equipment. On the other hand, success is doubly creditable, and the engineers in charge may well be proud of it. The officials of the New Haven Railroad, even if they incidentally took some chances of temporary discomfort, were far seeing enough to put aside the temptation of settling down into sunny standardization and made a choice that looked far enough into the future to view the probability of the general use of electricity as a motive power over great railway systems.

In this connection one of the most striking things in Mr. McHenry's paper is his recognition of the fact that freight and passenger service can be separated in motive power only as a temporary expedient, and that any complete scheme of operation must contemplate freight haulage. He lays down the postulate that electric service can be applied equally to heavy traction and to light suburban service, to freight trains and to single cars on special duty. His point of view is novel in this, that it contemplates the use both of locomotives and of motor cars, each for its appropriate work on the same system and under the same management. As a rule, engineers have taken strongly one position or the other, either denouncing the locomotive, or scoffing at the single-car system. This much can be said with certainty, that it yet remains to be proved that any multiple control scheme with trains made up of motor cars is capable of replacing locomotives for really heavy traction. Quick acceleration is certainly secured by making all wheels driving wheels, but there are some reasons for believing that the advantage is gained at a rather heavy cost in efficiency and upkeep, and there are cases in which acceleration is not important enough to warrant the price. The economies of the case are hard to get at for lack of data, but Mr. McHenry seems to have little fear on this score, and the case was certainly investigated very carefully. Most of the studies on



costs of electric traction have been briefs rather than judicial opinions, and have taken extreme positions for or against success. The one side has demanded pretty nearly that an electric locomotive should have all a steam locomotive's time honored peculiarities. They have almost insisted on its possessing a smoke stack and a steam whistle. The other has chanted the praises of the single motor car and the evolution of all transportation into an exaggerated trolley system. It is certainly refreshing to encounter a wider and fairer view.

The New Haven system has now made an excellent start and it represents an amount of painstaking preliminary experimentation that augurs well for the final results. It was a daring step to undertake an absolutely new system on so large a scale and when handicapped by circumstances, and it deserves the largest measure of success. Let it be judged by results, the results of two or three years of steady working. Small troubles it will doubtless have like every other system, but this it has which other systems have not, an efficient distribution capable of covering the whole field of its operations and of allowing for future growth.

### The Motor 'Bus

It will be an interesting study to watch the work of the new gasoline vehicles to be put into service by the New York Transportation Company. The motor 'bus is an object familiar enough in England where it can be put into service under an ordinary 'bus driver's license without the costly and troublesome acquisition of a franchise demanded here. Under such favorable conditions the motor 'bus has done fairly well, and there is some encouragement for its use under our American conditions.

The more general use of the gasoline 'bus abroad is, in a measure, evidence that it is preferred to the gasoline-electric vehicles hitherto used in New York. We understand that the company here, however, intends some further trials of this kind of 'bus. There are advantages in both systems and local conditions may affect materially the most desirable selection. The electric generator and motor form a very flexible and pretty type of speed-changing gear, but one which is heavy, costly and not so extraordinarily efficient or easy to keep up as to over-weigh these objections. It appears to be best suited perhaps to trucks and such like, slow and heavy affairs, where facile control is peculiarly useful in working through crowded and congested streets, or where high-class labor is not used for operation. Again, the greater weight of the electric combination makes it more suitable for routes where the grades are not very severe. The gasoline motor 'bus has more nearly the requirements of an ordinary motor car, and the gearing of a well designed car is quite sufficient for it, as experience seems already to have shown.

The interesting feature of motor 'bus operation is its peculiar field of usefulness. No one will seriously consider the 'bus as an active competitor of the street railway, but rather as an adjunct of it, able to be of great use in its own especial sphere. We who build twenty-story cities need not be surprised at finding that we require concurrently every kind of rapid transit device to be imagined, in order to make transportation keep pace with necessity. New York is

literally growing at a rate that subway-building cannot keep pace with. One has only to use surface and elevated cars to realize that these, too, are inadequate, and so we can well afford to welcome the motor 'bus as one more helper in the good work. There seems good reason to expect that it will be of service, and any help is welcome.

If experience is a safeguard the motor 'bus cannot prove an economic competitor of the vehicle that moves on tracks. The cost of fuel, care and up-keep rises to a figure that probably forbids 5-cent fares on any extended runs. The recent crash in the quotations of motor 'bus stocks in England, where the 'bus has had its widest development, proves that. But by the use of improved vehicles of the double-deck construction a 10-cent fare may very likely prove remunerative. This difference makes the 'bus a competitor, not at all of street cars, but rather, we hope, of cabs. New York, we must with sorrow admit, has at once the most inadequate, the most insufficient and the most extortionate public carriage service in the world. Foreign travelers would with justice scoff at it for its badness did they not curse it for its outrageous charges. We welcome with open arms any sort of vehicle that can help scourge it into comparative decency. This, perhaps, a well organized motor 'bus system will be able in time to do and the sooner it comes with all the modern improvements the better for the metropolis.

The motor car certainly has a legitimate field in public service. It can never compete with the street car as the vehicle of the people, but it can do many things which the latter cannot do. Not being confined to a track it can work its way through crowded streets by judicious detours and can make, upon the whole, better time than a surface car. It can reach and serve streets that cannot well be equipped with tracks, and more than all, it can relieve people to a considerable extent of the Turpinesque ministrations of the metropolitan cabby.

There is another field in which the public motor car can do, and in fact is doing, admirable work. This is in the prosaic task of furnishing quick and convenient transportation at summer resorts. As a general rule such places, especially at the seashore, are not easily reached from the railway stations, and the season is too short to justify the construction of electric roads. Hence one usually reaches through the last stage of the journey by an ancient and rickety barge drawn by a pair of X-ray equines. The situation would be funny were it less serious, but really the result is to render unavailable a very large amount of valuable territory. The time consumed in the last 2 or 3 miles is often equal to that required for a 20-mile run by train, and the resort that by the timetable was a mere hour away has slipped afield to an hour and a half. The motor 'bus exactly meets the requirements of such situations. It can make good time and give ample capacity at moderate cost, doing for the case in hand everything that an electric car could do. When the season is over and the resorts close, the motor 'bus is not an unproductive burden, but can be brought back to the city to keep up its earning capacity. The type of 'bus just brought into use seems simpler and more workable than some of its predecessors, and in so far will probably do better in the matter of cost, and certainly a practical and reliable motor 'bus has its work to do.



## The Preservation of Timber

The importance of preserving timber structures of all kinds; with the exception of those designed for temporary service only, needs no defense at this time. Every purchaser of timber on a large scale realizes the increasing cost of wood if he compares present prices with the figures of earlier contracts, and every user of timber ought to be interested in the prolongation of its life to the economical limit. At the present rate of timber consumption the question of an adequate supply will become critical in a few decades at the outside, and the National Government is very properly making a scientific study of the problem. Electric railways are, of course, small consumers of timber in comparison with the great steam trunk line systems, but even in the traction field the economies of increased life in poles, ties and trestle members are well worth securing if possible.

Two valuable bulletins recently published by the United States Department of Agriculture, Circulars 103 and 104, Forest Service, throw interesting light upon the problem of pole treatments. Although the tests and treatments enumerated were made chiefly upon telephone and telegraph poles, the results are of considerable importance to electric railways and power companies in general. Experiments show that both ties and poles of seasoned wood will, in contact with ground, far outlast those of unseasoned timber. Winter-cut wood seasons more regularly than that cut at other seasons, but does not, for many months, at least, reach as low weight as spring-cut wood seasoned equally long. The shrinkage of round timbers in air seasoning was found to be very slight, and when the poles were carefully cut, checking during air seasoning was found to be light. In case the tree is split or shaken in felling, however, serious checking may result. Very rapid seasoning, except after the wood is soaked or steamed, almost always leads to checks or splits on account of the unequal strain in the fibers, which dry at different rates. Winter and spring cutting of poles appear to be preferable from the standpoints of seasoning, custom, availability of labor, and susceptibility to decay. Under the conditions of the test made it was concluded that in order to secure the lowest freight charges, and at the same time minimize insurance and storage charges, winter-cut timber should be held from four to six months before shipment; autumn cut, seven to nine months; spring cut, three to five months, and summer cut, two to four months.

The preservative treatment of railroad ties and piling has been practiced commercially for a number of years, and about fifty treating plants are now being operated in the United States. The treatment of poles has made no such progress, and in many cases where it has been attempted the work has been carelessly done. Preservatives have been declared valueless because they have failed to prolong the life of green timber, or because they were improperly applied and perhaps faulty records kept. The best method of increasing the length of service of poles is a complete question to determine, and its solution demands definite knowledge of the advantages of seasoned over unseasoned poles in taking treatment. The increase in length of service of seasoned over green poles both when treated and un-

treated, the effect of submersion in water, in the case of treatment, influence of the season of cutting, facility of application and effectiveness of preservatives, as well as the best methods of application: time alone will solve some of these points. Bulletin 104 throws considerable light upon the capacity of poles—green, seasoned and soaked—to absorb preservatives, the degree of penetration secured with known woods and preservatives of a given chemical composition and physical characteristics, and the comparative cost of treatment by the brush and the open tank methods.

Experiments were made with seven preservatives, all being more or less modified distillates of coal or pine tar. Both the brush and the tank treatments were tried, careful notes of the conditions of temperature, penetration, area treated, etc., being recorded. It was found that the more thoroughly the pole is seasoned the deeper and more uniform is the penetration and the greater the absorption, both with the brush and tank treatments. The seasoned poles absorbed nearly twice as much as the green poles. No difference in absorption or penetration was noted on poles which had been soaked over those which had not, and in the brush treatment the season of cutting did not seem to affect the absorption. In the tank treatments, where only one preservative was used, the spring-cut poles absorbed the most—the cuts of winter, summer and autumn following. It was found that those preservatives which solidify at a low temperature were the least easy to apply. With the brush treatment, in most cases a better penetration was secured by applying the preservative when hot. In well seasoned wood the essential is that the preservative shall be thoroughly liquid. In partially seasoned or unseasoned wood, a higher temperature is essential, though in most cases it appears inadvisable to go above 200 degrees F., especially when the preservatives contain oils having a low boiling point. The light oils are undesirable in the open tank treatment. With the brush treatment a depth of penetration of  $1/16$  to  $1/4$  in. was secured, and with the open tank,  $1/2$  in. on the average.

As to cost, it was estimated that for brush treatment, six men in two days can treat 100 poles at the butts with two coats of preservative at a cost of \$22. The cost of the preservative absorbed was not included in this figure, but it can be approximately obtained by weighing the pole before and after treatment, or checked by the total loss from the buckets. For tank treatment it was estimated that six men and one team of two horses can handle and treat 50 poles per day at a cost of \$22.50. To the above 45 cents per pole should be added as the cost of the preservative absorbed. By the brush method the average cost per pole was about 40 cents, or 29 cents in the case of creosote. By the tank process the cost per pole with creosote was 67 cents, of which 22 cents was the cost of oil. Assuming that the cost of a standard 30-ft. pole at the setting hole is \$8, and that untreated it will last twelve years, the added life necessary to repay the cost of treatment with creosote by the brush method will be about six months, and by the open tank method, about one year. At least three years, was figured as a conservative estimate of the gain in life by the brush method, and from six to eight years as the minimum increase by the tank method seems conservative.



## ELECTRIC LOCOMOTIVES OF THE NEW YORK, NEW HAVEN & HARTFORD RAILROAD

In the adaptation of electric traction to the New York, New Haven & Hartford Railroad, a number of features were presented by the problem, which practically fixed the system which should be adopted, and to a large degree decided the design of both the locomotives and the line construction. Aside from the innumerable details which had to be considered, broadly speaking, the problem called for:

A system the first cost and maintenance of which would not be prohibitive; a system which would permit of large extensions with a high degree of efficiency at a reasonable cost; and locomotive equipments which would be capable of operating over the direct current lines of the New York Central Railroad.

The alternating current system was primarily selected on account of its facilities for transmission and transformation; and single-phase was decided upon because the character-

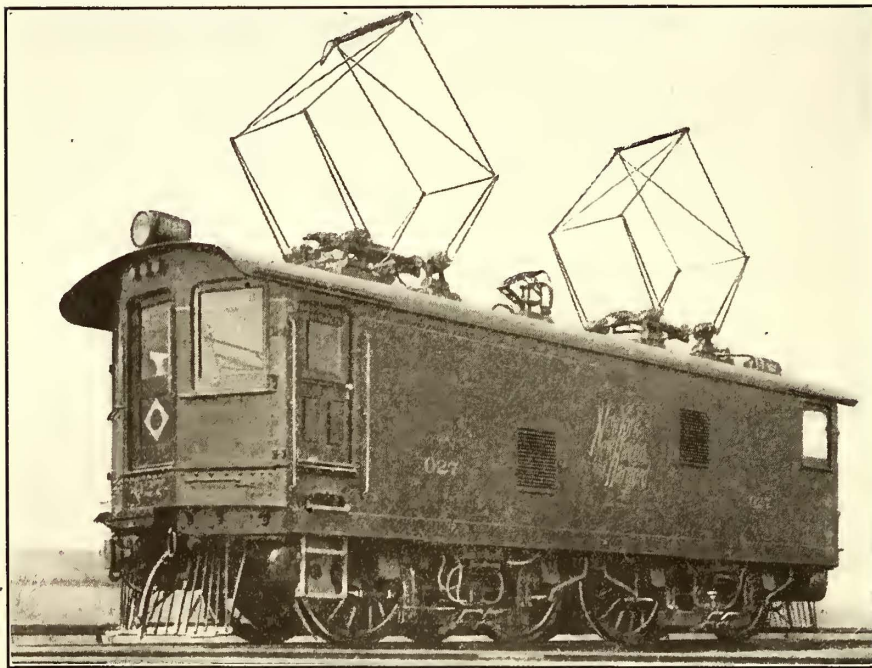


FIG. 1.—NEW HAVEN LOCOMOTIVE WITH PANTOGRAPH TROLLEY RAISED

istics of the single-phase motor makes it eminently suitable for railway work; and also on account of the simplicity of the line construction.

### SERVICE REQUIREMENTS

The specifications under which the locomotives were sold require that each of them shall be able to handle a 200-ton train in the most severe schedule on the present timetable, corresponding to the local express which stops about every 2.2 miles and operates on a schedule speed of over 26 m. p. h. This service requires a maximum speed of about 45 m. p. h. The locomotive is also to haul this weight of train at 65 to 70 m. p. h., and a 250-ton train at 60 m. p. h. in the long runs. Three hundred-ton, or even heavier, trains may also be handled on the long runs at reduced speeds. Heavy trains may be operated at high speeds by coupling two or more of the locomotives together and operating them on the multiple-unit system.

### DESIGN

The design of the locomotives was largely dictated by certain requirements: (a) gearless motors having a flexible drive, and with all the weight carried on springs were de-

sired and finally adopted as the most desirable form, and (b) operation on 600 volts direct current necessitated the use of four motors in order that they might be operated in the usual series-parallel relation. Having these two requirements in view, the bogie truck type was adopted after very careful consideration of the conditions imposed. It is not proposed to describe the locomotive in detail, as an extended account of it was published in the *STREET RAILWAY JOURNAL* for April 14, 1906. Since that time, however, other details have become available, and are presented herewith, with comments on the method of control employed.

### LOCOMOTIVE FRAME

The mechanical parts of the locomotives are built entirely of steel, measure 36 ft. 4 ins. over bumpers and weigh approximately 90 tons. The mechanical parts of the locomotive were built by the Baldwin Locomotive Company from designs developed with the co-operation of the Westinghouse Electric & Manufacturing Company, and the New York, New Haven & Hartford Railroad Company engineers.

The longitudinal members of the frame consist of deep plate girders reinforced at the top by channels, and at the bottom by heavy angles and plates. To these frames are riveted plate cross-members, one over each truck, forming the transoms for the transmission of weight to the center-pin. These transoms are further braced by gusset plates riveted to the bottom flanges of both sets of channels, which transmit the tractive power from the center-pin to the side frames. The side girders are placed outside the wheels as low down as the wheels and drawhead will permit and are braced and squared by substantial steel flooring plates which are riveted to the top flanges. The draw-bar effort is transmitted to the side frame through deep box girders joining the frames at the ends of the locomotive.

The cab is built up on a framework of Z-bars, which are riveted to the side girders. This whole design forms a very light, but extremely strong construction, able, not only to transmit large draw-bar pulls, but to resist heavy shocks in bumping.

### TRUCKS

The running gear consists of two trucks, each mounted on four 62-in. driving wheels. The trucks have side frames of cast steel to which are bolted and riveted pressed-steel bolsters, which carry the center plates. A very strong construction is secured without excessive weight by the use of bolsters 30 ins. wide at the center plate and extended to nearly double that width at the ends, which are bolted to the side frames. Center bearings 18 ins. in diameter transmit the tractive effort to the frame. They are well lubricated to permit free motion on curves. The weight on the journal boxes is carried by semi-elliptic springs. Under the ends of the equalizer bars are small spiral springs to assist in restoring equilibrium. The distance between truck centers is 14 ft. 6 ins.

### ELECTRIC AND MAGNETIC CIRCUITS OF THE MOTORS

As mentioned in the *STREET RAILWAY JOURNAL* for April 14, 1906, the propelling motors of the locomotive are of the



conductively-compensated, single-phase, series type. For the direct purpose of improving the power factor, the magnetomotive force of the current in the armature is counterbalanced by an equal magnetomotive force in stationary coils placed in the field core structure through which the armature current is required to pass. If the so-called compensation were complete, then the armature circuit and the stationary compensating coils as a unit would form a non-inductive circuit consisting of a certain resistance and no reactance. Due, however, to the magnetic leakage between the armature and the compensating coils the combined circuits contain a small reactance component in addition to the resistance.

It is noteworthy that by far the largest portion of the reactance of the motor circuits is found in the main field coils. As a rough approximation, it may be stated that at synchronous speed the tangent of the angle of lag (of which the cosine is the power factor) is equal to the ratio of the effective field turns to armature turns, and it decreases inversely with an increase in speed. Hence, with well designed armature and compensating coils, the power factor can be rendered quite high by using a small ratio of field to armature turns and operating the machine at a speed which is high in comparison with synchronism.

The requirements for obtaining a high power factor are well met when the field is made magnetically very weak and the armature correspondingly strong, and a large number of poles is used. The improvement in the power factor by using a weak field will be appreciated when it is remembered that for a certain field current the field varies as the first power, and the field reactance as the square of the field turns. The advantage of using a large number of poles resides in the fact that the magnetomotive force for producing the field flux is distributed throughout a large number of coils of few turns (and hence having a small reactance) rather than concentrated in a few coils having a much larger total reactance.

Incidentally, when a large number of poles is used, "synchronous" speed occurs at a low rotative speed. If an increase in the number of poles did not, from mechanical considerations, entail a corresponding decrease in the rotative speed it would be possible to improve the power factor of the motor by changing the ratio of the operating speed to the synchronous speed. It is to be noted, however, that, except insofar as an increase in the number of poles may allow a smaller pole-pitch or a higher peripheral speed to be used, no improvement in power factor is obtained from a change in the ratio of the operating speed to synchronism, because no such change takes place.

The motors on the New Haven locomotive are provided with twelve poles, so that the synchronous speed for 25-cycle current corresponds to 250 r. p. m. Since the locomotive drivers are 62 ins. in diameter, 250 r. p. m. corresponds to a locomotive speed of 4060 ft. per minute, and at synchronous speed the locomotive runs at 46 m. p. h.

It is instructive to note that if the motor had fourteen poles, and the drivers were 72 ins. in diameter, synchronous speed would again correspond to 46 m. p. h. with 25-cycle

current; if, however, the frequency were lowered to 15 cycles, synchronous speed would occur at 27.7 m. p. h. Moreover, if the same motor were used for 15 cycles as for 25 cycles, at synchronous speed in each case, the tangent of the angle of lag would be the same; at the same locomotive speed in each case the tangent of the lag angle would be reduced in the ratio of 25 to 15, or as 1 is to .6.

It should not be inferred from the statements made above either that there could be any very considerable improvement made in the operating characteristics of a motor by changing from 25 to 15 cycles, or that the performance at 25 cycles is unsatisfactory. The fact of the matter is that the power factor of a 25-cycle motor is so high that even a very great reduction in the tangent of the lag angle produces a relatively small effect on the operating characteristics. Assume, for example, that at a certain speed the power factor for 25 cycles is 90 per cent; the angle of lag is 26 degs. and its tangent is .483. If the same motor is

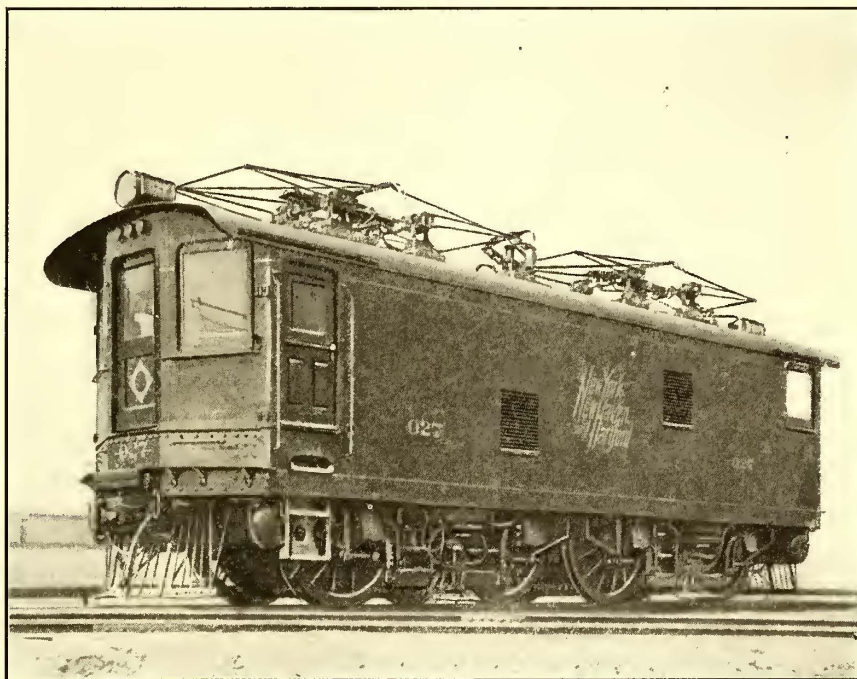


FIG. 2.—NEW HAVEN LOCOMOTIVE WITH PANTOGRAPH TROLLEY LOWERED

operated at the same speed with 15-cycle current, the tangent of the lag angle is .289, the lag angle is 16 degs., and the cosine (the power factor) is .96. Thus, the power factor has been increased by only 6.7 per cent. In any event, whether the motor is operated at 25 cycles or 15 cycles, its power factor will be better than that of a corresponding induction motor.

It will be noted from the facts discussed above that the prime object in compensating the armature magnetomotive force is to improve the power factor, and not to prevent sparking during alternating-current operation (as is frequently stated). At a certain speed and field strength the sparking depends upon the amount of current to be commutated, so that an improvement in the power factor, which results in a reduction in the current required for a certain power at a certain electromotive force does to a limited extent improve the commutation; but the minute reduction in sparking is of secondary consideration. During direct-current operation of the motors the current in the compensating coils prevents a distortion of the field by the armature magnetomotive force, and hence it removes a portion of the cause for sparking at high speeds. To the



extent that the alternating-current motor possesses the disadvantageous sparking characteristics of a direct-current motor, the compensation improves the commutation. Since the sparking in the alternating-current commutator motor is largely attributable to the transfer action of the field flux which is surrounded by the armature coil under the brush, it may be stated that in the prevention of sparking in

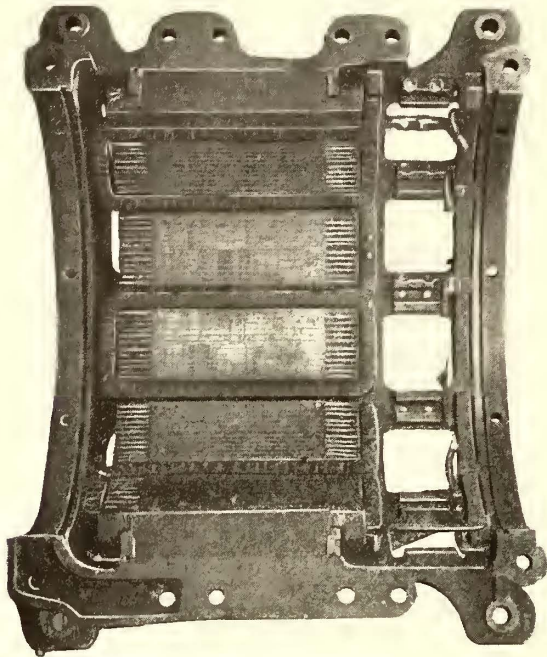


FIG. 3.—HALF OF FIELD FRAME

such motors the compensation of the armature magnetomotive force plays an unimportant part. The means for the prevention of sparking, which are confined to the armature itself, will be discussed below.

#### FIELD FRAME

A view of one-half of the field core structure, with both the compensating and the main field coils in place is given in Fig. 3. It will be noted that there are five complete

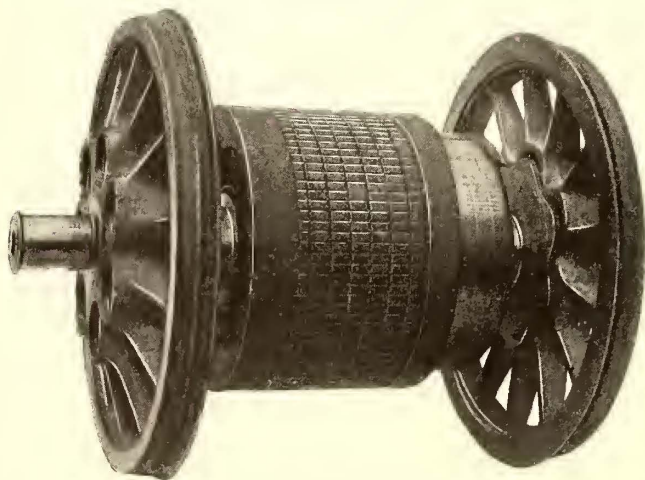


FIG. 2.—ARMATURE ON AXLE

field poles and two half-poles. Thus the field core structure is divided through the middle of two field poles, and not between certain adjacent poles as is done with the ordinary four-pole direct-current railway motor. The object in thus arranging the divisions is attributable to the existence of the compensating coils whose conductors are imbedded in the pole faces and whose end connectors pass between the adjacent poles.

It will be noted that there are twelve slots in each pole face; the conductors in six slots of each pole are joined directly to the conductors in the nearer six slots in the adjacent pole. To have divided the motor between adjacent poles would have necessitated the unsoldering and resoldering of twenty-four connectors in the compensating coil circuits. By dividing through the center of two poles, only a single connector of the compensating winding need be disturbed.

The splitting of the field core structure through the pole face has rendered desirable a slight change in the arrangement of the main field winding in order to minimize the disturbance to this winding when the two halves of the field structure are separated. Only one-half of the projecting pole cores are surrounded by main field coils, the magnetic poles at the other cores being of the "consequent" type. Thus only one connector in the main field circuit is disturbed when the field cores are separated.

Such an arrangement as the one here indicated might prove objectionable if the magnetic density over the pole area reached the saturation point of the core material. The field is magnetically very weak, however, and very little unbalancing of the poles takes place. Even when the field is

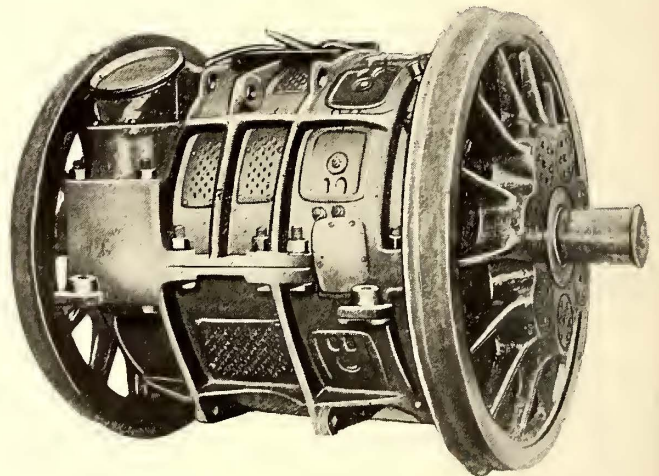


FIG. 5.—COMPLETE MOTOR, SHOWING VENTILATING APERTURES

strengthened for direct-current operation, the unbalancing is in itself of no great consequence. Moreover, the armature winding is connected at various equipotential points to "balancing rings," such as are commonly used in direct-current machinery, and no detrimental effect can be produced by a tendency to considerable unbalance in the magnetic fields.

#### ARMATURE

The most striking feature of the armature, which is shown in place on the locomotive axle in Fig. 4, is its appearance of compactness and stability. It differs from the ordinary direct-current armature in that the main winding is completely closed on itself, and connections to the commutator segments are made through resistance leads. The leads are tapped to the armature winding at the end of each turn, so that there is one armature turn per commutator segment. The object in inserting resistance between the armature coils and the commutator segments and in using only one turn per coil, is to overcome the sparking.

Each armature coil in its mechanical position when its commutator segments are under the brush is electromagnetically in the relation of the secondary circuit of a stationary transformer of which the primary circuit is the main



field coil; there is generated by transformer action in each secondary turn an electromotive force proportional to the product of the main field flux and the frequency. The advantages of using a single turn per armature coil, a weak magnetic field and a low frequency will be noted at once. The electromotive force generated in the single armature turn under the weak magnetic field at 25 cycles is low in value, but in an armature of the ordinary design it would produce a large value of current locally in the circuit including one armature coil, two commutator segments and the double-brush contact. The resistance of the leads, however, serves to limit the short-circuit current to an allowable safe value and to prevent detrimental sparking at the commutator.

As the preventive resistance leads are arranged so as to be non-inductive, the short-circuit current is approximately in time-phase with the transformer electromotive force in the armature coil, or in time-quadrature with the main armature current; moreover, the current in the coil undergoing commutation can be reversed most readily when the circuit of the coil is non-inductive. It will be seen, therefore, that the preventive resistance leads are well adapted to minimize the causes for sparking.

Since the main line current passes through two resistance leads in parallel, it is evident that some loss is occasioned by the presence of the leads. An excess of resistance would cause an enormous loss due to the main current, but would reduce the short-circuit current to an insignificant value; a deficiency of resistance would render the loss due to the main line current negligible, but the short-circuit current loss would be excessive.

The resistance of the leads used on the motors of the

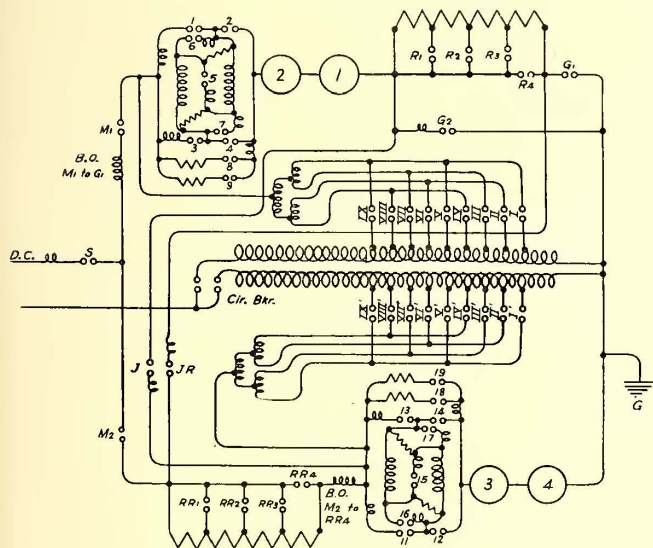


FIG. 6.—SCHEMATIC DIAGRAM OF LOCOMOTIVE CONNECTIONS

New Haven locomotives is so selected that neither the loss due to the short-circuit current nor that occasioned by the main line current is large, while the sum of the two is reduced to a satisfactory minimum.

The resistance leads are covered with insulating material similar to that used on the main armature winding and are placed in slots beneath the armature winding proper.

ARMATURE VENTILATION

Although, as stated above, the armature structure is very compact, ample provision has been made for ventilation and cooling. Experience has shown that the most effective

method of cooling dynamo-electric machinery is to embed the insulated coils snugly and compactly in the mass of iron and then to keep the iron cool. Iron is an excellent thermal conductor, and it serves to extract the heat from the coils through the insulating material more readily than is possible when air is depended upon to draw the heat from the coils. Advantage is taken of the knowledge of this fact in the arrangement of the coils and core of the motor armature. Numerous ducts are provided throughout the armature core structure through which air is forced for cooling the iron to which the heat is conducted from the

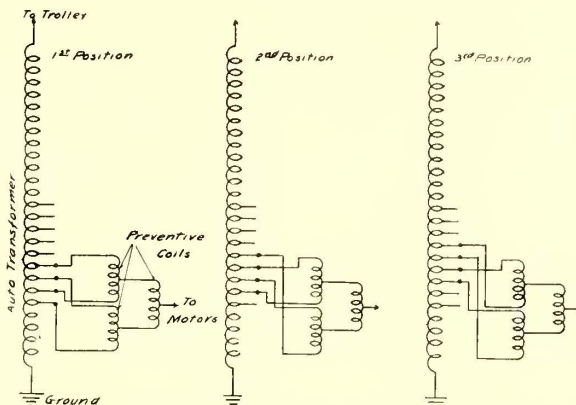


FIG. 7.—METHOD OF CHANGING CONNECTIONS OF AUTO TRANSFORMER

armature coils and the preventive leads. The air also passes through and around the commutator and serves to remove from it both the heat produced there by friction and  $I^2R$  losses and that thermally conducted to it from the resistance leads.

A view of the completed motor, indicating the means employed for cooling, is given in Fig 5. The circular opening at the top is normally connected through a canvass hose to a source of supply of air under a pressure of several ounces per square inch. In entering the motor structure the air is required to pass through a filtering screen and to the openings in the armature spider, from which place it flows outward around the commutator and through the ventilating ducts of the armature and along the air gap to the openings to the outer atmosphere, shown as perforations in sheet metal plates on the field core in Fig. 5. The forced-draft method of cooling has proved extremely effective. To guard against the remote possibility of clogging of the air ducts or some enforced stoppage, an electrical pyrometer with its thermo-elements in the motor structure and its indicating mechanism in the locomotive cab is used for showing continuously the temperature within the motor. By means of the pyrometer the motor-man can ascertain when the service is too severe for the equipment or when the supply of air has been interrupted.

CONTROLLER CIRCUITS

A schematic diagram of the motor-control circuits for both direct-current and alternating-current operation is given in Fig. 6. It will be noted that the armatures of the four motors are arranged in two groups, the two armatures of each group being connected permanently in series and controlled as a unit. During direct-current acceleration the motor units are connected in series and then in parallel, while during alternating-current operation each motor unit receives power at variable voltage from a separate auto-transformer.



Although not indicated on the diagram, the various switches are so inter-locked that the circuits used exclusively for alternating current cannot become active during direct-current working, and those intended solely for use during direct-current operation are inactive when alternating current is used. It is sufficient for present purposes, therefore, to discuss the direct-current and the alternating-current circuits separately, without any relation to each other.

#### DIRECT-CURRENT CONTROL CIRCUITS

During direct-current operation, switches 3, 2 or 1, 4 according to direction of operation of one motor

creasing the speed by weakening the magnetic fields. The motors being of the compensated type permit of an enormous weakening of the fields at the commutators. The fields are further weakened by the simultaneous closing of switches 9 and 19, and the speed becomes accelerated to considerably more than one-half of the normal running value.

The next movement of the controller handle opens switches 8, 9, 18 and 19 (thereby increasing the strength of the fields); closes switch J; opens switch JR, and closes switches  $G_1$  and  $M_2$ , thus subjecting each motor unit in series with four resistance sections to the full value of the supply potential. It will be noted that the transfer from

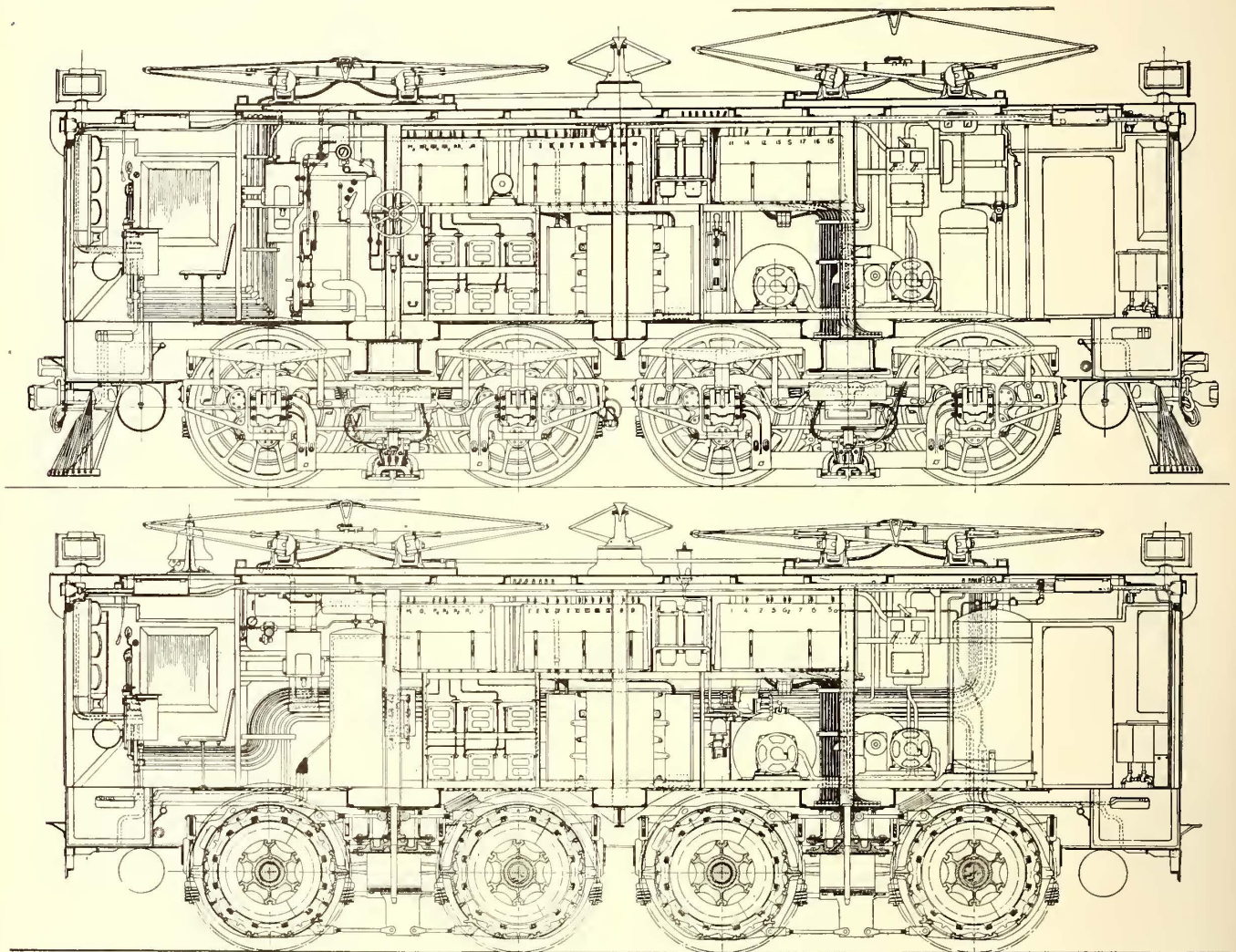


FIG. 8.—LONGITUDINAL SECTIONS OF LOCOMOTIVE 1 THROUGH CENTER AISLE, RIGHT AND LEFT VIEWS

unit, and switches 12, 13 or 11, 14 according to direction of operation of the other motor unit are kept closed so that the main field circuits of each motor unit are connected at all times in series with the respective armatures. At the moment of starting, switches S, M and JR are closed, thus connecting the two complete motor units in series with each other and with eight sections of resistance. As the speed increases, switches  $R_1$ ,  $R_2$ ,  $R_3$  and  $R_4$  of one motor unit, and switches  $RR_1$ ,  $RR_2$ ,  $RR_3$  and  $RR_4$  of the other unit are closed in succession, thereby increasing the voltage impressed on each motor unit until the two units are in series across the line without resistance. Switch 8 of one unit and switch 18 of the other are then closed simultaneously, thus placing a resistance in shunt to the field windings and thereby in-

full series to multiple connection is accomplished without opening any motor circuit, and without short-circuiting either motor unit. Higher speed points are obtained by closing switches  $R_1$ ,  $R_2$ ,  $R_3$  and  $R_4$ , and switches  $RR_1$ ,  $RR_2$ ,  $RR_3$  and  $RR_4$  in pairs successively until the full multiple position of the controller is reached.

#### ALTERNATING-CURRENT CONTROL CIRCUITS

During alternating-current acceleration no resistance whatsoever is used, the speed changes being obtained by impressing variable voltages obtained from auto-transformers directly upon the terminals of the motor units. There are two electrically and mechanically distinct auto-transformers, one for each motor unit. Referring again to Fig. 6, it is to be noted that when alternating current is



used the main line high-tension circuit breaker and switches 6, 7 and 1, 4 or 3, 2 according to direction of motion of one motor unit, and switches 16, 17 and 11, 14, or 12, 13 according to direction of motion of the other motor unit are closed during operation. It will be seen, therefore, that the main field circuits of the two motors of each motor unit are placed in parallel; thus the field magnetism per armature ampere is less during alternating-current operation than during direct-current operation (neglecting the fact that at times the field circuits are shunted for extra acceleration with direct current).

There are six running points with alternating current, each corresponding to a certain voltage impressed upon the motor circuits. For changing from one voltage point to another on each auto-transformer, use is made of three small so-called "preventive coils." These preventive coils are essentially auto-transformers, having a ratio of 2 to 1. It will be observed that the motor unit receives current from the middle connection of one preventive coil whose outer terminals are joined to the middle points of the two other preventive coils; the outer terminals of the latter preventive coils are connected to certain taps on the main auto-transformer. In shifting from one running point to another, the lower tap (No. I.) would be opened and connection would be made at a tap four points higher (No. V.). The successive changes are clearly shown in Fig. 7. There are a total of six running points with alternating current; at no time is the motor circuit opened or a transformer winding short-circuited. The current fluctuations are well limited and the acceleration is extremely smooth.

ARRANGEMENT OF APPARATUS ON THE LOCOMOTIVE

The various switches indicated in Fig. 6, and all of the switches in the circuits of the propelling motors, and of the

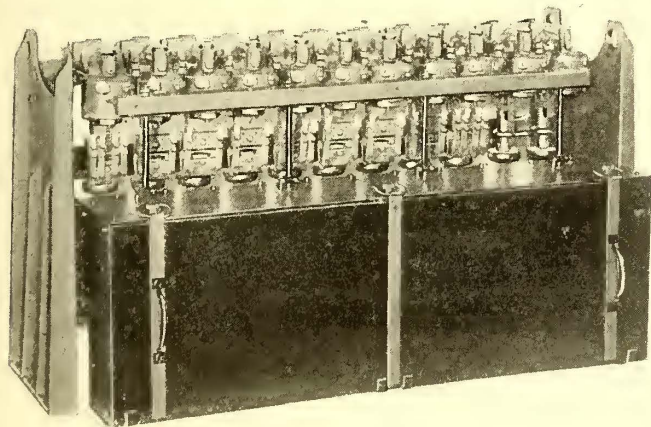


FIG. 9.—ELECTRO-PNEUMATIC SWITCH GROUP WITH INTERLOCKING CONNECTIONS

auxiliary equipment are operated by air under a pressure of 80 lbs. per sq. in., the supply of which to the switch valves is controlled by electromagnets which receive current from a 20-volt storage battery. The switches are arranged in groups that are conveniently located along each side of the center aisle of the locomotive. The groups on one side belong to one motor unit, and those on the other side to the other unit. Moreover, the main auto-transformer, the three preventive coils, and the four resistance units for each motor unit are placed on the side of the locomotive devoted to that particular unit. There are two independent sets of storage batteries, each consisting of ten cells, rated at 40-amp. hours. The batteries are charged by an induction motor-driven direct-current generator.

Fig. 8 is a reproduction of the inset published last week,

except that the key numbers have been omitted for the sake of making clearer the general apparatus in the interior of the locomotive. It shows two longitudinal sections through the center aisle with the apparatus on each side. This view indicates that, with the exception of such devices as are not in duplicate, the equipment on each locomotive is so placed that an interior view is the same from one end or side of the locomotive as from the other. Thus the weight is uniformly distributed over the drivers.

UNIT SWITCH GROUPS

A unit-switch group is shown in Fig. 9. Each unit switch, of which there are eleven in the group illustrated, is of the electropneumatic type, with which our readers are

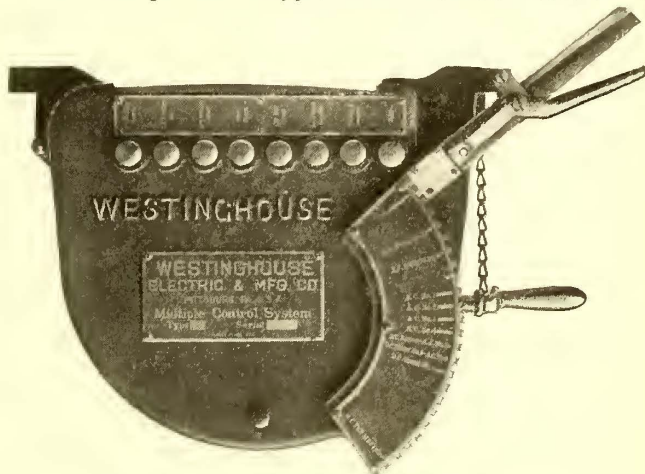


FIG. 10.—TOP VIEW OF MASTER CONTROLLER

familiar. An interesting feature is found in the means employed for "interlocking." The switches are interlocked electrically in such a manner that when one switch is closed the circuits to the electromagnets of the other switches which should not be operated are either held open or kept closed, as the case may require, by means of contacts controlled by the piston of the switch valve. These contacts are shown in Fig. 9. All of the motor circuits and switch wires are run in metal conduit along the lower portion of the locomotive, while all of the low-potential battery control circuits are arranged in metal conduit along the roof of the locomotive.

As intimated above, only the wires of the battery and electromagnet circuits pass into the controllers. These same wires are run overhead from each end of the locomotive, where they terminate in three contact plugs, taps being taken to each controller and to each unit switch along the route as desired. Thus the locomotive may be operated from either end, and two or more locomotives may be electrically interconnected through "jumpers" and controlled from a single point.

Fig. 10 gives a top view of a master controller, of which there are two on each locomotive. The controller is of the drum type, the drum shaft being revolvable by means of a handle closely resembling the throttle lever of a steam locomotive. The reverse lever, which is detachable, is mechanically interlocked with the operating lever of the controller, so that all control circuits must be dead before the reverse lever is thrown from one position to another, and the main lever cannot be moved when the reverse lever is in the neutral position. The row of knobs seen along the rear of the top of the controller are push buttons for performing certain duties not associated with the main controller lever or reverse handle, such as pulling the alternating-current trol-



leys down, pushing the direct-current trolley up, releasing the latches which hold the alternating-current trolley and the third-rail shoes down, pushing the third-rail shoes down, resetting the main line circuit breakers operating the front and rear track sanders and ringing the bell. All of the above mentioned duties are actually performed by com-

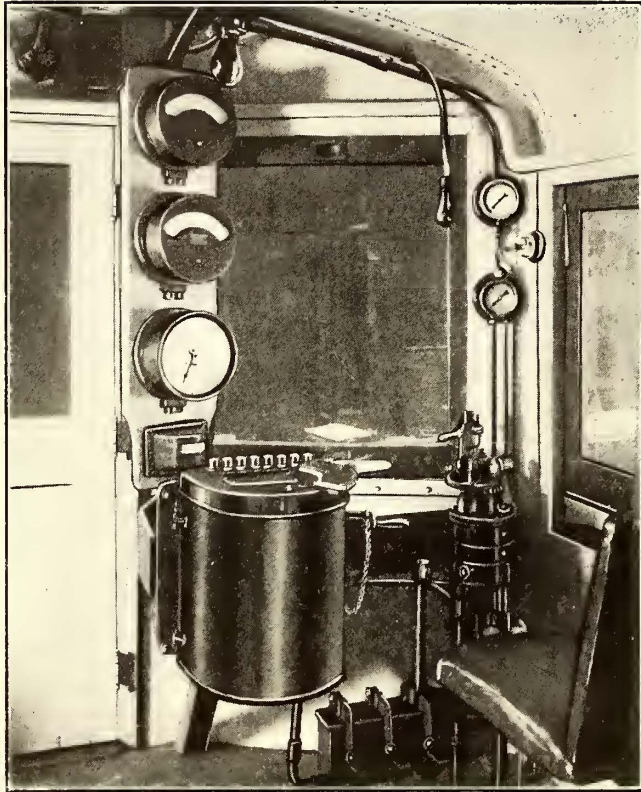


FIG. 11.—INTERIOR OF MOTORMAN'S CAB

pressed air, the eight push buttons serving merely to complete the circuit from the storage battery to the proper air-valve magnets.

A front view of the master controller in place in the motorman's corner of the locomotive is given in Fig. 11. For the convenience of the motorman, the electromagnets for operating the bell and the front and rear track sanders can be controlled by three pedals in addition to three push buttons. The motorman has an unobstructed view of air-pressure gages, a speed indicator, a direct-current ammeter, an alternating-current ammeter and an electrical pyrometer. The pyrometer, which indicates the temperature of the propelling motors, has been described. The speed indicator is an instrument which registers the voltage produced by a magneto-generator driven by one of the locomotive wheels; it is calibrated to show the locomotive speed in miles per hour. For the purpose of preventing the condensation of moisture on the under side of the steel roof of the locomotive the surface is covered with ground cork, which is then given a coat of white paint.

#### CURRENT COLLECTORS

Fig. 1 is an exterior view of a locomotive with the alternating-current pantograph trolleys in contact with the wire and the third-rail shoes drawn up, while Fig. 2 shows the same locomotive with the trolleys hooked down, and the third-rail shoes in the operative position. The small trolley over the center of the locomotive is connected to the circuits of the third-rail shoes and is intended for use only in case the locomotive should come to rest at some

point where the third rail had been omitted and an overhead conductor had been substituted therefor. The contact bows of the large trolley, which are made of galvanized steel, are 4 ft. in length. Each bow is given an upward curvature at the center and is provided throughout its whole length with a single trough for containing the lubricating material which consists of a mixture of graphite and grease.

The design of the third-rail shoe mechanism represents a solution of a number of difficult problems. The shoes must be held by spring pressure downward against an over-running rail, or by spring pressure upward against an under-running rail. They must be lifted so as to clear any ordinary obstruction along the track when a third rail is not used. The shoes are hinged from a framework, which, in turn, is hinged from the base plate of the device. The shoe framework may be thrown outward in a horizontal plane, or drawn upward to an angle of about 45 degs. from the horizontal by means of a toggle-joint mechanism, which is operated electropneumatically. When the framework is in the horizontal position, each shoe is held in place by means of a spring, which resists motion in either the upward or the downward direction. The valve-control circuits of the magnets for the shoe mechanism are electrically "interlocked" with those of the alternating-current trolleys, so that when the trolleys are up, the shoes are up also, and when the shoes are let down, the trolleys come down also; the trolleys can, however, be pulled down while the shoes are up. It is noteworthy in this connection that the "interlocking" is not depended upon for safety to the motor equipment and control circuits. As a matter of fact, it is a physical impossibility for direct current to reach the motors from the third rail while alternating current exists in the auto-transformers, because the "throw-over switch" either connects the motor circuit directly to the third rail and disconnects them from the high-tension circuits, or it

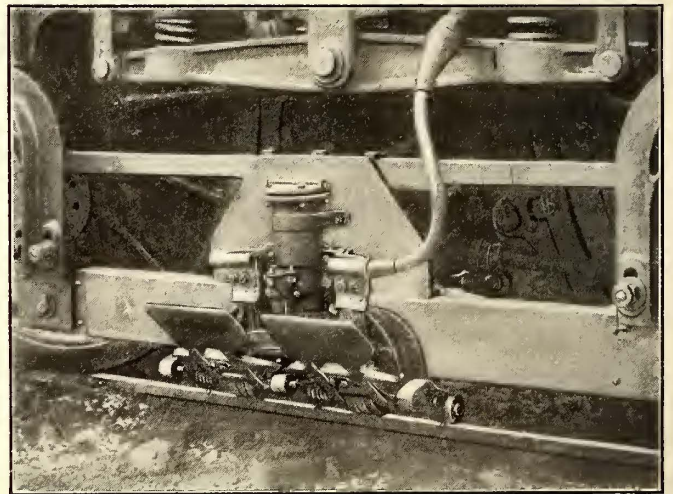


FIG. 12.—THIRD-RAIL SHOES WITH PNEUMATIC CONTROLLING CYLINDER

joins the motor circuits to the auto-transformers and thoroughly isolates them from the third-rail shoes.

#### PERFORMANCE OF LOCOMOTIVES

Although the locomotives have only recently been placed in actual continuous service on the New Haven Railroad, they have been subjected to a long series of tests duplicating actual service conditions. The track upon which the tests were made is equipped both with a third rail for the supply of direct current at 600 volts, and with an overhead catenary



trolley wire for alternating current at 11,000 volts. The track is 2.2 miles in length, and contains several curves and slight grades. During a recent series of tests a locomotive was required to make a scheduled speed of 26 m. p. h. with 45-second stops at each end, the maximum speed reaching

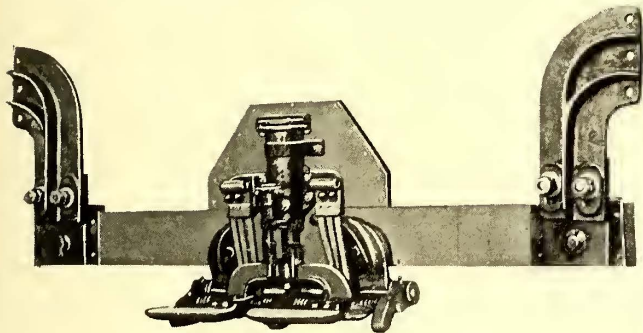


FIG. 13.—THIRD-RAIL SHOES LOWERED

45 m. p. h.; the total weight of train and locomotive being 294 tons. Watt-hour meter placed in the supply leads read at 3-hour intervals showed that during direct-current operation the consumption was 44 watt-hours per ton-mile, and that the consumption for alternating current working was 42.5 watt-hours per ton-mile. The values given represent the total energy received by the locomotive, including all losses in the control apparatus. Although the running efficiency was undoubtedly somewhat less for alternating than for direct current, the rheostatic losses during acceleration

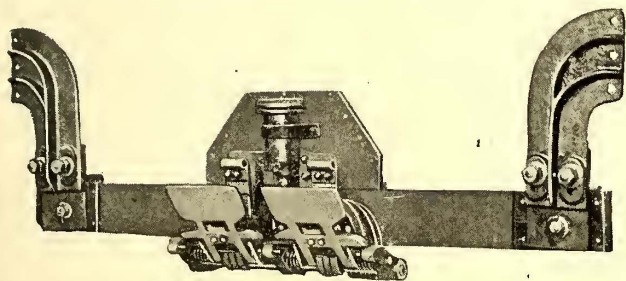


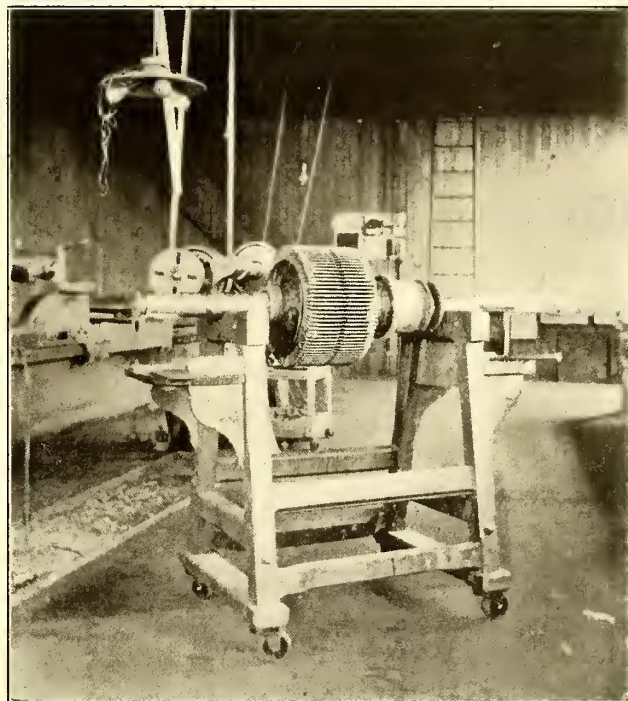
FIG. 14.—THIRD-RAIL SHOES RAISED

with direct current were much greater than the transformer losses during alternating-current acceleration, and hence the locomotive was operated more efficiently with alternating than with direct current. It is evident, however, that for longer hauls with less frequent stops, the advantage with respect to the efficiency of the locomotive as a unit would be with the direct-current working.

The Montreal Street Railway Company recently furnished seventy cars to transport some 50,000 children of Montreal free. Up to date there have been 182 cars given, and about 15,000 children have taken part in the outing. The program arranged for one week follows: Monday, 9 a. m.—Fairmount Presbyterian Sunday school, Papineau Avenue and Masson Street. Monday, 9 a. m.—St. Cunegonde Asylum, St. James and Atwater Avenue. Monday, 9 a. m.—Welcome Hall Mission, corner of Mountain and St. Antoine Streets. Tuesday, 9:50 a. m.—Berri Street Protestant school, St. Zotique and St. Denis Streets. Tuesday, 10 a. m.—Boulevard Protestant school, Beinvillie and St. Denis Streets. Wednesday, 9 a. m.—St. Elizabeth Church, corner of St. James Street and St. Elizabeth du Portugal Avenue. Thursday, 9 a. m.—All Saints Church, Marie Anne and St. Denis Streets.

### ARMATURE CRADLE USED AT THE ST. JOHN STREET SHOPS OF THE PORTLAND RAILROAD COMPANY

A convenient armature cradle, illustrated herewith, is in use at the St. John Street shops of the Portland (Maine) Railroad Company. The cradle is used chiefly in the waiting room and serves to hold the work in place as well as to enable it to be moved easily about the room. It consists of an oak frame supported on four ball-bearing rollers, with recesses at the top of each pair of posts for the shaft of the armature and two shelves for holding tools and supplies. The center of the armature shaft is brought 36 ins. above the floor when the device is in use. An angle-iron strap bolted to the inside of the left-hand pair of posts enables the cradle to be used for GE-800, 1000, 67 and 57 armatures, and Westing-



ARMATURE CRADLE USED IN PORTLAND, MAINE

house 68's. Different sizes of straps are used with the different armatures.

The frame is  $31\frac{3}{4}$  ins. long, parallel to the shaft and between posts at the top, 18 ins. wide at the top, and  $26\frac{1}{2}$  ins. wide at the bottom. Each shelf is 9 ins. x 16 ins. in dimensions, and is braced by a pair of brackets. Fiber and mica are kept on one shelf, and hammer, knife and wedges on the other. The principal members of the frame are  $2\frac{1}{2}$  ins. thick. The side posts are stiffened by  $\frac{3}{8}$  in. log bolts about 8 ins. long, and the upper longitudinal pieces are supplemented lengthwise by a  $\frac{3}{8}$  in. bolt about 27 ins. long. The lower longitudinal piece is offset 2 ins. to enable the workman to stand closer to the armature, and it would be an advantage if the top longitudinal pieces on each side were offset in the same way.

With this device the armature can be moved about the floor without the slightest difficulty, and the cradle can be taken downstairs to the machine shop on the elevator if desired. Armatures are ordinarily placed on the cradle, however, by small hoists, and the work is then moved to the corner of the winding room where the desired conditions of light and convenience obtain.



## IMPROVED INTERURBAN TRAIN TESTING APPARATUS

BY SYDNEY W. ASHE

In the article published in the *STREET RAILWAY JOURNAL* on Sept. 8, 1906, the writer described a train testing set which had been built under his directions. This apparatus was simple in construction and could be mounted in about an hour upon a car, whether trolley or high-speed inter-

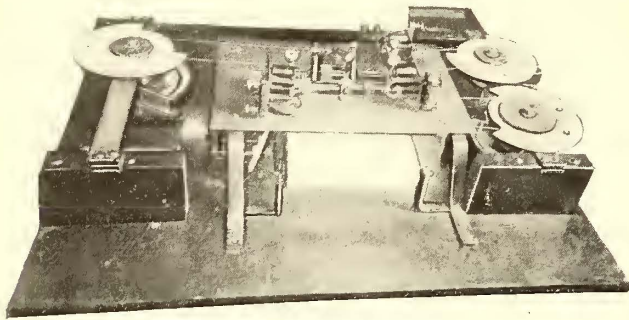


FIG. 1.—IMPROVED RECORDER

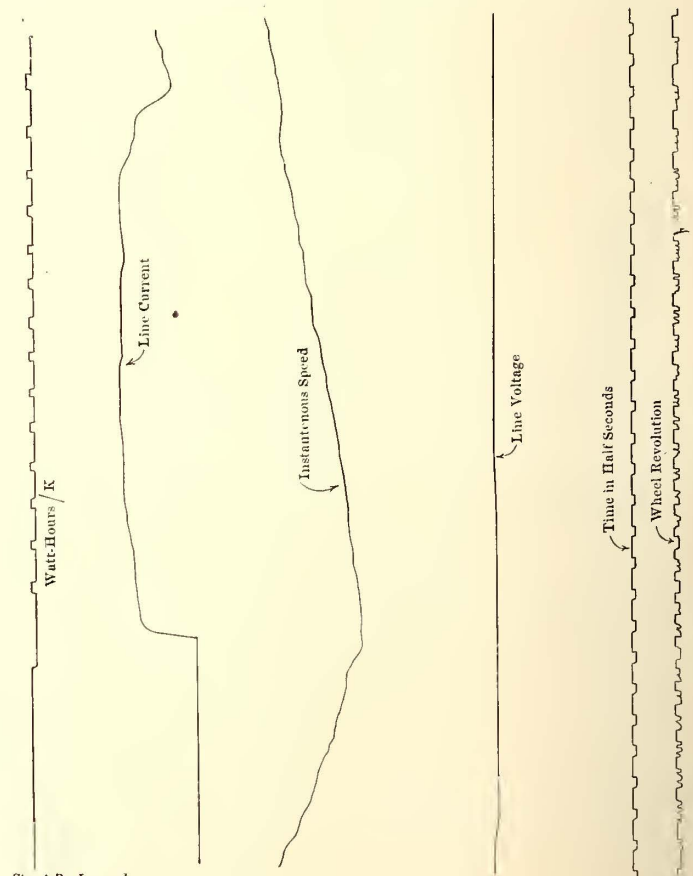
urban, and would indicate values of instantaneous speed, line current, line voltage, time in half seconds and wheel revolutions. In a later article under the title "How to Analyze Train Tests," published in the *STREET RAILWAY JOURNAL* of Dec. 1, 1907, the writer described the method of analyzing the results of a series of tests with this instrument. In working up the results of these tests the writer realized that there were several ways in which this train testing set could be improved, so as to yield greater accuracy and simplify the method of making up results. Some idea of the great improvement in this apparatus may be gained when it is realized that results which were previously obtained in a period of one week were recently obtained in a period of one hour. The changes made in this instrument were brought about through the efforts of G. W. Westcott and R. H. Mitchel, of the Brooklyn Polytechnic, whose thesis covered this work.

### IMPROVEMENTS IN APPARATUS

The first change in the apparatus consisted in substituting for the recording pencils stylographic pens (Fig. 1), and using for the record sheet transparent paper. The object of doing this was to facilitate the making of blue prints of entire record sheets, so that when tests were made copies of complete record sheets could be included when submitting a report. Several types of paper were tried and it was found in many cases that the grain of the paper would blue print also; finally a clear grain white transparent paper was secured which was very satisfactory. The paper had to possess sufficient toughness to prevent the hues from penetrating as the record sheet passed through the machine. Having solved the paper problem, the question of obtaining a speed time curve whose ordinate would have a maximum range of  $2\frac{1}{2}$  ins. was next considered. In connection with a magneto speed tachometer supplied by the Weston Instrument Company was a low-range voltmeter whose maximum scale reading was 0.3 volt. Placing in series with this instrument 4300 ohms gave a range of 1 in. of paper for a speed of 11.895 m. p. h. when the magneto was belted directly to a car axle of  $4\frac{3}{4}$  in., the diameter of the car wheel being 33 ins. The sector controlling the relative movement of the instrument pointer and the pen carrier had to be enlarged to give this range. With this adjustment a

very satisfactory speed time curve was produced, as is illustrated in Fig. 2.

To determine the energy consumption for an individual run with the previous apparatus, it was necessary to multiply the values of the ordinates of current and voltage, obtain values of watts, plot a curve of watt-hours, and then integrate this curve with a planimeter to obtain the watt-hour consumption. This involved considerable labor, to simplify which the following method was tried with success: A contact device in the form of a two-part commutator was mounted upon the spindle of a recording wattmeter, Fig. 3. The segments or bars of the commutator were grounded to the spindle of the meter, which then had the same potential as the case of the instrument. Several forms of brushes were tried for contact against the commutator, but their friction proved too great, affecting too much the accuracy of the meter. Finally a brush was taken from an old Thomson recording wattmeter, mounted and tried. It proved very satisfactory, changing the constant of the meter from 40.00 to 46.8. An additional relay was then mounted on the recording instrument, as shown at the left in Fig. 1. A small storage battery was placed in series with the relay, the case of the wattmeter and the



Street Ry. Journal

FIG. 2.—PART OF RECORD SHEET

brush playing on the commutator of the meter. With each revolution of the wattmeter armature the circuit was closed twice through the relay, which, becoming energized, moved the recording pen, producing a serrated line, as shown in the record sheet, Fig. 2. The details of the meter connections are evident from Fig. 4, where the device is shown assembled.

Considering Fig. 4, it will be noticed that the small commutator is mounted over the disc of the meter in the bottom of the case. From the curve sheet, Fig. 2, it is obvious



that the markings of energy consumption are opposite in formation from those of the wheel revolutions, being many at the start, then becoming fewer. It is recommended that,

was found desirable to use a mercury type of meter with floating disc. This type of meter is very satisfactory for railway work, as there are no jewels to puncture; but

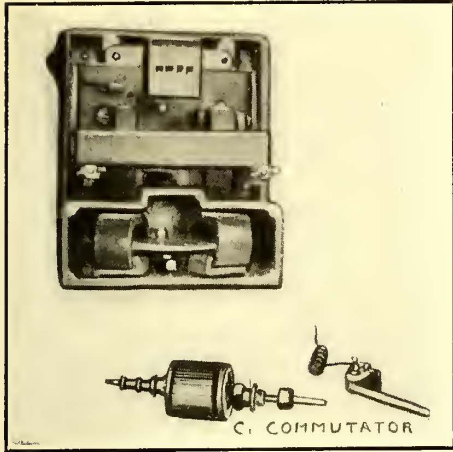
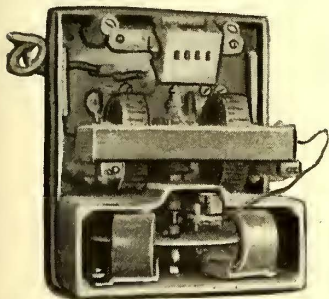


FIG. 3.—SHOWING COMMUTATOR ON CONTACT DEVICE

FIG. 6.—TYPE OF FOUR-MOTOR CAR TESTED

if this method should be tried by any of the readers, a high torque meter should be used, the Thomson recording meter being preferable, and that a four-part commutator instead of a two-part commutator be used; also that as low a range meter as will meet the conditions be employed. A 100-amp. meter is amply sufficient for trolley operation where the horse-power capacity of the motors is 140 per car. Furthermore, it is desirable that no iron should be present in the meter, as the constant changes too widely. Fortunately, with the tests made by the writer upon trolley cars, the variations in current, except where the rates of accelera-

tion were high, varied between 110 and 120 amps., through which range the meter used changed its constant inappreciably.



tion were high, varied between 110 and 120 amps., through which range the meter used changed its constant inappreciably. In taking readings of the total energy consumption, it

unfortunately it is not a high-torque meter, and cannot be used in connection with a contact device.

In the tests made, the Thomson recording wattmeter was mounted upon a spring-supported board to lessen the vibration. A modified form of contact maker was also used in these tests. It consisted of placing a sheet of fiber 1/16 in. in thickness and 4 ins. in length one-half way round the motor axle, and fastening it there with copper wire. A flat spring brush, as shown in Fig. 5, was then allowed to press against the axle, making contact for each revolution. The brush was mounted upon a piece of wood which could be quickly fitted into a ring on the motor frame, as shown in the figure. Leads were brought up from the contact brush and connected in series with a battery, the wheel revolutions relay and the grounded car body.

FIG. 4.—METER ASSEMBLED

OBJECT OF TESTS

The object of the tests, performed through the courtesy of J. F. Calderwood, of the Brooklyn Rapid Transit Com-

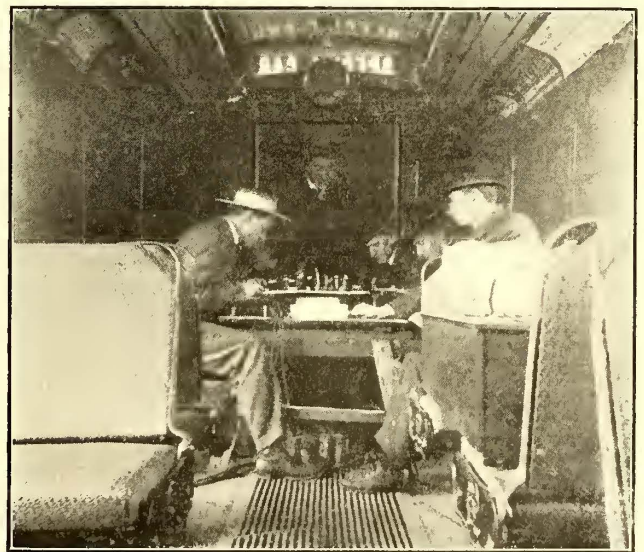
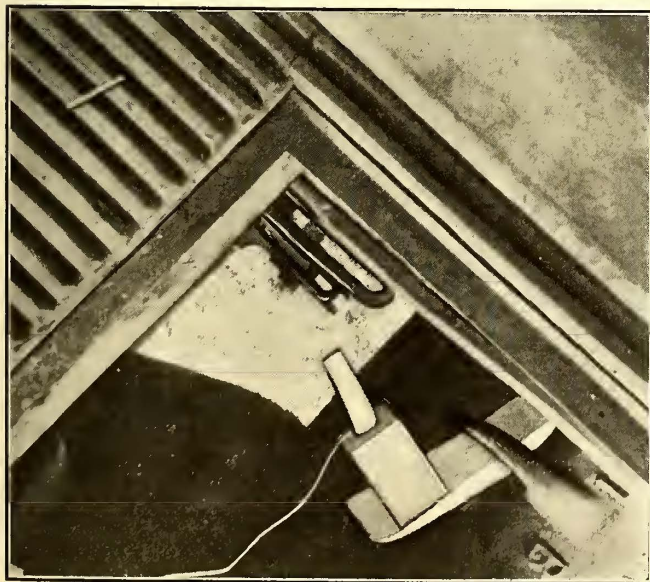


FIG. 5.—CONTACT MAKER PRESSING AGAINST MOTOR AXLE

FIG. 7.—RECORDER MOUNTED DURING TEST

pany, was to obtain a series of values of energy consumption for trolley cars, as operated under various conditions of initial acceleration, various schedules and various rates of braking. To obtain values which were comparative, the

pany, was to obtain a series of values of energy consumption for trolley cars, as operated under various conditions of initial acceleration, various schedules and various rates of braking. To obtain values which were comparative, the



same motorman and the same conductor was used in every case. The rate of notching up of the controller and the distances to be run were controlled by the same man. Cars were selected of the latest type of four-motor equipment, as shown in Fig. 6. The testing apparatus was mounted in the front of the car, as shown in Fig. 7, and the records of current, voltage, wheel revolutions, revolutions of watt-meter disc, time and instantaneous speed were obtained as



FIG. 8.—THE LAST TEST, DR. ATKINSON, PRESIDENT OF POLYTECHNIC INSTITUTE, IN THE FOREGROUND

shown in the record sheet, Fig. 2. The Weston magneto tachometer used for speed values proved very convenient, particularly as it could be mounted in a very small space. The idea of employing it for this purpose was evolved by the writer last year. It proved equally successful this year. Fig. 8 is an interior view of one of the cars tested, Dr. Atkinson, of the Polytechnic, being seen in the foreground.

### BOMBAY TRAMWAY REPORT

The report of the Bombay Electric Supply & Tramways Company for the year ended Dec. 31, states that the capital expenditure amounted to £1,229,349, and includes the payment of the balance of the purchase price of all the property, works, and other assets acquired under the agreement of July 3, 1905. The gross receipts amounted to £102,192; after deducting expenses chargeable to revenue, including repairs and maintenance, there remains £41,900. Interest on loans and debenture interest absorbs £28,056; the balance of £13,843 added to the amount brought forward, leaves a total available of £17,006. The dividend on the 6 per cent preference shares requires £15,642, and £1363 is carried forward.

The reinforced concrete power house which the Stone & Webster Engineering Corporation, of Boston, has been building at Georgetown for the Seattle Electric Company is completed; but, as is frequently the case, additional equipment was ordered before the completion of the building and foundations are being prepared for an 8000-kw turbine. A Weber reinforced concrete stack has also been contracted for. The car houses at North Seattle and the Georgetown shops are now practically completed. Foundations for two reinforced concrete sub-stations are now in, and it is expected they will be completed by Nov. 1.

### EFFECTIVE PARK ADVERTISING IN THE TWIN CITIES

Previous articles in the STREET RAILWAY JOURNAL have described the beautiful lake district which the Twin City Rapid Transit Company has made accessible at low fares to the people of St. Paul and Minneapolis. To foster the growth of this traffic the company created the position of general passenger agent with the appointment of A. W. Warnock. The latter immediately began a strong advertising campaign, and through posters, color folders, picture post cards, view stamps and other methods has kept the many-sided attractions of the lake district well to the fore. More recently a leaf has been taken from the book of those

# HI JINKS

THE PICNIC PERSON

## And His Adventures at Big Island Park.

Hi Jinks—The Picnic Person—  
Went out The Great White Way,  
Equipped with bait, rod, reel and line,  
To spend a holiday.  
The first fish pulled like blazes,  
Hi thought he had a shark,  
He got a dandy string of bass  
Around **BIG ISLAND PARK.**



Hi Jinks—The Picnic Person,  
He chortled loud in glee.  
To see his twisted visage  
In the laughing gallery.  
With a body like a porpoise,  
And features like a shark,  
He said: "Sure there are wonders  
Worked at **BIG ISLAND PARK.**"

Hi Jinks—The Picnic Person—  
Drew all his friends about;  
The old and young, the short and tall,  
The slender and the stout:  
And thus said Hi: "If you would  
have  
A most uproarious lark,  
Join me; we'll hit The Great White  
Way,  
Out to **BIG ISLAND PARK.**"



SPECIMEN POSES OF AND VERSES ABOUT HIGH JINKS,  
THE TWIN CITY PLEASURE RIDER

advertisers who praise their wares through the medium of a fictitious personage about whom all sorts of appropriate jingles are written. The Twin City Rapid Transit Company in adapting this idea to its own wants has created a genial fun-seeking character named Hi Jinks, the Picnic Person. Mr. Jinks' specialty is to appear on car posters in a different suit of sporting clothing every week with suggestions as to where to go for a good time via Twin City car and boat lines. His picture has been printed in colors on window cards 24¼ ins. x 13¾ ins. and also in black and white in the newspapers. The accompanying illustration, including some of the verses, will give some idea of this jolly tourist, but unfortunately the colors of his variegated clothing must be omitted.

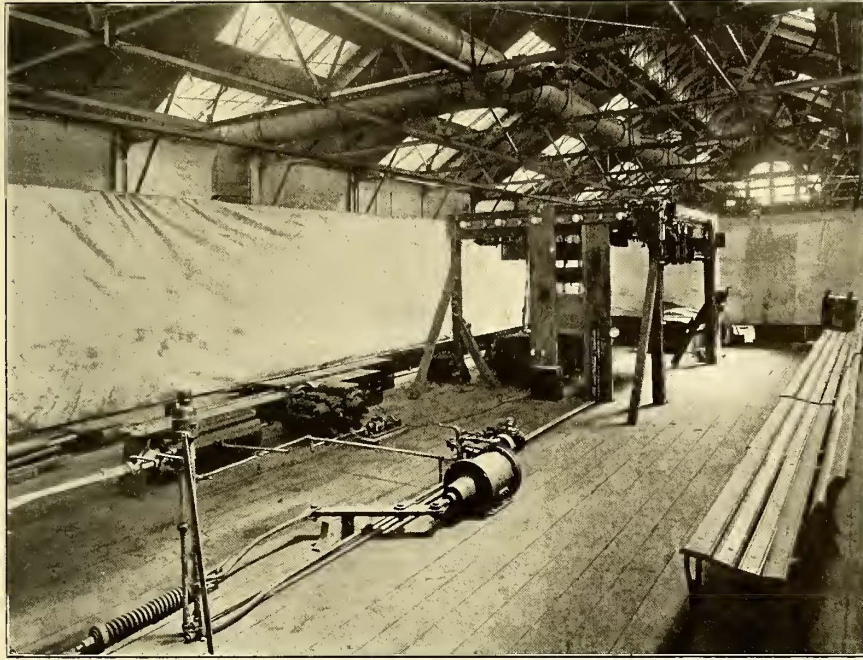
Hi Jinks appears to have proved a real hit with the company's patrons, for all classes have been sending verses about him and suggesting other pleasure trips. So he may yet become a Father Knickerbocker or Sunny Jim in pleasure traffic advertising.



### INSTRUCTION OF MOTORMEN AND SHOPMEN IN BALTIMORE

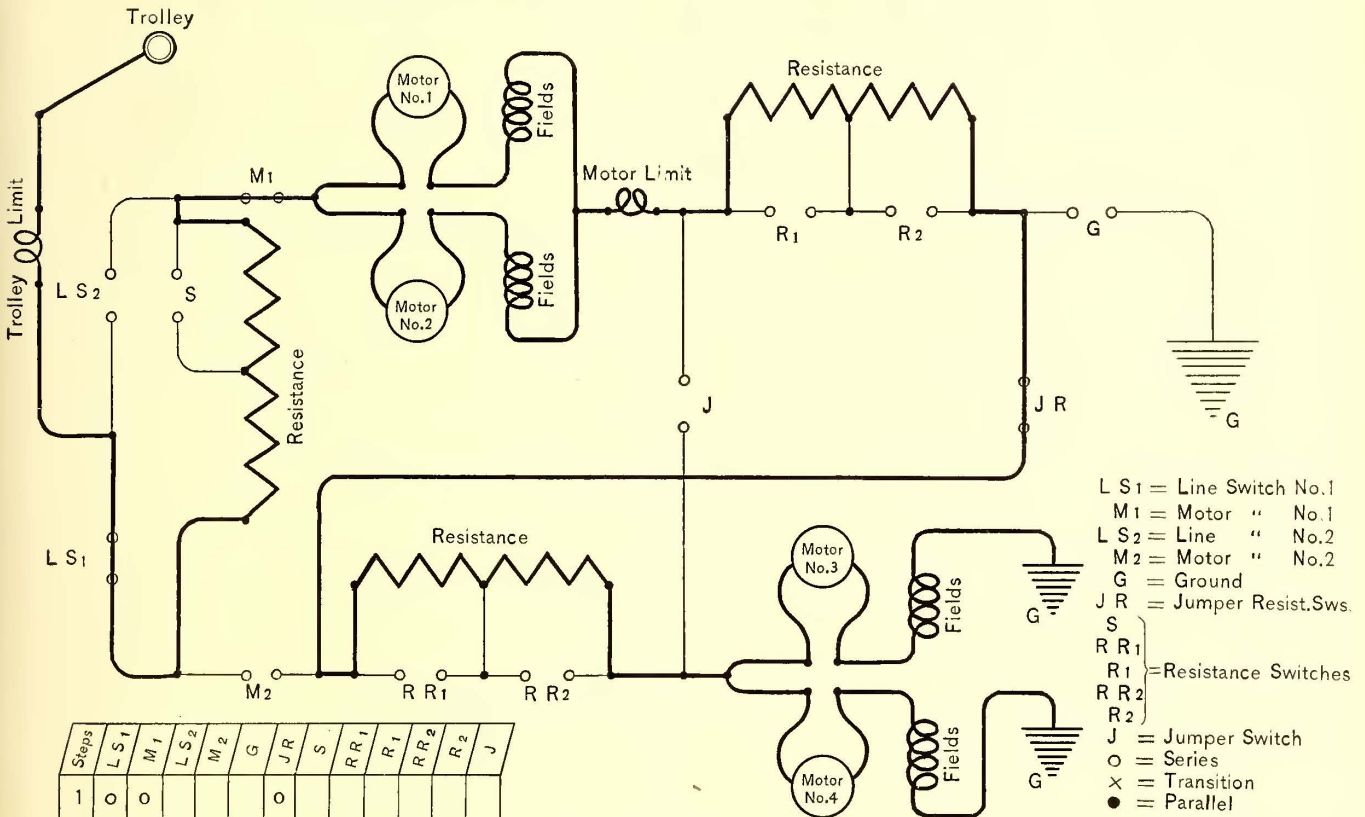
When one considers that the usual applicant for the position of motorman is innocent of the slightest technical

its workings with less effort. Recognizing these truths, the management of the United Railways & Electric Company, of Baltimore, when it decided to equip a large number of surface cars with Westinghouse unit switch group control, determined that all employees who were to come in contact with the more complicated equipment should be thoroughly schooled as to its leading features. The matter was taken in hand and a portion of the Carroll Park shops was set aside for a lecture room. Then a platform was erected upon which were placed a master controller, line switches, switch group, resistance, etc., together with a number of lamps for charging the batteries. Four old G. E. 800 motors were also secured to complete the equipment. H. H. Adams, superintendent of shops, then prepared a sheet showing the usual multiple connections and a sectional drawing illustrating the electro-pneumatic operation of the contactors. Both of these drawings were made on a large scale so the attendant at the lectures could readily follow the instructor.



SECTION SET ASIDE IN THE CARROLL PARK SHOPS FOR MOTOR UNIT AND AIR-BRAKE INSTRUCTION

In addition to the foregoing, Mr. Adams prepared a set of blue prints showing the exact course of the current at every step in a four-motor equipment using the Westinghouse multiple unit



COMPLETE DIAGRAM AND KEY OF FIRST STEP IN THE OPERATION OF THE UNIT SWITCH GROUP CONTROL, THE HEAVY BLACK LINE INDICATING THE COURSE OF THE CURRENT

knowledge, attempts to instruct him along the line of correcting electric troubles will fail unless the facts are presented in the simplest possible manner. The shop employee also, though acquainted in a practical way with car apparatus, will appreciate anything that makes him understand

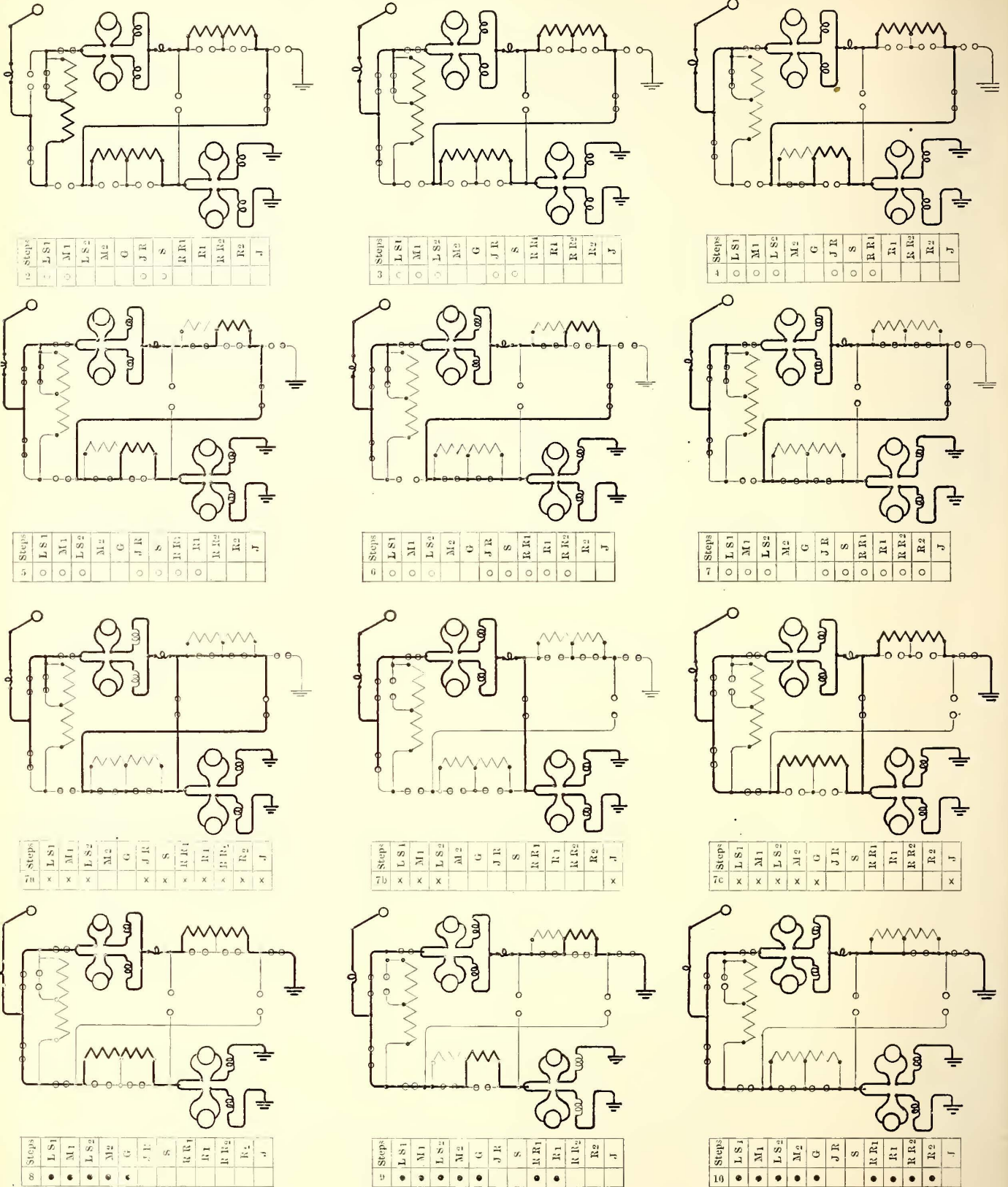
control. This he accomplished by taking the full set of thirteen prints and drawing a red line over the "live" portion of each diagram. This scheme has greatly simplified what is usually a very complicated subject and has done much to enable the men to understand the be-



havior of their equipment. The prints are made on linen for the sake of permanence, because they are so frequently handled. As they have been so valuable to the motormen

but it will be understood that the symbols indicated in step one apply throughout the series.

Instruction is also given in the use of the air brakes em-



Street Ry. Journal

DIAGRAMS SHOWING THE SUCCESSIVE CHANGES IN THE COURSE OF CURRENT FOR THE REMAINING STEPS IN THE UNIT SWITCH GROUP CONTROL

and shopmen in Baltimore, it is believed that the accompanying reproductions will be found worthy of attention. The red lines, of course, have been replaced by heavy black ones to indicate the course of the current. Only the first step is shown complete with all the explanatory lettering,

employed on the cars with the electro-pneumatic unit switch group control. The air brakes are of the Westinghouse combined straight and automatic type. To demonstrate their operation under both conditions, two complete air brake equipments have been laid out on the floor adjoining



the platform previously mentioned, and with this equipment the instructor shows just what takes place with either one or more cars.

While Mr. Adams does not believe in trying to make electricians out of motormen, he overlooks no opportunity to give the shopmen as much information as they can grasp easily. One feature which has been found to promote the interest of the men in their work has been to have experts from manufacturing companies lecture on the operating principles and care of different kinds of equipment. These talks usually provoke a good deal of valuable discussion, and, together with the data prepared from time to time by Mr. Adams, exercise in the long run a very favorable influence on the reduction of maintenance expenses.

**THE TESTING LABORATORY OF THE MILWAUKEE ELECTRIC RAILWAY & LIGHT COMPANY**

The Milwaukee Electric Railway & Light Company maintains a special testing department, with laboratories equipped for testing practically all the material used by the company. The department is subdivided into a chemical and a physical division. The laboratories occupy two rooms in the new Public Service Building.

In the physical testing laboratory is installed a Riehle

**The Milwaukee Electric Railway and Light Co.**

**Oil Test**

<i>Brand</i>		
<i>Bought From</i>		
<i>Received</i>	<i>Tested</i>	
<i>Color</i>	<i>Spec. Grav. @60° F.</i>	
<i>Viscosity</i>	<i>Flash pt.</i>	
<i>Burning pt.</i>	<i>Chill pt.</i>	
<i>% Acid</i>	<i>Animal</i>	<i>Mineral</i>
<i>Remarks:</i>		

(OVER)

REPORT CARD ON OIL TEST

oil testing machine, a machine for testing the transverse strength of stone, timber and concrete beams, a Riehle 100,000-lb. tension and compression testing machine, and the necessary apparatus for making cement tests.

The chemical laboratory is equipped with the proper chemicals and apparatus for making chemical tests of brass, babbitt metal, steel and other materials and chemical and B. T. U. tests of coal.

The oil testing machine is driven by an Electrodynamical interpole motor and is provided with a Niagara tachometer. With this machine the oils are tested for friction and temperature with different bearing metals at different pressures and different speeds. In addition to discovering inferior oils, one object of the oil tests is to find out what grades of oil are best suited for certain bearings. In testing the oils for engine bearings, for example, the conditions of the test are made to approach as nearly as possible those of actual service. The same bearing metal is used, the speed is made the same and the pressure per square inch is approximated. In addition to machine tests, oils are tested for their flash point, viscosity, acidity and specific gravity.

The beam-tester machine is operated by hand and will take beams measuring 8 ft. x 8 ins. x 8 ins. The machine for testing the tensile and compressional strength of materials is of 100,000 lbs. capacity. It is motor-driven and provided with an automatic device which keeps the beam bal-

anced and draws a curve of stresses against strains on a chart.

Cement is tested for firmness, initial set and final set. Pat tests and tests of neat briquettes and briquettes of three parts sand to one part cement are also made. A standard sand which sifts through a twenty-mesh and stays on a thirty-mesh sieve is used. Briquettes are tested after twenty-four hours, seven days and twenty-eight days. The American Society of Civil Engineers standards of strength are used. For testing purposes a sample of cement is taken from every carload received. A uniform sample is obtained by taking portions from bags in different parts of the car.

The coal used in the power plants is tested systematically in the chemical laboratory. Once each week a sample of coal is taken from that supplied to each plant and B. T. U. and moisture tests are run. In addition, once each month a chemical test for moisture, volatile matter, fixed carbon, ash and sulphur is made.

Beside the laboratory work, the testing department conducts all outside plant trials. Boiler tests are made once each month, a different boiler being selected each time. These tests are always made with different ideas in view, sometimes for capacity and at other times for efficiency with different loadings and conditions. In connection with them an attempt is always made to improve the methods of firing.

**The Milwaukee Electric Railway and Light Co.**

**Cement Test—Physical**

<i>Brand</i>	<i>Car No</i>	<i>Order No</i>	
<i>Bought From</i>			
<i>Proportions</i>		<i>Briquette No</i>	
<i>Made</i>	<i>Tested</i>	<i>Age</i>	
<i>Tens Strength</i>		<i>Ave. Tens. Strength</i>	
<i>Finesness %—100 Mesh Sieve</i>		<i>200 Mesh Sieve</i>	
<i>Pat test</i>	<i>hours in steam,</i>	<i>days in air,</i>	<i>days in water</i>
<i>Vicat Needle—Initial Set</i>		<i>Final Set</i>	
<i>Spec. Grav.</i>		<i>Remarks</i>	

(OVER)

REPORT CARD ON CEMENT TEST

The boiler-feed system in the Commerce plant is especially arranged for making tests. The boilers may be disconnected from the regular feed line and connected to one used only for tests which is provided with a weighing tank and a separate pump. Indicator tests of the engines are made frequently, and at intervals different sections of the plant are tested through from boiler to switchboard by isolating this section of the plant from the other portion.

Contemplated additional equipment to the testing laboratories include the necessary apparatus for an electrochemical laboratory and for making high-tension tests. Records of power house tests are kept in typewriting on legal cap paper. Permanent records of other tests are kept on printed cards measuring approximately 3 ins. x 5 ins.

A motorman of the Butte Electric Railway Company raced with a cloudburst in Elk Park Canyon recently and saved sixty lives. A dispatch says: "Pursued by a wall of water 15 ft. high, McDermott put on full speed ahead down grade, and, the car clinging to the track by a miracle, reached high land just as the flood, turning up the rails and sweeping all before it, obliterated the road behind him. The flood left 6 ft. of mud in the Great Northern tunnel. The damage to property at the foot of the canyon is heavy, but no lives were lost."



## GASOLINE BUSES FOR NEW YORK

The New York Transportation Company, which operates the Fifth Avenue omnibus service in New York, has just



HEAD-ON VIEW OF NEW YORK GASOLINE 'BUS

placed in service fifteen De Dion-Bouton buses of the straight gasoline type. These are similar to the one which has been running experimentally on the company's Fifth Avenue service for about a year, and their purchase might be considered significant in view of the fact that the company has had the opportunity of comparing it with a gasoline-electric bus running on the same avenue, were it not known that ten gasoline-electric buses are also on order in this country.

So far this first gasoline bus has proved very satisfactory. In no case has it been taken out of service for anything but minor troubles, all of which could have been quickly remedied on the road had the necessary spare parts, such as inlet valve spring, cotter pins and platinum, interrupter screw been provided. No adjustment of clutch, brakes or other wearing parts has been made, and the gears, both in the gear-box and the final driving gears, show very little sign of wear. Lubrication has given no trouble whatever and requires practically no attention on the part of the driver. The machine is reasonably quiet when running, considering its size, and gets through congested traffic with very little trouble. Four speeds are unneces-

sary for conditions as they prevail in New York, and a three-speed gear-box would be simpler and require changing gear less frequently.

The tires on the vehicle, although too small in section, have stood up very well, and this is attributed to the easy springs which reduce very materially the hammer blow on tires on rough surfaces. The repairs on engine and gear box are easily effected, as they are not only easy of access but can be readily and quickly removed. The gear box drops by removing three bolts. All wearing parts throughout the machine are case-hardened, glass hard, and ground to size, which is rather unusual on a commercial vehicle.

The framing of these buses is of ash, reinforced with 3/16-in. fish-plates on both sides. The cross-stays are of channel section pressed steel, and ample strength and rigidity are secured by sheet gussets riveted to longitudinal and cross-members. This rigidity, however, is all lateral, the frame being to some extent flexible vertically. The springs are extra long, of easy curvature and very well proportioned to the weight of body and passengers, so that vibration is very slight.

The front axle is forged and the journals case-hardened. There is also used a floating bronze bushing, having a number of 3/8-in. oil holes provided between the journal and the cast-iron box of the hub, thus constituting practically a double bearing. The rear axle is a steel tube, to the ends of which steel castings are shrunk and pinned, with provision for carrying the springs. The tires are 36 ins. x 3 ins. twins on the rear wheels, and 34 ins. x 3 1/2 ins. on the front wheels.

The body is of the typical "London Road Car" type, having longitudinal seats inside with a capacity for sixteen passengers, and transverse seats on the top, seating eighteen passengers. The end windows are removable; the side windows are permanently closed, ventilation being obtained



SIDE VIEW OF GASOLINE 'BUS RUNNING ALONG CENTRAL PARK

by louvers and small ventilating windows in the sides over the large windows. The winding stairway is of very light sheet steel and wood construction, protected by a high railing to prevent accident in case the bus should start sud-

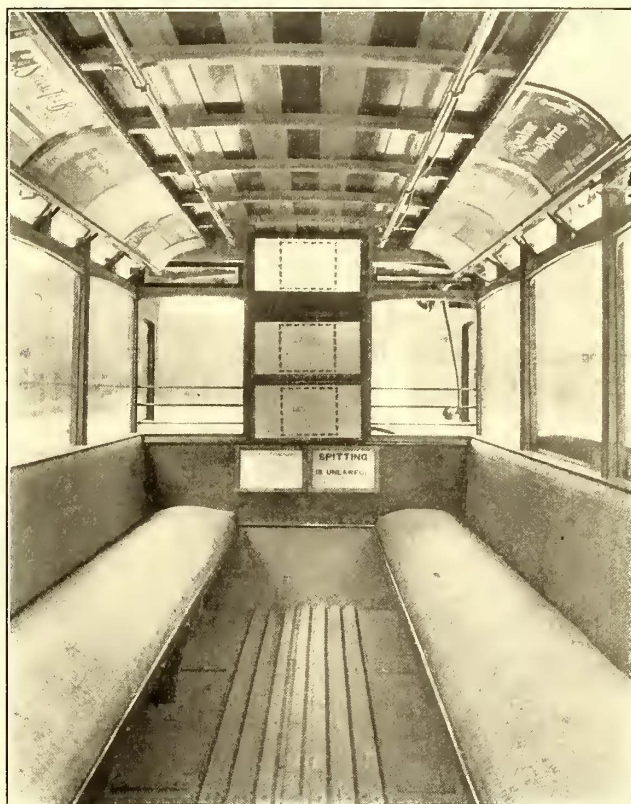


denly. The body is easily removable, having no connection whatever with any part of mechanism, brake rods, etc., and being fastened to members of the frame with eight carriage bolts.

The engine is rated at 24 hp capacity of the four-cylinder vertical type, with 105 x 130-mm. cylinders, automatic inlet valves, high-tension ignition, with high-tension distributor and single non-trembling coil, working either from the magneto or dry cells by a two-way switch. The water circulation is by a centrifugal pump driven by a flexible shaft. The carburetor is automatic and heated by shunt pipe from the circulating water. The radiator is of the honeycomb type, having a large capacity and good efficiency. The lubrication is entirely automatic, the oil being forced by a positive gear pump through the crankshaft, which has an oil passage drilled through it, the oil being fed through small holes to the main bearings, crank pins, magneto and pump spindles. After passing through the bearings the oil drops to the crank case and through a filter to the main oil reservoir which supplies the pump. The consumption of oil is very slight, as the bearings are so constructed as to prevent any oil escaping: the only loss is due to carbonization in the cylinders. The latter are protected from excessive supply of oil by baffle-plates, so that the exhaust is never smoky, nor do the cylinder walls, valves and spark plugs become coated with carbonized oil.

The gear box is of the sliding-gear type, having four gear ratios and a progressive engagement of gears. The gears are very light and of comparatively small diameter, but this is admissible owing to the large reduction of gear ratio between the driving pinions and the internal toothed driving rings on rear wheels; that is, the gears run at high speed and are subjected to comparatively small torsional

by a gear oil pump fitted to the bottom of the gear box, similar to the one used on the engine, this pump delivering oil to all the bearings and also to a pipe parallel to the gear-shaft and located directly above it. This pipe is pro-



INTERIOR OF BODY OF THE 'BUS



GASOLINE 'BUS IN SERVICE ON FIFTH AVENUE, NEW YORK

stresses and toothed contact pressures. The gears are made of chrome nickel steel, and after four months' operation show no sign of wear. The differential gear and countershaft are incorporated in the gear box, thus conducing to compactness and efficiency, owing to the elimination of extra bearings. The lubrication of the gears is

provided with holes directly above each of the gears. A constant stream of oil is thus playing upon the latter at all times when the vehicle is in motion, and practically no oil is lost, as special means are provided to prevent its escape.

The machine is extremely easy to control: two pedals are provided, the right one being the clutch pedal, and the left one actuating the differential hand brake and also closing the throttle. A change-speed lever and an emergency brake are at the right of the driver. Either the differential brake or hand brake will lock the rear wheels on asphalt. The clutch, which is of the single disc metal-to-metal type, is extremely smooth and easy in engagement, and the bus can be started on the top speed owing to the gradual way in which the clutch picks up the load. It runs in oil and is subject to very little wear, although automatic compensation is provided for it. When driving in traffic it is not necessary for the operator to remove either of his hands from the steering

wheel, as the clutch, throttle and brake can be operated with his feet. The bus complete with water and fuel weighs 7900 lbs., increased when loaded to 13,000 lbs. The speed is 12 m. p. h. on top speed at 1000 r. p. m. This engine speed can be safely increased to 1250 r. p. m., equivalent to 15½ m. p. h.



## SHUNTED TYPE OF GRAPHIC RECORDING METERS

BY PAUL MAC GAHAN AND H. W. YOUNG

The desirability of employing graphic recording ammeters and voltmeters has long been apparent to those operating d. c. railway power stations, but one of the principal reasons why they have not been more extensively used is that until recently the ammeters have been available only in the "series" type; that is, it has been necessary to pass all of the current through the instrument itself. In the very high capacities this has proved troublesome to instrument manufacturers and resort has been had to the use of a shunt placed across the instrument terminals. In either case, however, it has been necessary to carry the total current to be measured up on to the switchboard at a very considerable amount of trouble and expense; in fact, the cost of the extra busses, connecting straps and labor has frequently been higher than the cost of the meter itself, especially when the distances have been great. Again, the graphic ammeters heretofore used had many other disadvantages, among which might be mentioned short congested scales, circular or small slow-moving charts, absence of means for varying the dead-beat qualities, difficulty in interpreting readings (especially if the load is of a fluctuating nature), and inaccuracies due to friction of the pen.

It has been generally conceded that a "shunted" type of d. c. ammeter would overcome the greatest objection to the older forms, and efforts were made to develop and perfect a meter of this type. These efforts have resulted in a design which is not only operative from its own shunt, but can also be operated from the ordinary shunts used with indicating ammeters. In addition, the design employs the "band" or roll form of chart, thus giving rectangular coordinates.

Both ammeters and voltmeters are of the "relay type," employing a suitable measuring element in conjunction with a pair of control electromagnets actuating the recording pen. Each meter comprises three distinct elements: First, the measuring element; second, the pen actuating control magnets; third, the driving clock. The construction of an ammeter is diagrammatically shown in Fig. 1, in which the various elements of the meter are designated as follows:

- A-B = Astatically arranged permanent magnets.
- E-F = Movable coils mounted on supporting structure pivoted at G.
- G = Pivoted support of E-F.
- H = Upper adjustable relay contact.
- I = Lower adjustable relay contact.
- J = Movable relay contact attached to movable element E-F.
- K = Control electro-magnet (left hand).
- K' = Iron core of K.
- L = Control electro-magnet (right hand).
- L' = Iron core of L.
- M = Arm supporting iron cores pivoted at N and connecting O by pin bearing P.
- N = Pivoted bearing for M.
- O = Pen arm connected to M by pin bearing P and provided with guide slot at upper end which bears on stationary guide pin R.
- P = Pin bearing connecting M and O.
- R = Stationary guide pin for O.
- S = Recording pen arranged to pass across a suitable moving record paper T.
- U = Helical spring connecting movable coil system and movable pivoted supporting arm M.

The movable coils are connected in series and their terminals connected across a shunt or series with the load. The electromagnets K and L are connected as shown, with their junction point connected to one side of the line, a lead from the opposite side being connected to the movable contact J. A connection from coil K is made to the upper relay contact H, and from coil L to the lower relay contact I.

The measuring coils are so arranged that when current flows through them the left-hand coil E is deflected down, and the right-hand coil F upward, so that with the recording pen at zero position on the chart the contact J will be forced against the fixed contact I. A circuit is thus completed through the right-hand solenoid L, and the resultant electromagnetic attraction causes the core L' to move downward, which movement turns M about its axis, and through its connection with O causes the pen to move across the chart toward full scale position. This movement of M places tension on the spring U, which continues to increase until the core has traveled a sufficient distance to place

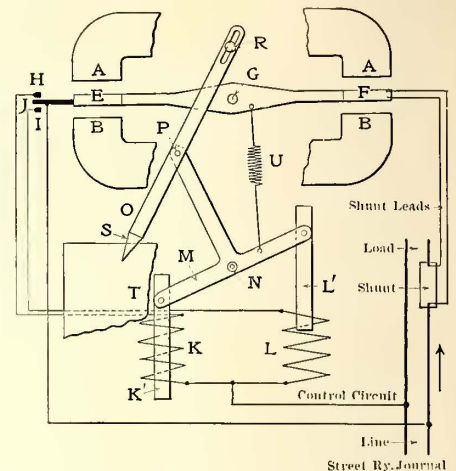


FIG. 1.—DIAGRAM OF CONNECTIONS

such a tension on U that it balances the torque of the movable measuring system E-F and draws the contact J away from I. The entire moving system, including solenoids, pen, arm and measuring coils, remains in the position assumed at the time the circuit was broken at the contacts J-I, and the pen continues to draw a line which represents the current of the circuit.

From the above description it will be seen that as the spring U is under tension, the position of the contact J, between contacts H and I, will represent a balance or state of equilibrium between the restraining and actuating forces. This action can readily be compared to the action of a "Siemens dynamometer" in which the tension or torsion of the control spring has drawn the movable coil-indicating pointer back to zero and the manually operated pointer will indicate the current. The indicating pointer of the dynamometer can thus be likened to the relay contact J of the graphic meter and the manually operated pointer may be likened to the solenoid operated recording pen of the graphic meter. It will be seen, therefore, that the electrical operation of the graphic meter's recording pointer replaces the manual operation of the Siemens dynamometer.

If the current of the metered circuit rises, the movable contact J is again deflected downward until it makes contact with the lower fixed contact I and the right-hand solenoid L again causes the recording pen to move across the chart until the increased tension of the spring U balances the increased torque of the measuring element, drawing the movable contact J away from I, and again opens the solenoid circuit. The recording system again remains stationary until the current of the circuit changes.

As the current in the circuit decreases, the contact J rises, and making contact with H energizes the left-hand solenoid K and its core is drawn down, thus causing the pen to move down the scale toward zero. This movement will continue until the arm M moves up sufficiently to relieve the tension on U and restore the balance between the measuring system and spring, at which instant the contact J will leave H and open the control circuit through K.

As the current varies, it will be seen that the contact J moves up and down, completing the circuit through one or



the other of the control solenoids, thus causing the recording pen to move across the chart and give a graphic record of the current variations.

In order that the charts may have rectangular co-ordinates it is essential that the pen-point move in a straight line. This straight line motion is secured by the mechanical arrangement of the solenoid arm *M* and pen arm *O*. As *M*, due to the magnetic pull of the solenoids, moves its ends up or down, the pen arm *O* slides on its guide pin *R* and rotates on pin *P*, thus imparting to the recording pen *S*, a straight line motion. By this arrangement an extremely simple and effective parallel motion is secured.

The contacts *H*, *I* and *J* are made of a special alloy metal and are shunted by a high resistance so that they will break the circuits with minimum burning or arcing.

To prevent the cores of the control magnets from over-running, they are provided with pistons operating in oil

$6\frac{3}{4}$  ins. wide and are perforated at each outer edge by a line of holes, which, engaging on projecting pins on the surface of the driving cylinder, insure a positively aligned feed under the recording pen. The record paper is ruled longitudinally with a set of parallel lines, representing the meter calibration, and at right angles to the calibration lines are a set of parallel lines representing hours. The paper is of such thin, tough texture that it can readily be used for reproducing the pen records by blue printing or other similar processes. Changes in speed of the chart are effected by the use of suitable gears and pinions having different ratios of teeth.

The recording pen is of the reservoir type and of such capacity that one filling suffices for several months' use. The pen-point is drawn to a capillary tube of heavy wall and small bore, giving maximum strength with minimum width of line. Filling of the pen is accomplished by inverting it and by means of a special filler inserted in opening in tube immediately behind the point, the ink is forced over into the large reservoir, and when full the pen may be righted in position.

The advantages of this construction can briefly be summed up as follows: A statically arranged measuring system; small current consumption; requires but 50 millivolts for operation; only requires small flexible leads for connection to circuit; uniform scales; can be made in combination indicating and recording forms; can be operated from any shunt or section of bus giving necessary drop.

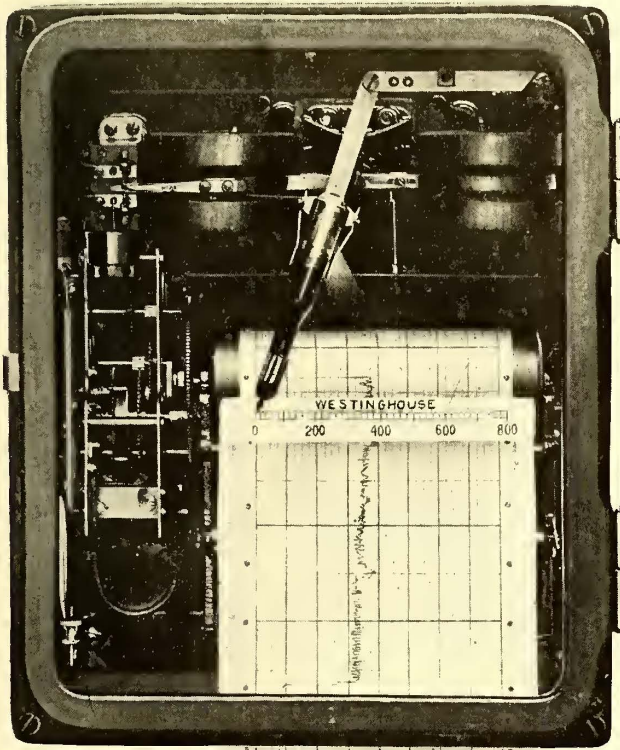


FIG. 2.—VIEW OF INSTRUMENT

dash-pots located in the solenoid cores. By adjusting the size of an opening or port hole in the pistons, the amount of damping can readily be varied. To dampen the movement of the measuring coils *E-F*, a piston is attached to this element and arranged to move in a small oil dash-pot. This arrangement prevents vibrating of the contacts and the magnitude may be varied by changing the oil density. The driving clock is a standard high-grade time piece of the electrically wound pendulum type. Its mechanism is operated from the same circuit as the pen actuating electromagnets and operates at intervals of 1 hour, the driving spring being of such a size that but a few of its outer convolutions uncoil during this period. Thus the clock mechanism is under a strong uniform force, which, together with the heavy pendulum action, gives a powerful driving force, insuring a positive feed to the record paper.

The record chart is 244 ft. in length, being sufficient for two months' use at a 2 ins. per hour speed, or a proportionately shorter time at 4 ins. or 8 ins. per hour. The rolls are

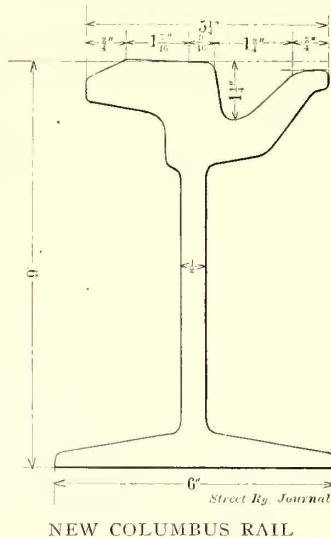
## NEW ENGLAND TROLLEY CHANGES

Changes in the street railway service, through the chain of towns in the Blackstone Valley which have just gone into effect are the forerunner of the through Providence and Worcester service to be given soon over the electric lines of the Rhode Island Company and the New England Securities & Investment Company, controlled in the interest of the New York, New Haven & Hartford Railroad. The service now in operation includes cars between Worcester and New City bridge in Blackstone, Mass., where the Rhode Island Company's cars make close connections and run between that point and Main Street, Woonsocket, connecting there with the direct Providence cars. The Uxbridge & Blackstone Street Railway Company has ceased to be an operating road, and its line between Plummer's Corners, in Northbridge, and Millville, in the town of Blackstone, has passed to the direct control of the new owners, who use the Worcester & Blackstone Valley Street Railway Company, a subsidiary concern, as the operating medium for the 26 miles between the heart of Worcester and Blackstone, the Valley cars and crews being employed. The connecting cars of the old Woonsocket street railway, now the Rhode Island Company, meet the Worcester cars at New City bridge, and in Woonsocket make close connection with the car for Cumberland Hill, thence through Lonsdale and Pawtucket to Providence, or, by passengers waiting from 10 to 30 minutes, connection can be made with the fast direct Providence-Woonsocket line. By the latter route the trip can be made in  $3\frac{1}{2}$  hours. As soon as the bridge at New City, Blackstone, is strengthened, the cars will run from Worcester to Woonsocket and the New City change will be eliminated. The fare by trolley between Providence and Worcester is 60 cents, while the fare by steam is 90 cents.



## THE RAIL CONTROVERSY IN COLUMBUS SETTLED

The controversy between the Board of Trade of Columbus and the railroad companies over the type of rail to be used by the interurban companies operating in the city, has been settled by the adoption of a type of rail which is almost a full groove, with the web nearly under the center of the tread. A section of the rail is shown herewith. It is said that the board proposes soon to take up the question of rails for the regular city lines and that a standard will be adopted which shall be used hereafter for new track and where track is rebuilt. The rail question at Columbus has been under consideration for months, and the decision reached will be of general interest, especially in other cities where a decision of the rail question is yet to be made.



NEW COLUMBUS RAIL

## ADDITIONAL CARS FOR CHATTANOOGA

In the STREET RAILWAY JOURNAL of Nov. 17, 1906, attention was directed to the activity on the lines of the Chattanooga Railways Company. Since then, in addition to occupying the new car shops and car houses and completing the general overhauling of the system, several new branches have been opened necessitating new rolling stock, to meet which requirement a number of grooveless post semi-convertible cars built by the G. C. Kuhlman Car Company have been supplied. These cars are generally similar to the single-truck cars of the same type furnished by the J. G. Brill Company last year for operation on the Mission Ridge line, one of the lines which were recently relaid with new

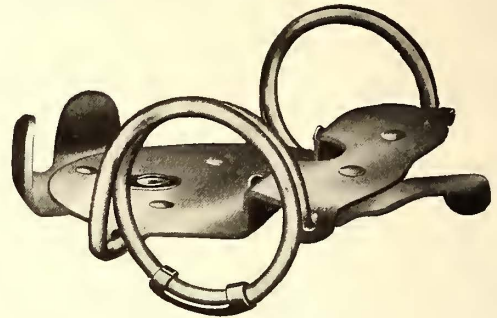


EXTERIOR OF NEW CHATTANOOGA CAR

rails and ties embedded in concrete. Following are some of the dimensions of the new cars: Length over end panels, 28 ft.; width over sills, including panels, 8 ft. 1 1/2 ins.; over posts at belt, 8 ft. 5 ins.; height from track to under side of sills, 2 ft. 8 1/2 ins.; size of side sills, 4 ins. x 7 3/4 ins.; end sills, 5 1/4 ins. x 6 7/8 ins.; sill plates, 12 ins. x 3/8 in. The trucks are of the No. 27-G1 type with 4-ft. 6-in wheel base. The seats and numerous patented specialties were also furnished by the builder named. The grooveless post semi-convertible car has proved itself to be peculiarly adapted to the short winters and long summers which prevail in this Southern climate.

## A SPRING HEEL FOR MOTORMEN

Physical limitations vary greatly in different men, and while the strain incident to standing at the controller for long periods does not effect some motormen materially it does prove serious in the case of others, not only impairing the service performed by the individual, but sometimes becoming so serious as to cause a temporary suspension of work. This, of course, has long been realized, but heretofore there has been no alternative except in the case of long



THE SPRING HEEL READY FOR USE

interurban lines where the character of the service has made it possible to permit the motormen to sit at their work during part of their run. Now comes a device designed partly to secure the comfort of a seat for motormen and so constructed as to make it practicable for use in all classes of service. It is a spring heel, designed especially to take up the jar of the car when in operation. Originally patented in 1904 by B. B. Bonney, a motorman of Pasadena, Cal., who had suffered physically in performing his duties, the rights to the device were taken over by Barney & Berry, of



THE SPRING HEEL APPLIED

Springfield, Mass., who, in developing it, brought to the device the result of their extended experience in building roller skates. The heel is extremely simple in construction. A metal plate of cold rolled steel and an adjustable rear clamp form a pocket for the shoe heel, to which it is clamped securely by means of a lever. On either side are attached "Torchon" springs 2 ins. in diameter, made of finely tempered steel wire, in sizes suitable to carry the weight of the wearer. The only part subjected to much wear is the guard at the base of the spring, which may be renewed at slight expense, making the life of the spring heels almost unlimited. The range of adjustment in heel clamp makes it possible to fit the device to any size heel. It can be quickly applied and is inconspicuous, being neutral in color. Letters in the company's possession from users of the heels testify as to its satisfaction in service. The device also has the recommendation of physicians, among them the surgeon connected with the company by which Mr. Bonney was employed.



## FINANCIAL INTELLIGENCE

WALL STREET, Aug. 21, 1907.

### The Money Market

Pronounced strength characterized the local money market during the past week. The continued heavy liquidation in, and consequent lower prices for, stocks were reflected in comparatively low rates for money for day-to-day use, but in the time loan department there was a further hardening of rates for all maturities up to six months. The local banks were practically out of the market, while the supply from outside sources was extremely light, thus forcing the asking charges for accommodations up to the highest of the year. Sixty-day money was in demand at 6 per cent, with little obtainable under  $6\frac{1}{2}$  per cent, while money for ninety days to six months commanded 7 per cent on good mixed securities. On all industrial collateral the charges were substantially higher. Shipments of currency to the West for crop-moving purposes continue, and there has been an increasing demand for money in the South, resulting in larger transfers of funds to New Orleans and other Southern points. Under ordinary conditions the high rates for money prevailing here would result in large offerings of foreign capital against exchange transactions, but thus far this season the supply of money from this source has been extremely light. Foreign bankers are not disposed to extend credit as freely as in former years, and this was largely responsible for the sharp advance in rates of exchange during the past week. Sterling exchange has risen to within a small fraction of the gold export point, but so far no shipments of the yellow metal have been made to London, and it is not considered likely that the Bank of England will force shipments from this side by allowing free advances on the gold while in transit. However, \$1,100,000 gold has been exported to Germany during the week, but it is understood that these transactions were of a special nature. The demand for gold continues active at all of the principal European centers, and especially at London. The Bank of England on last Thursday advanced the official discount rate  $\frac{1}{2}$  per cent to  $4\frac{1}{2}$  per cent, in order to protect its gold supply, and as private discounts are somewhat higher than the bank rate a further advance in the official rate may soon be made.

The demand for money from merchants continues brisk, and several manufacturing concerns have been forced into the hands of receivers owing to the inability to obtain necessary credits. Corporations also continue in the market for new capital. During the week the announcement was made that the Consolidated Gas Company had sold an issue of \$5,000,000 one-year 6 per cent notes, the proceeds to be used for general purposes of the company. At the close of the week the situation was not very encouraging. No action has as yet been taken by the Treasury Department to relieve the situation, but the belief prevails in banking circles that the Secretary of the Treasury will render at the proper time all the assistance necessary.

The bank statement published on last Saturday was rather favorable. Loans decreased \$14,231,200, and deposits fell off \$17,447,300. The reserve required was \$4,361,825 less than in the previous week. The surplus increased \$1,533,525 to \$9,294,075, as compared with \$7,101,500 in the corresponding week of last year and \$9,355,675 in 1905.

### The Stock Market

The address made by President Roosevelt at Provincetown had the immediate effect of a substantial recovery in values from the greatly depressed, not to say demoralized, condition into which they had fallen, but it is not yet possible accurately to gage the ultimate effect of the Chief Executive's latest utterances concerning a question that is now attracting the attention of business interests all over the world. The financial community, however, seems inclined to take a rather more cheerful view of the Administration's attitude toward the railway and industrial corporations than it has heretofore, now that it has become apparent that officials, rather than corporations, who

have been guilty of violating the law are to be punished, and the wisdom of this policy is becoming manifest, as it will assure innocent stockholders that they are not to be made suffer on account of the misdeeds of law-breaking officers of the companies in which they have invested their savings. It is this, together with moderate purchases on the part of that class of investors generally described as "bargain hunters," that has served somewhat to allay apprehension in the stock market during the week and to arrest in some measure the ruthless sacrificing of securities that has been going on, and which if continued much longer must have resulted most direfully. It is argued by many that the President's stand will have a tendency to place American securities of all descriptions on a higher plane before the entire investing world, and that while his determination to remain steadfast may be to the dislike of a certain class of capitalists, its final influence will be most beneficial.

Apart from the President's speech comparatively little attention was devoted to any other matter in financial circles, although, naturally, the marking up of the Bank of England's discount rate considerably in advance of the usual time for such action in the fall and the resumption of gold exports served to draw renewed attention to the foreign monetary situation, while the prospect that the demand for funds to move our crops will be larger from now on made the outlook for a let-up in the present stiffness of time money rates here rather dubious. Railway earnings reports coming to hand were again encouraging, and in some cases record-breaking, and at the same time it is noteworthy that the business of the United States Steel Corporation, which fell off considerably during July from that of the corresponding period last year, has been better in the current month.

The further sharp decline in values that took place prior to the publication of the President's speech, and which was participated in by all stocks, some of the gilt-edged investment issues suffering even more than those of lower grade, very naturally was communicated to the local traction group, and notwithstanding that there was a total absence of really unfavorable developments to account therefor, most stocks in this category fell to the lowest prices on record. The Interborough-Metropolitan securities were especially heavy, the present investigation which is being conducted into the affairs of the company having been partly responsible for the further serious declines in these stocks. However, there was renewed talk of a possible suspension of dividends on the preferred shares, and while there was no substantiation to these rumors they were none the less effective in prompting fresh liquidation in both the preferred and common.

### Philadelphia

Trading in the local traction issues was upon a comparatively small scale during the past week, but prices generally sustained substantial losses in sympathy with the declines recorded in other parts of the market. Union Traction, for instance, after selling at  $56\frac{1}{2}$  ran off to  $53\frac{1}{8}$  on light sales, while Philadelphia Traction sold at 91 and  $91\frac{1}{2}$ . Consolidated Traction of New Jersey lost  $\frac{1}{2}$  to  $69\frac{1}{2}$ , and Philadelphia Company common and preferred sold at 39 and 44, respectively. Philadelphia Rapid Transit was about the only issue of the group to display any degree of activity, and was relatively firm, upward of 8000 shares changing hands at from  $16\frac{1}{2}$  to 17. American Railways was steady at 48.

### Chicago

The traction shares were quiet and generally lower. Chicago City Railway sold at 155 and 150, and the 5 per cent bonds sold at 98. Metropolitan Elevated common sold at  $21\frac{3}{4}$ , Northwest Elevated common at  $21\frac{3}{4}$  and 21, and the preferred stock at 58.

### Other Traction Securities

Increased activity developed in the traction issues at Baltimore, but in most instances the dealings were accompanied by



falling prices. United Railway common lost  $1\frac{1}{4}$  to  $11\frac{1}{4}$ , and the 4 per cent bonds declined a point to  $85\frac{3}{4}$ . The incomes were also lower at  $50\frac{1}{2}$ . Lexington Street Railways 5s, after selling at par, lost a point to 99, and Baltimore City & Suburban 5s eased off  $\frac{1}{4}$  to  $106\frac{1}{2}$ . Other transactions included Norfolk Railway & Light 5s at 100, Baltimore City Passenger 5s at  $102\frac{1}{4}$ , and Washington City & Suburban 5s at 100. Pronounced weakness characterized the market at Boston. Boston Elevated early in the week sold at 155 ex. the dividend, and subsequently the price fell to 130. Massachusetts Electric sold at  $12\frac{1}{4}$  and  $12\frac{1}{2}$  and the preferred at  $52\frac{1}{2}$ , the lowest prices for these issues recorded for some time. Boston & Worcester also showed weakness, sales taking place as low as  $19\frac{1}{2}$ . West End sold at 87 and the preferred at 101.

#### Security Quotations

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

	Aug. 14	Aug. 21
American Railways .....	47	47
Boston Elevated .....	131	a130
Brooklyn Rapid Transit .....	42	41 $\frac{1}{2}$
Chicago City .....	160	150
Chicago Union Traction (common) certificates .....	—	2 $\frac{1}{2}$
Chicago Union Traction (preferred) certificates .....	—	—
Cleveland Electric .....	49 $\frac{1}{2}$	46
Consolidated Traction of New Jersey .....	69	67
Detroit United .....	62	62 $\frac{1}{4}$
Interborough-Metropolitan .....	87 $\frac{3}{8}$	87 $\frac{3}{8}$
Interborough-Metropolitan (preferred) .....	26 $\frac{1}{2}$	23
International Traction (common) .....	45	42
International Traction (preferred), 4s .....	a67	a67
Manhattan Railway .....	115	117
Massachusetts Elec. Cos. (common) .....	12 $\frac{1}{2}$	12
Massachusetts Elec. Cos. (preferred) .....	52	50
Metropolitan Elevated, Chicago (common) .....	21 $\frac{1}{2}$	21 $\frac{1}{2}$
Metropolitan Elevated, Chicago (preferred) .....	63	62 $\frac{1}{4}$
Metropolitan Street .....	a70	25
North American .....	55	53 $\frac{1}{2}$
North Jersey Street Railway .....	40	40
Philadelphia Company (common) .....	38	38 $\frac{1}{2}$
Philadelphia Rapid Transit .....	17 $\frac{1}{4}$	16 $\frac{3}{4}$
Philadelphia Traction .....	92 $\frac{1}{2}$	—
Public Service Corporation certificates .....	65	64
Public Service Corporation 5 per cent notes .....	92	92
South Side Elevated (Chicago) .....	80	80
Third Avenue .....	75	68
Twin City, Minneapolis (common) .....	86	85 $\frac{3}{4}$
Union Traction (Philadelphia) .....	56	53 $\frac{1}{4}$

a Asked.

#### Metals

The "Iron Age" says that generally speaking the undertone throughout the iron trade is one of increased nervousness over the future. There is a falling off in new business in nearly all directions, but specifications against old contracts continue very heavy, and there is no indication in the finished lines of any cessation of work under way. Throughout the country the buying of pig iron is from hand to mouth, and the market has not been really seriously tested in foundry iron for some time, but prices are weakening. The steel rail trade is very quiet, and business is coming in slowly in sheet tin plate, iron bar and tube trades.

Copper metal remains unchanged at about 23 cents for Lake and 22 cents for electrolytic. Lower prices are expected in the near future.

### HEARING ON AN ORDER BY THE UTILITIES BOARD

Preparatory to issuing the first order for an increase in the equipment of any road under its jurisdiction, the Public Service Commission of the first district in New York has adopted a resolution setting Sept. 4 as a date for a public hearing at which the Coney Island & Brooklyn Railroad Company might "show cause" why it should not add ten new cars to its equipment and increase the efficiency of its present rolling stock. In presenting the resolution for adoption Commissioner Bassett explained that a committee composed of Mr. Eustis, Mr. McCarroll, and himself had found, on investigation, that the cars of the Smith Street line impeded traffic frequently. To

obviate this, certain changes are to be recommended in the mechanism of the cars, providing that the Commission finds at the hearing that the order for such changes will be "just, reasonable, safe, adequate and proper."

### PUBLIC SERVICE CORPORATION OF NEW JERSEY FORMS SEPARATE COMPANY FOR TROLLEYS

The announcement is made that the street railway companies controlled by the Public Service Corporation of New Jersey will be merged in a corporation known as the Public Service Street Railway Company, with a capital of \$38,000,000, consisting of 380,000 shares at a par value of \$100 in cash. The securities of the various trolley companies now owned by the Public Service Corporation will be turned over to protect the new street railway company, which will be subordinate to the present Public Service Corporation. The parties to the plan are named in an agreement, dated July 30 last, as the North Jersey Street Railway Company, the Jersey City, Hoboken & Paterson Street Railway Company, formed by the merging of the Paterson Central Electric Company, Saddle River Traction Company, Palisade Railroad Company, White Line Traction Company, Paterson, Passaic & Rutherford Electric Railway Company, Jersey City, Hoboken & Rutherford Electric Railway Company, and Paterson Horse Railroad Company, and the United Street Railway Company of Central Jersey, formed by merging the Elizabeth & Raritan River Street Railway Company and Elizabeth & Plainfield Central Jersey Railway Company. The officers of the consolidated company, who shall hold their respective offices for the first year or until others are chosen in their places, are:

President, Thomas N. McCarter, Rumson, N. J.; vice-presidents, Charles A. Sterling, East Orange; Albert B. Carlton, Elizabeth; John J. Burleigh, Merchantville; secretary, Frederick Evans, New York; assistant secretary, Henry C. Stevenson, Newark; treasurer, James P. Dusenberry, Newark; assistant treasurer, Robert D. Miller, Jersey City.

In explanation of the proposed merger the following has been issued:

A little more than four years ago the Public Service Corporation of New Jersey purchased nearly all the stock of the North Jersey Street Railway Company, \$15,000,000; the Jersey City, Hoboken & Paterson Street Railway Company, \$20,000,000, and the Elizabeth, Plainfield & Central Jersey Street Railway Company, \$3,000,000. It subsequently acquired the stock of the Elizabeth & Raritan River Street Railway Company, \$2,000,000, making \$40,000,000 in all. All the stock which was purchased by the Public Service Corporation, except the stock of the Elizabeth & Raritan River Street Railway Company, was deposited with the Fidelity Trust Company as security for perpetual interest-bearing certificates which the Public Service Corporation had issued in payment for the stock so purchased.

The tracks of all these companies are connected and are practically operated as one system, although it is necessary to keep four sets of books and four different bodies of officials and employees. A few weeks ago the Elizabeth, Plainfield & Central Jersey Street Railway Company and the Elizabeth & Raritan River Street Railway Company were consolidated into a company called the United Street Railway Company of Central Jersey. The capital of that company was fixed at \$4,000,000, or \$1,000,000 less than the aggregate amount of capital of the constituent companies. More recently the directors of the North Jersey Street Railway Company, the Jersey City, Hoboken & Paterson Railway Company and the United Railway Company of Central Jersey made an agreement to consolidate these companies, subject to confirmation by the stockholders at meetings to be held next Tuesday.

The proposed capital of the new company, which is to be called the Public Service Railway Company, has been fixed at \$38,000,000, or \$1,000,000 less than the aggregate capital stock of the three companies, so that instead of increasing the capital, the plan when carried out will effect a decrease of \$2,000,000.

All of the \$38,000,000 of stock of the new company owned by the Public Service Corporation of New Jersey will be deposited with the Fidelity Trust Company in exchange for a like amount originally deposited with that company when the perpetual interest-bearing certificates were issued. The advantage to the street railway companies will be one united system, with a single set of officials and employees, in place of four connected plants not legally united.

The stockholders of the Jersey City, Hoboken & Paterson Street Railway, the North Jersey Street Railway, and the United Street Railways of Central New Jersey, on Tuesday ratified the agreement entered into by the directors of the three companies named, to consolidate the properties into one corporation, to be known as the Public Service Railway Company.



**THE TRANSIT INQUIRY IN NEW YORK**

The continuation of the hearing on the Brooklyn Rapid Transit Company before the Public Service Commission last Friday brought out some interesting facts regarding the expenditures made by the company to keep abreast of its growing business and also brought to light conditions hampering the company in its operation over which the company has had absolutely no control. It is stated that as a result changes may be effected that will materially assist the company, the Commission being ready to urge the city to hasten all such public work as shall tend to relieve congestion. In this connection, Mr. Ivins, counsel for the Commission, suggested a plan for relieving the congestion at the Brooklyn Bridge by carrying the trains over a loop running across the city as far as West Street and returning with several stations along the line. President Winter, of the company, said that the only difficulty was the financial question. If the city were to supply the money, he thought the plan proposed would be the best solution of the entire problem. Regarding the company's expenditures, Mr. Winter submitted a statement showing that since July 1, 1902, the company has spent for equipment, power houses, tracks, etc., a total of \$29,622,625. The various items for expenditures follow:

Rights of way and easements.....	\$844,215
Tracks and roadway construction.....	5,341,721
Electric line construction.....	1,867,642
Real estate .....	1,019,446
Buildings and fixtures.....	3,170,114
Power plant equipment.....	6,272,271
Tools and machinery.....	261,824
Cars and parts of cars.....	10,536,733
Miscellaneous equipment .....	130,733
Miscellaneous expenditures .....	177,926

Total .....	\$29,622,625
Underlying securities purchased.....	4,022,490

Mr. Winter testified that plans had already been made for ordering 100 elevated cars and 100 motor cars, and that as soon as it was possible to get a quorum of the executive committee he would recommend the purchase of these cars. This will mean a probable expenditure of \$1,800,000. Mr. Winter also stated that even with these new cars the company would be in the market for additional cars within six months. He believed that it would be possible to get delivery of these cars in from four to six months. Mr. Winter stated that there was constantly a cry for new equipment, which was needed, but that this need would have to be apparent for some time to come. Mr. Winter stated, however, that there was a limit to spending money for property that gave but little return. The Brooklyn Rapid Transit Company has never paid a dividend, but instead has put every cent of net profit and net revenue into the property.

The next great problem that would come before the company, Mr. Winter testified, was the Manhattan Bridge, which is building between the Brooklyn and the Williamsburg Bridges. The question of operating Brooklyn Rapid Transit trains into Manhattan, via the bridge and over the New York City company's tracks, and issuing transfers, is one that is not being considered, and will not be considered by the company. There are physical reasons why the operation would not be practicable, although, he added, there would be no physical reasons for not issuing transfers. He said the problem of operating into Manhattan had never been considered in connection with the transfer matter. The question of the service from the Thirty-Ninth Street Ferry was taken up by Mr. Ivins. Mr. Winter said the company was negotiating with Dock Commissioner Bensel for additional facilities at the ferry, so as to make a better connection. Such improvements as now contemplated, if authorized, could be made within a year. From this ferry there is a five cent fare line to Coney Island. If the municipal ferry, to be run to Thirty-Ninth Street, is well run, Mr. Winter said the company could take care of all of the traffic. He believed a thirty-five or forty minute schedule could be maintained from the ferry to Coney Island.

On Tuesday, the Interborough-Metropolitan hearing was resumed. Mr. Ivins concerned himself mainly with the history that centres around the newly completed Belmont tunnel under the East River from the Grand Central Station to Long Island

City. Mr. Bryan, president of the Interborough Company, explained that on Jan. 1, 1905, when the old Steinway franchise expired, the governing board of the property was changed from a board of directors to a board of trustees on the advice of the legal department, and that all the assets of the company were taken into the control of the trustees as now constituted.

Mr. Ivins inquired as to what corporate form the proprietorship of these assets might have taken, and Mr. Bryan explained that there was no stock other than the \$100,000 par value of the stock of the old Steinway company and no bonds, but certificates of indebtedness to the Interborough for the money spent in the construction of the tunnel. In answer to further questions, Mr. Bryan said that some \$7,000,000 had been spent in the construction of the tunnel exclusive of real estate, and that the franchise had been acquired by the Interborough interests from John Pierce for \$402,000. Mr. Bryan said that the total cost of the tunnel as provided for would be \$7,785,500, this sum including \$712,000 set apart for future expenditure. He declared that the firm of August Belmont & Company was only related to the project through the directorate of Mr. Belmont in the New York & Long Island Railway Company, as the tunnel building corporation is known officially. Mr. Ivins took the transcript of the record taken in appraisal proceedings on the property of William Steinway, on which Charles E. Lexow, as appraiser, reported on Jan. 28, 1904, that there was no property passing subject to tax. The record had to do with the disposition of 425 shares of the New York & Long Island Railroad Company having a par value of \$42,500. Louis Von Bernuth, one of the executors of the Steinway estate, testified that after the death of William Steinway, negotiation in England to dispose of the stock failed, after which it was offered to the Pennsylvania Railroad, which refused it, and then to ex-Mayor Hugh Grant, who also turned it down. William P. Baldwin, then president of the Otis Elevator Company, was another prospective purchaser who did not materialize, and eventually an offer was received from George F. Harriman, a lawyer, who paid the estate \$86,000, being \$39,452.15 for the stock and the rest in satisfaction of debts owing to the estate by the tunnel company.

The appraiser of the Steinway estate found that the stock was worth the price paid by Harriman—\$39,452.15. What happened between that time and the time of its acquisition by the Belmont interests from Mr. Pierce did not appear. Mr. Ivins again took up the story of the financing after the Belmont acquisition, asking what might be done to put the values represented by the cost of construction into tangible property that might be realized on by the Interborough. Mr. Bryan said that he expected the road would be put in operation.

Then followed an extended discussion of the possible connections for the transfer of passengers between the Steinway company and the Subway and Grand Central Stations at the western terminus. Mr. Bryan admitted that the question of connecting with the proposed Lexington Avenue subway was considered, and this brought Mr. Ivins to the matter of the bill introduced in the 1905 Legislature providing for a change in grade of the Steinway tunnel and some other things.

The original plan entertained, to connect the Belmont trolley properties in Queens with the subway at Lexington Avenue and the Grand Central and with the New York Central at that point, went smoothly enough until the threatened opposition of the Metropolitan interests in proposing to bid for the Lexington Avenue subway. It has been stated that it was largely owing to this possible competition that the Ryan and Belmont interests united to form the present Interborough-Metropolitan consolidation.

Mr. Ivins tried to draw from Henry C. Wright, secretary of the City Club, the facts underlying the report which that organization recently made on traffic conditions here. Mr. Wright was willing enough to tell, but after it had appeared that one observer had been charged with estimating the entire rush-hour crowd at Brooklyn Bridge and had reported, for example, that between 5 and 5:30 o'clock on May 19, exactly 3871 persons had been unable to obtain seats interest in that part of the investigation waned. Soon thereafter the shift was made to the Steinway tunnel history.

The main fact brought out at the continuation of the hearing on Wednesday was that the advisability is being considered of readjusting the finances of the company. It is said that there is every likelihood that the dividend on Interborough-Metro-



politan preferred will be passed. The entire situation will probably come to the crucial point on Thursday, Sept. 5, when the directors of the New York City Railway Company hold their meeting for the purpose of taking action upon the dividend on Metropolitan Street Railway stock. When the Interborough-Metropolitan Company, which is reported to hold some 96 per cent of the stock of the Metropolitan Company, is informed by the New York City Railway Company of its inability further to pay the dividend guaranteed by it on the Metropolitan Street Railway Company stock the Interborough-Metropolitan preferred dividend will be passed and the company, as a stockholder, will take its chance of getting something out of the Metropolitan Street Railway, along with the holders of the balance of the \$52,000,000 outstanding.

The Public Service Commission has adopted rules to be followed by all corporations coming under its jurisdiction, in the matter of making application for the approval of the issue of stocks, bonds, notes and other evidence of indebtedness. Practically everything pertaining to the financial standing of corporations is covered. The Commission has decided to order that the gas and electric corporations, in filing their annual reports with it, shall also include a statement relative to the manner in which each franchise stated to be owned by each company was acquired.

The Public Service Commission has passed a resolution approving the proposed subway improvement at Ninety-Sixth Street and requesting the Board of Estimate to issue bonds to the amount of \$850,000, the estimated cost of the work. The Commission also passed upon the form of contract which is to be given to John B. McDonald and the Interborough Rapid Transit Construction Company as a supplement to the original subway contract. The improvement, which will consist of the construction of three additional tracks, was approved by the Rapid Transit Commission before it went out of office. The approval of the Board of Estimate and Apportionment is necessary before the contract can be let. There is no doubt that the Board will approve the improvement. The next regular meeting of the Board will be held Sept. 20, but it is expected that a special meeting will be held before that time. The completion of the additional tracks is expected greatly to facilitate the handling of traffic in the subway. President Shonts of the Interborough-Metropolitan Company and President Bryan and General Manager Hedley of the Interborough Rapid Transit Company have testified that the subway is operated at present to its fullest capacity during rush hours, but that after the Ninety-Sixth Street improvement is made it will be possible to increase the number of local trains by 33 1-3 per cent and to increase the express service also.

The Public Service Commission in the Second District has issued a circular to railroad and street railway corporations embodying a copy of the law creating the Commission and also the freight and passenger tariff regulations prescribed by the Commission. If sufficient inquiries are received as to the application of these regulations the Commission announces that it will call a general conference at which opportunity for a discussion of all questions involved will be afforded. A feature to which the Commission directs attention is that joint fares over electric lines must in each instance be named in joint tariffs. All charges for baggage must be named by the railroads in tariffs filed with the Commission.

## THE CLEVELAND SITUATION

Through its attorneys, John G. White, Thomas H. Hogsett and Squire, Sanders & Dempsey, the Cleveland Electric Railway Company, as a resident and tax payer of the City of Cleveland, has requested City Solicitor Newton D. Baker, as the representative of the city, to bring injunction proceedings against the execution of the ordinance passed by the City Council on Aug. 3, which is intended to cure all the defects in ordinances formerly enacted, granting the Forest City Railway Company rights in the streets to build railway lines. In the communication to Mr. Baker, it is stated that the ordinance was passed in contravention to the laws and ordinances governing such action, that it is an abuse of corporate power and that its

passage was procured by fraud and corruption. Eleven reasons are given as to why suit should be brought in behalf of the city to prevent the execution of the ordinance that was passed at that time.

The communication states that the preparation of such a suit will probably disclose many other causes for its filing and reasons for the illegality of the ordinance. It is also asked that some haste be made, for the reason that the ordinance becomes operative on Aug. 15. Mr. Baker has refused to bring the suit requested, on the grounds that he does not consider these causes sufficient. The Cleveland Electric has opened the subject and given an idea of the ground on which the Forest City now stands, but will be forced to bring the injunction suit itself.

Charles S. Thrasher, of the Cleveland Construction Company, who owns five shares in the Forest City Railway Company, on Wednesday sent the officers a letter requesting the privilege of making an examination of the books and records of the company. President M. A. Fanning, of the company, replied that the officers would be glad to arrange a time for such inspection, either by Mr. Thrasher himself or his representative. Not to be outdone, City Clerk Peter Witt, owner of one share of stock in the Cleveland Electric, has made a similar request of that company.

Friday afternoon was set as the time for Thrasher and his attorney to examine the books of the Forest City Railway Company, but Secretary Alber called the meeting off, and suggested Saturday afternoon. The gentlemen were at the office, but Mr. Alber and Attorney W. H. Boyd, after a conference, announced that the books were at the office of the United Banking & Savings Company and could not be seen. They were promised for Monday of this week.

City Clerk Peter Witt went to the office of the Cleveland Electric Railway Company Saturday morning, accompanied by aids, with the intention of making an examination of the books. President Andrews told him to make himself at home and that he might examine all the books he desires and then publish his finding, if he so desires. In all probability he will have a job on his hands that will take some time, if he undertakes to investigate everything as closely as Mr. Thrasher had expected to look into the Forest City's affairs.

So far, Mr. Thrasher has not been granted the right to examine the books and accounts of the Municipal Traction Company, which is claimed to be only an auxiliary of the Forest City. Secretary Alber of the latter company and Attorney W. H. Boyd said they had nothing to do with the Municipal Traction Company and could not give them authority to examine the books.

The Isom injunction case, which involved the consents of property owners and which was decided against the Low Fare Railway Company in both the Common Pleas and Circuit Courts, has been taken to the Supreme Court on a petition in error. The claim that property owners have power further than merely to express their willingness to have a railroad in front of their property was vigorously attacked in this case. The low fare companies have advocated the idea that a property owner who gives consent for a railroad does not have power to express his choice of companies to build it. The court will not convene until October, so there is little chance of a decision until the first of next year any way.

It is possible that the railroad question will go into the campaign this fall, whether the leaders desire it or not. While no action has been taken on the report made by a committee of the League of Republican Clubs, it is said that various points have been under consideration. If a plank is made of the questions it is believed that it will include a division of profits of the company above 6 per cent on the actual investment with the city. Such a demand for a settlement of the matter is growing up that the election of Mayor this fall can hardly help but be based upon the stand the candidates take on it.

Although the ordinance re-enacting the grants to the Forest City Railway Company became operative Saturday, no attempt was made to take advantage of them on any of the streets affected. Most of the Cleveland judges are away on vacations and there could not be a better time for the company to get started, as it would probably be rather difficult to secure an immediate restraining order. In fact, some people have intimated that this is the reason for passing the ordinance at the time action was taken.



**NORTHERN ELECTRIC COMPANY**

The Northern Electric Company, which is building an inter-urban electric railway between Marysville and Sacramento, Cal., expects to have passenger trains in operation between those cities by Sept. 1. The distance between Sacramento and Oroville is about 90 miles, and it is estimated that the running time between these two divisions will be about two hours, the cars thus attaining a speed approximately 45 miles an hour. This will be lessened to a certain extent, however, owing to the fact that there will be at least ten stations between Sacramento and Oroville. Work in every department of construction on the railroad is being pushed, and it is expected that the work of ballasting and laying the third rail will be finished by Aug. 20. Already the first carload of freight has been operated over the line from Marysville to Sacramento.

As soon as the company's line is extended to Hamilton City, the 3 miles of roadbed will be replaced by permanent trestle work. In Hamilton City, a set of truck scales has been erected for the weighing of beets. On the completion of the road, hauling of sugar beets will begin and the work of building a permanent track will be completed before the rainy season. At present three grading outfits are at work, employing in the neighborhood of 200 horses and 55 men.

At a recent meeting of the California State Board of Equalization the officials of the Northern Electric Company explained the workings. The Northern Electric Company report shows 55.44 miles of track, valued, with the franchise and rolling stock, at \$126,895. There are 40.30 miles in Butte County, 14.09 in Sutter, and 1.02 in Yuba. The rolling stock is valued at \$22,000. The gross earnings are given as \$99,315.28, the operating expenses as \$61,303.44, and the net profits \$38,011.84.

It is reported at Woodland, Cal., that the Northern Electric Company has purchased the Vallejo & Northern Electric Railway interests. The latter road is the one which is planning to build a line from Vallejo via Suisun to Winters and Woodland, thence northward west of the Sacramento River to a junction with the branch line now being built westward from Chico to Hamilton City. The company will also build a branch line from Cement, near Suisun, to Sacramento. The latter branch will probably be the first part of the road constructed. The road has purchased the Niclas Building, at the corner of Main and Second Streets, in Woodland, for a passenger depot, and will have its power-house and switching yard probably further south on Second Street.

**AFFAIRS IN CHICAGO**

In rehabilitating its street railway properties the Chicago City Railway Company has spent \$683,604.69, according to the first complete certificate of expenses filed with the City Controller by the Board of Engineers. The certificate covers the months of February, March, April, May and June, and shows what credits shall be given the capital account of the street railway company. In this report it is shown that the company has earned \$95,178.28 brokerage and construction profit on the sum expended in rehabilitation. The report shows the following:

Actually expended .....	\$683,604.69
Residue of 70 per cent of gross receipts set apart for maintenance, operating and repairs.....	49,082.80
Balance .....	634,521.89
Brokerage and construction.....	95,178.28
Total to capital account.....	729,700.17

In getting the figures the engineers worked in two ways. Their field men made an "inventory" of the work done by the company and of the materials used, estimating the cost of each. Their auditors checked up the company's books and the items as disclosed by the field work were set against the items as shown by the investigation of the books. The board then took the two reports and endeavored to harmonize them. In instances where considerable variance was shown the work in the field and in the books was done over again, no figures of the company being taken without verification.

Bondholders of the West Chicago Street Railway Company have appointed a committee to act in their behalf in the reorganization of the Chicago Union Traction system. The bond-

holders oppose the traction settlement ordinance. The committee is composed of James N. Wallace, president of the Central Trust Company of New York; Hugo Blumenthal and Frederick H. Ecker. This committee has issued a circular stating that the terms of reorganization by the plan prepared by G. W. Wickersham and L. C. Krauthoff and indorsed by the arbitrators may destroy the value of the bonds, which now draw 5 per cent interest. The committee also states that bonds may be deposited with the Central Trust Company up to Sept. 16, 1907, in accordance with the terms of an agreement that will be ready for delivery at the office of the trust company within a few days.

Judge Grosscup, in the United States Circuit Court, on Monday, granted an appeal from his recent order directing that the properties of the Union Traction Company be leased to the Chicago Railway Company. The appeal will be heard on Sept. 5.

**SEPTEMBER MEETING OF THE STANDARDIZATION COMMITTEE**

W. H. Evans, chairman of the standardization committee of the American Street & Interurban Railway Engineering Association, has issued a notice that the next meeting of the standardization committee will be held in the offices of the American Street & Interurban Railway Association, 29 West Thirty-Ninth Street, New York, on Sept. 12, at 9:00 a. m., and will continue through Sept. 13, or until the report of the committee can be definitely decided upon. The subjects to be considered are: (a) standard axles, journals, journal bearings and journal boxes; (b) standard brake shoe and brake shoe head and keys; (c) standard section of tread and flange of wheels; (d) discussion of standard rail sections and special work as directly affecting wheel tread and flange.

The subjects will be considered in the order given, that is axles, journals, journal bearings and journal boxes will be taken up on Thursday morning, and in the afternoon, if that subject has been disposed of, subject (b) will be considered. On Friday morning the committee will reconvene at 9:00 a. m., to consider standard sections of treads and flanges of wheels. This meeting will be attended by P. H. Griffin, chairman of the wheel manufacturers' committee, which includes representatives of the various manufacturers of chilled cast iron wheels, and by E. Sidney Lewis, of the Standard Steel Works, who will act as chairman for the representatives of the manufacturers of steel wheels. At the same meeting the subject of rail sections and special work as affecting the section of wheel tread and flange will be taken up. Victor Angerer, vice-president of William Wharton, Jr., & Company, will act as chairman of the manufacturers of special work. In addition, the representatives of manufacturers, other than those mentioned above, will be present.

The chairman of the committee is especially anxious that all of the members of the committee should attend these meetings, as the time for holding the national convention is rapidly approaching and the report should be printed and circulated in advance of the convention.

**INCREASE IN WAGES IN ATLANTA**

An increase in wages of 10 per cent for motormen and conductors on the lines of the Georgia Railway & Electric Company, of Atlanta, is announced. The new wage scale is 16 cents an hour for the first six months of service; 17 cents an hour for the second six months; 18 cents an hour for the second year; 20 cents an hour for the third year; 21 cents an hour for the fourth year, and 22 cents an hour for the fifth year. The old wage scale was 16 cents an hour for the first year; 17 cents the second; 18 cents the third; 19 cents the fourth, and 20 cents the fifth year. The increase was announced at the regular monthly inspection of the men by Superintendent Hurt. Vice-President T. K. Glenn, who is manager of the railway department, also addressed the men, assuring them that the company appreciated their loyalty and their untiring efforts to co-operate with the officials for the good of the service. He had some remarks to make from the point of view taken by passengers, and requested the men to try and remember these things so that the public would have no cause for complaint.



## INCREASE IN WAGES FOR CONSOLIDATED EMPLOYEES

Details are announced of the new wage schedule for the Consolidated Railways Company's lines in New Haven which went into effect Saturday, Aug. 17. The chief change is that the men will get 25 cents an hour after they have been with the company for five years, or at the beginning of their sixth year, whereas formerly they did not get that much until their eighth year. Then, too, there is a provision that regular men, when called on for overtime work, shall be paid at least for an hour's work, though they may not work that long. Over an hour they will be paid for the exact time. The order provides for a rate of 21 cents an hour for first-year men, 21½ cents for second-year men, 22 cents for third, 23 cents for fourth, 24 cents for fifth, and 25 for all over five. Overtime will be paid for at the rate of 30 cents for all. The other provisions are as follows:

"Regular men who are ordered to report on the second half of their run later than their regular time will be allowed time from the time called for on their regular runs, but overtime will not begin until the time called for by their regular run has been worked.

"Regular men running into a car house, or a relief point, ordered to go directly to another car house to take out a car will be allowed time from the time at which they are ordered to leave their regular car houses, or relief point, and their time will stop when their car is run into the car house.

"Regular men who have finished their run will not be ordered to report for work unless they receive at least 1 hour's time.

"When men are held for orders or on the car so as to prevent their going to their regular boarding place for meals, the company will either furnish them a lunch check or a box lunch.

"Regular men breaking in new men will be paid regular rates only."

Wage schedules in Waterbury, Bridgeport, Middletown, Torrington and other cities are slightly lower than the New Haven schedules. For Waterbury the following schedule is announced: First year, 20 cents an hour; second year, 21 cents an hour; third year, 21½ cents an hour; fourth year, 22 cents an hour; fifth year, 23 cents an hour; sixth year and thereafter, 24 cents an hour. For Middletown and Torrington lines the schedule will be: First year, 19 cents; second year, 19½ cents; third year, 20 cents; fourth year, 21 cents; fifth year, 22 cents; sixth year and thereafter, 23 cents.

## AMERICANS AFTER OTTAWA TROLLEYS

American capitalists are reported to have obtained an option on the Ottawa Electric Railway, of Ottawa, Ont. The price named is \$3,000,000, in addition to floating liabilities of \$250,000 and a bonded indebtedness of \$500,000. The capitalization is \$1,000,000, and last year's net earnings were 18 per cent, out of which a dividend of 12 per cent was paid, the balance being carried to the reserve. The company's franchise has sixteen years to run, and at the end of that time the city has the right to take over the property at a valuation to be fixed by arbitration. Representatives of another American syndicate are inquiring into the terms on which the Ottawa Electric Light Company and the Ottawa Gas Company, now under one control, can also be acquired.

## CHARTERS AUTHORIZED IN CONNECTICUT TO THIRTEEN COMPANIES

An inventory of the work of the recent Legislature in Connecticut shows that charters were authorized to be issued to thirteen street railway companies with a total capitalization of \$8,000,000. The principal companies which were chartered are the Bridgeport & Danbury Electric Railway Company, the Danbury & New Milford Street Railway Company, the Danbury & Northern Electric Railway Company, the Meriden, Middleton & Guilford Electric Railway Company, the Norwich, Colchester & Hartford Traction Company, the Orange Street Railway Company, the Putnam & Rhode Island Street Railway Company, the Waterbury & Milldale Tramway Company, the Windsor Locks & Western Street Railway Company and the Windsorville & East Hartford Street Railway Company.

Several general laws relating to street railways were enacted. One of them provides that no electric railways shall be opened to public traffic until the operating company has first obtained from the Railroad Commissioners a certificate that the road is in a safe and suitable condition. Another act provides that when one railroad corporation is absorbed by or merged with another railroad corporation a sworn statement setting forth the facts and details of the transaction must be filed with the Secretary of State. Still another law requires that a street railway company shall supply reasonable accommodations for passengers and shall afford proper facilities for receiving passengers from and delivering them to other street railway companies. Another new statute provides that an employee of a street railway company through whose intoxication, misconduct or wilful neglect, loss of life or broken limbs are caused shall be liable to a maximum imprisonment for ten years.

## ATLANTIC CITY PAMPHLETS

The American Street & Interurban Railway Association is mailing to members of the association two pamphlets descriptive and illustrative of Atlantic City. They contain typical views of the resort where the convention is to be held this fall, with a list of the hotels and other information useful to the visitor.

## WHEEL GUARD TESTS IN MASSACHUSETTS

In connection with the testing of fenders and wheel-guards for street cars under the requirements of the Massachusetts Railroad Commission, the next step will be a test in actual service of a wheel-guard that is dropped into working position by the motor-man in making an emergency stop with the air brake. Brake and guard are so connected that although the guard remains suspended while the brake is making ordinary service stops, it drops to the rail level when the brake is thrown for an "emergency" stop.

The test of a wheel-guard composed of separate metal prongs, extending downward in front of the wheels in such a manner as almost to sweep the ground just in front of the wheels was a failure so far as the Boston & Worcester cars are concerned. In the apportionment of devices of different kinds this one fell to the Boston & Worcester Company. The experience is that the prongs strike the high spots in the roadbed and bend or crumple, rendering the guard of no practical value. While the Boston & Worcester speeds made the test a particularly severe one, the opinion was expressed that the same result would obtain if the device were tried on cars whose routes and speeds did not exceed those of city service.

The Boston & Worcester has now received a Hunter fender and trip wheel-guard, which it will try out on certain of its big cars. It has for some time been trying a high fender of the cowcatcher shape, formed of cordage net over a metal frame.

Cars of the Springfield system are trying, among others, a fender with tilting platform, which, though set with edge near the roadbed for ordinary service, is intended to tilt backward on striking an object, with the effect of lifting and holding the object clear of the rail.

In Boston the Boston Elevated Railway Company is making an extended trial of a fender consisting of a loop-shaped metal tube, hanging low in front of the forward end, and serving as the rim to a cordage net. In some cases the front of the car is also provided with an apron of thin metal strips, to deaden the impact if a person is struck. A trial is also being made of a device similar to the well-known Liverpool wheel-guard. The box around the running gear of the Boston cars, while it encloses the wheels completely in a manner intended to plough a fallen body clear of the tracks without allowing it to come in contact with the running parts, is exciting some adverse comment for the reason that it does not enclose all the truck frame and body supports. These projections, it is claimed, would be almost as dangerous to a person under the car as actual contact with the wheels.

Railroad Commissioner George W. Bishop, to whom the Massachusetts Railroad Commission has delegated the details of arranging for the tests, has recently been in Springfield and Worcester inspecting the operation of the different devices and noting results.



## STREET RAILWAY PATENTS

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

UNITED STATES PATENTS ISSUED AUG. 6, 1907

862,135. Automatic Trolley Retracting Mechanism; Henry B. Clarke, Highland Park, Ill. App. filed March 1, 1906. A spring drum and ratchet and means for actuating the same to pull down the pole when the trolley leaves the wire.

862,157. Aquatic Merry-Go-Round; Henry Healy, Buffalo, N. Y. App. filed Aug. 3, 1906. A special form of boat is guided through a circuitous waterway along which scenery is arranged in imitation of prominent places.

862,159. Trolley; Aaron Hill, Lynn, Mass. App. filed March 2, 1907. The pole has a hinged section at its upper end which moves upward to trip and drop the pole when the wheel leaves the wire.

862,186. Power Controlling Mechanism; William R. McKeen, Jr., Omaha, Neb. App. filed Dec. 19, 1905. Power controlling and speed-changing means mounted upon the car axle, a supporting frame mounted on said axle and levers pivoted to the frame adapted to respectively control the power-controlling and speed-changing means.

862,191. Trolley Wheel; Piatt M. Orlopp, Indianapolis, Ind. App. filed July 12, 1906. The spokes of the wheel are double springs so as to afford resiliency.

862,198. Suspension Means for Electric Motors; Charles A. Psilander, Pittsburg, Pa. App. filed Dec. 27, 1906. The combination with an axle, bearings thereon, a truck frame, means for resiliently supporting the same comprising members seated upon the bearings, a motor, and means for supporting the same comprising a frame having side portions that are seated upon the bearings and surround said members.

862,205. Mechanism for Controlling Air Brakes; Edward G. Shortt, Carthage, N. Y. App. filed March 6, 1902. Means for constantly supplying air to the train pipe and auxiliary reservoir until the pressure therein reaches a degree nearly equal to that required to effect release of braking pressure, the difference being readily supplied when needed from the excess in the main reservoir.

862,217. Combined Rail Chair and Joint; Harvey L. Toppin, New Castle, Del. App. filed March 19, 1907. A combined rail chair and joint comprising an integral member into which the ends of the abutting rails are inserted, said member embracing the base and web of the rails.

862,277. Spring for Trolleys and Harps; Ralph E. Noble, Chicago, Ill. App. filed Jan. 13, 1905. A spring for trolley harps comprising a bent strip of spring metal having a loop at one side and having perforations adapted to engage with the pin and axle of the trolley harp.

862,395. Car Switching Mechanism; Andre Hector, East Newark, N. J. App. filed Jan. 24, 1907. A wheel is mounted in advance of the car wheels, which wheel is adapted to engage a groove in the roadbed and compel the truck to swivel in the proper direction to take the switch.

862,441. Electric Controlling System; Charles P. Breese, Norfolk, Va. App. filed Aug. 11, 1902. A block signal system for electric trolley roads having a sectional trolley conductor and relay magnets operated by the passage of current thereto from the mains.

862,442. Electric Car-Controlling System; Charles P. Breese, Norfolk, Va. App. filed Aug. 11, 1902. Relates to modifications of the above.

862,582. Trolley Switch Frog and Pole; Augustus Neubert, Elizabeth, N. J. App. filed Feb. 15, 1906. A pair of laterally projecting rolls adapted to bear on the under surface of flat plates adjacent the trolley wire at turn-outs.

862,589. Automatic Electric Signaling Device; Avila J. Roy, Providence, R. I. App. filed March 9, 1906. A semaphore signal positioned by a circuit which is closed by a mechanical tappet adjacent the track rail.

862,607. Pleasure Railway; Arthur Bragg, Brooklyn, N. Y. App. filed Jan. 2, 1907. The car is hoisted to a high elevation and descends by a series of inclined trackways arranged one above the other, one end of each incline being upturned to stop the car and cause it to switch to the next incline, thus giving the car a forward and back movement.

862,701. Trolley Wheel; William H. Bradt, Schenectady, N. Y. App. filed Dec. 5, 1906. The wheel is laterally divided along

the line of the groove and the halves are spring-pressed together to afford better contact with the wire.

862,792. Brake; Paul X. Beaulieu, Presque Isle, Me. App. filed April 11, 1907. The usual brake staff wheel is provided with a lever extending beyond the periphery of the wheel so as to afford greater purchase.

862,798. Pleasure Railway; Arthur Bragg, Brooklyn, N. Y. App. filed Oct. 30, 1906. A framework of the "Ferris wheel" type is provided, to the axle of which, on both sides of the wheel, small wheels are attached which are adapted to run on a trackway. Means for operating the traction wheels and for operating the Ferris wheel through gearing from the traction wheels.

## PERSONAL MENTION

MR. R. H. CONOVER, secretary and treasurer of the People's Street Railway Company, of Nanticoke, Pa., is dead.

MR. D. P. BARNES, of Denver, Col., has been appointed assistant manager of the Berkshire Street Railway, of Pittsfield, Mass.

MR. J. D. GABOURY has resigned as manager of the Gadsden, Alabama City & Attalla Street Railway and lighting and ice plant of the same company.

MR. O. H. MURLIN, formerly auditor of ticket accounts of the Dayton & Troy Electric Railway Company, of Tippecanoe City, Ohio, has been appointed general passenger agent of the company, with offices at Tippecanoe City and Dayton, Ohio, and Mr. L. D. Johnson, formerly traveling freight and passenger agent of the company, has been appointed general freight agent, with headquarters at Tippecanoe City, Ohio.

MR. E. A. STURGIS, for the past two years superintendent of equipment, Boston & Northern and Old Colony Street Railway Companies, has tendered his resignation, to accept a position as master mechanic of the Rio de Janeiro Tramway & Power Company, of Rio de Janeiro, Brazil, of which Mr. Fred A. Huntress, formerly of Worcester, is general manager. Mr. Sturgis is succeeded by Mr. E. W. Holst, formerly superintendent of car repairs, Old Colony Street Railway Company. Mr. Sturgis is a member of the executive committee of the New England Street Railway Club.

MR. L. C. BRADLEY has been appointed general manager of the Eastern Pennsylvania Railways Company, of Pottsville, Pa., which controls the electric railway lines operating in and about Pottsville. Mr. Bradley formerly was superintendent of the Scioto Valley Traction Company, of Columbus, Ohio, from which he resigned to become connected with J. G. White & Company, of New York, who are syndicate managers of the Pottsville properties. Before becoming connected with the Scioto Valley Company Mr. Bradley was superintendent of the Seattle & Tacoma Interurban Railway.

MR. F. B. MALTBY, who has been connected with the Panama Canal work as principal assistant engineer to Mr. J. F. Stevens, has resigned to go with Dodge & Day, engineers and constructors, of Philadelphia, in the capacity of chief engineer. Mr. Maltby is a graduate of the University of Illinois, class of 1882, and in 1907 received an honorary degree from the same institution. He has had a long experience in railroad construction work, municipal engineering and irrigation work, and been connected at various times with the Wisconsin Central, Missouri Pacific, Great Western and Illinois Central Railroads.

MR. MARCY L. SPERRY has been appointed manager of the Savannah Electric Company, of Savannah, Ga., to succeed Mr. L. R. Nash, transferred. Mr. Sperry formerly was connected with Messrs. Stone & Webster, the syndicate managers of the Savannah property, being from May to November, 1902, with the auditing department of the firm in Boston. In the latter month he went to Savannah as purchasing agent of the Savannah company, remaining in that city until August, 1903. Subsequently he acted as first assistant treasurer and afterwards as manager of the Ponce Railway & Light Company. From February, 1906, to July, 1907, he was superintendent of Minneapolis General Electric Company.



## NEWS OF THE WEEK

## CONSTRUCTION NOTES

Items in this department are classified geographically by States, with an alphabetical arrangement of cities under each State heading.

For the convenience of readers seeking information on particular subjects, the character of the individual items is indicated as follows:

- \* Proposed roads not previously reported.
- o Additional information regarding new roads.
- † Extensions and new equipment for operating roads.

Numerals preceding these signs indicate items referring to:

1. Track and roadway.
2. Cars, trucks and rolling stock equipment.
3. Power stations and sub-stations.
4. Car houses and repair shops.
5. Parks and amusement attractions.

oENSLEY, ALA.—The Ensley Street Railway Company has let a contract to Smiley Sons & Company to build its extension on Avenue E and Twenty-Seventh Street to Ensley South Highlands.

\*HOT SPRINGS, ARK.—An ordinance has been passed granting Hayes Brothers, I. I. & Real Estate Company, its successors and assigns, the right to use Benton Street from its intersection with Cottage Street (West Side) to the city limits, for the building and constructing of a street railroad and erecting poles, stringing wires, etc., for the operation of same, and to operate electric street cars over said street.

oLAKEPORT, CAL.—The Sonoma & Lake County Railroad, which has been granted an exclusive franchise by the Lakeport Board of Trustees, is about to build an electric railway from Lakeport to Cloverdale, which will pass through Adams Springs, Highland Springs, Saratoga and Bartlett. The company will commence the construction of the line as soon as arrangements are completed for a connection with San Francisco. President A. E. Dickinson, J. F. Fulton, vice-president and general manager, and Engineer D. F. McIntyre are seeking to establish communication through the California & Northwestern Railroad or one of the other lines tapping their territory. Work will be commenced immediately the connections have been arranged. The line will cover a distance of 27 miles, the highest point traversed being the 1800-ft. altitude between Highland Springs and Pieta Creek, about 11 miles from Lakeport. The line will handle passenger and freight traffic and will cater to tourist trade. The company is composed of nine Lake County and Ukiah capitalists, who hold the entire 10,000 shares.

†LOS ANGELES, CAL.—The ship "Skogstad" has reached San Pedro harbor with a cargo of 2,000,000 ft. of oak lumber in logs, the first cargo of that kind of timber ever brought across the Pacific. The vessel was loaded at Mororan, Japan, and is under charter to the China Import & Export Lumber Company, of Shanghai. From the logs will be made 72,000 ties for Huntington's new electric lines. Construction work already under way will be hastened by the shipment. Lack of ties has delayed the completion of extensions and new work on several parts of the Pacific Electric system. The Huntington companies now are forced to depend upon the Orient for the major portion of their ties. W. Edwards, agent for the importing company, declares that this shipment of oak wood is the opening wedge for a business which will mean the importing of 10,000,000 ft. of lumber annually. Local agents will build a mill at San Pedro for sawing the oak logs for the market.

oMERCED, CAL.—The Yosemite Valley Railroad is about to start a survey over its entire line. For that purpose, the engineering crew which has for months past been stationed at El Portal has been ordered to report at Merced. The crew consists of eight men under Head Surveyor John C. Reeves. The actual work has commenced in Merced, and it is expected that it will be fully two months before the end of the line at El Portal is again reached. All minor defects along the line are to be corrected, the centers of all the bridges are to be lined up, mile posts will be established and section lines are to be located.

†PASADENA, CAL.—At a recent meeting there was presented to the City Council an application by the Pacific Electric Railroad Company for a double-track franchise on Colorado Street, in the business district of the city.

oSACRAMENTO, CAL.—The Sacramento & Lake Tahoe Railway Company has filed several notices of location in Placer County for water rights, dam and reservoir sites, etc., on the middle fork of the American River, for the storage of water for the generation of electric power. The railway will cross the American River near Folsom, and use the old railroad grade at the Owen King place, running east of Loomis and continuing up through Long Valley. It is expected that by another year the road will be in operation over the Sierras to beautiful Lake Tahoe.

†SAN BERNARDINO, CAL.—The Pacific Electric Railroad is rushing the completion of its system between Covina and Pomona, and it is said that plans are being made for the continuance of the line to San Bernardino.

oSAN FRANCISCO, CAL.—The bridge across the Pajaro River for the San Joaquin Valley Western Railroad is practically completed, and the work of laying rails will begin soon. The railroad company expects to have the road finished between Chittenden and San Juan within sixty days, although some trouble is being experienced in securing rights of way. A survey for the permanent line from Chittenden to Watsonville is to be made at once, and then a line will be surveyed from the San Benito River through Hollister to Fresno and Hanford. Information is given out that the Ocean Shore is to be pushed rapidly to completion.

oSTOCKTON, CAL.—The first cars over the Central California Traction Company's interurban line were run Aug. 5 as far as the Hildreth place, about 7 miles beyond Stockton. Two cars were put on the line, and they made thirty-minute trips. The line will soon be completed to a point about 3 miles from Lodi. Work on the new line is being rushed.

oDANBURY, CONN.—Frank S. Bishop, of New Haven, who is identified with the Danbury-New Milford Electric Railway, says that preliminary engineering will probably be the only work done upon the line before next spring. Mr. Bishop says the company will be formally organized soon, and plans for the construction of the road gotten under way.

†WILMINGTON, DEL.—The People's Railway Company has planned a new system for the Eleventh Ward, and has made application to the Board of Directors of the Street and Sewer Department for permission to build the proposed system.

†ST. AUGUSTINE, FLA.—It is understood that the St. Johns Light & Power Company expects to build about 5 miles of track during the next three months. It is said that the company will also purchase considerable rolling stock.

oBOISE, IDAHO.—The Boise & Interurban Railway has been placed in operation.

oBOISE, IDA.—The Boise Valley Electric Railway Company, which is building a line from Boise to Nampa, a part of which is already constructed and being operated, has just secured a franchise to run its line over the streets of Caldwell. This railway will connect Boise with Caldwell, going via Nampa and Deer Flat Reservoir, and thence over the Caldwell Interurban to Caldwell.

\*CHICAGO, ILL.—The Chicago & Interurban Railway Company, with a capital stock of \$100,000, has secured a license to incorporate. The road is to be constructed from Chicago south through Harvey, South Holland, Calumet, Thornton, Chicago Heights, Crete, to Joliet, Blue Island, Riverdale, Dalton, Hammond and other towns. The incorporators are: J. W. McGill, John W. Humphrey, Claude E. Fitch, L. E. Eaton, J. M. Miller, H. D. Moreland and Fred F. Myers.

\*SPRINGFIELD, ILL.—The Secretary of State has authorized the incorporation of the East St. Louis & Eastern Railway Company, with headquarters at East St. Louis, and a capital stock of \$2,500. The line is to be constructed from a point near Belleville in a westerly direction to East St. Louis. The incorporators are: L. C. Haynes, T. W. Gregory, G. C. Pierce, F. H. Thomas and F. H. Kruger.

oSPRINGFIELD, ILL.—A certificate has been filed with the Secretary of State of an increase in the capital stock of the Springfield Belt Railway Company from \$5,000 to \$500,000. This company is to construct a belt railroad from the interurban's line east of Springfield, to connect with the line south of the city limits, in order that it will not be necessary to run express cars through Springfield. The Danville & Eastern Illinois Railway Company certified to an increase of capital stock from \$5,000 to \$500,000. This road is to be built from Danville to Terre Haute, Ind.

†EVANSVILLE, IND.—The Evansville & Mt. Vernon Traction Company has decided to ballast the line between this city and Mt. Vernon with broken stone and make a number of betterments.

oNAPPANEE, IND.—The matter of underwriting the bonds in aid of the construction of the Nappanee-Syracuse section of the Fort Wayne & South Bend Interurban Railroad is progressing satisfactorily.

oNEV CASTLE, IND.—The concrete stack at the power house of the Indianapolis, New Castle & Toledo Traction Company has been completed. Work on the power house proper is nearing completion, and, after the laying of a few miles of rails, the line will be ready for operation.

oSOUTH BEND, IND.—The City Council has granted the Chicago, South Bend & Northern Indiana Railway Company the right to allow the Winona Interurban Company to come in over its local tracks, and within a week through service will be established between this city and Warsaw. The Wabash division will next be completed, thus enabling through connection between this city and Indianapolis.

†DES MOINES, IA.—The Des Moines City Railway intends to extend its line across the new Sixth Avenue bridge over the Des Moines River to Highland Park.



oMUSCATINE, IA.—A survey is under way for a projected electric railway to Davenport. It is reported that R. A. Roberts, of St. Louis, is the promoter.

oOSKALOOSA, IA.—The Oskaloosa Traction & Light Company has just contracted for the following apparatus: One 500-hp Buckeye cross-compound engine, one 300-kw G. E. three-phase alternator belted, one 200-kw 5000-volt railway generator; also switchboard, excitors and instruments.

oPARSONS, KAN.—The City Council has granted C. L. Brinser, representing Harrisburg (Pa.) interests, a franchise for a street railway line which is to be part of an interurban system. There will be two lines, one extending north to Chanute and Pittsburg and the other south to Altamont and Edna, and then on to Coffeyville. Work is to begin in sixty days, and the system is to be completed in one year.

oDANVILLE, KY.—The Danville Light, Power & Traction Company, which has been operating a lighting system in Danville for some time, is reported to be considering the construction of an electric railway and a line taking in Lancaster, Stanford, Hustonville, Junction City and Harrodsburg. Representatives of the Westinghouse Company have been in the city in the interest of the local company to prepare estimates of the cost of building the proposed system.

\*SOMERSET, KY.—The Somerset & Nashville Railroad Company has been incorporated, with a capital stock of \$10,000, to build an electric railway from Somerset to Nashville.

oALGIERS, LA.—It is promised that the first electric cars on the new line between Algiers and Gretna will be operated over the line Aug. 25. The work on the road is now progressing satisfactorily, and it is hoped it will be completed in the near future.

2-3-4LAKE CHARLES, LA.—It is reported that the Lake Charles Street Railway Company is actively engaged in erecting a brick car house 55 ft. x 150 ft., and a brick addition to its power station. The company has recently placed a contract for one 1000-kw Westinghouse steam turbine, to be delivered in September; also for two Brill semi-converter 28-ft. motor cars for October delivery.

oBOSTON, MASS.—The Boston Elevated Railway Company has filed plans with the Railroad Commissioners showing the proposed alterations of elevated stations due to the running of eight-car trains.

oSHELBURNE FALLS, MASS.—The Shelburne Falls & Colrain Street Railway Company has received the franchise from the Selectmen of Buckland for the proposed extension across the river from Bridge Street to the Boston & Maine station.

oEXCELSIOR, MINN.—The Minneapolis & St. Paul Suburban Railway Company has started work for the extension of the line to Birch Bluff, 2 miles. Geo. Turnham, of Orono, will do the grading.

oNATCHEZ, MISS.—The Southern Light & Traction Company proposes to relay its tracks with heavy rails.

oST. LOUIS, MO.—Extensive improvements are under way on the Hodiament branch of the United Railways Company system. The entire line from De Hodiament to Kirkwood will be practically rebuilt.

oBUTTE, MONT.—The Butte Electric Railway Company has recently placed contracts for the following construction work: East Centerville extension, Gallatin addition to city of Butte, 2½ miles, and the Silver Bow Park addition, all of which are to be finished by Oct. 1, 1907.

oRENO, NEV.—The rails and poles for the Nevada Interurban Railroad, which is being constructed from this city to Moana Springs, have arrived. The road leads to two suburban tracts and to Moana Springs, a popular resort 2 miles from the southern limits of the city.

oCATSKILL, N. Y.—The Catskill Electric Railway Company expects to build within the next five weeks about 500 ft. of track across the bridge over the Catskill Creek.

oDUNKIRK, N. Y.—The Buffalo & Lake Erie Traction Company is reported to be considering the construction of a branch from North East to Findley Lake.

oHEMPSTEAD, N. Y.—Arthur P. Heinze has been elected a director of the South Shore Traction Company, of Long Island. This company has obtained a new franchise from the Town Board and Highway Commissioners of Hempstead, L. I., and now has an uninterrupted chain of franchise from Patchogue, L. I., to the New York city line. The company proposes to enter the city of New York by way of the Fifty-Ninth Street Bridge. Among the other associates in the company are: James T. Wood, William P. Youngs, F. D. Kilburne and Paul T. Brady.

oITHACA, N. Y.—The Ithaca Common Council has granted a franchise to the Ithaca Street Railway Company for a double track. The feature of the franchise was a provision that tickets be sold six for 25 cents. Two months ago the company abolished a commutation-book rate of twenty-three tickets for \$1 and one hundred tickets for \$4.

oNEW YORK, N. Y.—As the result of a decision handed down in the Supreme Court by Justice Dayton, the Board of Estimate and Apportionment is prohibited from granting the application of the New York & Port Chester Railroad Company to alter its route to connect with that of the New York, Westchester & Boston Railway Company until the application for a permanent injunction brought by Robert E. Robinson, a minority stockholder in the latter company, is tried out, which will probably be early in the fall.

oPATCHOGUE, N. Y.—The Patchogue Village Trustees have denied the application made last April by the South Shore Traction Company for an electric railway franchise within this village.

oASHEVILLE, N. C.—It is stated that the Champion Fibre Company, of Canton, is interested in building an electric railway between Canton and Waynesville. The distance between the two places is about 10 miles, and the proposed line will run through one of the richest agricultural sections in Western North Carolina, with water power close at hand.

oFAYETTEVILLE, N. C.—It is reported that construction will begin immediately upon the line of the Fayetteville Street Railway & Power Company, from Fayetteville to Hope Mills, 7 miles.

oGREENSBORO, N. C.—Construction is reported to have begun on the electric railway to connect Greensboro with High Point and Winston-Salem. A. H. Jones, of Greensboro, has a contract for part of the construction.

oRALEIGH, N. C.—The Raleigh Electric Company, it is reported, may extend its line to Crabtree Creek, 2½ miles.

\*SALISBURY, N. C.—The New South Investment Company has been chartered to build and operate street railways, etc.; capital, \$5,000,000, but it may begin business when \$3,000 are subscribed. Those interested are Cornelius O'Connor, of New York; Frederick H. Payne, of Williamsport, Pa.; Dix W. Noel, of New York, and L. L. Gaskill, of Salisbury.

oSALISBURY, N. C.—The Board of Aldermen has granted a franchise to the Piedmont-Carolina Railway Company to build a belt-line railway from Newton Heights, in Spencer, to Irons Street, in Salisbury, and thence to a point near the new Fair Grounds.

\*GRAND FORKS, N. D.—J. L. Lambrecht, president of the Traction Securities Company, and Dr. Stewart, both of Minneapolis, are at work on plans for the incorporation of the Northwestern Interurban Railway Company, with a capital of \$1,000,000, for the purpose of building electric railways in Grand Forks and Crookston, an interurban line connecting the two cities, and a line eastward from Crookston to connect with the Soo. They propose to have on their board of directors business men of Grand Forks and Crookston, in order that the interests of the two cities may be properly represented.

oCINCINNATI, OHIO.—A committee of citizens of Bond Hill, a village of 2000, near Cincinnati, called upon President W. Kelsey Schoepf a few days ago and requested that he extend the tracks of the Cincinnati Traction Company to the town. Mr. Schoepf explained to them that the 2 miles of track would be a losing proposition to his company for some time to come. When the committee put up the argument that the road would develop the town and cause an appreciation in the value of property through the demand for it, Mr. Schoepf made a proposition to the effect that if the people of the town would organize a company, subscribe \$100,000 to the capital stock, which will be required to build it, he will operate it and assume all the duties of having it built, and that when it reaches a point where it will pay 6 per cent on the investment his company will take the stock at par. To show his good faith in the proposition he offered to take \$25,000 of the capital stock himself. The committee will report at a public meeting of the villagers.

oCLEVELAND, OHIO.—An announcement has been made by the Lake Shore Electric Railway Company to the effect that on and after Aug. 19 the purchasing for the Lake Shore Electric Railway Company will be done in the office of the general manager at Norwalk, Ohio, instead of in Cleveland, as heretofore. Purchases will be made over the signature of F. J. Stout, general manager.

oCOLUMBUS, OHIO.—The rails have all been laid on the London cut-off of the Indiana, Columbus & Eastern, and the work of ballasting will begin at once. It will probably be ready for use by Nov. 1.

oFINDLAY, OHIO.—The management of the Toledo, Fostoria & Findlay Railway Company has closed a contract with the Niles Car Company, of Niles, for four new cars, to be used when the extension to Toledo from Pemberville is completed. The cars will be very similar to those now in use by the company.

\*MANSFIELD, OHIO.—The Massillon, Wooster & Mansfield Traction Company has been incorporated, with a capital stock of \$10,000, by G. A. Bartholomew, W. C. Rhodes, O. Halm, J. H. Cousins and E. R. Lewis. The purpose of the company is to build and operate an electric railway between Mansfield and Massillon through Richland, Ashland, Wayne and Stark Counties.

oMARIETTA, OHIO.—The organization of the Muskingum Valley Traction Company has been completed under the laws of this State. The company is building an electric railway up the Muskingum Valley toward Zanesville, and it is thought that it will be completed as far as Beverly by next spring. The intention is to connect at Zanesville with the Columbus, Newark & Zanesville line of the Indiana, Columbus & Eastern, and thus complete the road to the river, and an east and west line between the river and Indianapolis. The roadbed is now being graded, and it is probable that the work of laying steel will be begun by Sept. 1.

oORRVILLE, OHIO.—James B. Meech, of Doylestown, is at work securing the right of way for the Orrville, Doylestown & Barberton Electric Railroad, and has reached the old Conrad homestead south of Marshallville. It is also said that the line will cross underneath the C. A. & C. Railroad north of Marshallville.



†TOLEDO, OHIO.—At a meeting of the City Council last week the ordinance granting the Lima & Toledo Traction Company the right to cross certain streets in the southern part of the city in gaining an entrance to the business district was referred back to the committee on railroads and telegraphs, in order that two amendments suggested might be considered further. One amendment will provide that inbound limited cars shall stop at some point between South and City Park Avenues. The ordinance provided for stops for local cars. The other amendment will be to the effect that if at any time within ten years the city shall decide to elevate the grade of the boulevard, South and Western Avenues so that they shall pass over the canal, and the tracks of the Lima & Toledo and the Clover Leaf Roads at a height of 10 ft., the companies shall lower their tracks and pay for the bridges and viaducts. This latter amendment imposes an element of expense that may be considered by the company before accepting the franchise as amended, since the City Council will have arbitrary power to make this change whenever it sees fit, without consulting the company about the matter. The original franchise provides for the separation of the grades at the points named within ten years.

1-2-3-4†TOLEDO, OHIO.—It is reported that the Marion-Bucyrus Railway & Light Company expects to place contracts during the next twenty weeks for the following construction work and apparatus: Twenty miles of roadbed and track, car house, power plant and equipment for same; also four passenger and one flat car.

oWELLINGTON, OHIO.—Right of way has been secured through Penfield Township, east of here, for the new Elyria Southern Electric Railway. This road has been laid out through Lorain, Medina, Wayne, Ashland and Knox Counties. The company has been incorporated by W. E. Elliott, W. E. Moser, F. N. Carpenter, J. M. Starr and F. L. Sargent, with \$100,000 capital stock.

3†PORTLAND, ORE.—The United Railways Company is reported to have secured water-power rights on the Upper Sandy River for the purpose of erecting an important new power plant.

oCOLUMBIA, PA.—Construction work on the Columbia & Manor Electric Railway is to be commenced shortly, in order to have the line in operation by Jan. 1, 1908. Stock books are about ready to close.

oCORRY, PA.—Preliminary surveys have been made for an electric railway from this city to Wattsburg and Findley Lake.

oDRAVOSBURG, PA.—The Council of Dravosburg passed an ordinance over the veto of Burgess J. H. W. Simpson, giving the Dravosburg Street Railway Company rights in the borough.

1-2-4†EASTON, PA.—Manager H. R. Fehr informs the STREET RAILWAY JOURNAL that the Easton Transit Company expects to build two steel and concrete car houses. One is to be built in Phillipsburg, N. J., and the other will be located at Sixteenth and Washington Streets, Easton. In addition, Mr. Fehr states that the company has recently placed an order with J. G. Brill Company for six semi-convertible cars, to be used on the Phillipsburg lines. A contract has also been awarded to T. M. Leshar, of Easton, to build an extension on Heckman Street.

4†GREENSBURG, PA.—A heavy electrical storm Aug. 9 wrecked the West Penn Electric Company's sub-station near Youngwood. The three-story brick building was racked from the foundations to the top, great cracks appearing in the walls, and the interior of the second and third floors was ignited by fire following the stroke.

oIRWIN, PA.—The Pittsburg & Westmoreland Railroad Company hopes to have cars running into Irwin by Sept. 1 and is doing everything possible to bring this about. When the connection is made at Bryn Mawr cars will run through to Irwin.

4†LANCASTER, PA.—The improvements to the Colemanville power plant have been finished, and the new 400-hp Westinghouse dynamo has been put into service, doubling the capacity of the plant, which supplies power to the York Furnace and the Lancaster Southern lines.

†NORRISTOWN, PA.—The Montgomery County Rapid Transit Company, which recently began operating its Lederochville & Pennsburg line between this city and Centre Point, expects to extend operations to Cedars in a few weeks. The ultimate terminus of this line is Souderton. The company is planning other important construction work in this county.

†ROYERSFORD, PA.—At a mass meeting of Royersford citizens last week a committee was appointed to confer with the officers of the Schuylkill Valley Traction Company regarding desired connections for an electric railway and the obtaining of power from the power house at Collegeville. The terminal of the road here will be at the corner of Second Avenue and Walnut Street. The line, when built, will give a direct line to Philadelphia.

1-2†SCRANTON, PA.—It is stated that the Northern Electric Street Railway Company will soon build a steel viaduct 500 ft. long, of 50-ton capacity; also 6 miles of rail and overhead construction. The company contemplates placing orders for ten double-truck combination smoking and passenger cars, with electrical equipment.

1†SPRING CITY, PA.—The Montgomery & Chester Electric Railway Company, operating an electric line between Spring City and Phoenix-

ville, has decided to erect a bridge over the Pickering Valley Railroad at Ironsides.

†SPRING GROVE, PA.—The Hanover & York Street Railway Company has agreed to put an overhead bridge over its line where the York and Hanover public road crosses it about a mile west of town.

3†STROUDSBURG, PA.—It is reported that the new power station of the Stroudsburg Passenger Railway Company is rapidly nearing completion. The company is planning to purchase a storage battery in the near future.

TARENTUM, PA.—A franchise has been granted the Tarentum, Sax-onburg & Butler Street Railway Company by the Tarentum Council.

†WAYNESBORO, PA.—The Chambersburg, Greencastle & Waynesboro Street Railway Company and the Blue Mountain House Company are negotiating the project of building an electric railway extension from Pen Mar to the Blue Mountain House and High Rock.

†WAYNESBURG, PA.—The franchise recently granted by Council to the Brownsville, Carmichaels & Waynesburg Street Railway Company has been returned by the company, which makes numerous objections to the various clauses in the ordinance. A meeting will shortly be held to consider the company's objections.

4†PROVIDENCE, R. I.—It is learned that a contract will be awarded this week for the construction of a car house on Social Street, in Woonsocket. The building is to be 495 ft. x 125 ft., and will be of mill type construction. The company has recently commenced work on a new car house on Thurber's Avenue, and is now working on plans for one on Academy Avenue, Providence.

†COLUMBIA, S. C.—The link in the electric railway operated by the Anderson Traction Company necessary to join Belton, Greenville and Anderson will be built at once. This statement was made by Wm. Elliott, Jr., general manager of the Columbia Street Railway Company and the Anderson Traction Company, upon his return from a trip to Anderson, where he went to have a conference with Engineer J. E. Surane. He states that work on the new line will be started at several points early in September.

\*MEMPHIS, TENN.—The Southern Memphis Traction & Light Company has been incorporated, with a capital stock of \$50,000, for the purpose of building and operating lines on several streets.

DALLAS, TEX.—The estimate made to the directors of the Dallas Interurban Electric Railway Company regarding the cost of construction of the road, by the engineers, places the figure at \$859,000. D. E. Waggoner is president of the company.

oMINERAL WELLS, TEX.—Major Beardsley has signed the contract with E. W. Barrows, secretary and treasurer of the American Engineers' Company, of Indianapolis, for the construction of the Fort Worth & Mineral Wells Interurban line. Work is to commence at once.

†ROANOKE, VA.—The Roanoke Street Railway & Electric Company, it is said, will build an extensive line in the southwestern part of the city.

\*KENNEWICK, WASH.—The Priest Rapids Railway has filed papers of incorporation with the Secretary of State at Olympia, declaring its purpose to build an electric railway from Kennewick to Wenatchee. The company is capitalized at \$1,000,000. The officers and incorporators are: W. R. Rust, president; M. B. Haines, vice-president and treasurer; E. H. Guie, of Seattle, secretary; H. K. Owens, engineer. The principal office of the company will be at Seattle. The route of the new road is down the Columbia River Valley almost on a straight line from Wenatchee to Kennewick. The distance is more than 100 miles.

†PALOUSE, WASH.—The Spokane & Inland Railway is now electrically equipped to this city. The Palouse depot is to be the largest on the line outside of Spokane, and will be built during the coming fall and winter.

oSEATTLE, WASH.—L. H. Griffith and other Seattle men are working on a plan for a complete system of subways for rapid transit in Seattle. Application will soon be made to the City Council for a tunnel through the hills of the city.

oVANCOUVER, WASH.—The Washington Railway & Power Company, which is building the street railway in this city, will complete the system here first and then extend the line to La Center, and immediately after build on to Orchards. The cost will be about \$20,000 per mile in the city and one-half that outside.

oGRAFTON, W. VA.—It is stated on reliable authority that the Grafton Traction Company will extend its line now building in this city to Blueville, the eastern suburb of Grafton. Rails, ties, etc., for the extension have already been ordered, and will be put down as soon as the line reaches the East End. Work on the street railway is progressing rapidly now that the workmen are on the paved streets in the west end of the city. Probably 1 mile of track is now laid. It is expected that the line will be in operation by not later than Dec. 1.

2†GREEN BAY, WIS.—General Manager G. W. Knox states that the Green Bay Traction Company will purchase four new cars between September and next spring.