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The Saratoga Conventions

This year's gathering of street railway men at Saratoga was exceptional not only because of the large number in attendance and the interest displayed in the proceedings, but because of the fact that three conventions were conducted at practically the same time. Saratoga possesses many attractions as a convention city, and the Hudson and Mohawk Valleys are especially interesting to electrical railway men. The parent organization was, of course, the principal factor, but the newer associations, comprising the Accountants' and the Mechanical and Electrical organizations, came in for their share of attention.

The list of papers prepared for the American Street Railway Association proved to be one of the most attractive that was ever presented to that organization, and the work of the several committees, as reported to the Association, showed exceptional care, and a very large amount of work and earnest thought on the part of the individual members. Vice-President Ely, who presided, owing to the unavoidable absence of President Hutchins, commended the committees for their earnest work and the excellent results shown by their reports. This recognition was well deserved.

In the meeting of the Accountants' Association the reports of the president, secretary and several committees showed that the organization has made considerable progress, and is now in a very flourishing condition. The secretary's report, however, emphasized the necessity for increasing the membership, and pointed out that representation in this Association was of vital importance to every operating company in the country, and that it was for the best interests of the industry as a whole that the companies should support and encourage the work in which the accountants were engaged. Vice-President Ely, of the American Street Railway Association, also referred to this feature in his opening address, and commended the results brought about through the persistent agitation of the accountants, which resulted in securing uniformity. The fact that financial interests throughout the country favored the methods advocated by the accountants, and the governmental recognition that had been extended to its work were subjects of much favorable comment.

Taken altogether, the meetings of each organization were thoroughly satisfactory in every respect, and the proceedings were conducted in a business-like manner, in keeping with the magnitude and character of the interests involved.

The Next Convention

There is undoubtedly a very strong sentiment in favor of selecting St. Louis for holding the convention in 1904. The principal argument in favor of going to St. Louis is, of course, that this will give all of the delegates an opportunity of visiting the Louisiana Purchase Exposition. It is needless to say that every member of the Association would like to make this trip next year, but it would be difficult for many of the active members to absent themselves from business for a week or more twice during the summer or fall, once to visit the Exposition and once to attend the annual meeting of the American Street Railway Association. There are other reasons, however, urging the selection of St. Louis as the convention city in 1904. Among them are the advantages to the entire railway industry of combining the meeting of the American Street Railway Association with that of the International Electrical Congress, as is proposed by the managers of the Exposition; while still a third argument is that St. Louis itself is an attractive city in which to hold a street railway convention, and those who attended the convention held in that city in 1896 will not soon forget the hospitality extended on that occasion.

There are, of course, arguments against the selection of St. Louis as the convention city in 1904; one is the crowded condition of the city at that time, another the possible difficulty of so arranging the programme of the Association as to combine the usual two or three-day sessions of the Association with the union meeting proposed by the International Electrical Congress; another that the exhibits at the Fair will be somewhat scattered, being divided between the electrical and transportation buildings of the Exhibition. We believe, however, that these difficulties are all of minor importance and that they can be so adjusted as to insure a satisfactory meeting in every

respect if St. Louis is selected. The subject will be thoroughly discussed before any decision is reached, and the advocates for St. Louis will undoubtedly have an opportunity of presenting the claims of that city. The sentiment so far expressed is in favor of its selection.

The Right of Way

Mr. Vreeland's paper before the American Street Railway Association, though short, points out clearly a phase in the relations between railway companies and the public which is often forgotten by both. The reason for the existence of the railway company is that it serves the public, and any obstacle placed in the way of its performing this mission is an injury to the public. Nevertheless, there often seems to be an idea in the minds of the authorities and the public in general that when an individual becomes a passenger on a street railway his interest as a member of the community ceases, or at least is subordinate to that of the portion of the public which is outside of the car. Statistics show that the street railways of the country serve a very much larger number of people than any other public utility in which electric power is used. This fact can be graphically illustrated by the statement that where the average number of times each person in this country uses the telegraph is twice a year and the telephone from forty to fifty times a year, the average man will ride sixty-three times on a street car; and where he spends $1 on electric lighting from central stations he spends $3.20 for transportation by electric cars. In the discussions which sometimes arise in regard to the service given and required of street railway companies, the position taken by the authorities and daily press often seems to be that any request made by the companies for additional terminal facilities, extensions or higher speeds should be regarded in the light of an attempt of the company to benefit at the expense of the city. The abutting property owner, the team driver and the needs of the city treasurer always figure conspicuously in discussions of this kind. The wishes and requirements of the public as regards satisfactory transportation service seem not worth considering. As Professor Sumner would say, the street railway passenger is the "forgotten man." Nevertheless, every inhabitant of each moderately sized city rides on the street cars on an average of from 100 to 200 times during the year, and as Mr. Vreeland clearly points out, from this standpoint alone a crowded car full of people should, by mere preponderance of the number of individuals which it contains, have a superior right of passsage to a vehicle with a single individual in it or to a van containing merchandise.

Type-M Control

The title of Mr. Mundy's paper, perhaps, sounded at first a little too much like an advertisement of one particular company's controlling apparatus to be in place on the programme of a national association, but the opening paragraphs abundantly explain why such a title was justified and also throw considerable light on the present status of train-controlling systems. As pointed out by Mr. Mundy, there has been a most complete abandonment by the manufacturing companies of the cylinder-type controller for multiple unit work, and the only train-control system about which particulars were available, which was being pushed on the market at the time the author prepared his paper, was the one mentioned in its title. Mr. Mundy points out the general defects of any system of control for handling heavy currents where the contacts and are-extinguishing devices are crowded too close together, and where the movement of the contacts is dependent upon the speed with which the motorman turns his controller, as in a cylinder, hand-operated controller. Attention is called to the fact that since the train-control systems have come into use they have also been adopted on locomotives and single-car equipments as well as for train control, although the train control feature will never be used in the new applications. They have been adopted in such places solely because of their ability to handle safely the large current necessary for electric locomotives and for heavy high-speed interurban cars. A number of interurban and elevated motor cars have been equipped with type-M control recently, simply for the reason that this form offers freedom from excessive trouble with controllers and places the bulk of the controlling apparatus under the car rather than on the platform.

Transferring Trucks in the Repair Shop

In the paper by Alfred Green on "Shop Practice" mention is made of one point in regard to the equipment and arrangement of new repair shops that is sometimes forgotten. This is the matter of providing facilities for removing the trucks of double-truck cars from under the car bodies for repairs. It is frequently desirable to take the truck from under the car body and substitute another in its place immediately. Mr. Green refers to the use of the transfer table for this purpose, which makes it possible to take the truck out sideways. In this way it is only necessary to raise the car body about 6 ins. in order to take a truck from under, which is considerably less time than would be required to run the truck out from under the end. If the road has a traveling crane the trucks can be picked up bodily and set down in any part of the shop desired, but very few roads, as yet, have traveling cranes spanning their shops. Another plan is to run the car over a truck elevator, which will lower the truck away from the car body. The old truck can then be taken off the elevator, and the new lifted into its place by the same apparatus. On a road which is constantly using the greater part of its equipment, so that there is only a small reserve, ability to change trucks quickly cannot be over-estimated. By always keeping a truck in good running order, ready to slip under any car upon which one of the motors may have become defective, it is necessary to detain the car but a very short time if there are good facilities for changing trucks.

Another matter of detail mentioned by Mr. Green which greatly adds to the neatness of the shops, to say nothing of saving time, is that of putting all loose parts away when the car is being repaired, rather than letting them lie around the shop floor during that time.

Improvements in Street Car Motors

Mr. Olds' paper on this subject puts in concrete form a number of the advanced ideas the author has advocated in street railway motor design for several years. As the double-truck car as a standard for city service was early adopted in Milwaukee, Mr. Olds probably felt the desirability of doing away with pit work sooner than a great many master mechanics, and he has been an earnest advocate of the type of motor which would be accessible from above for inspection and repairs. He does not believe that the quality of work done in the pit can ever equal that done on the open floor. Therefore, one of the principal features incorporated in the new motors which were designed especially to meet the ideas of the Milwaukee management, was a motor case which could be opened from above without disturbing the motor frame in the truck. The other improvements outlined by Mr. Olds and incorporated in these motors are, in general, a larger bearing surface for all wearing

parts, and oil lubrication, as a substitute for grease lubrication, used till recently on all smaller sizes of motors. These are all substantial improvements and will no doubt soon come into general use. We are enabled to present a complete description of these improvements in this issue, and we are sure that this article will be read with special interest at this time.

Care and Maintenance of Car Bodies

One of the strongest impressions gathered from reading the paper of C. F. Baker on this subject, is the thoroughness with which details are looked after in the assembling of car bodies in order that there may be no looseness in the joints or opportunities for moisture to creep in. "The painter should work hand-in-hand with the builder from the beginning to the finish of the car," says Mr. Baker. "The painter shall have one paramount idea in view, viz., durability." The highest degree of finish is not recommended, but rather that attention to the various coats which will give the longest life. The effect of moisture, when allowed to enter the frame work of a car, is said to be equalled only by fire and dampness. It is impossible to discuss in detail at this time the numerous points taken up by Mr. Baker, but his paper goes to show the great care given to all details, both in the construction and maintenance of car bodies on the great system at Boston.

A Good Begining

Beyond a doubt one of the most successful, useful and profitable gatherings of street railway men that has yet been held is the meeting this week at Saratoga of the American Railway Mechanical and Electrical Association. The proceedings of this infant association at its first convention have demonstrated beyond all doubt that the "Master Mechanics' Association," as it is familiarly known, is a great success, and that it will henceforth play the important part that such an association should in the development of the street railway industry.

Previous to the convention the fact that the American Railway Mechanical and Electrical Association was organized and prepared to do business, was perhaps not as well known among the street railway companies of the country as it should have been. Considering this, the excellent attendance at the very first session and the extended discussions, full of points of practical value to every company, were all the more encouraging. But after all it is not strange that the practical mechanical and electrical heads of departments of a road should be able to discuss matters pertaining to their departments better than the presidents and other higher officers of the companies who of necessity get much of their knowledge of these things second hand. It has been a matter of common remark for several years that the discussions on mechanical and electrical subjects in the American Street Railway Association meetings have been, with a few notable exceptions, woefully lacking in the exchange of experiences on practical details and methods of overcoming difficulties. Now that the mechanical men have gotten into a convention of their own, there is a free and profitable form of discussion which is productive of lasting benefit. This was amply demonstrated at Saratoga.

And now a word to non-member companies. This in an association that no live company which is looking out for its own interests can afford to stay out of. Neither can any master mechanic or electrical engineer of a road afford to remain off the association or personal membership roll, nor stay away from its conventions. To be sure, we are reporting the proceedings as fully as practicable in our columns, and those who cannot attend conventions and are not members can read them; but reading the proceedings cannot take the place of actual attendance at the convention. The "heart-to-heart talks," as they were jokingly called, where experiences and results obtained with particular kinds of goods were exchanged, were worth many dollars to those taking part in them, but for obvious reasons will never be seen in print.

Another commendable thing was the disposition of this new association to get down to business and stick to it. The junketing feature of conventions has to the knowledge of many kept down the attendance of those street railway men who believe that conventions should be for business purposes, and who do not care to spend the money and time involved unless results of practical value are discernable. We happen to know from certain plain talking at the sessions of the executive committee, as well as from conversation with many prominent men in the new organization, that it is to be conducted on the principle of "business first." That most of those in attendance were there with that idea in mind, the proceedings and the interest displayed amply demonstrate.

The new organization has made a good beginning and is entitled to respect, support and co-operation, and we believe that the railway interests of the country will respond in a way that will meet the expectations of those who have worked so hard to bring about these results.

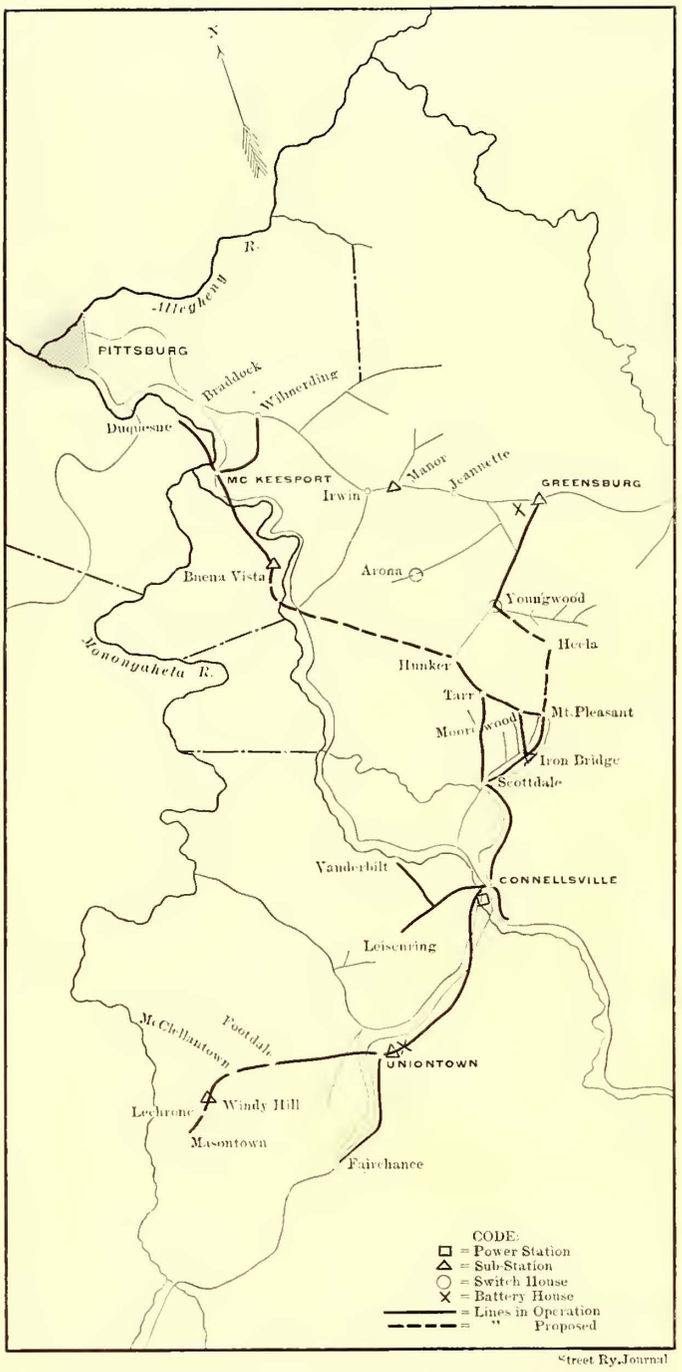
Shop Kinks

Mr. Adams' paper on "Shop Kinks," read at the convention of the American Railway Mechanical and Electrical Association, described a number of methods of accomplishing certain work peculiar to the shops of which he has charge in Baltimore. Some of these methods we know personally to have been adopted immediately, and with profit, upon their becoming known by the master mechanic of another large street railway company, which illustrates their practical value and the value of such papers. Experience has taught us, and we have tried to impress the lesson on others, that articles on shop kinks are always eagerly sought for and attentively read by progressive master mechanics. There is probably no class of street railway literature which is more appreciated or which leads to larger direct and immediate net returns in dollars and cents to those who make use of the suggestions. It is, of course, out of the question to expect any one man to give a large number of shop kinks in a convention paper, although Mr. Adams seems to have had a great wealth of material to draw from in his shops, but such a paper should cause others at the convention to "loosen up" in discussion, with the ultimate result of bringing out an immense fund of valuable knowledge on shop practice. It might not be a bad idea to follow the practice of the National Electric Light Association and start a question box, so that members can seek information during the year regarding the best way of accomplishing certain things, and also, in addition to answering the questions propounded by other members, give special ingenious methods used in their shops.

Among the features of Mr. Adams' notes to which especial attention should be called is the apparatus for revealing short-circuits in newly wound armatures. This apparatus makes use of an alternating field, and locates short-circuited coils easily and certainly. Mr. Adams' method of reinsulating fields, the wire of which is too heavy to be handled by the reinsulating machine, has been adopted with profit in other places. The other shop practices he describes are all well worth considering.

THE WEST PENN RAILWAYS AND LIGHTING SYSTEM

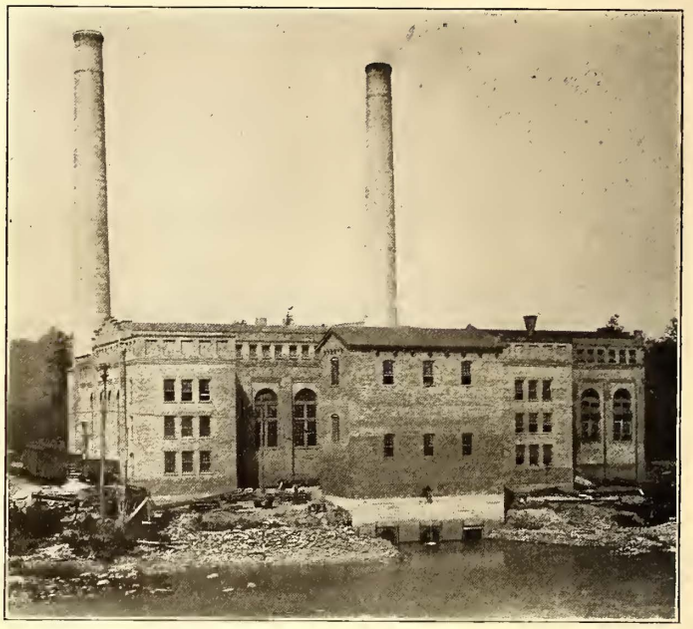
In many sections of the country there are mining and other industrial communities scattered over districts of 50 miles to 100 miles in extent, where the occupation and prevailing nationality of the inhabitants create a unification of interest both from a social and business standpoint. Especially is this true of the mining and coke regions of Middle and Western Pennsylvania. Numerous small towns, varying from 1000 to



MAP OF RAILWAY LINES OF WEST PENN SYSTEM.

10,000 inhabitants, constitute the nuclei of a larger distributed population, and in few cases have the more important towns failed to provide light and power, and, in some instances, railway plants for their exclusive service.

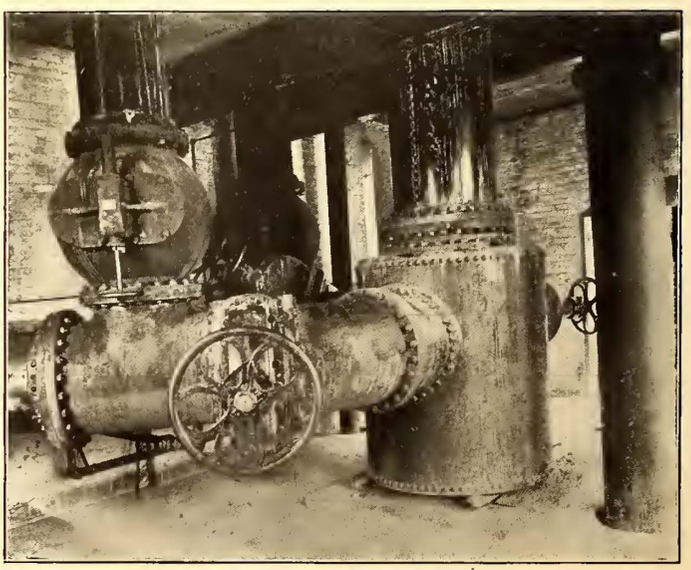
The system of the West Penn Railway & Lighting Company, in its scope and purpose, is a noteworthy example of modern practice in the rejuvenation of obsolete systems and the centralization of power stations. The forerunner of the present West Penn system was the Pittsburg, McKeesport & Connellsville Railway Company, the title under which the constituent railway companies now exist. It was originally intended to operate a line between the last two cities, and extend a line north to connect with that of the Pittsburg Railways. As the project grew, however, new opportunities arose, branches and extensions were decided upon, and, finally, local lighting was taken up in connection with the railway work, the company reorganizing for the purpose into the West Penn Railway &



MAIN POWER HOUSE, SHOWING TRANSFORMER HOUSE AND INTAKES

Lighting Company. The extent of the company's present operations may be judged from the fact that up to the present time four important railway power stations have been shut down, and at the completion of the lighting system and outlying substations three additional railway plants and eight lighting plants will have been discontinued, power for the entire system being supplied from one central power station.

The country in which the company operates is aptly termed the coke region, although many manufacturing interests are present. Important among these are the National Tube Works at McKeesport, and other large iron works, foundries, cast-iron pipe works and firebrick manufactories at several points in the



INTERIOR OF CONDENSER HOUSE

neighborhood of Uniontown, Scottdale, Greensburg and Connellsville. The towns in this territory are exceptionally prosperous, many of their citizens being men of large wealth and beautiful homes, derived from the sale of coal land to the Frick and other coke and coal companies operating in the district.

The road traverses the most populous district of Fayette and Westmoreland Counties, and the most important industrial section of Allegheny County, Westmoreland County being the fifth and Allegheny the second in population in the State. Six of the towns served aggregate, according to the census report, 65,000 inhabitants, ranging from 5000 to 35,000, and include two county seats, Greensburg and Uniontown. Twenty-four smaller towns, varying in population from 500 to 2000, are also served. The population tributary to the road is, however, much greater than is at first apparent from census reports, by reason of the large number of coke workers settled in the rural districts, and it is estimated that within a strip 2 miles in width on either side of the route there are fully 350,000 inhabitants who may be counted upon for patronage. In some districts an almost continuous community exists between towns, largely resulting from the topographical character of the country which confines the population within a narrow belt, through which the road runs.

RAILWAY LOCATION

The present railway property comprises three independent sections, which will be ultimately connected into one continuous or interconnecting system. Branches extend north of McKeesport and connect at Duquesne and Braddock, respectively, with Pittsburg Railways lines running into Pittsburg. This section and the former Greensburg and Southern Railway were operated independently until taken over by the syndicate. A short suburban line serving South Connellsville and outlying districts was also included in the system. The extensions now under way comprise a 15-mile line from Scott Haven to Hunker, completing the through line from Pittsburg to Connellsville; a branch from Mt. Pleasant through Hecla to Youngwood, thus connecting Greensburg with the main line, and a 2.9-mile extension from Lechrone, giving a southern terminus at Masontown.

The total length of single-track line at present in operation aggregates approximately 100 miles, half of which is through line. The extensions under way aggregate 25 miles, so that the completed road will consist of 75 miles of through line and 50 miles of city and suburban line. The greater portion of the route through rural districts is over private right of way, and in the present system but 31.6 miles operate on or along public highways.

The country traversed by the Pittsburg, McKeesport & Connellsville road is along natural water courses which are generally devious, and the location of suitable roadbed at times was found a difficult matter. Additional complications, arising from unavoidable intersection with present steam roads, including the Baltimore & Ohio, Pennsylvania and Pittsburg & Lake Erie, were met. For the greater part of its length the line parallels two, and sometimes all of these steam roads, which, in following the natural levels, have occasioned much difficult construction work for the electric line. Severe grades, in some cases as high as 10 per cent, have been encountered, especially in towns, and several curves of 50-ft. radius were occasioned by natural obstacles. The main section of the line, however, exclusive of towns, is well located, considering the geographical character of the country, which has proven serious, even to steam roads with their more favored locations.

THE ROADBED

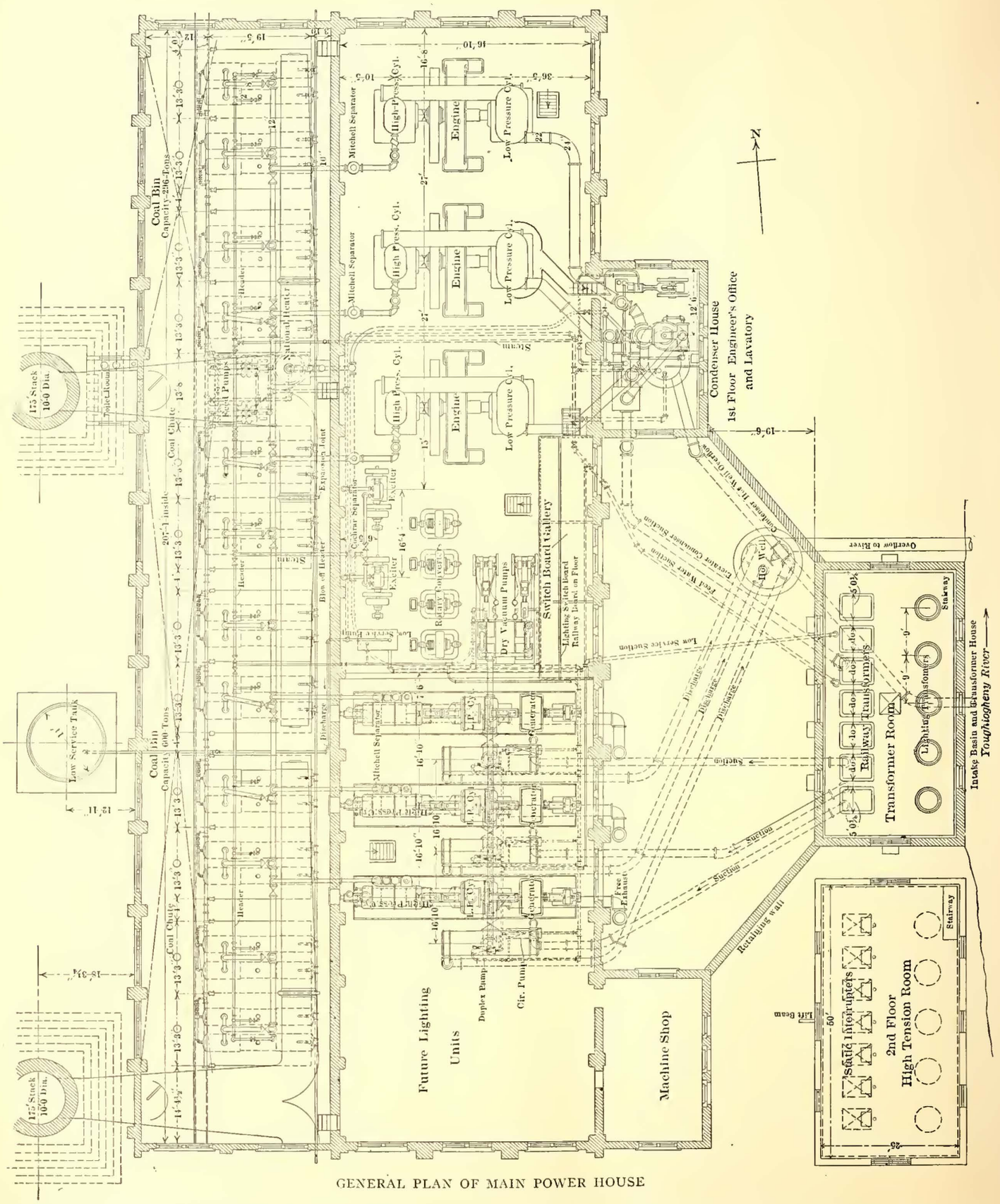
The right of way averages about 26 ft. in width, sufficient to accommodate a single-track line. Rock ballast was used where the material was available, and slag and cinder for the balance. The track is laid with No. 70 A. S. C. E. rail, on 8-ft. oak ties, with the exception of sections through towns where 7½-in. grooved girder rail is generally used, thus limiting the depth of wheel flanges to ¾ in. A 5-ft. 2½-in. gage is necessitated by the State laws framed for the purpose of facilitating vehicular traffic over city streets. Elevation of the outer rail occurs at all curves and easements are provided on all except very long radius curves. Flange guards are also used, consisting partly of standard rolled section bolted to the rail web, and partly of old T-rail, with special cast-iron separators. Spring switches are generally employed in the country, and tongue and mate switches through towns with solid frogs throughout. Some of these are of the cast-joint pattern furnished by the Indianapolis Switch & Frog Company. Wharton and Lorain special hard center work is otherwise generally used. The rails are bonded with 0000 Crown protected web bonds, compressed into ⅞-in. drilled holes, and cross-bonds are applied at intervals of 500 ft. All special work is completely shunted by copper cable running underneath the track, so that renewals may be made without opening the track return circuit.

BOILER ROOM, SHOWING SETTINGS AND COAL BUNKER CONSTRUCTION

Considerable bridge work was encountered, perhaps the most difficult being a short distance south of Connellsville, where it was necessary to elevate crossings of the Baltimore & Ohio Railroad and Pennsylvania Railroad tracks, and to make an

abrupt 90-deg. turn at the end of the bridge to avoid crossing a third set of surface tracks. The bridges are all of steel, and of the deck girder pattern.

The line is provided with turnouts at frequent intervals, the exact location of a number of which will be largely determined by future development in traffic and running schedules.



GENERAL PLAN OF MAIN POWER HOUSE

POWER EQUIPMENT

Previous to the incorporation of the West Penn system no less than a dozen plants were in operation within a 20-mile circle, centering at Connellsville. These furnished 550-volt current for railway operation and arc and incandescent lighting at numerous voltages and frequencies. The equipments were in many cases obsolete, although still serviceable, and flat rates for lighting prevailed.

The entire electrical separation of railway and lighting systems has been effected, but common distributing points have been adopted, and all apparatus is housed in the same buildings.

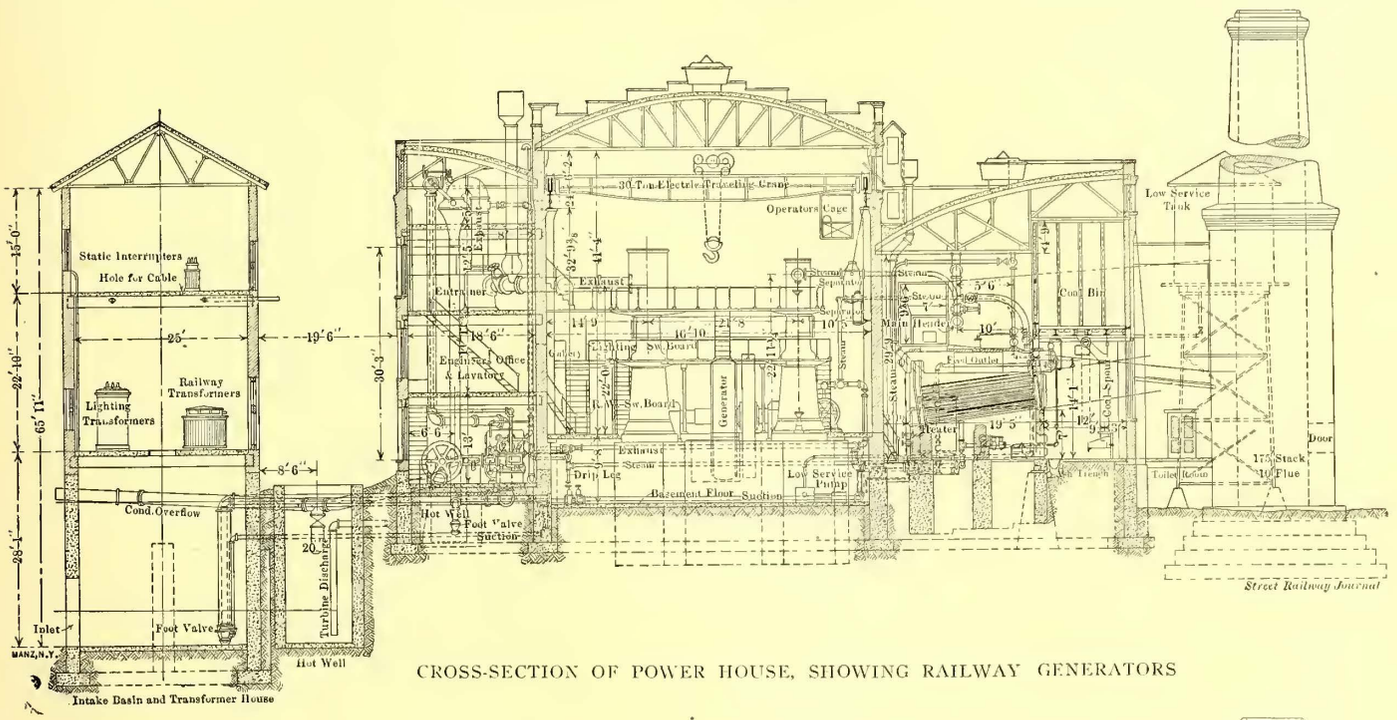
The power generating station, serving the entire district, is located on the banks of the Youghiogheny River, about 1¾ miles south of Connellsville, on the New Haven bank. The site furnishes excellent coaling facilities and mountain water supply, and is the logical electrical center of the system. Low-

tension, alternating-current is generated at the station, and high-tension alternating-current transmission at 22,000 volts is employed for both systems. The power is transmitted by pole line over a private right of way to the sub-stations, where the current is transformed at these points to the proper distribution potential, 650-volt direct current for railway, and 2200 volts, two-phase alternating current for lighting work. One of the rotary converter equipments is stationed at the power house and receives current at 390 volts, directly from the main alternating-current bus, thus avoiding the cost of a transformer equipment and maintenance of a nearby sub-station to supply the immediate district. Similarly, local lighting is furnished directly from the power station, the generators being wound for 2200 volts for this purpose.

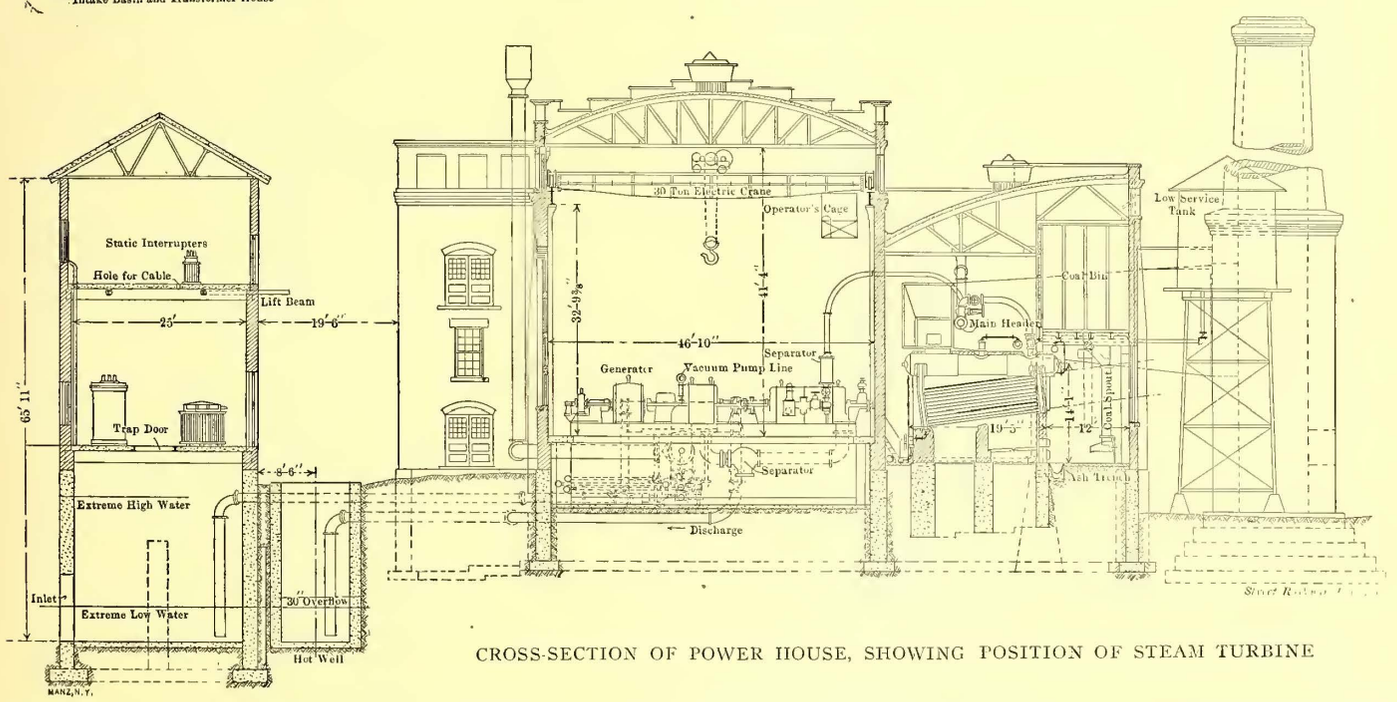
A feature of the lighting equipment is the employment of steam turbines in 1000-kw units. These were determined upon subsequent to the consolidation of railways and lighting interests, not only for their unique suitability for the lighting service, but particularly for the large saving in cost of power house extension.

Incandescent lighting is furnished entirely upon the 110-volt three-wire, alternating-current system, with ungrounded neutral and O. D.-type grouped transformers. Commercial lighting is also supplied from these mains through constant potential enclosed arc lamps. Constant current series enclosed arcs are employed for street lighting with 7½-amp. tub transformers, located in all cases in the sub-station. Primary distribution feeders are, in many cases, carried upon the railway pole line, where districts common to the two systems are served.

Power consumers are generally supplied with independent



CROSS-SECTION OF POWER HOUSE, SHOWING RAILWAY GENERATORS



CROSS-SECTION OF POWER HOUSE, SHOWING POSITION OF STEAM TURBINE

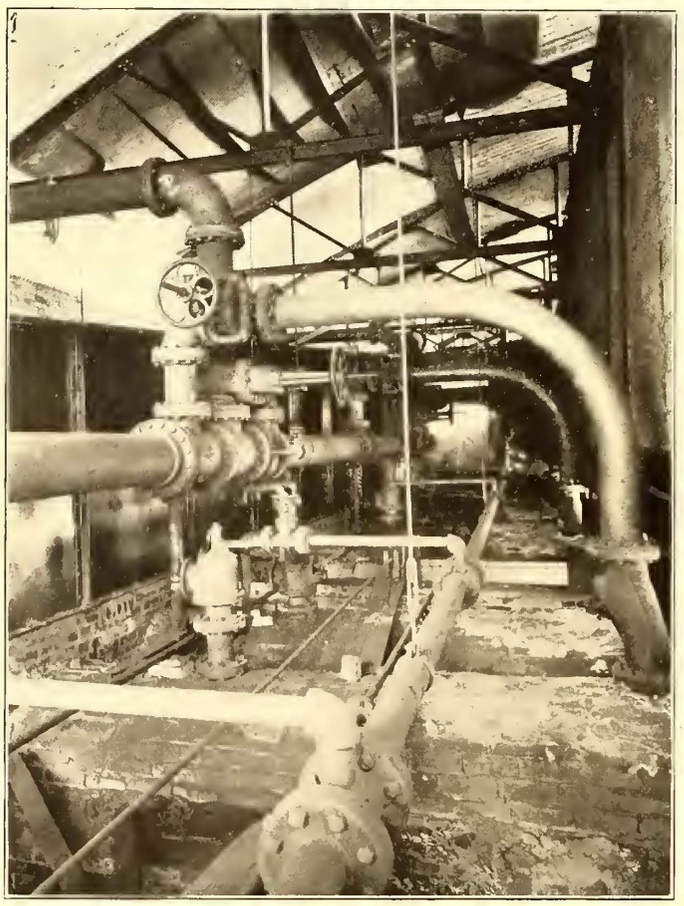
transformers, excepting in cases of small single-phase motors, of which a number are in service of both Wagner and General Electric type. Large motors are of the polyphase induction type, and one motor of 500 hp has recently been ordered to drive a mine air compressor. In such cases individual transformers and feeders will be used. In variable speed motor work, such as industrial haulage work, direct current will be supplied from the railway feeder system.

In addition to the sub-stations two high-tension switch houses are building upon the northern division through which the high-tension line will pass and the branches commence, thus permitting sectioning of the line in case of trouble. Two stor-

age battery stations are also in service. These were originally installed in connection with the former railway system, but are now highly effective in reducing the fluctuations of load at the two distant sub-stations at Greensburg and Uniontown. The stations are identical and are equipped with Gould type-S batteries, having a capacity of 320 amp.-hours at a 1-hour discharge rate.

THE POWER STATION

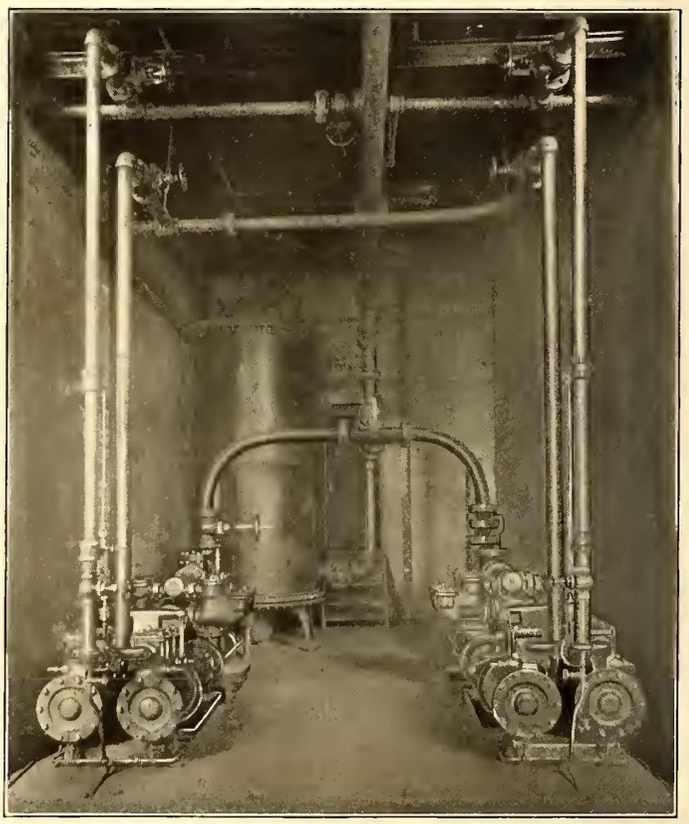
The power station in its present state has a rated capacity of 6000 kw, and an ultimate capacity of 8000 kw. The inside floor area is 165,000 sq. ft., or 15.4 sq. ft. per rated horsepower. It is fairly representative of advanced architectural and engineering practice, and, although erected and equipped at a cost of approximately $1,000,000, no unnecessary refinements have been indulged in, which in plants less favorably situated would have been considered indispensible.



HIGH-PRESSURE STEAM PIPING AND BIN CONSTRUCTION

The main part of the building is rectangular in shape, divided by an 18-in. brick wall into a boiler room 207 ft. in length by 35 ft. 3 ins. in width, and an engine room 207 ft. x 46 ft. 10 ins., the clear height to the lower chord of the roof trusses being 39 ft. and 41 ft., respectively. It is set back 65 ft. from the river bank, in order to make room for a high-tension transformer house, isolated from the main building. Upon the river side are two 18½-ft. x 30-ft. extensions; one containing the railway condenser equipment, engineer's office and lavatory, and the other a machine shop and tool room. The two chimneys are located outside and in the rear of the building. Fireproof construction has been employed throughout. The walls are of light brown brick, stiffened between windows with ornamented pilasters. Foundations are of concrete, resting upon hard gravel footings. Parapet walls are provided at each end, capped with sandstone flags and corbelled belt courses, cornices and blank windows to relieve the otherwise plain and monotonous exterior. The interiors are well lighted with large double-sash windows, with stone sills, the arch sash being operated from the floor through geared fixtures.

A row of smaller windows beneath the eaves facilitates the thorough ventilation of the building. Concrete and expanded metal construction is employed in roofs and floors, the basement floor being of plain concrete. The roofs are supported by latticed steel arched trusses and provided with Pancoast ventilators. A small extension to the boiler room beneath the stack flue serves as a lavatory and locker room for the firemen. An elevated coal bunker, 17 ft. in width and 14 ft. in depth, adjoins the rear wall of the boiler room above the top of the boiler settings. It is divided into two parts by the flue leading to the central chimney, providing a storage capacity of 300 tons and 600 tons for the railway and lighting plants, respectively. It is rectangular in section and constructed of concrete and expanded metal upon a steel framework. The engine room is spanned by a 30-ton 3-motor Cleveland plate girder crane. Both traverse and hoist are operated by electric power.



PUMPS AND HEATERS

The track is supported upon brick pilasters integral with those upon the outside of the building. Liberal future extension of the power station has been provided for, as is evident from the accompanying plan.

STEAM GENERATING PLANT.

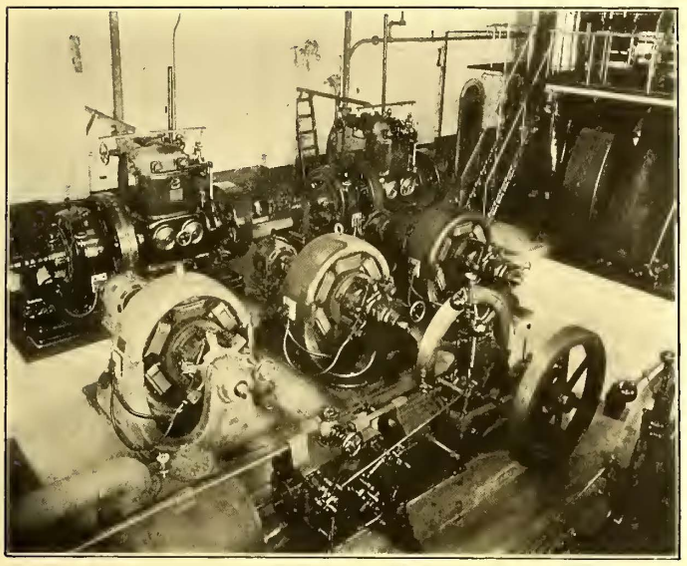
The boiler equipment aggregates 4800 hp, equally distributed between six independent batteries of two boilers each, all boilers being of the Geary water-tube type, rated at 400 hp, with 165 lbs. steam pressure. The boilers are supported independent of the brick setting, the front being hung from the steel bin structure and the rear resting upon a special footing in the rear foundation wall. The front of the settings are finished with white enamelled brick, thus improving the appearance of the room. All boilers will be equipped with mechanical stokers.

Coal is obtained from local mines over a Baltimore & Ohio spur track, and delivered at the power house at about 75 cents per ton. It is of the ordinary coking variety, used in the coke ovens, and averages about 13,500 B. T. U. per pound. A conveying system will be shortly installed, which will deliver directly into the bins. A spiral riveted chute, topped by a Hunt coal valve, will be installed in front of each boiler, delivering

coal to the floor in front of each boiler, as may be desired.

A concrete trough, covered by two iron gratings, runs in front of the ash pits, the full length of the building, sloping 5-16 in. to 1 ft. to a discharge opening at one end. When the trough is flushed with water ashes will be swept to the dump, where the water escapes to the river, and the ashes will be available for filling low ground or may be hauled away.

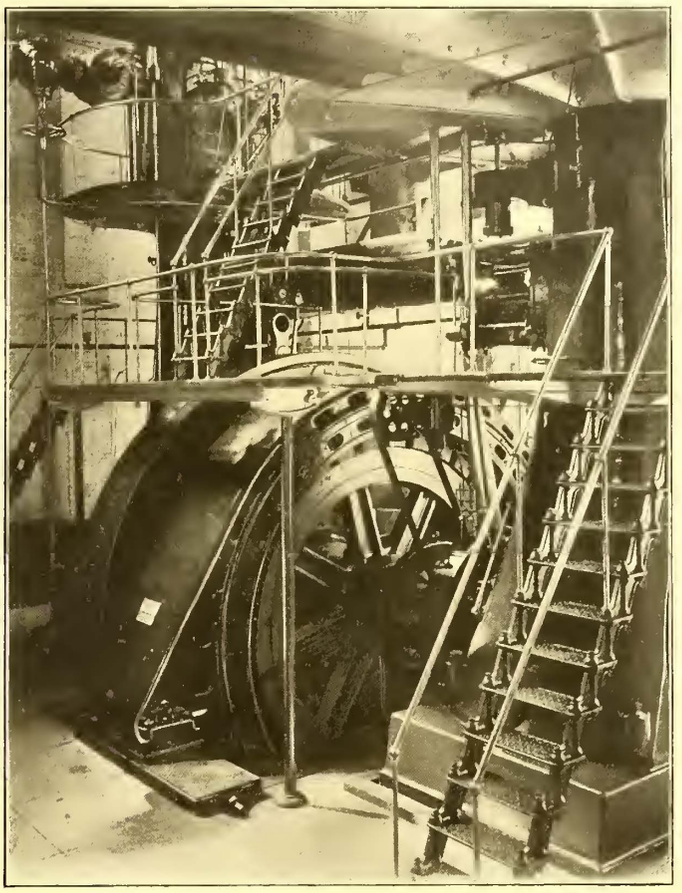
Draft is furnished by two stacks of Custodis radial brick construction, each 185 ft. in height, with a flue diameter of 10 ft.



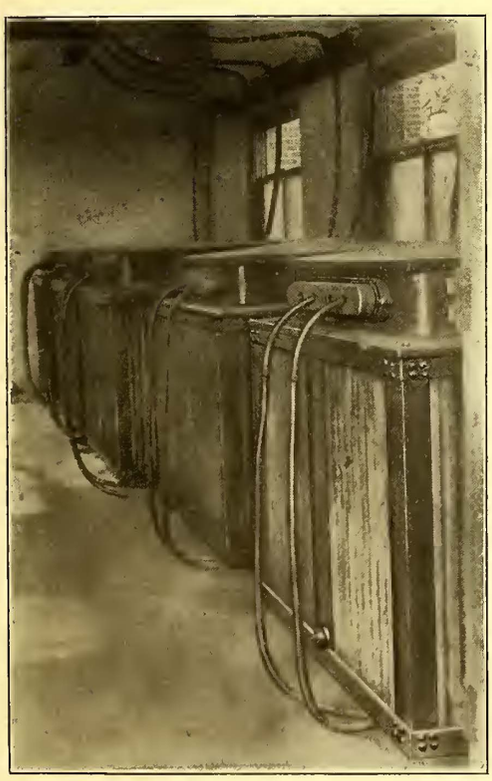
AUXILIARY APPARATUS IN ENGINE ROOM

Each stack is intended to serve eight boilers, and is connected to the settings by riveted sheet steel flues, a special expansion joint being inserted in each section. A Locke damper regulator operates the main flue dampers next to the stack.

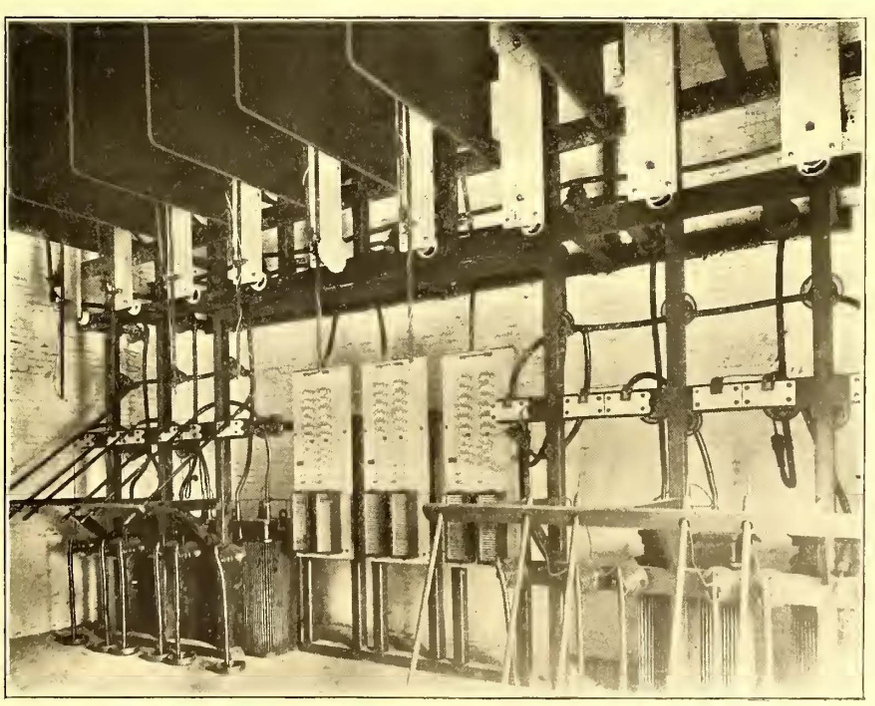
The water supply for all purposes except drinking is obtained directly from the river, and contains no scale-forming impurities. Feed-water is pumped directly from the condenser hot wells of the railway power systems, from a point 6 ft. below the water level. Duplicate connection is also provided to the general supply line through a duplex pump in the basement pumping from the intake well to an elevated tank in the rear of the building. This pump is kept floating on the line, and is automatically controlled by a pressure regulator. In the event of breakdown to the condenser a relief valve in the feed suction operates to transfer the suction to the general supply system. The feed pumps are in duplicate and are of the 12-in. and 7½-in. x 10-in. Worthington duplex outside plunger type. Each suction is provided with a short standpipe at the pump, serving as an air cushion to prevent water hammer. The pumps discharge into a 2000-hp National closed induction



ONE OF THE 1000 KW. UNITS IN MAIN POWER STATION



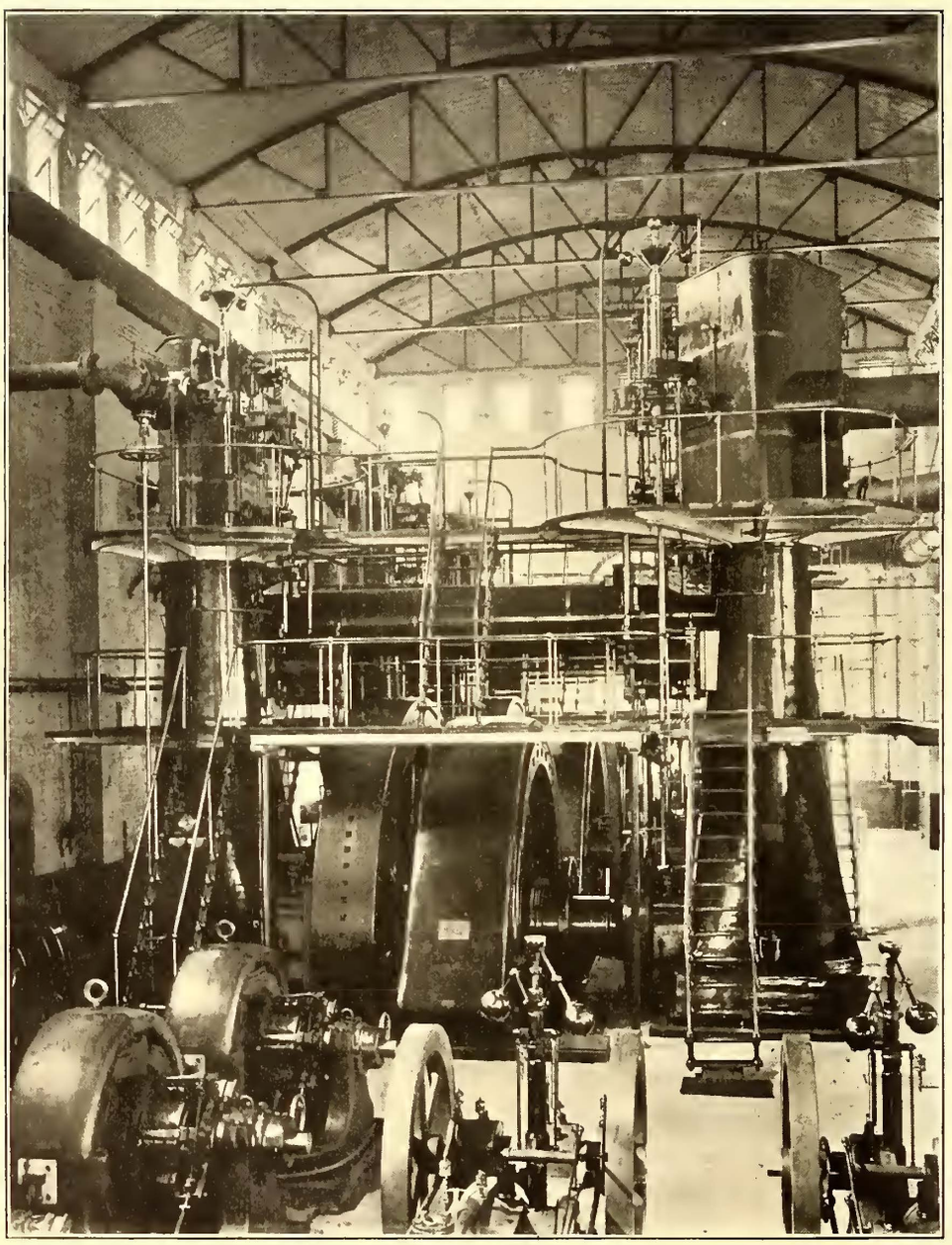
RAILWAY TRANSFORMERS IN UNIONTOWN SUB-STATION



HIGH TENSION APPARATUS IN TRANSFORMER HOUSE

heater, and thence into a 5-in. feed distributing main paralleling the boiler fronts. The heater is supplied with steam from the exciter engine and other auxiliaries, and may be by-passed if desired.

The high-pressure piping arrangement is well shown in the plan and sections of the power house. A 12-in. main and 4-in. auxiliary header, interconnected at both ends, run the length of the boiler room. The main header is sectional at each battery to provide for the isolation of a defective portion. It is suspended from the roof trusses and anchored at the middle point of the main sections, expansion being absorbed



ENGINE ROOM IN MAIN POWER HOUSE

by long radius bends to boilers and engines. The auxiliary main is tapped into each boiler drum beneath the safety valve, so that a continuous steam supply to all auxiliaries is reasonably certain. The entire high-pressure piping, together with valves and separators, is drained by a steam loop and Holly gravity return system, which returns the condensation to a main in the rear of the boilers tapped into each manifold. The piping was installed by W. K. Mitchell & Company, and is of standard full-weight pipe, with extra heavy flanged fittings screwed and peaned over 4 ins. in diameter. Chapman bronze seated valves are used throughout, all above 4 ins. being of the outside screw and yoke pattern, and all 12-in. valves by-passed. All joints are made steam tight, with corrugated copper gaskets and piping insulated with 85 per cent magnesia covering molded on pipes under 4 ins., and applied in strips wired in place and covered with a canvas jacket on pipes over 4 ins. in diameter. The entire piping system is sectioned so that the two sections supplying the railway and lighting units, respectively, may be isolated for purposes of conducting performance tests.

ELECTRIC GENERATING PLANT

The railway equipment comprises three units, and occupies the entire north end of the engine room, and consists of three 28-in. and 56-in. x 48-in. 1550-ihp Allis-Corliss vertical cross-compound engines, direct-connected to 1000-kw Westinghouse 390-volt, 25-cycle, three-phase generators of the revolving field type. The units operate at 94 r. p. m., and run in parallel, with common bus-bars. They are synchronized by means of a motor actuated sliding weight gear upon the governor lay-shaft, controlled by a double-throw switch upon the switchboard. An automatic speed limit device, controlled by an auxiliary governor, operates at a predetermined speed a quick-closing butterfly valve in the steam line. The engines are each provided with reheating receivers between the high-pressure and low-pressure cylinders, supplied with live steam from the throttle. The generators are excited by a duplicate set of Westinghouse exciter units, each consisting of a 62½-kw, 125-volt generator, direct-connected to an 11-in. and 19-in. x 11-in. compound engine, either unit being able to furnish the necessary exciting current for the railway plant.

The condensing plant consists of a 30-in. Worthington barometric jet condenser, with auxiliary vapor cooler, exhausted by an independent rotative dry vacuum pump. The condenser will handle 20,000 lbs. of steam at 27-in. vacuum, with injection water at 70. It is supplied by a 16-in. and 25-in. and 26-in. x 18-in. duplex compound pump.

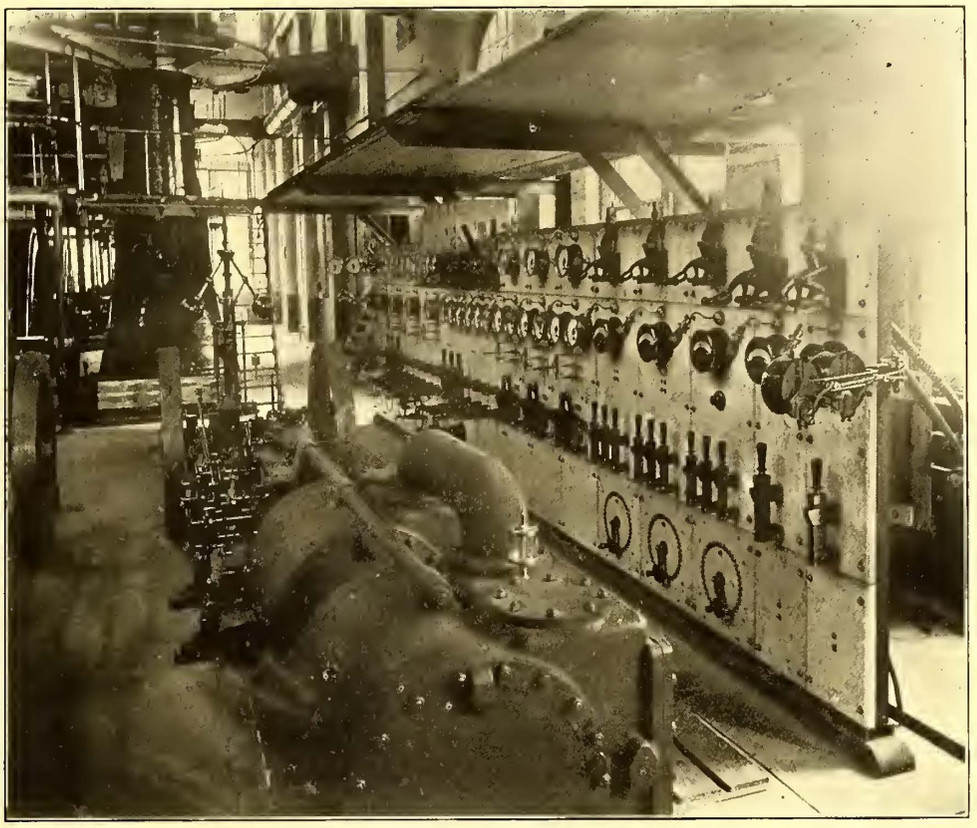
The condenser operates upon all three railway units, the three 24-in. exhaust lines from the latter converging to a central entrainer, piped to the condenser cone. A 25-in. Blake relief valve and gate valve are inserted in each engine exhaust line. The condenser tail pipe is sealed in a 6-ft. x 9-ft. elliptical hot well, divided by a central brick partition, which serves to preserve the seal in the event of loss of water in the main compartment. Provision has been made in the exhaust piping system for operating any or all auxiliaries upon the jet condenser, if found desirable. This feature has proved very satisfactory in the care of turbine-driven circulating pumps.

THE STEAM TURBINE EQUIPMENT

The lighting equipment comprises three 1000-kw Westinghouse turbo-generating units, each provided with an independent surface condenser outfit, arranged for high vacuum. With this arrangement the returning of hot condensation to the boilers thus becomes feasible and the condenser discharges are consequently piped directly to the feed-water suction.

The turbines are of the so-called compound, or tandem cylinder type, which at present is adapted by the builders for

machines above 400-kw capacity. Three units will be installed, one of which is now in place. The turbine operates at 1200 r. p. m., and is direct-connected to a 1000-kw, 6-pole, 2200-volt generator of the revolving field type. The unit is mounted upon a continuous bed-plate, sectioned at the center, the two parts being tongued and grooved and secured by interior bolts. As no vibration or jar is incident to the operation of the turbine, a comparatively light foundation is required, and holding-down bolts are entirely dispensed with. The foundation consists of two battered concrete walls, carried from the basement to the engine room floor level. These walls vary in thickness from 24 ins. at the top to 36 ins. at the bottom, and the space inclosed is utilized for the pipe connection between cylinders, and for the exhaust leading through the building wall to the roof level. In order to provide for linear expansion of the turbine casings, each cylinder is anchored to the bed-plate at one end only, the supporting pedestal at the other end being arranged to slide upon surfaced ways. This end motion as transmitted to the shaft is absorbed by flexible couplings inserted between cylinders, and between the low-pressure cylinder and the generator, respectively. The use of these couplings also prevents shaft stresses, due to possible misalignment and facilitates shipping by dividing the unit into three sections.

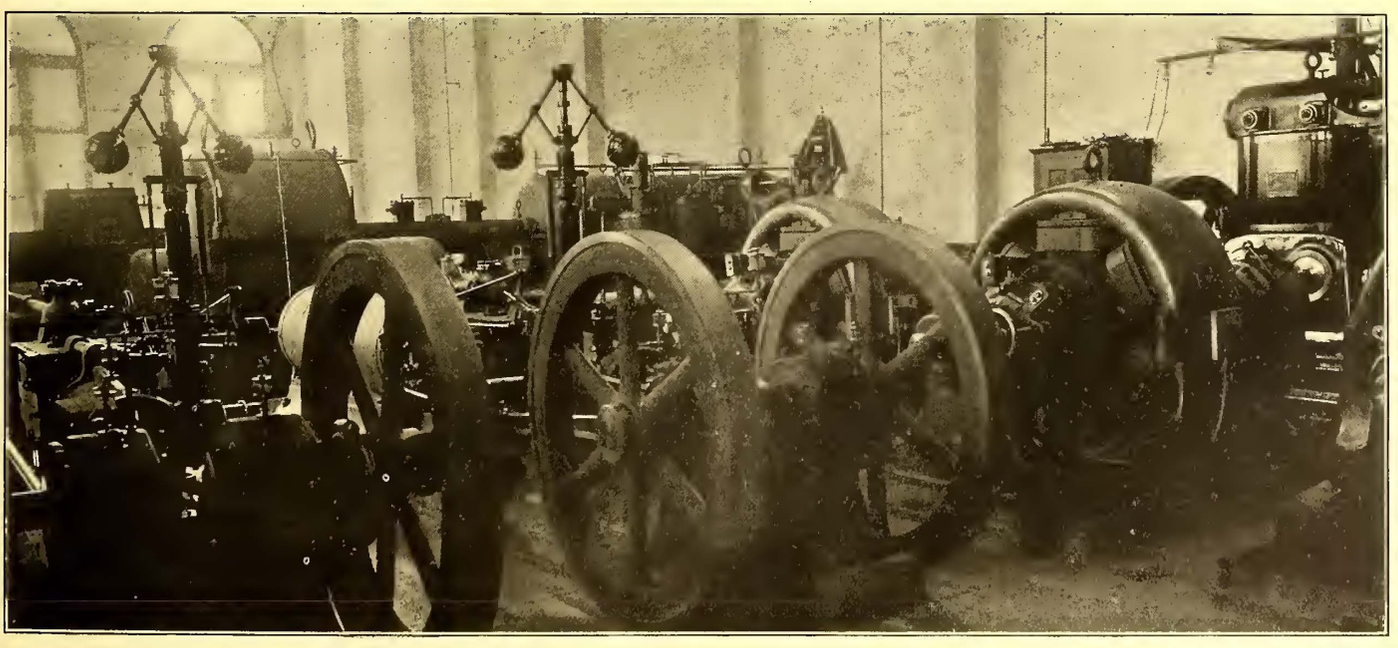


RAILWAY SWITCHBOARD IN MAIN POWER HOUSE

The turbine receives steam through a long radius 7-in. pipe bend from the main steam line, initial condensation being abstracted at the turbine by a special superheater fired by natural gas. Steam then passes successively through a quick-opening throttle, hand throttle, strainer and poppet admission valve into the first expansion stage of the turbine. The strainer has a removable perforated sheet steel pocket which serves to eliminate foreign matter from which turbine blades might receive injury. The admission valve, being nearly 1 sq. ft. in area, is not actuated directly by the valve gear, but by a small auxiliary cylinder, connected through a relay valve to the high-pressure steam. The relay is controlled through simple link work by the sensitive centrifugal governor mounted at the end of the high-pressure cylinder and driven from a worm gear on the end of the turbine shaft. This valve gear is directly actuated by a reciprocating lever and admits to the turbine short puffs of steam under maximum boiler pressure at a frequency of about 150 strokes per minute.

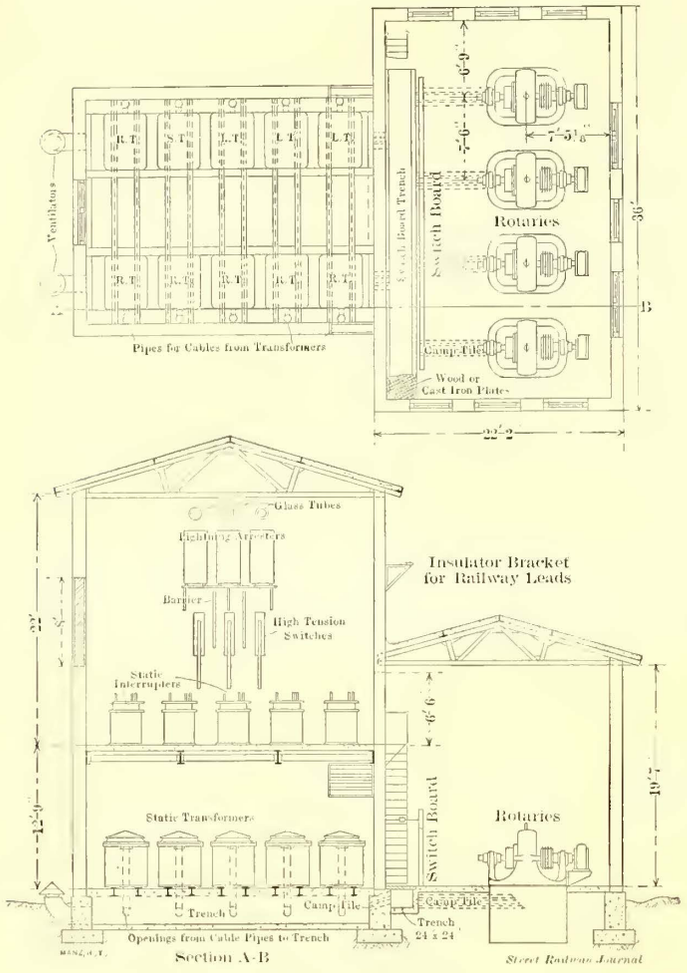
The method of governing involves a variation of the period of admission as determined by the position of the governor weights, this governing motion being superposed upon that of the reciprocating gear. A speed limit attachment is also used.

In anticipation of the accidental breaking of the vacuum or of fluctuating loads momentarily exceeding the normal capacity



ENGINE ROOM, WITH TURBINE IN BACKGROUND

of the machine, an automatic by-pass between two adjacent stages of the high-pressure cylinder has been provided. This device is actuated by the internal pressures of steam at the second stage in question, and serves to admit high-pressure steam



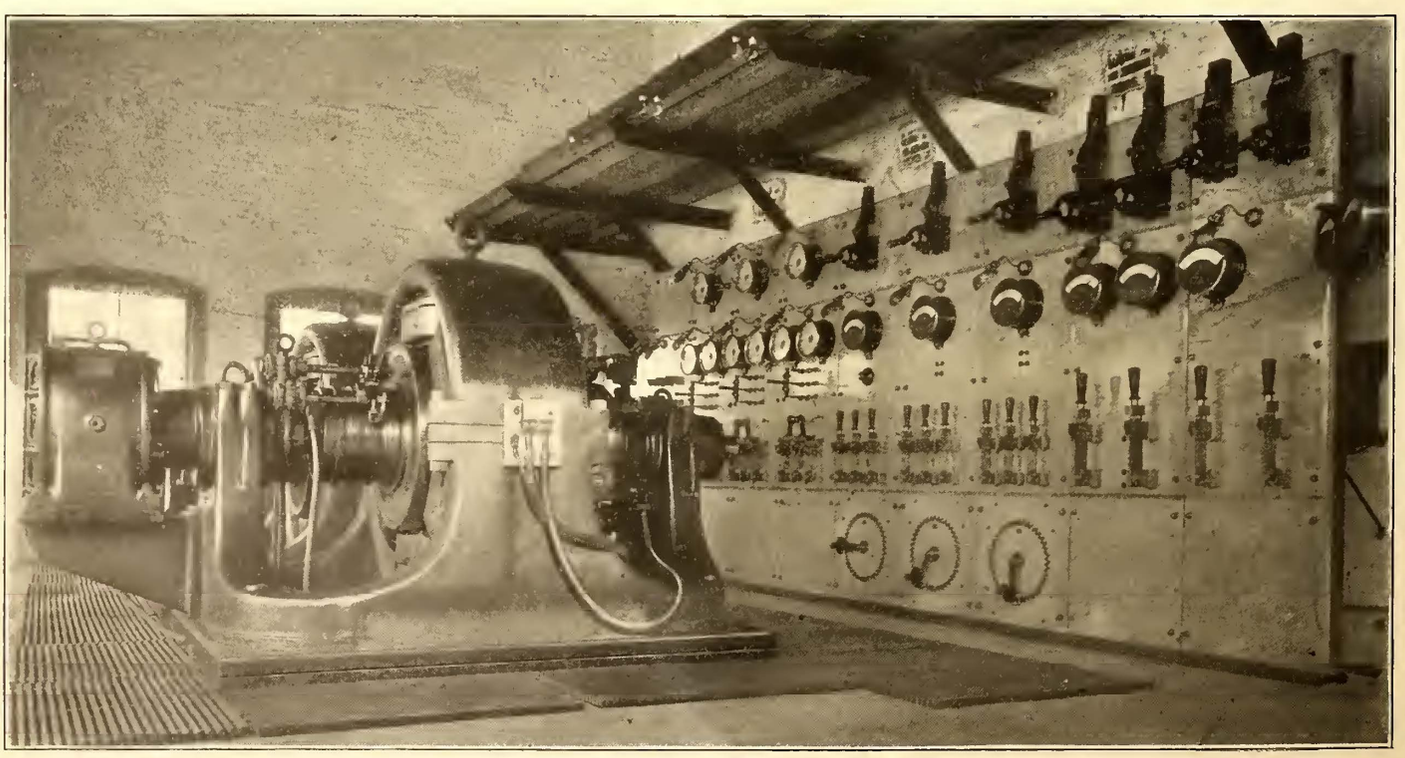
TYPICAL SUB-STATION

to the secondary stage, thus increasing the capacity sufficiently to sustain the overload. A visual index upon the side of the cylinder serves to indicate the position of the by-pass piston at all times.

All journals are of the concentric type, and have been designed with sufficient bearing surface to obviate the necessity of forced lubrication. An oil pump is employed to elevate the lubricant to a small storage tank, surmounting the end journal cap, and the resulting static head is employed for flushing the journal shells. The oil upon its return passes through a copper coil cooler, and thence into a reservoir, both located in the bed-plate of the turbine. It is then pumped to the elevated tank and the cycle of operation is repeated. The permanent adjustment of axial clearances between moving and stationary parts is maintained by thrust bearings, each constructed in two parts independently set up by set screws. The final adjustment is made during motion by means of sound transmitted through the casing to the ear. Both cylinders are heavily lagged with asbestos covering, retained by sheet-steel casings and polished steel retaining bands.

The turbo-generators are constructed particularly for direct connection at high speed, and are consequently of considerable length, but small diameter. The field is of steel, of high tensile strength, in which the copper bar winding is embedded. The armature winding is of the multi-coil or subdivided type, retained in position by the projecting teeth of the laminated core punchings. Thorough ventilation is provided by the fanning action of the field, the heated air escaping through radial ducts between punchings and frame. Exciting current is furnished by a 37½-kw compound-wound machine, driven by a turbine, as previously mentioned.

The condenser consists of three 4000-sq. ft. Alberger counter-current surface condensers, served in common by a duplicate set of two-stage rotative dry vacuum pumps. These are 10-in. and 24-in. x 24-in. machines, fitted with Corliss valve gear. Circulating water for each condenser is furnished by a centrifugal pump, driven by a De Laval steam turbine, exhausting into the auxiliary line leading to the heater. Sixteen-inch suction and delivery pipes lead, respectively, to common intake and hot wells, and as each pipe is sealed below water level, only sufficient power is required from the auxiliary turbines to overcome fluid and mechanical friction. The condensed steam in each condenser gravitates into a cast-iron hot well, and is controlled by a float. It is served by a small duplex pump, which returns the condensation to the boiler feed line. Each equipment occupies the space between adjacent turbine foundations, part of the condenser shells rising above the floor level of the

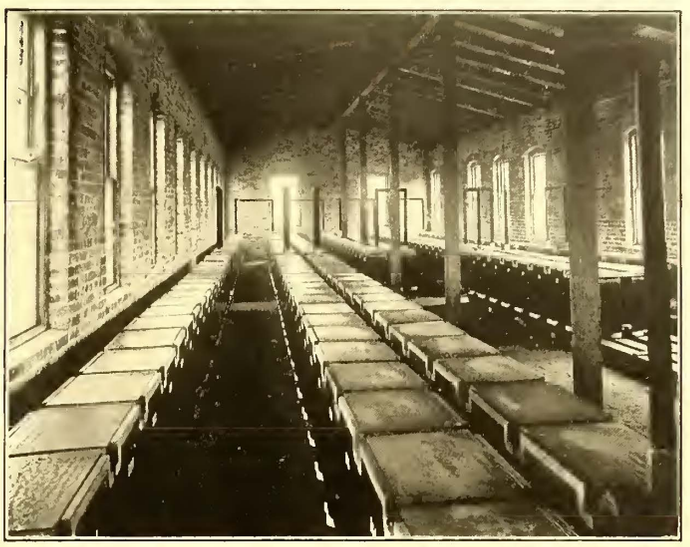


ROTARY CONVERTERS AND SWITCHBOARD IN UNIONTOWN SUB-STATION

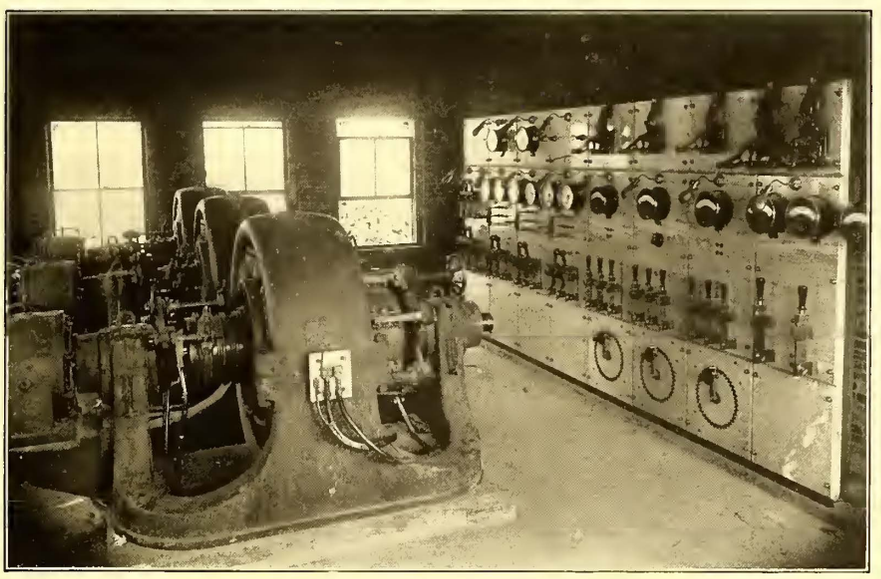
engine room. Under full load and similar water temperatures, 27½-in. vacuum will be readily obtainable and 28 ins. or over with cold circulating water.

An interesting and significant aspect of the turbo-generating equipment is the opportunity for comparison with reciprocating engine standards. The two sections of the plant have at present the same capacity, the ultimate capacity, however, without building extensions, will favor the turbine equipment in the ratio of 5 to 3. The actual space required for the turbine unit is 314 sq. ft., or 23.4 sq. ft. per horse-power, 59 per cent of that required for the engine unit. In the present layout, turbine condensers included, the total floor space for each turbine is 792 sq. ft., as compared to 1265 sq. ft. for each engine. The difference in head room required for the two prime movers is fully 20 ft., and the cost of foundations shows a considerable difference in favor of the turbine.

SUB-STATION AT UNIONTOWN.



STORAGE BATTERY INSTALLATION



INTERIOR OF SUB-STATION

OILING SYSTEM

The handling and distribution of both machine and cylinder oil is accomplished by a simple and effective system employing compressed air. The oil in barrels is delivered to the power house basement, and an air-tight two-pipe nozzle inserted in the vent. Compressed air is then turned on and the oil rises to a steel tank located in the condenser addition, the elevation being such as to create a static head of at least 8 ft. in the pipe lines leading to the machinery. The cylinder oil system serves only the sight feed power pumps upon the engine cylinders; the other system the remaining parts of the power units, including main journals, which, by this means, are kept continually flushed with lubricant. Machine oil drips are piped to a central filter, located in the basement, where foreign matter is removed. Cheese cloth screens are furnished for this purpose, and the oil is then washed during its progress around a number of vertical baffles into a riveted steel storage reservoir, also piped to the compressed air supply.

CAR HOUSE, BATTERY HOUSE AND SUB-STATION AT UNIONTOWN

COMPRESSED AIR

A piping system extending to all parts of the power house supplies air at 50 lbs. to 100 lbs. pressure, for cleaning electrical machinery and switchboards, operating oil lifts and for cleansing pipe lines. The air is furnished by a Westinghouse steam compressor, mounted upon the engine-room wall and pumping into a storage tank in the basement. Oil return and drip pipe lines are fitted with air connections at effective points, and are regularly blown out by air blast to prevent clogging.

ELECTRICAL EQUIPMENT

The sub-station equipment in the main power house consists of three 250-kw Westinghouse rotaries, operating directly from the three-phase, 390-volt alternating-current bus.

Individual reactive coils are permanently connected to each machine for purposes of voltage regulation. These coils are contained in standard oil-cooled transformer cases, and are provided with extra taps to enable an accurate adjustment of

reactance to be made to suit operating conditions. The rotaries are started by means of direct-connected type-C motors, controlled from the switchboard, where two voltages are available from the bus and from separate taps upon the transformer.

At present only the railway switchboard is in place. It consists of fifteen panels of blue Vermont marble mounted upon a 2-in. x 3-in. angle-iron framework, anchored at the top to the wall through hardwood insulators. The panels are sectional at one-third their height, the lower section being generally blank. An entire panel is devoted to each piece of apparatus, such as generator, exciter, transformer bank and feeder, and one to each side of the rotary converters. Automatic leaf contact carbon break circuit breakers are installed in machine transformer and feeder circuits. Series transformers in main bus and heavy alternating-current leads, and calibrated shunts in the direct-current leads permit the use of low-tension current in the ammeters. Small shunt transformers are similarly used on the alternating-current potential circuits. All alternating-current meters are of the Westinghouse round dial type, with calibrated scale, embracing nearly 360 degs. of its circumference. Bus and machine voltmeters are mounted upon swinging arms at the end of the board, the direct-current meter at the right, and alternating-current at the left. Rheostat contacts are mounted directly upon the front of the lower panels, connecting wires being bunched and carried through the floor to ventilated grid rheostats in the basement built up of standard-sized units. The entire output is measured upon the alternating-current side by a Westinghouse three-phase recording wattmeter, round dial indicating wattmeters being also used on each generator panel in order to show when a proper distribution of the load between machines has been secured. The generators are synchronized by the usual lamps in connection with the special device before mentioned. Transformer delta connections are made up at the switchboard. Each transformer circuit contains a switch and circuit breaker, so that in case of damage the disabled transformer may be instantly disconnected from the bus, and the system continued in operation upon the remaining two between which the load will be equally divided. The cable leads from the switchboard are entirely of lead-encased, rubber-insulated copper strand, carried through a rectangular opening in the floor and strung upon wood-insulated iron hangers clamped to the floor beams.

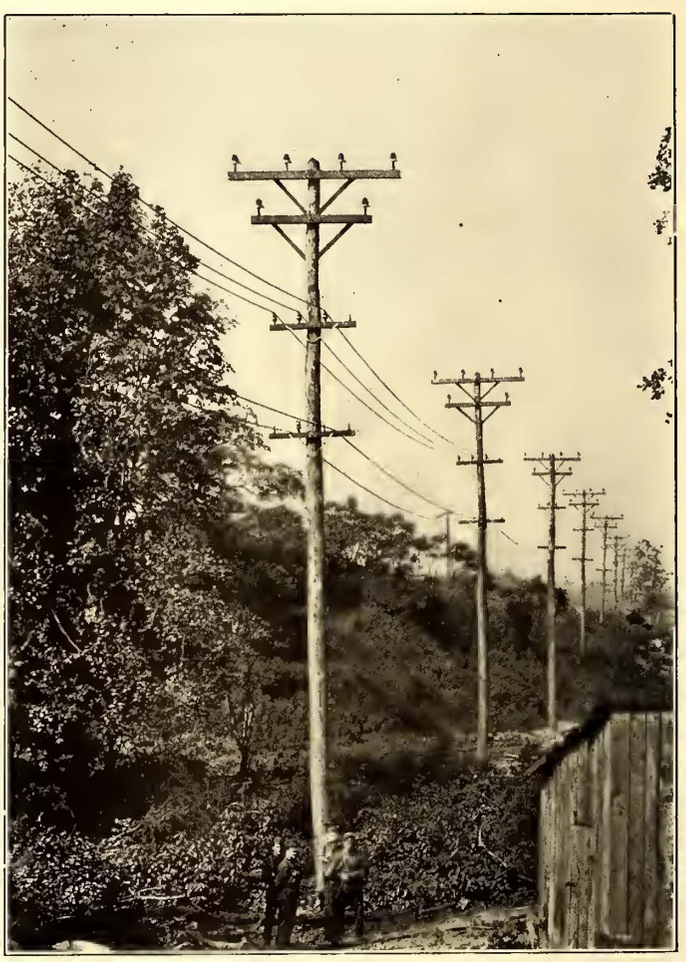
The lighting switchboard is designed for handling 2200-volt current, and will be equipped with oil-break switches, low-voltage meters and voltage regulators in each feeder circuit, compensators being also employed for indicating at the station the exact potential of each distributing center.

TRANSFORMER HOUSE

All high-tension apparatus is located in a separate building constructed as before mentioned with a view to isolating fires resulting from high-tension disturbances, or possible ignition of transformer oil. The entire ground floor is used for transformers, those for the railway system being ranged along one wall and for the lighting along the other. The railway system is served by duplicate banks of oil-insulated transformers, each bank containing three 500-kw units, connected in delta and raising the bus voltage to 22,000. Cables from the power house enter from beneath the floor through 6-in. tile, and the high-tension leads rise to the floor above through similar openings. In all cases of entrance and exit through walls or floors liberal air insulation is depended upon in place of glass or porcelain.

High-tension switching apparatus is arranged upon the third floor in independent systems. The apparatus is mounted upon a 4-in. x 4-in. wood framework, thoroughly filled with asphaltum after erection. Connections are made with No. 4 wire, covered with 5/8-in. rubber and jute braid insulation. The wires are carried upon standard glass line insulators and wooden pins. High-tension transformer leads terminate in two banks of selector switches, which provide means for instantly cutting out the high-tension winding of a defective transformer, also furnishing the high-tension delta connections. Should it be found desirable to install a spare unit the high-tension leads may be brought to the selector board and a separate pair of connections provided so that a disabled transformer may be replaced by the spare circuits issuing from the selector switches, first passing through the impedance coils of Westinghouse static interrupters and thence through pole-fuse switches to the 22,000-volt bus. The high-tension transmission line is connected through an auxiliary bank of pole-fuse switches. Lightning protection is afforded by two banks of low-equivalent arresters, with adjustable spark gap operating in connection with the static interrupters.

The lighting system will comprise five 750-kw oil-insulated, water-cooled transformers, connected two-phase three-phase



HIGH TENSION POLE LINE

in two banks with one spare. These will raise the bus-voltage of 2200 two-phase to 22,000 three-phase for transmission. A complete equipment of switches and arresters will be provided so as to separate absolutely the two power systems and secure independent control.

The high-tension line circuits leave the building through 8-in. and 12-in. glazed tile, sloped outward to shed rain. A single cross-arm anchorage upon the inside wall is used for the southern pole circuits. A long river span, however, occurs at the beginning of the northern line, for which special anchorages have been erected.

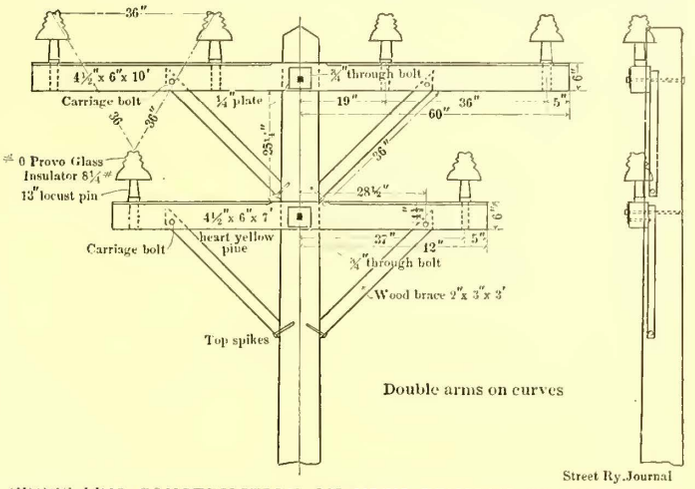
TRANSMISSION SYSTEM

Both northern and southern transmission lines traverse private right of way for the entire distance. The system was originally designed according to the common practice of carrying the high-tension line upon extra long poles, which also sup-

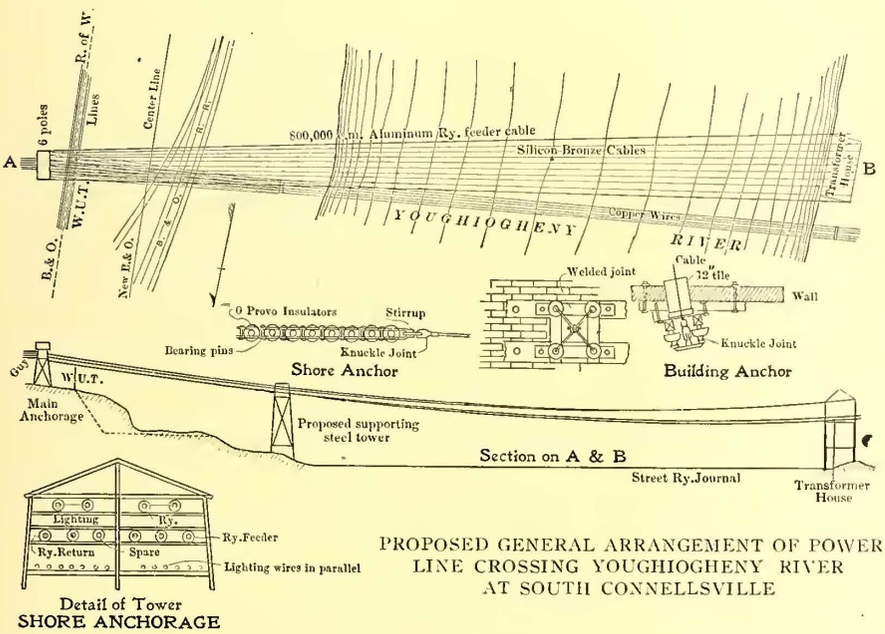
ported the trolley spans, but, with the acquirement of the lighting systems this plan was abandoned. Some difficulty was also anticipated in the coke districts from the breaking down of line insulation, due to smoke deposits upon the insulators. The present location of the pole lines avoids the coke ovens as much as possible and obviates this trouble. Both lighting and railway lines are carried upon the same poles, transposition being resorted to in order to prevent induction. Cross-arms are of 4-in. x 6-in. yellow pine, dipped in asphalt and through-bolted to the pole, double arms being employed on all curves, together with side, back and head guying. Wooden braces are used to facilitate insulation. The line insulators are Hemingray No. 0 Provo type. They are provided with 8-in. and 4-in. petticoats and support the cable 6 ins. above the lower rim and 12 ins. above the cross-arm. A 13-in. standard locust pin with 2-in. shank is used without protecting sleeve. The poles are of chestnut, 8-in. tops, spaced 100 ft. apart, and graded in height from 35 ft. to 60 ft. in order to compensate as much as possible for the irregular profile of the right of way.

The line wire is partly of No. 4 solid copper and partly of stranded aluminum cable strung with screw couplings at joints. Transpositions are executed with a simple 120-deg. spiral between poles 25 ft. apart, double arms being used for safety. One line is carried straight through from station to station, and the other has two spirals. The river span at the power house is composed of eight ½-in. silicon bronze cables, strung with a center dip one-thirtieth of the span. The two center cables are held in reserve and may be cut in upon either line in a short time in case of necessity. All cables leave the transformer house at the same level, and are spaced 5 ft. apart, but assume their triangular arrangement at the opposite anchorage. Outside of the transmission cables are strung two 800,000-circ. mil stranded aluminum cables, one serving as a local railway feeder, and the other as a metallic return. Lighting circuits will be strung below the transmission lines, and will require no special anchorage at the power house end. In order to provide greater security to passing trains a steel tower will be erected upon the river bank, which will considerably shorten the clear river span.

The shore anchorage is constructed of 40-ft. poles, set in concrete and laterally braced and back-guyed to withstand the strain of about 15,000 lbs. due to the river spans. The tops are framed together with standard cross-arm material and roofed over. The cable strain is transmitted equally to eight standard insulators by an iron stirrup, ending in a cable socket. All insulators are mounted upon standard pins in an upright position in order to shed rain. The transformer-house anchorage is similar in character, with the exception that the insulators and pins are placed under compression instead of side strain, this being possible on account of being housed. The cable socket is bolted to the center of an iron crow-foot, which distributes the thrust among four insulators, the bearing being adjusted by imbedding the pin thread in plaster. A heavy oak framework extending along the river wall of the switch room serves further to distribute the cable strain.



CROSS-ARM CONSTRUCTION ON HIGH TENSION TRANSMISSION LINES



PROPOSED GENERAL ARRANGEMENT OF POWER LINE CROSSING YOUGHIOGHENY RIVER AT SOUTH CONNELLSVILLE

SUB-STATIONS

The sub-stations are of similar design, that at Uniontown being typical in all respects of the others. It is shown in plan and section herewith. Conforming with the arrangement of the main station all high-tension apparatus is isolated in the high-tension tower, including transformers on the main floor, and selector switches, pole and fuse switches, arresters and static interrupters upon the upper floor, the equipment being identical with that of the main station, except in point of size. Railway and lighting apparatus occupy opposite sides of the tower. The main room contains three 250-kw Westinghouse rotary converters without reactance control. The size of unit has been adopted as standard throughout the system. An eight-panel switchboard controls the low-tension system and embodies the same features as the main station board, with the exception of a double alternating-current bus, enabling either bank of transformers to be operated singly or in parallel. Massive copper choke coils, with tank arresters in addition to Wurts railway arresters on the board are used upon the direct-current system. Two transformer banks, delta-connected at the boards, reduce the line voltage to 390 for the rotaries. They consist of 200-kw and 100-kw units, respectively, each of the oil-cooled type. The two banks are arranged to operate either singly or in parallel.

OVERHEAD DISTRIBUTION

Throughout its length the road is supplied with current through an overhead trolley with span-wire construction. A single round 0000 hard-drawn wire is used, sectioned between stations for facilitating the localization of faults. Bare stranded copper cable with feed-in taps at every ten poles convey current from distributing stations. The pole line consists of 30-ft. and 40-ft. poles, set with a backward rake of about 3 ft. at the span. A 100-ft. spacing is usual on straight runs, reduced on curves where the poles are reinforced by back guys strung nearly vertically by reason of the rake and limited width of roadway.

Through towns iron poles are largely used. The trolley is suspended from 5-16-in. galvanized steel strand, with soldered ears, and cap and cone straight-line hangers, pullovers being substituted on curves. The span wire is permanently looped through insulated eye-bolts, passing through the poles with extra thread for taking up sag. The trolley curves are sprung

CAR HOUSE AND SHOPS AT NEW HAVEN

in by guys, and the wire is anchored at intervals by back and head guys. The feeders are carried upon a four-pin arm, through-bolted and braced to the 40-ft. poles just above the span wire. Upon all curves greater than 4 degs. double arms are employed for greater safety.

CAR HOUSES AND REPAIR SHOPS

The main storage and repair buildings of the road are at present located at New Haven, about 500 ft. back of the main line to Uniontown, with which the yard tracks are connected. Twenty-four car storage houses are also located at Uniontown and Iron Bridge for accommodating the cars on the Uniontown and Mount Pleasant divisions, respectively. Minor repairs are made at these car houses, but all heavy work upon car bodies, trucks or motors is done at New Haven. Car storage and repairs on the Greensburg and the McKeesport divisions are provided for in buildings erected by the former companies.

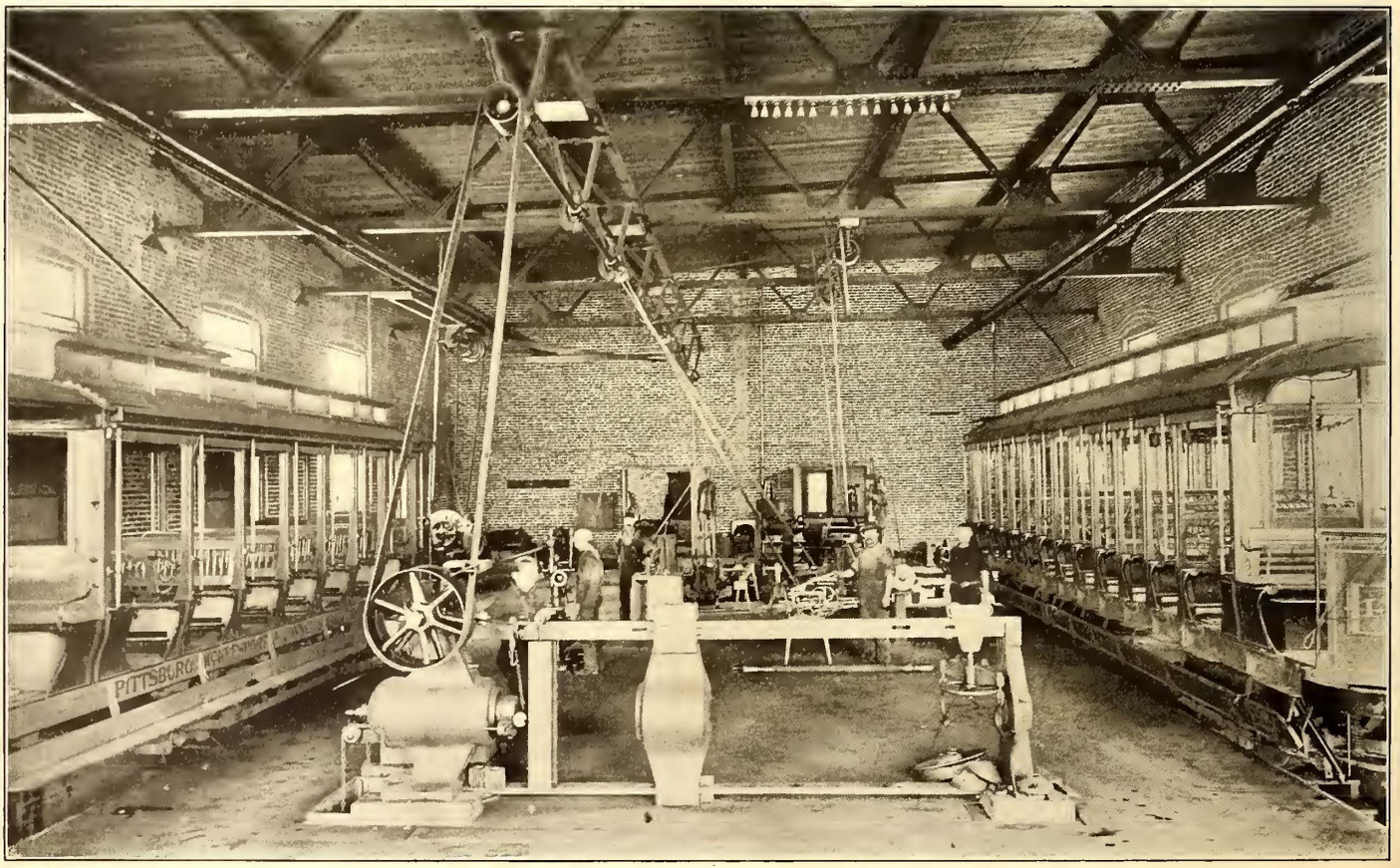
The New Haven shops comprise three independent buildings of approximately the same size, viz., the car house repair shop and woodworking and paint shop, all of the same general construction, to which the Uniontown and Iron Bridge car houses and brick firewalls between storage compartments. The roofs are of 2-in. matched pine sheathing, laid on 4-in. x 6-in. wood purlins, and covered by tarred paper and gravel. Double sash windows with stone sills, spaced at frequent intervals, furnish plenty of light to the interior. The building fronts or parapet walls are supported by steel columns set between tracks, and the openings are fitted with Kinnear rolling steel doors, each having a short section of dummy trolley wire to span the break between the two live sections upon either side of the door, and form a continuous tread for the trolley wheel. The house trolley wires are suspended from cross-spans, eye-bolted to the building walls. They are fed through a switch located near the doorway, so as to be cut out of the service if necessary.

STORAGE HOUSE

This building is 226 ft. x 52 ft. 6 ins., and contains four tracks with a capacity of four 50-ft. cars each. Inspection pits are located in each track of sufficient length to accommodate one car. Water and compressed air are available at frequent hydrants for cleaning purposes.

MACHINE SHOP

The front section only is devoted to repairs, the rear serving as the general store room for the road. Between these two compartments are located the blacksmith shop and armature winding room, each occupying one-half of the building width. The machine shop has two tracks next to the two side walls, the central space constituting the machine floor. Each track has an inspection pit accommodating one car. The machine tool equipment includes the following apparatus: 3-in. engine lathe, 20-in. engine lathe, 24-in. shaper, Mueller radial drill, taking work up to 6 ft. in diameter by 7½ ft. high, two smaller drill presses, one of which has a variable speed friction attachment, a 150-ton Schaffer wheel press, with a 9-in. ram, and



MACHINE SHOP

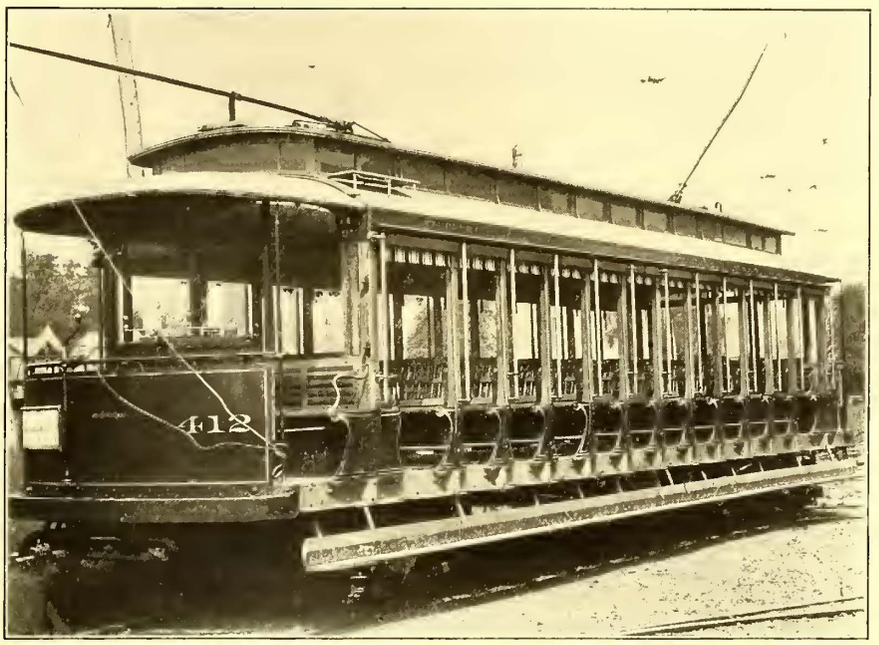
grindstone and emery wheel, power hack saw, drill grinder, air compressor, pneumatic drills, etc. The armature room contains racks for reserve armatures, is supplied with natural gas, compressed air, and the usual repair equipment. A Franklin portable crane, with a capacity of 2000 lbs., is used for shifting motor and truck parts about the shop. The blacksmith shop contains a Dupont power hammer, anvil blocks, vises, power forge and sand dryer. The shop machinery is operated by line shafting, belted to a 20-hp direct-current motor supplied from the trolley. The shop is also supplied with a 20-hp motor driving a line shaft from which is operated a single surfacer, band saw, hand jointer, combined cross and up-saw, self-feed timber saw and boring machine.

WOODWORKING AND PAINT SHOP

All car body repairs and redecoration of old cars are conducted in this building. The front section is devoted to a two-track paint shop, and a third track outside parallels the building wall, extending into the carpenter shop in the rear, which is about 12 ft. wider for this purpose. Disabled cars can then be run into the carpenter shop without disturbing work in the paint shop. A freight service track also runs between the two buildings to the storeroom in the rear.

ROLLING STOCK

A number of types of cars are in service upon different parts of the line, resulting from the absorption of independent lines and local requirements upon the several sections of the present system. All cars are double-ended with reversible seats and duplicate controller and brake equipments. The longer cars are fitted with two trolley poles, and the shorter with a single pole. Electric heaters are used throughout.



OPEN CAR FOR SUMMER TRAFFIC

INTERURBAN CAR

Two types of closed cars are in service, a 44-ft. double truck, 220-hp car for interurban winter service upon the main line, and a 30-ft. single-truck, 110-hp car for city and suburban winter service. The interurban equipment consists of twenty-five cars, all of Stephenson make, fitted with 27-F Brill trucks, and four Westinghouse No. 56 motors, with K-14 controllers. Three of these cars have Westinghouse magnetic traction brakes, and the remainder Christensen air brakes in addition to the usual hand brake. These cars were originally divided into two compartments, the forward end being reserved for smokers. The partition, however, has been removed and smoking prohibited, with a view to preserving a clean interior, which was found to be impossible with the former arrangement. The cars have a seating capacity of fifty. The interior is finished in mahogany and cherry, and the exterior in olive green and gold, which are the official colors. The city and suburban cars were built by the St. Louis Car Company. They have 20-ft. bodies and 5-ft. platforms, and are fitted with Peckham single trucks and two No. 56 motors. They are finished similarly to the interurban cars and have fourteen cross-seats for twenty-eight people.

For summer interurban service the company has recently added to its equipment fifteen "Narragansett" open cars, built by the J. G. Brill Company. The length of the cars over crown pieces is 41 ft. 4⅜ ins.; the width over sills and post brackets, 8 ft. 2 ins., and over posts at belt 8 ft. 7 ins.; other dimensions are: From center of corner post over crown pieces, 4 ft. 6 ins.; from corner post to first side post, 3 ft. 5 ins.; from center to center of side posts, 2 ft. 6 ins.; thickness of corner post, 3⅝ ins.; thickness of side post, 2¾ ins. The crown pieces are 2¾ ins. x 12½ ins.; from rail head to top of floor, 3 ft. 2 ins. Step heights are as follows: Sixteen and one-half inches from rail to top of folding step; 13½ ins. to sill step, and 8 ins. from sill step to car floor. The load distribution is arranged as follows: One-third of the load is carried at each end, supported directly on the bolster. Through the combined strength of the side sills and center stringers the central section between the ends of the stringers, constituting one-third of the car length, carries its quota of the load, supported entirely upon the Z-bar side sills.

Fifteen reversible benches, together with the twin end benches furnish seating accommodation for ninety passengers. The exterior is finished in green with yellow sills and canopy and gold letters. The interior of the cars are finished in cherry

and ash, natural colors, with ceilings of decorated birch. "Dumpit" sand boxes, angle-iron bumpers, radial draw-bars, ratchet brake handles and "Dedenda" gongs find place in this equipment. The trucks are Brill 27-G-E-1, with solid forge side frames and spring-link suspended semi-elliptic equalizers. The wheel base is 4 ft., the wheels 33 ins. in diameter, and the axles 5 ins. Each truck is equipped with four Westinghouse No. 56 motors, with K-14 controllers and magnetic brakes. Though the motors are outside hung the cars may be run at a speed of 30 miles an hour with perfect safety, and without oscillation of the trucks.

The city and suburban equipment for summer comprises forty cars of standard construction, fitted with Peckham trucks, two No. 56 motors and handbrakes. All cars, the latter type excepted, are geared to approximately 45 m. p. h. on level track, the ratio employed being 18 to 64. Thirty-three-inch spoked wheels with 2½-in. tread and ¾-in. flange are used on regular cars. The standard trolley wheel is 4 ins. in diameter, with graphite bushing, and all cars are equipped with 12-ft. poles and United States trolley bases.

OPERATION

Until recently a 40-minute headway upon main and branch lines was in force. This, however, has been reduced to 30 minutes upon the main line better to accommodate increasing traffic. The interurban cars make an average schedule speed of approximately 14 miles, including runs through city streets, and frequent stops. The cars are despatched by telephone from a central station located at Connellsville. Booths are stationed at all switches and sidings, and all instruments are bridged across a main line, comprising a cable which consists of twisted pairs of telephone conductors. This cable is strung along the pole line beneath the railway feeders.

The passenger traffic of the road is undergoing marked development as a result of increased facilities incident to the starting of the transmission system and sub-stations, and additional converting machinery has even now become an immediate necessity. The average passenger rate over the company's lines is approximately 1.5 cents per mile. Neither express nor freight is carried.

MANAGEMENT AND ENGINEERING

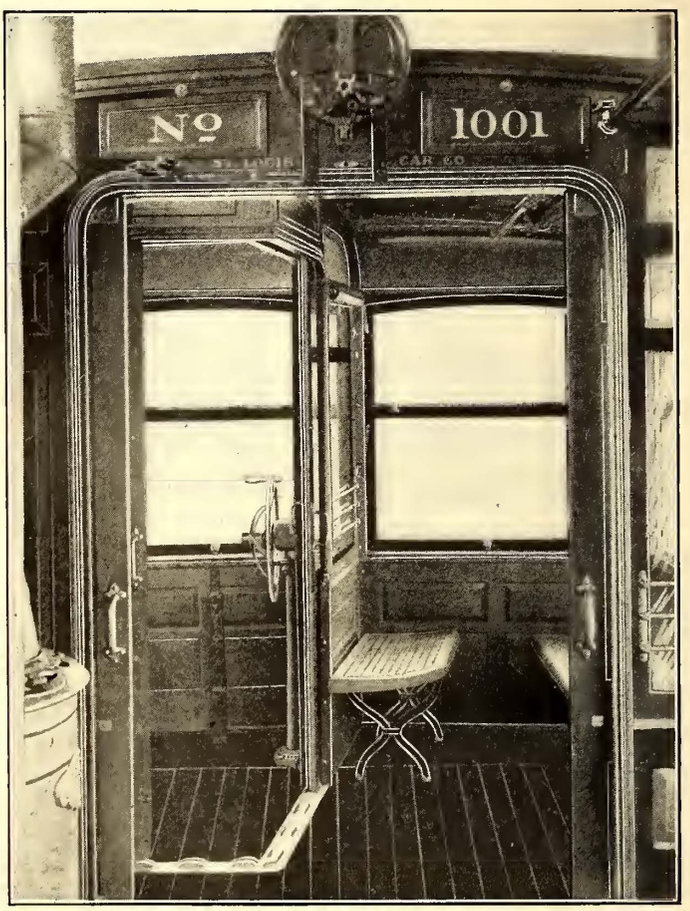
The West Penn Railway & Light Company is financed by a syndicate of New York and Pittsburg capitalists. The permanent officers of the company will be: President, E. C. Converse, president of the Liberty National Bank, of New York, and the Bankers' Trust Company, of New York; vice-president, J. S. Kuhn, president of the Pittsburg Bank for Savings; secretary and treasurer, J. B. Van Wagoner; general manager, Thomas Elliott; superintendent of construction, W. E. Moore. The official headquarters are in the Title & Trust Building, at Connellsville, Pa.

The reconstruction of the railway and lighting properties has been largely the result of co-operative effort on the part of manager and engineer. The designs for the power station were executed by Westinghouse, Church, Kerr & Company, consulting engineers for the Pittsburg, McKeesport & Connellsville Railway, who also prepared preliminary designs for sub-stations, car houses and overhead distribution system. The construction of the power station, with such extensions and modifications as were occasioned by the addition of the lighting feature, together with the sub-station and car house, was carried out under the direction of Thomas Elliott and R. W. Hunt & Company, Pittsburg, inspecting engineers of buildings and equipment. The corporation now maintains a thoroughly organized engineering department, equipped for executing the general construction work of all departments. The entire electrical railway and lighting equipment was furnished by the Westinghouse Electric & Manufacturing Company, Pittsburg, Pa.

IMPROVEMENTS IN INTERURBAN CARS AND MOTORS BY THE MILWAUKEE ELECTRIC RAILWAY & LIGHT COMPANY

The Milwaukee Electric Railway & Light Company has the past summer put into operation twenty-five interurban cars which are notable innovations in several respects. The design of the car body introduces several radically new and desirable features, and the motors are also of a new design, brought out especially to meet the specifications of the company.

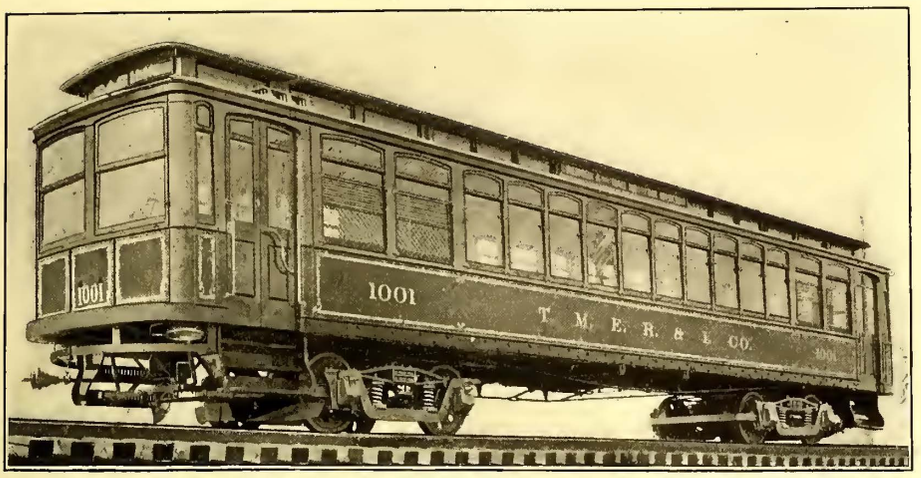
When the fact is stated that the car bodies are 51 ft. 6 ins. over all and seat comfortably sixty-four passengers, enough



MOTORMAN'S CAB AND END COMPARTMENT

has been said to arouse at once the interest of the practical electric railway man, who is accustomed to figuring the seating capacity of an interurban car at about one passenger per foot of length over all. Not only is the car notable on account of its great seating capacity but because it is arranged to be practically an observation car. The accompanying plans and engravings from photographs give some idea of the design of the car, although it is difficult to appreciate all of its good qualities until a personal inspection has been made. Looking at the plan of the car body, it is seen that each end of the car has a compartment of peculiar design. The main body of the car presents no unusual features, most of the study having been given to the proper arrangement of the end compartments. The arrangement, as shown, permits the motorman's compartment to be turned at once into the rear entrance of the car as soon as the motorman changes ends at the end of the route. The motorman's cab is partitioned off from the rest of the car by means of two sliding doors, which meet at an angle of about 100 degs. When these sliding doors are open there is no obstruction whatever to the entrance and exit of passengers. These doors are amply provided with glass, and the side of the car not occupied by the motorman also has a large window, so that an almost unobstructed view to the front or rear is offered. The end compartments have side seats, arranged as seen in

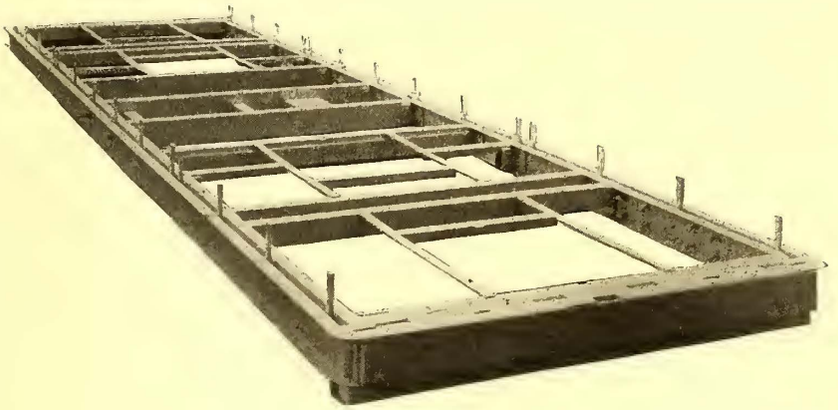
the plan. The folding seat is raised when the car is in the city and taking on passengers, as it occupies the space over the front steps on the right-hand side. This seat is shut down when the car is in the country, so that the view to the front is unobstructed. The rear compartment only is used for smoking, because of the draft which would carry smoke into the main compartment if there was smoking in the front compartment. Type-M control is used on these cars, so that very little room is taken in the motorman's cab by the controlling apparatus. The motorman's stool is placed on a hinged support, which is swung back against the side of the compartment when the compartment is at the rear of the car. The seat is removable from this support, and is changed from end to end along with the controlling handles. Both end compartments are on the same level as the main compartment. The sliding doors of the motorman's compartment can also serve a useful purpose in closing this compartment in the winter when at the rear of the car and in use as an entrance. Passengers can mount the steps before coming to the sliding doors. A view is shown looking forward through the front compartment, and it can be seen how unobstructed the view ahead is to the passengers. The toilet room occupies one corner of the main compartment, and the hot-water heater a corresponding corner diagonally opposite.



MILWAUKEE INTERURBAN CAR

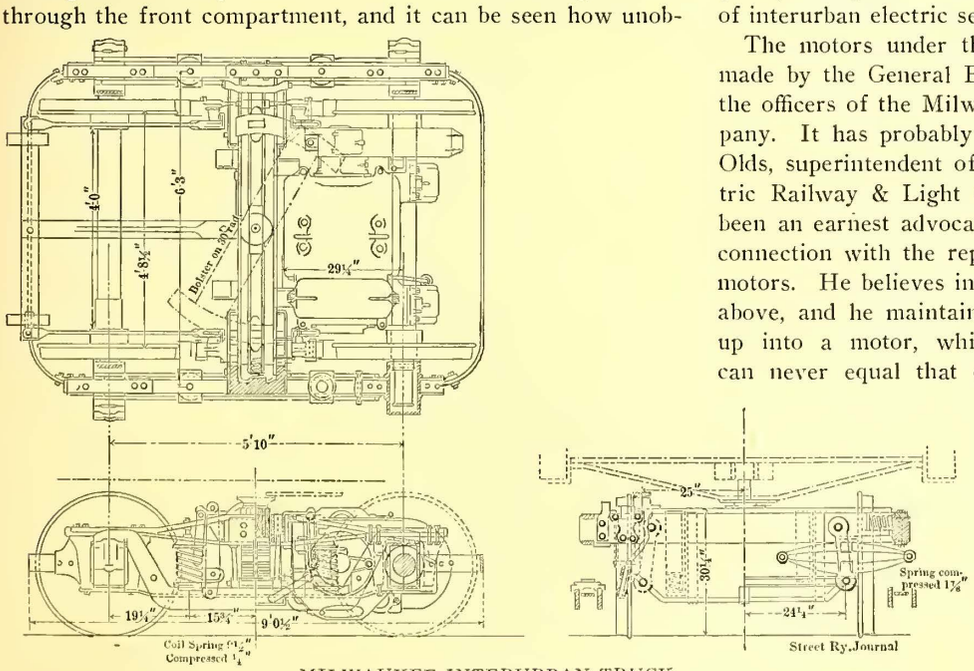
In these cars considerable pride is taken, both by President John I. Beggs, of the railway company, and the St. Louis Car Company, which built them. This pride is certainly justified, for it would be hard to find an interurban car in which all the details have been more carefully worked out, and in which so many passengers can be comfortably seated and afforded such observation privileges.

The trucks put under these cars were designed especially for the Milwaukee Electric Railway & Light Company by the St. Louis Car Company. They are somewhat similar to the No. 23 trucks which the St. Louis Car Company has built in large numbers for the Milwaukee city cars. The new truck is designated as No. 23-E. It is an M. C. B. type of truck, and differs from previous trucks of this type built by this company in having the end frames lowered so as to present a neater appearance and interferes less with the under rigging of the car. The side frames of this truck are arranged as a truss. This type of truck has practically all the flexibility of the M. C. B. steam road passenger trucks, while at the same time giving strength and compactness for the peculiar requirements of interurban electric service.



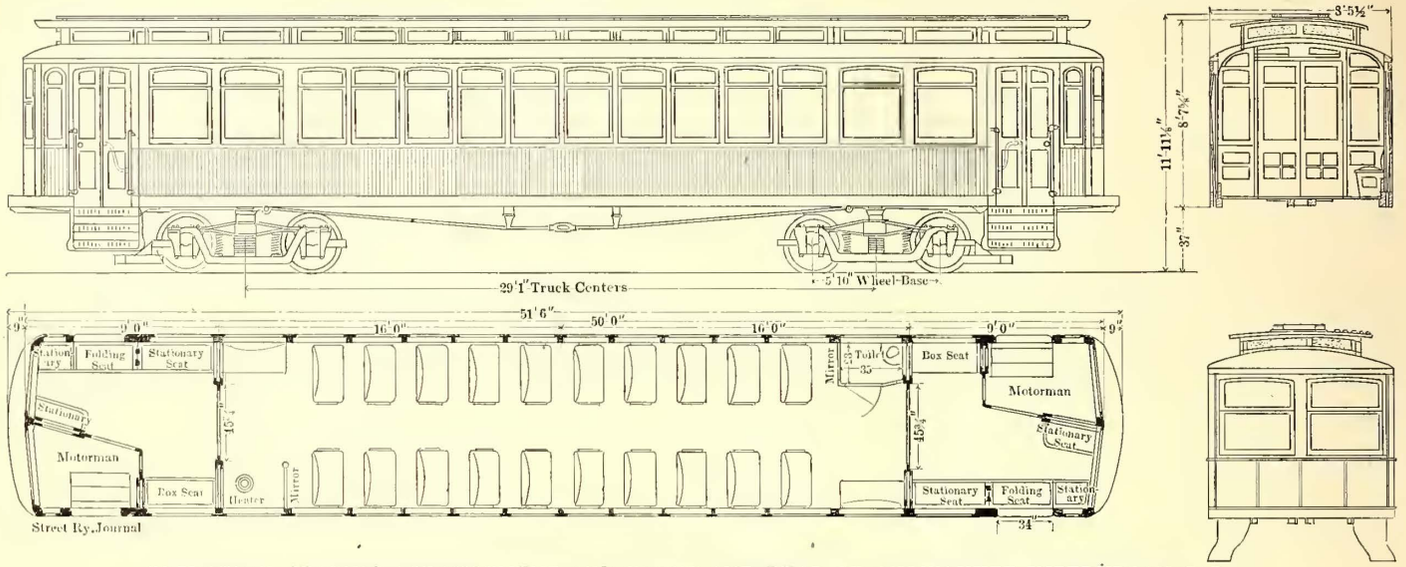
FLOOR FRAMING

The motors under these cars are of entirely new design, made by the General Electric Company to meet the ideas of the officers of the Milwaukee Electric Railway & Light Company. It has probably been known to the friends of E. W. Olds, superintendent of rolling stock of the Milwaukee Electric Railway & Light Company, that he has for some time been an earnest advocate of doing away with all pit work in connection with the repair and inspection of electric railway motors. He believes in doing as much work as possible from above, and he maintains that work done from a pit looking up into a motor, which necessarily has some dirt in it, can never equal that done out on an open floor, working from above. He has, therefore, favored a motor which is adapted to go on a modern swivel truck, which can be opened from above for casual inspection, and which can be lifted out of the trucks from above for further overhauling if necessary. This idea is incorporated in the design of the new motors. President Beggs believed so thoroughly in the correctness of these ideas and others mentioned later that the new General Electric 74-motor, with a capacity of 60 hp for interurban work, and the General Electric 70-motor, with a capacity of 40 hp for city work, were designed especially by the engineers of the General Electric



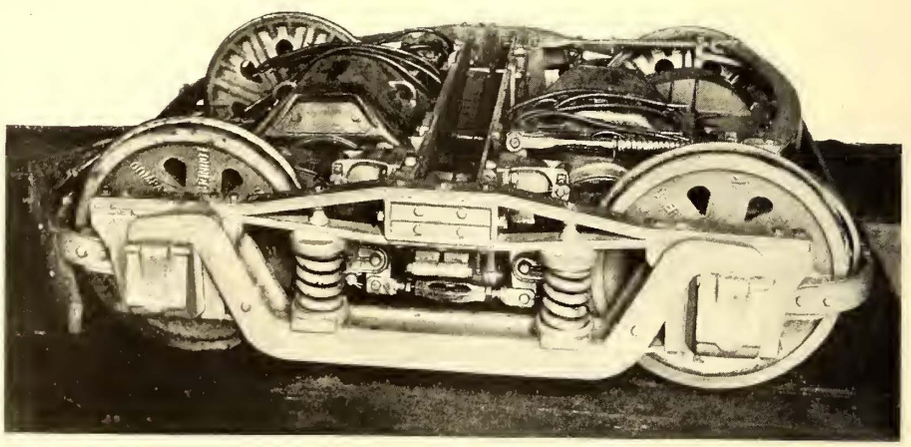
MILWAUKEE INTERURBAN TRUCK

Company at his request. The motor is supported on the truck by means of a suspension bar, which bolts to two lugs cast on the lower frame, instead of to one lug, as is common. This relieves some of the twisting of the motor in the bearings and consequent throwing out of parallel

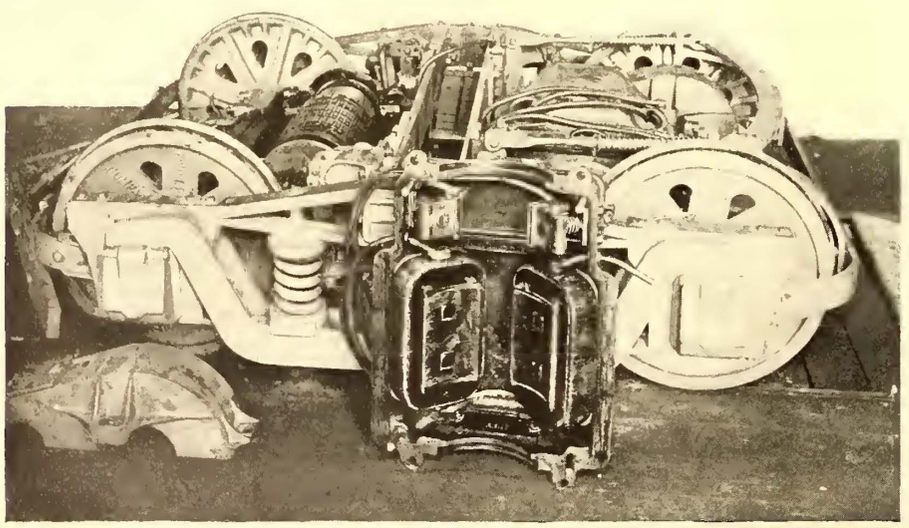


ELEVATION, SEATING ARRANGEMENT AND FRONT AND REAR OF MILWAUKEE INTERURBAN CAR

of gear and pinion which is so common on motors suspended with a single lug. The frame of this motor is octagonal in shape, and is divided in a horizontal plane considerably above the center into a large upper frame and a large lower frame, which are bolted together. The lower frame has two large openings on the sides, into which frame heads carrying the armature bearings are bolted in bored seats, these frame heads being somewhat similar to those used on the well-known box type of General Electric motors, in which the armatures are removed endwise. These frame heads are cored for liberal oil wells, in which oil waste is packed, as



MILWAUKEE TRUCK



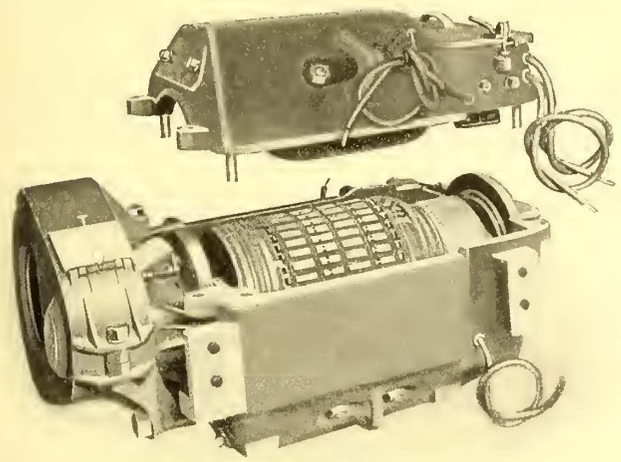
MILWAUKEE TRUCK, WITH UPPER FIELD OF ONE MOTOR REMOVED

in the box type of motors. The upper frame of the motor is not hinged, but lifts directly off, and has two of the field coils upon it. To protect the field coils from injury, pins set in the four corners of the upper frame form legs upon which the upper frame is set when removed.

When the upper frame is removed, together with the upper half of the gear cover, the armature, together with the frame heads, may be lifted out, leaving other parts of the motor still intact as assembled on the trucks. Once the upper frame is removed the motor and armature can be thoroughly inspected without disturbing the motor frame in the truck. The gear case is suspended in a way which will tend to prevent it from dropping off. It is suspended at three points. Three lugs are cast on the lower frame and the gear case is bolted to these. This furnishes a more rigid support than when lugs are placed on separate halves of the frame. With this arrangement the gear case is not affected by loose bolts on other parts of the motor, and excessive vibration of gear covers in service is largely prevented, so that the liability of breakage is reduced. This feature has been used on the General Electric box motors, and the peculiar design of this new split motor makes it possible to use it here. Hitherto many of the excellent features which have characterized the construction of the box type of General Electric motors, like the General Electric 66, of 125 hp, and the General Electric 69, of 200 hp, such as construction of bearings for oil lubrication, ventilation and gear case suspension, have been chiefly confined to motors of large capacity, but in the General Electric 74-motor these advantages are embodied in the split frame construction and in the smaller sizes. The axle-bearing linings are supported within axle caps, bolted to vertical planed sur-

faces in the lower frame. The axle caps are also cored for large oil wells and oil waste lubrication.

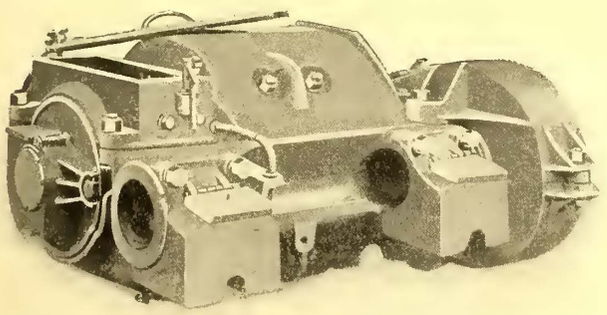
The provisions for ventilation and the easy inspection of the interior of the motor are quite complete. Besides the opening over the commutator the frame is provided with liberal openings at the top and bottom of each end of the motor. These openings are closed by malleable iron covers, which may be removed to secure perfect ventilation and circulation of air within the motor whenever the service conditions will permit. To reduce to a minimum the tendency to flash all short-

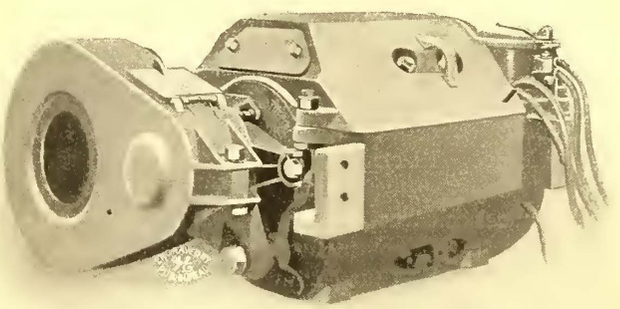


MOTOR, OPEN

circuiting devices around the pole pieces have been carefully avoided.

In general, the details of electrical and mechanical construction follow the well-known practices of the General Electric Company, but with some added improvements which have been thought desirable. Among these improvements is the more liberal surface given the armature bearings and the gears. In comparison with the General Electric 57, which is slightly smaller, the General Electric 74 has a pinion-end armature bearing 3⅝ ins. in diameter by 8¾ ins. long, as against 3¼ ins. x 8¾ ins. The commutator-end bearing is 3⅛ ins. in





END VIEWS OF GENERAL ELECTRIC 74-MOTOR, AS USED IN MILWAUKEE

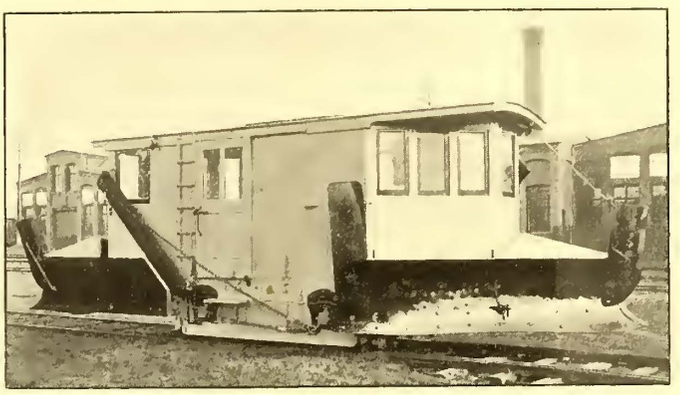
diameter by 6¾ ins. long, as against 2⅞ ins. x 6⅜ ins. The width of the gear face is 5½ ins., as against 5 ins. in the General Electric 57. The weight of the General Electric 74-motor complete with gear and cover is approximately 3320 lbs. The General Electric 70 is a lighter motor, which the Milwaukee Electric Railway & Light Company has ordered for city service, and which has the same ideas embodied in its design. There have been 100 four-motor equipments ordered for this city service.

Orders have been received from Washington designating the Worcester & Southbridge Street Railway, operating between Worcester and Southbridge, Mass., as a mail route, beginning Sept. 14.

WASON SNOW-PLOWS

The accompanying engraving shows the latest type of single-truck Wason snow-plow, which has been handled very successfully during the last five years by Thomas F. Carey, of Boston. The popularity of these plows makes some particulars of the latest type of single and double-truck plows of interest.

The four-wheel plows are made compact and simple, are easy of operation and not liable to get out of order. The shares are raised by a large, strong worm and worm gear, and are so connected that they balance one another, making it easy to



WASON SNOW-PLOW

raise and lower. This connection can be cut out at any time so that the shares may be worked independently, all by a hand-wheel staff at either end of the plow.

The shares are so hung that they may be adjusted and are free to conform to the unevenness of the rail at all times. The bottom edge of the share is fully protected by a heavy steel plate, ¾ in. thick, so shaped as to conform to the crown of the road bed between and just outside the rails; heavy steel shoes bear on the rail, insuring a clean rail, saving much loss of power; for ice heavy tool steel pointed diggers are provided forward of the wheels, making a clean rail doubly sure.

Each share is provided with an indicator, showing plainly the exact height of share from rail, a device of much value for properly clearing switches, frogs, guard rails, etc. The share can be raised 10 ins. above the rail.

The nose or working point of the share is a strong malleable casting to which the plates and irons are securely bolted. A cast-steel point or cover is fitted to this and can be easily replaced when worn out. The wings, both rear and front, are powerful, and can be worked easily at any height from the inside of the plow.

The share plate is curved, giving a rolling motion to the snow, throwing it far to the side of the track. This method requires much less power than to push the snow sideways.

The force of the blow on the share is conveyed to the body and truck frame by heavy angle-irons and forgings.

Powerful brakes control the plow. All parts beneath the body are protected from the flying snow by a side covering. The working parts inside the body are so arranged as to give a large amount of room for salt, sand, tools, etc. All plows can be fitted with a long leveling wing, on either side or both sides, which can be raised or lowered from inside of the plow. All plows are so constructed that air brakes may be applied at small additional expense.

The double-truck plows, while having all the advantages of the smaller ones, contain many new and valuable additions. The shares are well counterbalanced, making the operation by hand very easy, considering their weight, but when fitted with the air lift they are as easily controlled and operated as air brakes.

These shares, like those of the smaller plows, are provided with the same steel shoes and points, also powerful diggers on the truck frame, steel pointed, guarantee a clean rail.

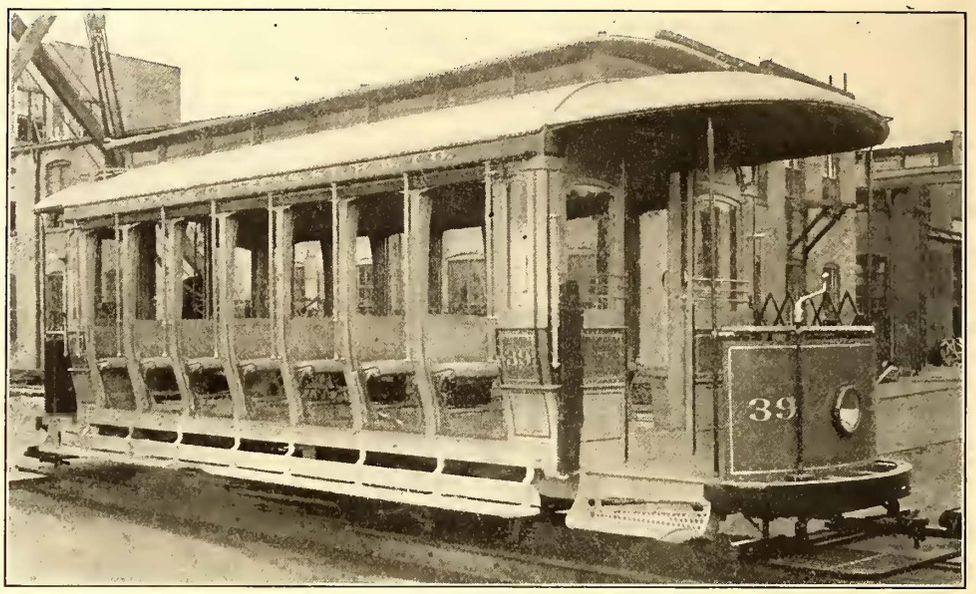
The double-truck plows are so ample in their arrangements that many railways are using them for other work than plowing. The large amount of clear space inside renders them a most practical part of the railway equipment for hauling, transportation and repairs. Some plows have been fitted with towers which raise above or lower to the level of the roof. When used in this way the shares are removed. A draw-bar head can be provided, which, with a link and pin, couples directly with any M. C. B. coupler.

The Boston Elevated Railway Company, of Boston, Mass., and the Rhode Island Company, of Providence, R. I., have recently placed contracts for Wason plows.

CONVERTIBLE CARS FOR VINCENNES, IND.

The American Car Company, of St. Louis, has recently finished an order for cars of the Brill patented convertible type for the Vincennes Citizens' Railway Company. This railway is distinctively a city system, operating about 7½ miles of lines, with more under construction. The several parks in the vicinity of Vincennes furnish considerable traffic during the summer months. The city is on the southwestern border of the State, and is one of the most important railway centers in that locality.

The new cars present a very attractive appearance, as the accompanying cut shows, and furnish seating capacity for twenty-eight passengers, with standing room considerably larger than the ordinary type of summer car. The cars are mounted on Brill 21-E trucks, which carry them low and make ingress and egress at the sides rapid and safe. The interiors are finished in ash with birch ceilings, making them bright and attractive. The corner posts are 3¾ ins. thick and are substantially connected with the first side posts with solid panels. The side posts are 3⅜ ins. thick, and are 2 ft. 7 ins. from center to center. The panels and sashes are stored in roof pockets in warm weather. The runways which guide the window trunnions are of metal, to prevent any possibility of sticking. Round-corner-seat-end panels strengthen the lower portions of posts, together with substantial connection with the seats, thus entirely compensating for the small addition of weight in the side roofs when the panels and sashes are stored in the pockets. Sweep of the posts is 5 ins. The lower sashes are 23 ins. x 28⅝ ins., and the upper sashes 16 3-16 ins. x 28⅝ ins. The side sills, of long-leaf yellow pine, are 5¼ ins. x 6 ins., plated on the outside with ⅝-in. x 6-in. steel. The end sills, of white oak, are 4¼ ins. x 6 ins. From rail to platform step 14¼ ins., from step to platform 12 ins. Length of cars over end panels is 20 ft. 7 ins., over crown pieces 29 ft. 7 ins., from panel over crown piece 4 ft. 6 ins. Width over sills 6 ft. 10 ins., width over posts, at belt, 7 ft. 9 ins. Under corner seats are located sand boxes of the American Car Company's make. The wheel base of the truck is 6 ft. 6 ins., and diameter of wheels 33 ins. Trucks are equipped with two 25-hp motors. Weight without motors about 17,500 lbs.



CONVERTIBLE CAR FOR VINCENNES, IND.

PENNY SALES MACHINE

The penny-in-the-slot machine as an auxiliary source of revenue is not new to the street railway manager, but hitherto no devices of that kind have succeeded because they were not designed to meet the conditions peculiar to street car service. Realizing the need for an efficient and durable machine for street cars, the New York Penny Sales Company, of New York, has recently devised the machine illustrated herewith.

The size of this machine, 2¾ ins. x 2¾ ins. x 30 ins. high, makes it very suitable for putting it in places where it will not interfere with the movements of passengers. It is made entirely of steel in any desired finish. By bolting to a car angle-iron it can be fastened so securely that nothing but a crowbar can dislodge it. Experiments with this device have proved conclusively that it cannot be operated by the insertion of counterfeit coins, metal discs or anything else except one cent. The machine is designed for the sale of matches, chocolate, chewing gum, confectionery and other articles which can be profitably sold in small packages.

The manufacturer of this device is prepared to make contracts based either upon space, rental or division of gross receipts, and is confident that it will prove a source of large revenue to all railways installing it.

As the latest models of this machine will be exhibited at the Saratoga Convention, street railway men will have an excellent opportunity to investigate the claims made for it by the manufacturer.

PROCEEDINGS OF THE SARATOGA CONVENTIONS

AMERICAN RAILWAY MECHANICAL AND ELECTRICAL ASSOCIATION

The Convention of the American Railway Mechanical and Electrical Association was held at Saratoga Springs, N. Y., Sept. 1, 2, 3 and 4.

President Thomas Farmer called the convention to order at 10:45 a. m. on Sept. 1, and introduced Joseph P. Brennan, the village attorney of Saratoga Springs, who delivered an address of welcome, to which the president responded.

COMMUNICATIONS

Secretary Walter Mower read the following letter:

THE UNITED RAILWAYS & ELECTRIC COMPANY, OF BALTIMORE

BALTIMORE, August 27, 1903.

MR. WALTER MOWER, Secretary and Treasurer, Detroit, Mich.

Dear Sir—I have to advise you that I shall be unable to attend the convention of our Association at Saratoga Springs. Our general manager is going away for a few weeks' trip, starting Monday, Aug. 31, and it is his desire that the heads of departments should not be away at the same time. I regret this exceedingly, as I shall be unable to present my paper on "Shop Kinks" in person.

There was one suggestion that I desire to present at the meeting of the executive committee, and it was that an open discussion be held upon the points suggested in the last issue of the STREET RAILWAY JOURNAL (Aug. 22, 1903), namely, on the method used in determining when equipments should be overhauled. I feel that a discussion of this kind would be beneficial to all of us.

Kindly explain my situation to the officers of the Association, and say that it is with regret that I am unable to be present to assist them in this work.

Trusting that you may have a successful meeting, believe me,

Very truly yours,

H. H. ADAMS,
Superintendent of Shops.

The secretary also read a letter from E. F. Peck, general manager of the Schenectady Railway Company, inviting officers and delegates of the Association to make use of its lines in Schenectady, Albany and Troy during the convention, for which privilege the badge of the Association would be recognized on all divisions on Sept. 1, 2, 3 and 4.

PRESIDENT'S ADDRESS

The president read his annual address, which is presented herewith:

Gentlemen of the Association:—It gives me great pleasure to meet with you here at this the first annual meeting of the American Railway Mechanical and Electrical Association. As all present may not be familiar with the conception of this organization, I will briefly state that the matter had been talked over between a few of the master mechanics during the summer of 1902, and that during the convention of the American Street Railway Association, held at Detroit, in October of that year, a number of the mechanical and electrical men who were present came together and effected a temporary organization. It was then decided to meet at Cleveland, Ohio, on January 12, 1903, to perfect a permanent organization. The date was later changed to February 16th.

The meeting at Cleveland was attended by representatives of a number of roads from all sections of the country, and a spirit was manifested at this meeting that at once spoke for its future success. Since that time, owing in a great measure to the personal efforts of the executive committee, ably seconded by our worthy secretary, the membership has now reached a total of 85.

I earnestly hope that while we are here in Saratoga, with the opportunities we will have to meet the different companies and their representatives who are not our members, that each and every one of you will use all possible endeavors to increase our membership to at least 150. We should all make an extra effort in this direction, and there is no doubt but what this result may be accomplished.

The objects of this association are clearly set forth in our Constitution, Article 2, which says: "The object of this association shall be the acquisition of experimental, statistical, scientific and practical knowledge relating to the construction, equipment and operation of street and interurban railways." Added to this are the advantages to be derived by all of us in the opportunities it affords for the interchange of ideas and the hearing of the members' papers, and to be able to freely discuss the same. The subjects of the papers which we will have the pleasure of hearing are as follows:

"Care and Maintenance of Car Bodies," C. F. Baker, superintendent of motive power and machinery, Boston Elevated Railway, Boston.

"Improvements in Street Car Motors," E. W. Olds, superintendent of rolling stock, Milwaukee Electric Railway and Light Co., Milwaukee.

"The 'M' Type of Control," W. O. Mundy, master mechanic, St. Louis Transit Company, St. Louis, Mo.

"Use and Abuse of Controlling Mechanism," D. F. Carver, chief engineer, Public Service Corporation of New Jersey, Jersey City, N. J.

"Shop Kinks," H. H. Adams, superintendent of shops, The United Railways & Electric Company, Baltimore, Md.

"Car Shop Practice," Alfred Green, master mechanic, Rochester Railway Company, Rochester, N. Y.

We should all take part in the discussions, as one of their principal objects is to provoke discussion, and from the many intelligent faces which I see before me there is no doubt but what they will be most ably handled. It should be the duty of each member of this association to freely impart to his fellows any information that he is possessed of regarding details, not only of matters relating to the electric car and regular shop practice, but of any special knowledge that he may have regarding same, for by so doing it will brighten us all up and make us, one and all, of more value to the companies we have the honor to represent. The representatives of the smaller roads can be of especial value in this respect, as, their facilities being more limited than those of the larger roads, the tendency of these men is always to be thinking of and working out new ideas which can be elaborated if necessary to meet the requirements of any sized road. We should all lend a helping hand if we wish to accomplish results laid out by our association. The American Street Railway Association has a committee on standards, appointed for the purpose of investigating and suggesting better methods and devices than are now current practice, and to secure uniformity in all matters relating to the electric railway equipment. The work of this committee has been very ably handled, and the results obtained, while not as far reaching as they should be, can be seen in many ways. It should be the earnest effort of every member of this association to give this committee every possible assistance to bring about the results hoped for in this direction. The fact of there being at present virtually no acceptance by the manufacturers of street railway material of any such standards leads to an enormous multiplicity of repair parts, not only electrical, but mechanical. The stock rooms of some of the larger roads have the appearance of a wholesale hardware store, and the amount of money invested in these stocks could be very materially reduced, as well as stock room attendance, by weeding out unnecessary parts and sizes. Too much stress cannot be laid upon this question of standardization. The steam roads are very far in advance of the electric roads in this respect, and it is up to us, as the mechanical representatives, to try and get order out of existing chaos. It will not only be better for the companies, but will lessen our own labors to a very appreciable extent.

Thanking you, gentlemen, for the honor you conferred upon me by electing me to the highest office within your gift, and again thanking you, one and all, for your co-operation in making this association the success that it is, I will not trespass further on your time, but commend the business of the association to your hands with the fullest confidence that the results will be most satisfactory and beneficial to every one present. We will now proceed to the regular order of business.

EXECUTIVE COMMITTEE REPORT

The secretary read the report of the executive committee, as follows:

"Rather than read the minutes of all preceding meetings, in order to save time, I will state briefly the substance of the business transacted.

"The first steps toward organizing this Association were taken during the American Street Railway Convention, held in Detroit, in October, 1902, seventeen different companies

being represented. A committee or six, with Thomas Farmer as chairman, was selected to proceed with the organization. In response to a circular letter issued by this committee a meeting was held in Cleveland in February of this year, and a permanent organization effected. Fourteen companies were represented and officers elected, details with which you are all familiar. Immediately after this meeting adjourned the executive committee went into session, selecting a committee on membership, fixing the salary of the secretary-treasurer at $500 per annum, placing his bond at $2,000, and electing the Street Railway Review, Street Railway Journal and Western Electrician honorary members.

"A special meeting of the executive committee was held Monday, Aug. 31, at the Grand Union Hotel. The minutes of the last meeting were read and approved; the reports of the secretary-treasurer were read, and after being audited by a committee of three and found to be correct, were approved. Mr. Farmer presented the secretary-treasurer's bond for $2,000.

"A letter from the Schenectady Railway Company, inviting members of the Association to make use of its lines upon presentation of badges, was received, and a vote of thanks given for the kindness."

On motion of C. F. Baker the report of the executive committee was adopted.

SECRETARY-TREASURER'S REPORT

The secretary-treasurer then presented his report, showing the following list of members: Active members, 21; honorary, 3; associate, 27; junior, 34. Total, 85.

Dues from active members to Sept. 1, $420; from associate members, $135; from junior members, $102. Total, $657.

Disbursements to Sept. 1, $176.77. Balance on hand, $480.23.

The report was adopted.

MEMBERSHIP

The President—I think it would be well to have a discussion on the best way to increase our membership. We have done fairly well so far, but we must do better than we have.

E. W. Olds—Nearly all of the members have joined the Association through the instrumentality of the letters and circulars that have been sent out by our secretary, and it is now up to us to see what can be done further to increase our membership. Our expenses have been considerable, and to get out our reports and bear the other expenses which will fall upon us at this meeting, and also to be ready for our next year's meeting, will require quite a good deal of money, and I think the only way for us to get at it is for each member to be a committee of one and get all others who are eligible to membership in the Association interested in its work so that they will become members.

We all know that the smallest shop, the smallest road, will give us ideas that are of great value. We do not always adopt exactly what we see, but we get ideas which we apply to our conditions and are greatly benefited by them. If we do not do this we are liable to keep following the old beaten path, and the first thing we know we are side-tracked. Let us bring out our ideas. Another thing, as we pass around let us become better acquainted with each other.

W. O. Mundy—The object of our Association is for the betterment of the railroads, and incidentally anything for the betterment of the road is for the betterment of the individual. It is only a few years since the engineer was considered to be the man who turned the throttle, and the master mechanic the fellow who shoved a file or scraped a bar. We must establish our work as a profession and not a trade, and we must make ourselves felt. I believe that this Association will help us more than anything else in reaching that end. It gives us a prestige we have never had before. It is necessary for this Association to be a financial success as well as a success from the engineering standpoint. That means we must have an income which will keep the Association in good financial condition. I want to urge that instead of considering that because the road is a member of the Association there is no necessity for you being an associate or junior member, we get over that idea. The yearly dues for associate members are $5, and junior members $3, a very small amount in either case. That class of membership includes the receipt of copies of the reports and all discussion that go on at the meeting. A number of the roads around the country have said that they can get the transactions from the technical press. Suppose they can? If all the roads and all master mechanics did not care to become active, associate or junior members there could be no Association. If we want success we must, as individuals and companies, become members and help along from the financial standpoint. Each must consider the necessity of becoming an associate or junior member, and not a hanger-on, and going around to hear what the other fellows say and get the results without helping to pay for them.

Alfred Green—This is one of the most important times in the history of the profession of master mechanics and electricians. We are now starting out to make a beginning that is either going to raise us in the estimation of all men or we are going to go below the level that we now hold; for there is no man, no set of men, no men in any profession, that can stand still. There is not, in my opinion, any set of men that have any more brains, any more ability, or any more power to adapt themselves to circumstances than have the master mechanics and chief electricians of this country. There is no reason why we should not have and hold the honor that our position gives us; but we must earn it, we must earn it honestly, we must earn it by hard work, careful thought, plenty of discussion and heart-to-heart talks. We have a nice start, but it is nothing to what it must be. We are now a branch of the American Street Railway Association. There is no reason why we should not be the ones that they will come to hear discuss the papers that are the most important, or take care of the most important details of any street railway system. There is, of course, in the general manager's office the financial part of the business, with which we have nothing to do, and there is the department of the superintendent of transportation. But neither one of them can be a success unless the master mechanic and the chief electrician succeed in their departments; unless the latter are taken care of and brought to the point of success in careful business management which will give the best results with the least expenditure. Now, there is no reason why we should not attain the standing that belongs to us, and, as I have said before, what we want is hard work, and plenty of it.

DISCUSSION OF PAPER ON "THE CARE AND MAINTENANCE OF CAR BODIES"

The president then introduced Mr. Baker, of Boston, who read his paper on "The Care and Maintenance of Car Bodies," which is presented elsewhere.

Mr. Green—Mr. Baker says after a newly painted car has been placed in service for six months it is taken off and given one coat of body varnish. I would like to ask how many coats of finishing varnish that car gets before it goes out, and when he gives it the extra coat after six months does he add that as an extra coat, or what does he do before the car goes out?

Mr. Baker—I referred there to a new car. I would say, gentlemen, that we have Mr. Libby with us, who was formerly our master painter, now superintendent of our car shops, who could give you the details of all this much better than I, and he will answer any questions in that connection.

Mr. Libby—Mr. Baker referred to the new cars on which two coats had been applied. We deem it advisable to have a new car in service at least six months before we give it a third coat. Some builders advocate putting on three coats when the car is built. We think it better to have six months elapse between the

second and third coats. That applies either a new car or a car burned off.

Mr. Mundy—In applying that varnish in two coats do you put on two coats of rubbing, or one coat of rubbing and one coat of finishing varnish?

Mr. Libby—We use no rubbing varnish on the exterior except on the sashes and doors.

Mr. Mundy—If you put the third coat on after six months do you give it one coat of varnish every year when you renovate?

Mr. Libby—One coat.

Mr. Green—How about the interior?

Mr. Libby—Our repair work on interiors is simply a question of touching up the heel board, the toe board, and, possibly, the window sills. Other than that we expect to get ten or twelve years out of a new car with a rubbing up. We have not tried patented processes as yet. We mix our own preparation.

Mr. Green—It is a nice thing, if it can be done, to bring your car in after it has run for six months, because the first two coats had a chance to harden. Then, when you bring it in before the weather has had any effect on the varnish and give it an extra coat, you have something there which is a great help to the body, but I do not know how many roads there are that could afford to do that.

Mr. Mullin—What is the object in omitting the rubbing varnish? It has been my understanding that it was of special benefit to the body varnish as a binder. It is in use on our road and on several others that I know of.

Mr. Libby—We believe a rubbing varnish makes a brittle finish, and it is our purpose from the beginning to make the surface of the car as elastic as possible. It will stand more vibration, and we believe that we get better results. Rubbing varnish is used very largely to facilitate getting a good, smooth surface, and must necessarily dry hard and brittle in order to be rubbed with pumice stone and curled hair. We do not make any attempt to produce such a fine surface, but we do get a softer and more elastic finish if we omit the use of rubbing varnish.

Mr. Olds—That has been our experience regarding the painting of cars, whether new or old. Leave the rubbing varnish in the manufacturer's cellar. We have no use for it. We use two coats of finishing varnish.

It is very pleasing to note in Mr. Baker's paper the method they pursue in painting their cars. As nearly all of you know, the rough stuffs and primers that are brought to our attention are a curse as a whole. There may be some of them that are good, but I have yet to find them. The lead surface will produce an elastic coat that will give years of service. I can show you cars that have been painted for about eight years, and the body is not cracked; it is solid and sound. The car has been varnished quite a good many times, and a few times the varnish has been taken off—it got too old and became yellow. There are a number of varnish removers, but we have had as good results from using ammonia. If it is used properly and with reasonable care it will not injure the paint. If the ammonia is removed thoroughly and the car cleaned off, the car can be brought up then with small expense, not to the fine finish that we used to get upon a coach, but a good, durable and elastic finish.

Ten years ago we were getting out some cars that were needed for a special summer service. The car builder said that it was impossible for him to finish the cars for us. We went through very nearly the same process that Mr. Baker has described, but instead of using the knife coat we simply leaded, and did not wait for the knife coat. In fact, the cars were finished in four days and put into service—and they were not repainted for four years, being simply touched up and varnished. There was very little body on the cars, but it was good.

As to the finishing of the inside of the car we have many mechanics who are not as clean as they should be, who injure the inside of our cars, causing the wearing off of the varnish at the doors, window sills and various other points. We find we have to clean them and quite often refinish them. Then, as Mr. Libby has stated, the principal part of the work is the rubbing of the inside with some varnish renovator or some preparation of oil to bring out its life.

Mr. Green—In washing the cars, Mr. Baker, what do you use? What help have you? I understand there are some roads that employ women for washing cars.

Mr. Baker—We employ men in our car house and pay them $1.50 a day for ten hours' work. I believe they work 63 hours a week. John Lindall, foreman of the elevated shops, is here, and will give us his experience on that point.

Mr. Lindall—We pay our car cleaners $1.50 a day, and they work seven days a week, one car cleaner taking care of seven cars. Our method is to wash the cars every day in wet weather, or keep washing them until they are cleaned up after a storm, and then clean the inside of the cars.

There is something which interests me very much just now on account of the recent disaster in the Paris tunnel, and that is the fireproofing of cars. We try to make the elevated cars fireproof, and have the motor end of the car flooring covered with asbestos and galvanized iron. On account of some trouble we have had on account of fire ignited through the light switches, etc., we have put asbestos mats under the switches and stripped the insulation of the wire back 6 ins. or 8 ins., and put on asbestos stockings. We are also contemplating extending this practice to the light sockets on new equipment. I believe there has been some discussion among the underwriters in regard to putting the wiring in the cars in conduits.

Mr. Green—When we used the old-style rheostat, and when we had the old contact boards, we tried asbestos and found it one of the most dangerous things we ever used. We fastened asbestos board to the floor of the car, covered it with sheet-iron and fastened the rheostat to that. We found the asbestos would not only take up and hold moisture, but it got hot and the iron got hot; the asbestos held the heat long enough to set fire to the car on several occasions.

It is certainly to the interest of the railway companies to improve the method of wiring, especially where the climate is such as we have in Rochester. We have for six months in the year slush and mud, and where we use salt in the switches it cannot be kept away from the wires. The moisture seems to work through every crevice in the car where you have the cables. In that case it is necessary that the car wires eventually shall be put into a conduit, not for the benefit of the underwriters as much as for the benefit of the railway companies themselves. We are now getting away from the use of the old-style rheostat so that we have something from which the heat can radiate. I do not think we will ever be able to prevent motormen from running on any part of the rheostat. They will run on it and get it so hot that they will simply burn it up. You ask the motorman why he did it, and he will tell you that the car was in that condition when he took it out.

The President—We had trouble in Detroit with snow-plow cables. We use salt on the tracks, and after every storm we had five or six out of the eight ordinary snow-plows come in with the cables burned out. We took some 1½-in., inside diameter, lead pipe and made junction points at the proper place with small lead pipe leading into the larger lead pipe, and put all the cables into those pipes. This overcomes the trouble. It is expensive, but it is an absolute protection.

All the cars in Detroit are heated by stoves, set in a box, which is lined with asbestos inside and iron outside. We have had a great many fires in the interior of cars because of the non-protection of asbestos. Lately we have used merely sheet-iron with a good big air space, both top and bottom; a good circulation of air through the box is better than any insulating material.

I would like to know if Mr. Libby has tried wiping the outside of cars with linseed oil to brighten up the varnish?

Mr. Libby—We never did that. If we should attempt that it would have to be done in the car house. We are now using a very weak solution of linseed oil soap. On white work, the lower panels around windows and under the bonnets, etc., we have to give them a very hard rubbing sometimes to get them clean, but our main dependence is upon the use of clean water.

The President—Do you have trouble with the soap getting in the corners and accumulating dust?

Mr. Libby—We have the soap thoroughly diluted and give it to the men in diluted form, so that it will easily rinse out of all crevices.

The President—We had trouble in Detroit with the soap lodging in corners and crevices. We are using it yet, but in much less quantities.

The President—How often do you paint your floors?

Mr. Libby—Only when we shop the cars, once a year.

The President—Do you not have trouble with the car floors rotting from the excessive amount of washing which you give them?

Mr. Libby—No; we have not experienced any great trouble with that. We paint them once a year, when the car is shopped.

The President—On one suburban line in Detroit the car floors are all rotting out, and it is because of the excessive amount of water they used and the fact that they did not dry it out at all after they washed the cars. The result was that we had eight cars on one line there on which the floors had to be replaced. You can stick a knife right through the floor, it is all brown wood.

Mr. Libby—Do you hose them out inside?

The President—Yes, take a hose and wash it all around.

Mr. Libby—We do not use that amount of water on the interior.

The President—Do you ever use any ochre in your paint on the roofs?

Mr. Libby—No, sir.

The President—Have you any reason for not using it?

Mr. Libby—The management wants white paint.

The President—Are your car roofs painted white?

Mr. Libby—Well, they are supposed to be white, but we have gradually been introducing lamp-black, a little at a time.

The President—If the management did not prefer a white roof do you not think ochre better than lead?

Mr. Libby—I should most decidedly change the tint. I should prefer the base to be white lead.

The President—Mr. Baker said on open cars the seat backs and arms should have attention, and that the half-round iron on the steps and running boards should not be allowed to project above the edge. What do you do when that iron does project above the edge, as it does in a whole lot of places. Do you put on a new running board?

Mr. Baker—Yes. Otherwise it would be a very slippery and dangerous thing.

The President—Do you use the same old iron?

Mr. Baker—Yes.

Mr. Olds—In a number of cases we have lowered the iron about ⅛ in., and have been quite successful in that way. The running board originally was 1¼ ins., so that we were able to lower it and get the same result.

The President—I was going to make a suggestion after hearing what Mr. Baker had to say about putting on the new running board—why wouldn't it be a good plan to make an oval hole when you put that on? Then you have got it right on the start, so that when it does wear you can slack up on your screws and drop it down at no expense whatever.

Mr. Olds—I am afraid we would have trouble at times. The iron will get a hard blow. That will drop it down. It will then wear off the board and we will be unable to drop it again.

The President—You could bring it back?

Mr. Olds—Yes, but as it comes out of the car house, my experience is, that some of those things are overlooked. We have to issue orders calling that car in. Our company is very short of cars, and to get the car in for the necessary painting and overhauling is like pulling teeth. During the last winter we have been obliged to neglect our cars for that reason. In Boston they use a double equipment, as a great many others do. With us our equipment runs the whole year round, practically, and in that way we are obliged to bring them in from service.

The President—Mr. Baker spoke about the trap-door lift being kept in proper shape. What is the best form of trap-door lift?

Mr. Baker—I think we have had the best success with the T-lift. The only thing is to keep them down, keep the dirt out from under them. They will get rusty anyway and want to be renewed at times and kept clean and in workable condition.

The President—In building up on your first painting you use less oil in each coat, do you not?

Mr. Libby—Yes, that is the idea exactly. It is our object to fill the grain or pores of the wood only to a level surface; in other words, to apply as little on the car as possible. It is our object to get as much off as possible and press into the grain and pores of the wood. After having sand-papered that coat we then give it just one coat of ground color, which depends upon what the body color of the car is going to be, and then two coats of color and two coats of varnish.

We ornament practically on the flat color and give two coats of body varnish, about 48 hours between the coats, rubbing the first coat slightly.

The President—Mr. Lindall said he allowed one man to seven cars. Do you mean that one man can wash seven cars in a day?

Mr. Lindall—Yes, wash and clean them.

The President—That beats the record out in our country.

Mr. Baker—I might say that we have in our car houses seven cars to the man, for sweeping and maintenance. We have tried eight cars to the man, but we did not get our work done satisfactorily. Possibly we do too much work, and clean our cars too often. As I stated, we wash the cars once a week, except in wet weather; and, as Mr. Lindall went on to say, in bad weather we wash them every day, or keep at them until we get through. It is a question, really, of doing all the work we can with our men. If we cannot wash them every day they have to go two days or three days. In our inspection and other work, as I said before, we have tried to do that every third day. Some roads have criticised us, I believe, because we had too many men in our car houses for that work, but if we find other roads that can keep their equipment in good shape with less inspection and less work, we would like to know how they do it. We are anxious to get down our cost as low as we can, and keep our equipment in proper shape.

Mr. Green—I would like to ask Mr. Baker what percentage of rolling stock he operates per day.

Mr. Baker—At this time of the year, or practically all times of the year, our equipment is operated up to probably 85 per cent or 90 per cent. We might have 10 per cent at times in the shops. At the present time we have almost that, on maintenance and revestibuling our cars. But we can at this time of the year operate all of our open cars except a few that might be damaged, and also a large portion, 80 per cent or 90 per cent, of our box-cars. We run them out in wet weather or bad weather, even in the summer time.

Mr. Green—Yes; but you have a double equipment then?

Mr. Baker—We have, practically, in the summer time.

Mr. Green—Of course that makes a great deal of difference in handling the system.

Mr. Baker—Yes; makes extra work to keep up in one sense of the word; we have the two equipments to keep up, and it is pretty hard for our men in the summer time to keep up the open car and the box equipment; makes more inspection.

Mr. Green—I think you would find it harder if you ran about 80 per cent of your entire equipment every day in the year.

Mr. Lake—This matter of car cleaning has been a great bone of contention between myself and the management. I would like to inquire about the size of the cars. Of course, the city cars vary a great deal from our interurban cars. I suppose that the seven cars that Mr. Baker turns over to one man to clean are small city cars, are they not, and perhaps open cars at that?

Mr. Lindall—Twenty-five foot.

Mr. Lake—My management is very particular about car cleaning; wants them very clean inside and out. I perhaps have a different combination to contend with than the majority of you in the territory that we go through, which is composed of oil and gas country. The oil and gas, of course, comes from the ground, but I find a great deal of it circulating about through the air, and the cars accumulate a great deal of it when they are passing through; and about the best I can do on a 40-ft. car is to allow one man to a car per day. I change my cars off. I only run cars every other day, a run of a little better than 20 hours, making from 350 miles to 390 miles a day. In order to keep these cars up in any kind of presentable condition I have to clean them every day, windows and all. When they come in they are coated with a kind of yellow sediment that looks very much like brick dust, mixed with water. Just what it is we have not been able to find out, but we think it is a sediment that comes from the oil, and that is also very greasy.

We use what is known as linseed oil soap. There are two or three different makes. We have a very hard water and we have to use some kind of soap with it in order to get this grease off the cars. Another trouble we have is that we take our water from a river which is lined with paper mills, I guess from one end to the other, and those paper mills dump their refuse into the river.

Mr. Lewis—We clean six cars a day with one man, on an average. Our equipment is a mixture of interurban and urban, ranging from 25-ft. bodies up to 52 ft. Probably our interurban cars have to be cleaned more frequently on account of the higher speed and greater accumulation of dust upon the body and the windows of the car, but our average is six cars a day.

Mr. Mundy—We are using a soap very similar to that Mr. Libby speaks of, and do not find any serious results on varnish. If Mr. Lake got some other kind of water he might get better results with the soap. I think that has a great deal to do with it.

Mr. Lake—Our cars have been in operation now more than six months. We received four new cars less than two months ago that have not been in operation yet, and you can see very little difference in the paint. I would say that much, that I have preserved my varnish and paint to very nearly a new luster, but I have been very careful.

Mr. Mundy—Referring again to the paint question, I am hardly in a position to say very much on that, because at the present time the St. Louis Transit Company cannot pride itself on its cars. We are practically a combination of a lot of roads that left the cars in about the most inartistic shape in which you could possibly find them. We have been short of cars, and for that reason unable to get around and cover them to the best advantage, but we have been doing the best we could, and have been following out some lines in painting slightly different from those commonly used. We have got down to the point where we put the color on the car and then do nothing but stripe it. We have not the name of the St. Louis Transit Company on it; in one corner we have the initials, "St. L. T. Co.," and the number appears in the middle of the panel, on the side and on each dash, but the car is free from decoration of any kind. We are getting quite a number of new cars for the World's Fair, and in doing that we have even gone further; we have made the inside woodwork absolutely plain. We have not put a line of beading in the whole car surface. For instance, the pilaster on the window is simply a plain face with a corner taken off, about ¼-in. radius. The cars are finished that way all through, so that when it comes to cleaning in the future we will have it right down to a minimum, with no place for dust that we can possibly avoid, and no decoration to maintain and rub up.

W. D. Wright—We do not use very much soap; we believe in plenty of good water, no paper-mill water. I do not know that I can give you any statement as to the number of cars assigned to each cleaner. Many of our car cleaners have other duties, shifting cars, etc. We keep our equipment looking pretty well. We have the idea, just mentioned, of eliminating much of the decoration and fancy work on the cars. I believe that idea will gain strength—it is good common sense.

Speaking of the trouble from fires through electric circuits we have had some trouble in that line. We had one quite serious fire that I am satisfied was started by a heater wire on a side-seat car. The car was in the repair house not many minutes before the fire started. I think it was started by a small rubber-covered wire connected with the heater becoming moist to the breaking point, and, finally, from some little jar, it gave way and the heater circuit happened to be on. One of the first things we did to guard against fire was to stop the use of a solid conductor, especially in the smaller sizes, and for our lighting and heater circuits we use nothing but a stranded wire, which will not become nicked and break off inside the insulation. Inside, under the seats, we go still further, and in our heater wiring use a slow-burning cover, the same as is used in houses, and get the rubber out of the way. We use nothing but stranded wire. In order to avoid trouble from the cables, due to water under the car, we adopted a plan of putting our cables as much as possible above board, even in the cross-seat cars, having a conduit for them along the side and making all taps to the cables above the floor. That seems to be the weak point of the car cables, underneath the floor. Now we make all taps above the floor and bring the wires from the floor through porcelain or clay tubes, not cleated, to the inside of the car body. We use a porcelain knob that will hold two wires, designed to take different sized wires. We put two wires on one knob. The idea was to give an air space around the wire which would be better than any tube you could put on. The wheels can throw water on these knobs, but they will dry off sooner, and they also prevent the lodging of mud which holds the moisture, and which affects the woodwork all the time. Eliminate all these points if possible. Sometimes, for resistance, we bring a whole bunch of resistance wires, six or seven, in a separate cable. These are in the center of the car and not subject to the water from the wheels, and you can protect them better. When we come to the center line of the car motor leads, the resistance leads are in position where they can be cleated safely in carrying the wire around resistance boxes. In the first place we lower the leads and get them down over the car floor, and in carrying lead wires to the resistance box we never carry a wire with a rubber covering on it from one box to another or between boxes. We cut off the insulation and leave a part of the wire bare, leave it so that it can have an air space. If it is necessary to insulate it we put on a piece of porcelain or clay tube. Of course, the trouble is that we have got to go out of the car body somewhere. In the case of a box-car, which gives the most trouble from water, we have adopted a 2-in. pipe where we go out at the corner of the car, using a 45 deg. L, and use that pipe to go from above the floor down to a point where you would branch off and run under the platform to the controller.

H. E. Farrington—The matter of car cleaning on our road is in the hands of the superintendent of the transportation department, and, therefore, I have nothing to do with it. I do not believe in using a strong alkali, or a very strong solution

of soap upon the outside of the car. My experience has been that if the cleaning is handled by men who understand how to do it properly, no bad results will follow; but if it is handled by the ordinary run of car cleaners, unless they are watched very carefully, we are apt to have bad results.

We are governed in our car building by the same conditions that govern the Boston Elevated Road, as we run into Boston and our cars are practically the same as theirs, except some few which we have on the long lines out of town, where we have some larger cars, using the same straight side car with cross seats. Our methods of painting differ from those described by Mr. Libby. For some years we followed the same method as the Boston Elevated; but our people thought we should have a little better lustre and higher polish, and we went back to the old method of carriage painting. We gave up the knifing, but filled and rubbed down. The only object of the filling is to put it there for the purpose of producing a good finish, and, I believe, as the committee does, that better results can be obtained by using an oil lead primer, using your second coat, than knifing. Better results can be obtained in this way than is possible by a coat of any rough stuff that may be used. It insures long life and more durability. I have never followed the practice of putting varnish into a flat color. I tried that several years ago, but had more or less chipping or flaking off of the color. Then, after the color was reduced to a consistency for use, my men applied a very small amount of raw linseed oil, not enough to produce what we call an egg-shell gloss, or keep it from drying, but you can make the color more elastic than would be possible to get by using the varnish. I have seen cars painted with the knifing process that have been out in service from eight to ten years before coming back into the shop with any apparent cracks. I do not believe rubbing varnish is intended to do any more than rough stuff for producing a fine finish and getting down to a surface. It is heavily freighted with drying qualities not elastic, and if there comes a hot day it will not expand and contract with the outside varnish. The result is you get cracks. If you carry the same elastic coating through from foundation to finish, you will find that the ground work will stand for a number of years without showing any cracking or peeling, and stand up and do good work. I think for car work that method is the best of any I have ever seen.

As to the method of inside varnishing—the finishing of the inside of the car—I believe if we use inside lead color, not a rubbing varnish wholly, but mixing it possibly with one-half rubbing, or two-thirds rubbing and one-third finishing, it will dry sufficiently hard to give better results. With an occasional cleaning and rubbing with oil it will stand for several years and make a good appearance without any expense to the company. I follow that method, and the only varnish we have on the inside of the car is on the doors and windows and similar places.

William Pestell—I am interested in the matter of fireproof car wiring. Has any one else had any experience in putting cables or wiring in conduits on car work?

Mr. Ballard—On the Boston Elevated we have experimented a little with lead cable; we have only four cars running with that cable. We took our motor leads and encased them with 1¼-in. lead pipe, the pipe coming up under the seat and carrying it directly over the motors. The cables are not encased in lead—only the leads. The cables are encased in linen hose, and fastened up under the seat. The taps are made in the cable. For a great many years we had much trouble with the leads parting at the brush holder or other points, and taking fire and setting fire to the car underneath the seat. There is a fireproof wire which we use entirely on our field leads, bumper leads and the taps that run to the resistance boxes. We never had a case where the fire would run more than 3 ins. on this wire. It is impossible to burn it with a torch. There is a coating outside which is practically waterproof, it is impossible to set it on fire, and we have not had a case where a fire was carried under the seat of the car or for any distance whatever.

The President—Where we take the taps off we wipe the joints the same as a plumber would, so as to make them smooth. We never have had a cable down since they have been put up according to these plans. These cables are on the snow-plows only.

Mr. Olds—Our method of car construction is a little different from some others. We have two sills running through the full length of our cars that are placed 6 ins. apart, and the space between these sills is separated by a small cast-iron box, which gives a space between the sills. Our cables are run in between them. As you come to four motor equipment the leads are taken out from that hose, through the sill, dropped directly to the motor, which is inside hung, on the other side of the body bolster. By so doing they are absolutely protected from the water, and the lead being very short is not injured by the swinging of the trucks. We have been using this method for about seven years, and have found it very successful. In fact, the only short circuits we have had in any of our cables have been caused by very hot resistances, or in a few cases at the trap-door, where the cleaners have allowed the mud and dirt to accumulate, and in very wet weather this causes a short circuit of the wiring in the hose. At the ends of the car we used two center platform leads, coming up directly under the sill, the cables being passed in between them in the same way.

In regard to car cleaning I have found that no matter what soap you use you need to take extra care and caution with the car cleaners to keep them from using too much. It does not really matter much what the soap is, in my opinion, if you use a small quantity. We must have a little alkali in the soap in order to clean the dirt off.

Mr. Ballard—In car wiring have any of the members used any method of keeping the wires separated where they go into the controller underneath the car platform, whether they put them in one post or two posts? We have had a great deal of trouble with moisture getting in from the platform and getting into the cables, and the cables being short-circuited a foot or two from the controller on either platform. In our last lot of cars we have taken the wires out of the holes entirely and run them separately, and they do not arc if the water gets near them.

Mr. Pestell—When we get the water guard on we are pretty careful to get it tight, and underneath the car, at the right-hand of the bumper sill, we put a canvas around the cable where it comes out, nailing it on and keeping it painted. That takes the washing of the water away from the cable. The place we find they burn is where the bend comes in the cable underneath the sill. We protect that so as to keep the dust out of the controller and keep the water from getting on the cables at that point.

Mr. Mundy—We have had some trouble in the grounding of cables, but most of it occurred in summer cars on which the car company put the cable in. We were using at that time rubber-lined hose. They cut the hose level with the top of the floor, so that the water got into the hose and ran down it. We found if we ripped the hose open for about 3 ft., retapped it, providing an opening so that the water could get out after it got in, the wires dried themselves off, and we eliminated short circuits. On our ordinary work we run the hose 3 ins. above the floor and set the controller on a wooden block so that the hose keeps the water from getting in. We find it better to split the hose and retape it so that any water which gets in will work out of the hose, owing to the split.

On motion the meeting then adjourned until 2:30 p. m.

TUESDAY AFTERNOON SESSION

President Farmer called the meeting to order at 2:45 p. m.

Mr. Green called up the question of the time of the meeting

of the next convention, and suggested that it would be wise to hold the mechanical convention two days in advance of the National Association's meeting, on the ground that a great many more master mechanics would attend the meetings, because it would give them an opportunity to attend the convention and get the full benefit of the papers and discussions of both associations.

Mr. Baker—I would offer the further suggestion that we have three sessions a day, morning, afternoon and evening. We do not come here on a junket.

The president put the question on the motion to have the meeting of the Association two days in advance of the meeting of the American Street Railway Association, at the same place, and that there be three sessions a day instead of two. It was determined in the affirmative.

The president called upon E. W. Olds, who read his paper on "Improvements in Street Car Motors," which is presented on another page.

DISCUSSION OF PAPER ON "IMPROVEMENTS IN STREET CAR MOTORS"

The President—The paper by Mr. Olds is now open for discussion.

Mr. Green—Do you use split boxes?

Mr. Olds—We did use them until about a year ago exclusively. We now use some of the solid boxes.

Mr. Green—Why do you use a solid box?

Mr. Olds—The general construction of the bearing and of the oil-well is such, on account of getting the long bearing, we are obliged to let the bar extend, so to speak, somewhat into the end of the armature so that the bearing is all lifted out together, and as all pinions are now put on with a taper fit we have not the same objection to the solid bearing that we had years ago.

Mr. Pestell—How much larger are the bolts and gears?

Mr. Olds—About one-eighth of an inch.

Mr. Pestell—Do you use outside or inside hung motors principally?

Mr. Olds—Inside.

Mr. Pestell—Have you any outside hung motors?

Mr. Olds—Yes.

Mr. Pestell—Have you made any changes in regard to bringing the leads out on either side, so as to bring the leads into the center of the truck?

Mr. Olds—When we ordered the motors for the cars we had the leads changed and brought out on the axle side. We have but twenty cars with the outside hung motors, and these have the leads coming out on the axle side. They are General Electric 1000-motors and were built in that way for us.

Mr. Pestell—We have many trucks with the motors hung outside, and the lead troubles have been reduced 50 per cent by bringing the leads on the opposite side. It occurred to me, in ordering new motors, it would be well to have holes drilled, and then plugged, so that you could use the motors either way.

Mr. Mundy—We have gone into the motor proposition and are having some new motors built. I talked this matter over with Mr. Olds, and we placed an order. We went perhaps a little further than he has done. Our motors are all outside hung and the leads are brought out on the axle side. We have motors arranged so that we can use solid gear for small motors down to 40 hp. As far as bringing the leads out is concerned, the company decided it would put in bushings on both sides and plug the side which was not to be used. These motors are Westinghouse. We have had some motors from the General Electric Company with the leads coming out on the axle side, and in that case we simply drill one side.

Mr. Wright—In our double-truck cars we bring the leads from the top of the motor. That leaves the car bolster as it should be. The lead goes into the motor on the outside, and we bring it into a piece of canvas which lies on the top of the motor. It makes no difference in the life of the lead.

Mr. Olds—In that type of truck, with outside hung motor, how do you get the brake rigging on?

Mr. Wright—We lay it down right on top of the lid of the motor. Our types of motor have a lug on the side for side-bearing suspension, and we bring them around through there. I believe that is the place to support the lead to the bolster.

Mr. Mundy—Just a word on the subject of lids. Our cars are set low, and they barely clear the wheels, and the brake-rod, inside hung and straight rod, rubs sometimes on top of the motor. It sometimes carries off the motor lids and leaves them on the street. I have been hunting for something in the way of an improved motor lid and have not found it yet.

Mr. Green—We had the same trouble, and we made a long stirrup and fastened it on the cross sill so as to give the brake-rod plenty of room to adjust itself to the swing of the car. It travels in the stirrup. Otherwise it would take the lid off the motor.

Mr. Olds—Regarding the twenty cars equipped with the outside hung motors, we made a little stirrup or guard that carried the rod so that it was always above the motor—just clears it. We have no trouble with the leads, as they come out on the axle side of the motor. This is the General Electric 1000-motor, and it is no trouble to make the change.

Mr. Wright—You can make a little sling to be attached to the motor, which is set over the top of the grease-cup.

Mr. Mundy—I had reference to the cam type.

Mr. Lake—I had some experience with the fastenings of the motor lids on work cars; we were losing them frequently. Our passenger equipment does not trouble us. I made a hinge hasp, sort of loose staple, drilled through the lid so that the hasp came down on the side of the casing, a thumb button turned through the loop in the hasp, and dropped it down. It answers better than the gear rigging.

The President—Mr. Mundy, do I understand that you are using solid gears down to 40 hp?

Mr. Mundy—We have just gone into them.

Mr. Annable—We have used solid gears at Grand Rapids for eight years, on all sizes of motors, from 25 hp up. The only split gears in use are those on new equipment.

The President—We get all gears bored to a standard size. Take a gear and press it onto an axle, about 25 tons to 30 tons pressure. That gear goes onto the gear fit. After the gear is worn out, and is pressed off the axle, it occurred to me that the next one that went on, bored to the same size as the first one, would not be as tight a fit. That thing could continue indefinitely. Suppose you wore out a half dozen? Each one would be looser than its predecessor. Is it your practice to turn the gear fit very smooth, or do you leave it rough?

Mr. Annable—All the axles we have used it on have been cold-rolled finished axles. All we did was to cut the keyway and reduce the journal, and the manufacturer bored it. The only dimensions given the manufacturer was the size of axles.

The President—Have you experienced trouble in having the gears become looser after pressing on one or two on the same axle?

Mr. Annable—We have not, for the reason that the first axles the gears were used on were on cars of lighter equipment and lighter trucks. The result was there are new axles placed under them to take care of other equipment. We put on new axles. Where we ran along on that type of axle we have not had any trouble in that direction. We put them on with a hydrostatic press instead of clamping them. This has reference to the split gears. We get much better fit than by bolting. While these split gears will become loosened from the stretching of the bolts, of course, we would not meet with that trouble in the solid gear. After one gear has been removed the next one would be a stronger fit, put on with a hydrostatic press, than

if we put on a split gear. We have close enough fit so that in increasing our key we hold them, and in increasing the fit we do not throw the gear out of center any more than in the other case.

The President—I have only had a year's experience with solid gears, but it has been in my mind that as you keep on pressing on new gears you will get a loose slim fit. In the use of the solid gear on some of our axles the hub goes right against the hub of the wheel. Most of us have 100-ton presses, and we have found that we do not dare to press them off, the gear and wheel together, with a 100-ton press. We have had to split the gear—drill holes into it and split it—before we dared to shove them off together; otherwise we would break the press. For this reason a short time ago I advised the purchase of a 200-ton press, so as to be able to shove them both at once. There is no way of getting presses in between them.

Mr. Mundy—I do it with a split gear—shove out the split gears. I have not anticipated any trouble with the solid gear, because I have large holes in the web of the gear and run columns through there and shove the wheel off.

The President—We could not get anything that would stand the strain. Our wheel has very heavy arms, which makes the distance between the arms small and we cannot use that method.

Mr. Mundy—We use a piece of iron shaped like a horseshoe for slipping between the wheel and the gear. The columns go into little pockets and make a bird-cage through the gear, and shoved the gear off and left the wheel on. That is a system which we use with split gears.

The President—The trouble with split gears is this—we put on a nut which does not fit. They ought to make a nut wrench fit the whole length of the bolt, but they do not do that.

Mr. Wright—We use crown nuts altogether. We have no trouble with the nuts working loose or the bolt breaking off.

Mr. Mundy—We have been using 7/8-in. bolts on all of the small gears and using crown nuts. The bolts seem to become crystallized and break off, and get in between the gear and the pinion, and you know what happens. That is one thing we prevented by using the solid gear. I may be mistaken with regard to the fit of the gear, but I do not expect any great amount of trouble, because for a number of years we have been following the practice of placing our wheels on axles in a manner slightly different from the general custom. I do not let my wheel fitter fit a wheel to the axle. The axle is turned to a gage and the wheel turned to a gage, and he does not know what axle the wheel is going on. We carry that standard right through. We will press on and off eight or ten wheels before the fit is loose enough to give any trouble.

Mr. Baker—We can do that also. We can get the same fit eight or ten times.

The President—Speaking of the heads of the bolts crystallizing I have used a rod with nuts on both ends.

Mr. Mundy—It crystallizes in the thread just under the nut and breaks off there.

Mr. Baker—I think we should try to get a better quality of iron. Two years ago we used Norway iron for almost everything about the truck. We have given that up, and we find that a 3/4-in. rod running over a wooden block will crystallize and break off like a piece of chalk. We have tried to get a fibrous iron, but the trouble with us seems to be to get the right quality. The purchasing agent naturally wants to make the best showing he can on the price paid for supplies, and as a result he does not always get us the kind of material that would really be the cheapest in the end.

Mr. Ballard—I would ask Mr. Mundy, speaking about putting the wheels on the axles, whether it was a taper or straight fit?

Mr. Mundy—A straight fit, with a small taper at the end of the axle, about 3-16 in. The bore in the wheel is tapered for about the same length, so that in starting you get a chance to enter the heel on the axle a little easier.

Mr. Ballard—I have tried fitting wheels on old axles, and I find I cannot get as good fit by boring as fitting the axle to the bore of the wheel. In our solid gears I cannot see how it is possible to get the wheel to fit, where you have to renew the wheel, without removing the gear.

Mr. Mundy—The gears which we have are supplied with four holes about 3 ins. in diameter, all carried through the web. I figure on pushing it off by using a double horseshoe arrangement, one of which has columns in it 18 ins. long; the other arrangement shoves in between the gear and wheel and has little recesses for little pockets, and the other end of the columns will fit in these recesses without passing through the gear.

In St. Louis we are using a web-spoke wheel; the plate is almost solid except a little bit of a hole taken out to get rid of the sound.

Mr. Pestell—In regard to the insulation for fields, Mr Wright sent me some time ago samples of insulated wire, and he may give us some information about that matter.

Mr. Wright—About seven years ago an effort was made in Providence to get up an insulation which should not have any cotton in it. It is pure asbestos. They spin the yarn and wind it on the wire, just a little spiral. There is some compound put on the copper to help the asbestos cling to it. I have some fields which have been in use two or three years. I am following this method myself and I believe it is going to make a field that is indestructible. The field is wound on a metal form, and there is brushed on each layer a compound of shellac and whiting, made about the consistency of mud. When we take the field spool onto the form, the outside layers are held together with a little tape, and then we bolt the field spool between some iron plates, so that when we put it in the oven to bake it it cannot swell and get out of shape. In that way we get a field which is of the proper size, and after it is cooked you can take it and throw it for 5 ft. or 6 ft. on the floor, and you will not start a wire. It is like a rock. I think it will make a good field. If we can get the field trouble eliminated from weak fields we will cure half the trouble with the motors.

Mr. Green—I think one thing which will help insulation is to get motors big enough to do our work.

Mr. Mundy—How will you get the general manager to pay the extra price for the extra motors?

Mr. Green—He has to pay it, and pay heavily right now.

Mr. Mundy—What is the outside insulation?

Mr. Wright—The field is afterwards wound with cotton tape, and this tape is dipped into an insulating compound. I should have said that for the first layer of tape we put around the field, after we wind it, we brush on some of the compound referred to, shellac and whiting, not getting it too wet to be handled conveniently, and then we wind a 1-in. web around a field and draw it tightly, and the compound oozes through the webbing to a certain extent and makes a cement. Outside of that we take 8-oz. tape and roll it, and make a heavy tape in that manner. For the last coating we use lampblack and oil and try to get it waterproof. I will say that the insulation is put on small wire, as a rule, but we have some armature coils in service with that asbestos insulation.

Mr. Mullin—I understand you use this compound on the bare wire?

Mr. Wright—No, sir; the wire is covered with an asbestos cover, and we use the compound as a sort of cement.

Mr. Mullin—Over the asbestos cover?

Mr. Wright—Yes. It is supposed to be fully as good a conductor of heat as is the air around your wire.

Mr. Baker—Do I understand that that is the commercial asbestos, or do you use a special asbestos?

Mr. Wright—We use a special make, just about ready to go on the market. We have had to work pretty hard to get what we wanted. It has been a great trouble to get an asbestos that would be fine enough and still be strong enough to work.

Mr. Mundy—I really was very much disappointed last night to find that Mr. Adams, of Baltimore, was not going to be here, because I, for one, wanted to express to him my great appreciation for some little schemes that he has gotten up, and to tell him that he actually got me out of trouble this year. We were getting ready for the dedication of the World's Fair, and owing to the trouble with circuit facilities it was almost impossible to get field wire for the motors. Mr. Adams, as is shown in his paper, has a way of putting on tape by hand that saves lots of money. I was able not only to get out of the trouble, because I was able to put my motors into service by using the old fields over, a thing I had not been able to do before, but found it an excellent insulation scheme.

Mr. Baker—Regarding the axle bearings, armature bearings, I take it for granted that Mr. Olds used babbitt. In specifying our motors we have the shells made of cast-iron and the lining about one-quarter inch thick of composition. We have our own brass foundry and make those linings, and we find that on the average they wear something over a year, and in some cases on test they run much longer. We do not have the trouble about bands that we had where we have tried the babbitt recommended by the motor builder.

Mr. Mundy—Mr. Baker, what is your experience, as far as cutting the axle is concerned, with the use of a composition bearing? Do you not find that the axle does become moist?

Mr. Baker—No; I think we have less trouble with our axle bearings. The babbitt is apt to be cut if it gets burnt. If you burn babbitt, it is about as apt to cut as anything you can find except cast-iron with cast-iron. Mr. Ballard is here. He can tell us more about it. He has the armature bearings to look after, that is, the armature shafts.

Mr. Ballard—We have very few cut bearings. We have one occasionally, but they do not cut badly. The cut is just in little grooves, instead of cutting the same as if they were babbitt. When they do cut with babbitt, they cut the whole width of the bearing, but with metal we find it only cuts in grooves.

Mr. Mundy—What method do you have of getting those bearings into shape afterward? Do you turn them down and shrink a sleeve on, or put a new shaft in, or what do you do?

Mr. Ballard—With the W. P. we put a new sleeve on when it is necessary. When they get worn to a certain size, if they are too small, say 1-64 in., we turn the shaft down and we have a special bearing for it. On our old motors we have three sizes of bearings on our shafts, 1-32 of an inch decrease in each size. When they get below that we renew the shaft.

Mr. Mundy—I know there are a number of roads using the shells with shrinking sleeves on. Is there anybody here that has experience in that line?

Mr. Pestell—We have adopted the practice of shrinking on sleeves when the shafts were below a certain size, using a sleeve rough-turned on the outside and true on the inside; simply a matter of turning the armature shaft to a proper fit, cleaning up the sleeve, putting it on and turning it off. It is an inexpensive process.

Mr. Mundy—Do they give them with a finished interior that way?

Mr. Pestell—Yes, sir.

The President—How thick are they, Mr. Pestell?

Mr. Pestell—We figure to use a sleeve on the start about ¼ inch thick, turned down at the bottom about 1-16 inch.

The President—Where your taper leaves your armature bearing?

Mr. Pestell—We only turn a fit to that part, and not beyond the taper.

The President—There are a whole lot of armature shafts up in Detroit that have no shoulder left at all on the old steel motors. The taper runs right straight out to the armature, the bearing side.

Mr. Pestell—Even if they were so and you cut your sleeve right up so that it left a shoulder, you wouldn't lose enough of the fit of the pinion to do any harm. I should not consider that anything. As I remember it, there would not be more than about 3-16 in. of your fit gone.

The President—When you press these sleeves on do you increase the size of the armature shaft over the original size?

Mr. Pestell—No, bring it back to the original size.

The President—Then, under that condition, if it is ¼ in. thick I should think that you would turn away down into that taper.

Mr. Pestell—On our motors it does not affect it much.

Mr. Mundy—Do you find it necessary to either pin or key that shell at all?

Mr. Pestell—No, sir; the shrinking is sufficient. You have to do it pretty quick or you lose your fit.

Mr. Green—We have put on a great many sleeves to bring our armatures back to size, but our greatest trouble comes on the commutator end. What are they doing in Boston in regard to lubrication? Are they using oil or grease? We are using oil entirely in Rochester. I do not know what results we are going to have when we come to cold spells—it may tell a different story—but we find that with the oil lubrication we are getting most excellent results. We oil with a feed-cup. We are experimenting with a cup of our own and another form. We are getting good results. In greasing your outside bearings, your grease gets to the back part of the box and collects dirt and dust from the street, and it hangs to that grease and forms a perfect emery wheel on the axle, cuts it, and the dirt keeps working back into the grease if you do not watch it very closely. With the oil we find our brasses are giving us better results, and on our busiest days, where we run the 80-mile round trip to Sodus and back, we never have a hot journal or hot brasses of any description. Our axle bearings are all babbitt.

Mr. Mundy—Do you use oil on the outside bearings too?

Mr. Green—No, but we lubricate with oil.

Mr. Pestell—What is the comparative cost of lubrication as between oil and grease?

Mr. Green—Up to date we have not been able to go into it deep enough to be able to tell; but I can say to the present time that the improvement in the shafts and bearings all around and the cutting down of the number of boxes that we have had to babbitt, from the time we have started in with oil, is considerable. The babbitting alone has dropped down more than one-half. On our busiest days, with long trips to Charlotte and Summerville, and the cars going out in the morning with no inspectors to take care of those things, you can save enough to pay the increased cost of the oil, if there be any, without taking into consideration the benefit you get to your bearings.

Mr. Mundy—Is it necessary for a man to turn on these oil cups when he goes out or is it self-lubricating?

Mr. Green—There is the principal trouble. Your grease cup always feeds. We are experimenting now with a double cup, one feeding down into a lower cup, with a ball set over the opening, which vibrates with the action of the brake or the car, allowing the oil to feed, and the moment the car comes to a standstill the ball drops over the hole and stops the flow of oil.

Mr. Mullen—We have been using the cup that Mr. Green refers to for about a year and a half, and are very much pleased with it. We save about one-third in the cost of our lubricants besides prolonging the life of our bearings 50 per cent.

Mr. Baker—Mr. Green asked me if we used oil or grease. We use both. We use oil on car journals almost exclusively. On some of our motors we are using grease or solidified oil, and we are having very good success with that. On our elevated lines, Mr. Lindall, who is here, tried that device that has been spoken of, and in some places he had some trouble with it. I

think he is using oil altogether. I think oil is better in a great many cases.

Mr. Wright—In regard to oil versus grease I will say we have not used grease for six years for lubrication. I believe in oil as a lubricant.

Mr. Mundy—On the question of gear casing we have had a great deal of trouble with gear casings breaking, also the supporting bolts that hold those casings breaking and dropping in the street. I guess everybody here has had that experience, and the difficulty of getting a gear casing out from under a car when it was broken. It means a tie-up of anywhere from 45 minutes to an hour; and in trying to overcome that we have been getting our new motors according to a design which is somewhat radical. They are going on double trucks, and we expect to do all repair work by running the truck out from underneath the car and working from overhead. The trucks that we are using are known as the Dupont double trucks, in which the truck goes underneath the axle; the axle lifts up. So we have had this motor designed so that the gear case is supported on top of the motor, and you cannot take the bottom half of the gear case off without lifting the pair of wheels out, so we are not depending on a bolt in any manner for holding it up. The lugs are underneath. Whether that is going to prove a remedy for this dropping of gear cases in the street I do not know. We have tried on other motors everything we could think of, tried all kinds of bolts, all kinds of nuts, and still the bolts will break and the gear cases drop down in the street. I would like to know whether anybody else has had any experience in this line?

Mr. Annabel—That works out very nicely when we are going after new machines and can have them built to receive those improvements, but what are we going to do when we have a lot of them giving us that trouble, and still have to use them? I will tell you what I have been doing since 1894 on the old type of machines. On General Electric 800-motors we are using a wood gear case, of ⅞ in. hard maple (though I prefer sycamore), with a 12-in. gage steel top screwed on. I use an 18¾-in. screw for holding the 12-in. gage, and use the same support or anchor that was originally designed for the machine. That means we have reduced the weight to a point where there is not any self-destruction, and as for the life of the gear case, to say nothing about its breaking loose from the motor, it has doubled the life of the gear case, we have found, five or six times.

The President—I have just designed a gear case, and we have some of them in use in Detroit. It is just four angles, curved in the form of a case. Then for the sides I use 5-16-in. thick wood, and for the outside, the periphery, of the case I use wood ⅛ in. thick. The reason I made it so thin was that if a bolt breaks instead of getting in there and springing your armature shaft it will go through the gear case and not hurt anything.

Mr. Mundy—How do you hold that bolt?

The President—I put the thin pieces in first, in between the two ends, and then I put the side pieces in next, and the side pieces hold the outside pieces in. You see, it cannot get out. Then in between these angles I put in distance pieces and rivet the whole thing up together. The outside angle pieces, the large pieces, are cast with lugs on to hold onto the motor case. I have patterns out now for a 12-A, a 38-B, a Steel-34, and a Westinghouse-76. I think the patterns are nearly out for all the different motors we have, and it looks pretty good. It looked so good to me that I started to get a patent out on it, and I found some other fellow had patented it away back in 1893.

Mr. Mullen—We have designed a gear case something after the pattern described by Mr. Annabel, made of ⅞-in. maple, and covered with No. 14 galvanized iron covering, but we have a little different method of anchoring the gear case than formerly. We use an angle on the side of the gear case and fasten it onto the lower bolts on the axle cap, which gives the strain right in the heavy part of the gear case, or in the widest portion, almost directly under the axle, and it takes practically all of the strain off of the gear case; and then on the front end we anchor it in the old place provided for the purpose on that style of motor, and I can safely say we have decreased the cost of our gear case expense for the last two years at least 30 per cent.

The President—In making it out of wood you get rid of the excessive weight. The gear case on a 12-A weighs 126 lbs. This gear case I got up weighs 58 lbs.

Mr. Mullen—You do not have that jumping effect to loosen bolts that you do with a heavy gear case.

The President—This structure is elastic.

Mr. Anabel—You just about take off 100 lbs. with this class of gear case that I make. They weigh about 32 lbs.

Mr. Olds—I would like to describe a method we have been using now for about two years. We made up our mind that most of our gear cases were broken by coming in contact with something on the street. It breaks the top half. The lower half very often is not injured at all. We cut off the lower half, about 3½ ins. to 4 ins., and got out a new set of patterns, cast in malleable iron, for the upper part, and then made a sheet-iron bottom of No. 20 iron. The lower edge of this lower half of the gear case had a flange cast on it and bolt holes. Now, this little sheet-iron bottom has an edge turned something like this (indicating), then in just the ordinary folding machine we make a folded joint. There is another ring made out of 3-16 in. x 1 in. That slips over; then there are bolts through. I have yet the first case to renew after I have put that on, which is about two years ago. We have to renew the bottom parts very often.

Mr. Pestell—We have adopted a little scheme in Worcester to prevent the gear case from falling when a bolt does break. We put a little angle right under the bolt, right on the end of the gear case, and let the bolt go right down through it. The bolt breaks off usually right down near the nut, near the thread, and this angle is still retained on there, and holds the gear case up. It has saved us a great deal of trouble on the street. We put one of these on both ends of the gear case.

Mr. Green—We have a condition to go up against at Rochester that I think is different from what any one else here has. We have 38 miles of track between the curb and the sidewalk, so that we have to chop out the side of the trees to get the cars through. We start to plow snow every year about the middle of November, and we will plow snow up until the latter part of March. On this side-track we have to use a nose plow, and they will not let us throw any more than they can possibly help in between the trees and the walk, and they will not let us throw it out into the street any more than they can possibly help. The consequence is, using the nose plow, the plow keeps climbing, and leaves a certain amount in the center, and then the frost heaves all the cross-walks that are in that track, and the consequence is that if we do not watch it we have to take up a great many cross-walks and relay them again in the spring. They take out gear cases right square off, so that we cannot get anything strong enough in the form of a gear case just on account of that piece of track—38 miles of it.

The President—As you all know, Mr. Adams is not here, and it has been suggested that we read his paper this afternoon.

(The president read the paper referred to, which appears elsewhere.)

DISCUSSION OF PAPER ON "SHOP KINKS"

The President—With regard to the glass question, I would like to ask if it is necessary to have the glass ground to make the glue do its work. In our case, at home, we take plain glass

and put the glue on, and it will lift it every time if the glue is good.

Mr. Bigelow—A friend of mine, connected with the Boston & Maine, described to me a simple arrangement they had in which they had a box, the top covered with plush, and about a 2-in. hole through it, and a sandpipe discharging directly underneath this hole, a lead pipe about 1½ ins. in diameter, and they moved the glass around on top of this plush as the writer describes. If they wanted it to come up to the edge of the glass they would put another piece of glass or cloth against it. They had no trouble with dust blowing. There was a reservoir for the sand at the side of this box, and the sand dropped into the pipe from that, the same as the writer describes, with a 45-deg. fitting, and then the sand dropped to the bottom of the box. The box was beveled.

The President—On that question, as to the reinsulating of fields, if any of you have had any experience I should like to hear from you.

Mr. Mundy—About reinsulating, although we did not get started at it until April, and have not had a chance yet to determine how long it will last, we see no reason why it should not last just as long as the cotton insulation, because if anything the tape is better than the cotton for holding, and I find that unless the difference between the price of scrap copper and insulated copper is more than eight cents and a half it pays me to reinsulate. In the majority of cases the copper we have been getting makes a difference of about five cents, so that we are just that much to the good. You would naturally think the field would occupy considerably more space than it does with copper, but after the men get a little used to it they can get it into almost exactly the same space. The wire goes back right into the former positions and gives a very solid field indeed.

Mr. Wright—You use about ¾ in. tape?

Mr. Mundy—Use a ¾-in. tape, and have the tape cut into lengths to take one side of the loop; go around the loop, starting from the top and going down to the bottom. We work it to have two men to clean. The first thing is to spread it out, then go over it with a knife and clean up the insulation. After it is cleaned either those same two men or another two take it out and wind the two sides right along together. Then it takes two men to put it on. The actual labor of reinsulating and putting on is probably twice that of winding with cotton.

Mr. Green—We have reinsulated wire now for seven years, and we have reinsulated wire which we use on a Westinghouse 3 and all other sizes for the different fields. We have one of the Detroit machines that we use and an old lathe that was bought second-hand, rigged up with a head to wind fields. We have a boy for that whom we pay $1.38 a day for nine hours' work. All our men get free transportation. In regard to cost, I am very sorry that I have not the exact figures with me, as I could give it to you in detail, since every field is wound under a job order number. I will not make any guess at it, but if any one wishes to get the full data in regard to the cost of reinsulating fields I will give it to him. Every field is numbered as it goes out and the day and date recorded. The copper hardens after a time. If there were no way of softening that copper, of course you would not be able to reinsulate that field more than twice before it would be perfectly worthless. We take the field right out into the yard, build a fire and burn the insulation off and let it stay there, of course, until it is cold. That softens the copper. We do not put any tension on when we rewind, only the tension of the machine. We use insulated tape with gum on one side; it is a thin tape. On every layer we also use the St. Louis compound. We have tried everything. And of course you cannot use that St. Louis compound only just where it is going to stay just where you put it, because if you bend it you will break the body.

The President—When you form a field, after it is wound have you had any trouble with the insulation being destroyed when you form it in the wheel press?

Mr. Green—We do not form a field.

The President—In forming fields we wind with new wire, but do not use insulated wire.

Mr. Mundy—That is the reason we have not heretofore been able to reinsulate No. 56 fields.

The President—We used new wire, as we found in forming them up it would destroy the tape.

Mr. Olds—Mr. Mundy gave his method of reinsulating the field, which is practically the same as Mr. Adams'. I have seen the work done in Mr. Adams' shop, so that I simply got his method, which is practically the same at the start as that of Mr. Mundy, except that the cleaning of the old insulation from the wire and the winding of the tape is all done by girls and women. He told me he found them better workers and that they did the work neater, and after they were broken into the work they would stay by it, whereas a man would wish to advance himself to something higher. I saw some fields that he had when I was at the works last fall, that had been put in shape that certainly looked as neat as anything I had ever seen in that line.

Mr. Mundy—By using six men we can get eight fields per day on the basis on which we work. To overcome the possibility of a man being careless in getting the tape on (of course we have to press them somewhat in the press to bring them down tight) I transform all fields, and if the man has been careless the transformer breaks it down. If it does, I then open the field and reinsulate the place that gives the trouble. I agree with Mr. Adams that this matter of transforming to get at defects in the armature room is a big money-saver. The least carelessness of any kind on the part of the coil makers or the armature winders is detected at once and saves the expense of putting an imperfect armature into the motor. I will not state the name of the company I got them from, but not long ago we found some difficulty in getting cotton-covered wire of the right size for one of our motors. We ordered by telegraph from a manufacturing concern 25 sets of armature coils. I got them and started to place them in service, but I found six or seven coils in which the wires had been crossed and put in the press so hard you could not tell the difference between them. I do not know whether they put this kind of coil into their own armatures, or send them out to people who buy repair parts. We adopted a transformer test. We have a home-made machine, made up of an old Sprague motor by simply taking the commutator off, replacing it by a couple of copper rings and bringing out the leads at opposite sides. It runs 1300 revolutions and gives me 25 cycles alternating current. For a really satisfactory test it is claimed the current should be of a high frequency, up to 125, if possible. I find the 25 cycle transformer gives me everything we want, and it is not an expensive apparatus to fix up. Any road that has not taken it up, if they will look into this matter it will pay them.

Mr. Pestell—We use a method for testing all windings of the armatures, etc. We use a milli-voltmeter, and a current from a lamp circuit through the armature. It is handy and does not require moving around and can be used at any armature stand. If it is a repair job and the armature comes in, it is simply a matter of putting the current through the armature with a wooden yoke (putting the current through the same points as the brushes), and then running the connections of the milli-voltmeter to the commutator. Many short circuits in the armature can be located quickly and the bad coil taken out and replaced, and also new work can be checked up in that way in a short time and at very little expense. We use no shunt; but enough current from the armature to get a suffi-

cient deflection, 75 or 150 milli-volts, through a normal coil. If there is a short circuit we do not get as much deflection.

Mr. Baker—In addition to the test mentioned, we put our armatures into a frame and run from 20 to 30 minutes with a load on the armatures before they go out. We have a report of every armature that comes in that has not been out thirty days in actual service. There is no doubt that some of them are damaged between the time they leave the armature room and the time they are placed on the cars.

Mr. Ballard—We take two motor frames and put them together end for end. We have them mounted on old pieces of railroad iron and move them forward and back. We use one motor as a generator and the other as a motor, and run the current to 40 amp. to get them to the highest point they will run at. We run them from 20 to 30 minutes, first as a motor and then as a generator. In testing for short circuits we use a step-up transformer.

Mr. Mundy—May I ask what voltage you use for testing a newly-wound armature, and also what voltage you use for testing an armature brought in for repairs?

Mr. Ballard—On new work we run up to 2000; as high as they can step up. On old work we calculate to run from 800 to 1000. If the armature will stand 800 volts we let it go out.

Mr. Baker—Mr. Lindall can give us a few shop kinks in regard to steel-tired wheels. We have had to take our wheels out and grind them about every two weeks.

Mr. Lindall—Owing to our severe conditions, curves, etc., in Boston, we wear out the steel-tired wheels very rapidly. The road has been running now about two years and we have replaced over 200 pairs of tires in that time. We have a gas heater. After the wheel is taken out we heat up the old tire until it drops off. Then with a large lathe we bore out a new tire to a shrinkage fit, allowing about 31-1000 of an inch in a 33-in. tire. The heater is arranged so we can drop the wheel into it, and we can take off a tire in 6 minutes with the heater. It takes 10 minutes to heat a new tire so that we can drop the wheel in it. In this way it costs us about $2 a wheel for changing the tires.

Mr. Ballard—In repairing heater coils it is necessary to wind long coils of wire, and in place of winding them on a mandrel the wire is fed through a fine hole into the interior of a die containing several screw threads, which is revolved in a lathe, and the coil of wire is fed out as long as desired.

Mr. Lindall—There is a way which has come to my notice of moving motor trucks. There is a large lift which takes the truck from underneath the car on the upper floor and carries it to the machine shops. We have to move the trucks from the lift or elevator 25 ft. or 30 ft. At one time we had ropes and tackle and pulled the trucks around the shops in that manner, but one day of the men said, "Why don't you make the trucks run themselves?" We took one of the car rheostats and put it on the wall and connected a line to it and ran a flexible lead out to the truck. In moving the truck we simply take the lead to the truck and make the connections. We have saved a great deal by doing away with the pushing and pulling of the trucks.

Mr. Pestell—We are using a little scheme for regrinding air-brake valves that may be of some interest, using a small motor with a little fine wheel on it, mounted to the post of a lathe, and mounting the valve seat in the lathe, revolving the valve seat and then running this motor right across the face of it and finishing it up in 2 or 3 minutes. We have a hardened steel head for grinding the disc, a small hole to take the stud on the face of the disc, and put in ground glass and oil between the two faces, after which it is simply a matter of grinding.

Mr. Bigelow—An arrangement which we adopted in one of our stations may be of interest. We wished to make some columns to support a heavy weight. We took some 9-in. girder rails and riveted to each side of the web a 5-in. T-rail to make a strong column. In this way we can use up some of the old iron. It makes a solid and substantial column, riveting the flat part of a T-rail against the web of a 9-in. girder rail.

The president then appointed the following gentlemen as a committee on nomination, the election of officers to occur at the last session of the convention: Messrs, Olds, Green, Baker, Mundy and Mullen.

TUESDAY EVENING SESSION

At the session on Tuesday evening the constitution and by-laws were carefully gone over and revised in some particulars. The most important changes were in regard to membership. Active members, according to the new constitution, will consist of the heads of the electrical and mechanical departments of railways. All active members will be entitled to a vote and must pay dues of $5 per year. Associate members will consist of railway companies, and will be entitled to one vote through a properly accredited delegate. Associate memberships will cost $20 a year in dues. Junior members, as before, will be employees in electrical and mechanical departments who are not eligible to active membership.

WEDNESDAY SESSION

The Wednesday morning session was opened by the reading of the paper by Alfred Green on "Car Shop Practice," which is published elsewhere.

President Farmer—The paper is open for discussion, gentlemen. I see that there are quite a number of gentlemen here to-day who were not here yesterday.

DISCUSSION OF PAPER ON "CAR SHOP PRACTICE"

William Pestell, of Worcester—I should like to ask Mr. Green what his experience has been with the air hoist, whether he has any trouble with it slipping when he gets the load on it?

Mr. Green, of Rochester—For putting armatures in the lathe we don't use the straight hoist. We use the Chisolm & Moore air lift, one of the finest little tools ever put in a shop, and you can put your load anywhere and have your load there as long as you want it. With the straight hoist we cannot use it to put an armature in the lathe or anything of that description. It will drop its load.

Mr. Mundy, of St. Louis—Have you had any experience with the balance hoist, using air on both sides? I am using that for handling armatures and I find you can place it just about as carefully as you can with chain and block.

Mr. Green—No; I haven't had any experience with that.

Mr. Lake, of Muncie—I will say I am using the same thing with satisfactory results.

Mr. Pestell—Do you find that holds the load in any position? For the information of the members I will say that in our shops we have handled over 30,000 trucks with these hoists. We have arranged a little runway to near where those trucks are placed, and it is probably 500 ft. from where we start to where we drop it. We hoist our truck and can push it along on this little trolley until it comes to the cross-track. We have no trouble in carrying it that distance. We do not have the one long hose. We have a short hose at each end and pass it along that way.

Mr. Lindall, of Boston—We use in our shops at Boston a straight-lift pneumatic hoist of from 3000 lbs. to 6000 lbs. capacity, and we have no trouble in putting the wheels on the lathe centers with a straight-lift hoist. We also have a pneumatic gear hoist.

Mr. Olds, of Milwaukee—In Milwaukee we also use the straight lift in putting the armature in the lathe, and in hoisting we have no trouble to speak of. Once in a while in the handling of trucks or wheels or holding motors suspended for some time it will give down a little, but generally speaking there is no trouble in that respect. The hoist that we

use for putting armatures in the lathe has a small valve on it so that the air goes into it very slowly, and you don't get the jerk that you would otherwise.

Mr. Pestell—I would like to ask if anyone else has had experience with the eross transfer table in taking trucks out of double-truck ears?

Mr. Green—I would like to say we are building a 300-ft. ear house on one of our divisions and we are putting a transfer table in that ear house for that purpose alone.

Mr. Bigelow, of Boston—In our shipping department equipment shop we have a straight air hoist that works very satisfaetorily in loading the ears with the material we wish to ship.

Mr. Olds—I note by Mr. Green's paper that he does all of the work in the pit. I presume that refers more particularly to the single-truck cars. With us our double-truck work is all done after the truek is removed from under the car. We have found it more satisfactory than doing it in the pit.

Mr. Mundy—We are doing a good deal of the repairing from overhead and intend to do it all; but this brings us into a situation which has been quite a puzzle to me, and if there is anybody else who has had any experience in that line it would be a great deal of help. I have installed a motor-driven mechanieal hoist with which from the time the car enters the shop until it is in the air ready to allow the truck to run out, there is less than 1 minute. With a four-motor car we have at least sixteen leads to disconnect. With the ordinary method of conneeting those leads it takes a pretty good man at least 2 minutes; in other words, it will take longer to disconnect the motors than it will to hoist the car. I am looking for and trying to get up some very rapid method of connecting the motor leads which will be thoroughly efficient. At the present time I will acknowledge I have not struck it. I have asked the General Eleetric Company and the Westinghouse Company to solve this problem, but they both say they have had no experience in this particular field, and they don't appear to be very enthusiastic in being able to hit it. Now, if anybody anywhere around the country has had any experience along that line and can give me any information it will help me considerable, beeause I will surely need it. It means dollars and cents to me.

Mr. Green—I would like to say in answer to Mr. Olds that we do not jack a body of any description or lift a body off the trucks under any consideration unless the car is going through the shops for general repairs.

Mr. Lake—I would like to ask Mr. Mundy what kind of motor connections he uses—what kind of a joint?

Mr. Mundy—At the present time I am using a 2-A connector with screws.

Mr. Lake—The General Electric eonnection?

Mr. Mundy—Yes.

Mr. Lake—The Westinghouse broken connection is much more convenient to handle, and quicker to operate. By using a piece of hose instead of tape, on the joint, I find they can be connected and disconnected very quickly, and the hose slips on and off readily.

Mr. Mundy—The Westinghouse connector, if I remember eorrectly, is better proportioned for a large size wire. You are probably using that on your interurban cars. When you get on motors of 20 hp and even up to forty, the connector is a small piece of apparatus. To be thoroughly satisfactory it must be so that you can put it onto the motor cable and pull it through the insulation bushing in the motor. We don't want to have to solder or do any other connection of that kind after the lead is in the motor. Especially is this true of the brush-holder leads, and before adopting anything at all I am still hunting around with the hopes of striking something that will be small enough to go through the opening in the motor, and yet can be thoroughly insulated. The use of hose or tape either, I think, is objectionable, if it can be overcome. At the present time I don't know how it is going to be done, so I don't know how it can be.

Mr. Lindall—On our elevated motors we use the Westinghouse double-joint connector and we appreciate the value of having some easy way of disconnecting them on account of having to take the trucks out every two weeks. We use over the connectors a piece of rubber hose, and each side of the connector we have a little cleat that takes the four leads so that the leads and the insulation for the connector are held in place by these cleats; the cleats are held by one bolt in each. It takes a man about two minutes to disconnect the motor, that is, including the work of taking up the traps and so forth.

Mr. Morgan, of Youngstown—I would like to ask Mr. Green if he has any figures. I notice he made the statement that he never removes the car body from the trucks unless it is for general repairs. I would like to know if he has any figures or general statement which shows the economy of taking the truck out to remove the armatures, or of removing the armatures from below, which he would have to do if he didn't take the truck out?

Mr. Green—I couldn't give the exact figures now.

Mr. Morgan—There seems to be some doubt as to the easiest way to handle trucks, and whether to take them out. Personally I should imagine that the thorough inspection of a truck after being taken out from under a car is of such value as an economic proposition that it would be better to take the trucks out. That is our custom. We take the trucks out and get an examination, and we run a high-speed road—not a phenomenal speed—about 45 miles to 50 miles an hour in parts of our road, and we think that the taking out of the trucks, and the mechanical department being able to give them a very thorough examination, materially decreases our liability of loose bolts and other things which cause annoyance and accidents.

Mr. Baker, of Boston—How often do you take those trucks out?

Mr. Morgan—When the armature gets low on the bearings we take them out.

Mr. Baker—How do you find that out?

Mr. Morgan—From below, by inspection done from below, and we have gages. I guess it is an almost universal custom for testing the armature; and if we find the armature low we take it out and replace the bearings and then examine the truck. We can do that easily with jacks, although we are at present equipping our shops with a large motor-driven hoist which is being manufactured especially for us, which will take the entire car, trucks and all, up in the air if we want to do it.

Mr. Baker—Do you make any other inspection under the car?

Mr. Morgan—All our general inspection is made under the car.

Mr. Baker—General inspection?

Mr. Morgan—Yes, the entire general inspection is made under the car.

Mr. Baker—Is that a daily inspection?

Mr. Morgan—Daily, yes.

Mr. Lake—This matter of car inspection I would like to inquire about for information more than anything else; how often or what method the most of you use in this general overhauling. My method has always been to give a car a general overhauling and general inspection after it has made, say, 20,000 miles. Taking a number of cars that will vary, say, from 20,000 miles to 30,000 miles before you can get around. I have my cars inspected from underneath thoroughly every day, or every other day. They don't get an inspection every day, because, as a general thing, during the week-

days they only run every other day, that is, in cool weather. If the days are warm I change them off in the middle of the day when we change crews. The car makes from 375 miles to 390 miles a day if it runs the full day. Saturdays and Sundays our cars are all in service. Of course these two days the cars are not inspected any more than the regular running inspection that every car gets as it goes by the car house. That running inspection is a matter that quite a number have brought up to me as to why I do it. My car inspector says it takes a good deal of time to run out and inspect a car every time it goes through. He says: "We never find anything wrong." I said: "You do once in a while." He said: "Oh, yes, once in a great while." I said: "You found a fault one day," and he said: "Yes," and I said, "That will pay all it will cost for a number of days' inspection." So I think the traveling inspection is a good idea.

Mr. Ballard—I should like to ask in the inspection of these cars, or any cars, what experience you have had with the Conant testing machine or any other device for determining weak fields when your armatures are giving trouble, to locate whether it is a weak field or what the trouble is. We are using a device made by Mr. Conant called the Conant testing device for testing weak fields, and we have had great success with it.

Mr. Lake—My experience with that device has been very satisfactory, although with the new equipment that we have I have not been troubled very much in that respect with weak fields, thus far.

Mr. Mundy—Referring first to the inspection of the car by mileage, I think that undoubtedly this is the only way that we will eventually get thorough success, for, in my own case, during the rush hours we are operating about from 875 cars to 900 cars, but during the middle of the day that number is dropped to about 425 cars to 450 cars, meaning that in the morning and evening we run out a number of trippers, that in a great many cases don't make more than one trip; hence a single car in a month may make from 6000 miles to 7000 miles, and its mate may not make over 1000 miles. If we try to go by the time basis, the one car might destroy its apparatus, while the other one has hardly commenced to show any signs of wear. Taking this into consideration, I considered that the mileage basis was the only one on which I could work, and I have since the first of the year been keeping the individual mileage of every car. But when you get into that, especially in city service, you find a great many difficulties that you had no anticipation of. I find that on our different lines—and we have some thirty-two or thirty-three—that the same motor will run a different mileage on the different line. Another thing, the same motor will run a different mileage when mounted on different trucks. The method of mounting, the vibration which the truck has, make just as much difference on the wear that the bearings will stand as the inspection and care the men give them. Taking these things into consideration, I have had armatures that will not stay out 3000 miles. Another armature on a similar car will run 10,000 miles to 12,000 miles. When I say 3000 miles, it is very low. I am almost ashamed to acknowledge it, but it is a condition that we have to meet. We have dirt of the worst kind, and some of the trucks are shaped so that they do shake the motor up the worst in the world, and all give you the mean conditions to meet. Now, if we can get the basis down correctly and work on the mileage basis I think it is undoubtedly the only one which will give thorough satisfaction.

Referring again to the testing of fields, it is a subject in which I have had a great deal of trouble, because we have small motors that are doing more work than they were ever intended to do. As you all know, that means baking out the insulation and weakening the fields in a short time. I have experimented with different methods of testing these fields. I have the Conant coil testing machine; I can go out and work it myself, but when I give it to the shop man I find I might just as well give him a stick of wood to play with. He doesn't know anything about it. As far as checking fields up by resistance there is a difference between summer and winter weather of 15 per cent to 16 per cent, and the temperature of the motor will make that much. When you drop the resistance of a field off that amount it commences to show too, and so the resistance method is a poor thing. The only method that I know of at the present time that really gives any accurate results is the transformer test; but with that you have to have two conditions. You cannot have a coil in a brass form; you have to have a mummy field. Another thing, you have to have it out of the motor because the frame of the motor will become red-hot before you can tell anything in measuring the field. I have checked up a great many fields taken out of the motors with the transformer, but we don't meet the conditions that we want to meet. The field may be all right when it is put on a transformer test and may be all wrong when it is put in the motor, because, in the motor, after it is heated up, naturally the copper swells in size and occupies more space, and then again it is under pressure from the pole tips. You want that coil held tightly so it will not shake around, so you must have a certain amount of pressure there. You may have layers in the coils which, if the coils are left without pressure, putting them in the motor and pulling down the pole piece will pull them together and short-circuit your turns. We have spent probably two or three months trying to devise a scheme of measuring the fields in the motor. I thought at one time I had it but at the present time I am going back to the woods. It is a serious point. The weakening of a field necessarily affects your apparatus all the way back, burning out the armature and that in turn the rheostats, thus blowing up the controller; and when a controller blows up with us we have a few passengers perhaps jumping off the car while it is running at full speed and have a few damages suits on our hands. So these motor fields cause as much trouble as anything. But how to measure, where we ought to measure, is a question I have not as yet solved.

Mr. Pestell—Mr. Mundy says he can work the Conant test himself, and I cannot see any reason why he cannot educate somebody else to do it. I don't expect every car house employee to work the Conant test, but it seems to me the St. Louis Transit Company can afford to have a man educated to use that machine and keep him going around and finding the measurements of all motor fields. A motor field doesn't usually get short-circuited in one day. It is usually a question of some little run, and if those cars were gone over periodically it seems the trouble would be reduced. I really believe we could afford to have a man do little else but test fields. We could surely find some one man there to work the coil-testing device.

Mr. Baker—We have a similar road in Boston, and we have some eight, ten or twelve-coil testing machines, and we have had no trouble to educate our men to use them.

Mr. Mundy—I have always heard that the Boston Elevated could be heard a few miles around in Boston, and under the circumstances I am quite surprised to hear Mr. Baker state that the instrument is satisfactory, because when I want to work that instrument myself I want to get out in the woods, clear away.

Mr. Green—We use the bridge—Wheatstone bridge. All of our men, that is our leaders, what we call our leaders in the pit, are held responsible for testing the fields of the equipment as the cars pull in. Of course, if the cars are going through general repairs the entire fields of all motors are read up by that time. In rewinding or reinsulating your fields you find it is actually necessary to keep tab on every field that is rewound, because if you are not careful and give them an opportunity to

stretch that wire in winding you have trouble. So we read every field before it goes into stock and it is marked.

Now, getting away from that, I would like to take up the question of car inspection. That is one of the most important things that a road has to contend with to-day on a system of any size. Our conditions are such that we cannot do in Rochester what Mr. Baker would do in Boston, and probably Mr. Mundy in St. Louis would have it entirely different from what Mr. Green would in Rochester, and thereabouts all the way around. We have taken into consideration the idea of having inspectors out on the lines, giving so many lines to each one to take care of and inspect and report on each day. We have tried that. If you could hire a foreman to stand with each inspector you might get a better report. It runs all right for a little while and then you are in trouble. You cannot find your inspector or he is not getting out his reports as they ought to be. We operate 80 per cent of our rolling stock every day, which gives the master mechanic an opportunity to put two cars in shape a week. It is important to us, because we have to do our inspection at night. If you can possibly get away from night inspection it will be a good thing, because it is one of the poorest things ever thought of. In the first place, you get your men out in the early part of the evening, and there are very few cars in the car houses, and the consequence is you are losing time. Your cars go out early in the morning, and you have your men there, and paying them for so many hours' work, and the consequence is you are losing time again, so you are not getting results out of money expended for car inspection, and if there is anyone here operating a road under the same conditions I would like to have him tell me what he does to get results.

Mr. Olds—Regarding the operating of cars, I would say this: In Milwaukee we are practically a double-track, four-motor system. All our regular cars are of that class. When our lines are all full with double trucks we have three extra cars to keep the system up. Our extras are single trucks, which the boys have all called "dinkies," and as a matter of course they turn in their double-truck car and get a dinkie, and there is at once a kick, not only from the motorman, but from the transportation department. For the past year we have been unable to give our cars the attention that they should have. Our rule and practice has been that a car shall not be in regular service to exceed four months before it shall come to the shop for a general overhauling. We have been obliged to leave them out as high as eight months before they have come in. It is not good practice. I think the cars should come in on a certain mileage. As we use all of our cars all the time the monthly proposition works out practically the same. We hope sometimes to have enough cars that we can hold in and use them as extras, about one-third of our equipment. By so doing, they can receive a daily inspection, and then the night inspection will be but very little. Our night inspection is very unsatisfactory, as our friend Mr. Green states—there is but very little done. The men cannot work at night, and get the results that they do in daytime. So, as I said before, we hope to see the time that our cars will get a day inspection at least every third day. By so doing I believe we shall reduce our expenses very greatly.

Mr. Bigelow—Showing the necessity of a rigid inspection, and also the power lost in tight brakes, a case that came under my observation recently might be interesting. We were making tests on some cars. We had a 25-ft. box car loaded so as to weigh about 36,000 pounds, equipped with four motors, and it had hand brakes. We had run the car through the early evening slowly, making numerous stops, and everything had worked all right. The brakes appeared to be loose, if anything. We started on a speed run and the brakes appeared to be tight. At the end of the run we examined and found the brake-shoes and wheels were warm. On further examination we found the trouble to be the large link at the end of the brake chain had become jammed into the hook at the end of the brake rod in such a manner as to shorten the chain and jammed in so tight it took several blows of the hammer to loosen it. On making the second trip, made under the same conditions and same direction, the results were quite interesting. The length of the run was 5 miles, and we made the first trip with tight shoes, making fifteen stops of about 10 seconds duration in 23 minutes and 45 seconds. The second trip, same conditions and same direction, was made in 21 minutes and 3 seconds, a difference of 12 per cent in running time. One less stop was made, and the correction has been made for this stop. But the difference in power consumption is still more interesting. We took 10-second readings of amperes and voltage. The power consumption of the first trip was 216 watt-hours per ton-mile, and the second run, 140 watt-hours, a difference of 54 per cent in power consumption, this difference being caused simply from tight brake-shoes. I think that will show we have an unsuspected loss in power consumption, being caused by tight brake-shoes, and also I believe one of the papers speaks of controlling the speed of cars by not shutting off the power but by using the brake. I believe that would give a very high loss.

Mr. Hile, of Boston—It has been my business to look after the overhead line. Perhaps you will not see the connection between car inspection and what I am going to say, but I would like to inquire if any of you have any method in regard to inspection of overhead poles, trolley bases and trolley harps and sills. We are having a good many lines coming in over our lines, and I can see poles bent in every direction, and that necessarily leads to considerable trouble on the overhead line, and it strikes me that there are a great many that don't give much attention to that, and so many things can occur about a trolley post or harp that will lead to the pulling down of the wire, making stopping of traffic and, perhaps, accident. I have not heard anything bearing on that matter. It may be too small from your point of view to deserve consideration, but it strikes me that it is nevertheless deserving of some thought as to whether you have a method of keeping a certain tension on the wire, and what attention is paid to a motorman or conductor reporting that his trolley is coming off. You may say it is the fault of the overhead line, and he goes out again and pretty nearly every corner his trolley is flying off, and it may mean an accident, and does mean inconvenience. When you take a wheel off or run along until a wheel splits and then run along on the bearing, that means they are liable to pull down the trolley. And the same with a pole that is badly bent. A car has a trolley pole bent and it leaves the wire. It is blamed on the overhead wire, and the linemen come and cannot see anything wrong, and they watch car after car go over, and nothing happen. But this car comes along and goes off, and every time it goes over the line somebody reports it, and then things are vitally interesting.

Mr. Baker—I will say a word in answer to Mr. Hile. I don't think he told quite all the story. Mr. Hile don't tell us sometimes he goes out and finds a crossing worn out so that it pulls our trolley pole off the car.

Mr. Mundy—Replying to Mr. Hile, we try to maintain a uniform pressure on our trolleys. I tried to have my own inspectors inspect these trolley bases, but I don't listen much to the other fellow. A little story to illustrate: Some years ago I was connected with the Louisville Railway, and I got the idea I could get up a better trolley base than any other on the market. We built fourteen. Almost immediately we started a new line, which required fifteen cars, and as we had these new bases in stock, we put fourteen of them on these cars, and one of the old T. H. bases for the old original type of long body. It had been a mule-car line, and we used the old drivers for new motormen. As you can imagine they didn't handle the

cars in the most artistic way, especially at crossings, and we had all sorts of trouble with trolley bases and trolley poles. One night I was going home from the shop and we stopped at a transfer point by which this line ran. There had been a block on the line for half an hour when we got there. We asked the transfer agent what was the trouble. "Oh, one of those new trolley bases pulled off and came down through the hood, and came near killing a man." "What number is that car," said I. He said "224." No. 224 was the only car out of the fifteen that had the T. H. base.

Mr. Bigelow—I would like to ask if any one has had experience in running four General Electric 800 motors? I understand Mr. Mundy has been running four General Electric 800 motors.

Mr. Mundy—I have four General Electric 800 motors running under cars, but they are too heavy for them. The repair account is a little high, but outside of that they are giving thorough satisfaction, and they run thoroughly well provided they are not used on our country lines. There where our voltages are a little high the bands don't stay on, and they come in and we get a bird cage. Outside of that they are all right. We don't use any shunt whatever. We use the motor with the full field.

Mr. Green—What is the weight of the body?

Mr. Mundy—The cars on which we have had them installed are 36,000 lbs., 18 tons. That is too heavy a car for these motors, and we are figuring on putting them on cars that will weigh 26,000 lbs. or 27,000 lbs. That, of course, means the total car body, trucks, motors and all.

President Farmer—I think you are getting a little off the subject of the discussion of Mr. Green's paper. There is nothing in his paper about some of the things that have been discussed, and it will only lengthen the session to a point where we will get tired. I would suggest that if the discussions are confined to the subject in hand it will be a great deal better, and we will make better progress. After we get through all the discussion on the paper then we can take up what was termed a heart-to-heart talk at the last meeting.

Mr. Hile—I would like to inquire from some of those here as to the best shop practice in the use of shafting and belt gear and of motor-driven machinery. By this time, it appears to me, there ought to be some experience to show which method is the most desirable.

Mr. Pestell—We have just finished a small shop—our shops are not very large—and we have subdivided the equipment to some extent by using separate motors for different departments. Thus, the machinery in the blacksmith shop, comprising the forges, power hammer and the belt cutter, is driven by one motor. The idea being that with the power-driven blower and power hammer one of the blacksmith's helpers would usually be more or less idle, and he could do all the bolt cutting that would be necessary. Then our machine shop is driven by another motor. In addition to that, in our winding shop, which is directly over the machine shop, we use a separate motor for driving coil tape machines. This plan seems to work out well in our case. Unless a road is very large the shops will not assume very great proportions, and I do not think that it is good policy to use individual drive for different tools. I believe that shops can be divided up into departments, which can be driven by separate motors with shafting and belting, although when a shop is very large the larger tools can profitably, perhaps, be driven by separate motors. I think Mr. Wright, of Providence, could give us a little information on that subject. He has a new shop.

Mr. Wright—We purchased the tools for our shop about two years and a half ago, and there was not as much motor-driven machinery on the market at that time as to-day. We have no tool in the shop or no machine that is direct motor-driven with the motor built on a part of the frame. In the carpenter shop most all of the machines are driven with individual motors, the motor resting right on the floor and being boxed up and the belt running to the machine. In the iron shop, of course, it is different. Iron-working machines operate different speeds, and unless you have a variable speed-motor you must necessarily use the cones. There we have a section of shafting for three or four machines, and perhaps a section of shafting for a dozen more somewhere else, so I think our practice is more to divide up the machinery into groups and handle the group with the motor except in the carpenter shop, where individual driving is the rule.

Mr. Bigelow, of Boston—There is no question in my mind but that for a large shop individual motors should be used for the larger machines, while the smaller tools should be driven in groups. We have one of our large shops, an old shop, driven by a motor, and the loss in driving the shafting is a very large per cent of the power used, taking readings of the power used by the motor in driving the shafting alone and then when the machines are in use. We have another shop, about which Mr. Lindall can tell you more than I, in which the large machines are driven by separate motors. There we have one group of smaller machines driven by a separate motor, and the results of power consumption there are much better than they would be in the shop if driven entirely by one motor, or any other source of power, as far as that is concerned.

Mr. O'Brien, of the Chicago City Railway—We have our machinery divided up in groups and driven from separate shafts. In the machine shop we have three motors. I have a line shaft divided up in three parts, driving each line shaft with separate motors, and the same plan is carried out throughout all the other shops. It is my opinion it is the most practicable way in street railway shop work. We tried to look into the matter very thoroughly when we were laying out the machines for the new shop and we came to that conclusion.

Mr. Green—If you will permit me, and excuse me for interrupting the discussion any further in regard to shop uses, I would like to have a little talk with our members here in regard to our Association. I see that we have a number of strange faces with us this morning, and I am very sorry that they were not with us yesterday, and could have taken a part in the discussions. We had three meetings yesterday, and what we are after now is to get all the roads possible interested in our society, and all the engineers and mechanics and heads of the departments to belong to our society as junior members. Mr. Ely, in making the opening address for the Street Railway Association, is going to call attention to our Master Mechanics' Association, and will do a little missionary work for us. But the thing for us to do is to exert ourselves and get all the new members possible. Our society is a success. I think we can honestly say this at this time, and what will help it along a great deal more is to get all the boys in. And what will help us along after that is that at the meetings the members relate their practice, and that is going to help us. It is surprising how many new ideas were suggested at the meetings yesterday.

President Farmer—The next in order is the paper by Mr. Mundy, on "Type-M Control."

DISCUSSION OF PAPER ON "TYPE-M CONTROL."

Mr. Mundy read the paper and said:

I called upon the Westinghouse Company on July 15 to get some information that I could embody in this paper. Mr. Westinghouse at that time was on the other side of the ocean and did not wish any information given out. They have their apparatus on exhibition here to-day. I haven't had the opportunity of looking into it as yet, as they had a padlock on it, but it is on exhibition now, and I think it would be a good thing for all the members to look into it.

Mr. Green—Mr. President, I would have liked to have had Mr. Mundy go into the question of the relative cost of

construction or maintenance and where to draw the line with type-M control. Where would hand control come in and what conditions would you have to operate under in order to use the type-M control; for instance, with single-truck cars, using other cars as travel increased and operating them as a train? There is a great deal that could be gone into on that subject.

Mr. Mundy—To be able to draw a line where you should start to use train control and stop hand control is, of course, a very much disputed point, and one which I don't believe anyone could reach. They are installing the apparatus on equipments as small as four 40-hp motors. They have also apparatus made, I believe, that is to handle two 40 hp. The difference in expense, of course, varies materially with the size of the apparatus. Roughly speaking, though, I should say that the difference between an equipment fitted with K-6 controllers, which you all probably know, and with the train control, is somewhere in the neighborhood of $800 to $900. This is an item. I may be mistaken in that, and I am only getting at it by guess work. Therefore, the question of a road equipping with the train control means materially greater cost. It is a very satisfactory apparatus in the sense that as far as the burnt tips are concerned the repairs are almost nothing. From quite a lot of experience with these contact tips that have run from nine months to twelve months, don't show much more wear with the use of current than they do if you simply make them all the same number of contacts without current. This is demonstrated more particularly in the factory, where we have run one idle and the other with current-breaking arcs, showing that the small arc I spoke of is not a destructive arc. The use of the apparatus on the single-truck cars is, of course, more a question of the operation of the road.

Mr. Olds—Regarding the use of the type-M control on single cars we now have it on twenty-five of our interurban cars. It has only been in use a short time and has proven very satisfactory. The motors with which they are used are each 60 hp, being a new machine gotten out by the General Electric Company, which is numbered 74, and which will also be on exhibition at the Schenectady works. I understand there has been some trouble by those who have operated it during the winter on account of the contactor sticking. We have had two stick thus far, but they didn't cause any trouble, as the circuit was open and the minute that it was again thrown in the effect was like putting the trolley on with the controller turned on full; the motorman knew it and got out and examined the apparatus. By simply touching the contactor it opened. The mechanism is more or less complicated, more so than I wish it was. There are a great many wires underneath the car, and the contactors are, of course, under the car, which is, I think, a very valuable feature. It takes the fireworks off the front platform. In Milwaukee passengers ride on the front platform as well as on the rear platform, and with hand control we get a display of fireworks once in a while on a four-motor equipment that we did not get on the single-truck two-motor equipment. This is caused by the larger amount of current fusing more metal in breaking. In this larger arc an arc of metal vapor is formed, which is very hard to break. As to the wearing of the contactors or burning of them I would like very much to hear from some that are using them, some who have had them in service for some time.

Mr. Lindall—Mr. Mundy states that undoubtedly the principal cause of our trouble is the necessarily heavy working parts of the controller having to move slowly. The arc is therefore longer in being broken, but I cannot say as I can see that principle clearly. For instance, we compare a platform controller operated by the motorman, and the Sprague controller, the current being broken by the reverser which is operated by a powerful spring. The break is much quicker with the Sprague than it is with the ordinary platform controller. It is an undisputed fact that the trouble in making and breaking contacts increases enormously with the current, but is it not a fact that the success of the contactor is due more to the individual blow-out than to the fact that they do not break heavy currents, on account of cutting in the resistance before the break is finally made. We have some few cars equipped with four G-73 motors, on which we use the Sprague controllers, and two reversers. With those reversers we have very little trouble. In fact some of them are in service for a year and a half without our being obliged to change any of the plates, showing very little burning, while on the reversers where we use 150-hp motors it is quite an expense for copper. I merely state this fact to show that the difference is rather in the amount of current that you are breaking, and as the current gets higher the destructiveness of the arc is very much more.

Mr. Olds—I see that we have with us this morning, Mr. John A. Beeler, vice-president and general manager of the Denver Consolidated Tramway Company. I understand they also have some of the M-control in service. We should be pleased to hear from Mr. Beeler.

Mr. Beeler, of Denver—We have had for a short time, about thirty days, one or two of our freight cars equipped with type-M control. We have had no opportunity as yet to use them in trains, only in coal trailers, simply to trail behind type-M. As far as we have used them we have found that they gave very satisfactory service. We use General Electric 53, 50-hp, four motors to a car, and we have had for the past year or two a number of passenger cars equipped with the K-6 and four 37 Westinghouse motors. We have had no trouble, however, with these controllers burning, nor have they, after eighteen months' service, shown any excessive wear upon the controller. Our experience with the type-M control has not been sufficient to give an opinion as to their durability, or the amount of wear, but as far as we can ascertain we believe it is certainly a great improvement over the regular controller.

Mr. Mundy—In my reference to the slower movement, I did not necessarily mean that of a pilot motor or electro-pneumatic controller, but if you take a controller of the size of a K-14 and compare it with a K-10 or K-12, the cylinder on the K-14 must necessarily move more slowly than on K-10. If you have equally rapid movement, when you cut off, something is liable to shake loose. As far as the breaking capacity of the contactors is concerned, I will state that personally I have tested these contactors, breaking 700 volts as high as 2500 amps. apiece. I don't believe the drum controller is made which will do that. There may be, but I have never seen it.

Mr. Olds—That is just the position I take in regard to the matter of drum controllers upon our heavy four-motor equipment. The motorman will feed up quickly and very often get over into parallel before they have gone 10 ft. Then, if they get a quick bell to stop, they throw current instantly off. The current that is being used is then enormous, and the arc that will form sometimes burns out the controller. The Chicago City Railway people, as well as ourselves are using a good many of these in city service, and I would like to hear whether they have any trouble burning out controllers under those conditions.

Mr. O'Brien—We are operating now in the neighborhood of 205 large double-truck cars, K-6 controller. The most have been in operation now two years. We are not having any special trouble at all with K-6 controllers. The fact is there is no more wear on them than naturally should be.

Mr. Mundy—I want to modify my remarks. I don't mean to say that I think the drum controller is not a satisfactory controller, because I do. I bank a great deal on it. I think it is the best we can have for some service, and the idea of adopt-

ing any kind of control similar to type-M control for all cars would be unreasonable, and we could not think of doing it. I don't think we would give any better service to our passengers or any safer service to our passengers, but there are some conditions under which the train control on cars will be more satisfactory than that on the smaller controller.

The meeting then adjourned.

AMERICAN STREET RAILWAY ASSOCIATION

WEDNESDAY AFTERNOON

The first session of the twenty-second annual convention of the American Street Railway Association was held in the ball room of the Grand Union Hotel, Saratoga Springs, on the afternoon of Wednesday, Sept. 1.

In the absence of President J. C. Hutchins, of Detroit, First Vice-President W. Caryl Ely called the meeting to order at about 2:15 p. m.

Vice-President Ely—By reason of the absence in Europe of President Hutchins the pleasant duty now devolves upon me of calling to order the twenty-second annual convention of this Association. During a recent visit to Europe, from which I have but just returned, it was my pleasure on the outward voyage to be a fellow passenger of President Hutchins, whom I afterwards saw at several different points and on different occasions. I bear to you his personal greetings, coupled with the highest expressions of regard and of regret at his inability to be present at this meeting. I am glad to be able to confirm the statement concerning his health contained in his letter, which you will hear read, and to say that it has continued to improve, and that he now confidently expects to return within the month and resume the active duties of his business position. The duties thus devolving so unexpectedly upon me, pleasant and agreeable though they may be, are not without embarrassments, but I shall enter upon them confidently relying upon your forebearance and asking your assistance and co-operation at every stage of the proceedings. We assemble to-day at one of America's oldest, most famous and beautiful watering places, in the midst of the historic associations and beautiful scenery of the upper Hudson Valley. Concerning all that may be said of the locality and its surroundings, its people and their hospitality, and of the great State within whose borders it is situated, there is no one better qualified to speak than the able and distinguished lawyer who has been selected by the local committee to welcome you to the place. I have the pleasure in introducing to you one of the leaders of the Senate of the State of New York, the Honorable Edgar T. Brackett, of Saratoga Springs.

Senator Brackett—On behalf, and in the name, of the municipality in which you are assembled, I give you welcome to her borders. Saratoga, the greatest pleasure resort of the Western Continent, extends to you her most cordial greeting. As a layman I cannot forbear to extend to you, workers in one of the most important lines of the world's industries, congratulations on the progress you have made in the last decade. The problem of transportation, of the comfortable, speedy carrying of the crowds in our cities and villages, is second only to the problem of feeding the same crowds. Indeed, the problem of carrying is corelated with, and not a little involved in, the problem of feeding. How well you have worked out this problem, both in urban and country communities, will be recalled and appreciated by every one who compares the present lines and methods, with those of twenty years ago, when behind a sorry team you entered a little car, and reached through an opening in the front door to pay your fare to the driver, who furnished you change up to $2. The world moves, and with it our crowded populations move too, and with speed and comfort. It is,too, not only in the centers of population that your work has resulted in comfort and in satisfaction to the people; to my mind, if possible, a greater good has come to our rural communities from the extension and perfecting of your work. No one who has failed to have the experience of life on a remote farm can appreciate the monotony and loneliness there existing during the months where the highways are practically impassable. I do not forget that there are compensations, but the monotony and loneliness are there. I know of nothing that so relieves from these conditions as the coming of an electric line through a neighborhood. With its facility of boarding at any point it often means to a rural community, especially the women, all the difference between absolute isolation and a reasonably close touch with the rest of the world. And so I place your work, not simply as one that develops commercial propositions, but one that goes further and becomes one of the positive forces in the diffusion of education and in the development of our civilization, and as such workers I again bid you welcome to Saratoga Springs.

The Vice-President—We return our hearty thanks to Senator Brackett for his most gracious welcome to Saratoga Springs. The next order of business is the calling of the roll. If there is no objection the registration at the door will take the place of the roll-call and will be passed. The next order of business is the reading of the minutes of the last meeting, and unless objection is made the minutes will stand approved, as heretofore printed. The secretary has a resolution, which is offered by Mr. Vreeland.

Secretary Penington read the following resolution:

Whereas, The executive committee of this Association, at its meeting held in Saratoga Springs, Feb. 23, 1903, owing to its inability to secure hotel accommodations for the annual meeting of the Association at any other time, issued its call for the meeting of the Association to be held in Saratoga Springs Sept. 2, 3 and 4, 1903.

Resolved, That the action of the executive committee be, and the same is hereby approved, ratified and confirmed, and that this meeting is hereby declared to be the regular annual meeting of the Association for the year 1903.

Resolved, That all of the business of this Association be proceeded with at this meeting in accordance with the by-laws of the Association applicable to regular meetings called and held within the date provided by article vii. of said by-laws.

The Vice-President—Gentlemen, you have heard the resolution. Are there any remarks?

Mr. E. P. Shaw, Newburyport, Mass.—I move the acceptance of the resolution. (Motion seconded and carried.)

The Vice-President—If there are any persons present who are representatives of companies not members of the Association, and they desire that their companies shall become members of the Association, we shall be glad if they will make known their wish to the secretary at the close of this meeting.

The secretary has a letter from President Hutchins, and some other communications of interest, which he will now read:

Zurich, Aug. 3, 1903.

Mr. T. C. Penington, Secretary American Street Railway Association, Chicago.

My Dear Mr. Penington.—I have delayed writing you until now because my plans were not quite certain; but it is now finally settled that I shall not be able to return in time for the Saratoga Convention. I am much disappointed that this is the case. My health is very much improved—in fact I feel as well as I have ever been, but it is thought I should not risk a relapse by hastening back, and consequently I have concluded to remain in Europe until the middle of September.

I am sure, remembering our trip to Saratoga, that you have everything in good shape for the convention. Mr. Ely will, doubtless, be back in time to preside, and I am confident everything will pass off all right—better, in fact, under his skilled handling, than would be the case were I present. My duty, however, is there, and it pains me that I have to write that I cannot discharge it.

Hoping that I may make amends by such work as I may be able to do for the Association in the future, I remain,

Sincerely yours,

J. C. Hutchins.

The Vice-President—The very great sorrow I have felt at knowing it would be impossible for President Hutchins to come here, I know will be shared by all the members of this convention. His integrity, his ability, his stick-to-it-iveness in the transaction of his business and his work are well known to you all. It is also well known that his devotion to the duties of his position brought him well nigh to death's door, and that he left the country under the imperative orders of his physicians, as the only way to save his life. He is a better-feeling man, and is more hopeful now than he has been for a number of years, and I congratulate him upon it and I congratulate you all upon it, because we could ill afford to lose so useful a member of this Association. It is customary, gentlemen, to have an annual address presented by the president of the Association. Mr. Hutchins has been in such condition that he could not prepare one. I arrived in New York last Saturday, reached my home in Buffalo on Sunday, and got here on Monday, and have felt that something should be presented to you. I have prepared something in the nature of an address, rather hastily, but I could not affront you by offering anything to you which was not the result of careful thought. The following is what I have prepared for this occasion:

VICE-PRESIDENT ELY'S ADDRESS

In presenting to you under existing circumstances a few brief references to matters and things of importance affecting the interests of your Association, a proper sense of the importance of the occasion and the magnitude of the interests represented here impels me to ask your indulgent consideration of the statements, which, while representing the result of careful thought and reflection, have been somewhat hastily formulated and put together.

The present condition of your Association, as appears from the reports of the executive committee and secretary and treasurer about to be submitted, is most gratifying and calls for sincere congratulation.

Statistical information of any great length concerning the magnitude of the interests represented in this Association would be wearisome and perhaps confusing. It is sufficient to say that from the recent United States Census reports upon the street railway industry it appears that there were on June 30, 1902, in the United States 987 companies, owning and operating 22,589 miles of single track, upon which were transported in that year more than four and a half billion passengers, by the use of more than one and one-q arter million of horse-power. The aggregate mileage run by the cars used in these operations exceeded one billion miles. In these stupendous operations capital is employed as represented by capital stock and funded debt in the aggregate amount of two billion four hundred million dollars. These figures represent the investments of many thousands of people and relate to the intimate concerns and the daily life of millions of people. They are therefore the legitimate subject alike of popular and governmental interest and inquiry, and correct data and information concerning them are matters of the very highest importance.

I am glad to be able to state that the methods of keeping the records and accounts of this class of transportation companies are improving from year to year, and that it is rare to find an instance where the fullest and freest information is withheld from even the most casual inquiry. Service of great value has been rendered in this department of street railroad work by the Street Railway Accountants' Association of America. The classification of construction accounts and operating expense accounts which has finally been settled upon by this Association was adopted by the United States Census Bureau in gathering statistics for its census of electric railways, and a representative of the Census Bureau has prepared a paper on the subject which is to be read in the Accountants' Convention now being held here. This classification has been officially adopted by the State Railroad Commissions of New York, Massachusetts, Connecticut and Maine, and is about to be adopted by the Commission of the State of Pennsylvania. The Association's form of monthly and annual report has also been approved and adopted by the National Association of Railroad Commissioners. The standard classification and forms of report have also been approved by the leading bankers and financiers of the country. It is quite common, I am informed, at the present time, for a banking firm examining properties with a view of purchasing to require the accounts to be changed in accordance with the forms of the Accountants' Association. It has already been adopted by many of the most progressive electric railways and by a larger number of companies than any other one system of accounting. Exact and precise uniformity in forms of classification and report are highly desirable, and the sooner it is attained the better it will be for the stability and value of electric railway investments, and it would seem that the system which has been worked out by our Accountants' Association and adopted by such high governmental authorities, and which has received the approval of the financial and banking community, ought to be speedily adopted by all. The members of the Executive Committee of your Association join me in urging upon members the desirability of immediate affiliation with the Accountants' Association, and the speedy adoption of its forms of classification and report.

The work of the various State Railroad Commissions has come to be of the highest value, not only in this regard, but in its bearing upon the actual operations of railroads in States where such commissions exist. The annual reports required to be made to such commissions are full and complete, and present data and statistical information exhibiting in the clearest manner the actual results of the operations of all of such properties within their jurisdiction. Their investigation of accidents and their causes, and their directions and recommendations concerning construction of safety appliances; condition of roadbed and bridges; signal systems and various other matters bearing particularly upon the operation of cars are in the main in accordance with the highest state of the art of railroad operation. The railroad commissions have come to be regarded by all progressive managers as wise and safe tribunals for the settlement of vexed questions which are continually arising. It is a singular fact that these institutions, which at the beginning were so vigorously combatted by railroad managers, almost without exception have come to be regarded as almost indispensible and of the highest benefit and advantage to the very corporations which are subject to their control and regulation.

The rapid growth of interurban electric railways and their extension through long stretches of country have brought the street railroad fraternity face to face with the problems which for fifty years have been from time to time the subject of settlement at the hands of steam railroad managers, and the wisest and most progressive electric railway operators are now following more and more closely steam railroad methods. The safety of the passengers intrusted to your care is your first and highest duty. In a short time your business has been almost revolutionized; the light cars drawn slowly by horses have given place to heavy ones, swiftly propelled by the powerful agency of electricity; the dangers attendant upon the operation of cars have been multiplied, and have in many cases far outstripped the protective measures and appliances absolutely necessary for proper and safe operation. The frequent recurrence of accidents on electric railways has been the subject of criticism by the press of the country, and the public mind is thoroughly awakened upon the subject. The attempt is now being made in a sister State to hold directors criminally responsible for an alleged failure to install safeguards at the crossing of a steam railroad where a fatal accident occurred. Apart from considerations of humanity and law, the proper discharge of your business requires that money shall be expended wherever improvements of this kind are necessary. From every point of view money spent for the prevention of accidents is money well expended, and you should never fail to impress upon those in control of the finances of your companies these views, and never flinch in pressing your recommendations until favorable action has been secured.

The greatest activity displayed during the year has been in the development of the suburban and interurban properties as distinguished from the purely local service of city companies. This development has been notable not only in the increased mileage, equipment and volume of business transacted by the interurban and suburban properties, but also in the extent of the field occupied and the scope of the service given.

A discussion of the possibilities of interurban electric railroading cannot fail to be of interest to any gathering in the Hudson Valley, where some of the most notable pioneer work in this branch has been done. The operating companies of this section have not only set a good example in indicating the possibilities of this class of service, but have gone on developing it and have maintained their commanding position as leaders in this field. It is estimated that there are now nearly 100 companies throughout the country engaged in the handling of freight and express business, and there are possibly as many more who are contemplating engaging in this work. All of these will be interested in the methods employed by the interurban companies of the Hudson and Mohawk Valleys, and by the city systems of Albany, Schenectady, Troy and other large communities which serve as distributing points. The organization which has been perfected in these places and the experience gained by the man-

agement, will, of course, be placed at the disposal of the visiting managers, who will need no assurance of the value of this opportunity for the examination of the practice adopted.

At the present time the water-power development in this region is one of the largest and most important in the country, and the street railway properties are taking advantage of it in securing their current at a low rate and insuring reliable and constant service. The engineering features that have been developed in this connection appeal to those who are directly in touch with this branch of the service. Preparations are now being made for greatly increasing the available power from this source, and it is anticipated that within a few years the entire electrical service of this region will be operated by current produced by water-power.

Another striking development of the year has been the tendency displayed toward consolidation of the street railway properties in the smaller cities, together with the electric and gas-lighting service; in fact, this tendency has been so marked during the last year that in spite of the large number of new street railway corporations that have been formed in the last twelve months, the actual number of operating systems has been only slightly increased. The value of the properties, however, has been growing constantly, and the general average increase in gross receipts for 1902 over 1901 was 9 per cent. The largest individual consolidation was that of the properties of the North Jersey Street Railway Companies and allied lines in the Public Service Corporation of New Jersey. Other notable consolidations were those at Augusta, Mobile, New Orleans, Kingston, Oakland, Norfolk, and Newport News.

From a financial standpoint, probably the most important development of this character was the acquirement by the Interborough Rapid Transit Company, of New York, through lease, of the lines of the Manhattan Railway Company, thus assuring the operation of the elevated and subway properties of New York under a single management. The physical union of the two properties had already been recommended by the Rapid Transit Commission, and it had been suggested that the trains pass between the subway and the present elevated structure at several different points. This is hardly practicable at present, although it is within the possibilities that an exchange of traffic may be effected. The rolling stock of the elevated system would not be suitable for operation through the subway, and the great weight of the cars that are being built for the latter would prohibit their operation in long trains upon the present elevated structure. This feature of the change in methods of construction and equipment is, of course, suggestive of the general advancement that has been made in the rolling stock of all branches of the service with a view of increasing the comfort and convenience of passengers, as well as the safety and reliability of operation.

The growing importance of mechanical and engineering departments in electric railroad operation has resulted in the formulation of a new association, The American Railway Mechanical and Electrical Association, which is meeting for the first time this year in connection with this convention. It is the purpose of this new organization to discuss mechanical and electrical subjects, exchange ideas on construction and equipment, and raise the standard of operation wherever improvement is possible. The necessity for better shop methods, and the advantages of correct and comprehensive records in the mechanical department are now generally recognized, and it will be the duty of the men forming the new organization to determine the best practice to be followed and see that it is adopted. It will be recognized, therefore, that the new association has an important mission and is entitled to the support and co-operation of this, the parent organization.

A number of individual instances have been afforded during the year showing the progress that has been made in electric railway engineering. In Pennsylvania two very important interurban properties operated by third-rail systems have been opened. One of these employs a protected third-rail, and is the first attempt at commercial operation of such a system. The line extends from Hazleton to Wilkesbarre, through a district that is visited by severe sleet and snow storms, and this feature of the equipment will receive a severe practical test of its efficiency. The other third-rail system mentioned is that recently opened through the Wyoming Valley and intended for freight and express service, as well as the transportation of passengers, in competition with several well-established steam lines. This property is particularly noteworthy because of the terminal facilities that have been provided and the organization effected for the collection and distribution of freight and express, as well as its transportation over the electric lines. It is really the first instance of the organization and establishment of an electric property intended for this class of service in which provision was made for handling a large volume of business from the opening of the road.

In station equipment and distributing systems, as well as in the character of the rolling stock, appreciable advancement has been made. At the last annual meeting, it will be remembered, a very interesting paper was read upon the steam turbine. The investigation of this important subject has been continued during the last twelve months, and a further contribution is promised for this meeting, which it is hoped will embody the record of the advancement during the last year. Already plans have been prepared and actual work has been begun upon the installation of several large power stations in which this class of apparatus is to be installed. The most important of this character for street railway service thus far announced is that of the new station of the Union Traction Company, of Philadelphia, where an installation of ten 5000-kw engines is contemplated.

A year ago considerable interest was awakened among street railway men, particularly those interested in interurban electric railroading, in the possibility of developing a single-phase motor for railway service. It was, of course, understood that such a motor would not be adaptable for city service, but many promises were held out to those who were interested in the development of long interurban lines. During the last twelve months assurances have been given that progress was being made, but up to the present time no reliable information has been available, and the electric railway engineers are still dependent upon the direct-current motor for interurban as well as city work.

Vice-President Ely (speaking)—This brings us, in a somewhat crude manner, to the close of the year. If you will bear with me yet a few minutes, I wish to speak very briefly upon several points of the highest importance. As I have run out of manuscript, I feel that you will pardon me if I go ahead without any.

First, I wish to refer to the work that has been done by the committee on rules, and I ask and earnestly urge every member here present to read the report of that committee with great care between now and to-morrow morning.

I also wish to refer to the papers to be presented here. The subjects were chosen with great care at the meeting of your executive committee held in this place last February, which was very fully attended. A businesslike and intelligent method in the printing and distribution of the papers upon the subjects so chosen has been heretofore adopted, and it is earnestly to be hoped that the same method will hereafter be pursued.

I wish also to speak of the admirable exhibit which has been prepared and installed here by the supply men. I think that a good, fair share of each delegate's time should be given, not only to a careful examination of the exhibits, but to a pleasant greeting and extension of thanks to the representatives of the companies which have expended so much money and so much effort in getting these exhibits here and installing them in perhaps a somewhat difficult and expensive place.

Another most important subject is that of general standardization. We have now arrived at a point in electric railway practice where it would seem that it would be possible very shortly to reach a general standardization which should extend, not only to road construction, equipment, and other features of the system, but also to every branch of accounting, and every branch of the operating, mechanical and engineering departments.

All these things appeal to business men; all these things appeal to those who have dollars in their pockets. It is business, and the quicker we arrive at a similar situation in our affairs, the better it will be for the value of the stocks and bonds of our properties, and the better we will stand in the face and eyes of the world, because we are charged, first of all, and most important of all, with the safety of millions of people.

The present status of this Association seems, according to expressions which yesterday found vent in your executive committee, to be somewhat incompatible with the nature and extent of the work now before it. It represents at the present time an attempt to mix fun and business, and from the mixture to obtain valuable business results—oil and water will mix as easily. No one can deny that it is a source of genuine pleasure to meet each other annually, but that feature could

still be retained, though the plan of the Association were to be changed. If the Association shall serve its highest purpose there should be, perhaps, a permanent place of meeting, with a settled, business-like method of defraying expenses, and no reliance upon the good nature and generosity of local companies for free entertainment; but a payment for all amusement by the individual members enjoying or participating in it. In this way the expenses could be reduced to a small sum, which might be defrayed in a manner similar to that adopted by a leading steam railway association.

Your executive committee has devoted considerable time to the consideration of this matter, and some plan will undoubtedly be communicated by it to the members in due time. Meanwhile, it may be, perhaps, proper to state that as yet no invitation has been extended to the Association by any company for next year's meeting.

I do not intend to weary you with long remarks, but I cannot refrain, in closing, from saying a brief word concerning the nature of your business. There is no other business in the world to-day that more intimately concerns the private life, the private necessities, the private conveniences of the citizens than the street railroad and the electric railway business; and, as Senator Brackett observed so correctly, not only the people who dwell in cities, but those who live in the small communities and upon the farmlands and in the byways of the land.

Draw a line which shall fairly define what belongs to you from the property of the public; then toe the mark, do not run away, be aggressive, be well informed, be prudent, fair, and confident, and win every fight that you go into, because your cause is just.

E. G. Connette, Syracuse, N. Y.—I move that we tender the thanks of this Association to our presiding officer for the very able address which he has presented to this convention.

The secretary put the motion, which was unanimously carried.

The secretary announced that the Hudson Valley Railway, the United Railway, of Albany, and the Schenectady Railway extended the courtesy of their roads to the delegates and their friends. Free transportation to be given on the badges of the Association.

The secretary also announced that the American Telephone & Telegraph Company and the Hudson River Telephone Company extended the courtesies of their long-distance telephone system to the delegates; the service to be given between 5 p. m. and 8 a. m. on presentation of the badge of the Association.

The Vice-President—The next order of business is the presentation of the report of the executive committee, which the secretary will read.

The report of the executive committee described the business transacted at two meetings of the executive committee during the present year, at which arrangements for the convention were made, including the selection of topics for papers, the assignment of the topics to the writers of the papers, and the various details of the convention.

On motion of Mr. C. D. Wyman the report of the executive committee was adopted.

The following rules of order to govern debate, recommended by the executive committee, were then presented and adopted by the Association:

1. No member shall be recognized by the president unless he shall announce distinctly his name and address.
2. Speeches will be limited to ten minutes, unless the time shall be extended by the convention.
3. Members who desire to offer resolutions, or other matters, to be considered by the convention, are requested to submit them in writing over their own signature to the secretary.

The Vice-President—The next business will be the report of the secretary and treasurer.

Secretary Pennington read the report, which showed that twenty companies had joined the Association since the last meeting; that five companies had withdrawn, mainly because of consolidation. The membership on August 24 was 206 companies.

The financial transactions during the year were as follows:

Balance in bank, Oct. 1, 1902, $9,948.03; receipts, $7,677.28; total, $17,625.31. Expenditures during the year, $7,286.62, leaving a balance on Aug. 22 of $10,338.69.

The Vice-President—The chair announces the following gentlemen as the members of the committee on nominations to nominate officers and select a place for the next meeting: Messrs. Laffin, of Worcester; Goodrich, of Hartford; Sloan, of Chicago; Stanley, of Detroit; Henry, of St. Louis. This completes the preliminary business laid out for this session, and unless there is some other business to come before the meeting, we will adjourn until 10 o'clock to-morrow morning, promptly.

Mr. Grant, of St. Louis—I will bring before this Association the question of mail car service in cities. Some time ago a representative of the government came to St. Louis and said to the officers of our company, when we had the subject of mail car service up with him, that if some concerted action was taken by this Association he thought it would be possible for us to get an increase in the compensation now paid. This payment, as every one knows who has to do with the operation of mail cars, is not adequate. I should like to state, at this time, that at this meeting I will offer a resolution that a committee be appointed to confer with the government officials on the subject of increasing the compensation paid to street railway companies for carrying the mails.

Mr. Beggs, of Milwaukee—I would ask what report was made by the special committee which was appointed by this Association some three or four years ago, and of which the present Postmaster-General was a member, on this particular question. I should like to know whether the committee ever made a report. If not, I ask whether it would not be well to address a communication to the Postmaster-General, as a member of that committee, for a report on that subject.

The Secretary—The committee never made any final report. I heard from one member of the committee, who said it was impossible to do anything. He said that some effort had been made to secure increased compensation, but nothing had come from it.

Mr. Grant—If any action is to be taken it must be taken right away, because we shall have to go to the Postmaster-General and before the committee on appropriations before Congress meets. Unless we do that we cannot get any more money. A certain amount of money is appropriated for this service, and unless the appropriation is increased there can be no increase in the compensation. The committee's work would have to be done before Congress meets, whether Congress meets in October in special session or not; but the business relating to the subject of appropriations for mail service will be taken up in December, and the committee work must be done between now and December. The only thing the committee can do is to appear before the proper authorities and seek to secure an increase in the compensation which is allowed per car-mile for the carrying of the mail for the government. The committee should be appointed and go ahead, and then it can report what has been done at the next session.

The Vice-President—The motion of Mr. Grant is that the chair appoint a committee of three to take up the subject of the compensation to be paid by the National Government to the street railway companies for carrying the mail, the committee to enter immediately upon the discharge of its duties and to report at the next annual meeting.

Mr. Beggs—Does Mr. Grant contemplate the compensation allowed for rural delivery or does his motion only contemplate the city service?

Mr. Grant—Only the city service.

Mr. Beggs—I would broaden it, because the government is seeking, almost importuning, the interurban and suburban lines to carry mails at a rate which is wholly inadequate, as they desire to broaden the service in all of the cities. I declined to accept a proposition to carry the mail for rural delivery within thirty days, because of the inadequate rate. I should like to have Mr. Grant broaden his motion.

Mr. Grant—I have no objection to that.

The Vice-President—Mr. Grant consents to broaden the scope of his resolution.

Mr. Myers—What is the use of appointing a committee now to report twelve months hence. It seems to me there is not a uniform service, or a uniform compensation, except for mail cars on city tracks. I have three different kinds of contracts on my road. I certainly do not want to wait thirteen months before being put in possession of the report of this committee.

The Vice-President—The chair suggests that the resolution be committed to writing, and so amended that it will provide that as soon as the committee has finished its work it shall file a report with the secretary of the Association, who shall forthwith communicate it to all the members of the Association for their guidance. The chair will request Mr. Grant to frame such a resolution and present it at his convenience.

The meeting then adjourned until 10 o'clock Thursday morning.

THURSDAY MORNING'S SESSION

The convention was late in assembling, and the only paper presented at the meeting was W. L. R. Emmett's contribution on "Steam Turbines."

STREET RAILWAY ACCOUNTANTS' ASSOCIATION OF AMERICA.

WEDNESDAY MORNING

The first meeting of the Street Railway Accountants' Association of America was held at the Grand Union Hotel, Saratoga Springs, on Wednesday morning. President H. J. Davies, of Cleveland, called the convention to order at 10:20 a. m.

The reading of the minutes of the previous meeting was, on motion, dispensed with, having been issued during the year in printed form. The President's address was then read and appears below:

PRESIDENT'S ADDRESS

As I was not present at last year's meeting I did not have an opportunity to express my appreciation of the honor you then conferred upon me in electing me to the highest office within the gift of the Association, and I wish, first of all to-day, to give you my heartfelt thanks for that evidence of your confidence. It was the more complimentary and the more appreciated because it came to me after an absence of several years from the street railroad business.

The Street Railway Accountants' Association has grown within the past year in membership, in wealth and in influence. Notwithstanding the numerous consolidations of street railway companies, there has been an increase of sixteen in our membership. The treasurer's report, to be presented this morning, shows a balance in the treasury of about $2,400. When we remember that in 1899 the Association called upon the members represented at the meeting in Chicago for voluntary contributions to wipe out a deficit the present condition of the treasury is very gratifying. It is due mainly to the unflagging interest, zeal and activity, in this as in all Association matters, of our able secretary and treasurer, Mr. Brockway. The increasing influence of the Association is shown in the adoption by the United States Census Bureau and by various State bodies having to do with street railway statistics, of its recommendations as to the classification of construction and expense accounts, and as to blanks and forms of reports. The Railroad Commissioners of several States have adopted our classification of accounts, and the National Association of Railroad Commissioners, at its annual meeting six or seven weeks ago, approved with slight changes the form of report recommended at our Detroit meeting. I think it safe to say that the work of this Association has been more widely adopted and applied, with fewer modifications or criticisms, than any work of any similar organization in any line of business anywhere.

The standard system of street railway accounting is so simple and logical, and the definitions and explanations which accompany the Association's classification of accounts and form of report are so clear and minute that a street railway accountant whose company uses a different system may, without difficulty, make a report for any period for his company in accordance with the standard system, and so obtain a valuable comparison of its business with that of any company using our system.

Valuable as the work of the Association has been, however, much useful work remains to be done. It is not necessary, nor, perhaps, very important, that a standard method of shop-cost-keeping, of storeroom accounting, or of time-keeping, or a standard form of conductors' report, for example, be adopted by the Association; but these subjects are of interest to all our members. We all want to find the surest and shortest ways to results. One of the most beneficial features of our annual meetings is the exchange of ideas in conversations among ourselves outside of the regular meetings. Improvements in methods of accounting come to us every year from constant study and effort on our own part and from the relation of the experience of fellow-workers in the same line. Other subjects for consideration at future meetings may be the use of the kilowatt-hour as a unit (although this may not extend beyond statistics regarding the operation of the power plant), the best form of inventory of buildings, fixtures, track machinery, cars, material and supplies, and a further discussion of a standard unit of measurement and comparison. The rapid development of the transportation business will bring new problems from year to year, and give the Association good reason for continued existence.

A topic that has been touched upon at nearly every meeting of the Association, but never discussed, and which has always seemed to me of vital importance to every company, is that of accounting for depreciation in the value of the company's property, or providing a reserve fund from which to pay for renewals and betterments of the property. I know it has been said, in our meetings and elsewhere, that it is not the province of a street railway auditor to say whether depreciation shall be included in his accounting, or, if included, the rate at which it shall be calculated; that that is the business of the board of directors or the managing officers of the company. Of course, it is the business of the directors. So is the question of whether more cars shall be purchased, of whether track shall be renewed, of whether wages shall be increased or decreased. But it is the duty of the manager to report to the board the need of additional cars, of renewal of track, and to recommend an increase or decrease, if occasion calls for a change, in rate of wages.

And so it is the duty of the accountant to keep the managing officers and the directors informed, not only as to the gross earnings, operating expenses and net earnings of the road, but as to its real financial condition, which involves a statement or account of the actual value—not merely the first cost, but the actual present value—of the company's property. His books should show, not alone the cost of things and the expense of their maintenance, but their value at all times, and their value cannot be stated without taking into consideration the effect upon them of constant use—of wear and tear and waste. Street railway companies in these days employ experts as accountants, and pay them the compensation of experts, and accountants do not perform their full duty to their employers unless they point out to them (if they lack knowledge on the subject) that the value of a thing after years of use is not its original cost; that the difference between gross receipts and the cost of operation is neither surplus nor net income; that as track, cars and machinery wear but if the company makes use of them, the wear should be accounted for from year to year or month to month as it occurs; that the payment of interest upon bonds is not a discharge of the principal, but that the obligation will mature in time, and that, to provide for it, a fund should be accumulated from year to year or month to month, out of earnings; that while growth of population may add to the value of franchises, and this added value may offset for a time depreciation in the value of the company's tangible property, yet, as franchises approach their expiration, they depreciate in value, notwithstanding continued increase in the population of the territory served, and that financial embarrassment, if not ruin, is likely to result from constant disregard for these considerations.

It may be said that these are matters of common knowledge, and that it is not necessary for an accountant to speak of them, but the accounting methods of street railway companies indicate that the knowledge has not been generally applied. Promoters

and directors of many street railway enterprises have been either ignorant of the first principles of accounting, or guilty of an attempt to deceive their stockholders and the investing public as to the dividend-earning possibilities of their properties, and it seems to me eminently proper for this Association, or some one for it, to point out the effect of such misleading practices in accounting. I have never been an advocate of the publishing of detailed statements of the business of street railway companies, but, if their accounts were properly kept, and had been so kept from the beginning of the street railway business in America, with a proper appreciation of depreciation, and of the obligation to return borrowed money, it would not be so hard to convince the people of our cities that they have not been robbed so extensively as they supposed, that franchises are not as valuable as the capital stocks of railroad companies indicate, and that it may not be profitable nor practicable for a municipality whose officers ought, of course, to provide for its citizens efficient street railway facilities at the lowest reasonable fare per ride, to itself construct and operate lines of street railway and furnish as good acommodations as are now furnished by private corporations, at a rate of fare lower than that now almost universally charged in American cities. Roads are built with borrowed money—from the proceeds of the sale of bonds at less than par, with a stock bonus. If well located they are operated, even in the first year of their existence, at an apparent profit, no account being taken of depreciation, and no provision made for the accumulation of a fund to pay the bonds or renew track and equipment. From the gross earnings, operating expenses and interest on bonds are deducted, and the remainder is called net income, or surplus applicable to the payment of dividends. If dividends are not actually paid representations are made that they have been earned. The promoters list their bonds and stock on the local stock exchange and dispose of part or all of their holdings to people unfamiliar with promotion accounting. Then things wear out and must be renewed; more money is borrowed for this purpose or the company is "reorganized;" the vision of dividends recedes; the troubles are charged to political agitation, rather than to false accounting, and the process begins again. This is an extreme case, perhaps, but, although the capital stocks of most companies represent an actual investment much in excess of the bonded debts of the companies, the practice has not been uncommon. All companies have been affected and injured by it. Whether this method has been practiced with a design to deceive or through ignorance of the principles of accounting, the effect has been to mislead the public as to the amount of profit in legitimate street railway business, and to create or confirm the impression that an unjust and unconscionable contract was made between the company and the people's representatives. Unreasonable contracts do, doubtless, exist. That is not the point. I am not arguing that all profits are reasonable or all contracts just; I am pleading for honest accounting. The effect of improper accounting in one notable case was most forcibly stated by T. S. Williams, of Brooklyn, in a paper read by him at our meeting two years ago.

Honest accounting—I am not blaming the accountants; put the responsibility on the directors—they say it is their business, and not ours—honest accounting from the beginning of the business might have prevented many of the efforts now making by municipalities to reduce fares and to increase the taxes of street railway companies. The profits to the promoters from the sale of their stocks would not have been so great, but the legitimate earnings of those investors who actually put their money into the property would not have been less, and their investments would be in better condition to withstand some of the unreasoning assaults now made upon them. Publicity in accounting will not be so injurious to street railway investors as the false methods of accounting heretofore prevalent. Past methods in many cases—in nearly all cases—have been deceptive to stockholders and to the public. If the deception has come from ignorance it is inexcusable; if from design, it is dishonest. Whether it is dishonest, or whether it only deceives, it is bad policy. Let us be honest.

Some of us in late years have been trying to offset the neglect of depreciation by charging the cost of renewal of track and equipment to operating expenses. There is precedent for this in steam railroad practice, and it was recently defended by the Wall Street Journal in an article on "Capitalization," in the following words: "In a general way capital accounts or capital assets represent permanent investment and are in antithesis to quick assets. When an item is capitalized it usually means that the money has been sunk once for all in some kind of property that it is not expected to sell or convert. If we could imagine a railroad completely finished and in perfect condition, its capital accounts would be finally closed and its expenditures would all be charged to operating account." But, however honestly meant, this is only another mode of deception. It is not the truthful method. To charge against earnings the cost of renewals is to make one month, or one year, bear an undue proportion of expense or depreciation. The effect will be clearly apparent if we imagine all franchises terminated and the business of a company at an end. Under such circumstances the property of the company would stand on the books at its original cost—a valuation which, unless the road had just been entirely renewed and re-equipped, would be fictitious.

These suggestions are not new; they have been made by former presidents and others who have addressed the Association. The subjects of depreciation and of sinking and reserve funds are treated in every book on accounting. The only justification for their repetition here is the fact that improper methods still prevail.

The relation between the accounting and managing departments of our street railway companies is much closer than it used to be, and the work of the accountant, which has come to be more and more appreciated by the manager, has become more useful to the company. All receipts and expenditures coming under his eye, he can be a most val able aid to the manager in the operation of the road, and his usefulness in this capacity is as great as in that of recording the company's transactions for the information of its directors and stockholders. Systematic and intelligent accounting saves more than it costs. The accounting department is not a direct producer of revenue; its province is to keep tab on all income and on every item of expenditure; to compare the results of one period of operation with those of another, the receipts or expenditures, per unit of measurement or comparison, of one route with those of another; the business of one company with that of another; to ascertain why receipts are lower or expenditures higher on one line or at one station than at another; to show clearly and concisely the true financial condition of the company and the value of its property at all times; to throw a calcium light upon all the details of management so that the experience of the past and present may be constantly before the eyes of the officers and directors of the company as a guide for the future. The value of figures is not mainly in their numbers. A single fact succinctly stated is usually more effective than a volume of figures. But the figures should be behind the statement to verify it if questioned. It is more effective, for instance, to say that the number of passengers or transfers on a given line increased in the past month more than upon any other line of the system to give the percentage of increase, and, if possible, to point out the probable reason for the change, than to give to the management a detailed statement of figures showing the number of cash fares, number of ticket fares, number of transfers, fares and transfers per trip or per car-mile, upon each of fifteen or twenty lines of railway, from which the manager must pick the facts that will enable him so to change his schedules as to produce a like increase in business on the other lines; first, because the manager has not time at command for the study of these statistics, and secondly, because he has not usually an accountant's love of the study of figures. Of course, the detailed statements should be prepared and should be within the manager's reach, but the accountant will be more valuable to his company if, when he makes up his figures, he selects and makes a brief and pointed report of the most striking and important facts.

Your executive committee met at Cleveland in April with eight of the nine members in attendance. Several matters were considered and discussed, as will appear in the secretary's report of the proceedings. The most important was an invitation from the Association of Tramway Managers of Great Britain to attend a meeting of that body in Glasgow on July 10, at which a paper on standardization of tramway accounting was to be read. The invitation came to us through correspondence between C. N. Duffy, the secretary and auditor of the Chicago City Railway Company, and James Dalrymple, chief accountant of the Glasgow Corporation Tramways, on the subject of the differences between the methods of accounting of our Association and those of the city of Glasgow. In view of Mr. Duffy's careful study of the Glasgow tramway accounts, his extensive correspondence with Mr. Dalrymple and his intimate familiarity with this Association's work, the committee requested him to attend the Glasgow convention as the representative of the Association and at its expense. Mr. Duffy expected until within a few days of the meeting to go to Scotland to represent us, but the franchise situation in Chicago made it impossible for him to leave. A copy of Mr. Dalrymple's paper has reached us, and Mr. Duffy will give us the benefit of his study of it and of the discussion which followed its presentation.

One other committee, the committee on standard form of report, has been active in the year. A majority of its members attended at Boston a conference of the committee of the National Association of Railroad Commissioners on the same subject, and

represented us at the annual meeting of that association at Portland, Maine, last July. W. F. Ham, of Washington, and E. M. White, of Hartford, will present a report for the committee.

The secretary's report was then read, but the report of the executive committee was deferred until a later session.

REPORT OF THE SECRETARY AND TREASURER

It is pleasant again to report to you that we have prospered, that we have more members and more money than last year, and that if we were a stock company we would declare a dividend without cramping the business. We have added since my last report the following companies:

Atlantic Coast Electric Railway, Asbury Park, N. J.
Northwestern Elevated Railroad, Chicago, Ill.
Lynchburg Traction & Light Company, Lynchburg, Va.
Rockford & Interurban Railway, Rockford, Ill.
Nashville Railway & Light Company, Nashville, Tenn.
Santa Barbara Consolidated Railway, Santa Barbara, Cal.
Cleveland & Southwestern Traction Company, Cleveland, Ohio.
Hoosac Valley Street Railway, North Adams, Mass.
Evansville Electric Railway, Evansville, Ind.
Geneva Electric Tramways Company, Geneva, Switzerland.
Ashville Electric Company, Ashville, N. C.
Beaumont Street Railway, Beaumont, Tex.
Monterey & Pacific Grove Railway, Monterey, Cal.
Metropolitan Railway Company, Oklahoma City, Okla.
Pittsburg, McKeesport & Connellsville Railway, Pittsburg, Pa.
Little Rock Railway & Electric Company, Little Rock, Ark.
Spokane Traction Company, Spokane, Wash.
Stark Electric Railroad, Alliance, Ohio.
Columbus, London & Springfield Railway, Columbus, Ohio.
Conneaut & Erie Traction Company, Girard, Pa.
Sheffield Company, Sheffield, Ohio.
Cedar Rapids & Iowa City Railway & Light Company, Cedar Rapids, Ia.
Northern Illinois Electric Railway, Dixon, Ill.
Sanford & Cape Porpoise Railway, Sanford, Maine.
DeKalb & Sycamore Electric Company, DeKalb, Ill.
Canton-Akron Railway Company, Canton, Ohio.
Fairmont & Clarksburg Traction Company, Fairmont, W. Va.
New Orleans Railways Company, New Orleans, La. (Consolidated.)
Worcester & Connecticut Eastern Railway, Worcester, Mass. (Consolidated.)
Virginia Passenger & Power Company, Richmond, Va. (Consolidated.)

Total, 30, of which 27 are new, and 3 consolidations.

There have been withdrawn from our lists for various causes the following named companies:

Tiffin, Fostoria & Eastern Railway, Tiffin, Ohio.
Merida Tramways Company, Merida, Mex.
Erie Transit Company, Erie, Pa., Resigned.
Indianapolis & Greenfield Rapid Transit Company, Greenfield, Ind.
St. Louis, Belleville & Suburban Railway, Belleville, Ill.
Natchez Electric Railway, Light & Power Company, Natchez, Miss.
Citizens' Electric Company, Eureka Springs, Ark.
Central Rapid Transit Company, Pittsburg, Pa.
Consolidated Traction Company, Pittsburg, Pa.
New Orleans City Railway, New Orleans, La.
New Orleans & Carrollton Railway, Light & Power Company, New Orleans, La.
People's Tramway Company, Putnam, Conn.
Richmond Traction Company, Richmond, Va. (Consolidated.)
Richmond Passenger & Power Company, Richmond, Va. (Consolidated.)

Total 14, making a net gain of 16 for the year.

The record of membership since the organization of the Association is:

Year	Admitted	Withdrawn	Balance
Organization	25		
1897	12	1	36
1898	32	0	68
1899	34	2	100
1900	21	25	96
1901	25	11	110
1902	19	7	122
1903	30	14	138
	198	60	138

The finances are summarized as follows:

Brought forward from Oct. 3, 1902		$1,640.93
Received this year from		
New members—27 at $20	$540.00	
1901 dues	20.00	
1902 dues	120.00	
1903 dues	2,120.00	
Interest on deposits	53.06	2,853.06
		$4,493.99
Payments have been made this year for		
Salaries Secretary's office	$600.00	
Expenses Secretary's office	118.61	
Traveling expenses Secretary	99.49	
Traveling expenses, committees	424.61	
Account of Detroit convention	51.26	
Stenographer Detroit convention	110.00	
Printing report of convention	300.55	
Printing and stationery	278.78	
Miscellaneous	111.20	$2,094.50
On deposit Home Savings Bank, Toledo, Ohio	$1,058.11	
On deposit Van Norden Trust Company, New York	1,341.38	$2,399.49
		$4,493.99

There is open on the books for unpaid dues, $140.00.

There are no unpaid rendered bills.

No blanks have been added to the collection exhibited this year for the reason that it is considered better to make a new set soon rather than to have it partially up to date. The collection is now four years old in its present form, but some parts of it are a year older. In some measure it has been added to each year, until now, but not to the extent its importance deserves; therefore, to stop adding to this set now and to begin upon another collection which will comprehend those great changes in practice that have been brought about by consolidations and by experience, seems to be the best step to take to keep it really useful.

Now and then in the secretary's report there has been mentioned the addition of something to the Association's library. This effort has now resulted in a rather substantial collection of magazines and railway commissions' reports, and some books. So far it has cost nothing, but I wish to advise that a certain sum be set aside for the purchase of works upon such subjects as enter into our needs. This accumulation will always be useful, and an early start is better than lots of afterthought.

I might consider my duty done by a mere report of the changes in finance and membership during the years as they go by, but I connot refrain from setting before you at this time a more comprehensive view of the way some of the Association's problems appear to one who is at all times very near to them, and who has no period of weeks or months, as you have, of inaction in Association matters, but is constantly within hailing distance of its aims and its works during and between the annual conventions. Another reason I would bring forward would be that it is the only time during the year that I can say anything to you verbally, and should I limit this report to the mere details I would, perhaps, miss an opportunity to gain something for the Association. When it is remembered that this office has come in contact with every company that is, or has been, a member since the Association was organized, it will be readily agreed that some lessons have been seen and learned in that time, and so far as I am able I want to have you as the representatives of the members see one or two things as I now see them. It would seem that an association the same as our business can grow only by effort, and that effort should be in a direction pointed out by self-examination.

An association can be organized from two standpoints, one being for entertainment, and one being for work, these two can only be combined by the most careful administration, and by the members keeping clearly before them where the one leaves off and the other begins.

This, I believe, this Association has done pretty well, if our reputation and our records can be taken for a guide.

There are four things an association must watch carefully if it would truly be a success, its personnel, its finances, its work and its reputation. Of these I want to speak of but one, its membership.

Since the organization a constant plea has been made from this office, and from the president's, for the increase of the membership to its widest possible extent. But it is only fair to you to remind you that outside of a few enthusiastic members this effort has resulted lamely. In other words, it has been left largely to the officers to put forth the energy for membership. It may not have occurred to all the members, yet one thought stands out clearly to me, and I want you to see it, too. It is this: This is an association for the mutual benefit of its members and American

street railways. What it does to benefit one is to benefit all. Therefore, it is a mutual association, and so it follows that all are responsible, and all should help toward its advancement. We have withstood the loss of about fifty members through consolidations in the last three years, besides others, and yet we have gained even under these circumstances. I see plainly that we will lose at least ten more the coming year from the same cause, and I want to urge you to take up this matter and help to overcome this natural loss.

We thought at first that the smaller companies would not freely join; that the larger ones would be in the majority, but we have seen by experience that it is the smaller ones that gain the most by membership; therefore, our efforts should be directed toward any company, be it ever so small. There is no small item in operating expenses that can bring so large a return if properly used, as a membership in the railway associations, which is an argument that should be used to every company not now a member with us. Our past is one to show with reasonable pride, and the future will be as bright and useful if the present membership keeps awake to its opportunities, which I think it will. The correspondence of this office is filled with queries relating to a great range of subjects in railway accounting, and when these are properly solved by the secretary or by reference to other members, can any one doubt the usefulness of the Association? I hope to see the time when our work will be so large and important that it cannot be handled as it is now, but will have its secretary a regularly salaried officer and devoting his whole time to the work. Those are not idle words, but come from more than seven years' intimate contact with the whole situation, and with its possibilities plainly understood. When that time comes it may be permissible to let your officers work for the membership, but until that time I cannot help but feel that it is as much the duty of the individual member to be on the lookout for members, as it is for your officers, and I think you agree with me. We need a large membership, not so much for the finances, although they are important, too, but for the broader effect our deliberations will have.

Very respectfully,
W. B. BROCKWAY,
Secretary and Treasurer.

NEW YORK, Aug. 31.

Secretary Brockway called attention to the fact that the accountants had a separate registration booth, and that it was desirable that all members register there and secure the badges of this Association as well as those of the American Street Railway Association, with a view to advertising in that way the Accountants' Association.

The secretary also read an invitation from the Schenectady Railway Company to make use of its lines in Schenectady, Albany and Troy, for which purpose the badges of the Association would be honored, together with a schedule furnished by the company of its different lines.

F. E. Smith, of Chicago, suggested the advisability of considering the question of admitting public certified accountants to membership in the Association, with such standing therein as might be decided to be practicable. Several members reported the existence of a demand for the information gotten out by the Association on the part of the general accountant. While some members expressed a willingness to enlarge the field of membership in the direction proposed, others doubted the wisdom of such a departure, preferring that the Association be continued exclusively in the interests to which it had been devoted in the past. In view of the fact that the change proposed would involve an amendment of the by-laws, the president was, on motion, authorized to appoint a committee of three to draft such amendments for submission at the next convention, and he appointed as such committee Messrs. Smith, Magilton and Brockway.

Irwin Fullerton, general auditor of the Detroit United Railway, then read a paper on "Freight and Express Accounts," which is published elsewhere in this issue. This paper was discussed at length by the members generally. The discussion brought out much valuable information on a variety of details, such as the time and opportunity under varying conditions for making out way bills, statements rendered as to tonnage, commissions paid at the smaller stations to agents, the methods of charging the expenses of the freight and express business and the desirability of establishing a standard on that subject, the rights of companies in the several States of the country under existing charters to engage in this branch of business, the liability to shippers for goods carried, and methods of determining the weight of shipments.

In connection with this general subject, Secretary Brockway read a paper prepared by Mr. Harmon, auditor of the Electric Package Company, of Cleveland, accompanied with a set of blanks, which it is intended to reproduce in the convention report. The latter paper developed some discussion of the methods adopted for checking the collections of agents and preventing thefts. Reverting to the question of separating the expenses of an express and freight department, Mr. Ham thought electric roads might follow the example of the steam roads, which had determined that such differentiation was impracticable, and made no effort whatever to keep a distinction between passenger and freight expenses, but that some unit like the car mile or the car hour would admit of determining whether or not a given department was profitable or otherwise. In reply to the president, Mr. Duffy stated that the committee on standard classification of accounts had not considered the question of freight and express accounting as yet, but he thought it was in line with the work of that committee, and that if the convention desired he had no doubt the committee would undertake the work.

The president appointed the following committees:

On nominations: Messrs, Ross, of Montreal; Pease, of Buffalo; Bartlett, of Boston; Simpson, of Birmingham, and Duffy, of New York.

On resolutions: Messrs. Mitchell, Rogers, Fullerton, McAssey and Yeatman.

The question box was then taken up, with a view of giving opportunity for eliciting information upon matters not covered by the formal programme.

Mr. Mackey inquired as to the issuing of stopovers on interurban roads, on trains where the tickets were issued by conductors.

Mr. Pease, of Buffalo, stated that his company did not give what were regularly termed stopovers, but they did have a coupon for each division, allowing the passenger, when he reached the end of a division, to stop over as long as he pleased and then continue his ride. These tickets are issued by the conductors and credit is allowed for the 5 cents paid on the original division; the through ticket is sold for that much less, and the conductor returns the coupon as 5 cents, and the station clerk in settling with the conductor at the close of the day allows the latter 5 cents on each one turned in. The interurban conductor selling the ticket receives from the city passenger either a coupon or a transfer.

The secretary read the following question which had been sent to the desk in writing:

"What is the customary way of putting up receipts for the banks? It is asked because the banks in my city desire all coin to be wrapped, and I want to do it otherwise, if I can?" (Laughter.)

Mr. Henry A. Ferrandou, auditor New Orleans Railways Company, said that they had established a system of receivers at their seven different stations in New Orleans, and with a view of saving in office force they attempted to deposit their earnings as they came in from the receivers direct into the bank. It so happened that his board of directors was composed of presidents of the leading banks of the city, and at the end of two weeks they directed a change in the system on the ground that otherwise the banks would be obliged to hire more help; so he was now putting up the nickels in $5 packages, dimes in $10 packages, and dollars in $500 packages. He did not have to roll the packages, however.

Mr. Fullerton said that in Detroit they received a great deal of Canadian money, and the banks further insisted that that must be sorted from the American, both silver and bills.

In reply to a question by Mr. Lynn as to what part of the

ticket sold on interurban roads, or city and interurban combined, was treated as earnings of the day on which it was sold, Mr. Mackay said that in the case of round trips they put it all as earnings, because it must all be used on that trip; in the case of return coupons, they were treated as earnings the day they were lifted.

Mr. Mackay added, in reply to Mr. Simpson, that where a general ticket was used it was taken up and credited not only to the line on which it was taken up, but to the divisions in that line, and that they carried a ticket acount; the going portion of the ticket must be used on the day it was purchased, and on the same train, because it was sold on the train only, and represented a passage; under this method they had no regular ticket offices.

In reply to a question by Mr. Swift as to the methods employed to get rid of canceled tickets, Mr. Ham said that after looking into the question of mutilating machines, they found that there were machines that worked fairly satisfactorily, but at the same time they had decided that if the burning of the tickets was surrounded by proper safeguards they felt it was preferable. He thought that a macerating machine such as is used in the Treasury Department for the destruction of paper money would be very expensive. There was another scheme for treating the material chemically, which took off all the ink, but it was a nasty method.

President Davies stated they chipped out triangular pieces from the ends of the tickets, and sent them to the furnace to be burned in the building in which their offices were located, but found that in the summer time it made too much heat.

Mr. Mackay inquired whether it was the general custom to charge injuries and damages to account 33 as paid, or to pass them through a reserve. In their own case they passed them into a reserve. He raised the point that the standard classification made no provision for that, and the question arose whether it was not to that extent misleading.

President Davies replied that his companies passed them into a reserve account, or an accident fund account, charging a per centage of gross receipts in that account, and charging to that account the damages as they were paid.

Mr. Brockway said it was customary in his companies to charge it into that reserve fund and a certain proportion of the account into operating expenses each month, but to wipe that account out absolutely at the end of each fiscal year. As to providing for accidents which had occurred during the year and must be paid for later, that offset itself in a measure by having taken into the expenses, and into the fund, liabilities which were created during a prior year.

Mr. Mackay stated that the amount which went into expense account with them, for accidents, was an arbitrary figure based upon past experience, a percentage of the gross receipts, and at the present time their injuries and damages reserve fund, instead of being balanced, stood about $125,000 to the good, to take care of injuries and damages that had occurred, and which would have to be paid in the future.

Mr. Duffy thought that damages were only one of many other similar propositions which had to be estimated and apportioned, and that it was not necessary that the classification should specify anything on the subject.

Mr. Ford thought that if he had $125,000 set aside from surplus as a damage fund he would stop there and attempt to close his damage account with each fiscal year, inasmuch as by increasing that fund the company was deprived of the use of that much of its surplus. He thought the experience of Mr. Mackay's company in having a credit balance was the exception; that most railroads had a debit balance.

After some further discussion of the question of a damage fund and the expression of somewhat conflicting opinions as to the best procedure, an adjournment was taken until Thursday morning at 10 o'clock.

THURSDAY MORNING'S SESSION

The programme for the second day's proceedings was followed closely. The first subject on the list was the paper by S. C. Stivers, of the New Jersey & Hudson River Railway, on "Car Maintenance Records." This paper will be found on another page of this issue. The report of the committee on a standard form of report for electric railways, of which William F. Ham, controller of the Washington Railway & Electric Company, is chairman, had been prepared in the following form:

REPORT OF COMMITTEE ON FORM OF REPORT FOR ELECTRIC RAILWAYS

To the President and Members of the Street Railway Accountants' Association of America:

At the last convention of this association your committee submitted a report which was thoroughly discussed and finally adopted. The form of report presented was primarily for use in submitting reports to the Railroad Commissions of the several States. The same subject was to be considered by a joint committee of the National Association of Railroad Commissioners and your Association, and a report presented by such joint committee to the Portland convention of the National Association of Railroad Commissioners, to be held in Portland in July, 1903. By action of your convention the committee was continued and authorized to agree to such corrections as the Railroad Commissioners might require.

Your committee conferred with the Hon. George W. Bishop, of the Massachusetts Board of Railroad Commissioners, at Boston in June last, and a form of report was prepared, embodying, without change, the form of report prepared by your committee. This report was presented at the convention of the National Association of Railroad Commissioners, held in Portland July 14, 15 and 16 last, and was unanimously adopted.

To show the latitude allowed the several States in the use of this report, the following excerpt from the report of that committee will suffice:

> We realize that it is no easy task to prepare a form of report acceptable to all, as what one State might demand, another State might consider entirely unnecessary. If the form submitted lacks information which in the opinion of any State should be furnished, provision may be made for it without interference with the balance of the report.
>
> If, on the other hand, more information is demanded than is thought necessary, it may be omitted without changing the substance of the report. In this connection we refer particularly to "Schedule C," "detailed statement of rental of leased lines and terminals;" "Schedule D," "construction and equipment," and "Schedule E," "construction and equipment of leased lines."

In presenting the report, the chairman, Hon. George W. Bishop, of Massachusetts, stated before the convention that he felt very much indebted to his associates on the committee representing the Street Railway Accountants' Association of America, stating that they had spent a great deal of time on this matter, and that practically what they had worked out had been adopted in the report; also stating that he thought that the convention should feel much indebted to them and their associates for the time they had devoted to this work. Your committee make mention of this simply to present to your attention the cordiality felt toward this association by the National Association of Railroad Commissioners.

At the Portland convention your delegates were treated with the greatest courtesy and consideration, and we feel that the work of this Association was impressed upon the minds of the Railroad Commissioners present.

Having fully completed our labor, we suggest that our committee be discharged. Respectfully,

W. F. Ham,
E. M. White,
C. N. Duffy.

It is wonderful what different opinions judges have of the ethics of behavior in public. At St. Paul, Minn., recently a justice remarked that a motorman, under certain conditions of service, was justified in not stopping to take on a passenger. In striking contrast with this is the vehement utterance of a St. Louis judge, who, in discharging a man who had held up a street car with a revolver, said that any street car motorman brought before him on a substantial charge of passing passengers at street corners would be fined the limit of the law." "It is small wonder," said the judge, "that anarchistic feeling prevails among people who support the street car lines, for every day they see their rights trampled upon."

THE FIRST THIRD-RAIL ROAD IN CALIFORNIA

The North Shore Railroad of California, which is being converted from a steam to a third-rail electric railway, has been placed in operation between Mill Valley and Sausalito, a point across the bay north of San Franciso, and which is connected with San Francisco by a line of fast ferryboats. The official opening took place on the evening of Aug. 19, when 200 persons made the trip over the line as the guests of General Manager W. M. Rank. To transport the party a train of five cars was made up, two of which were motor cars. Power to operate the line is secured from the Bay Counties Power Company, whose line voltage is 40,000. This current is stepped down at the Alto power station and converted into direct current at 550 volts, at which pressure it is fed to the third rail. At the Alto power house is an auxiliary steam plant, and there also is a storage battery of sufficient capacity to carry the load for one-half hour. Oil burners are used under the boilers in the auxiliary plant. The rolling stock was supplied by the St. Louis Car Company, which also furnished the track equipments. The trail cars are very similar to light steam railroad cars in construction. They are 50 ft. 6 ins. over all, and seat sixty-six passengers. The motor cars are combination baggage and passenger cars. They are 50 ft. over the bumpers and 40 ft. 8 ins. over the corner posts. Unlike the trail cars they have vestibules, so that the motorman can shut off the platform he is occupying to form a cab.

SHOP NOTES FROM THE AURORA, ELGIN & CHICAGO RAILWAY

Braking service on the Aurora, Elgin & Chicago Railway is very severe and causes a large number of flat wheels as compared with ordinary interurban service where stops are not so frequent and speeds are not so high. One peculiar wheel trouble noticed on this road is blistering-like effect on the thread of the chilled cast-iron wheels. At the present time 800-lb. standard steel tire wheels are being substituted in place of cast-iron wheels.

Brake-shoes last about 5000 miles. This shows the severity of the braking service on this road probably better than anything else could.

During the last winter all of the contactors used in the General Electric type-M controllers which were placed under the cars have been boxed in, to protect them from flying dirt and snow. This was found necessary because of the high speed and the force of the air currents around the car, which caused snow to pack in the contactor boxes.

Cars are now equipped with a new lubricating device which has just been put on the market by the Railway Journal-Lubricating Company. This has two ball-bearing wheels running in oil held by springs against the journal. They carry the oil from the bottom of the box to the journal.

NEW POWER HOUSE AT LITTLE ROCK, ARK.

Ford, Bacon & Davis, engineers of New York, have designed a new power house for the Little Rock Railway & Electric Company, the construction of which is now under way. The building is a brick and steel construction with concrete floor, consisting of engine and boiler rooms with a basement under the engine room. There is being installed in this new plant one 1000-kw 500-volt railway generator, made by the General Electric Company. This generator is direct-connected to an Allis-Chalmers cross-compound condensing engine. A second railway unit of 600-kw capacity, General Electric make, direct-connected to a Hamilton-Corliss cross-compound condensing engine, is also being installed. In addition to this two lighting units will be removed to the new station from the old one. These units are three-phase, 60-cycle machines, one of 350-kw capacity and the other of 650-kw. The 350-kw machine is direct-connected to a McIntosh & Seymour tandem-compound condensing engine, and the 650-kw machine is direct-connected to a Hamilton-Corliss tandem compound-condensing engine. Wheeler surface condensers will be installed. Two new batteries of two boilers each, Aultman & Taylor make, are also being installed, and in addition an Aultman & Taylor boiler will be removed from the old plant and reinstalled. The new boilers are 550-hp each, and are of the water-tube type. The Buffalo Forge Company's forced draft system will be used. The building has been designed to allow of considerable increase in capacity.

THE RESPONSIBILITY FOR ACCIDENTS

Worcester, Mass., Aug. 15, 1903.

EDITORS STREET RAILWAY JOURNAL:

Of the large number of recent criticisms of present methods of interurban railway operation a major part lay the chief blame of the accidents upon the car crew. This seems to cover only a part of the story. For is it not true that railway companies issue in their instruction books "rules" that are systematically and openly violated—rules that are not enforced, and the existence of which is not suspected by the outside public until some accident brings forth from the management the statement that the crew disobeyed orders? Are not rules, the open violation of which is permitted, worse than no rules? And should not the management see that its instructions are not allowed to lapse into a state of desuetude that becomes at times anything but innocuous?

The riding public, although violent in its denunciation of the "criminal negligence" on the part of the company in case of an accident, will shout "let her go" when all is well, and "No. 10 is motorman and he will make up for lost time." Such approbation on the part of the public is not rare. It seems to the writer that criticisms at the time of accidents should sometimes be directed toward the management and the public as well as the car crew.

Dr. Bell, in a recent article, states in effect that not one motorman in twenty appreciates the danger space in front of his car at difference speeds. This appears rather a small estimate of the intelligence of the ordinary motorman. It is certainly a lower estimate than could be made of motormen of some of the roads throughout the country. If this gentleman will attempt to run a car over some of the New England roads, keeping up to schedule day after day, he will find that, at times at least, he must take chances on the danger space around curves.

This is a broad question, one that cannot be settled by the vociferations of a few theorists; yet I may venture to suggest that a school for managers and superintendents may be a good institution as well as one for motormen.

In this letter I have endeavored to call to your attention an aspect of the subject that does not appear to me to receive its share of the discussion. If I have erred in the attempt I trust you will pardon the error. READER.

Recently there was introduced in the City Council of Toledo, Ohio, an ordinance to "destroy" what is known colloquially as the end-seat hog, and the Detroit "News" expresses the opinion editorially that the railway companies themselves, through the improper arrangement of the seats in their cars, are responsible for the hog. With the poor Councilman at Toledo it is easy for one to sympathize, for back of his effort there certainly is sincerity born of personal suffering. With the "News," however, one is inclined to become impatient, and say that its utterance on the "pig-philosophy" of the end-seat hog is "damphoolosophy."

SOME OF THE PAPERS AT THE SARATOGA CONVENTIONS

CARE AND MAINTENANCE OF CAR BODIES

BY C. F. BAKER, SUPERINTENDENT OF SHOPS AND MACHINERY, BOSTON ELEVATED RAILWAY COMPANY, BOSTON, MASS.

The writer, in giving his views regarding the care and maintenance of car bodies, expects to meet with criticism, although it should be borne in mind that on the various roads in different sections of the country the conditions may vary considerably. In Boston, referring to the surface lines, we have comparatively few severe grades, but our crossings are numerous, and many of the streets are so narrow and crooked that they form an important factor in governing the size of our cars; so really our first care is to see that we keep within certain prescribed dimensions in order that we may pass on curves, keep off the sidewalk corners and be able to pass teams that may be standing on the street. Occasionally we are obliged to wait for a team to get out of the way, for with one wheel next the curb the hub on the other side of the wagon will not clear our cars.

Our next care is the drawings and specifications. We furnish the car builders with both general and complete detail drawings, so that should we place an order for 100 or more cars, dividing same between two or more car builders, they would all look alike; and should the workmanship and material be equally good in all cases, the cars would be practically the same. By pursuing this method we believe the cost of maintenance is materially reduced, as we have less spare parts to keep in stock, and a workman can do more routine work in a day than he could if working on first one design of car and then another.

Referring to our specifications, I would say these cover some twenty odd pages, and while to some of you this may seem voluminous, we often find that something has been omitted which should have been included.

We not only specify that all material and workmanship shall be first-class in every respect, and that all lumber shall be cut from live timber, to be free from injurious checks, wanes, shakes or damaging knots, but we designate the kind of material for each part and how it shall be put together. For instance, all tenons must be coated with white lead thinned with varnish; the bottom framing shall have two coats of lead paint mixed with oil. As the vital parts inside the car are covered by ceiling, finish, etc., and the outside with paint and varnish, its strength and durability depend upon the fitness of the material used and the honesty of the builder. It is most difficult to judge from the appearance of a car whether or not it will be long or short lived, and whether it will spend most of its time on the rail or in the repair shop. Full painting instructions are also given. But the point I wish to make is, that care taken to protect all tenons, joints and bottom framing or foundation of the car, etc., will add to its life and help to keep down the cost of maintenance.

The next point I would call to your attention is the car body bolster, which, if not amply strong, especially where center bearing trucks are used, the car will go down at the sides, or apparently up in the middle; and where this is the case there is more or less liability of trouble with the doors.

Assuming that the car has been properly designed, is built of the best material, and the workmanship throughout is first-class, care for same should begin in mounting it on trucks that will give it the best possible support and relieve it as much as possible from twisting strains, jar or vibration. Care should also be exercised in attaching the trucks, electrical equipment and all other apparatus to the body of the car, as boring or cutting holes in the various parts not only tends to weaken them but it is liable to furnish a path for moisture, which, if allowed to reach any portion of the work, is only equalled by fire or dynamite.

We have now reached the point where the car goes into service and is put into the hands of the car house foreman for inspection and care. On our road we have what the men term a "pit list," which arranges for one-third of the cars in each house to go over the pits every day; or, in other words, each car is over the pits every third day for general inspection and care of the car body and its equipment. The car house foreman makes out a list of the cars to have attention each day, and hands it to the men who are responsible for the different parts of the work, and they, at the end of the day's work, return the slips with all defects they have found reported thereon, in the meantime reporting to the foreman anything found out of the ordinary line of repairs. A car coming in from the street and reported for any trouble has immediate attention and is not held up for the three-day inspection. We hold our foremen responsible, and insist that they give their personal attention and supervision to all defects or irregularities reported by their, or other, inspectors. A man selected to inspect the car bodies is one who has served through the various departments of pit work and is considered capable of doing any of the work required of the car house men. I would say, however, that we do no extensive repairing or painting in our car houses, the work consisting of inspection of motors, trucks, controllers, changing wheels and axles, armatures, brake-shoes and the renewal of all parts subject to wear. The car houses are, however, supplied with a forge and some minor tools, and we have quite an extensive stock room in each house for supplying the spare parts of the various equipment, so that the work falling upon the car house foreman and his assistant in connection with the care and maintenance of car bodies is limited largely to that of inspection and renewals; although it is their duty to inspect and adjust the tie-rods, bolts, trusses and struts, keeping the cars in perfect alignment; doors, windows, ventilators, hand straps, rods, brackets, bells, register and bell cords should have thorough inspection and attention. Doors, rolls, pins, etc., should be oiled, and if a little bayberry tallow were occasionally applied to the sashes and posts, it would save trouble and possibly broken glass. They are cautioned to pay particular attention to all parts that might cause accident to passengers; for instance, loose register backs, signal bells, ventilator sashes, which might become loosened and fall; grab handles, rails, trap-door lifts, or screws that may project. On open cars the seat backs and arms should have attention, also the half-round iron on the steps and running board should not be allowed to project above the edge. Floor slats, where used, should be thoroughly inspected and none allowed to project above the level; trap-door lifts should be kept in proper shape so they will be available for use when necessary; all dirt should be cleaned from under the trap doors, so they will fit down closely and not project. The dirt which collects in the crevices will hold moisture, which is very detrimental to both wood and iron.

Under the head of care of car bodies might be included the cleaning, which, in some cases, comes under the department of transportation. It is a very important question, and one on which a great deal has been written. In 1900 the subject was one for topical discussion at the meeting of the American Master Mechanics' Association, and the questions of washing at terminals, dry wiping and using various cleaning oils and compounds were considered, and the report was published in July, 1900.

On the New York Central the success met with in dry wiping was quite gratifying, and I understand that road has done away with washing cars at terminals, except during damp weather. They claim the varnish stands better and the equipment looks better. Mr. Pflager, of the Pullman Company, stated that they had cleaned cars by dry wiping, also by using water, and at the end of twelve months very little difference was noticeable in the appearance of the car as to which method was used. Mr. Morris, of the Chesapeake & Ohio, said that for light-colored cars they used a cleaner of evaporating oil combined with linseed oil to neutralize the alkali in the quantity of soap deemed necessary for the composition. This cleaner was used about once a week on light-colored cars, while on the darker cars the dry cleaning could be used longer without the introduction of liquid cleaner.

Regarding our method of washing cars, we attempt to wash them once a week in dry weather, and every day during wet or muddy weather. We use a little alkali or soft oil soap for cleaning the sinker panels or parts that are painted white. Our instructions are to use cold water and as little alkali or soap as possible, and only when necessary. The cars are swept and dusted once every day, and the glass cleaned with Bon Ami every third day.

The elevated cars we do not attempt to clean, more than the glass and the inside of the car, for in their constantly going through the subway they become covered with a coating of grime or oxide, caused from the iron dust arising from the excessive wear of the brake-shoes, etc., which is impossible to remove without taking the varnish.

The practice of cleaning cars with petroleum is in vogue in England, it is claimed, with very good results. I understand this is being done by some of our steam roads, and would like to learn if any here are following that practice.

As car cleaning is a subject of interest to us all in the discussions which I trust will follow, I hope to hear expressions from the other roads represented here.

When our cars go into the paint shop for the annual overhauling, touching up, or repainting, they are dismantled or stripped of all cushions, seat backs, doors, hand rails and all metal or composition parts are removed and sent to the various departments for refinishing, polishing and lacquering, and the cushions and backs are thoroughly cleaned. The mechanics then take hold and do all the wood and iron work necessary to put the cars in proper repair and ready for the painters. If the painting is properly done we may be sure of many years of service.

The painter should work hand in hand with the builder from the beginning to the finish of the car, to the effect that all parts of contact and all exposed parts are thoroughly coated with best lead and oil as the building progresses in order to insure against decay. The painter should have one paramount idea in view—that of durability—as I believe the time is past when it is wise, or even possible, to tie a car up in the shops long enough, or to expend that amount of money necessary to attain the perfection of surface called for on a private carriage or coach. It is not the object of modern street railways to maintain, at a considerable expense, a painting department for the exclusive purpose of embellishing its equipment to the highest degree, nor is it the intent that all the energy of the painting department should be concentrated in the development of extreme display; but it is expected that the company shall receive adequate returns for the money invested, by giving its rolling stock all the protection possible under the existing conditions. The important points to be obtained are durability, cleanliness and wholesome appearance at a minimum cost.

To obtain the above standard nothing but the best material should be selected. The painter who specifies and insists upon having nothing else is the most economical man. With the best of body varnish that money can buy, together with choice pigments and vehicles, assembled and applied under the supervision of the head of the department in a judicious manner, after the method I am about to describe, we will, I am sure, have cars of continuously neat and dignified appearance, which should be commended by all who criticise from a reasonable standpoint and at a comparatively low cost.

Our procedure is what is known as the knifing process. After due care has been given to the steel and iron work, all rust, scales and imperfections eradicated, the woodwork as smooth as the cabinetmaker and sandpaper can make it, all parts thoroughly dry, all crevices, nail and screw holes well dusted, we proceed to prime with pure lead and a liberal supply of linseed oil, care being taken that not the minutest part of the car is slighted and that the priming is well rubbed in. Having seen to it that the car is well primed, a very important part of the work has been accomplished. It is then we putty all nail holes and indentures, care being taken to fill all places to more than the level of the work, as after same is dry and hard it must be sandpapered to a smooth surface.

We now continue the work on a lead basis; we mix what is known as a knifing coat. This is compounded from a portion of keg lead, dry lead, japan and turpentine, mixed quite thick and applied in liberal quantities and allowed to partially dry or set, as it is termed among painters. Then with a broad putty knife it is gone over by men who have become proficient in the work until the same has become perfectly smoothed, all brush marks obliterated, and uneven places leveled up; when dry, this is gone over with fine sandpaper and is ready for the ground color which is to follow. Again a light sandpapering and the car is ready for the body color, of which two coats are applied. It is our practice to add a small portion of body varnish to the body color, as it gives a little more binding and elasticity, which is of much importance. The car is then ornamented and two coats of body varnish applied, 48 hours between coats. The exterior of the car is now finished, and the knifing process has been substituted for the rough stuff and block pumice stone; and if the work has been properly done all requirements have been met at a much reduced cost and in less time.

The time consumed to finish a car from the wood by the above process should be about two weeks; while by the rough stuff method I would say not less than double that time. If, after a newly painted car has been placed in service six months, it is then taken in and one coat of body varnish applied, I know of no better investment or guarantee for its future condition, providing it has its yearly renovating. Thus we may expect many years of good service before having to repaint.

Regarding roofs, I would add that it is our practice to cover with No. 8 duck, care being taken to paint the top side of the roof boards with a mixture composed of linseed oil, lead and whiting, the canvas to be laid while the paint is wet. We then paint with two coats of lead and oil, excluding the use of sizing. By the addition of one coat of paint every two years, we are sure of a tight roof for many years; in fact, I can go back for very many years and trace roofs that are in a good state of preservation to-day.

FREIGHT AND EXPRESS ACCOUNTS

BY IRWIN FULLERTON, GENERAL AUDITOR, DETROIT UNITED RAILWAY, DETROIT, MICH.

The freight auditor of a large railroad said to me: "A good system of accounting is, of course, better than a poor one. But the poorest system thoroughly carried out with constant attention to every detail is much better than the best system when it is not vigorously enforced; and I make it a rule to follow up every error, however small, and insist that every agent carry out my instructions and be accurate in all his reports." The steam roads have, however, some advantages over electric lines. Their consignments are larger; the rates average much higher, and their employees have grown up with them. Our earnings do not warrant employing salaried men at some stations. The work is done by storekeepers who are paid a commission. They keep the most primitive accounts of their own business, and it is necessary to make up all their reports, and we are pleased when they are willing to pay cheerfully the amount the reports show due the company.

But I presume those who have to do freight accounting know of the troubles, and are only interested in the best method of doing the work. Let us, then, commence with the way bills which the billing clerk has just made out covering all the consignments from his station to all the other stations on the line.

These way bills are copied in a tissue copy book, and an extra tissue copy is made, which is sent to the auditor's office by first mail. These tissues must be sent in full size, even if but partially filled up.

Tissues from each station are sewed into a patent book in regular order, as shown by dates and numbers. These books will hold about 1500 tissues, and keep them in condition for handy reference.

The tissues from all stations are checked daily by the rate clerk, who examines the classification of all articles, the rates, the extensions, and the additions of every way bill.

Errors are reported on a correction form, which is "Exhibit No. 1." This is copied for our reference, and an extra tissue copy made. The original is sent to the station whose accounts are affected by the correction, and the tissue to the agent at the other end, for the purpose of calling his attention to the error.

We now return to the copied way bill, which is given to the conductor who checks the freight into his car by it, and receipts in a book for the way bill and all articles enumerated thereon in good order or with exceptions.

The conductor takes the way bill to destination, and gives it to the receiving agent, who checks his freight by it and receipts to the conductor. Articles over, short, or damaged, are reported at once on a form which is shown as "Exhibit No. 2." The way bills, as soon as received, are numbered in regular order, and this number—called Pro number (progressive) is used by the agent for reference.

The agent must immediately make out expense bills covering each consignement on the way bill, and show on each expense bill the Pro number of the way bill. The agent, in expensing, must check the weight, classification, rate and extensions, since he is held responsible for the collection of the correct freight charges when an error has been made by the biller. When he finds an error, he makes the expense bill for the correct amount, and makes a correction, Form "Exhibit No. 1," for the difference, sending the original correction and two tissue copies to the auditor, who approves the same, keeping one tissue on file and returning the original to the station affected, and tissue to the other station. The original figures on way bills are never changed. When the expense bills are made out they should be checked back on the way bill to see that they are all made out, and are correct.

Agents are particularly instructed to secure the receipt of consignee, or his authorized agent, at the time the freight is delivered on one-half of the expense bill, and the halves should not be torn apart until the charges are paid. The consignee cannot dispute payment of charges when the half bearing his receipt is presented attached to the bill for freight. The agent next enters an abstract of the way bill in his warehouse book. "Exhibit, No. 3" in Pro number order, and the total of the consignments should be checked with the total of the way bill. Next, the way bill is pasted in a scrap book in the same order. This scrap book makes

a convenient and safe file for the way bills, to which the agent can refer at any time. The warehouse book, being condensed, is of great benefit in checking up the month's work, and agents are always anxious to keep it, because it saves time in the end, being a check on abstracting, as will be explained later. But in the case of small stations, the checking can be done on way bills in the scrap book. At large stations it is best for agents to keep a freight forwarded book similar to the warehouse book, and abstract in this book from the tissue copy book of forwarded way bills all consignments on which freight has been billed prepaid, or with advance charges—but for the smaller stations this is not necessary.

The next record, the cash book, "Exhibit No. 4," is the most important of all; and when this book has not been properly kept the traveling auditor "is up against it." We, therefore, insist that this book be written up and balanced *daily*.

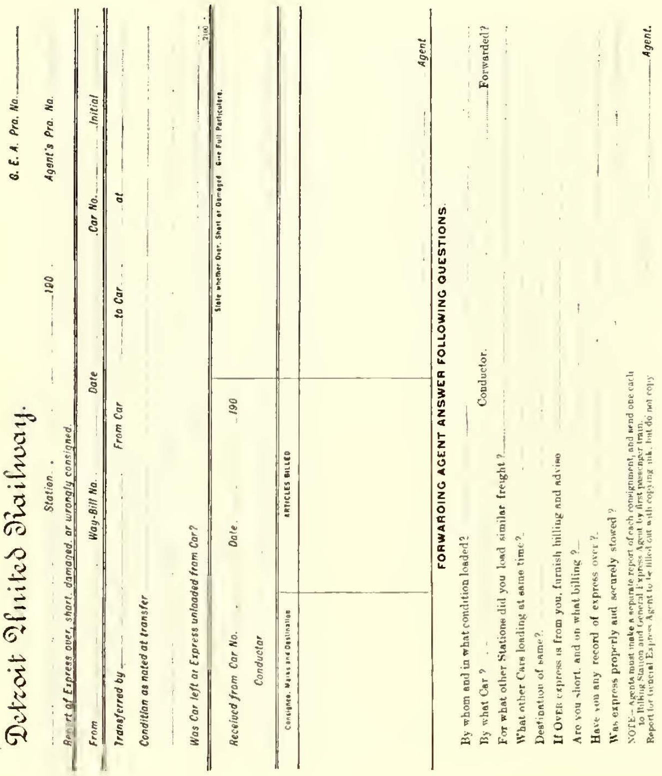


EXHIBIT NO. 2, 9 INS. X 8½ INS.

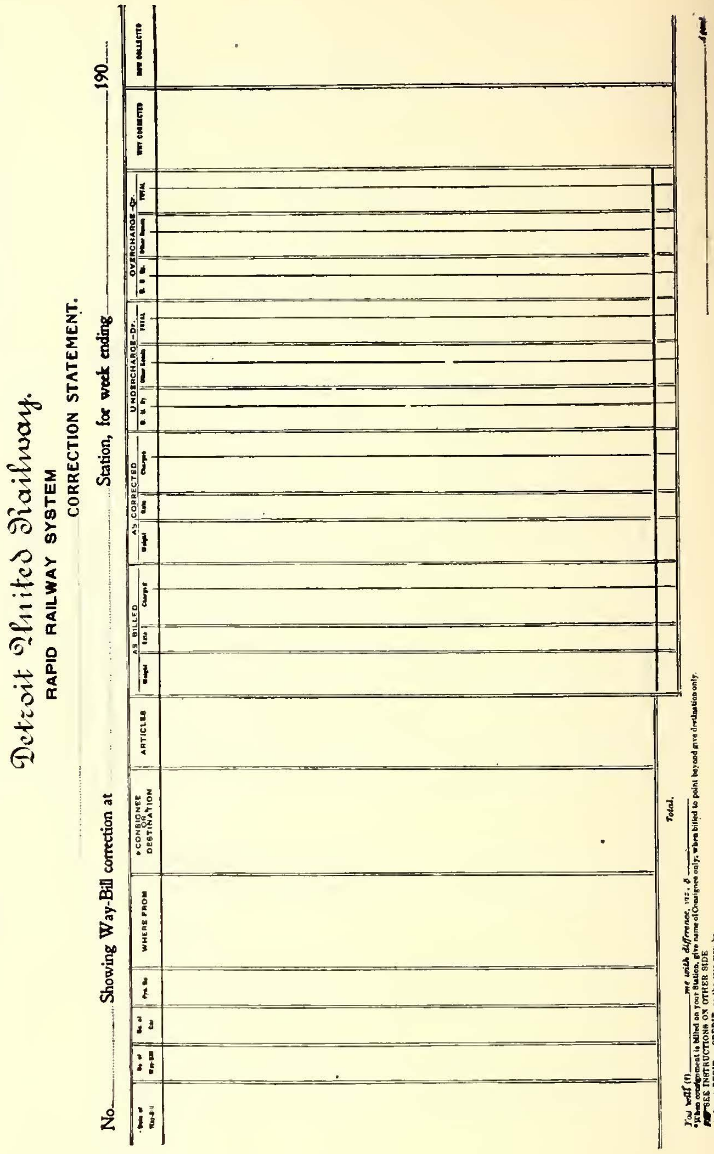


EXHIBIT NO. 5, 16¾ INS. X 10¾ INS.

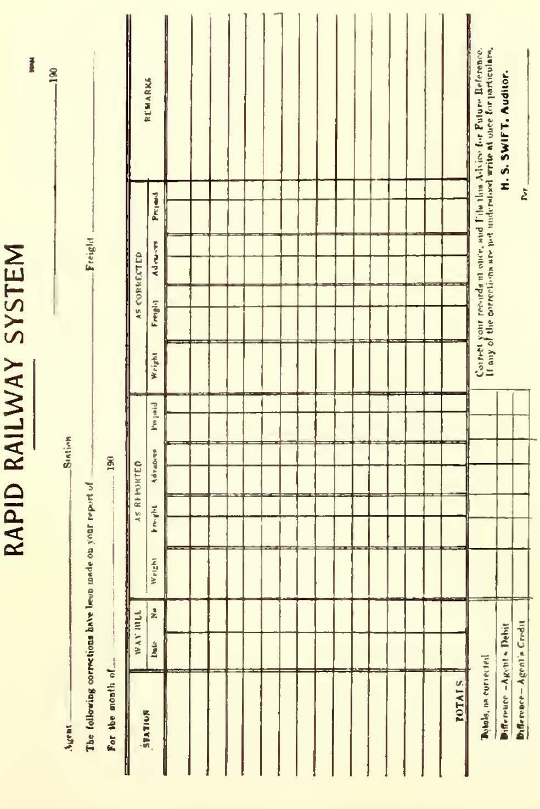


EXHIBIT NO. 1, 8¼ INS. X 10¾ INS.

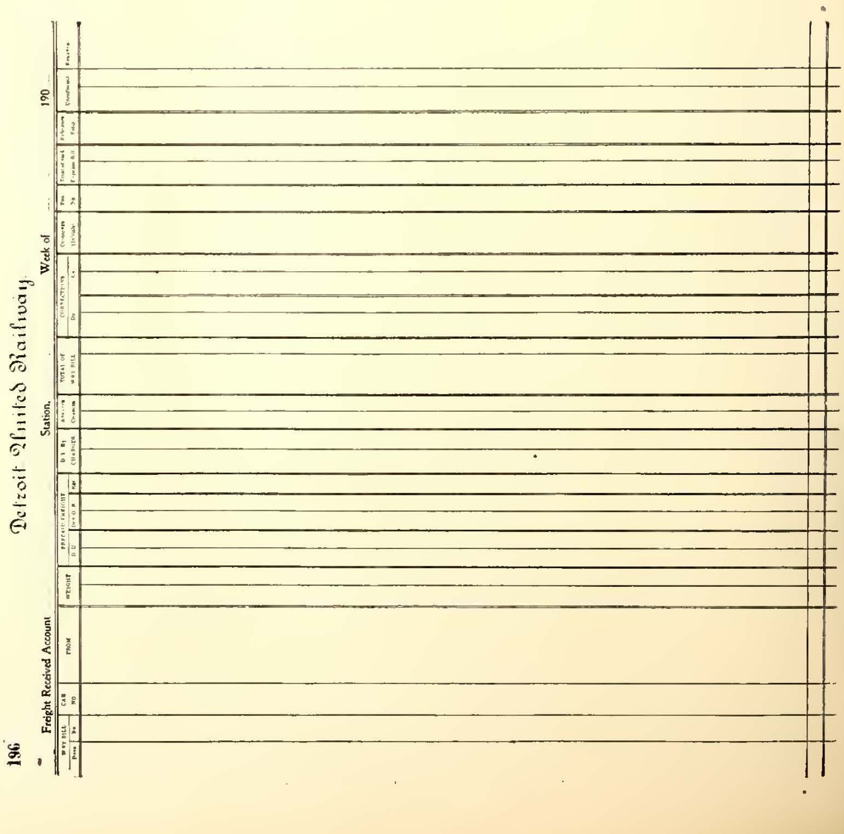


EXHIBIT NO. 3, 16 INS. X 18 INS.

When this is done, and the other records have been kept, it is only a question of checking to determine not only the exact balance due from the station, but also to show an agent whose accounts do not balance, the various errors he has made.

The agents check the entries in the cash book with the warehouse book, noting after each consignment paid the page in the cash book, and also noting cash-book page in the way bill tissue copy book of all prepaid items and items advanced.

The uncollected expense bills on hand should always agree with the items not checked off in the warehouse book and the unchecked prepaid items, while the advance items not checked (or advances to be paid) are a debit against the agent.

Agents are requested to remit the exact amount of each day's collections, and it is important to have a safe system for handling these remittances.

We have provided our agents with station seals, sealing wax, regular express envelopes, also needle and thread for stitching. The contents of envelope must be marked on the outside, and the agent signs and dates envelope, the signature of agent being an additional safeguard. Agents advise cashier of remittances under separate cover, and conductor receipts to agent, and cashier to conductor.

Conductors should also be provided with strong boxes in which to lock up remittances and valuable packages.

We were not anxious to take up the collection of C. O. D. packages, but found that it was necessary, in order to compete with express companies. We have done away with the return of the money collected as a needless risk and, instead, bill up the charges to be collected in the advance column. This gives the forwarding agent a credit with which to pay the consignor when the receiving agent reports on a special form that the consignee has accepted the shipment and paid the charges.

You will notice a column in the warehouse book headed "Corrections, Debit and Credit." Whenever a correction has been made, the cash-book entry is for the correct charges, and will not agree with the amount shown in the warehouse book. The amount of correction, debit or credit should be entered in the correction column, and is, of course, the difference.

The entries in the correction column should agree with those of the correction statement at the end of the period.

I have already told you that all billing is corrected in the auditor's office and that agents also make corrections, since they alone can detect errors in weight and in the description of goods. Of course, the agents duplicate a great many of the auditor's corrections, but in that case the agent's correction is made void.

There are some errors, such as mistakes in the prepaid or advance columns of a way bill, which are always a debit to one agent and a credit to the other. These are corrected by issuing a way bill showing the amount of the correction in the prepaid column only when the error is a charge against the station making out the way bill, and a credit to the station receiving the way bill.

With the amount entered in the advance column only the forwarding station is charged, and the receiving station credited.

Our baggage is all handled by checks which are sold at a uniform rate of 25 cents for each piece, and as the checks are all numbered it is quite easy to audit the agents' accounts. Separate abstracts are made for baggage. Checks are reported in numerical order on forwarding abstracts, and in numerical order by stations on received abstracts. Baggage consigned to points where there are no agents is double-checked. That is, the owner does not receive his half of the check.

I have now outlined the daily work of the agents. Our agents make out four abstracts each month, covering the 1st to the 7th inclusive, 8th to 14th, 15th to 21st, and 22d to the last of the month. But *one* balance statement is made out covering the work for the entire month.

Abstracts of forwarded way bills are made up from the tissue copy book. All way bills to each station are entered in regular order, as shown by numbers and dates. The footings of the prepaid and advance columns are proved by those in the forwarded book where one is kept; if not, the prepaid and advance columns are checked with the cash book before abstracts are sent to the auditor's office.

Received abstracts are made up in the same form from the original way bills posted in the scrap book. When totaled, the footings are checked with the footings of the received warehouse book. Forwarded abstracts are sent in promptly at the end of the period, but the received abstracts are held three days to allow all way bills forwarded each period to reach the receiving station.

A correction statement is made out on "Exhibit No. 5," shown herewith. On this blank are entered all the corrections for the month, and these entries are checked with those made on the warehouse book when checking the cash book.

The agent is next ready to make up his balance statement (Exhibit No. 6).

He first enters his balance from last month, then fills in the totals from his abstracts and correction statement, as indicated, also baggage collected, remittances made, and auditor's corrections on his previous month's abstracts. Next, the agent enters in the amount of the uncollected items made up from the uncollected expense bills on hand, and proved with the amounts unchecked on the warehouse book and in the tissue copy book. At large stations there is also a debit entry, "Charges advanced on way bills and not paid out," and a credit entry, "Advances paid and not way-billed." Another debit entry, "Charges prepaid and not way-billed," but the items billed prepaid and not collected go

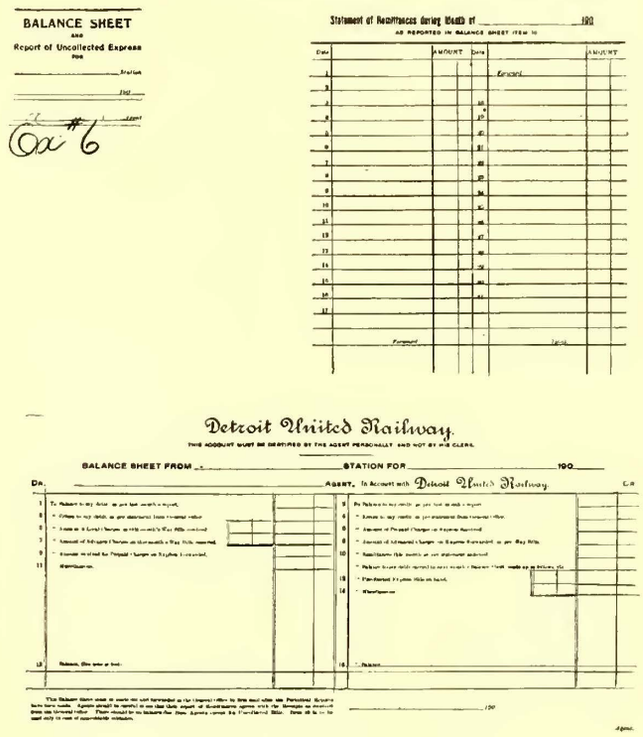


EXHIBIT NO. 6, 17 INS. X 14 INS.

in with the uncollected items. These last entries are not necessary at small stations, because they usually do a cash business.

The debit and credit sides of the balance statement should agree. If they do not, the agent should check over his month's work and locate the errors. Agents are required to list on the back of their balance statement all the items uncollected, and bring forward on the warehouse book the unchecked items, so that it is not necessary, when checking, to go back in the warehouse book further than the first of the month. At large stations, we allow the agents to hold their balance statement and make up a list of uncollected on the 10th of the month. They show the uncollected account on their balance statements in two items, "Amount paid 1st to 10th," and the "Amount unpaid on the 10th."

This reduces the work, as most of the last month's collections are made by this date. In the auditor's office the footings of abstracts are proved, and the forwarded abstracts are checked with the received abstracts. Each way bill should be checked.

I have already told you that all way bills are abstracted at original figures, so that the total of a forwarding agent's abstracts should agree with the total shown by the receiving agent's abstracts.

Errors in abstracting are corrected by reference to tissue copies of way bills. Agents' correction statements are also checked with the tissue copies on file in the auditor's office to see that they have taken up all corrections issued.

Reports of remittances are checked with the cashier's record. The abstract footings of each station for each period are entered in a freight record book (Exhibit No. 7), together with all debits and credits. In this book each agent has a separate page every month. The page is practically a balance statement made up from agents' abstracts, with the debits and credits necessary to correct errors, but, in addition, we enter the total freight and baggage forwarded. This book is, therefore, a summary of the freight movement at each station, as well as a record of total debits and credits. The balance in this book will agree with the agents' balance, if correct, after adding the remittances in transit. If agents'

balance does not agree, all errors are reported to him, and he is advised of the correct balance to bring forward the next month. From this book an abstract is made showing the earnings of each station, and the total represents the freight earnings for the month.

Our company handles most of the milk coming into the city from the districts we reach. It is shipped in 10-gal. cans. The revenue from this source is considerable.

We have a ticket (Exhibit 8) like a shipping tag, one of which must be attached to every can. This ticket has two coupons. The first reads:

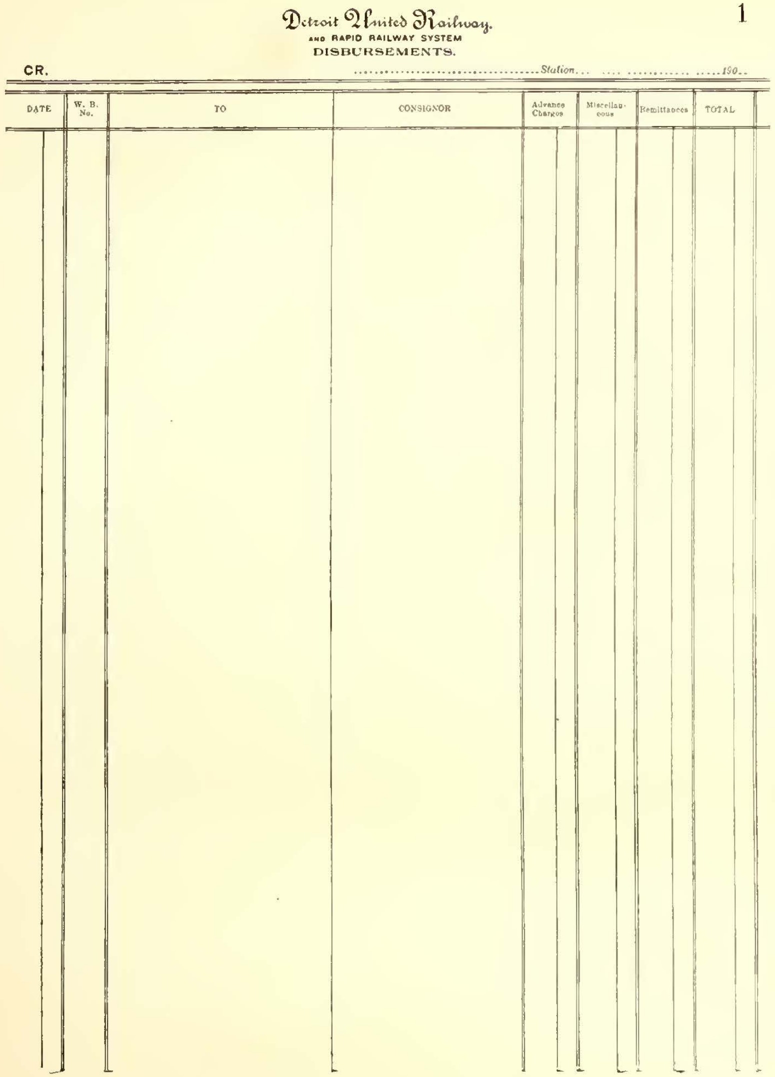


EXHIBIT NO. 4, 10 INS. X 15½ INS.

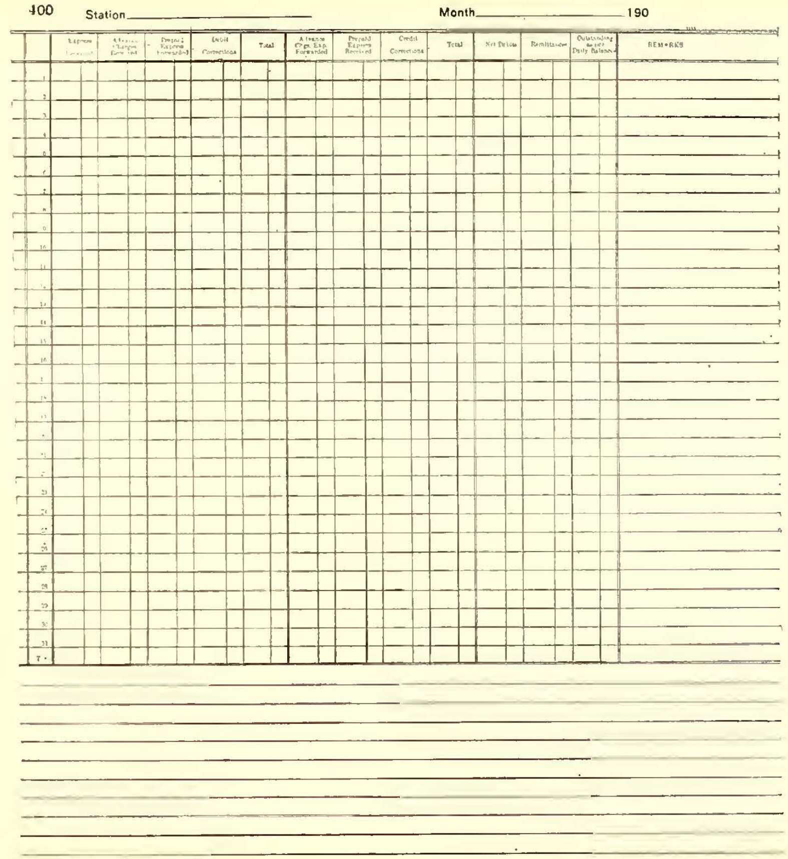


EXHIBIT NO. 7, 13½ INS. X 16 INS.

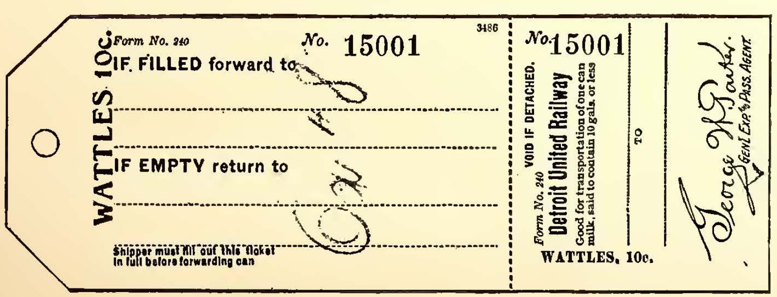


EXHIBIT NO. 8, 6¼ INS. X 2¼ INS.

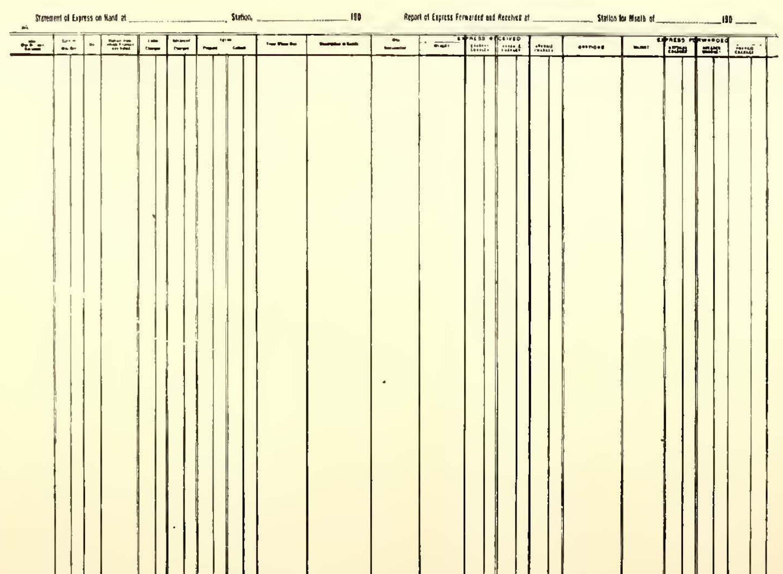


EXHIBIT NO. 6, 17 INS. X 14 INS.

2870

Detroit United Railway.
RAPID RAILWAY SYSTEM

CORRECTION STATEMENT..........

No.......

.... Station

Week ending.......... 190...

INSTRUCTIONS.

Report W.-B.'s at original figures. Way-Bills must be *reported at original figures.*

Use corrected figures for Expense-Bill. Expense-Bills must be made on corrected figures, and the difference *debited* or *credited* to the Station, as the case may be, by this blank.

Entries and in station order. Make entries on this blank in the order of Stations, and leave one or two blank lines at least, between stations.

Extend Amount of correction. Extend the amount of the "Undercharge" or "Overcharge" on each Expense-Bill; give divisions of the same *when such corrections affect other Roads*, and show total "Undercharge" and "Overcharge" from each station in "Total" column.

Why corrected *Authority* for making the correction *must invariably*, but briefly, *be given* in the proper column.

How collected. In the column at the right, note whether charges were collected *before or after the correction.*

Attach receipts etc., for refunds When charges, for any lawful cause, are *reduced* on expense bills *that have been collected*, the receipt of consignee *for amount refunded* must invariably be attached, together with any correspondence or other papers giving special authority.

Appear in Fr't Rec'd account Book. All corrections *other than "refunds"* will appear in detail on the Freight Received Account Book.

When to be made, etc. Correction Statements must be completed at the same time and sent with "Abstracts of Way-Bills Received"; and must comprise all corrections made on way-bills included in such abstracts or corrections, not previously reported, on way-bills dating prior thereto.

Recapitulate and prove. Do not carry forward the totals from one sheet to another, but recapitulate *the several sheets of each statement*, on the last page thereof, and see that the difference between the total "As Billed" and "As Corrected" columns is the same as that of "Undercharge" and "Overcharge" columns. Do not crowd recapitulations, but use a separate sheet for this purpose if necessary.

Final proof and result. When each statement is completed as above, recapitulate the totals of *each statement on the last sheet*, and prove the combined amounts with the Freight Received Account Book for the same period; and insert the final amount to be "Debited" or "Credited" to the Station.

IRWIN FULLERTON, Auditor.

Detroit, 1901.

BACK OF EXHIBIT NO. 5

"Good for the transportation of one can of milk or cream, not over ten gallons, between ———— and Detroit," and it is detached by conductor bringing the full can into the city.

The second coupon provides for the return of the empty can, and is taken up by conductor on its return.

The body of the ticket shows the address of both the consignor and consignee. The blank is printed with the name of the furthest station from which milk can be shipped at the rate at which ticket is sold. These tickets must be purchased in quantities, and in advance.

No receipts are given or taken for full or empty cans.

Conductors make daily reports of each consignment of full and empty cans, and return the coupons collected, with their report.

It is our custom to send the traveling auditor periodically to check up stations. He does not go like the bank examiner, so many times each year, but rather like the doctor, when there is sickness. Sometimes, the disease is weakness. The agent writes that he is not strong enough to make out a balance statement. Sometimes, it is a case of disordered intellect. When I went to school, one arithmetic had all the answers in the back. The teacher used often to remark sarcastically at the number of mistakes and incorrect methods which ended up with the right answer.

There are social visits when there is nothing wrong, but he has only to see that the agent's records are properly kept.

In each case, the traveling auditor should proceed in about the same manner. First, count the cash and see that it agrees with the balance shown on the cash book; then go back to the last correct balance, and check over the agent's work down to date. This is only a matter of time when you have the cash book properly written up.

Next to the inefficient agent, we find the greatest trouble with some agents who cannot understand the necessity of keeping their accounts your way.

I think that there is a certain literary instinct in everyone which suggests that a paper should be interesting, as well as instructive, but I shall be satisfied if this effort is worthy of the last adjective, and will content myself with the belief that I could have earned the first if I had written my experience with agents' accounts.

CAR MAINTENANCE RECORDS

BY S. C. STIVERS

In taking up this subject, the writer has confined himself to a description of a system of repair-shop accounting adaptable to small street railway systems, where the facilities for office work are somewhat limited, and where it is necessary to have as good results as some of the larger systems.

As the most important reason for keeping repair shop accounts is to enable the cost of maintaining individual cars, trucks and electrical apparatus, to be known in a manner that comparison of equipments may be made and an economical basis of maintenance be followed, to see whether the improvements in equipments, from time to time, are giving the results expected, and to see that the labor employed on the different classes of work is being performed in an economical, as well as satisfactory, manner, the accounting resolves itself primarily into a record which shows the amount expended for labor and material upon the different classes of repairs upon individual cars, trucks and electrical apparatus, and, secondarily, into an individual record of the more costly items of repairs, such as armatures, wheels and bearings.

The system of accounting in mind provides for these objects in having: First, an individual car record which shows the cost of all repairs, both labor and material, on any one car for any period or mileage. Second, an armature record. Third, a wheel record. Fourth, a bearing record.

The repairs are classified in fourteen classes, viz., paint, glass, fender, miscellaneous body, brakes, journals, wheels, miscellaneous

Form 39.

Do not write on back of this card.

*Check*_____

DAILY TIME CARD.

*Date*_____

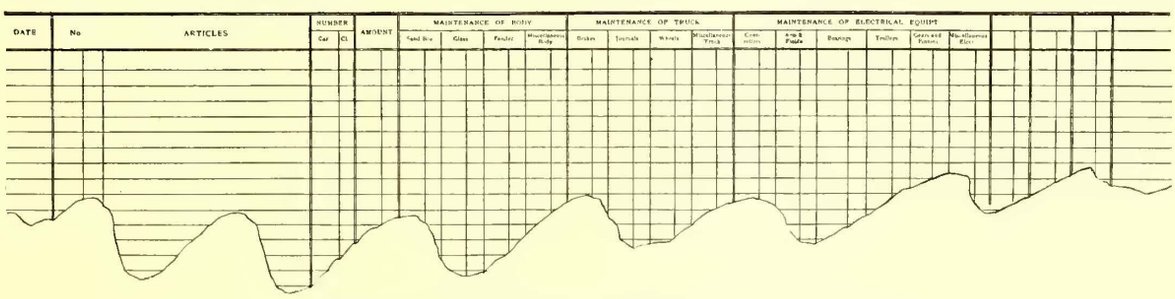
*Name*_____

*Order*_____

*Hours*_____ *Car*_____

Cl.	NATURE OF REPAIRS	HOURS	REMARKS.
1	Paint		
2	Glass,		
3	Fender,		
4	Miscellaneous Body,		
5	Brakes,		
6	Journals,		
7	Wheels,		
8	Miscell. Truck.		
9	Controllers,		
10	Armatures & Fids,		
11	Bearings,		
12	Trolleys,		
13	Gears & Pinions,		
14	Miscell. Electrical.		
	Accident,		
	Other than Cars,		

DAILY TIME CARD—Original size, 3¾ ins. x 6½ ins.



INDIVIDUAL CAR RECORD—Original size, 20½ ins. x 15 ins.

JERSEY CITY, HOBOKEN & PATERSON STREET RAILWAY COMPANY

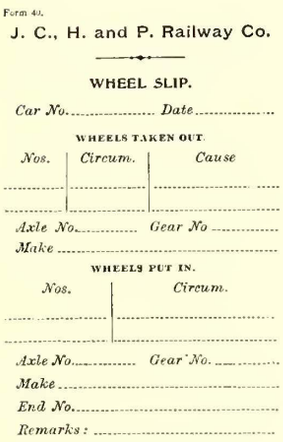
Car No. _____ Division.

Date	MAINTENANCE OF BODY					MAINTENANCE OF TRUCK					ELECTRICAL EQUIPMENT							
	Paint 1	Glass 2	Fender 3	Miscellaneous 4	Total	Brakes 5	Journals 6	Wheels 7	Miscellaneous 8	Total	Controllers 9	Arm. & Fields 10	Bearings 11	Trolleys 12	Gears & Pin. 13	Miscellaneous 14	Total	AMOUNT

STOREROOM RECORD OF MATERIAL ISSUED—Original size, 3¾ ins. x 6½ ins.

trucks, controller, armature and fields, bearings, trolleys, gears and pinions, miscellaneous electrical, which are numbered from 1 to 14, respectively.

The car record, which, as mentioned above, shows the amounts expended for both labor and material on the different classes of repairs which may be done on each car complete, is operated in the following manner. When a car is received at the repair shop for repairs it undergoes a thorough inspection, of which a report, showing the necessary work to de done, is made. An order bearing the car number as an order number is issued to the shop, and time cards are issued to the men employed on the repairs. These


Form 40.

J. C., H. and P. Railway Co.

WHEEL SLIP.

Car No...... *Date*.....

WHEELS TAKEN OUT.

Nos.	*Circum.*	*Cause*

Axle No...... *Gear No* .....

Make .....

WHEELS PUT IN.

Nos.	*Circum.*

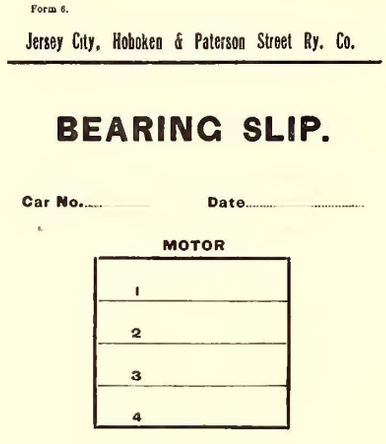
Axle No...... *Gear No.* .....

Make .....

End No......

Remarks: .....

WHEEL SLIP
Original size, 3⅜ ins. x 5 ins.


Form 6.

Jersey City, Hoboken & Paterson Street Ry. Co.

BEARING SLIP.

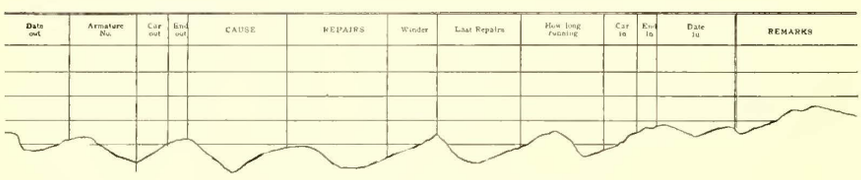
Car No..... Date.....

MOTOR

1
2
3
4

BEARING SLIP
Original size, 3⅜ ins. x 4¾ ins.

time cards are printed to show the date, name of employee, total hours worked and car number, and are subdivided into fourteen spaces, each space being for one of the classes of repairs. These cards also have columns which allow the number of hours spent on each class of work to be inserted opposite the respective class. The foreman of each department enters the time worked on each class of repairs in the proper space on each employee's time card



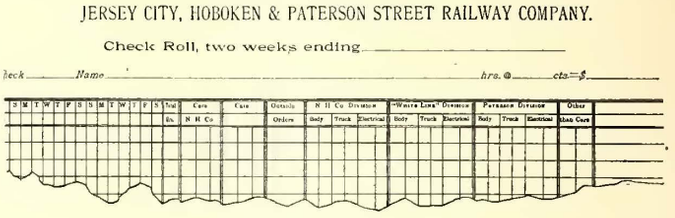
ARMATURE RECORD—Original size, 12¾ ins. x 10 ins.

and forwards it to the shop clerk, who enters this time in his time book. A summary is then made of the items on the cards which shows the amount spent for each class of work for each car. This is then entered on a daily report of repairs to all cars for that day. From this last report entry is made of each car in the car record, in which is provided for each car a page ruled in lines for the date and with a column for each class of repairs as enumerated above.

The material for the repairs is drawn from the storeroom upon an order issued by the foreman of each department. These orders show the material desired, car and order number, class number of repairs, and are entered by the storekeeper in a record book showing material delivered, price, class number and car number. The amount chargeable to each class of repairs for each car is daily abstracted from these books and entered on a report similar to the daily car report of labor mentioned above; entry is made from this report to the individual car record in the same manner as for labor. It is therefore evident by this means that a complete and detailed record of the repairs to each car is kept and by referring to the proper page and column one can learn at once the cost of any particular class of repairs on any car.

The armature record is important as a record of one of the more costly class of repairs, and it not only shows by the time the armature was in service whether the material used was up to the standard, but also acts as a check on the armature winder. This record consists of a properly ruled sheet with columns having the following headings, viz.: Date Out, Armature Number, Car Out, End Out, Cause Repairs, Winder, Last Repairs, How Long in Service, Car in, End in, Date in, Remarks. When an armature is removed from a car the motor repairer makes an entry of it on the blackboard in the motor shop, stating car number, armature number, end number and cause of removal. The foreman of the motor shop makes a report at the end of the day, using this blackboard as a basis, and entry is made in the record under the proper columns. The armatures are removed to the armature room, the repairs made and a report is made stating the nature of repairs and who worked on the same. Entry is made from this report to the armature record. The report of installations is made in the same manner. Thus the master mechanic is able at any time by looking up the record of the work to tell the value of any man in the armature room.

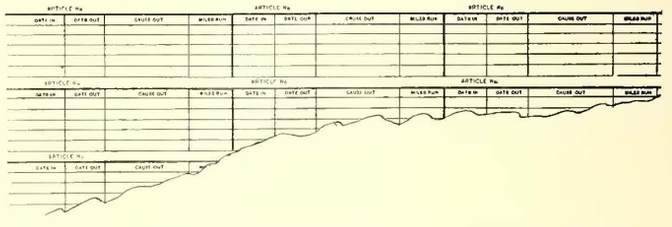
All of the wheels purchased by the company in mind have an


JERSEY CITY, HOBOKEN & PATERSON STREET RAILWAY COMPANY.

Check Roll, two weeks ending.....

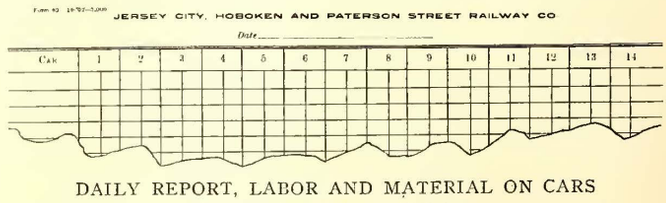
Check..... Name..... hrs. @..... cts=$.....

TIME BOOK—Original size, 12¾ ins. x 16¾ ins.


WHEEL AND BEARING RECORD—Original size, 15½ ins. x 9¼ ins.

individual guarantee to make a certain mileage, and it is therefore important that a record should be kept for the purpose of seeing that the guarantee is fulfilled. This record consists of a sheet having spaces for Wheel Number, Date In, Date Out, Cause Out and Mileage, and is operated in the following manner, viz.: A report is made to the office by the foreman of the motor shop on a blank which is printed to show the car number, date, wheels taken out and wheels put in. The heading of "Wheels Taken Out" is subdivided as follows: Numbers, Circumference, Axle Number, Make, End Number and Cause. Under the heading, "Wheels Put In," the subdivisions, Numbers, Circumference, Axle, Number, Make, End Number, likewise appear. Entry is made from this blank to the wheel record. The individual car mileage for the car under which the wheel was placed is procured for the time that the wheel was in service and is entered in its proper column in the wheel record, and if the mileage made is not up to that guaranteed, the proper parties are notified and demand is made on the wheel company for replacement.

The armature bearing record is used principally for the purpose of keeping track of the bearings, and is very desirable, as it enables the master mechanic to see if the bearing metal furnished is of the proper quality and makes the mileage desired. A report called the bearing slip is made by the foreman of the motor shop, giving the car number, date and motor from which bearing was removed


JERSEY CITY, HOBOKEN AND PATERSON STREET RAILWAY CO

Date.....

Car	1	2	3	4	5	6	7	8	9	10	11	12	13	14

DAILY REPORT, LABOR AND MATERIAL ON CARS
Original size, 10 ins. x 13¾ ins.

and this report, with the mileage made by the bearing, is entered in the bearing record. When a bearing is installed a report giving the car number, date and motor is made and entered accordingly.

In conclusion a few words about the time book may be of interest. The book provides spaces for the date of the pay roll, employee's name and rate, also columns for the days of the week, total hours and for the distribution of the charges which are headed Maintenance of Body, Maintenance of Truck, Maintenance of Electrical Equipment and Other Than Cars. When a time card is received the number of hours worked is entered under the respective day and the number of hours chargeable to the different accounts, as above, is extended to the proper columns. At the end of the pay roll the totals of the charge columns should equal the total hours worked. By multiplying the total number of hours of each charge

column by the rate the amount chargeable to each account is ascertained and entered accordingly on the distribution sheet which accompanies the pay roll to the auditor's office.

The total number of hours worked each day is entered on the pay roll, totalized and amount due set opposite the employee's name.

I might add that where work chargeable to other than maintenance account is done, that the same method described in the portion of this paper relating to the car record is used, with the exception that order numbers are given and an order number book is used instead of the car record.

The time is handled as for maintenance and amounts chargeable to the different accounts are extended to column headed, "Other than Cars," and the order number entered opposite charge.

Among the advantages to be obtained by the use of this system are economical office operation and elasticity of records.

One company, which has been using this system for some time with satisfactory results, operates upwards of four hundred cars and has repairs done at six of its car barns besides the repair shop, with shop office force consisting of two clerks, who, in addition to keeping the accounts, attend to the other office work connected with the shop, including correspondence, making reports, etc., which are called for from time to time.

The equipment of the company using this system might be increased within certain limits without increasing the expense of the office, it being necessary only to have pages enough in the record books to accommodate the additional car numbers, etc.

IMPROVEMENTS IN STREET CAR MOTORS

BY E. W. OLDS, SUPERINTENDENT OF ROLLING STOCK, MILWAUKEE ELECTRIC RAILWAY & LIGHT CO., MILWAUKEE, WIS.

We live in a progressive age and have to look back but a few years to see that improvements in street car motors have been made at a very rapid rate. The growth of electric railways in this and other countries has certainly been wonderful. Many of us remember when the first street car motors were put into successful operation—the old Sprague No. 6 and T. H. F.-20 being wonders of their day, the Sprague equipped with Sprague controllers, and T. H. with the so-called rheostat coffee mill. With them we were able to haul a 14-ft. or 16-ft. car with an eight or ten-bench trailer at a speed of from 5 m. p. h. to 12 m. p. h. We remember the trouble caused by burning out of controllers, breaking of rheostat cables, also short circuiting and burning out of brush holders, armatures and fields, caused by water and the picking up of wires, etc.

To meet the demands of to-day, our service must be rapid, reliable and safe. Our manufacturers and designers have not been idle. We now have reliable equipments, all motors being constructed practically waterproof, with the gears entirely inclosed, and are well lubricated (except when the gear cases are broken or out of order). The controllers are practically all series parallel and are giving good satisfaction.

Some of our street railway companies have had, and are having special motors built according to their ideas and to meet their conditions, the manufacturers being not only willing but anxious to push the development of the machines to meet the railway company's requirements. One of the weak points being covered by the manufacturers and railroad companies in their special machines is the construction of the motor frame to make it more accessible for inspection and repairs. Nearly all of our motors, as now designed, are arranged to open at the bottom, doing practically all of the repair work in the pit. In repairing double-truck equipments it has been found more satisfactory to lift the car body from the truck, making it possible to do all of the repair work from the top. To do this the top half of the motor frame should be designed to lift off, giving access to the armature, bearings, fields, brush holders, etc.

The dimensions of our gears have not been increased in proportion to the motors, as they show excessive wear, causing, very often, the swedging of the teeth. This should be remedied by making the gears with wider face. The quality of the steel should be better, that is, closer grained, and tough, thereby increasing the life of the gear with but little additional cost. The life of our present gears is from eighteen months to twenty-four months, and of pinions from twelve months to eighteen months. This should be increased 100 per cent. The advisability of using split or solid axle gears is an open question, each having its advantages and disadvantages. If split gears are used the bolts should be made larger and provided with nut locks, double nuts and cotters, making it impossible for them to become loose and fall out.

The gear case should be so constructed that it would stand abuse as well as use. To make such a case I believe it would be necessary to cast it as a part of the lower half of the motor frame, doing away with bolts and giving the gears absolute protection.

The armature bearings should be made longer and larger, with linings that may be easily removed and either rebabbitted or renewed. This would, we believe, make a saving of 50 per cent in our bearing expense. Their lubrication, also, is a very important matter. Until recently nearly all of our motors have been designed to use grease. Some manufacturers have used both grease and oil, feeding the oil with a wick from below and grease from cups above the bearings. Bearings have been designed to use only oil, to be fed through wool waste or wicks placed in oil wells below the bearings, both of which have been found very satisfactory.

Upon comparing notes with other master mechanics I find that a great many of them are using a cheap grade of babbitt. My experience is that the best is not good enough. We should have a metal that is hard, tough and close grained. Our motors must necessarily run more or less in the dust, the soft or open-grained metal will hold the small particles, thus causing excessive wear of the shafts. The average life of bearing linings on our city cars at present is about six months. It should be increased to not less than one year. On interurban cars the average is about eight months, and should be increased to eighteen months or twenty-four months.

The contact between commutators and carbon brushes should certainly be improved. This can be done by making the commutator bars longer and deeper, giving better contact with the brushes and longer life. The best manufacturers do not produce a carbon brush that is always reliable, the brush being, very often, either too hard or too soft, which makes poor contact and causes the commutator to become rough and black, thereby causing the motors to become overheated, burning out the armatures and fields. A better connection should be made between the carbon brushes and brush holders. Motors have been constructed to use the so-called "pig tail." Some users report that it is very satisfactory, and others that it is of no value. Without the "pig tail" the current is practically all carried by the brush hammers and springs, often causing the springs to become overheated, destroying their tension and making poor contact between commutator and brush.

One of the weakest points of our motors is the insulation of the magnet wire used for fields and armature coils. There have been a great many experiments made to find a satisfactory substitute for the cotton covering, but nothing better has been found. After all the skill and thought that has been put upon our motors to make them perfect, mechanically and electrically, it seems too bad that we are obliged to use the same cotton covering we did years ago, as their electrical life depends, to a very great extent, upon our being able to produce an insulation that will not carbonize.

As previously mentioned, we are living in a rapid age, and to keep up with it we must give the people rapid transit, not only rapid, but reliable and safe, and at the same time as attractive as possible. To meet these conditions our motors must be improved with the balance of the equipment. The high speed and quicker acceleration makes the strain greater and we must design our motors to meet the conditions, making them stand not only hard use but abuse, ever keeping in mind that the cost of maintenance must be as low as possible.

The Milwaukee Electric Railway & Light Company has had designed and manufactured, for its city and interurban service, motors embodying some of the special features previously suggested. The gear case is made more substantial and is well secured with bolts to the motor frame. The motor frame itself is constructed in two parts, the top half of which can be removed by loosening four bolts. The axle and armature bearings are constructed with oil wells, packed with wool waste and are lubricated with oil. For city use the axle bearings are 5 ins., and for interurban service 5½ ins. Armature bearings are made larger and longer, the commutator end increased about 30 per cent and the pinion end about 16 per cent. The commutator is made longer, increasing the contact surface 20 per cent, and the depth of bars is increased 30 per cent. The gear fit is made ¼ in. larger than the body of the axle. The face of the gears is increased about 15 per cent. The brush holders, their springs and hammers are better insulated and made more durable. The construction and insulation of all electrical parts have been given careful consideration to bring them to as high a degree of perfection as possible.

SHOP KINKS

BY H. H. ADAMS, SUPERINTENDENT OF SHOPS, THE UNITED RAILWAYS & ELECTRIC COMPANY, OF BALTIMORE, MD.

I do not know who it was that suggested the name for this paper, or what part of the shop was to have the "kinks," but I shall endeavor to submit a few ideas covering some of the things I have

found useful in a repair shop. If any of them appear old, kindly remember the title of the paper, and think it is beeause they have been "kinked" so long that they have been unable to take on new life. But also remember they are still doing good serviee, and the idea, though old, may have a new feature which will be useful.

In visiting the repair shops of the different roads, I have found

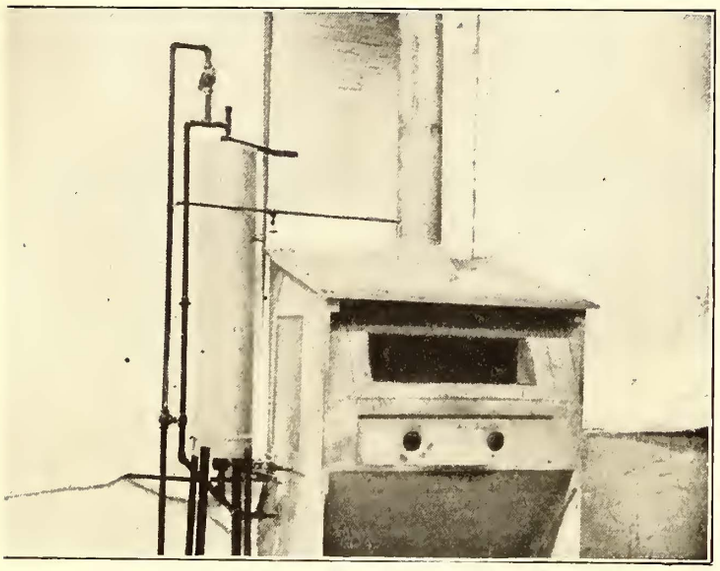
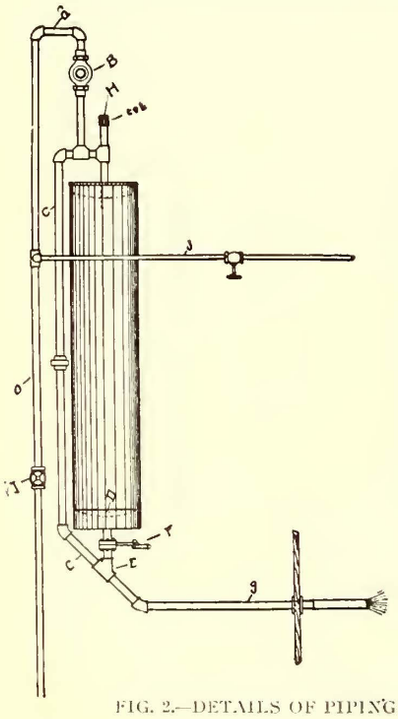


FIG. 4.—ILLUMINATED SIGN

that each shop has its individual kinks, and I have also noticed that it is not necessarily the shops of the large roads which have the best kinks, or the best ideas, as I have frequently seen in the shops of some of the smaller roads unique devices for accomplishing various results, which are common to railway work. I have often thought that if it were possible to have more frequent interchange of ideas in this line alone, it would be a great advantage to all concerned, and in presenting the few ideas which are in this paper it is with the hope that they will be of assistance to others, and may, in turn, bring forth ideas of a like nature from some one else.



A. Supply pipe; air pressure, 80 lbs.
B. Reducing valve.
C. Pipe supplying air pressure on sand; pressure, 10 lbs.
D. Outlet for sand.
E. Sand and air union.
F. Valve controlling sand.
G. Pipe leading to enclosure for sanding.
H. Cap over opening used for filling tank with sand.
I. Valve in supply pipe.
J. Small pipe supplying air to exhaust the dust.

FIG. 2.—DETAILS OF PIPING FOR SAND BLAST

Sand Blast.—The sand blast is a very old device, and probably familiar to most of my hearers, but I desire to submit the arrangement installed in our repair shop, and deseribe the work done with it in connection with our glass work, particularly as applied to signs. Illustrated in Fig. 1 is the apparatus, whieh consists of a 14-in. x 48-in. tank, with piping arranged as shown in Fig. 2. The small inclosure shown at the side of the sand blast is arranged so that the blasting may be done with as little disturbance from dust as possible. The operator stands at the front, placing his arms through the two holes, and direets the sand blast against the glass to be ground. There is also a vent leading out of the top of this inclosure, which runs to the outside of the building, and the small pipe leading into it from the main pipe is used to supply a small jet of air to blow the dust outside the building.

Our repair shop is supplied with eompressed air at a pressure of 80 lbs., and by means of a reducing valve, the working pressure

FIG. 3.—ILLUMINATED SIGN

for the sand blast is reduced to 10 lbs. The redueing valve is shown in Fig. 1 at the extreme top of the apparatus.

The method pursued in grinding or frosting glass is as follows: The glass to be ground or frosted is placed in the inclosed house or box. The air pressure is then turned on, care being taken to remove all moisture from the air by draining the pipes leading to the

FIG. 4.—ILLUMINATED SIGN

sand blast previous to starting operations. The sand valve is then opened, and the blast from the end of the nozzle direeted against the glass, passing over the same gradually until the surface is ground. The time required to grind a glass of 6 ins. x 40 ins., on one side only, is 3 minutes.

To illustrate the use this ground or frosted glass has been put to,

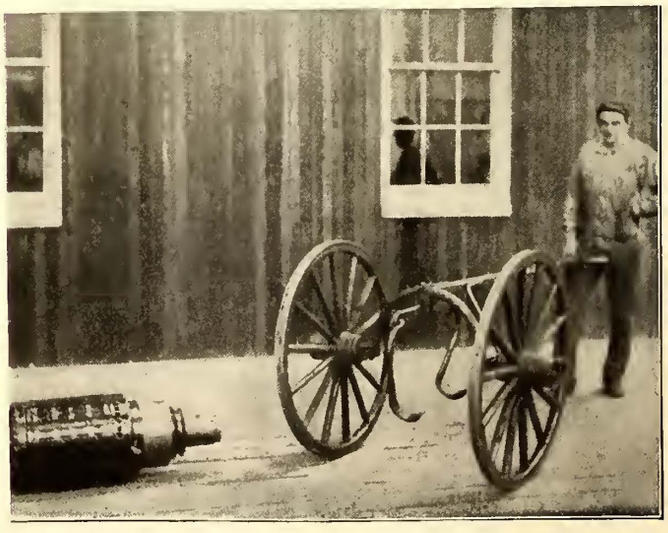


FIG. 7.—ARMATURE CART

Fig. 3 shows an illuminated sign, whieh consists of a glass ground on both sides, and the letters painted on one side in black. This is placed in the end of the deek of the car with the lettered side of the glass out, making a sign whieh is prominent in the day time, as

well as being an excellent illuminated sign for the night.

It is also possible to grind various designs by the use of patterns, which may be placed over the plain glass previous to the grinding. Fig. 4 illustrates what may be done in this connection. These glasses were ground for use in a United States mail car as ventilator glasses, and show how a plain glass may be ground to resemble beveled glass, this being accomplished by cutting the pattern at the corners on the proper angle, and leaving a small strip of the plain glass exposed to the blast.

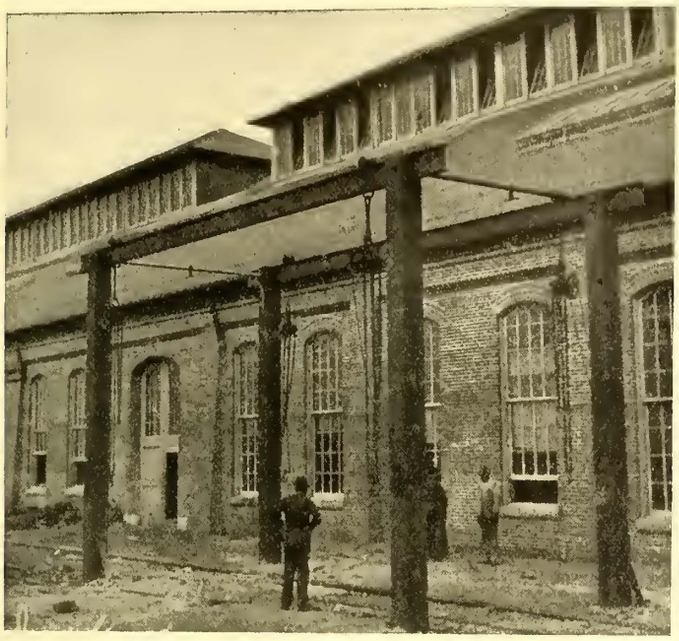


FIG. 6.—DEVICE FOR LIFTING CARS

A further use for this apparatus is in making chipped glass, which is used so extensively in the cars of to-day. This is done as follows: A glass to be chipped is ground on one side only. This is then covered with hot glue, and the same is allowed to dry. As it dries, the glue will chip the grinding from the surface of the glass, and will produce the effect desired. In this, as well as in the simple grinding of the glass, various designs may be worked out by the use of patterns on the ground glass before the glue is applied. The patterns used are generally made of heavy paper, and fastened with paste to the surface of the glass. The sand used in this apparatus is a clean white sand, known as "Brunswick Sand."

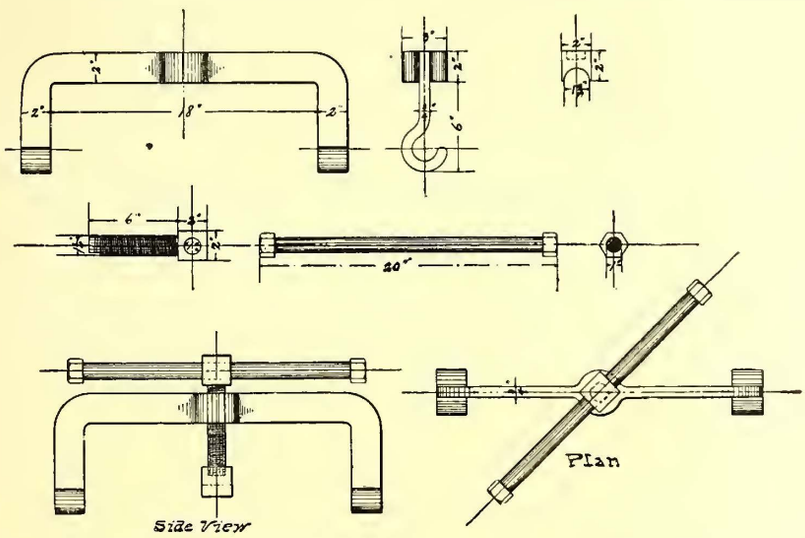


FIG. 8.—DETAIL, SIDE ELEVATION, AND PLAN OF JIM CROW

A DEVICE FOR CUTTING DASHERS FOR HEADLIGHTS

The apparatus illustrated in Fig. 5 is used for cutting the dashers for electric headlights. It consists of a circular plate, ¾ in. thick and 12 ins. in diameter, and a forging, which is arranged at each end to hold a standard pipe cutter. On each end of the forging there is bolted a handle, which is used to turn the cutters. The circular plate and the forging are connected with a spindle, which is threaded at each end, and has a collar in the center. The collar is ½ in. thick and 2½ ins. in diameter. The diameter of the spindle, which passes through the center of the circular plate, is ⅝ in., and the diameter of the other end of the spindle, which passes through a hole in the center of the forging, is ¾ in. On the side of the plate which is farthest away from the cutters is the feed arrangement, which consists of a "U" shaped piece, threaded in the center to receive the ⅝-in. end of the spindle.

The method of operation is as follows: The center of the headlight hole in the dasher is determined, and an 11-16-in. hole drilled. The apparatus is then set up with the circular plate inside the dasher, and the forging with the cutters on the outside. Two men are required to operate it; one on the inside of the dasher to manipulate the feed, and the other on the outside to turn the cutters. With a device of this kind, a dasher of No. 12 soft steel can be cut for a 10-in. headlight in about 8 minutes.

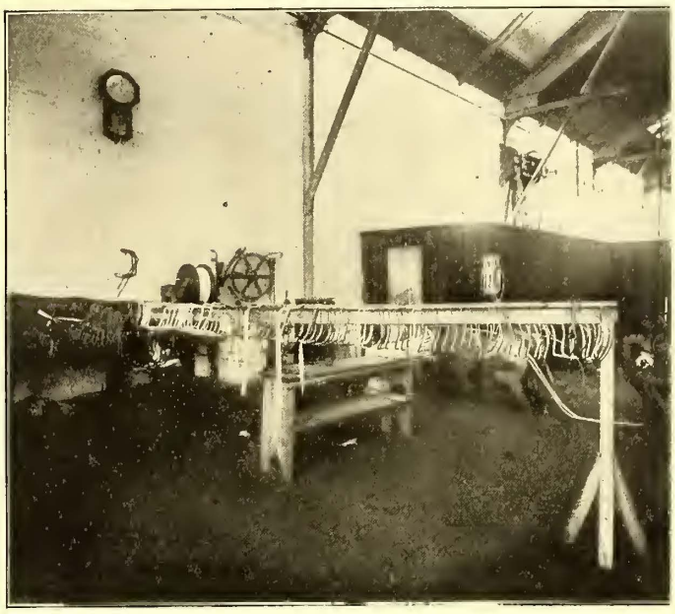


FIG. 9.—RE-INSULATING FIELDS

FIG. 5.—DEVICE FOR CUTTING DASHES FOR HEADLIGHTS

AN ARRANGEMENT FOR UNLOADING CARS

The question of unloading cars from railroad flats is one which most roads have to contend with, and in the majority of cases it is done by some makeshift device, frequently at the expense of a long operation, and attended with more or less danger of accident to the workmen, or damage to the car.

A simple device for unloading cars and the method pursued in the operation of the same, is illustrated in Fig. 6. It consists of four upright posts, 12 ins. x 12 ins., placed two on each side of the track, with sufficient clearance to pass all types of steam railroad cars. A 12-in. I-beam is framed into the top of each pair of posts, and the posts are tied together across the tracks at the top by means of tie-rods, using pipe as spacers. The pipes are also fastened to the posts by flanges and lag screws. On each I-beam there are two 7000-lb. chain hoists, which are suspended from rollers by means of a U-iron. The connection between the lower

hook of the hoist and the truck consists of a flat bar, 1 in. x 4 ins., bent into the form of a square hook to fit the side of the truck, with an eye at the upper end. This hook is made of a flat bar in order to allow it to be slipped into the opening between the top of the toe-board and the bottom of the sill plate.

A few words as to the time required for unloading cars with this arrangement will show its value. A shipment of 110 open cars on

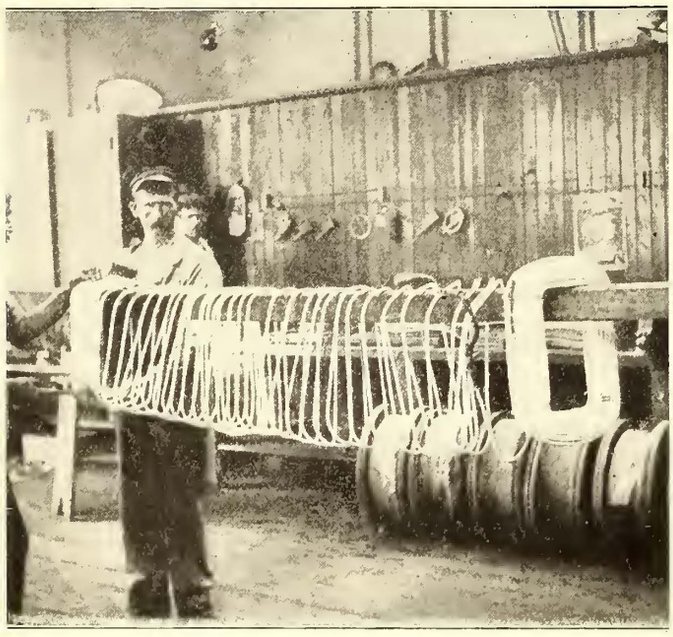


FIG. 10.—RE-INSULATING FIELDS

trucks was received by the United Railways & Electric Company of Baltimore, all of which were unloaded by this device, and for a number of days the time required for unloading was taken. The average was 10 minutes to the car, with a gang of six men; this time including the placing of the car in the shop and the shifting of the railroad flat car outside of the yard. The whole cost of erecting this device did not exceed $100.

ARMATURE CART

An armature cart is illustrated in Fig. 7. The armature is carried at a good height from the floor, and as the wheels of the cart

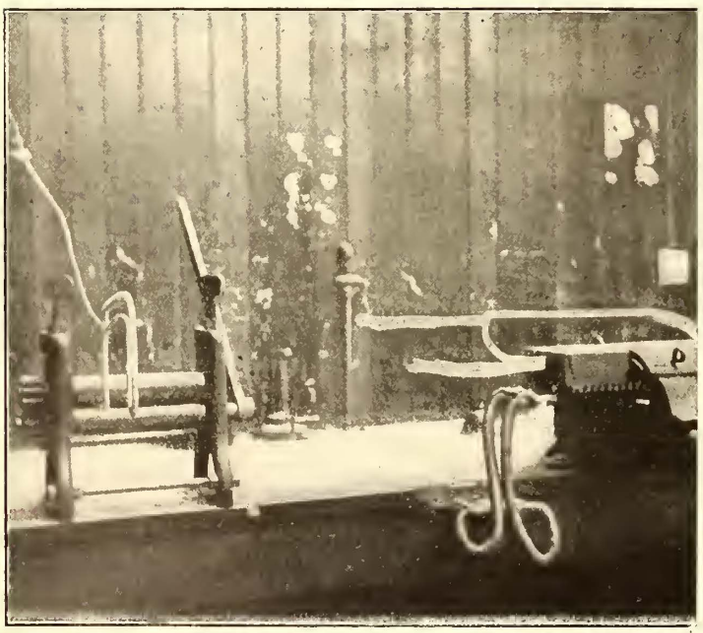


FIG. 12.—DEVICES USED IN THE MAKING OF ARMATURE COILS

are 36 ins. in diameter, it is moved very easily from place to place.

A cart of this kind removes all necessity of rolling an armature on the floor, which is a practice that is dangerous in the cleanest of shops, as a metal chip, too small to be readily distinguished, is frequently picked up by the armature in rolling it over the floor. This chip may not be discovered until the armature has been placed in the motor ready for service, when it is very liable to make itself known in a disastrous way.

As soon as the armature is removed from the motor it is placed on one of these armature carts and carried just outside the building, where there is an attachment for cleaning the armature with compressed air. The armature may be readily revolved in the hooks on this cart without placing same on the ground, and in this way the compressed air is blown into all the openings in the armature, thus clearing out all the carbon dust it is possible to reach in this manner.

TROLLEY-POLE STRAIGHTENER

A small Jim Crow is a very useful device about a repair shop or car house. Fig. 8 gives the details of one, which may be used to straighten trolley poles, dash posts, etc. It is not too heavy to take on the roof of the car, and a trolley pole may be straightened without removing it from the stand.

REINSULATING FIELDS

The question of reinsulating fields is one which has been before the electric railway repair men for some time. Some have adopted

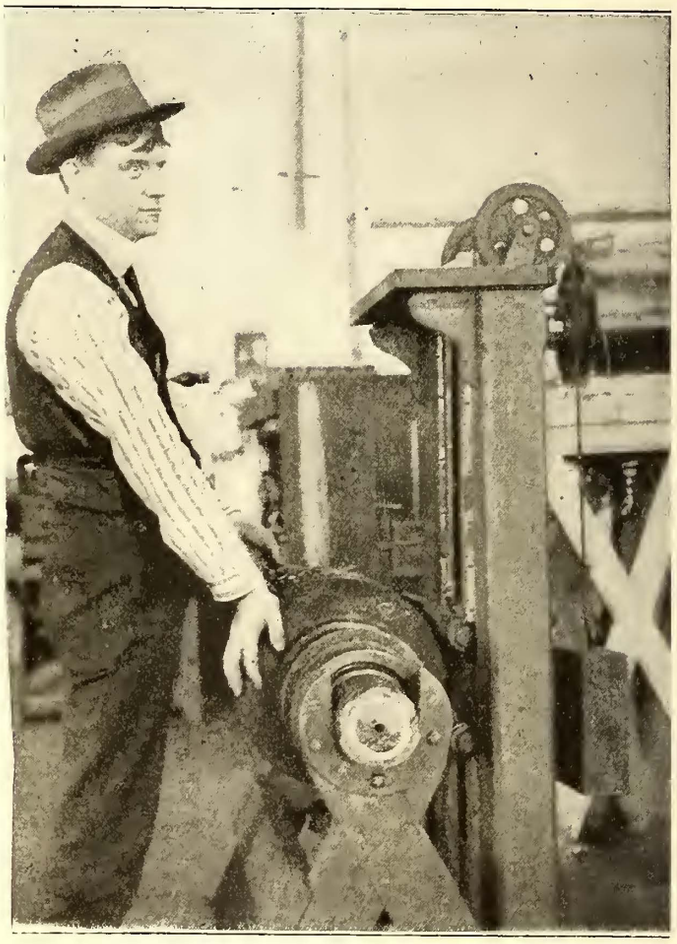


FIG. 11.—TESTING ARMATURE FOR SHORT CIRCUITS

a scheme and others have passed it by. I consider that there is a large amount of economy to be gained in the reinsulation of fields.

In using the reinsulating machine for this purpose great care must be exercised not to stretch the wire excessively in putting it through the machine. The tension placed upon the wire in order to straighten it must be as light as possible.

Illustrated in Figs. 9 and 10 is another scheme for reinsulating fields, the wire of which is too heavy to be handled by a reinsulating machine. The method pursued in this case is to reinsulate the field by hand. The field which is burned out has its exterior cover removed, and if it is badly charred it is taken outside the building and as much of the insulation and dust removed as can be blown out by 80 lbs. of compressed air. The field is then placed on a long wooden bar, opened up, and stretched along the same. The insulation which remains on the wire is cleaned off by hand with the use of scrapers. After being thoroughly cleaned the new insulation, which consists of a reinsulating tape, is placed on the wire by hand. This being accomplished, the field is assembled, beginning with the inner turns, and following turn for turn to the outer ones, as shown in Fig. 10. The field is then recovered and ready for service, and I consider that it is just as good as when new.

A field assembled after being reinsulated is shown in Fig. 10. The field shown in the illustration is the Westinghouse No. 56 field, which is made up of No. 1 wire. There have been 281 fields

successfully reinsulated from October, 1902, to July, 1903, which are at present in service and giving us no trouble.

INDUCTION TESTS FOR SHORT CIRCUITS

Fig. 11 illustrates the method pursued in testing armatures for short circuits. The apparatus used in this case consists of an old Baxter motor field suspended between two uprights, and balanced with a counterweight, so that it may be adjusted to conform to the various heights of the different armatures. This field is wound with No. 9 wire, and supplied with alternate current from a small alternator, which is belt-driven. The armature is placed in the magnetic circuit of this field and revolved slowly, and a small tell-tale piece, consisting of a light piece of sheet metal, is held at the top of the armature, as shown in the illustration. If there are any short circuits they will easily be determined, as the tell-tale piece will set up a vibration, which can readily be felt by the hand. A device of this kind is one of the greatest money savers possible to put in an armature repair shop, and it will save many an armature from being needlessly burned out, as the short circuits can be detected in the shop, instead of their developing after the armature has been placed in the motor.

Fig. 12 illustrates two devices which are used in connection with the making of armature coils. The one shown on the right-hand side of the illustration consists of an ordinary vise, to which is attached cast-iron jaws. The jaws are each heated by a gas burner. The use this device is put to is in drying the glue which is used in fastening the insulating cell of the coil. Also, as shown in the illustration, it is used in pressing two coils together, where the coils are to be assembled in this manner, as, for instance, the Westinghouse No. 56 coils, which consist of two coils of three wires, having two turns to a coil. This device drives out a large amount of moisture, and puts the coils in shape to be taped. Various lengths of jaws are used for the different types of coils.

The device on the left-hand side of the illustration consists of a pair of rollers, these being used to flatten the leads of the coil, and by a very simple trick removes, at the same time, the insulation of these leads, instead of having to scrape it off by hand, as is usual. This is accomplished by the use of a little glue upon the rollers.

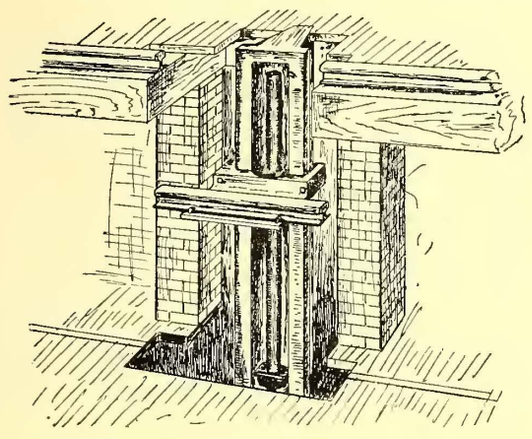


FIG. 1.—WHEEL ELEVATOR

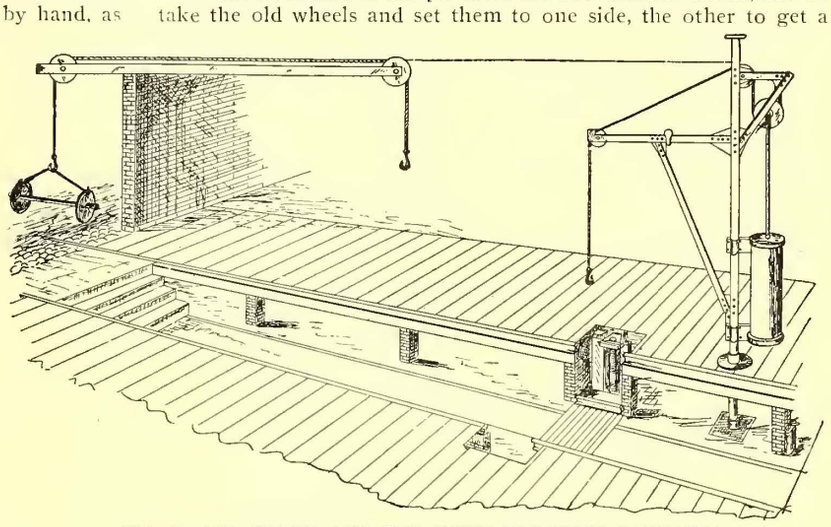


FIG. 2.—AIR CRANE AND PIT, WITH ELECTRIC ELEVATOR

SHOP PRACTICE

BY ALFRED GREEN, M. M., ROCHESTER RAILWAY COMPANY, ROCHESTER, N. Y.

In my opinion the best way of treating the subject which has been assigned to me will be simply to give my own experience, describing the plant of the Rochester Railway Company and some of the practices in vogue.

Our shops have a frontage of 166 ft. and a depth of 191 ft., being divided into three parts by walls at right angles with the front of the building. On the north side are the carpenter and paint shops, on the south side the motor repair and machine shops, the center being occupied by the office and store room, with the blacksmith shop at the rear. A door leads from each department into the store room; a very convenient arrangement. All orders for material are signed by the foremen of the various departments, and are filled by the stockkeeper. The store room is 126 ft. wide and 143 ft. deep. All necessary equipment for the entire system is kept in stock, the small material on the ground floor and the heavy material in the basement. The basement is also provided with a large room for the storage of car wheels, extra motors, controllers, etc., and is equipped with a narrow-gage track and overhead travelers for the handling of heavy machinery. For the floor plan of the building see the STREET RAILWAY JOURNAL of April 11, 1903.

Our road being a small one, of course, we have not the facilities for doing work that perhaps larger roads have. In the motor and truck department at the main shops on St. Paul Street, we have eight men. The special tools in this department are two wheel elevators, as shown in Fig. 1, one piston air crane and one motor air lift. The wheel elevators are operated by an electric motor

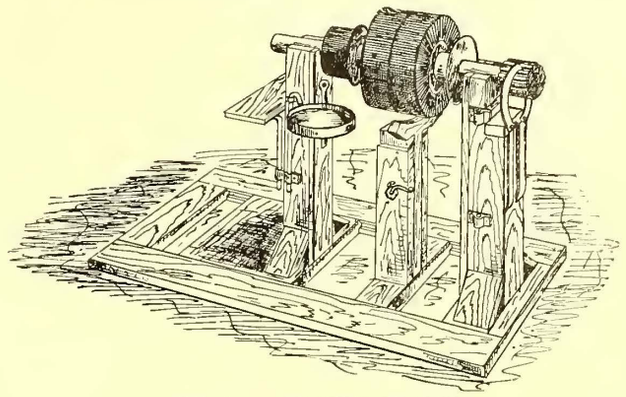


FIG. 3.—ARMATURE HOLDER

at the bottom of the pits; the construction of the wheel elevators being two long vertical screws set in a casting having a face for two large iron castings, with a section of rail fastened to the top of them, and working on the screw the same as a large nut, the two sides being connected by a longitudinal shaft with bevel gears on each end.

On the floor line of the pit there are two transfer tables, one to take the old wheels and set them to one side, the other to get a new pair and bring them on a line with the floor of the pit, where they can be placed on the elevator and carried up, directly under the car and into their place.

As you will note by Fig. 2 the air crane is near the wheel elevator, so that we have two ways of taking wheels out of the pits. With this arrangement we are able to take out a pair of old wheels, replace them with new ones, and have the car ready to leave the building in 40 minutes.

The air compressor which furnishes the air for all departments is placed in one corner of this room, and is belt-driven, being operated by two 20-hp motors, placed on the floor line of the motor repair pits. All repairs to motors are made from underneath the car, and the car body is not taken off the trucks unless the car is going through the shops for general overhauling.

The armature repair department and machine shop are in one large room, 100 ft. x 96 ft. In this room all the field and armature coil work is done.

The machine shop contains five lathes, five drills, one taping machine, large shears, thread-cutting machine, pinion press, drill grinder, speed lathe, cold cutting-off saw, shaper and planer, two milling machines, two emery wheels, also buffing machines for brass polishing. This department is operated by a 30-hp motor.

In the field and armature room we have one lathe for winding fields and one taping machine, one armature band-wire machine

and two armature coil winders with interchangeable heads for different kinds of coils, also the necessary dipping tanks and dry boxes. One of the novel features in our armature room is the

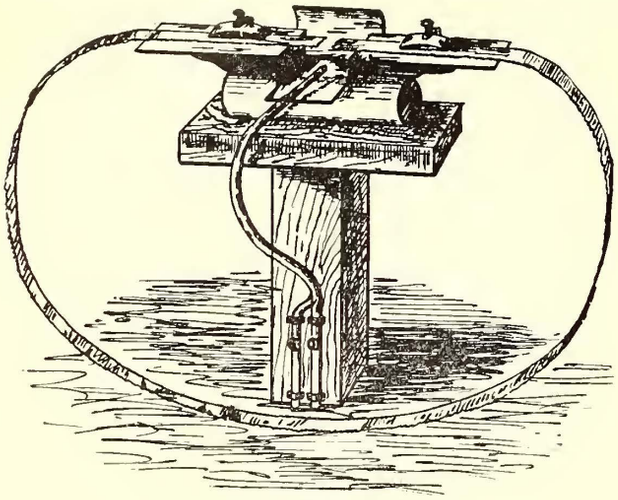


FIG. 4.—BAND SAW BRAZER

horse used for holding armatures while being repaired, which is shown in Fig. 3. This armature holder can be raised to any height and stretched out to accommodate any length of armature shaft. It is provided with a center support operated by a rack, which can be arranged to take the weight of the armature, so that the front part of the armature rack can be removed to take off or repair the commutator. Attached to this frame is a holder for a seat, so that the man doing the work can sit down to connect his commutator. There is also attached to this horse a removable table for holding the workman's tools, and on the back end are two adjustable hooks that can be thrown over the pinion in case the commutator is to be tightened or loosened. The room is fitted up with overhead tracks and air lift for handling the armatures and carrying them to the different parts of the shop. The armature room is also equipped with small furnaces for heating soldering irons, air and gas being used, which can be so regulated as to heat the soldering irons to the necessary temperature without burning the face of the iron. This does away with all charcoal furnaces and gasolene lamps. All hard soldered joints in the motor fields are also made with an air and gas burner of very simple construction.

The blacksmith shop is directly over the boiler room, 18 feet above the ground, and consists of five forges and one power hammer. The coal for this department is delivered into a bin in the boiler room and is carried up into the blacksmith shop by an endless chain with buckets. The blower is operated by a 20-hp motor. The furnace in the blacksmith shop is both a soldering furnace for tinning and a babbitting furnace for babbitting all motor journals.

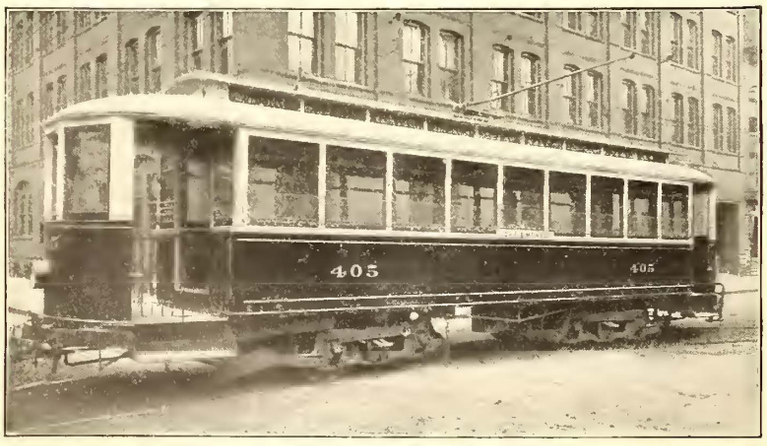


FIG. 7.—EXTERIOR OF LATEST TYPE OF CAR

In the babbitting of motor journals, we have tried to arrange our mandrels and babbitting devices so as to leave as little work as possible to be done on them after the boxes have been rebabbitted.

One of the features in making repairs on double-truck cars is the use of the transfer table, which, you can readily see, saves a large amount of work by being able to take the truck out sideways, in which case we have to jack the body only high enough to clear the truck, and it certainly saves a great deal of labor, as it is only necessary to raise the end of the body from which you are going to take the truck, six inches.

Our carpenter department is 76 ft. by 98 ft., having five tracks running its entire length. Under one of these tracks is a pit 4 ft. deep for the examination and repairing of cars. At one side of the pit is an entrance to a large storeroom, where all parts are put away while the car is being repaired. By having this room, all unnecessary material is kept off the carpenter shop floor, there is no possible chance of anything being damaged by careless handling, and we know where every part is when we want it.

This department has a complete equipment of wood-working machinery, including all tools necessary for car building and repairing. These machines occupy a space 24 ft. by 98 ft. on the north side of the building, and include the following: Mortiser, one large cut-off saw, rip saw, band saw, tenoner, jointer, shaper, sticker, turning lathe, router and planer.

All shafts and counter-shafts are in the basement underneath the carpenter shop, and all belts come up from below directly to the machines which they drive, thus doing away with the inconvenience of having belting in the way when handling timbers. These machines are driven by two 25-hp motors, one-half of the machinery being entirely independent of the other, so that in case of repairs or break-down, one-half of the shop can be run independently of the other half.

Special attention is given to cleanliness and keeping the shop

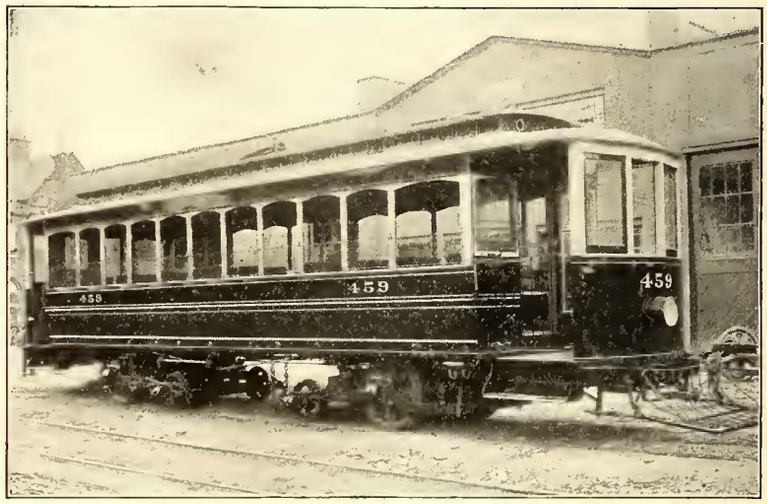


FIG. 5.—SEMI-CONVERTIBLE CAR

neat at all times, this being accomplished by a large Sturtevant exhaust fan piped to the different wood-working machines, which blows all the shavings and sawdust into a large shaving bin in the rear of the building.

This department is also piped for air the same as the other departments, and is equipped with connections between the tracks, so that it is convenient at all times, and at any part of the shop, to connect the Little Giant pneumatic tools, of which we have two. Also, in connection with this, we have a device for brazing our band saws, of very simple design, which is shown in Fig. 4. We were unable to find anything for this class of work, so necessity forced us to make the present arrangement. It is simple, and, as you will note by the sketch, the two ends of the band saw are held by clamps and hard-soldered, borax being used with a Bunsen burner for doing the brazing.

Among the conveniences in this department, there is also a panel bender which is heated by gas, and a set of glue pots, which in the winter are heated by steam and in the summer by gas.

All finished material for car construction is kept in a large storeroom in the basement, which is provided with racks. These racks are numbered, thus enabling the man in charge of this room to keep his stock up, and doing away with unnecessary waiting for materials.

In another large room in the basement is kept all rough lumber until it becomes thoroughly well seasoned. The runway is so arranged as to take all lumber directly to the large cut-off saw, thus enabling us to keep down all extra expense of handling same.

In regard to shifting cars from one department to another or

getting cars from the carpenter shop to the paint shop and out to the street, there are only two ways in which this can be accomplished with any economy. The first is to have the carpenter shop at one side of the paint shop; the second is to have the paint shop directly in the rear of the carpenter shop, with a rear exit, so that cars can be moved from one department into the other without interfering with work in other departments.

The arrangement depends upon the amount of room you have for buildings and tracks. In the laying out of the Rochester Railway Company's shops it was impossible to accomplish the first-named plan, on account of the scarcity of land, and, therefore, the second was followed.

We have all kinds of rolling stock in operation on the Rochester Railway and Rochester and Sodus Bay, giving us a number of different classes of cars which we both build and repair, including flat cars for hauling gravel, box and flat cars for freight, combination cars for express and passenger service, cars with longitudinal seats for the winter, and cross-seat open cars with center aisle for summer service.

There are no cross-bench open cars in operation on this system, on account of the number of miles of track which are placed

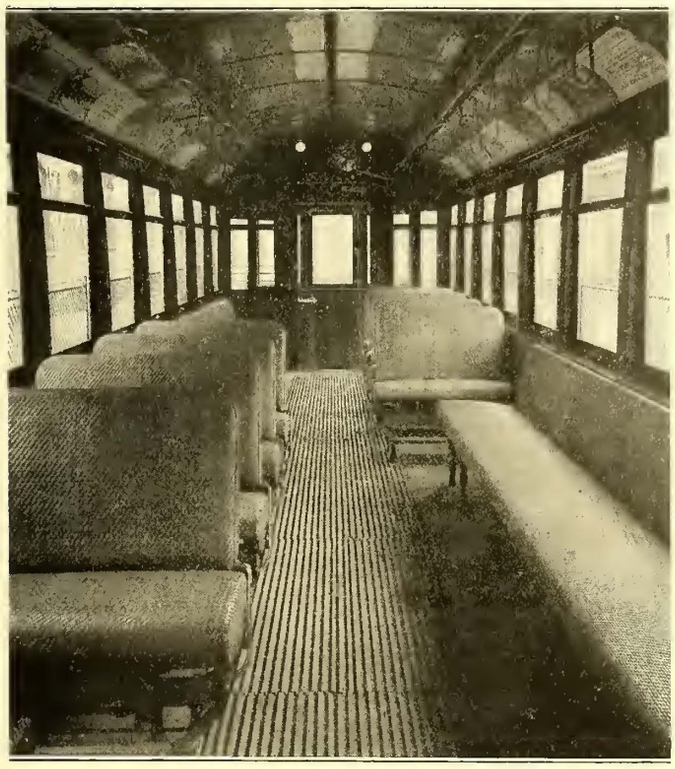


FIG. 6.—INTERIOR OF LATEST TYPE OF CAR

between the curb and the sidewalk, making it unsafe to operate this style of car. We have no funeral cars on this system.

Figure 5 shows one of our 27-foot, convertible type mounted on maximum traction trucks.

Another detriment to the building of cars for this system is the number of low iron railroad and canal bridges under which our lines run, making it impossible for us to operate a car over 11 1-3 ft. from the rail to the top of the bridge board. Still another bad feature, in regard to our tracks being inside the curb, is that it only allows us to use a car 8 ft. wide over all, which gives, in a cross-seat car, a very narrow aisle.

The interior of our latest type of car, with the seats arranged part cross and part longitudinal, is illustrated in Fig. 6, and Fig. 7 shows the exterior. In one of the last cars that we rebuilt out of two trail cars, not having sills on hand long enough, we built up our sills of four pieces of 2-in. by 9-in oak. The length of this car over corner posts is 40 ft. This car is 51½ ft. over all, and is to be used on the Rochester and Sodus Bay road, which runs between Rochester and Sodus Bay, a distance of 40 miles. Undoubtedly there will be much criticism of the building of sills out of 2-in. oak, but while there are some things against it, there are others in its favor. The most that can be said against it is that the water will work in between the joints and rot the timber. But each and everyone must admit that it gives us a sill of greater strength than we could possibly get from a solid timber, so that by putting the planks together with white lead, breaking joints by 6 ft., and bolting same together thoroughly, I do not think we are liable to have any trouble with water. Additional strength may be readily obtained in a built-up side sill by placing a steel plate from ⅜ in. to ⅝ in. thick between the second and third planks.

In regard to the paint shop, there is a great deal that can be taken up and thoroughly discussed for the benefit of everyone concerned, but as the painting of cars will more correctly come under the head of "Care and Maintenance of Car Bodies," which paper is to be handled by Mr. Baker, I will say only a word on this subject.

Our paint room is 100 ft. by 69 ft., with five tracks, each capable of holding two cars 44 ft. long, or three cars 26 ft. over all. Part of this room is used for washing and varnishing sash and other car parts, which are kept on a rack, and faucets attached. A graduated stick, which is fastened to a float, passes through a slot in the cover indicating the quantity of material in the tank. The bench beneath the rack used for mixing paints, putty and colors, is covered with zinc, which is easily cleaned. In connection with this is a box or paint brush holder, which is simple in design but very effective. No one can take a brush without the master painter first unlocking the rack, which enables him to know at all times where his brushes are, and that they are properly cared for when returned. We keep our paint brushes in water suspended on a wire and the end of the brush about 2 ins. from the keeper. Varnish brushes are kept in oil and turpentine in the same manner.

The next important feature in this department is the use of gas and air for burning paint off cars. In our opinion, it is not so much the question of economy in the use of air and gas as against the gasolene torch, but the burner is safer and more convenient to carry about. It is also light and durable, and when once regulated will remain so as long as it is in use.

In regard to the grinding of colors, I do not think it economy for any ordinary-sized road to go to the expense of equipping a shop with the necessary apparatus for grinding colors, when we can buy them ground in any shade ready to thin down with turpentine, and we know then just what they cost.

As to the paint skins, we have a slush bucket that all odds and ends go into. We stir in with this a little Princess brown and other material necessary to make paint that will do for slushing bottoms and canvas panels of cars, so that we waste very little material.

In every department, a great deal depends upon the ability of the foreman in getting the best results, not only out of his tools, but also from his men, and it is for the master mechanic or chief engineer to demonstrate to his company the value of tools and equipment, and prove to them that they are not luxuries, but every-day necessities.

THE ADVANTAGES AND DISADVANTAGES OF THE "BAG SYSTEM," AS COMPARED WITH THE "RECEIVER SYSTEM" OF HANDLING CONDUCTORS' REMITTANCES.

BY FRANK R. HENRY, AUDITOR ST. LOUIS TRANSIT COMPANY, ST. LOUIS, MO.

I shall begin my subject at a time when street railroading was in its infancy; especially, when the accountant and the accounting department were not considered as a necessary adjunct to the operation of the road. In those days the bob-tail cars were in use and passengers deposited their fares in a box at the end of the car, or in a slot connected with the box.

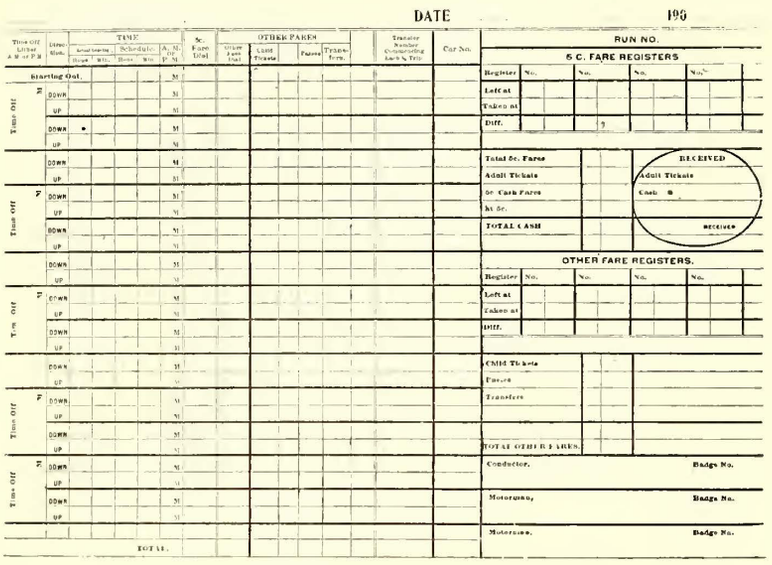
It became necessary afterwards, on account of increased travel, to abolish these cars for larger ones and employ conductors to operate the cars and to collect fares. Tickets were then introduced to the public and generally used by passengers, who were induced to buy them in slips of five at five cents each, in preference to paying seven cents cash fare. The system in vogue was to have the tickets collected each half trip, put in packages marked with the number of the trip and the number of fares and deposited by conductors into their individual receptacles communicated with by a slot arrangement above which their numbers were indicated; the company adhering to the box and slot arrangement, as used in the bob-tail days, by aggregating the boxes at the stations for the conductors to make their deposits in. At the end of the day these packages were taken out and sent to the general office to be compared and checked against the trip cards.

After the general use of the tickets was discontinued, passengers paid their fares in cash and registers were inaugurated. The system of having conductors make remittances in boxes at the stations still remained in force for some time, however, but eventually proved so unsatisfactory that it was abandoned. The frequent mistakes of the conductors depositing their cash and tickets

through the wrong slot arrangements, and claiming money had been deposited when it had not, were the chief dissatisfaction.

It was then that the system of having conductors place their money in bags, together with deposit slips showing the contents, and deposited into a safe of special construction located at the stations, was adopted. This, too, was abandoned and we are now using the "Receiver System."

By comparison the quickest and most accurate knowledge is



FORM A (FRONT)

gained. I shall therefore present as concisely as possible the "Bag System" and "Receiver System," as operated by the St. Louis Transit Company, with the comparative advantages and disadvantages that have been experienced. The description to SOME may be *short* and *over* to OTHERS.

THE BAG SYSTEM

(1) The conductors were required to register all fares. Each car was provided with two registers, one on which the 5-cent fares

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ST. LOUIS TRANSIT COMPANY.

DAILY CAR REGISTER REPORT.

Date 190 Car No.

LINE NO.	RUN NO.	NAME OF CONDUCTOR	TIME	A. M. OR P. M.		STATEMENT OF REGISTERS 5c FARE REGISTER	ALL OTHER FARE REGISTER
		REPORT OF REGISTER TAKER		M	Out at		
				M	Taken at		
				M	Left at		
				M	Taken at		
				M	Left at		
				M	Taken at		
				M	Left at		
				M	Taken at		
				M	Left at		
				M	Taken at		
				M	Left at		
				M	Taken at		
				M	Left at		
				M	Taken at		
				M	Left at		
		REPORT OF REGISTER TAKER			In at		

FORM B (BACK)

(cash and adult tickets) were registered, the other on which all other fares (transfers, half-fares and passes) were registered. The conductors were provided with trip cards (Form "A") of their respective lines, on which were columns to indicate the operation of the car (or cars) each half-trip.

(2) Each conductor on taking his car (or when taking car from another conductor) found a register card (Form "B") in the rack located under the registers. On this card were indicated the starting-out readings of the registers (or readings of previous conductor). He examined the card to see if it agreed with the readings of the register taker (or readings of previous conductor taken in each other's presence). If so, he placed his readings beneath. If not, he called the attention of the foreman (or motorman, or another conductor) who made a statement of the difference on the register card, signing it; failing to call anyone's attention to the difference, conductor was charged with the register taker's (or previous conductor's) readings. Next, he wrote in the proper place his line number, run number, name and time of taking car. He then took his trip card and enumerated the register readings on it.

(3) When completing each half-trip, all ticket-fares (excepting adult tickets) collected were placed in an envelope with name, number of car, number of trip, time and the number of the several kinds of fares, and deposited in a small locked box located under the registers. From time to time he recorded on the trip card the operations of the car each trip, and before leaving the car he took the register card and wrote below the first (or last) readings, the time of leaving and the readings of the registers. On his trip card he recorded the register readings and filled out the spaces showing the results of the day's operation.

(4) Then he counted his money and adult tickets and made up a conductor's deposit slip showing the different denominations, adult tickets, name and badge number of conductor, placed the money, adult tickets and deposit slip in a bag with the number of his line on it, tied it with a string and deposited the bag through a slot arrangement into a safe, specially made for conductors' deposits. His trip card he disposed of by depositing it in a box.

(5) Each register taker, in gathering up the register cards and envelopes from each car, took the register card, read the registers and checked off the last statement made on the card; if not correct or figures were indistinct, he wrote the correct readings on the bottom. On a new card he wrote (with indelible pencil) a statement of the register showing what the registers were charged in with (what they would start with next morning) and placed the same in the rack. After collecting the envelopes from the box beneath the registers he tied them together. Upon completing the collections, all register cards and envelopes were taken to the office and locked up.

(6) Seven or eight buggies were used by money counters from the treasurer's office to make the rounds every morning to collect the bags, reports, etc. Each counter was accompanied by a clerk who took the bags out of the safe, counted them in the foreman's presence and gave him a receipt showing number taken. These bags were brought to the treasurer's office and opened and contents counted by the money counters, and checked against the conductor's deposit slips. If correct, the money was separated and thrown into different receptacles. If not, an actual inventory was made opposite the conductor's inventory.

(7) When the remittances (money and adult tickets) from each line were counted, the money was placed on trays for each denomination. The deposit slips were then taken to an adding machine and totalized to find out the amount of cash received from each line. The trays of money and deposits were then passed to the head money counter, who checked the contents against the counter's deposit slip. When all the money counters had finished, he put the money up into bankable shape to be deposited the following morning. The deposit slips, fastened with a slip attached showing total cash received from each line, together with adult tickets, were sent to the auditor's office.

Operation in the Auditor's Office:

(8) Each register clerk, upon receiving the register cards and trip cards allotted, arranged the register cards numerically according to their number, and the trip cards according to their run number. The outgoing register statements were then checked against the incoming statements on the register cards of the previous day to see if the readings recorded by the conductors were correct.

(9) In the meantime the ticket boys (who counted the contents of the envelopes) checked the different fares (transfers, half-fares and passes) indicated by each conductor on the outside of his envelopes against the fares as entered on each trip card. As the envelopes and trip cards from each line were checked, the trip cards were handed to the register clerks who had that particular line. Each ticket counter then proceeded to count his tickets and check

the contents against the number of different fares indicated on the outside of each envelope. If any discrepancies were found, an actual inventory was made on the envelopes which were handed to the register clerk, who made a note of said differences on each conductor's trip card.

(10) As the contents of the envelopes and bags were being verified, each register clerk took the register cards and checked the various statements of the conductors against the readings made by each conductor on his trip card to ascertain if all of the operations of each car were accounted for.

(11) After all of the register cards were checked against the trip cards and additions and subtractions verified, the deposit slips received from the treasurer's office from time to time were next checked against the total cash and adult tickets as indicated on the trip cards to find out if each conductor had remitted for all of the five-cent fares collected. As fast as one line was completed, or the trip cards were checked in their entirety, they were entered on their respective statements of passenger receipts (Form "C") in run order, and the conductor's name and the results of the day's operation, together with all shorts and overs, were entered in their proper columns. The entire returns from the treasurer's office were not received until about 3 o'clock in the afternoon.

(12) Before recapitulating the receipts for each line, the register clerks made out an original and two carbons of over and short report, stating the nature of each difference. Two of these were sent to the treasurer's office to the over and short clerk, who in turn sent one copy with an over or short envelope made out for each conductor, to a clerk at each station to collect or pay, and return. The shortages, when collected, were placed in the short envelopes; the overs, when paid, were taken on the over envelopes and returned every morning.

THE RECEIVER SYSTEM

Each receiver should be conveniently located and afforded proper protection. Therefore, the station is considered the most accessible and suitable place for the reason that the conductors turn in their cars there, and because they generally reside near the station. Another reason is that the receiver can be better protected in case an attempt is made to hold him up, as an alarm can quickly bring the men working in and around the station to his assistance.

Our receivers are protected by iron cages, in which are located one or two foot push buttons which ring a gong in the shed. It is their duty to test these signals at six o'clock every night, same being answered by one of the men.

The "Receiver System" is practically the same as described in paragraphs one (1) to three (3) inclusive, of the "Bag System" in setting forth the operations of the conductors and register takers, except the following changes which were found necessary:

Instead of conductors depositing their money and adult tickets in safes and trip cards in boxes, they are required to present them to the receiver. This is done so the receiver can determine whether he has received the full number of five-cent fares.

Instead of the clerks in the auditor's office making out the statements of passenger receipts as to 5-cent fares, each receiver makes his own statement, so that he can kept an account and check off each conductor as he turns in.

Each receiver upon commencing his work is provided with a run sheet by the foreman. On the statements of passenger receipts for each line, he fills in the run number in numerical order, afterwards writing in the name of each conductor opposite his run.

When a conductor presents his money and trip card the receiver counts the money and adult tickets in his presence, checks and verifies the subtractions and additions of the 5-cent fare register, indicates the amount of each received on the trip card, and signs his initials thereto and deposits it in its proper place.

From time to time, as opportunity presents, results of each trip card are entered (so far as the five-cent register fares are concerned) upon their respective statements of passenger receipts

ST. LOUIS TRANSIT CO. DATE 190

TRANSFERS.				REMARKS.
	Number Commencing	Number Ending.	Number Used	
TOTAL No. USED.				
Punched and not issued.				
TOTAL ISSUED.				
CHILDREN TICKETS.				
Book No.	No. of the Stub Ticket, Starting Out.	No. of the Stub Ticket, Turning In.	Number Used.	
TOTAL USED.				

FORM A (BACK)

ST. LOUIS TRANSIT COMPANY. STATEMENT OF CAR RECEIPTS.

No. LINE. 190

RUN No.	CONDUCTORS NAME	Initial	TOTAL CASH	5c FARE REGISTER	5c Cash Fares	Adult Tickets	Short	Over	Balance of Shortage	Other Fare Register	Child Tickets	Trains	Transfers	Short	Balance of Shortage

Shorts
Overs
Cash Receipts

5c Fare Cash Tickets
Child Tickets @ 2½c.
Total Revenue Passengers
Trains
Transfers
Total Passengers

Tickets Received Local
Actual Car Receipts

FORM C

opposite the indicated run number and name of conductor, the total cash, total five-cent fare register (as indicated on trip card), 5-cent cash fares and adult tickets.

Each receiver is supposed to keep posted about when the conductors turn in their runs, and if they are not in promptly he immediately makes out three notices (original and two carbons), sending one to the night foreman and one to the treasurer's office along with his cash.

When all of the conductors have reported a total is made of the cash—five-cent fares and adult tickets—on each of the respective statements of passenger receipts.

Two receiver's remittance blanks (Form "D") and a bank deposit slip are then made out. On the two receiver's remittance blanks (made out in duplicate for auditor and treasurer) he recapitulates the total of each line at the bottom by entering opposite their respective line numbers, the total cash and adult tickets from each line. These added together give the total amount of money and adult tickets he should have.

The money, separated into different denominations, is counted. Totals of each denomination are then entered on the two receiver's remittance blanks and bank deposit slip opposite their respective class, and when totalized should agree with the grand total of the different lines. The adult tickets are next counted to see if they agree with the grand total of the different lines and then entered on the two receivers' remittance blanks in a space provided, after which they are placed in an envelope marked with receiver's name and number of tickets.

The money, together with envelopes containing adult tickets, receiver's remittance blank (for treasurer) and bank deposit slip, is placed in a metallic box (locked with a Yale lock) marked with the number of that particular station, then placed in a safe and locked up.

The statements of passenger receipts, fastened together with receiver's remittance blank (for auditor) and trip cards, are placed in a drawer. These, as well as the envelopes and register cards, are collected every morning by a collector from the auditor's office.

Three sets of metallic boxes (marked with station number) are kept to supply each receiver. There are two keys to each box, one held by the receiver, the other in the custody of the assistant to the treasurer. The combination to the safes is known only to the receivers, relief receiver and collectors.

Three cars are now used to make the rounds every morning to collect the money boxes. Each car, operated by a motorman and conductor, is accompanied by a guard and clerk from the treasurer's office. The boxes are taken out of the safes and brought to the general office (which is centrally located and a convenient place to have the three cars meet), where they are collected by two cars and transferred to the special money car.

The assistant to the treasurer boards this car, unlocks each box, checks the receiver's remittance blank and deposit slip against the total on the packages of paper and bags of silver, leaving each receiver's bank deposit slip in its respective box, only taking the receiver's remittance blank with him. The adult tickets are taken

from each box and sent to the auditor's office, receiving receipt therefor. He then selects the boxes to go to a certain bank and makes out a regular bank deposit slip specifying thereon the number of each box and setting opposite total amount in said box. These amounts added together show the total deposit for that particular bank.

The money is then taken to the bank by the assistant to the treasurer, two guards, conductor and motorman. The boxes are passed into the receiving teller, who checks the total on the packages of paper and bags of silver against the receiver's bank deposit slip, likewise checking the total of each station box against the deposit slip made out by the assistant to the treasurer.

All shortages in money and adult tickets are charged against the receiver.

All persons handling money are bonded in surety companies.

The company carries hold-up insurance.

The actual passenger earnings are deposited each day, a separate deposit being made for miscellaneous cash received from any other source.

The work in the auditor's office is practically the same as that described in paragraphs 8, 9, 10, 11 and 12 of the "bag system," except the following:

Instead of checking the conductor's deposit slips, which formerly came through the treasurer's office, against the trip cards, the report of the receiver, now on the trip cards, is checked against the five-cent register fares on the statements of passenger receipts; besides, the other preliminary changes previously mentioned.

ADVANTAGES AND DISADVANTAGES OF THE BAG SYSTEM

When the "bag system" was in use, we operated cars, during the greater portion of the time, from nineteen stations over twenty-eight routes. Five of the stations were very small, and the clerical work was done by the foremen. Five money counters were employed in the treasurer's office and twelve register clerks were engaged in the auditor's office in checking registers and conductor's cash remittances. To have adopted the "receiver system" under the above conditions would have required nineteen night and nineteen day receivers. Allowing that the assistants to the foremen could have done the day receiving, and that a portion of the work in the auditor's office could have been done by the receivers, it would have necessitated the employment of at least twelve additional clerks, which would have been an additional running expense. Besides, cages and receiver's equipment would had to have been installed in nineteen stations. The advantages to be obtained by the institution of the "receiver system" under these conditions, we did not believe would justify the outlay. Economy in operation is a single advantage the "bag system" possesses over the "receiver system," under the above or like conditions.

The disadvantages we experienced were as follows:

(1) Numerous errors and shortages occurred daily, classified and proportioned as follows:

First. Errors in register readings, 15 per cent.

Second. Errors in calculations, 15 per cent.

Third. (*a*) Failure to deposit money bags and half-trip envelopes.

(*b*) Errors in contents of bags and half-trip envelopes.

In disputes arising over errors of the first and second class, we were always able satisfactorily to show to the conductors that they were responsible for the discrepancies.

When disputes arose from the third class, we were unable to produce any convincing evidence whatsoever. Conductors would claim that they deposited money bags when they had not done so; and contend they had turned in one amount while we claimed they had turned in another amount. According to their way of putting it, the office clerks made all the mistakes. The utmost care was exercised in handling the bags and counting the contents; every courtesy was shown the conductors who called to investigate errors; nevertheless, the greater proportion of the conductors who were compelled to pay shortages of the third class firmly believed they had been treated unfairly, which we believed had a tendency to make conductors dishonest, because they desired to get even with the company. Up to the time of the consolidation, the constituent companies of the Transit Company had not experienced any serious dissatisfaction, but a short time thereafter, and especially during our labor trouble, the dissatisfaction among the conductors became very great. I attribute this principally to the fact that the offices of the constituent companies were consolidated into one general office which required most of the conductors to go a great distance (from some stations, consuming as much as two hours), in order to investigate their errors; also, a desire to find fault with everything in general.

(2) It took about twenty-four (24) hours after conductors were supposed to have made their returns before a failure to do so was detected. This enabled the conductors to borrow the company's money for a few days, which was especially evidenced just before pay day.

(3) The loss of two days' collections was possible.

(4) Deposit in bank was delayed two days.

(5) The work in the auditor's office was delayed by having to wait for returns from the treasurer's office.

(6) The general office had to be kept open on Sunday and holidays until 2 p. m. in order to count and check remittances. If this had not been done, conductors would have had a good opportunity to purloin two or three days' collections.

ADVANTAGES AND DISADVANTAGES OF THE RECEIVER SYSTEM

When the "receiver system" was adopted the stations were reduced to eight. This required ten receivers; one each at seven stations, two at one station, and a relief man to relieve the nine men once in ten days. Under the above condition and arrangement we found the running expenses no greater than under the "bag system."

The results we experienced, enumerated in order of their importance, were as follows:

(1) Reduction in number of charges for errors about sixty (60) per cent., and about ninety (90) per cent., in the value of same. This reduction was caused by the money being counted in the presence of the conductors and any errors as to amount (foreign or counterfeit money) being corrected instantly, as conductors are required to account for the amount as shown on trip cards, therefore making it impossible (except by doctoring trip cards) to borrow the company's money. The number of charges under the "bag system" was reduced as follows:

First. Errors in register readings, none.

Second. Errors in calculations, 10 per cent.

Third. (*a*) Failure to deposit money bags and half-trip envelopes.

(*b*) Errors in contents of bags and half-trip envelopes.

This reduced the work neeessary to keep account of charges.

Much satisfaction has been experienced in the reduetion in charges of the third class, as it removed the dissatisfaction among the eonductors, and confusion in office force, growing out of the futile attempts to substantiate our claims for shortages; also, reduced losses from dishonesty of conductors by removing the incentive "to get even" for imaginary wrongs.

Receiver's Remittance.

STATION NO. _____ DATE _____

	Dollars	Cts.	
Currency—Large Bills			
do Ones and Twos			
Gold			
Dollars			
Halves			
Quarters			
Dimes			
Nickels			
Coppers			
Canadian Dimes			
Total Cash			
Adult Tickets			

Line	A. T.		Dollars	Cts.	
Total					

_____ Receiver.

FORM D

(2) Failure of eonductors to make remittances for cash collections at the proper time and for the correct amount can be detected quieker.

(3) Opportunity for purloining receipts reduced to one day's collections.

(4) Money can be deposited in bank one day earlier, thereby saving interest on one day's earnings.

(5) Facilitates work in the auditor's office, as no delay is caused by waiting for returns from treasurer's office; also, receipts for the day can be ascertained earlier the following morning without having to do the unnecessary work of recapitulating trip cards on adding machine to ascertain same.

(6) The general office ean be closed on Sundays and occasionally on holidays.

(7) A better system and uniform hours can be established in the offices.

Final—The local conditions in some cases would have to be the determining factor as to the advantages of either system, but matters of accounting should be less susceptible to the influence of local conditions than matters of operation and construction.

The choice would also rest upon the consideration of accuracy in accounting and economy in operation.

However, it will be conceded, I think, by all that the ideal

method of having conductors make returns, is to have them settle in person with the company's agents.

"TYPE-M" CONTROL

BY W. O. MUNDY, M. M., ST. LOUIS TRANSIT CO., ST. LOUIS, MO.

In view of the fact that we should be very careful not to allow our association to be in any way an advertising medium for the manufacturer, I had intended making this paper somewhat broader than indicated by the title, or, in other words, to cover the subject of "Train Control."

There are but three recognized systems of control in use in this country, namely, the Sprague pilot motor control, used on the South Side Chicago, Boston Elevated and Brooklyn Elevated; the Westinghouse electropneumatic control, used on the Brooklyn Elevated and several small installations, and the General Electric "type-M" control, used by the Manhattan Elevated, and adopted by the Interborough, both of New York, the Chicago-Aurora & Wheaton, and a large number of others.

Taking these three in order, I find that the Sprague Company has been absorbed by the General Electric Company, and is no longer pushing the pilot motor control; and, in fact, the Sprague Company, before said consolidation, had proposed and was advocating a scheme somewhat similar to the contactor system. Thus we can safely drop the pilot motor control from our discussion, considering it as not being up to date.

Referring next to the Westinghouse electropneumatic drum control used in Brooklyn, we find that the manufacturers are no longer advocating same, but have recently come upon the market with their so-called turret controller. However, upon investigation, I find that they are not ready to give to the public details of the system, and we are, therefore, compelled to drop it from our considerations to-day. This, unfortunately, places us so that the only remaining system for discussion is the "type-M" control of the General Electric Company.

It is safe to say that in no part of the electrical equipments of our cars are the effects of the different conditions imposed upon us by the constantly heavier and faster cars we are putting into service more markedly shown than in the operation of the controllers themselves. Apparatus that was almost ideal when used with motors of comparatively small power has been both enlarged and strengthened to meet the more severe conditions, and yet, with the very best of construction has failed to be entirely satisfactory; consequently, the majority of us are looking for something better. Whether or not we will be able to find it is as yet problematical, and the future alone can tell.

Undoubtedly, the principal causes of our troubles are that the necessarily heavier working parts of the controllers must move more slowly, and the arc is, therefore, longer in being broken. That, combined with the greater amount of metal vapor caused by the larger currents, makes the arc the harder to break, even if the voltage is no higher, and in the majority of cases we are compelled to use higher voltages in order to give the proper service.

These three causes combine to make the problem a most serious one to meet, and is, without doubt, the reason that while the Sprague controllers were very successful in Chicago when used with 80-hp motors, they were not nearly so satisfactory when used in Brooklyn and Boston with 160-hp motors; hence the newer electric switch control proposed by the Sprague Company before its absorption.

Although having no definite information on the subject, it is probably safe to say that these same reasons were of prime importance in causing the change of front of the Westinghouse Company, as, without knowing positively, I think that the turret controller is a segregated piece of apparatus having small working parts that act somewhat independently.

As most of you are probably aware, the "type-M" control consists of a number of electrically-operated switches or contactors that make the motor current connections, the contactors being controlled in turn by a small master controller operated by the motorman. The only current passing through the master controller is that small amount necessary to operate the contactors, and as the contactors on every car are connected in the same kind of groups, and these groups in multiple, the operation becomes the same whether one or more cars are connected together, the only difference being that the master controller in use must handle an additional small amount of current for each car attached to the train. But the operation of the motors themselves is identical and simultaneous from necessity, no matter in what part of the train they may be.

This apparatus has been so well described in the excellent articles that have appeared in our technical journals that I shall not go further into details at present, but will be glad to give further information, if it is desired, when we come to the discussion of the paper.

While developed particularly to meet the conditions of train control, the use of the "type-M" apparatus has created for itself many uses, and has demonstrated a number of almost self-evident facts that were not fully appreciated before.

The almost absolute necessity of increasing the rapidity of the movement of the contact-making and braking devices as much as possible, especially when handling heavy currents at high voltage, is one of these facts, and it is undoubtedly due to the use of a working member weighing not over 5 lbs. together with a large excess of power, that the contactors are such a success.

The apparent greater capacity per inch width of contact and much longer life of same is readily traceable to this cause, combined with the better type of blow-out possible when used for one arc each. Why these differences should exist is apparent when it is considered that drum controller cylinders, to do the same work, must weigh not pounds, but hundreds of pounds each, and the gap between the arc blowing poles must be much greater and the field more indirect.

From experiments made to determine the rapidity of movement it was found that the average contactor requires less than 1-50 of a a second to attain its widest gap from the instant the contacts first take part in breaking the circuit, and accordingly, only a small amount of metal vapor is formed; hence, the small amount of arc developed.

The "type-M" control is of necessity more complicated than an ordinary series-parallel controller, but there are some advantages that will give it a field outside of train use; for instance, as nearly all the weight can be placed under the car body, the platforms have much less to carry, besides making more room for passengers. Again, as the motorman has a much smaller handle to operate and there is so much less work to do, he should do it more carefully, but whether he will is quite another question.

The case of handling has caused quite a few electric locomotives to be equipped with this apparatus, although they will in all probability never be connected so as to use the train system feature.

Of course, as the system readily lends itself to distance control, new uses will continually develop, such as hoists, cranes, rolling mills, printing presses, etc. But these are aside from the question and do not particularly interest us, as they have almost nothing to do with our lines of work.

THE USE AND ABUSE OF CONTROLLING MECHANISM.

BY D. F. CARVER, CHIEF ENGINEER, PUBLIC SERVICE CORPORATION OF NEW JERSEY, JERSEY CITY, N. J.

This paper presupposes that the driving and controlling machinery of the rolling equipment has been bought and installed in a manner best adapted to meet the special conditions of service which vary on many of our roads, subject to local conditions of grade and alignment, operating management, stops and starts to be made, vehicle traffic to be avoided, acceleration desired, and laws and restrictions imposed by the community through the municipal government. With the machinery at hand properly designed to work under the conditions imposed, it is not a difficult matter nor an expensive one to keep the controlling mechanism in first-class condition and prevent it from depreciating in earning value to its owners at a faster rate than has been caused in the past by the progression in the art of design and construction of operating machinery. It now seems probable that the present type of magnetic blow-out controller for city cars has come to stay, and that the future changes in it will be only in detail and not radical.

Therefore, it is a good investment to spend necessary money in maintaining these controllers and keep their depreciation through wear and tear as small as possible, and it is good railroading to watch them and care for them and protect them from the abuse which they too often get from inexperienced and untrained handling while being in use on the road.

The secret of successful mechanical management is watchfulness, care, systematic inspection. It is not often that machinery breaks down as the Deacon's One-Horse Chaise. It gives indications and warnings beforehand that something about it is not doing the right thing. Our difficulties are to provide methods to watch the operations of our mechanism, so that the first indications of internal trouble may be made known; after that there must be provided the experienced inspector who is trained to know what causes the peculiarities he discovers, and he must know how to remove the cause of trouble. Several times every day, while the cars are at once off the suburban terminals, the controller cases should be opened and the whole interior mechanism given a hasty cleaning and a little lubrication of the contact

fingers with a good quality of refined lubricant, vaseline being one of the best, though somewhat expensive.

There is a tendency on some well-managed roads to have only two points on the controller, viz., on and off—the various graduations of resistances being largely a matter of form. This method gets the cars over the road and pleases passengers who like a jolt now and then, but it is exceedingly hard on the motor equipment, and runs its cost of maintenance into large proportions.

There are some methods provided to limit the rate of turn of the controller handle in going towards the loop and in the larger equipments the rate of application is automatic and not under the control of the motorman. In city traffic, where cars and vehicles have to go over the same ground and where the vehicle has, by common consent, the right of way, it is not good practice to limit very much the rate of travel of the controller handle, because the men will find they cannot make ordinary slow-downs for the vehicle traffic with a controller slow of application and cover the ground on schedule time, so they resort to the much worse evil of only operating the controller in case of a last resort and using the brake to hold down the speed, making the motors work against the load on cars, as well as the brake. This is especially easy to do with power brakes—except the electric—and is a violation of rules which is very hard to detect.

A somewhat common form of abuse for which no one in the service can be held directly responsible is due to the fact that, on many of the roads, there are now running small equipments which were designed to haul small cars and small loads. The great growth of traffic which has come so rapidly on the trolley systems was not anticipated ten years ago, so many of us are in the position of having a large number of equipments partly worn out, which are always overloaded by any loads they now have to carry; consequently, they are running on our roads mixed with motor equipments of recent design and ample strength, and the poor old inadequate equipment must be driven along out of the way of the new and fast cars, and it usually gets all the abuse of heavy loads, fast schedule and frequent stops; without any friends, it runs along somehow, because it was so well built that it takes its own time about failing.

THE WESTINGHOUSE TURRET SYSTEM OF ELECTRO-PNEUMATIC CONTROL

One of the exhibits which attracted a great deal of interest at the Saratoga Convention was the new pneumatic system of multiple unit control recently brought out by the Westinghouse Air Brake Company, and known as the "Turret System." Several references have been made to this system in recent issues of this paper, but no details have been published. For this reason the exhibition of the complete system at the Saratoga Convention attracted great attention.

Briefly described, the connections are made by a series of "unit switches," or contactors, grouped in a circular case, or "turret," underneath the car, the movement of the individual switches or contactors being secured by air power, controlled by magnets from a battery circuit through a master controller.

As the actuating mechanism is not directly connected to the main source of electrical energy, the connections for the low voltage control circuits are the only ones which have to be established between the cars of the circuits, no air connections being required outside of the ordinary brake hose. Seven wires only are required in the train line battery cable. Another advantage claimed for the use of the separate electrical circuit is that the controlling apparatus can be worked while the main current is cut-off. This makes the control independent of any momentary interruption of the current from the blowing of a fuse, etc.

The master controller, which is carried on the platform or in the motorman's cab, is a small piece of apparatus, and weighs, complete, only 16 lbs. It contains a separate reverser handle, which is interlocking. The master controller handle is capable of four positions, viz.: (1) Closes circuit breaker, (2) motors in series with all resistances, (3) motors in straight series, and (4) motors in parallel. The battery circuit used with this controller is of 14 volts only.

The main controller, i. e., the one carried under the car, is made up of thirteen unit switches, or contactors, arranged radially around an air cylinder, with one blow-out coil in the center for the entire number of switches. Each unit switch, as stated, is operated by compressed air, working against spring pressure, the air valves being controlled by solenoids, operated by the battery current.

The acceleration is regulated by a limit switch, which is a shunt across the No. 2 motor field. The reverse switch and circuit breaker are interlocked, so that the former can not be thrown when the circuit breaker is closed. The reverse and circuit breaker are operated pneumatically. The weights of the different parts for a long double-truck car, similar to those used on the New York subway, would be, approximately, as follows: Main controller, 695 lbs.; reverse switch, 118 lbs.; resistances, 490 lbs.: two master controllers, 32 lbs. Fuller details of the system will appear in an early issue.

EXHIBITS AT SARATOGA

The display by manufacturers and supply men at Saratoga last week was exceptionally interesting, and was much larger than had been anticipated. The Grand Union Court, the hotel veranda and the cottages were occupied by exhibitors. Owing to the necessity of providing covered temporary booths for the displays that were assigned space in the court, there was some delay in getting everything in readiness. No extended description of these exhibits will be attempted this week, but they will be fully discussed, and illustrated in the next issue.

WABASH SPECIAL

The Wabash Special, carrying a large number of Western members of the three associations, left Chicago at 5:20 p. m. Aug. 31, with five Pullmans, a dining car and a baggage car. At Detroit two extra Pullman cars were attached—one from Detroit and the other from St. Louis. About ninety persons were on this train.

N. C. Keeran was in charge of this special train, and did all that was possible for the comfort of the travelers.

KUHN-LOEB HOLDINGS IN METROPOLITAN SECURITIES COMPANY SOLD

On Saturday, Aug. 29, the announcement was made that Thomas F. Ryan and his associates had purchased the holdings of Kuhn, Loeb & Company in the Metropolitan Securities Company, of New York, which holds the stock and bonds of the Interurban Street Railway Company, which in turn operates under lease the Metropolitan Street Railway Company. The stock held by Kuhn, Loeb & Company, the underwriters of the company, amounted to $6,600,000. The Herald and The Times say the purchase presages a gigantic deal in tractions in New York, but the Wall Street Journal says: "There is no reason to suppose that anything more is involved than a transfer of these holdings to the Whitney-Ryan interests already so largely identified with the company." Kuhn, Loeb & Company say they sold because the details of the management of the properties and the practical operation of the roads required more time than they found practicable to give to the work.

CHICAGO & MILWAUKEE ELECTRIC RAILROAD OPENS BRANCH

The Chicago & Milwaukee Electric Railroad Company, which operates an interurban line along the lake shore north of Chicago from Evanston to Waukegan, celebrated the opening of its 6-mile branch from Lake Bluff to Libertyville on Saturday, Aug. 29. Over 100 guests of the road were taken by special car to the large new depot and sub-station at Libertyville, where lunch was served. President A. C. Frost included in his invitations officers and citizens of the suburban towns along the road and a few railroad men. The new Libertyville branch, besides being a passenger road, will also give certain steam railroads an entrance to the manufacturing town of Waukegan. It is intended to extend the Libertyville line to the Northern Illinois lakes, and possibly to connect with the Rockford & Belvidere line.

During the course of some after-luncheon speeches E. C. Noe, general superintendent of the Northwestern Elevated Railroad, announced that negotiations were under way which were likely soon to result in the operation of the Northwestern Elevated trains from their present Wilson Avenue terminus to Evanston, over the Chicago, Milwaukee & St. Paul Railroad tracks on the surface, thus giving both Evanston people and those living along the Chicago & Milwaukee Electric Railroad much improved transportation facilities to Chicago. A number of other important improvements are being made by the Chicago & Milwaukee Electric Railroad, and during the celebration speeches President Frost received many compliments for his enterprise in improving this property.

MR. WESTINGHOUSE ON THIRD-RAIL DANGERS.

Mr. George Westinghouse contributes a long letter to the New York Times of Sept. 1 on the dangers of third-rail electric roads and the proper methods of guarding against them. The letter will undoubtedly attract a great deal of attention, and for this reason is published in full:

Erskine Park, Lenox, Mass., Aug. 29, 1903.

To the Editor of The New York Times:

The public as well as those financially interested in the development of electric traction should feel indebted to The Times for its thoughtful editorial articles on the recent Paris underground electric railway accident, in which it makes doubly clear by quoting Mr. Yerkes that combustible materials should be avoided, particularly in train construction and in station work of underground and elevated railways.

I agree with The Times that the lessons to be drawn from this accident are important, and believe they will lead to the adoption of apparatus and methods which ought to make an electrically propelled train as safe as one drawn by a steam locomotive, and thus insure a realization of the great advantages of electrically-driven trains.

The supreme importance of the subject prompts me again to urge such a revision in the heretofore accepted plans as will insure safety to passengers and employees, as well as the avoidance of ultimate great losses to companies operating electric railways.

It will be recalled that, following the collision between steam-propelled trains in New York City in the Fourth Avenue tunnel on the New York Central Railroad in January, 1902, involving great loss of life due to escaping steam, there was an exciting discussion of the event, with a widespread expression of a belief that had such trains been operated by electricity there would have been no loss of life; and for days almost the entire press of New York devoted columns to the subject and urged prompt legislation which would compel the New York Central Railroad Company to use electricity instead of steam for the operation of its trains within the city tunnels.

Having had a long experience in matters pertaining to the safe working of railway trains, and having acquired a very considerable knowledge of the power and pecularities of electricity, I believed I might do a public service by drawing attention through the press to the elementary fact that the electric operation of trains could not lesson some of the risks, but might, on the contrary, add new ones of a serious character, and I therefore wrote a letter which you published in your columns at the time, and which has recently been extensively republished.

That letter was criticised favorably by some, but was belittled and denounced by interested parties as calculated to impede the introduction of electricity for traction purposes.

Since then, as a result of that discussion, there have undoubtedly been great improvements demanded and made in the character of electrical apparatus for railway use; but, as often happens, it has required an awful experience to bring home to those charged with the responsibility of guarding against railway accidents the fact that there is no margin for use in tunnels of combustible material in proximity to a heavily charged electric conductor.

The recent injury to a number of workmen engaged upon the elevated railway is only another illustration of the need for a revision of the plans which have heretofore prevailed and which have evidently been regarded by many railway officials as reasonably safe.

The realization of the great cost of such an accident as the recent one in Paris, regardless of the horror of it, will undoubtedly cause the plans already decided upon to be most carefully reviewed, and should bring to the officials of the companies interested the highest skill in determining the requirements, the compliance with which will render the carrying of passengers on trains operated by electricity as safe at least as if propelled by other means.

It seems almost axiomatic that the third rail should only be charged with electricity when required to operates a train; that there should never be more electric energy at any point of a third rail than sufficient to operate one train; that the electric machinery required upon a train should be reduced to a minimum, and should be so located as to be under the convenient supervision of the train attendants, and in all tunnel and elevated railroad work there should be no material to create fire or dense smoke.

The following requirements, among others, can easily be complied with, and are respectfully suggested for consideration and discussion:

1. Trains to be constructed of iron or steel, with the interior finish of incombustible materials.

2. The division of the third rail for the supply of electric current into suitable sections, each section being supplied with current only when required to propel a train.

3. The limitation, by suitable devices, of the amount of current supplied to each section so that in the event of a short circuit on the train the current will be automatically and instantaneously cut off at a point some distance from such section of the third rail.

4. Provision for the cutting off of the current from each supply section of the third rail at the will of the motorman.

5. No other live conductors than the third rail to be in close proximity to the line.

6. No wires carrying high voltages except upon motor cars, and motor cars only at the ends of a train.

The state of the electric art has so advanced that compliance with the foregoing requirements is simply a matter of additional expense incomparable, however, to the financial losses which the companies will suffer if they do not make the electric operation of their railways absolutely safe.

Believing the foregoing requirements can be complied with, I have read with amazement the opinions quoted in your Friday's issue under the heading "No Device to Stop Third-Rail Killings." I am sure Mr. Hedley must have been misquoted in regard to the possibility of collisions due to the temporary shutting off of the current from the third rail, for, as a matter of fact, the stopping of the trains on the elevated railway is not in the slightest degree affected by the temporary cessation of the current on the third rail.

It is true, however, that the system of train control in use upon the elevated road, and which has been ordered for the rapid transit trains, is so organized that its correct operation is dependent upon a constant supply of current to the third rail, and that, therefore, the division of the third rail into sections and the temporary supply of current only as needed, might, with the existing system of train control, be inoperative, but there are available well-tried train controls which are operative regardless of a temporary interruption in the supply of current.

It is well and sorrowfully recognized by our great railway engineers that early mistakes, due to inexperience, in the dimensions adopted for tunnels, gage of track, and in the method of coupling cars have established practices which cannot now be escaped from, because of the necessity for a uniform practice, in the points cited, on connecting railways.

The advantages to accrue from this necessity for uniformity in railway practice to that concern which can secure the adoption of its plans covered by patents has led to a commercial rivalry the influence of which for evil cannot well be appreciated.

This intense rivalry between the two great electric manufacturing companies of the country, each enjoying the same rights under numerous patents, has undoubtedly led to a great improvement in the electric art, but to that rivalry, where none should exist, can also be attributed much of the cause for the present alarm concerning the unsatisfactory method of electric operation of trains.

If, therefore, a frequently adopted practice be adhered to, viz., that having already expended a large sum for electric plant and equipment of a certain character, there must hereafter be used for extensions and upon connecting lines only such apparatus and methods as will fit in with the existing plans, however imperfect they may be, then there is small hope for a safe system of electric traction.

The most recent accident on the Paris underground railway, where passengers were frightened and jumped from the train, illustrates how necessary it is to so install electric apparatus that there can be no such alarming occurrences.

Being sure of my ground and of the necessity for public pressure in securing the desired reforms, and with a full belief that electric traction can be made safe, I am, respectfully yours.

GEORGE WESTINGHOUSE.

THE RICHMOND STRIKE ENDED.

The strike of the employees of the Richmond Passenger & Power Company, of Richmond, Va., has been formally declared off. The strike lasted just sixty-nine days, and is estimated to have cost the company $125,000; the strikers, in loss of wages, $50,000; the State, by reason of the necessity for troops to maintain order, $75,000; and the city, for special police, etc., $5,000. One man was shot and killed by soldiers during the trouble, and one motorman was fatally stabbed by another, while scores of persons were more or less seriously injured in various ways.

NEW PUBLICATIONS

Cram's Atlas. Published by George F. Cram, of New York and Chicago.

Cram's Business Atlas for 1903 is to be commended for the attention it has given to electric railways. Practically all of the longer and older interurban roads are included in the maps in this atlas, interurban lines being designated in a way which distinguishes them from steam railroads. In view of the fact that our prominent map makers have heretofore been rather lax as regards the showing of interurban lines, the efforts of this publisher along this line show a realization of the important part interurban roads are now taking in the transportation world.

The World's Commerce and American Industries. Published by the Philadelphia Commercial Museum, of Philadelphia, Pa. Price, 50 cents per copy.

This little volume was prepared by John J. Macfarlane, A. M., librarian of the Philadelphia Commercial Museum, and illustrates graphically by charts the progress and present condition of the commerce of the world, of the manufacturing industries of the United States, and of British and American shipping. In all there are eighty-six charts, and in addition there is an alphabetical list of the cities of the United States having an output of over $20,000,000 of manufactured goods according to the census of 1900, with the leading industries of each city. This graphic method shows more clearly than statistics alone would do, what proportion of the world's trade belongs to each of the principal nations, and the relative importance, from a manufacturing standpoint, of the leading cities of the United States.

STREET RAILWAY PATENTS

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

UNITED STATES PATENTS ISSUED AUG. 18, 1903

736,345. Electric Railway Signal; Henry A. Ammann and Albert D. Campbell, Spokane, Wash. App. filed Nov. 19, 1902. Relates to the details of construction of a circuit closer to be attached to the trolley wire and actuated by the passing trolley wheel.

736,350. Brake-Shoe; Thomas M. Bell, Philadelphia, Pa. App. filed Nov. 19, 1902. A brake-shoe having a reinforcing web of steel casting and an external portion indicating the safety limit to which the shoe may be worn.

736,539. Center Bearing; John E. Norwood, Baltimore, Md. App. filed Oct. 18, 1902. Details of construction of a center ball-bearing to be employed between the bodies and trucks of railway cars.

736,610. Trolley; Louis Lavagne and Louis Bertrand, Marseilles, France. App. filed Feb. 21, 1902. A guard to prevent the wheel from leaving the wire and adapted to tilt backward when an obstruction is encountered.

736,620.—Car Strap for Street Cars; Julio S. Navarro, Havana, Cuba. App. filed March 11, 1903. The main part of the strap is formed in the shape of a diamond and doubled around the supporting bar, the hand strap being pivoted between the two ends of the main strap.

736,641. Trolley; Thomas P. Seastrunk and James P. Archer, Dallas, Tex. App. filed Jan. 14, 1903. The trolley is permitted to swing or tilt in passing around curves.

736,721. Trolley; Edward Hall, Whitestone, N. Y. App. filed May 28, 1903. Details of a trolley wheel guard.

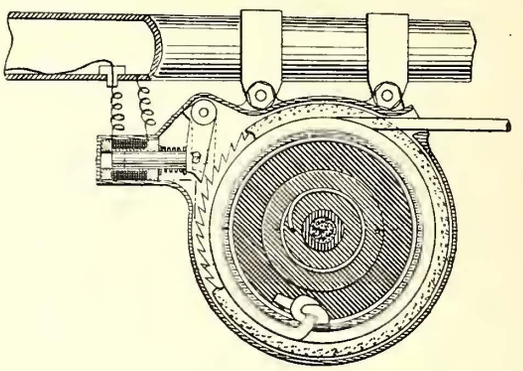
736,752. Electric Railway System; Timothy Mahoney, San Francisco, Cal. App. filed Feb. 7, 1903. In surface contact systems a circuit closer consisting of a hermatically sealed casing having a pivoted bar therein which is swung on its axis by a magnet carried by the car to close and open the circuit between the feeder and contact button or rail.

736,816. System of Train Control; Frank E. Case, Schenectady, N. Y. App. filed Feb. 28, 1898. Comprises a master controller provided with power, reversing and brake switch, motor controllers provided with power, reversing and brake switches and mechanism regulating the action of the motor controllers under the control of the master controller.

736,817. Electric Brake; Frank E. Case, Schenectady, N. Y. App. filed Dec. 17, 1898. In a system where the motors are used as generators to supply current for operating brake-shoes an auxiliary source of current is used to increase the current supplied to the shoes as the current generated by the motors decreases with the decrease of momentum.

736,861. Fare Register Operating Device; Buren B. Moad, Webb City, Mo. App. filed Oct. 28, 1902. Consists of a revoluble rod mounted in brackets adjacent to the register, which is so constructed and arranged as to obviate the necessity of running the ordinary operating cord at various angles at points adjacent to the register and which permits the use of an operating cord which extends in a straight line from one end of the car to the other.

736,897. Trolley Catch; Morris C. White and Otho C. Duryea, Los Angeles, Cal. App. filed July 5, 1902. Consists of a spring



PATENT NO. 736,897

drum, pawl and ratchet attached to the trolley pole, adapted to be tripped by an electromagnet in the trolley circuit, when the wheel leaves the wire, to lock the cord and prevent the trolley pole from rising.

736,914. Method of Operating Electric Brakes; Frank E. Case, Schenectady, N. Y. App. filed Dec. 17, 1898. This method is carried out in connection with the apparatus described in patent No. 736,817.

UNITED STATES PATENTS ISSUED AUG. 25, 1903

736,941. Convertible Car; Henry Covert, Waterford, N. Y. App. filed June 19, 1903. The car is provided with side openings, the lower portions of which are adapted to be closed by horizontally movable doors and the upper portions by vertically movable panels.

736,942. Trolley Base; Albert D. Crossley, South Norwalk, Conn. App. filed March 4, 1903. Relates to an arrangement of contact plates upon the pole base.

736,997. Brake; George E. Moffett, Jarilla, Territory of New Mexico. App. filed Jan. 31, 1903. A brake mechanism comprising a vertically-disposed rocker-arm, a draft rod connecting the rocker-arm with the brake mechanism, a toggle moving in a vertical plane and connected to the rocker-arm and means for actuating the toggle.

737,053. Electric Railway Signal; Henry A. Ammann and Albert D. Campbell, Spokane, Wash. App. filed March 9, 1903. A device for attachment to the trolley wire adapted to be actuated by the passing trolley wheel to close a signal circuit.

737,076. Automatic Car Fender and Sweeper; Charles P. Cathcart, Kansas City, Mo. App. filed March 30, 1903. A rotatable guard or brush normally held in an elevated position above the car track and disposed transversely thereto, is provided with means by which the guard may be lowered adjacent to the track and caused to rotate by a motor, and means by which the motor is controlled by the raising and lowering of the guard.

737,132. Four-Wheeled Truck for Tramway Cars, Railway Carriages, etc.; Andrew S. Nelson, Albert Stewart and Thomas J. Foster, Motherwell, Scotland. App. filed Dec. 27, 1902. Details of construction.

737,185. Railway Brake-Shoe; Bruce Willhide, Grafton, W. Va. App. filed Feb. 13, 1903. A brake-shoe so constructed that the suction created by the rotation of the wheel in connection with which the shoe is used is enabled to draw sand or dust through the shoe to the face thereof; also contemplates the provision in the face of the shoe of one or more chambers adapted to receive the air drawn in with the sand or dust.

737,265. Electric Brake; Frank C. Newell, Wilkinsburg, Pa. App. filed Dec. 31, 1902. An automatic reversing switch adapted to set up the proper combination of circuits for braking when the car is moving in either direction.

737,528. Car Fender; Herman Thiele, Milwaukee, Wis. App. filed Jan. 10, 1903. Details of an automatic fender.

PERSONAL MENTION

MR. A. H. METZELAAR, who has so efficiently filled the position of general manager of the Knell Air Brake Company, of Battle Creek, Mich., has severed his connection with that company.

MR. TOM L. JOHNSON, Mayor of Cleveland, municipal ownership advocate, single-taxer, and former street railway magnate, has been nominated by the Democrats for Governor of Ohio. It

has been unkindly said by some of his friends that Mr. Johnson has "Presidential aspirations."

MR. H. S. BEATTIE, formerly treasurer of the Metropolitan Street Railway, of New York, and at one time a Street Commissioner of New York, was seriously injured in a fall from a car of the Union Railway Company in Mt. Vernon, N. Y., on Aug. 29.

MR. WILLIAM F. BREIDENBACH has resigned as manager of contracting and installation departments of the Ohmer Fare Register Company, of Dayton, Ohio, and is now assistant manager of the N. Thomas Brewing Company, of Dayton, in which company Mr. Breidenbach is financially interested.

MR. CHARLES M. SHIPMAN, formerly general superintendent of the North Jersey Street Railway Company, was presented with a massive loving cup and $365 in gold by employees of the company, on Friday evening, Aug. 28. The gifts were given in appreciation of Mr. Shipman's kindness and fair dealing with the men while he was connected with the company.

MR. JOHN B. PARSONS, president of the Philadelphia Rapid Transit Company, of Philadelphia, Pa., returned from Europe Tuesday, Sept. 1, after an extensive tour of the continent. Mr. Parsons left Philadelphia June 19, last, and returned on the Kronprinz Wilhelm from Bremen. While in Europe he spent considerable time in Russia, visiting St. Petersburg and Warsaw, in Russian Poland. He also toured Germany, and made a visit to Vienna. Mr. Parsons was particularly impressed with the advancement made in Germany.

MR. W. T. VAN DORN, of Chicago, has just returned from a six weeks' European pleasure trip. He visited the electric underground road in Paris, on which the recent appalling accident occurred, and naturally was interested in the coupling methods. He criticises the practice there of coupling cars permanently together by bolts and chains in the shops, so that they cannot be uncoupled on the road. Had it been possible quickly to uncouple the burning car from the rest of the train, he thinks the accident would not have been as serious as it was.

MR. CHARLES E. DONNATIN, superintendent of the mechanical department of the Pacific Electric Railway Company, at Los Angeles, Cal., has resigned, and will devote his time hereafter to his private business, which has become extensive. For twenty-seven years Mr. Donnatin was master car repairer of the Southern Pacific Railroad, and left that position about eighteen months ago to accept service with Mr. H. E. Huntington in his street railway systems. Among many other business ventures, Mr. Donnatin is interested in the pneumatic trolley base recently adopted for use by the Pacific Electric Railway Company on the high-speed cars of its interurban lines.

MR. MAURICE FITZMAURICE, chief engineer of the London County Council, who came to this country for the express purpose of studying the New York Subway, returned to London on the Cunard liner Umbria, which sailed for Liverpool on Saturday, Aug. 29, after a short stay in the city. He was all over the work with Chief Engineer William Barclay Parsons, and had nothing but praise for the work. Mr. Fitzmaurice's work is entirely independent of the Royal Commission on London Locomotion, five or six members of which are coming to the United States within a month to make an exhaustive study of the transit facilities of the larger cities. The Blackwall tunnel under the Thames was built under the supervision of Mr. Fitzmaurice.

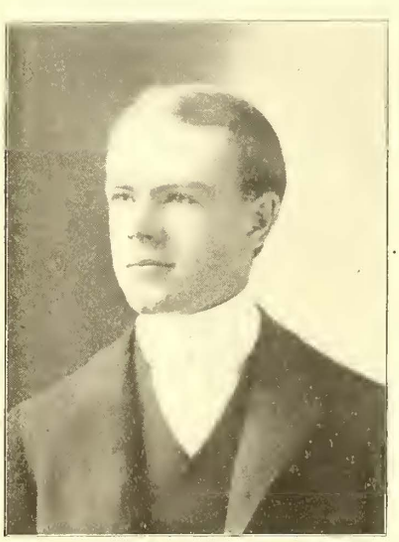
MR. J. D. HAWKS, of Detroit, is the subject of a complimentary biographical notice in "The Gateway" for August. An excellent portrait accompanies the article. Mr. Hawkes is president of the Detroit, Ypsilanti, Ann Arbor & Jackson Electric Railway, the Grand Rapids, Grand Haven & Muskegon Electric Railway, and the Lansing City Electric Railway Companies, and has taken a very prominent part in the development of electric interurban lines in Michigan. Mr. Hawks is a member of the American Society of Civil Engineers and of the Institution of Civil Engineers of Great Britain. He has been in the railway service since Feb. 1, 1870, and had an extended experience in all the departments of steam railway work before taking up the electrical service.

MR. BENJAMIN J. WEEKS has resigned his position as general superintendent of the Tacoma Railway & Power Company, of Tacoma, Wash., and has accepted that of manager of the Spokane Traction Company, of Spokane, Wash. He assumed the duties of his new position Aug. 20. Mr. Weeks is well and most favorably known in street railway circles, especially in New England, and has been connected with street railways for about twenty years, having worked up from the positions of driver and conductor on the old horse cars in Boston. He was later appointed superintendent of the Framingham Street Railway, of South Framingham, Mass., but upon the development of the electric system entered the employ of the Thomson-Houston Electric Company, at Lynn, Mass., as expert. From there he went to Newport, R. I., as superintendent of the Newport Street Railway, and then to Quincy, Mass., to take the position of superintendent of the Quincy & Boston Street Railway, Quincy, Mass. When Mr. Weeks commenced with that road it had only 7 miles of track, but during the years he acted as superintendent he saw the road grow to 56 miles. He resigned from the Quincy & Boston two years ago last February to accept the position of general superintendent of the Tacoma Railway & Power Company, which position he has held until the present time.

GENERAL FRANCISCO ALTSCHUL, late Minister a'Fomento of the Republic of Honduras, Central America, is in New York on business connected with Central American projects. Among other important matters he is looking up details and getting estimates and plans for the conversion of the present street railway of Puerto Cortez, the Atlantic seaport of Honduras, into an electric line. The road is about 5 miles long and extends from the city of Puerto Cortez to the village of Laguna. Senor Altschul says there are many fine opportunities all over Central America in populous and prosperous cities in Costa Rica and Nicaragua, as well as Honduras, to put in paying electric railway lines. Leon, Nicaragua, a large and prosperous town, is a particularly fine field.

MR. C. NESBITT DUFFY, secretary and auditor of the Chicago City Railway, has resigned from that company and has accepted the position of controller of the Interurban Street Railway Company of New York, a new position which has been created for him. Mr. Duffy expects to move to New York within a few weeks. Mr. Duffy is recognized as one of the ablest street railway accountants of the country, and the Interurban Street Railway Company is to be congratulated upon having secured his services. He is a native of St. Louis and entered the street railway business in 1886 as secretary and treasurer of the Union Railroad Company of that city. During the subsequent consolidations which followed the organization of the National Railway Company, Mr. Duffy continued his association with the companies as secretary and treasurer, but resigned about four years ago on the organization of the St. Louis Transit Company, to become auditor of the Chicago City Railway. The title and duties of secretary were later added to those of auditor, as were also those of assistant to the president. Mr. Duffy has been prominently identified with the Association of Street Railway Accountants since its organization and has done much to advance its standing and welfare. He was first vice-president of the association during the first year of its existence, and president during 1899-90, and has been a member of a number of the most important committees which have been appointed by the association on different subjects.

MR. FRANK WARREN EVERETT, recently one of the engineers of Wendell & MacDuffie, died on June 28, at North Creek, N. Y. Mr. Everett graduated from the Massachusetts Institute of Technology in the class of 1897, where he afterward took a post-graduate course. Some time after leaving this institute Mr. Everett was with the Union Iron Works, of San Francisco, leaving there to go into partnership with Frederick C. Field, in the firm of Field & Everett, consulting engineers of New York city. In the fall of 1899, Mr. Everett associated himself with Wendell & MacDuffie, of New York, and while with this firm undertook and brought to completion the installation of the Gamewell Fire Alarm and Police Telegraph System, in the city of Havana. The work in Havana occupied the best part of a year, during which time Mr. Everett applied himself so closely to his work that his health failed, and on the day his work was accepted by the Havana authorities, he was obliged to leave Cuba, returning to this country in the hope of regaining his health and strength. Mr. Everett was married in the fall of 1900 to Miss Julia Kimball, and leaves a widow and one son. Mr. Everett's manliness, ability and integrity made him hosts of friends wherever he went, who greatly deplore his untimely death.



FRANK WARREN EVERETT

NEWS OF THE WEEK

CONSTRUCTION NOTES

COLLEGE HILL, ARK.—The College Hill Light & Traction Company has been chartered, with $195,000 capital; E. K. Smith, president; J. D. Sanderson, vice-president; E. J. Spencer, secretary; J. L. Chatfield, treasurer, and F. W. Offenhauser, assistant secretary.

EUREKA, CAL.—The Humboldt Transit Company began work here Aug. 3 on the construction of 10 miles of line. The company is doing its own construction work, but the National Construction Company is doing the overhead work. Power will be secured from the Eureka Power Company. During 1904 and 1905 the company plans to build 27 miles of interurban line. The officers of the company are: J. C. Bull, Jr., president; George Henderson, vice-president; Charles P. Cullen, secretary; Bank of Eureka, treasurer; George Henderson, manager; F. Herrick, manager.

LOS ANGELES, CAL.—The Pacific Electric Railway is preparing specifications for a new type of car to be used on its interurban lines, with which it is to make a speed of 60 miles an hour. The cars will be 60 ft. long and weigh 93,000 pounds. Each car will be equipped with four 150-hp motors. Fittings similar to those used in steam railway coaches and separate smoking compartments will be provided. Each car will have a carrying capacity of seventy-two passengers. An order for fifteen or twenty of these cars will be placed soon, according to announcement made at the offices of the company. They will be used on the projected line to Riverside, a distance of 60 miles, which it is proposed to cover in an hour, and also on the other interurban lines of the company.

OAKLAND, CAL.—The Street Railroad Committee of the City Council has favorably recommended a petition of the Oakland & East Side Railroad Company for a franchise in connection with the Emeryville terminal. The hearing was recommended for Tuesday, Sept. 8.

PETALUMA, CAL.—Bids will be received up to 7 o'clock p. m. Sept. 8 for a franchise to operate an electric railway on certain streets and highways within Petaluma as applied for by Burke Corbett.

SAN JOSE, CAL.—The San Jose-Los Gatos Interurban Electric Railway has secured a franchise for a city terminal here.

SANTA ROSA, CAL.—The Board of Supervisors of Sonoma County has sold an electric franchise over the county roads leading from Petaluma to Sebastopol and then through Green Valley to Forestville. The price obtained was $100, this being the highest bid received for the franchise offered for sale. It was sold to Burke Corbett. The franchise goes into effect in fifteen days, and within four months from that time the construction of the electric line must commence. The Board exacted a bond of $1,000 from the successful bidder.

NEW LONDON, CONN.—The incorporators of the Groton & Stonington Street Railway Company have voted to accept the charter recently granted by the General Assembly. The capital stock of the company is fixed at $600,000, and the proposed road will run from New London through Groton, Mystic and Stonington to the Rhode Island boundary at Westerly. The company will organize soon.

WILLIMANTIC, CONN.—The Willimantic Traction Company has placed in operation its line between here and Baltic, where connections are made with the lines of the Norwich Street Railway Company, thus completing a line between Willimantic, Baltic and Norwich. Willimantic, in the center of the State and on the Air Line of the New York, New Haven & Hartford Railroad, is a city of only 10,000 inhabitants, but the territory contiguous to it is thickly, but it cannot be said densely, populated. Located at Willimantic are several mills, which employ thousands of operatives, who are drawn in many cases from the territory through which the new road operates. South Windham, where the power house is located, is a beautiful little village whose residents are for the most part well to do and who have long desired trolley facilities. The new road will eventually form an important link in a through line from Harttord to Norwich.

DENVER, COL.—The engineers of the Denver, Northwestern & Pacific Railway, known as the Moffat Short Line, now building between Denver and Salt Lake City, have under consideration the use of electric locomotives for hauling the trains through the 2-mile tunnel that is to be bored through James Peak. Electric locomotives similar to those in use on the Baltimore & Ohio tunnel will probably be employed.

APALACHICOLA, FLA.—The Apalachicola Street Railway Company has been granted a franchise by the City Council to build a street railway on Market, Live Oak, St. Vincent's, Pine, Chestnut, Juniper, Franklin, Columbus, Locust and other streets. The incorporators are: H. W. Grady, John M. Fowler, Andrew L. Wing and Domingo Cattanetti.

MARIETTA, GA.—A petition for a franchise to operate an electric railway between Marietta and Atlanta via Pace's Ferry, will be filed with the Fulton County Commissioners by Attorney W. R. Power, who represents the Atlanta & Marietta Electric Company. The proposed line will run out Donaldson Avenue, between the reservoirs, along Howell's Mill Road to Ross' store, thence northerly and westerly to the Chattahoochee River; along Pace's Ferry Road, crossing Buckhead and Pace's Ferry Roads. Also crossing the Seaboard Air Line tracks and Peachtree Creek in Fulton County.

OCILLA, GA.—The Ocilla & Valdosta Railroad Company has given notice of application to the Secretary of State for incorporation. According to the application, the road will run from Ocilla, in Irwin County, to Valdosta, in Lowndes County, a distance of 80 miles It is also proposed to build an extension from Ocilla to Helena, in Wilcox County, connecting there with the Southern Railway. It is proposed to issue capital stock in the road to the amount of $10,000 per mile, or a total of $800,000, for the 80 miles. The general offices will be in Ocilla.

CHICAGO, ILL.—The directors of the South Side Elevated Railroad have declared the regular quarterly dividend of 1 per cent, payable Sept. 30.

CHICAGO, ILL.—The Union Elevated Loop has completed arrangements with the Commissioner of Public Works for permits to extend its platforms and so relieve the present congestion of traffic, which is due to the fact that two trains can stop at a station at once. This extension of platforms has been recommended by several experts as a plan which will relieve the present congestion. Most of the platforms will be more than doubled in length, according to the plans which are made. The stations at State and Dearborn Streets on Van Buren Street will be combined, so that there will be one continuous platform from State Street to Dearborn Street.

CHICAGO, ILL.—The new coal station of the Metropolitan Elevated at Forty-sixth Street and the belt line is nearly completed, and it will only be a short time before it will be in operation. With the exception of the downtown terminal the road has no new construction work under way. It is not believed the new terminals will be completed in time to have them in operation during the present calendar year owing to a certain amount of litigation over the property which stands partially on the proposed right of way and the inability to get structural material.

MARSEILLES, ILL.—The Illinois Valley Traction Company proposes to extend its line from Marseilles through to Morris and Joliet as soon as the road between LaSalle and Marseilles is completed and in operation.

MT. VERNON, ILL.—The preliminary surveys are made and the calculations, maps, profiles, etc., well under way for the Southern Illinois Electric Railway. This line will extend from Mt. Vernon to St. Louis, passing through Drivers, Webb, Boyd, Irvington, Hoyleton, New Mindon, Covington, Okawville, Club House, New Memphis, Mascoutah, Rentchler, Belleville, French Village and East St. Louis, a distance of 90 miles. There will be a branch line 23 miles long beginning at Irvington, on the main line, and running to Centralia, Central City, Sandoval and Odin to Salem. Rights of way are nearly all obtained, as are also the franchises to use public streets in towns where needed. The estimated cost of the line is $2,000,000. The road is to be operated by the trolley system, and will handle passengers and freight traffic. It is expected that the road will be finished in time for the World's Fair at St. Louis. John R. Piercy, of Mt. Vernon, is president of the company.

NASHVILLE, ILL.—The Southern Illinois Electric Railway Company has filed articles of incorporation. The articles provide for building an electric railway through Washington, Marion, Jefferson, Hamilton and White Counties to a point near Maunie, Ill. The incorporation papers are for a period of fifty years, with a capital stock of $50,000. The principal offices are at Mount Vernon, Ill., and the organizers are: John R. Piercy, George F. M. Ward, Samuel Casey, Louis G. Pavey, Samuel T. Maxey and Albert L. Johnson, of Mount Vernon, Ill.

SPRINGFIELD, ILL.—The Kewanee Short Line Electric Railroad, Kewanee, Ill., has been incorporated with a capital of $15,000, to be constructed from Kewanee to Annawan, Henry County. Incorporators and first Board of Directors are: W. V. Eddy, F. H. Davis, H. S. White, A. P. Eddy, A. C. Scott, all of Kewanee.

ANDERSON, IND.—President McCulloch says that it is impossible to foretell at this time just when the Indianapolis Northern line will be placed in operation. The distance from Broad Ripple to Tipton is 32 miles. About 16 miles of track have been laid. The bridges are in course of construction. Substantially the entire grade between Indianapolis and Tipton is completed, and the tracks are down in Tipton and Noblesville. The work north of Tipton is being pushed. Work on the bridges over the Wabash River at Logansport and Peru will be begun within a few days. The material for the entire work is on the ground. The company hopes to be able to operate cars between Indianapolis and Tipton early in October, and hopes to be able to operate cars from Indianapolis to Logansport and Peru by Christmas.

FT. WAYNE, IND.—The contract for grading the Ft. Wayne & Springfield traction line between Ft. Wayne and Decatur has been awarded to H. Tubman & Company, of Cleveland.

EVANSVILLE, IND.—The Evansville, Boonville & Rockport Electric Company has filed a $10,000 bond with the City Treasurer, guaranteeing to build its line. The survey is completed and work will begin this fall.

EVANSVILLE, IND.—The Evansville, Boonville & Rockport Traction Company has filed a bond for $10,000 with the Board of Public Works to insure the carrying out of the provisions of its franchise, as granted a few weeks ago. In six months the company will have to file a bond for $3000, to be forfeited to the city in case all of the provisions of the franchise are not carried out.

INDIANAPOLIS, IND.—Charles F. Smith, general manager of the Indianapolis & Martinsville Rapid Transit Company, is advertising for bids to construct 24 miles of road between Martinsville and Bloomington. There will be about a quarter of a mile of tunneling.

INDIANAPOLIS, IND.—The commissioners have granted a franchise to the Indianapolis, Danville & Rockville Traction Company to enter the county by way of the Rockville pike. The road will enter the city by way of West Washington Street.