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A Change of Horizon

The educational value to the superintendent or manager of visiting and inspecting the working of other street railway systems has often been mentioned in this paper, but too much emphasis cannot be placed on it. Even with this opportunity, a man who is constantly working in the same operating environment very often gets so accustomed to certain conditions that he accepts them as a matter of course, and very rarely realizes that they can be improved. An instance of this was afforded recently in the case of a company which was interested in two rather widely separated street railway systems. The superintendent of one system was sent to make a report on the other road, and suggested a number of changes which had escaped the attention of the resident manager, but by which the cost of operation was largely reduced. So successful was the result of this experiment that the manager of the second road was requested to make a report on the first road, and he recommended economies of an entirely different kind, but which were equally effective in lowering the operating cost. Both of these men were good operators, but they had remained so long in their positions that they could not view the situation from a broad standpoint. The result was that the two men exchanged positions, greatly to the benefit of both roads.

This solution of the problem is not always possible; we do not mean to say that it is often advisable. We do consider, however, that no street railway employee, whether he is the manager or occupies any other position, can secure the best results or even give satisfactory service with the work in his charge, unless he is given an opportunity of learning what others are doing, and of comparing his work with that of others on roads of similar character.

It is for this reason that a technical paper is of great practical value to the operating force of an electric railway company. It is not practicable in most cases to send the operating manager around the country visiting other systems, and if it was, it would be out of the question to give the same educational advantages to any considerable number of his assistants or heads of departments. It is possible, however, to place in the hands of each man a weekly resume of the technical practice of a large number of the different electric railway companies throughout the country. We do not mean to say that the same benefits can be derived from reading about the operating practice of a railway company or the improvements which have been made in its technical service as by a personal visit. Nevertheless, no operating manager would have the time, nor could any operating company afford to keep a trained corps of inspectors, such as are employed on the staff of a technical paper like this, constantly engaged in inspecting electric railway practice in this country and abroad, and in placing it in readable form. The electric railway business is one which is constantly developing. New improvements and inventions, as well as more desirable methods of operation, are constantly being adopted upon different roads, and no one who wishes to keep in the front rank of progress can afford to neglect the opportunities for self-improvement afforded by the pages of the technical paper. None realize this more than those who are the leaders in electric railway practice.

Authority in the Car House

The importance of granting liberal discretionary powers to car-house foremen in regard to the movement of rolling stock at times of emergency, is not always realized by operating officials. This is largely due to the fact that upon many systems the car house is a division headquarters, so that the foreman is an immediate subordinate of the division superintendent. The latter official keeps both early and late hours; watches the traffic at night, on Sundays, holidays and week days, and generally has complete charge of the car movements within his particular district. Nevertheless, plenty of occasions arise where the superintendent is out of reach, and where the move-

ment of traffic could be greatly expedited if the car-house foreman had authority to send out and call in cars, as the exigencies of each case demand.

On some roads this authority over car movements is vested in a starter, whose sole duty is the supplying of cars in sufficient number to maintain the regular schedule, to send out or withdraw extras from service when needed, and generally to lubricate the machinery of the transportation department. In times of break-down, derailment and blockade, the usefulness of this official is immediately manifested in the continuity of the service, and upon large systems there is no doubt that it pays to employ such skilled supervision of the traffic.

Operating companies which limit the control of car movements to a division chief or to some despatching clerk at the general offices of the road, lay themselves open, in the momentary absence of either, to a serious embarrassment of the service in critical times. We have seen a large group of would-be passengers collect at a car house after a half hour's blockade on a city line, while the foreman had no power to send out a single car to relieve the situation in the absence of a higher official. To make matters worse, empty cars bound for a park were being sent out over the line by the exact route of the delayed cars, and although these cars started from the car house, the foreman disclaimed the authority to permit passengers to ride upon them. It is certainly incumbent upon every street railway manager who wishes to carry all the passengers possible and give first-class service, to confer enough authority upon the car-house foreman, chief clerk or other qualified second in command to the division superintendent, to enable the rolling stock and car crews to be used to fill up gaps in the schedule and thus earn money for the company in the prevention of demoralized service at times of emergency.

The Trackless Trolley

We are always interested in the commercial trial of new projects, and we are therefore watching with interest the reputed scheme for establishing a trackless trolley line near Boston. The last similar enterprise hailed from Scranton, and is not, we understand, now in operation. We trust the present effort in the same direction will meet with happier circumstances. The idea of a trackless trolley, really an automobile line, taking its current in transit from overhead conductors, is, at first sight, rather an attractive one. To be relieved of the cost and care of a roadbed and track is certainly an end to be earnestly desired by the eternally badgered street railway manager who, day by day, keeps his track gang busy. If the only offset to this gain were a moderate increase in the cost of power it is safe to say that the trackless trolley system would fill a long-felt want. There is great need of good transportation in country districts, where the cost of ordinary electric road construction is nearly or quite prohibitive. If the total cost could be kept down to the overhead structure and the rolling stock, and the operating expense increased only by the increased cost of power, the scheme would commend itself immediately for general work in the country. But, with or without cause, it seems to provoke a grin on the face of the average street railway man, and to be regarded by him not as a rival, but merely as a source of unseemly merriment.

Physically, there seems to be no good reason why a vehicle on a good road should not be able to draw its motive power from overhead conductors without any serious difficulty at ordinary speeds. And it is reasonably certain, too, judging from automobile practice in attaining a fair speed with a moderate load at a very reasonable expenditure of power. Why then should such a proposition bestir the public to mirth? There is surely by this time no distrust of electricity as a motive power, nor is there the least doubt that an automobile with far less power than could readily be supplied from a trolley wire is able to make first-class speed over even a country road. The argument from experience would seem at first sight to be conclusively in favor of the scheme. But following up the matter more closely, the analogy does not seem to be quite satisfactory. To start with, the automobile in or near its present situation is very far from being an economical mechanism to operate. In the mere matter of tires the expense runs up to a large figure. With good luck a single set costing from $100 to $120, even for a comparatively light machine, may run 4000 miles or 5000 miles. This means a cost of two to three cents per mile for this item alone, or from one-half to three-quarters of a cent per passenger-mile in an ordinary car. Is there any reason to suppose that an automobile taking power from a trolley wire would either be able to do without rubber tires in passenger traffic or doing without them would not require at least an equivalent cost in extra power and extra repairs? Every year sees rubber scarcer and a larger proportion of shoddy substitutes going into rubber products. Would any attainable tires on a vehicle carrying a dozen or more passengers lead to a less replacement cost per passenger-mile? To be frank, the outlook is anything but favorable in this respect. Lacking a smooth track, is it reasonable to suppose that general repairs to the vehicle will be any less on a trackless trolley car than on an automobile, independently of its motive power?

Here again is a large item of expense that must be taken into account. And then there is the cost of motive power itself, which is certainly increased per ton-mile by the lack of a track. More serious than any of these is the difficulty of securing large carrying power per vehicle—that is, large earning power on any plan yet proposed, which means again a considerable increase in cost per passenger-mile. If our roads were all of first-class construction and well maintained, if they had trivial grades and were designed for heavy traffic, the items of maintenance which we have mentioned would be materially reduced. Given a roadway of artificial rubber, such as is described in one of H. G. Wells' forceful romances, the difficulties of trackless trolley operation would be brought within reasonable bounds, but our actual roads are of quite another sort. The fact that trackless trolley roads have been successfully introduced abroad is undoubtedly due to the prevalence of good roads in Europe, even in the country districts. But it should be remembered that very few installations of this kind have been made even there; while here the existence of a good highway nearly always is indicative of a considerable population, and one generally large enough to support an electric road of the usual kind.

Here, then, is the fundamental difficulty that must be met by automobile vehicles of every sort. A campaign of education on good roads has already been begun, but for the successful working of the trackless trolley and of automobiles in general more than a good road is required, a road in fact on which rails could be laid almost without further preparation, and its up keep is far in excess of that of a railway roadbed. Such roads are not impossible, but those for whose especial requirements they are designed are more than likely to have to meet no small part of the necessary cost, which is no trivial matter. For freight haulage at very moderate speed all vehicles operating on roads labor at a disadvantage—the very disadvantage that railroads were invented to obviate. In other words, the roadbed giving minimum total cost of haulage seems to be one

laid with steel rails. There may be special cases in which automobile vehicles on other forms of roadbed will show good economic results, and such cases we hope our friends of the trackless trolley will find. We wish them the best of luck in their daring venture, but they must not be surprised to find themselves a century or two in advance of feasible road constructions for the purpose.

The Safety of Passengers

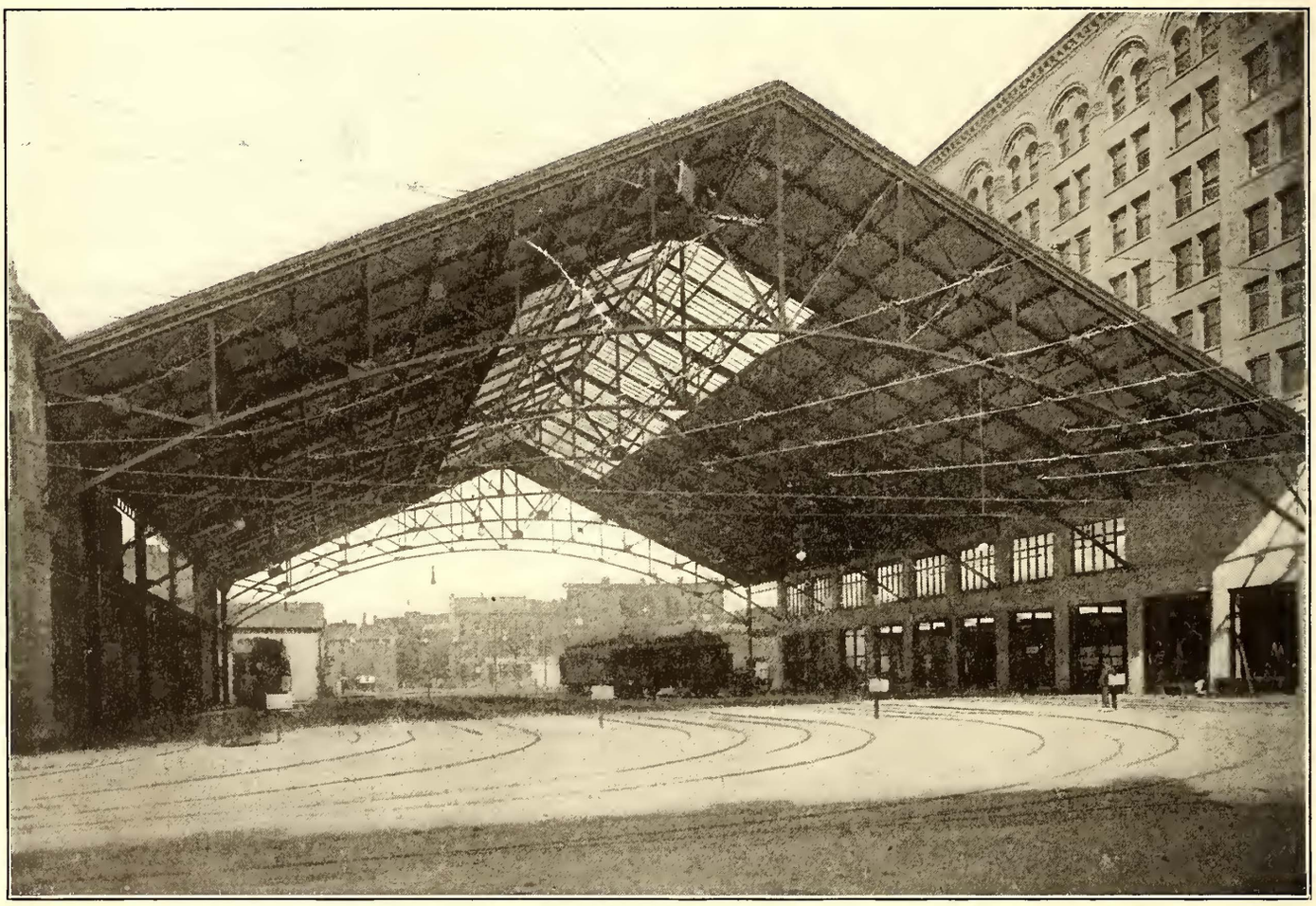
Street railway managers are sometimes subjected to caustic criticism on account of occasional accidents upon their systems. We have no desire to condone carelessness, and we have over and over again sounded the warning for more caution and a more thorough use of safety appliances. But we feel almost like apologizing to the subjects of our admonitions when we glance over a recent bulletin of the Interstate Commerce Commission on the casualties of the last year on the steam railways of the United States. It is a grim and terrible record of misfortune and negligence. Within a twelve-month nearly 10,000 human beings laid down their lives in the horror and agony of railway wrecks, while almost eight times as many went to swell the list of the injured. An International Peace Congress has just finished its sessions, striving to mitigate or abolish the terrors of war, but in the last decade the American railways have killed and wounded more victims than all the world's wars combined within the same period. The railway casualties of last year alone rose to nearly double those sustained in the two years of desperate fighting in South Africa. Peace hath her massacres no less than War! Contrasting this awful record with the results of street railway operation for the last year, we feel like offering heartfelt congratulations to the men who carried last year 6,000,000,000 passengers with so relatively insignificant a list of accidents, either to passengers, employees or to the public at large. It must not be for a moment supposed, to do the steam railways justice, that the list of injured consists mainly of passengers; on the contrary, the contingent of that class is barely 10 per cent of the whole, but even so, the proportion rises to one passenger in about 90,000 carried, while in England, with more traffic, the proportion is less than one per million. Here the list of the injured is mostly made up of employees, and that of the dead from the public. It is not a cheerful subject to contemplate from any point of view, but street railway men may well return thanks for their relative immunity from disaster.

Many physical causes are operative to produce the difference, chief among them the absence in street railway practice of the innumerable chances for accident involved in making up and operating long freight trains. Yet even these are not the acts of Fate. Trainmen are not willingly mangled in coupling cars by methods over and over condemned as dangerous, and retained because human life is held cheaper than improvements. If street railway managers were half as careless in providing safety appliances, they would be mobbed. The greater speed of railway trains is responsible for many chances of disaster unknown on tramways, but on the other hand, in the latter case, as we have many times remarked, there are not yet sufficient precautions for the speed attempted. And while the railroads operate on their own rights of way, save in rare instances, and through a sparsely settled country, the tramways have for the most part to pick their way through crowded streets, with a great population hustling back and forth across the tracks. A street railway comes pretty near to being a continuous grade crossing, yet its cars run down wonderfully few people all told, while to keep up the deadly ratio of casualties to passengers maintained by the steam roads, they would have to strike about 130,000 victims per year and kill nearly half of them. Of course, in extenuation it may be pleaded that American railways have an enormous mileage difficult to guard and maintain, and much of it necessarily single track, while the street railways carry about eight times as many passengers on about one-eighth the track mileage; but that does not account for the rapidly increasing proportion of railroad casualties. In the past seven years the American railway mileage operated has increased a little over 10 per cent, and the number of passengers carried by about one-third, while the casualties have risen 95 per cent, according to the careful records of the Interstate Commerce Commission. This increase is mainly in the number of injured, but the roll of the dead has risen far more rapidly than the mileage or the passenger traffic, almost as fast, in fact, as have the total dividends. It is a sinister topic at best, this death roll of the rail, and we would not discuss it at all were it not for the criticisms often leveled at the street railways, which are by far the most innocent of common carriers, in spite of the difficult conditions under which they are operated.

It is not altogether easy to analyze the moral causes of the comparatively clean record of street railways in the matter of injuries. Perhaps more than to anything else, it may be charged to the peculiarly intimate relations that exist between the roads and the public they serve. A street railway is in the main a local institution; it lives by the nickels of the people who live along it, and has to sympathize with their necessities. If the manager knows his business, as he generally does, he keeps in close touch with local affairs, and is quickly responsive to local necessities. An accident is a matter of personal concern to him, affecting possibly some of his own acquaintance. It is this personal element that goes straight through the service and secures an added efficiency, the value of which it is hard to overestimate. Then, too, the tramway is directly responsible to the community. It does its business under local franchises, under regulations imposed in the main by local authorities, and is, sometimes to an unfortunate extent, at the mercy of local sentiment. Consequently it has every possible incentive to exercise the greatest tact and caution in all its relations, and to be an active and supremely useful member of the civic community. This personal and local relation is one which does not exist in the case of a large railway system. If an accident occurs, the division superintendent takes care of it and reports it in regular course to the main office, maybe 500 miles away in another State. The claims are referred to the local department to settle cheaply or fight indefinitely, and then the general management forgets all about it in the rush of other business. Nor can the heavy hand of public wrath be laid upon anybody really in authority. Consequently conditions known to be dangerous are allowed to exist, claiming victims year after year. For instance, witness the terrible accident in the St. Clair tunnel, referred to in a recent issue. The experience of some years has taught that in that tunnel a stalled train generally means death, and unless a change is made, some day it will be a passenger train stalled and a hundred lives instead of half a dozen. Yet with all the common knowledge of the success of electric traction in tunnel working, nothing has been done. The line does not only an interstate, but an international business, and cannot be brought to book. Verily, it is somewhat inconvenient at times for the street railway man to shoulder local responsibility, but he gains thereby more friends than enemies, and the blessing of a clear conscience.

INDIANAPOLIS TRACTION TERMINAL BUILDING

In the last few years gigantic strides have been made in the enlargement of railway facilities all over the country, and particular attention has been given to methods which are conducive to the speedy and convenient handling of traffic. In the large cities the question of ample terminal facilities is a vital one. As the practical and convenient working capacity of a railway is often determined by its terminals, and as such necessities require expensive construction on valuable real estate, it is evident that the proper solution of such problems of construction, with their co-ordinate economic factor, is a matter of very great importance. The proper function of a railway terminal station is to satisfy three separate conditions:



STRUCTURAL IRON TRAIN SHED WITH CEMENT FLOORING, 190 FT. LONG AND 175 FT. WIDE, BUILT BY THE INDIANAPOLIS TRACTION & TERMINAL COMPANY

First, the transportation of cars, including the necessary switching; second, the storage of cars while awaiting loading or unloading, or until the proper distribution can be made; and, third, the convenience and comfort of the traveling public.

In this connection the Indianapolis Traction & Terminal Company has just completed at the corner of Illinois and Market Streets, extending through to Ohio Street, what is said to be the most modern and complete electric terminal railway station in the world. The building was erected for the occupancy of the general offices of the company, now located on the ninth floor, and for a terminal station for the nine interurban lines operating trains in and out of the city. No expense has been spared. President Hugh J. McGowan has given the project the most careful and painstaking attention, so that when completed the company would have a structure as fireproof and as near perfection for its purposes as human skill and mechanical agencies could provide. The building is nine stories high, fronts 170 ft. on Illinois Street and 70 ft. on Market Street, and contains 250 office rooms, six store rooms and a spacious basement finished in marble. In preparing and carrying out the plans, the matter of fireproofing and every other detail contributing to safety and convenience was given the most careful consideration. The Illinois and Market Street facades are constructed of Indiana stone and brick, and the west frontage joined by the train sheds is of white brick. The steel frame work is one-third heavier than that usually used in similar buildings.

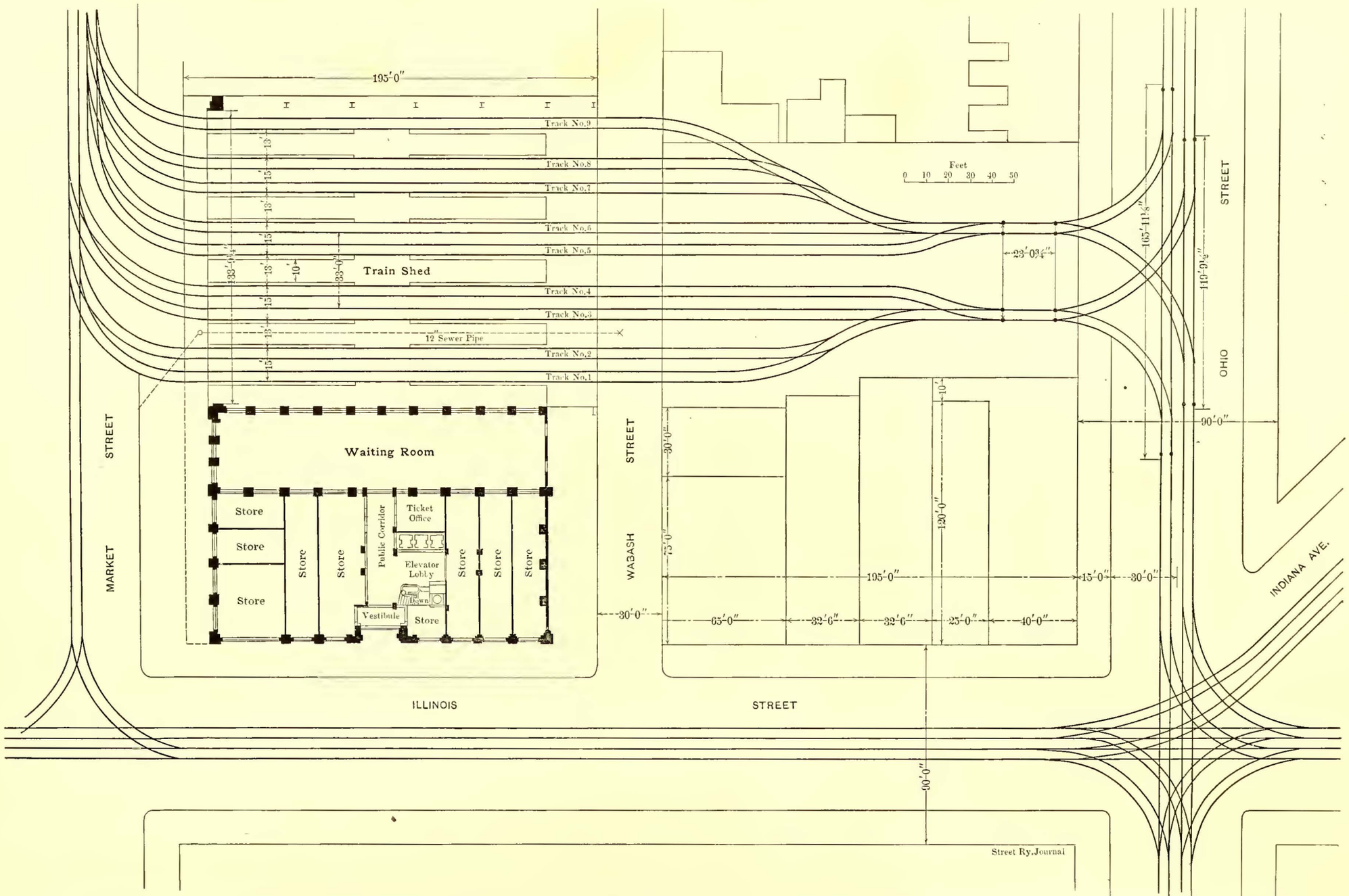
In the north half of the basement a large quantity of modern machinery is installed, consisting briefly of a heating system for hot air and steam, refrigerating system for cooling and purifying the water, ejecting plant for sewage, hydraulic lifts to run elevators, hydraulic pumps run by a magnetic controller operated automatically, a number of motors, piping, boilers, etc.

The principal entrance is on Illinois Street, but there is also an entrance from Market Street. The ground floor is devoted to store rooms, cafe, baggage and check room, ticket office and waiting rooms. Toilet room, rest rooms and smoking rooms fitted up in elegant style for the comfort of passengers are situated beneath the large waiting room. The entire ninth floor is used for the offices and departments of the Traction & Terminal Company. President McGowan will occupy the south end, his suite containing five rooms.

Several traction companies have rented office rooms in the building, including the Indiana Union Traction, the Indianapolis Northern, the Indianapolis & Cincinnati Traction, and the Plainfield Traction Company.

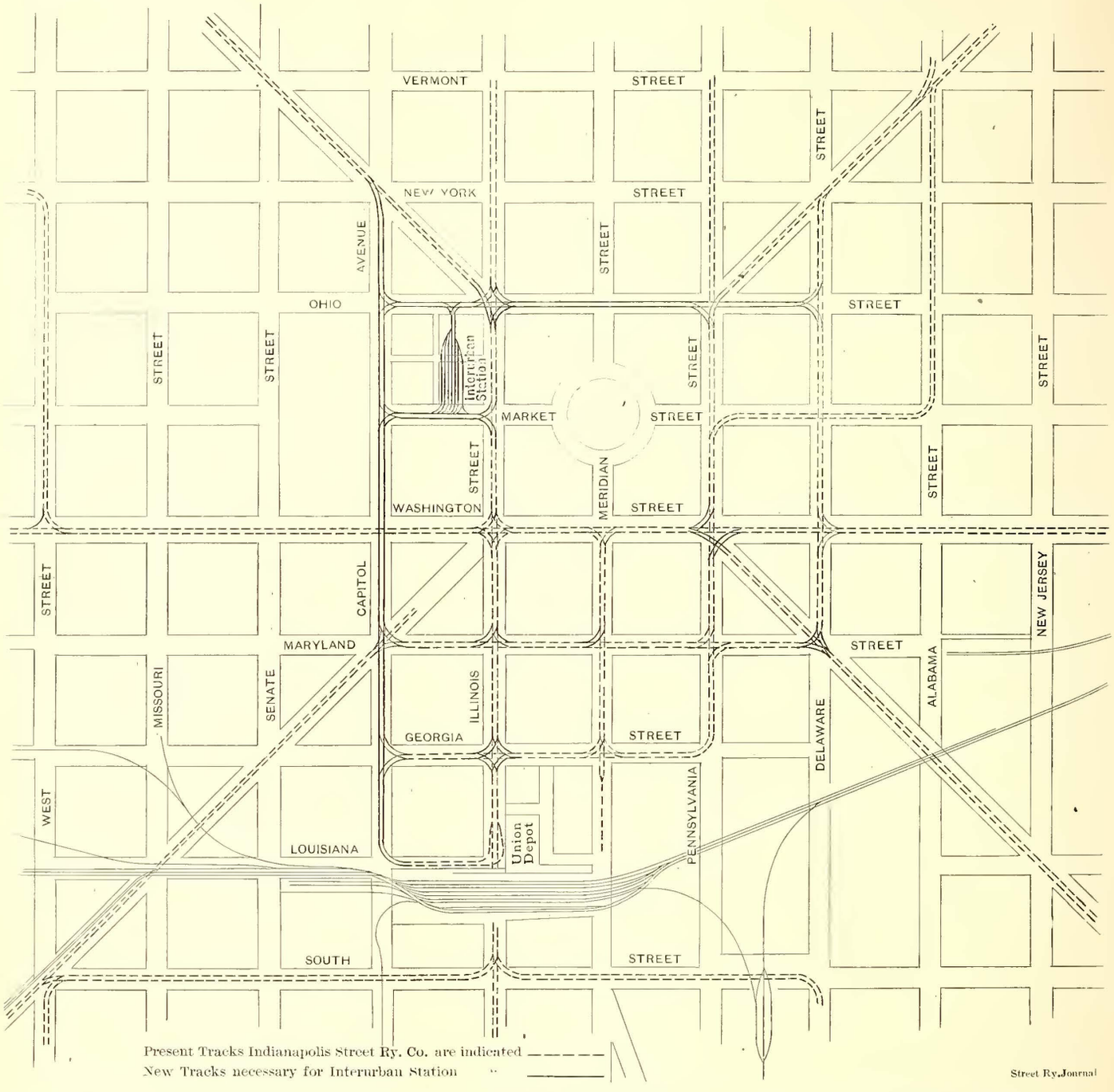
THE TRAIN SHED

The train shed is 190 ft. long and 175 ft. wide, and contains nine tracks. The structural iron work is both massive and artistic. The floors are cement, and the arrangements for the convenience of the passengers are as complete and as safe



ARRANGEMENT OF TRACKS FOR ENTERING OR DEPARTING VIA MARKET AND OHIO STREETS, TOGETHER WITH PLAN OF GROUND FLOOR OF TERMINAL BUILDING

as possible. The entire site occupies three-fourths of square 47, and the aggregate cost of site and office building and station was $1,800,000. The location of the terminal station is most fortunate for the public. It is within one or two blocks of the Capital Building, four of the largest hotels, the State Soldiers' Monument, three opera houses, the principal mercantile section and a number of down-town churches. Local street



PLAN VIEW, SHOWING PRESENT AND FUTURE TRACK ARRANGEMENTS IN THE VICINITY OF THE INDIANAPOLIS INTERURBAN RAILWAY TERMINAL

from Ohio Street consists of a single four-track throat through which trains may be switched to any one of the nine tracks. In addition to this, the switching of cars to and from the train shed tracks may be done from the double tracks approaching the Market Street entrance. Beyond the throat at the Ohio Street entrance, the tracks diverge in both directions to connect with the main belt traction system, which completely encircles eight blocks in the heart of the city. Over these belt tracks the interurban lines enter from the four quarters of the city and approach and depart from the terminal station.

cars can be taken directly in front of the station for any part of the city.

Perfect construction and a record for unsurpassed comfort and convenience have been the aim of the owners, and the acknowledged consummation of this ideal station along these lines is a matter of which Mr. McGowan and his fellow officers are justly proud.

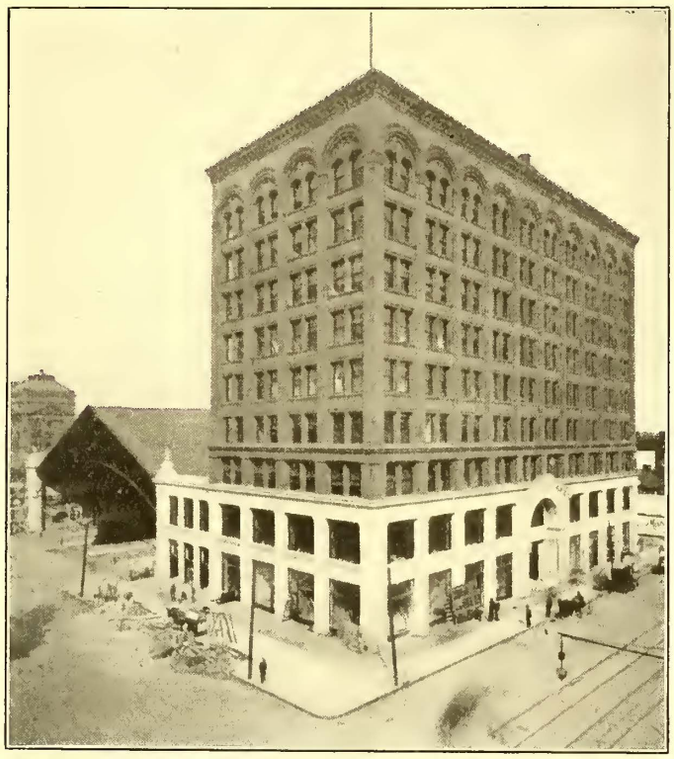
THE TRACTION SYSTEM

The station has a train shed of the dimensions given above, covering nine tracks conveniently arranged. Trains may enter and depart from either Market or Ohio Street. The approach

The terminal station was opened Sept. 12—State Fair week—and its capacity was tested during that time. Nearly 10,000 passengers were handled each day except on Thursday, when about 25,000 passengers were brought into the station. The train sheds will hold nearly fifty cars at one time, and on Thursday it was demonstrated that from 3000 to 5000 passengers could be moved out of the station at one time.

The following companies are now using the station: Indiana

Union Traction Company; Indianapolis & Northwestern Traction Company; Indianapolis, Columbus & Southern Railway Company; Indianapolis & Eastern Railway Company; Indianapolis & Cincinnati Traction Company; Indianapolis & Martinsville Rapid Transit Company; Indianapolis & Plainfield Traction Company.



TERMINAL BUILDING CONTAINING WAITING ROOM AND OFFICE OF INTERURBAN ELECTRIC RAILWAYS ENTERING INDIANAPOLIS

TOLEDO EXTENSION ORDINANCE PASSED

The ordinance extending the franchises of the Toledo Railways & Light Company twenty-five years was passed by the City Council on Monday, Oct. 31, amid a storm of protests from the radical element. The ordinance as passed was not the same as regards conditions as the one that had been submitted by the company as the best terms it could offer, and grave doubts remain of the company accepting it. The rate of fare as fixed in the skeleton ordinance submitted by the company provided for six tickets for 25 cents, or twenty-five tickets for $1, until the earnings amounted to 25 cents per car-mile, when the fare was to have been seven tickets for 25 cents, with a further reduction to eight tickets for 25 cents when the receipts reached 30 cents per car-mile; children between the ages of six and ten years, it was provided, were to have been charged a fare of 2 cents each. These provisions were amended by the Council to provide for seven tickets for 25 cents for ten years, and eight tickets for 25 cents for the remaining fifteen years. The other provisions of the ordinance are as follows: Universal transfers; the company to pay the Robison tax of 1 per cent on earnings, and the city its lighting bills, leaving a balance in favor of the city of $4,298; the expenditure by the company of $2,000,000 in betterments in nine years, and $400,000 of that sum the first year; forty cars to be added in six months; all track more than seven years old to be rebuilt; the company to pay $150,000 to $200,000 toward a new or enlarged Cherry Street bridge; an extension to Ottawa Park and a new cross-town line; the company to pave 12 ins. on the outside of each rail; owl cars to be operated every hour, if the Council passes an ordinance directing their operation.

NEW CAR HOUSE AND REPAIR SHOP AT DUBUQUE, IOWA

The Union Electric Company, which controls and operates the electric railway, as well as the lighting systems, in the city of Dubuque, Iowa, has been making a number of important improvements in its electric railway equipment during the past summer. The rebuilding and improvement of the system has been a direct result of the work of consolidation of the various companies formerly operating in that city, which has enabled the controlling company to make extensive betterments of a radical nature, which are of the greatest advantage to the properties operated. One of the most important improvements was the installation of the large steam turbine power plant, a preliminary description of which was published in the August 6 issue of the STREET RAILWAY JOURNAL (page 184). This, with the many other improvements which are under way, have involved an outlay in the neighborhood of $700,000.

The rolling stock equipment of the railway system has been almost completely replaced during the past few years, and certain portions of the track systems have been entirely rebuilt. At present, the remaining portions of the system in which girder rails were formerly used, are being relaid with 60-ft. 72-lb. T-rails of high section in the paved street portions of the city, and the A. S. C. E. standard section of T-rail of the same weight in the unpaved streets. These changes involve 11 miles of the most important lines in the city. The street railway system of the Union Electric Company now embraces a single-track length of 18 miles, and twenty cars are usually operated.

The new car house and repair shop which is being installed will give the company the facilities which are required for the proper maintenance of the large equipment which the combination of the various systems has thrown on to the operating department. In addition to the provision for running repairs of a light nature, it is intended to do heavy overhauling of cars in this new shop installation, and the shop has been designed with considerable care, to adapt it particularly to the requirements and operating conditions in Dubuque. The accompanying drawings illustrate the ground plan of the shop and also interesting features of construction and the general exterior appearance which will result. The half-tone view shows the progress of the work upon the structure up to date.

As may be noted from the ground plan of the buildings, a large portion of the present area occupied was formerly used for a car house, light repair shop, tower-wagon stable, etc.: the parts which are heavily shaded indicate the north and south walls of the old building, which are being retained for the repair shop division of the new structure. The latter structure will thus provide a considerable addition to the present car house facilities, to which will be added the extensive repair shop improvements that are included. The south wall will serve very effectually as a fire wall in the new structure, that wall being of brick and stone, the first level of which is 36 ins. thick, which the upper portion is of hard brick 18 ins. thick. The large number of openings in this wall between the two buildings are now being closed up and replaced by automatic closing fireproof iron doors.

At the rear of the old car house was formerly located a shop building of similarly heavy construction, the walls of which are also being retained as a part of the paint shop and a portion of the machine shop. The building in which the brick stack, shown in the view, is located, formed the power plant which in the early days of electric railroading in Dubuque, was used for charging the storage-battery cars formerly operated there. This plant will now furnish heating for the new shop. The square building at the rear of the stack is used as a stable.

The roof of the present car house is being entirely removed, as shown in the accompanying view of progress upon work, and the walls carried up several feet in order to afford the necessary additional height for the new structure. The new

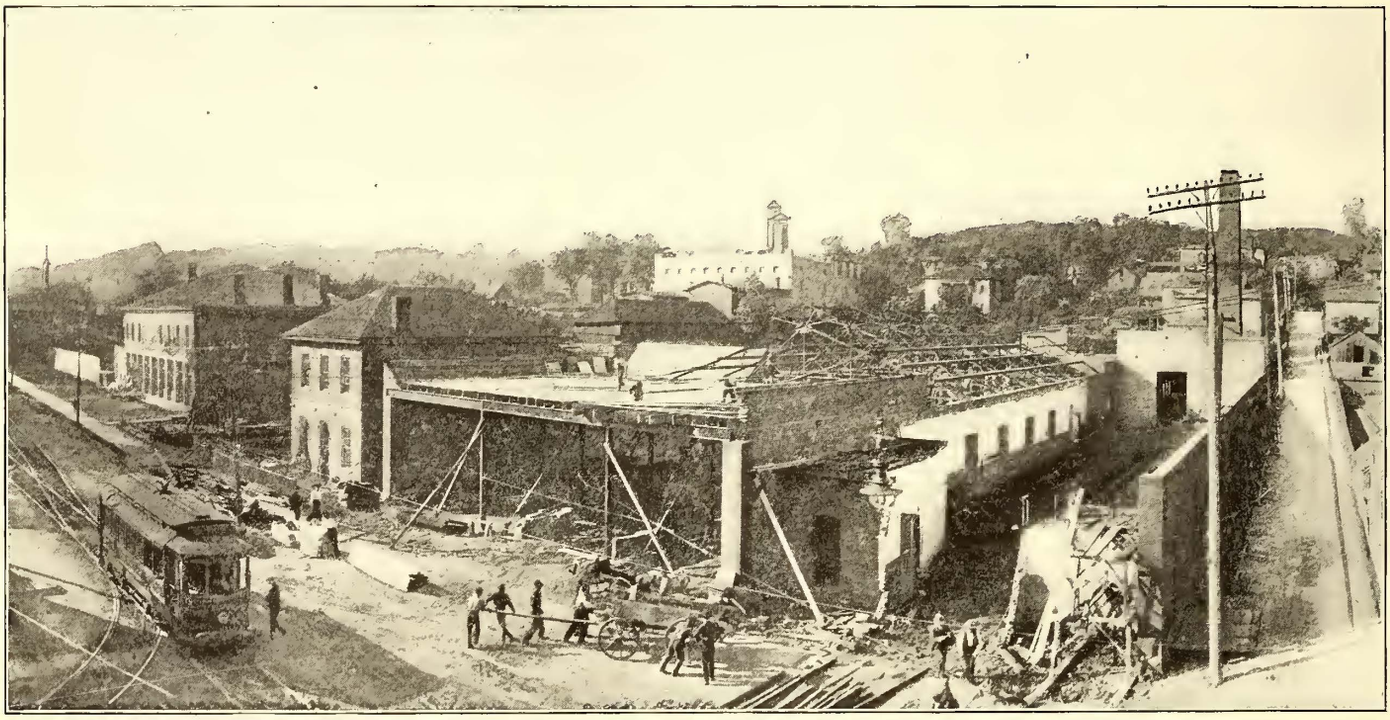
roof, which is being installed, is of the steel truss type. The style of truss used is shown in an accompanying drawing. The total width of the new building will be 108 ft. 6 ins., which will give a total capacity of the car house for storing fifty cars.

The east elevation of the building, as well as the additional detail plan, shows the addition of a second story at the front, to provide offices for the superintendent and the lockers, bath rooms and an assembly room. The latter room is 40 ft. x 46 ft. in size, and is to be fitted up for the comfort and convenience of the car service men. The bath room facilities will also be very advantageous, as the most excellent sanitary provisions are being made, including the installation of shower baths.

As may be noted from the general plan, in the completed shop three of the four tracks in the old or erecting shop portion are provided with pits, and one track will be similarly equipped in the new car-storage section. Eighty-five feet of the rear of the old car house will be devoted to a carpenter shop and to a portion of the blacksmith and machine shop. This will give excellent facilities for the woodworking shop, especially as rolling doors are provided for shutting it off from the car house proper, and tracks from that portion are carried through into the carpenter shop space. This provides for heavy repairs being made on at least three and perhaps four of the tracks at the same time. It will be noted that one track extends through to the blacksmith and machine shop so that truck repairs may be carried out by running the trucks directly into that shop. The blacksmith and machine shop formerly occupied the extension at the rear of the old car house, but has been given an additional space of 17 ft. in the main building. The paint shop, stock room and armature winding room occupy a new addition to the south, as shown, the paint shop having two tracks carried through into it from the new portion, so that painting may be carried on upon two tracks at the same time. The facilities for heating the building are provided for in the boiler room adjacent to the machine shop, where also the sand drying equipment is located.

The machinery equipment for the new machine and woodworking shops has not been definitely determined as yet, but it is intended to install machines of the following types: Two lathes, a milling machine, a planer, a shaper, a drill press, a wheel boring machine, a wheel press, emery wheels, forges, an equipment of woodworking machinery and a Pittsburg car hoist. In the boiler room, a new 75-hp boiler will be installed to furnish ample steam for heating and washing. It will be noted from a careful study of the plans that a very compact and convenient layout has been provided, and one in which work can be carried on to advantage. The distance of transporting the material is reduced to a minimum, and many of the ideas to be noted in the best shop designs have been incorporated.

Since the preparation of the original car house plans, changes have been made with the end in view of securing additional storage room in the car house, and also taking into consideration the heating problem. Dubuque has, as a rule, a long, cold winter, the mercury often falling to 20 degs. below zero. The heating of a building 108 ft. x 208 ft., therefore, presents a matter of some interest when fuel and attendance is taken into consideration.



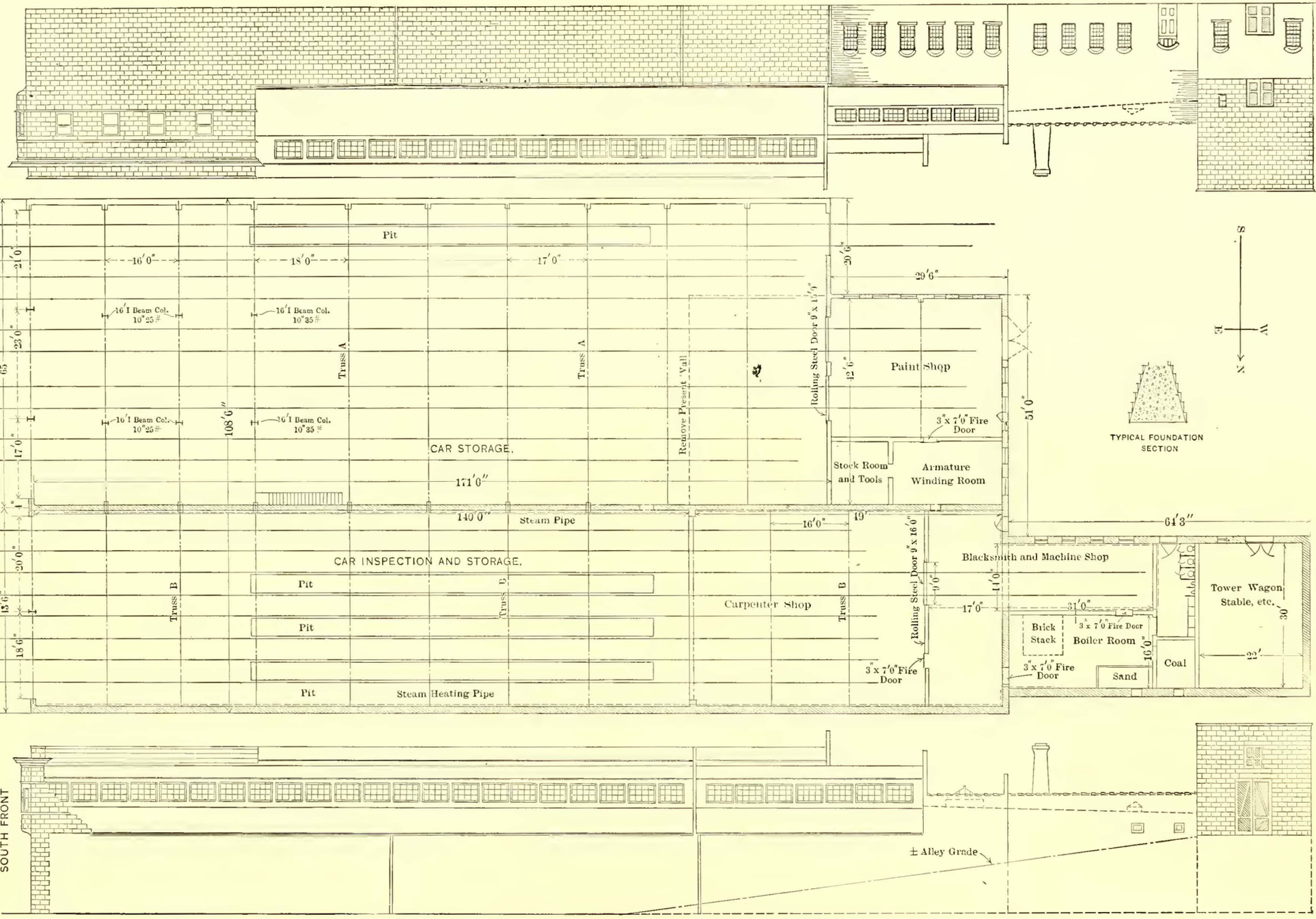
CONSTRUCTION VIEW OF THE NEW DUBUQUE CAR HOUSE, SHOWING PROGRESS OF WORK

For purposes of efficiency and economy, the company has determined to eliminate the heating question entirely on the south side of the fire wall dividing the two sections of the building. The area of the north section is considerably less than that of the south section, and also has the advantage of direct distribution of steam, the steam plant, which will consist of the 75-hp boiler already mentioned, being in the rear of this section.

An additional, or fourth, track is being installed in the north section of building, and all repair work will be done in this section, as well as the car washing and cleaning. For this purpose a "wash track" is being constructed on the north side of the north section. This construction consists of a concrete valley, or scupper, which has a slope from a point 12 ins. outside of each rail to the center of track, from which point the water runs into a storm sewer outside of the building.

The paint shop, being in the rear of the south section, will be heated by an independent steam main, and working temperature can be at all times maintained, as the shop is separated from the main car storage space by rolling steel doors.

All floors in both sections of the building will be of concrete. The two center tracks of the north section will have pits for their full length; the space between the inner rail of the two



PLAN AND SIDE ELEVATIONS OF THE NEW CAR HOUSE AND REPAIR SHOP OF THE UNION ELECTRIC COMPANY, AT DUBUQUE, IA.

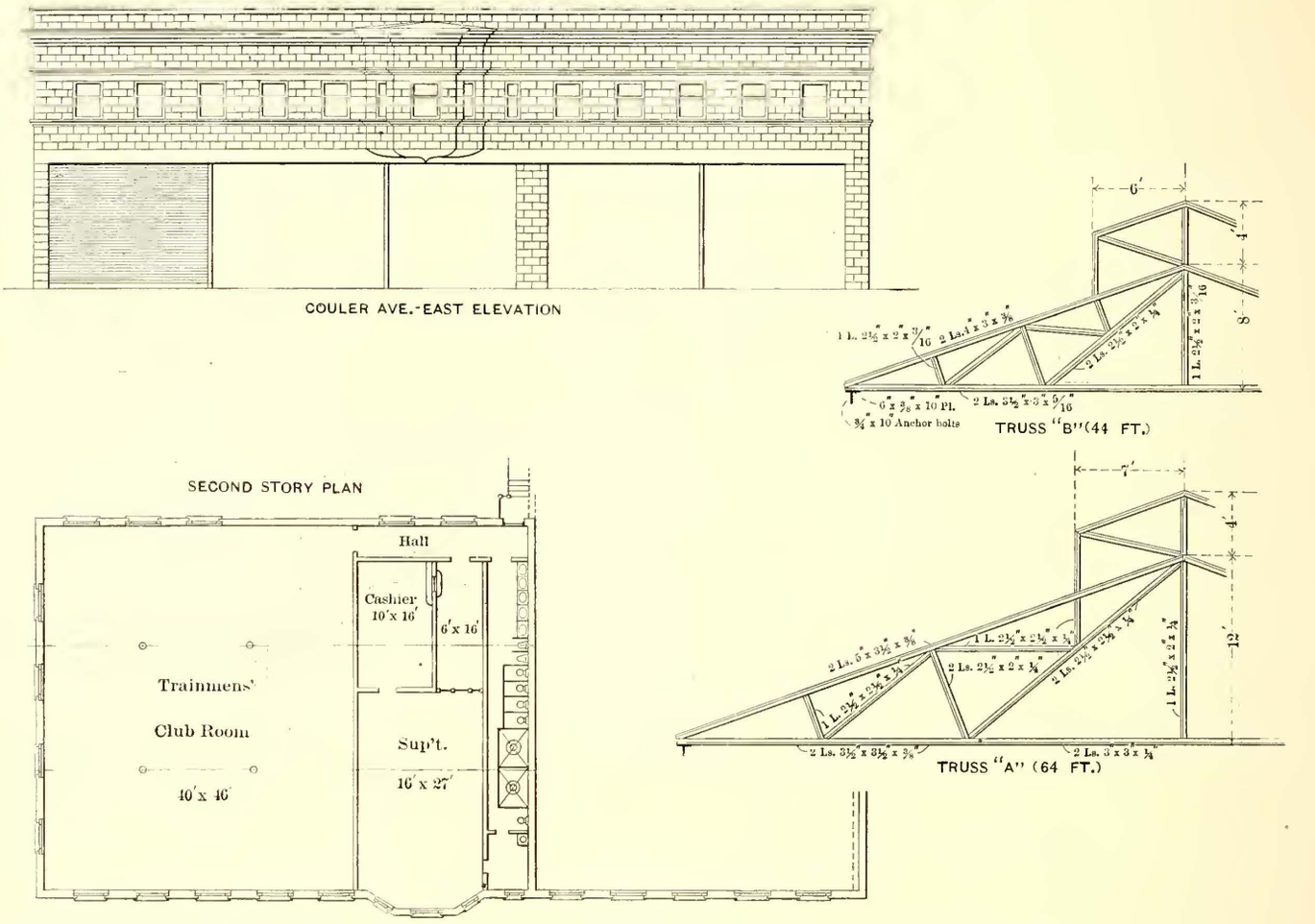
inner tracks will be cut out, allowing the two pits to run together, and thus affording storage space for brake-shoes and other material considered pit stock. The center track of the south section will have a pit through the entire length of the building, to permit the adjustment of brake-shoes, brake repairs or other minor repairs which can be effected without running the car into the shop section. In pit track construction the rails are to be carried upon 6-in. x 8-in. stringers, across the pit posts. The concrete used in the pit construction, as well as for all foundations, was in the proportions of one part Atlas Portland cement to three parts clean, sharp sand and five parts of 2-in. clean broken stone.

As all Main Street and Union Park cars return on one side of the loop which passes in front of the car house, a gauntlet track will be laid for the purpose of saving the continual wear on special work of the nine tracks entering the car house.

The topography of the ground occupied by the building is very uneven. The east end faces upon a street traversed by one of the car lines, while, as shown in the side elevations of the building, the level of the ground rises very noticeably toward the rear or west end, the ground at that point being on a level with the second story of that portion. The street on the north side of the building runs up an 8 per cent grade to the tower stable section of the building. This, while inconvenient in some respects, is very advantageous to the proper caring for the stable department of the system, which is of more than usual importance on account of the fact that here are stored not only the tower wagon and necessary horses, but also a part of the livery facilities which are required for use in the electric lighting department. The tower stable occupies a portion of the rear end of the building 22 ft. x 30 ft. in size, this being provided with a loft for the storage of hay, grain, etc.

A feature of the arrangement of the upper story will consist of a private bed room for the superintendent of the railway and a number of additional rooms for use in emergency cases, such as snow plow crews, who are frequently held at the car house continuously during snow storms. Steam tables will also be provided for the purpose of furnishing the men with facilities for warming their coffee, lunch, etc. Another provision will be a steam or electric drying closet wherein employees can hang their clothing after the same has become damp through inclemency of the weather. This room will be lined with asbestos and made absolutely fireproof. A heat regulating switch will permit temperatures of from 70 to 200 degs.

Numerous minor features of equipment will be provided, all with the general idea of contributing to the comfort and convenience of the car service employees. The use of individual lockers, one for each car service employee, is one of the advanced ideas which is being incorporated. The bath room facilities will be complete and of the best, and the shower baths in particular will be enjoyed by the employees.



FRONT ELEVATION AND SECOND-STORY PLAN OF THE DUBUQUE CAR HOUSE, SHOWING ALSO DETAILS OF ROOF-TRUSS CONSTRUCTION

The improvements above mentioned, including the rebuilding of track equipment, are being carried out by the L. E. Myers Construction Company, of Chicago, Ill., under the charge of Charles E. Collins, superintendent. Mr. Collins has had an extensive experience in street railway improvements, having recently had charge of the reconstruction of the Topeka Railway Company's system, of Topeka, Kan. The work at Dubuque is being carried on under the direction of L. D. Mathes, general manager of the Union Electric Company, to whom credit is due for this information.

The Columbus, Buckeye Lake & Newark Traction Company has made arrangements with Columbus theaters for having its ticket agents reserve seats for patrons who desire them.

FIELD NOTES ON THE ELECTRIC RAILWAY TESTS

A complete series of tests have just been concluded by the Electric Railway Test Commission at the St. Louis Exposition on a single-truck car furnished by the St. Louis Car Company. The car is of the standard semi-convertible type of this company, and was taken directly from stock. It is 33 ft. over all, and has a seating capacity of thirty-two. The weight with equipment is 15 tons, and in addition, the car carried 3100 lbs. of steel billets to represent an average load of passengers. The car is equipped with two Westinghouse No. 56 motors, magnetic brakes of the Westinghouse Company, and the B-23 controllers of the same company. Fig. 1 shows an outside view of the car, and Fig. 2 the interior, with the testing instruments in place.

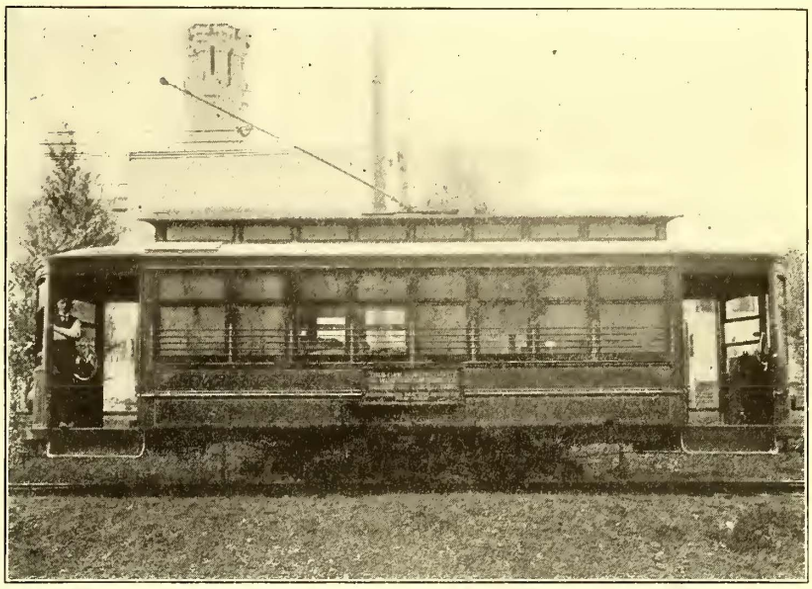


FIG. 1.—SINGLE-TRUCK, SEMI-CONVERTIBLE CAR USED FOR ELECTRIC RAILWAY TESTS

The equipment for testing includes a General Electric Company recording ammeter for the line current, an ammeter in each motor field, a line voltmeter, and voltmeters across each motor. A Boyer speed recorder is used for speed readings. The car is also equipped with an electrical speed-time and speed-distance recording device, shown in Fig. 3. This consists of a chronograph drum revolved at constant speed and equipped with two pencils. The magnet actuating one of these pencils, that tracing the base line, is connected to two circuits, one of which records time intervals of five seconds from the chronometer on the General Electric ammeter, and the other records distance by means of a track circuit breaker. This breaker consists of a sliding contact, held in place by springs and mounted on the car truck. As the car moves, the circuit is broken by the arm on which the contact is mounted, striking wire "trippers" located at various distances apart. The speed is indicated on a voltmeter connected to an Apple ignition dynamo, manufactured by the Dayton Electrical Manufacturing Company, which is driven from the axle. In order to preserve an absolutely uniform field strength, this dynamo is excited by storage-battery current maintained at a constant value. The observer follows the needle with a pointer rotating about an axis on the instrument case and fastened to the second pencil on the drum. This pencil is moved against the tension of a spring. The device works satisfactorily, and some very good curves have been obtained.

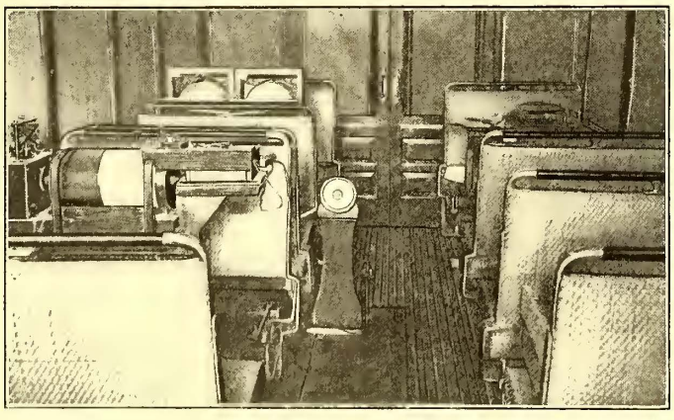


FIG. 2.—VIEW OF CAR INTERIOR, SHOWING THE TESTING INSTRUMENTS IN PLACE

The tests included motor heating runs with several different schedules, with hand braking, and repetitions of the same with magnetic braking. The schedules were run throughout the day until a constant temperature was reached, and two sets of complete readings were taken during the run, each of about an hour's duration. The schedules were all of the same duration from start to start, and differ only in the maximum speed attained and the coasting distance. The distance run was 825 ft., giving 6.6 stops per mile. The average time from start to start of each run was fifty-two seconds, corresponding to a schedule speed of about 11 miles per hour. During these runs the indicating instruments were read every five seconds. The Boyer speed-recorder record was run back and forth between the two points marking the ends of the run, and thus gave the average curve direct.

In addition to the heat runs, a series of acceleration and braking runs were made. The braking curves were taken for hand and magnetic braking, and over braking distances of from 45 ft. to 150 ft., from a maximum speed of 20.5 miles per hour.

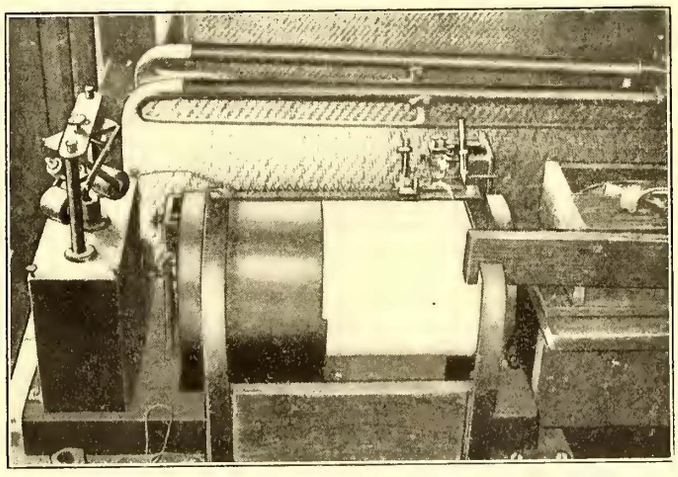


FIG. 3.—SPEED-TIME AND SPEED-DISTANCE DEVICE FOR ELECTRIC RAILWAY TESTS

The acceleration tests were in two parts. The first included tests where power was turned on full for from 40 ft. to 200 ft., and the car accelerated up to a maximum speed. The second set involved acceleration up to a fixed speed only. During the braking and accelerating periods, readings of the instruments were taken every second for the shorter tests, and every two seconds for the longer ones. An integrating wattmeter gave the total energy used in each test, it being turned off at other than the periods of the run under test. Twenty runs under a given set of conditions were made.

In the issue of Oct. 22 the plans of the commission for mak

ing high-speed tests near Anderson, Ind., were published. These tests will be conducted with both a typical interurban car and a special car to measure the air resistance. The latter was illustrated in the issue referred to. The former is one of an order of twenty cars recently built by the Cincinnati Car Company for the heavy interurban service of the Union Traction Company, and is shown in Fig. 4. This car has been a center of interest during the summer as a working exhibit at the Louisiana Purchase Exposition upon the test tracks north of the Palace of Transportation, and it was described in the issue of this paper for Sept. 24, 1904. It is furnished with the electro-pneumatic control system of the Westinghouse Electric & Manufacturing Company, insuring perfect control of acceleration. This car was placed at the disposal of the commission by the Cincinnati Car Company early in the season, but the limited

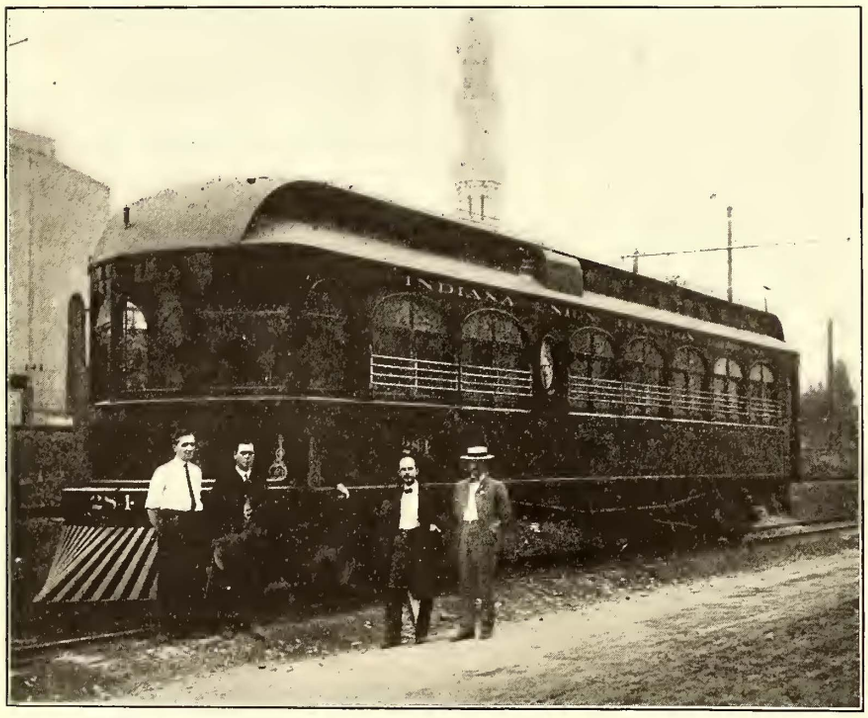


FIG. 4.—THE INTERURBAN CAR CHOSEN FOR MAKING HIGH-SPEED TESTS

track facilities at St. Louis made it necessary to postpone tests upon it until it could be spared from the Exposition.

The interurban tests will probably be conducted upon a stretch of tangent track of the Indiana Union Traction Company between Noblesville and Carmel, about 10 miles north of Indianapolis, Ind. In this piece of track there is a ½-mile length which is absolutely level, while the maximum grade is but a fraction of 1 per cent.

THE OPERATION OF A FOUR-MOTOR EQUIPMENT WITH A TWO-MOTOR CONTROLLER

BY EDWARD TAYLOR

A great many attempts have been made to operate cars with four-motor equipments by means of a two-motor controller. In some instances, it has been found to be a satisfactory arrangement for a short time following the installation, and this has led the engineers in charge of the work to the belief that good results could be obtained with this system of connections. In other cases, however, trouble was experienced from the outset, and in all cases, after a varying length of time, complaints were received of the unusually high cost of maintenance for such equipment.

Various causes were assigned for the trouble experienced on such cars, such as careless shop inspection, overloading of the cars, motor troubles, and, in particular, the reversal of the cars while in motion has been blamed for the difficulty encountered. Recently the writer was called upon to explain definitely the feasibility of this connection, and to give comprehensive reasons why a number of cars equipped in this manner were constantly in the shop for repairs. A concise summary of the conclusions drawn will facilitate a clear understanding of the details of the problem.

When using a two-motor controller on a four-motor equipment, the motors must necessarily be arranged in two sets of two motors, each set having the armatures and fields connected in multiple, with a jumper between the positive field leads—a connection that is never made when using a four-motor controller. On the contrary, with a four-motor controller, the field of each motor can receive current only through its own armature, no matter how the motors be arranged with respect to each other.

Under the above conditions, when using a two-motor controller, a slight difference in the relative resistance of the fields in either pair will throw the fields out of balance, distorting the magnetic circuit of the weaker, which causes flashing at the brushes, and often short-circuits and grounds. Another effect is an excessive flow of current through the armature of one motor, unduly heating it and destroying the insulation; and these conditions cannot be avoided or provided against except by placing four-motor controllers on all such equipment.

For detailed analysis of above summarized conditions, I will refer throughout this article to Figs. 1, 2, 3 and 4, which are, respectively, as follows: Four-motor equipment, with two-motor controller, in series; the same in multiple; four-motor equipment, with four-motor controller, in series, and the same in multiple.

It is, of course, understood that the connections must of necessity follow the courses which have been shown in the several drawings. It will be noted that the essential difference between the use of the two-motor controller and the four-motor controller is that on the former there is a connection between armatures Nos. 1 and 3 and their fields, and also between armatures Nos. 2 and 4 and their fields, which are marked "W"; on the four-motor control there is no such a connection. This "W" connection is not applied to the two-motor control ordinarily, but necessarily exists when four motors are operated from it, because two sets of wires must be led from the same binding post on the controller, which, it is obvious, would place them in multiple. This wire "W" is directly responsible for the trouble where attempts are made to run equipment connected in the above manner.

The normal resistance of a General Electric type 800 motor field is .4 ohm. If now the field of motor No. 1 has a lower resistance than that of No. 3, the initial current passed through them will divide, the greater current flowing through No. 1, the lower resistance field. For instance, if a current of 200 amps. was flowing through one set of motors, say Nos. 1 and 3, Fig. 2, and the field of motor No. 1 had only half the resistance of that of motor No. 3, 133 amps. would flow through field No. 1 and only 67 amps. through that of No. 3. This would excite a strong magnetic field in motor No. 1, which will build up a high counter electromotive force in No. 1 armature. It then follows that with a high counter electromotive force, the amount of amperes flowing through No. 1 armature would be proportionally low; on the other hand, the magnetic field of motor No. 3 will be comparatively weak, and hence there will be a lower counter electromotive force and a correspondingly

higher amount of amperes flowing through the No. 3 armature. This condition will, of course, be aggravated as the speed is increased.

We now have the following condition: Armature No. 1 has approximately (to illustrate this argument) 50 amps., while No. 3 has 150 amps.; and field No. 1 has 133 amps., while that of motor No. 3 only 67 amps. Taking the conditions under which each motor is running separately: Motor No. 1 has 50 amps. passing through its armature and 133 through its field, which is an abnormal condition, but one from which no ill effects are likely to take place. Motor No. 2 has 150 amps. passing through its armature and only 67 through its field, a condition which is radically wrong and directly in opposition to all theories of motor design or operation.

As the trouble or damage to the motor occurs right here, I will explain the action at some length. Railway type motors

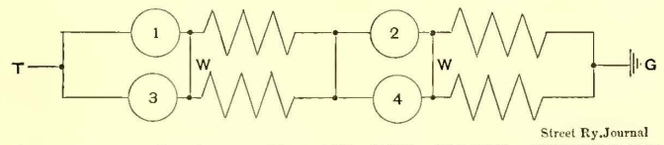


FIG. 1.—CONNECTIONS FOR THE FOUR-MOTOR EQUIPMENT, WITH TWO-MOTOR CONTROLLER—IN SERIES

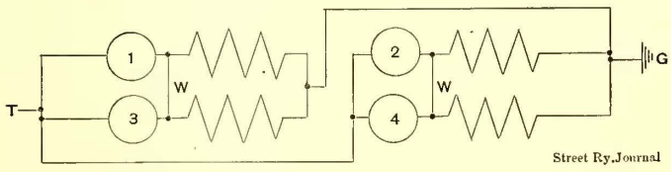


FIG. 2.—CONNECTIONS FOR FOUR-MOTOR EQUIPMENT, WITH TWO-MOTOR CONTROLLER—IN MULTIPLE

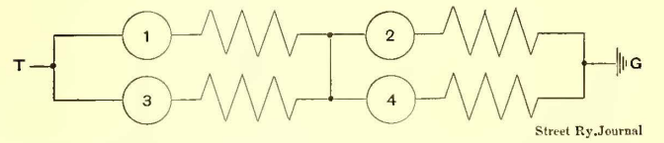


FIG. 3.—REGULAR CONNECTIONS FOR FOUR-MOTOR EQUIPMENTS, WITH THE FOUR-MOTOR CONTROLLER—IN SERIES

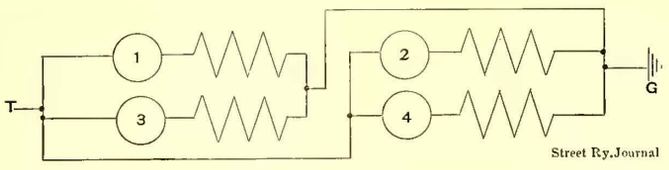


FIG. 4.—CONNECTIONS FOR THE FOUR-MOTOR EQUIPMENT, WITH THE FOUR-MOTOR CONTROLLER—IN MULTIPLE

are designed with the intention of keeping the neutral point at a fixed location, as it is impossible to trim the brushes for the load. This works out very well when the armature and field currents are identical, as when we have strong currents in the armature we have a proportionally stronger field to overcome the increased reactance of the armature, thereby holding the neutral point fairly constant. But with the condition I have above pointed out, with 150 amps. in the armature and 67 in the field, it will readily be seen that there is a very strong current in the armature, reacting and setting up cross magnetization, which tends to shift and distort the field, with consequent change of the neutral point.

The field being only 67 amps. and comparatively weak, is readily susceptible to this reactance and cross magnetization, and the neutral point is less pronounced, and is dragged over in the direction in which the armature is traveling. The brushes being in a fixed position, and thus not following the neutral points, set up a vicious sparking, as they are unable to properly commutate the heavy currents which are passed through them. This constant sparking tends to carbonize the brush holder and armature, and greatly overheats the commutator, so that the leads become unsoldered. Another effect is that the excessive current passing through this armature greatly heats the windings, which destroys the insulation and causes short-circuits and grounds.

From Figs. 3 and 4 it will be noticed that the conditions just described are impossible with a four-motor controller, as the current in the armature and field of each motor is the same, thereby holding the neutral point practically constant. It is evident from these drawings that this defect in the operation of four motors on a two-motor controller cannot be avoided or remedied. Even were the resistance of the fields absolutely standard when installed, which is a condition not obtained in practice, deterioration in service will produce changes that will be sufficient to initiate the conditions mentioned, in which case motor trouble is certain to result with considerable and aggravating regularity.

LUBRICATION OF STREET RAILWAY MOTORS

BY W. H. PAPE

The growing practice of substituting oil for grease in motor lubrication is one of the striking developments of the last few years. The reason for this is not hard to discover. Grease is simply solidified oil, just as ice is solidified water; hence it does not become a lubricant until it is reduced to a liquid by the application of heat. Heat in this case must necessarily come from friction between the armature shaft and the lining, and can be produced only as the result of wear and increased power consumption. Among the indirect evils easily traceable to use of grease are loss of car service, due to increased amount of current required; extra wear to power house machinery, due to increased load; shortened life of armatures and field windings by increased heat, etc.

While cold weather prevents grease from acting as a lubricant and calls for an excess of heat and consequently of wear, the opposite extreme of temperature produces other evils. Thus in summer many armatures are lost because the supply of grease becomes overheated through motor radiation and atmospheric temperature and runs through the bearings in a short time, leaving them without lubrication, perhaps in the middle of the run; moreover, a portion of the grease is apt to enter the motor and damage the windings by saturation.

Another prevalent cause of trouble with grease is the impossibility of keeping it free from sand and grit. As a rule, the grease barrel is rolled into one corner of the car house or oil house, and while the door is open the head is knocked out. Usually a small vessel is used to carry out the contents to the car, and often the barrel is left uncovered to catch any dust that may drift that way when the wind is blowing. The motor bearings and car journals are usually filled by the car greaser at night with a poor light and in an unadvantageous position, either by reaching down from inside the car or by climbing up between the wheels and brake rigging from below. If the car greaser spills or smears some on the outside of the journal, as he often does, it is usually scraped into the cup, together with what has been spilled out the day before, carrying with it the sand, clay and all. After the greaser has completed greasing his car, or if he is called away to assist some other employee in the meanwhile, he will often set his pail to one side. This may be under or close to an old casting, sand car or some other haven of grit and dust, part of which is quite likely to find its way to the motor bearing by the grease route.

The interurban high-speed line developed the necessity of oil lubrication, and the results have been so satisfactory that to-day practically all manufacturers of street railway motors are building motors from 35 hp up, with bearings designed for wool waste and a high grade of oil lubrication. It is the intention

of the present article to describe some of the oil cups used for this purpose, and then give some statistics on the use of oil for electric motor lubrication.

The cup shown in Fig. 1 fills all of the requisites, and is the only one coming under the writer's notice which embodies cheapness, durability and reliability. As will be seen, it is so designed in shape as to fit the inside of the grease receptacle of any type of motor designed for grease lubrication. Fig. 2 shows the parts of which the cup is composed. Fig. 3 represents the wick holder, showing a combination of strands of cotton wicking drawn loosely through the cross holes at right angles. Fig. 4 shows the set screw in the vertical hole of the wick holder, and having the set nut for the purpose of locking it in any position. The flow of oil through the wicking is regulated by the amount of pressure applied to it by the set screw. At the bottom of Fig. 3 is shown a needle valve which, when the motors are at rest, shuts off the flow of oil. The jar of the motors, when the car is in motion, unseats this valve and permits the oil to pass out. The patent on this valve also covers a ball valve, but the needle valve has been found to be superior for the reason that the ball will unseat while the car is standing on a grade, also because in some types of motors it is impossible to place cups in a perfectly upright position. In this event the ball valve would also be unseated. As the valve is automatic in its action, a car requires no attention when it is run into the car house at night or at the end of a run, and the car house floors are kept free from oil. The adjustment of the cup is so good that it can be regulated to feed any quantity of oil with reliability at any temperature, and the wicking cannot clog with foreign substance, which may be in the oil, as its outlet is raised slightly from the bottom of the cup, although the ends of the wicking which rest on the bottom of the cup will syphon out all of the oil. There is also no possibility of the valve sticking, as all the oil is filtered through the wicking before reaching it. In Fig. 2, A shows the oil reservoir, B the wick holder, C the regulating screw, D the automatic valve, and E the cotton candle wicking.

FIG. 1.—ASSEMBLED OIL CUP

FIG. 2.—PARTS OF OIL CUP SHOWN IN FIG. 1

FIG. 3.—WICK HOLDER

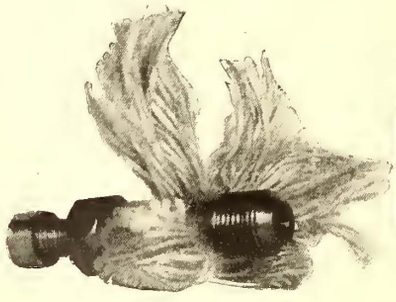


FIG. 4.—WICK HOLDER AND SET SCREW

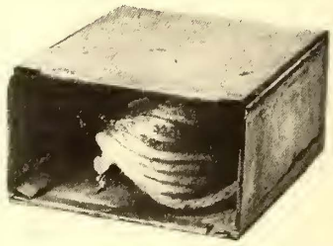


FIG. 5.—EARLY OIL CUP

Fig. 5 shows one of the early types of oil cups, which was used with more or less success for want of something better. The oil was syphoned up through several strands of wool yarn and flowed by gravity down the tube in the center, and projected through the bottom of the reservoir. The regulation depends upon the number of strands drawn through the tube, and the cup keeps feeding continually as long as there is any oil in it. Fig. 6 shows the same cup with wick removed to show construction.

The Columbus Railway Company, Columbus, Ohio, has been lubricating all of its motors with cups and Galena electric car oil for more than three years, with success. In 1900, the first year in which oil was introduced on part of the cars, the saving was 0.1 cent per 1000 car-miles as compared with the previous year. In 1901, when all the motors had been equipped with oil feed-cups, the cost was reduced 5.3 cents per 1000 car-miles. In 1902 the cost was reduced 2.5 cents per 1000 car-miles over 1901, making a total reduction of 7.9 cents per 1000 car-miles. These results were exceedingly gratifying, especially because the traffic per 1000 car-miles for 1902 was approximately 30 per cent greater than during 1899, and the life of motor bearings was more than doubled. For example, on the GE No. 57 motors, purchased in 1900, only a comparatively small portion of bearings had been renewed up to June, 1903, and the average life of those taken out was 107,264 miles. Oil lubrication is considered so satisfactory that all motors in Columbus are now equipped with cups before being placed in service. During the year ending June 1, 1904, out of a total of 250 cars operated, only three armatures were lost.

The Citizens Traction Company, of Oil City and Franklin, Pa., has been lubricating its motors with oil for a period of one year, with results equal to those of the Columbus Railway Company. On this line Westinghouse No. 49 motors are used. Armature linings are running from 50 per cent to 75 per cent longer than when grease was used as a lubricant, and one man now does the repair work at the Franklin car house, which formerly required two. The same proportionate reduction has been made in the Oil City car house force.

The Pittsburg Railways Company started to equip its cars with cups and Galena oil on June 15, 1904, using the cups shown in Fig. 1. On Aug. 1 between 500 and 600 cars, all the cars on Division No. 1, had been so equipped. On Sept. 1, after one month's operation, three armatures had been lost, as against thirty-seven in the month of July. This will be considered remarkable when it is stated that a large percentage of the cars on this division are double-truck, with closed bodies 50 ft. in length, weighing 25 tons to 26 tons, and have only two Westinghouse No. 56 motors per car. The service is exceedingly heavy, there being many grades, varying from 5 per cent to 10 per cent. The writer has observed these motors so hot that he could not bear his hand on them even for a moment. While grease was being used, the receptacles had to be refilled from three to four times daily, but with oil, attention is required not oftener than once a day, and in many cases they are allowed to run two or three days without refilling.

Fig. 7 shows an improved axle bearing, and Fig. 8 an armature bearing designed for wool waste and oil, both of which are being manufactured by the Westinghouse Company. There are, of course, two armature bearings and two axle bearings on each motor. The armature bearings may be described as follows:

The armature bearing proper is made in one piece, and comprises a cast-iron shell with a babbitt bearing face. It is held in a cast-iron bearing housing, to which it is keyed to prevent turning. The bearing housing is in turn clamped between the halves of the motor frame, to which it is further held by two bolts, one in each half of the frame. The bearing housing contains also the oil well, a waste oil pocket and a receiving groove which collects waste oil from the wiper ring on the armature shaft and carries it off to the waste oil pocket. The oil well contains wool waste and oil, and at about its middle has an opening which extends through the bearing to the armature shaft. The shaft is thus lubricated by contact with oily waste. The part of the oil well below the opening to the shaft acts as a reservoir from which the waste in contact with the shaft is replenished.

The axle bearing is made in two parts, and comprises a cast-iron shell with a babbitt bearing face. It is clamped to the motor frame by an axle cap, to which it is secured against turning by a dowel pin. The axle cap contains the oil well which feeds through an opening in the bottom of the axle bearing. Wool waste and oil are used, as in the armature bearings.

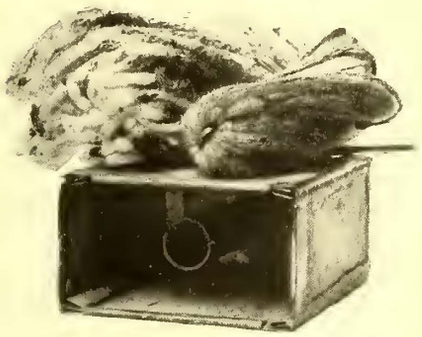


FIG. 6.—EARLY OIL CUP WITH WICK REMOVED

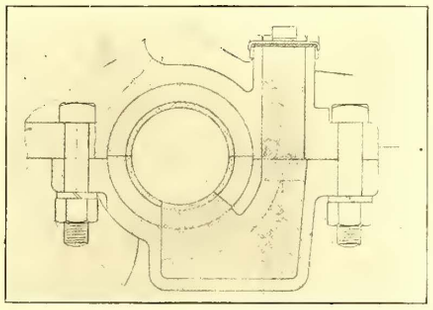


FIG. 7.—AXLE BEARING

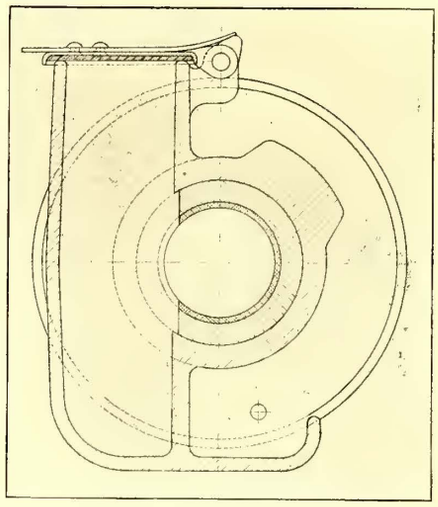


FIG. 8.—ARMATURE BEARING

From the standpoint of economy, the bearing designed for wool waste and oil is superior to the oil cup, while from a lubrication standpoint, the results are about the same. There is equal freedom from sand in both systems, because in the wool waste bearing, sand or grit of any kind will pass by gravity through the waste to the bottom of the oil reservoir, but can go no further. Comparing first cost of either system with grease, oil will be found slightly more economical.

In selecting the oil to employ, a good grade of petroleum should be used as a base, and to it should be added a certain percentage of whale oil and lead. The whale oil gives the mixture tenacity and the lead fills the uneven places in the bearing. It is quite easy to distinguish a shaft which has been running in oil containing lead by its bright, smooth appearance. Experience has also shown it to be necessary to use a lighter weight of oil in winter than in summer.

ELECTRIC TRACTION ON BRITISH RAILWAYS

An interesting paper on this subject, by Philip Dawson, and devoted largely to methods of applying electric power to the trunk line conditions of British steam railways, was presented at the International Electrical Congress at St. Louis. The author first states that the 1901 capitalization of the steam railways in the United Kingdom was £1,184,070,145, and the total length of route, 22,078 miles. During this year, the companies carried, exclusive of season ticket holders, 1,172,395,900 passengers, and 415,593,441 tons of freight, with net receipts of 3.27 per cent on the total paid-up capital. The percentage of operating expenses to gross receipts was 63 per cent. The companies have felt the competition of parallel trolley lines to a great extent in their suburban and short-distance traffic. Not a few of them have expressed their opinion that they have no objection to the tramways taking this traffic, as it is not a profitable source of revenue, but there are two objections to their doing this. One is that it is extremely doubtful whether the government will allow them to drop their suburban traffic completely; again, there is too much capital tied up in this branch to render it possible to dispense with it entirely. According to the author's opinion, there is no reason why they should do this, since there is no railway company that could not operate its suburban traffic in the neighborhood of most of the large British manufacturing towns at a substantial profit if it was to be electrified.

The writer is a firm believer in the use of the overhead conductor, and states that the experience on the Valtelina Railway shows that there is no difficulty in maintaining two overhead 3000-volt conductors in spite of the fact that steam locomotives burning soft coal are continually passing over the line, and that the aerial conductors in some cases have to pass through tunnels through the roof of which water is always percolating. He considers the single-phase motor well adapted to this work.

The conductor should be supported in such a way that it will have no sag, and it should be practically impossible for it to fall on the track and get in the way of the train, even in the event of its breaking, and its insulation should permit of the use of very high pressures, say up to 10,000 volts. For its support, the writer recommends stranded wire composed either of steel covered with an outer layer of copper, or else of phosphor or silicon bronze wire, with supports not more than 4 ft. apart. For the conductor, he recommends a hard-drawn copper wire with a diameter of at least ½ in.

For the collector, he recommends a sliding contact, possibly of the Oerlikon type. He believes, however, that a collector of the "scissors" type would present many advantages. The contact bar should be made at least as long as the whole width of the car, and this would allow considerable latitude in the position of the overhead wire.

He believes that the adoption of motor cars in the place of heavy locomotives would reduce greatly the wear and tear on the permanent way, particularly at frogs and crossings; also that the operating expense per car-mile would be greatly reduced and the carrying capacity of the line increased. He quotes the experience on the Lancashire & Yorkshire Railway, where the carrying capacity of the line was not only doubled, but the terminal capacity was also doubled, on account of increased simplicity in switching.

The Dayton & Muncie Traction Company's road, between Muncie, Ind., and Dayton, Ohio, will be in complete operation by Jan. 1. Wire has been strung and rails laid within 3 miles of Muncie. A portion of the road is now being operated.

LEWIS AND CLARK EXPOSITION

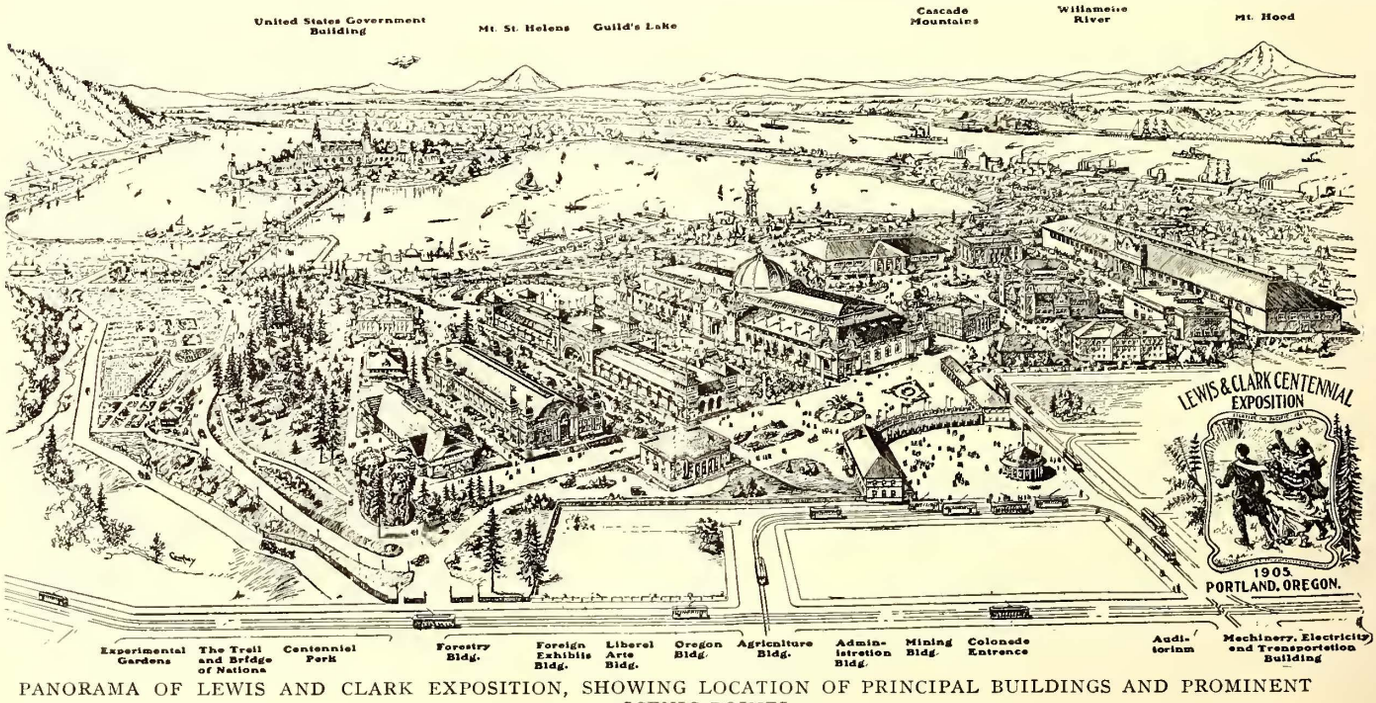
With the St. Louis Fair drawing to a close, the attention of the nation is being attracted by the Lewis and Clark Centennial and American Pacific Exposition and Oriental Fair, which is to be held in Portland, Ore., during the summer of 1905.

The Exposition will commemorate the centennial anniversary of the arrival of Captains Lewis and Clark and their sturdy band on the North American shores of the Pacific Ocean to establish title and explore what was then an unknown region, and will, as well, serve to exploit the coast and its resources, its climate and scenic beauty.

When the Exposition opens its gates on June 1, 1905, it will represent an expenditure of $5,000,000, part of which is to be furnished by the United States Government. The location chosen for the Exposition consists of 190 acres of land on a lake of nearly 300 acres in surface area, situated in the northwestern part of the city near one of the best residence districts. The ground is in two pieces, separated by the lake, and they will be connected by an arched bridge. On the side nearest the city, there are over 130 acres of rolling ground, which reaches an elevation of over 100 ft. above the level of the lake; on this portion are erected the main buildings, many of which are nearing completion. Here also is located a park of about 50 acres, covered with many large evergreen trees and native shrubs. The grounds are well laid out with wide boulevards and walks, and when the proposed improvements are complete the place will be very attractive.

BIRD'S-EYE VIEW OF LEWIS AND CLARK EXPOSITION, FROM WILLAMETTE EXHIBIT BUILDING, BEGINNNG OF TRAIL ON THE LEFT END. SNOW-CAPPED MOUNT HOOD IS SHOWN FAR BEYOND ON THE RIGHT

Across the lake is a peninsula of about 60 acres, on which the Government buildings and exhibits will be placed. This peninsula will be connected with the mainland by a bridge 2000 ft. long, which will be the Midway or Pike of the Fair, and will be called the Trail and Bridge of Nations. On each side of the bridge for about 900 ft., the concessions will be located, the remaining 1100 ft. being taken up with arched construction. The bridge will end at the main entrance of the Government



PANORAMA OF LEWIS AND CLARK EXPOSITION, SHOWING LOCATION OF PRINCIPAL BUILDINGS AND PROMINENT SCENIC POINTS

Building, and besides being a unique feature, it will afford a grand view of the Exposition grounds and of the surrounding and distant scenery, which cannot be surpassed. For a background there are timbered hills rising several hundred feet, while to the eastward lies the Columbia River Valley, with the Cascade Mountain Range for a boundary, in which are seen Mounts Jefferson, Hood, Adams, St. Helens and Rainier, all covered with perpetual snow, while between the Exposition grounds and the mountains flow the Willamette and Columbia Rivers. On these may be seen at all times numerous deep-water craft and inland steamers.

Transportation to the grounds will be furnished by the lines of the Portland Railway Company and the City & Suburban Railway Company. Both have recently built additional tracks to the grounds, and have also been relaying their roads with heavier rails in order to take good care of the traffic during the Exposition. The systems of the two companies are so arranged that each has the use of two sets of lines running on different streets, but coming together in the center of the city at the principal transfer points, so that the street railway service will be equivalent to four distinct lines to the grounds. Long before the Exposition opens, the recent consolidation of the two railway companies to form the Portland Consolidated Railway Company will be effective, and comprehensive arrangements will have been completed for the expeditious and harmonious handling of the Exposition traffic. A double-track one-way loop at the main entrance will be used by all the lines centering there.

Steamboats will carry people to the peninsula, giving them a 3 to 5-mile ride. In addition, the Northern Pacific Railway has a spur to the grounds, and its main line passes through the peninsula, so that with all these transportation facilities, trouble in handling the attendance is not anticipated.

The grounds, buildings, bridge and park will be illuminated with incandescent lamps. All buildings will be outlined, 8-cp frosted lamps being used for this purpose. The roadways and bridge will be illuminated from post electroliers, as also will be the boulevards along the lake. The park will be lighted by 7000 incandescent lamps. These will be placed among the trees and shrubbery and along the paths and walks. It is the intention to decorate many of the large fir trees in the park, and, as some of them are over 200 ft. in height, the effect produced will be impressive. The Government Building is designed in the Mission renaissance style. On each end of the main structure there will be an electric tower 260 ft. high. The ends of the main building are flanked by peristyles connecting smaller structures.

The Midway or Trail, built over the water, will present an unusual construction, and its brilliant lights, together with the great amount of illumination on the lake, will make the scene a most attractive one. The design and supervision of the electric installation is under the direction of James R. Thompson. Current for the lighting and power of the Exposition will be furnished by the Portland General Electric Company from a new steam turbine plant which is building near the grounds to supplement the power received from the company's water-power plant at Oregon City.

The principal exhibit buildings are already under roof, and are prepared for the storage of such exhibits as may be shipped from St. Louis at the close of its Fair. A general view of the grounds taken from Willamette Heights, which is reached by one of the Portland Railway Company's lines, is shown in the accompanying illustration. The photograph was taken early in October, and shows the main buildings nearly completed. In the distance at the right appears Mt. Hood.

Henry W. Goode, president of the Portland General Electric Company, is president and director-general of the Exposition; Henry E. Reed is secretary and director of exploitation and publicity, and Oscar Huber is director of works.

PAPER ON SINGLE-PHASE RAILWAY MOTORS AT THE NEW YORK ELECTRICAL SOCIETY

At the October meeting of the New York Electrical Society, Prof. A. S. McAllister, of Cornell University, delivered a lecture on the single-phase motor which, with the discussion thereon, forms a notable contribution to the subject.

In introducing the topic of the evening, Frank J. Sprague, president of the society, said there is perhaps no one branch of electric traction which is commanding more energetic study, ingenuity and detailed application than the development of the single-phase, alternating-current motor.

Scarcely a quarter of a century has passed since Dr. Siemens, in 1879, at the Paris Exposition, and in 1881 at Lichterfelde; Edison at Menlo Park, and Field at Stockbridge, operated experimental equipments supplied by current from a dynamo, that at Lichterfelde being really the first commercial attempt. Sixteen years only have passed since the modern electric railway development began at Richmond; without this development the New York subway, about to be opened to the public, would have been impossible. Up to the present, this development has proceeded along one very definite line, using in the motor continuous current, originally generated directly and transmitted through the trolley wire to the car, but more recently, of course, on all large installations, transmitted primarily from a central station as an alternating current to sub-stations, and there stepped down through transformers and through rotaries transformed into continuous current.

The common practice the world over has determined the character of the motor as one centered at one end on the axle to which it is geared and by which it is partly directly supported, while the other end is carried from the truck in the same manner as to permanent parallelism of the driving and driven axles under all conditions, as on the Manhattan Elevated experiments in 1886.

The motor has by evolution now been brought to a very simple, efficient and reliable state. We can hardly imagine a piece of machinery so simple in construction, of more all-round efficiency, or more capable of withstanding continued hard service and abuse. It represents the result of hard study and ingenious work by hundreds of designers, guided by the exacting demands of practice.

The potential at which those motors are operated has been, by common consent, limited on account of motor commutation to about 600-650 volts, an increase of only 150 volts to 200 volts in the past fifteen years. There now seems to have grown up the conviction that this is the limit to continuous-current potentials for practical railway purposes. To that Mr. Sprague took exception. But, be that as it may, it is perfectly clear that if electric railroads are going to extend beyond the tramway, beyond the underground, the elevated and the single-car suburban service, the question of investment in conductors and in apparatus for transforming energy must be very seriously considered. At present an electric railway may be considered as a combination of a series of railways, each operated from a sub-station, which we may call the central station for that division. The railways being joined together, the loads on any section receive current from two or more sources. These stations have dynamos which, instead of being operated from local boilers and steam engines, are driven by current transmitted through a transformer from a distant point at which all the necessary boilers and engines are concentrated.

It is clear that up to the sub-station, whatever is used for operating the motors, whether continuous or alternating currents, has little bearing upon the question of cost or efficiency of initial transmission, because it is possible to transmit the primary current through to these sub-stations at any required pressure, which will not be affected by any change which may take place in the motor per se.

What is desirable, and what is sought in this new development, is to get rid in the first place of one of the elements in the sub-station; that is, the rotary or movable one, leaving the step-down transformers as the permanent equipment. The other is to raise the potential on the trolley line considerably above that which has ordinarily been used on continuous-current operation, and therefore increase the distance between sub-stations. Mr. Sprague considered that possibly the hopes in this respect are somewhat exaggerated, and for the following reasons:

When taking up the heavier problems of railway transportation, it is, of course, with the necessity of a plurality of motor equipments, no matter whether we deal with locomotives or with cars distributed throughout a train, and if a plurality of motors be used then adhering to our present practice of series-parallel operation, it is possible to raise the working potential to, say, 1300 volts.

Potentials varying from this to about double have been characteristics of much of the alternating-current work thus far proposed, excepting, of course, such experimental development as has been made at Zossen on a military line under the auspices of the German Government. But there are some things we must bear in mind when we deal with these higher potentials, and what they are going to result in. The laws governing losses in transmission with localized loads are quite plain. They may be briefly stated as follows:

With any given amount of energy transmitted, the electromotive force and current will vary inversely.

With any given work done, loss on a line, electromotive force at the terminals of the motor and distribution, the weight of copper will vary as the square of the distance, its cross section, of course, varying directly as the distance.

With the same conditions, the weight of copper will vary inversely as the square of the electromotive force used at the motor.

With the same cross section or conductor, the distance over which a given amount of power can be transmitted will vary as the square of the electromotive force.

If the weight of copper is fixed, with any given amount of power transmitted and loss in distribution, the distance over which the power can be transmitted will vary directly as the electromotive force.

Now, in railway service, the average load will ordinarily increase directly as the unit of distance, which means that with any fixed unit investment in trolley copper the distance between sub-stations should increase directly as the increase of potential.

It may also be remarked that the size of sub-stations will also increase, but not quite in the same ratio, and the aggregate capacity should be somewhat less.

If we compare continuous and alternating-current layouts, then, considering maximum potentials, and bearing in mind that the effective working potentials of the alternating current is considerably less than the maximum, and, further, that the iron rails offer much less facility for conducting alternating currents than continuous ones, we will find that if we have a given distance between sub-stations or a continuous-current layout of, say, 1300 volts or 1400 volts, to go double that distance on an alternating-current layout, the maximum potential would have to be raised to not less than 3000 volts or probably 3500 volts.

But whatever the difficulties, and however these various considerations may be viewed, it is important, if possible and safe, to raise the working potential on a trolley line, and it is likewise important if a motor can be built to operate on a single-phase alternating current which will be as satisfactory as its continuous-current rival. As to the polyphase motor, Mr. Sprague considered that for general railway purposes it is absolutely unfitted, despite the admirable work that has been done by the Ganz and Siemens companies in Europe. Its characteristics are not satisfactory for the class of service, and it requires either two or three wires overhead. As to the single-phase motor, there is an amount of energetic application directed to this one problem which is deserving of all praise, and Prof. McAllister will present an account of the various solutions of its difficulties which have been attempted, and the results which have been accomplished.

The lecture of Prof. McAllister dealt with the characteristics of the plain series motor and its defects; the improved qualities of the induced and forced compensated series motors; the comparative performance of the induction series motor, and its high power factor; the repulsion motor and inverted repulsion motor, and a discussion of the methods for using resistance as condensance to cause motors possessing series characteristics to draw leading wattless current from the supply system.

In his opening remarks, Prof. McAllister showed that if in an alternating field there be placed an armature connected to a commutator by methods common in direct-current practice, it will be found that with the armature stationary there will be generated in the conductors an electromotive force on account of the rate of change of flux through the armature coils as in a stationary transformer, and that the maximum measurable value of such electromotive force, as it appears at the commutator, will exist between points placed in mechanical line with the field flux and spaced 180 electrical degrees apart. When the armature is in motion, neither the effective value nor the time phase position of this transformer electromotive force is altered, except in so far as other disturbing influences may be brought into play, but, due to the dynamo speed effect, there is generated in the armature coils an electromotive force which appears externally as a maximum at points on the commutator 90 mechanical degrees from the field flux, as is true with direct-current generators. This latter electromotive force is proportional to the product of the speed and the field flux, and hence is in time phase with the alternating field. Experiment verifies the theoretical determination that at synchronous speed the effective values of the dynamo electromotive force and of the transformer electromotive force are equal, and due to the fact that they are in electrical time quadrature and mechanically displaced 90 degs. An electromotive force of equal value will be found to exist between any two points on the commutator situated 180 electrical degrees apart. From these facts it follows that when such an armature is revolving at synchronous speed in an alternating field of any strength, the effective value of the electromotive force at the commutator must be the same in all diametrical positions.

In the case of a plain series motor, having an equal number of effective turns on the armature and on the field coils, and with the magnetic reluctance the same in all directions around the armature core, the field coils, under all conditions of operation, act as an impedance in an alternating-current circuit, while, when the armature is stationary, its coils form a similar and equal impedance. Neglecting hysteretic effects, the armature current and the field magnetism are in time phase and in mechanical position to give to the motor a torque which retains its direction with the reversal of flux and current. When the armature is in motion, there will be generated an electromotive force, which appears at the brushes, and which is in time phase with the field flux, or phase opposition to the armature current. At synchronous speed this in-phase component of electromotive force is just equal to the reactive electromotive force of the armature or of the field, so that, neglecting losses, the power factor would equal the cosine of that angle whose tangent is 2, or the power factor is .446, and the apparent impedance has increased to $\sqrt{1 + .25} = 1.1$ of its stationary value. Thus at synchronous speed the torque, which varies as the square of the current, would be reduced only to 66.6 per cent of its stationary value. If the frequency be lowered, the speed corre-

sponding to synchronism will be correspondingly altered, but the above relations will yet hold true at this speed. It is, therefore, apparent that the unity-ratio, single-phase, plain-series motor with uniform reluctance around the air-gap is unsuited for traction.

It may be shown that a change in the ratio of field to armature turns only slightly affects the relations given above, unless such change be accompanied with an increase in reluctance of the magnetic structure in line with the brushes. By using projecting field poles, thus leaving large air-gaps in the axial brush line, the local inductive reactance of the armature may be materially reduced, even when an increased number of armature conductors is employed, so that at synchronism the armature speed electromotive force may be made large in comparison to the reactive electromotive force of the armature and field circuits, and the power factor will be thereby correspondingly increased with a resultant improvement in the torque characteristics of the machine. Even under the most favorable conditions, it is impossible to reduce the reactance of the armature circuit to an inappreciable value, due to the inevitable presence of the magnetic material of the projecting poles.

The most satisfactory method of reducing the inductive effect of the armature current is to surround the revolving armature winding with properly disposed stationary conductors through which flows current equal in magnetomotive force and opposite in phase to the current in the armature. This compensating current may be produced inductively by using the stationary winding as the short-circuited secondary of a transformer of which the armature is the primary, or the main line current may be sent directly through the compensating coil. In the former case the transformer action is such that the compensation is practically complete, giving minimum combined reactance of the two circuits, while in the latter case the proportion of compensation can be varied at will. It is found that in any case the best general effects are produced when the compensation is complete, and experiments seem to indicate that under such conditions the induced and the forced methods of compensation differ inappreciably for strictly alternating-current operation, but that for direct-current work, where the forced compensation can be used to prevent field distortion and improve the commutation, the latter method is preferable.

Excellent performance of the compensated alternating-current motor may be obtained by using the field coil as the load circuit from the compensating coil employed as the secondary of a transformer, the armature being used as the primary. Under the conditions here assumed, the current in the primary (armature) is in phase opposition to that in the secondary (compensating and field coils), while the field flux is more or less accurately in phase with the secondary current. Since the field flux and the armature current reverse together, the fluctuating torque remains in one direction.

The speed electromotive force is in phase with the field flux, or approximately in phase (opposition) to the armature current. At synchronous speed neglecting losses, the tangent of the angle of lag is equal to the ratio of turns in the field coil to those in the compensating coil, and decreases directly with increase of speed, so that the power factor, the corresponding cosine, can be made quite large for synchronous speed, while it continually approaches unity as the speed increases. These statements, which easily admit of theoretical demonstration, are substantially corroborated by experimental observation.

Tests show that the effect of the short-circuit by the brush of a coil in which is generated an active electromotive force which would tend to decrease the power factor, is counterbalanced by the fact that the field flux lags somewhat behind the secondary current, and the real speed electromotive force, therefore, lags behind the primary current, tending to cause the current to become leading and to increase the power factor. The field flux continually decreases with increase of speed, so that in any case the short-circuiting effect is relatively small.

A slight modification of circuits of the above-described induction series motor, such that the primary and secondary circuits are interchanged, leads to the American Thomson type of repulsion motor. Under starting conditions and up to a speed slightly above synchronism, the performance of each machine is quite similar to that of the other. Beyond synchronism, however, the repulsion motor is in all respects inferior to the induction series machine, due to the fact that with the former motor the short-circuiting effect increases with an augmented rate as the speed increases, though of zero value at synchronism, and becomes prohibitive when speed is much in excess of this value. It may be shown that the facts do not justify the claims for high power factor of the primary current due to condenser effects in the secondary low iron loss in any magnetic circuit, except the armature at synchronism, and superior commutation of this machine, except near synchronism, and that the operation of the repulsion motor is limited to the range between zero speed and synchronism.

A type of alternating-current commutator motor suitable for railway service, which, as a subject for theoretical investigation, is of all machines the most interesting, is found in the repulsion series motor. The circuits of this machine are similar in most respects to those of the plain series motor with uniform reluctance around the magnetic circuit, but it possesses an additional set of brushes shunted upon themselves in mechanical line with the windings on the stator. In distinction to the performance of the compensated series motor, in which the effect of speed is to increase the apparent resistance of the armature which possesses negligible reactance, the armature of the repulsion series motor possesses at starting the major portion of the apparent reactance of the motor circuits, and the effect of speed is to decrease such apparent reactance continually with increase of speed according to a parabolic law, the reactance becoming zero at either positive or negative synchronism, and negative at higher speeds in either direction. While with the series motor the field circuit constitutes at all times the major portion of the reactance of the machine, with the repulsion series motor the field circuit is practically non-inductive at starting, and the effect of speed is to introduce in the coil an apparent resistance which increases directly with the speed, and becomes negative when the speed is reversed.

This behavior on the part of the circuits of the machine is due to the fact that under speed conditions the armature conductors cut the flux produced by the current which flows through the armature coils, the electromotive force thus generated in the armature at the short-circuited brushes being counterbalanced by an electromotive force, due to the rate of change of flux introduced into the armature core by current in this local circuit, such flux generating in the field coils an electromotive force in time quadrature with itself, and hence in phase (opposition) with the circuit current, giving the effect of resistance and causing the generation at the main brushes of an electromotive force in time phase with itself, and hence in quadrature with the circuit current, giving the effect of negative reactance. Experiments fully confirm these theoretical deductions. A disturbing influence is found in the fact that the armature is never strictly without apparent resistance, nor the field coils entirely free from reactance, due primarily to the short-circuiting at the brushes, which becomes quite prominent and predominating above either positive or negative synchronism.

If a resistance be placed in shunt circuit to the field coils of a direct-current series motor, the armature is in general subjected to an increased torque, and the result is an increase in speed. If a similar resistance be placed across the field coils of an alternating-current series motor, the result is entirely different, since the current, which flows through the resistance, is out of phase and leading with respect to the field flux.

Under speed conditions, the current taken by the resistance traverses the armature circuit quite independently of the current which reaches the field coil, the effect being that the resultant line current leads the impressed electromotive force, so that the resistance acts quite similarly to condensance to cause the power factor to become unity, and then to decrease with leading wattless current. It can be shown that the energy thus absorbed is that incidental to the use of the resistance and that for a given current it is unaffected by the speed electromotive force. Thus the current taken by the resistance multiplies into the stationary transformer electromotive force to give the actual watts absorbed, while the same current multiplies into the speed electromotive force to give apparent leading wattless power. Experiment verifies this feature, and shows that even a plain series motor with uniform reluctance around the field core may thus be caused to operate at unity power factor at any speed greater than about one-half of synchronism.

CORRESPONDENCE

CONCERNING ELECTRIC TRAINS ON STEAM RAILWAYS

New York, Oct. 31, 1904.

Editors Street Railway Journal:

The discussion on the electric conversion of steam roads at the International Engineering Congress and your editorial consideration of the subject last week, raises the important question as to the difference, if any, in the rolling stock requisite to handle a heavy suburban passenger traffic and that on the average elevated railway. The latter, with stations from 1000 ft. to 2000 ft. apart, requires the highest acceleration up to the point of application of the brakes, hence the necessity for heavy motors and the multiple-unit system. On the other hand, there seems to be no special demand on the average converted steam road for a greatly increased schedule speed over that possessed by the steam train, except in rare cases where there may be strong competition for the same traffic. It follows then that an acceleration as high or a little higher than the steam locomotive, combined with a fair maximum speed, is all that is necessary when stations are a mile or more apart.

In comparing the service required of the steam road with that of the elevated road, why are any considerable number of motor cars necessary? Why not one motor car instead of three to a five-car train? Do not the cost of maintenance and the increased cost of so much electrical equipment play an important part?

Steam roads are very particular about the cost of upkeep, and rolling stock is maintained in a systematic manner from the time it is new. If the cost, reduced to a locomotive or car-mile basis, rises above what they consider normal figures, they must know the cause. They are not like the manager of a certain new electric road who said his cars were new and would maintain themselves for several years. He would keep oil on the bearings and change wheels when necessary, but that was all.

In a suburban traffic there are two principal peaks in the load curve, morning and evening, the latter being usually much the sharper. The question arises, shall these loads be carried by an increased number of trains, all of the same length, or by increasing the number of cars in the regular trains, or both? Another question is, what is to be the unit train, or rather the minimum train? Shall it be a 40-ton or 50-ton electric locomotive hauling one light combination passenger and smoking car, or a passenger and smoking motor car of the same weight as the above locomotive and equipped with the same power, say about 800 nominal hp; or a combination baggage and smoking car of the same weight and equipment and hauling one light passenger coach?

These are extremely important questions, and vitally affect the economy of operation.

The cost of operation is influenced by many details, among which is the efficiency of the railway motor. Considerable has been said recently on the subject of the efficiency of the new single-phase a. c. motor, and the claim is made that it approaches within a very few per cent of the standard d. c. motor. Why is so much stress placed upon 2 per cent or 3 per cent in the efficiency of any railway motor? It is probable that on an average road the cost of power is about 35 per cent of the total cost of operation, exclusive of fixed charges. It would seem that to reduce the power cost, the best place to start is the coal pile or the boiler room, but the struggle to gain 2 per cent or 3 per cent in the efficiency of the motor has gone on for some years, and while the work is by no means wasted, in the past at least, the mechanical efficiency, i. e., the all around ability of the motor to withstand rough usage and to do the work required without breaking down, has sometimes seemingly been forgotten.

The cost of maintenance on one road using heavy motors once rose so high on account of an infinitesimal air gap, or clearance space for the armature, that the road had to demand a much greater clearance in a new type of motor, and in spite of solemn warnings about the reduction of efficiency, they got it. The principal trouble ceased at once and the cost of maintenance was reduced to normal figures.

One thing to be noted is that the managers of a steam road, after the installation of a heavy suburban electric train service, will demand from their operating department just as heavy a service as it was possible to get out of the former steam locomotives, and if this is not possible the new system will be criticised. In order to meet these conditions the electrical equipment, whether under a heavy car or a locomotive, must be able to withstand all the hard usage a steam locomotive gets, and must continue in service a reasonable length of time without breaking down, so that its reliability becomes unquestioned. The mechanical parts of the electrical equipment should be most carefully designed for the service required, and the same attention given toward their improvement as has been given the running gear of a steam locomotive for many years.

Few steam railway men are ready to acknowledge the capabilities of the electric motor until they see it do the work of a steam locomotive. An interesting example, or perhaps we may call it an object lesson, was furnished some years ago. A severe snow storm began, and a steam locomotive was hurriedly ordered to haul the electric train, and the power shut off. In a short time the locomotive became stalled; the power was then thrown on and the motor car pushed the locomotive through the drifts and cleared the line, and afterward kept it open. It is needless to say there was considerable surprise from some observers; not so much from others.

The time will soon be at hand when the largest steam roads will be able to decide for themselves what the general make-up of their electric trains should be to most safely and economically handle their service. It is the opinion of some that the advantages of an electric locomotive hauling a train of light, but strong coaches, are many. As regards safety, it is possible to localize all heavy electric current in the locomotive, thus preventing those electrical displays, either in or under the car, which are so sure to cause a panic among the passengers. If a protected third rail or some overhead structure be used, a current-collecting device of sufficient capacity could be carried by the locomotive, obviating the necessity of using a main cable through the train for collectors on each car. The flexibility of the service is very great, due to the variable number of coaches, from one up to six or eight. It seems probable that such a service could be operated at less cost, including maintenance and fixed charges, than is possible by any other arrangement of trains.

Some will claim that it is far better policy to put the electrical equipment under a heavy combination coach and cut out the locomotive, on the score of less power consumption. When it is realized, however, that a train consisting of an electric locomotive and two coaches would probably only consume 10 per cent more power than the same train without the locomotive, one car being a motor car, the argument loses considerable force, especially when the other advantages of the locomotive are considered.

The number of electric locomotives necessary to operate a given service is much smaller than that required with steam power, owing to the very large daily mileage of which they are capable. The same thing applies to the heavy motor car. The number is also very much smaller than the number of motor cars required in a service operated by multiple-unit trains. An electric locomotive is easily able to maintain a daily mileage of 500 in eighteen or twenty hours out of the twenty-four. In the vicinity of New York it should cost an average of 21 cents to operate a steam locomotive a mile, including coal, water, oil, waste, wages and maintenance. With power costing 1 cent per kw-hour at the motors, it should cost a little less than half the above to operate the electric locomotive, excluding fixed charges in both cases. To this is only to be added the wages of the train crew and the maintenance of the passenger coaches to arrive at the cost per train-mile. It should be remembered, however, that the high daily mileage of the locomotive is responsible for some of this reduction. In other words, the electric locomotive does not stand idle for any considerable length of time.

EDWARD C. BOYNTON.

THE FIRST ELECTRIC RAILWAY ON THE PACIFIC COAST

SEATTLE, RENTON & SOUTHERN RAILWAY COMPANY,
Seattle, Oct. 19, 1904.

EDITORS STREET RAILWAY JOURNAL:

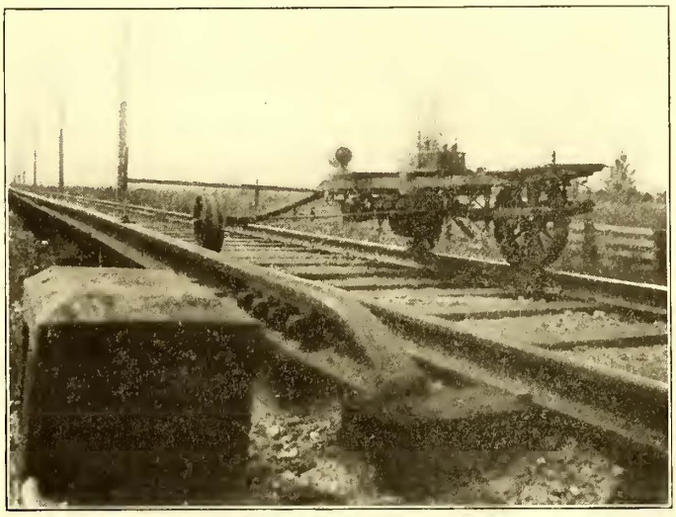
In the article in your issue of Oct. 8, 1904, on the early electric railways of the Pacific Coast, I believe an unintentional error was made where the author speaks of the first electric roads in the Pacific States. I was one of the first, if not the pioneer in the electric railway development on the Pacific Coast, and believe that, with the possible exception of the Daft experimental line at Los Angeles, referred to in your article, which may or may not have been of earlier date, the first successful electric line on the coast, and the first built west of Omaha, was installed in 1888 in this city by the Seattle Electric Railway Company, of which I was the president and manager. My recollection is that Mr. Daft went from here to Los Angeles after our line was in operation. The road built by the Seattle Electric Railway Company has been in continuous and successful operation from the day the road was opened to the present. It was in operation for a year or more before any lines were started in California. They were preceded, as I remember, by lines in Victoria, B. C.; Spokane and Tacoma, all under the same system, which was the Thomson-Houston.

F. H. OSGOOD, President and Manager.

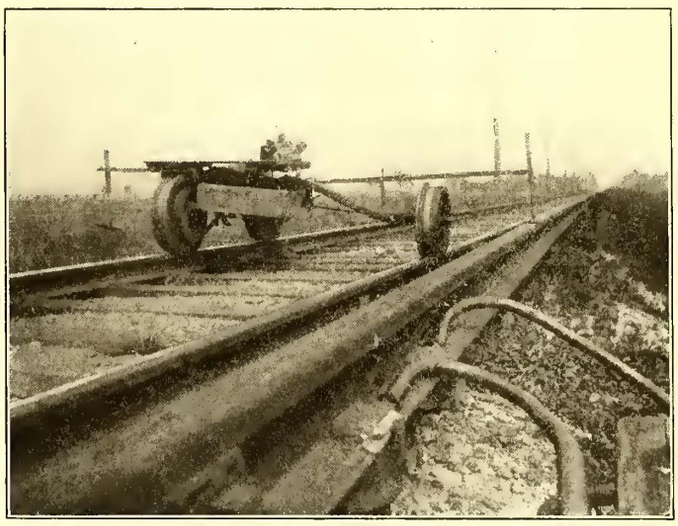
The Toledo interests who make the statement that they are willing to make a better proposition to the City Council of Toledo for franchises than that of the present company operating in the city, the Toledo Railways & Light Company, have incorporated the Toledo Transit & Light Company, capital stock $10,000; incorporators: C. E. B. Lamson, J. M. Ormond, E. P. Hull, Charles Fox, C. A. Thatcher. The hopes of the company for recognition from the Council are blasted temporarily by the announcement of the city solicitor that before the company can make an offer for the franchises of the old company it must present a petition signed by the majority of the foot frontage along the streets on which it proposes to operate.

THIRD-RAIL WORK CAR

The two accompanying illustrations show a third-rail work car recently built and in regular use by R. J. McClellan, electrician of the Puget Sound Electric Railway, of Kent, Wash. The car is an ordinary railway velocipede with the handles and driving gear removed. A 250-volt ½-kw motor is suspended and belted to the front wheel, as shown. The motor is controlled by three suitable taps on a Climax wire resistance frame on the outside. On straight track a speed of 36 miles per hour has been maintained. The car can easily be removed from the track by one man. It is used by Mr. McClellan and his assistant in their inspection work.



REAR VIEW OF THE THIRD-RAIL WORK CAR USED ON THE PUGET SOUND ELECTRIC RAILWAY

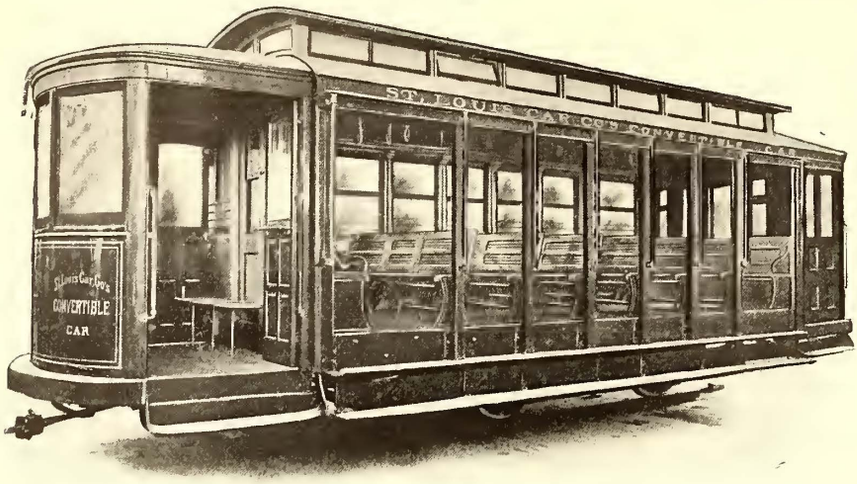


FRONT VIEW OF THIRD-RAIL WORK CAR

Traffic arrangements have been made between the Indianapolis & Northwestern and the Indianapolis & Eastern Traction Company, and tickets are now on sale good for all points between Lafayette, Ind., and Dayton, Ohio. By the agreement the tickets are good over the above-named lines, the Richmond Street & Interurban Railway and the Dayton & Western line. These tickets are being sold for $4.45 for the round trip, which is practically the price of an excursion ticket on the steam road. A large party went from Crawfordsville to Dayton on the first day of their issue. The volume of traffic between Indiana and Ohio is very heavy.

THE NEW ST. LOUIS CONVERTIBLE CAR

A short time previous to the recent street railway convention, the St. Louis Car Company surprised the electric railway fraternity by placing a convertible car in its exhibit in the Transportation Building. Three views of this car are reproduced herewith. One of these shows the car as equipped for winter service. Another shows one side of the car open ready to be operated as a regular summer car, with cross seats the full width of the car, and a running board. The interior view shows the front seats of the car arranged for summer, and the rear seats arranged for winter. If the management prefers, of course the center aisle arrangement can be retained during the summer and the running board can be dispensed with. From the interior view it will be seen that the seats along one side of the car have backs to which there is a hinged attachment, which can be brought out to form the back of that part of the seat which occupies the aisle in summer. To convert from an open to a closed car, the running board is folded up and the arm rail, which is a bar supported at either end by counterbalancing weights, is brought down from the roof to the level of the window sills. This bar is the key to the situation, as it were, and is very strongly constructed of steel and wood. The removable side panels of the car fit in between this bar and the car floor, and the window sashes fit in above the bar.

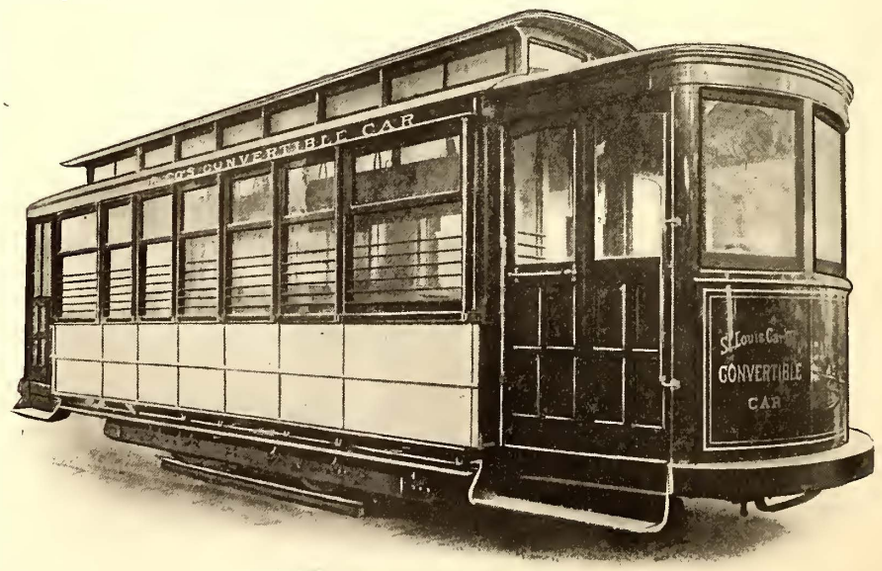


THE NEW CONVERTIBLE CAR WHEN OPEN

DETAILS OF CONSTRUCTION

The side sills of the car are 5-in. x 10-in. yellow pine, each sill being reinforced by one 10-in. channel iron. These sills have malleable iron pockets secured by ½-in. carriage bolts, which pockets receive the side posts. The side posts are secured in the pockets by ½-in. carriage bolts passing through the pocket, side post and sill, thus fastening the channel iron of the sill to the side posts in a rigid manner. The corner posts and door posts are also secured by malleable iron pockets fastened to the end sills in the same way. The use of these pockets does away with the necessity of mortising holes in the side and end sills to receive the posts of the car. The side posts of this car are constructed stronger than those used on present types of cars, because of the peculiar requirements of a convertible car. These posts are of 3-in. x 3-in. ash. The outer sides of these posts are grooved to receive a 2-in. x 2-in. x 5-16-in. T-iron. This T-iron is inserted in the groove of the side post and screwed to it with iron screws in such a way as to leave the smooth, flat surface of the T-iron exposed on the exterior of the car. This surface is necessitated by the combination sliding guard and arm rail. This arm rail slides up and down between the grab handles and the side posts, and is attached to the grab handles by means of brass brackets which slide over the grab handles. This arm rail is made of 2-in. x 2½-in. x 5-16-in. angle iron running the full length of the car. This continuous arm rail, extending from one end of the car to the other, is one of the essential features of this car not provided on other types of convertible car which have been on the market in recent years. It is operated by means of sliding weights in the pockets in the corner posts. These weights are attached to the arm rail by ¼-in. wire cables passing through a small opening in each corner post and over a large brass pulley. The arangement is similar to the weights used in house window sashes. The panels or sections below the arm rail are made of 4-ply veneer 9-16 in. in thickness, covered with sheet aluminum, making them light in weight and weather-proof. The length of these panels depends on the distance which the purchaser

VIEW OF INTERIOR, SHOWING FRONT SEATS ARRANGED FOR SUMMER USE AND THE REAR SEATS ARRANGED FOR WINTER



THE NEW CONVERTIBLE CAR WHEN CLOSED

specifies between the centers of side posts. They are 30 ins. high and extend from the bottom of the side sills to the under side of the sliding arm rail. The outside of each panel is divided into two equal spaces by a strip ½ in. thick and ⅛ in. wide, screwed on top of the aluminum sheathing by iron screws. At the center of each side post 1¼-in. x ⅛-in. beveled edge steel straps are placed vertically between the bottom edge of the sliding arm rail and the strip dividing the panel just mentioned. The side of the car, therefore, looks very similar to an ordinary closed car. The panels or side sections are held in place by a small lip cast on the bottom of each side post pocket. In the lower edge of the panel there is a small groove at each side post that fits over the lips mentioned. To hold the panel at the top, there is a rabbet at the bottom of the arm rail, which is in the form of an oval molding, projecting about ⅜ in. below the bottom edge of the arm rail. The panels fit directly under the arm rail, and this ⅜-in. oval molding covers the opening between the panels in the arm rail. As the side posts of the car fit into the pockets before mentioned, there is a space of about 3 ins. between the bottoms of the panels and the outside of the car sill. This space is filled by a hinged door of sheet steel attached to the panels. The window sash on this car is placed in a metal frame or slide. The arrangement of sashes is difficult to describe clearly, and it will be sufficient to say that the windows can be removed quickly without the use of a screw-driver. To convert the car from closed to open, the metal frame, with the window grating and sash combined, is lifted out of each window opening and placed on a little truck which is furnished by the car builders. This is of suitable size to receive these metal frames and sashes and the different panels or sections. After the sash is taken out, the sliding arm rail is pushed up to the under side of the letter board. The counterweights are sufficient to hold it there. The panels can then be lifted out and placed on the truck built to receive them.

METALLIC PHOSPHORUS FOR COMBINATION WITH BABBITT METALS

The New Era Manufacturing Company, of Kalamazoo, Mich., makes a material known as metallic phosphorus, which is used as a tempering agent for low-grade babbitt metals. Different brands and grades of babbitt combine with different proportions of metallic phosphorus to produce the best results. This is due to the fact that the principal difference between the low and high-grade babbitts is caused by the different quantities of tempering agents contained by them. Hence, the better the quality of the babbitt, the less metallic phosphorous is required.

In high-grade babbitts, such as Magnolia Metal, Copper Genuine, etc., 2½ per cent, or one-half lb. of metallic phosphorus is required per 19½ lbs. of babbitt. In medium-grade babbitts, such as No. 1, Extra, Duro, and other anti-friction graphite metals, ranging in price from 12 cents to 10 cents a pound, 5 per cent, or 1 lb., is recommended per 19½ lbs. of babbitt. For commercial, No. 4 babbitt, 2 per cent, or 2 lbs., is used with 18 lbs. of babbitt.

This last combination is said to give the most economical and desirable service that can be secured. It is especially adapted for heavy bearings and electric railway service, and its cost is about one-third of high-grade babbitt metals giving similar service. No extra trouble or expense is caused by using this tempering agent, as it may be added when the babbitt metal is melted for use.

The Dayton & Troy Electric Railway, in Ohio, is thoroughly alive to every possibility of creating traffic. It gave an all-night service on election day and displayed the returns in all its stations.

INCANDESCENT LAMP SOCKET RING

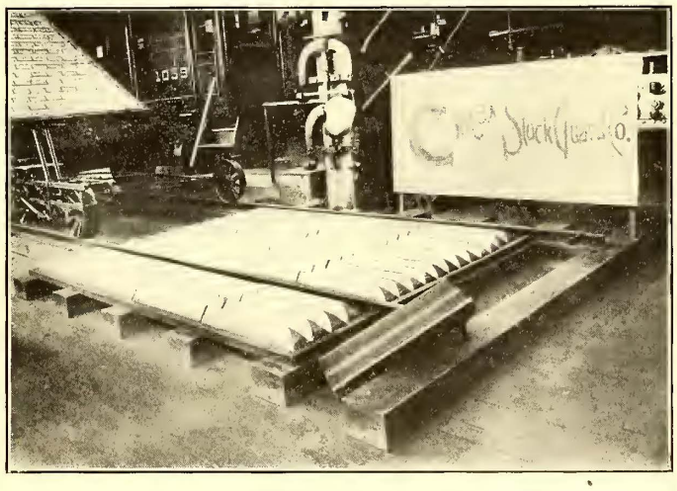
An "electrobestos" incandescent lamp socket ring is a new device which the H. W. Johns-Manville Company, of New York, has brought out as being especially suitable for electric railway service. Several advantages over rings now in use are claimed for the new ring. "Electrobestos" is an asbestos product and the rings made from it are fireproof and practically non-breakable. They will not melt like rubber, neither will they break through vibration or because of atmospheric changes as do porcelain rings. These features alone make them worthy of general use. Their non-conducting properties have been established in a break-down test of 2000 volts.

INCANDESCENT LAMP SOCKET RING

THE ST. LOUIS EXHIBIT OF THE CLIMAX STOCK GUARD COMPANY

The accompanying illustration is a view of the exhibit of the Climax Stock Guard Company, of Chicago, located in the Transportation Building, aisle J, post 95. Here the company has laid a section of track in combination with its well-known Climax cattle guard, so that visitors can examine the construction and advantages of the latter. This guard is giving excellent service to-day on scores of both steam and electric railways, and owing to the fact that it is manufactured from vitrified shale clay, it is practically indestructible.

The Climax guard has a perfectly smooth glazed surface with inverted "V" shaped ridges, as this shape has proved to be the most practical and effective. The guard never needs painting, repairing or attention of any kind, nor does it warp or get out of place, as its own weight keeps it in position. It is always free from snow, water, dirt and rubbish of all kinds, because, having a perfectly smooth surface, the draft of passing trains is sufficient to keep it clean. Unlike



ST. LOUIS EXHIBIT OF THE CLIMAX STOCK GUARD COMPANY

other guards, this one does not require to be taken up at least twice a year that the weeds growing through it may be cut, as no weeds grow through this guard.

Other meritorious features of this guard are: no special preparation required to place it in the track beyond the possible respacing of five ties; readily adapted to any gage and length of guard desired without the use of any but ordinary section hands; broken blocks easily replaced; no liability of entanglement of dragging brake rigging, compression bars, etc.

TICKET OFFICE AND TOILET ROOM HEATERS FOR THE NEW YORK SUBWAY

For the heating of the subway ticket offices, the engineers of the Interborough Rapid Transit Company have adopted the Prometheus heater, shown in Figs. 1 and 2. The former illustrates the exterior of the heater and the latter its internal construction.

The heater consists essentially of a cast-iron box 16 ins. wide, 17 ins. high x 4½ ins. deep, supported on two sets of legs. As will be seen in Fig. 2, the air is admitted through the bottom of the heater, and escapes, after being heated, through an

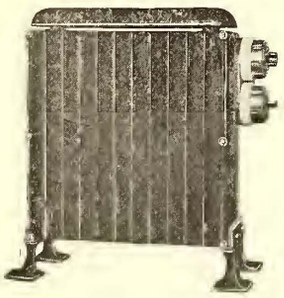


FIG. 1

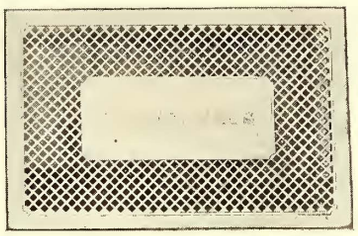


FIG. 3

opening at the top of the heater, which is covered by an iron canopy, leaving an air space of 1 in. between the box and the canopy. To prevent any possible overheating of the box which might cause scorching of clothing, a number of slots are provided on the back of the heater to facilitate the escape of heated air.

Two 500-volt, 10-amp. switches are mounted on a special support at one end of the heater, and by means of these switches one-half of the full heating equipment of each heater may be used. A ribbed plate is attached to the front of the heater by means of screws, and by simply taking off this plate the interior of the heater may be inspected, as shown in Fig. 2. The electric equipment proper consists of eight iron-clad Prometheus heating units supported on blocks of porcelain, which are attached by means of studs to the back of the box. The main circuit wires leading to the heater are passed through a special

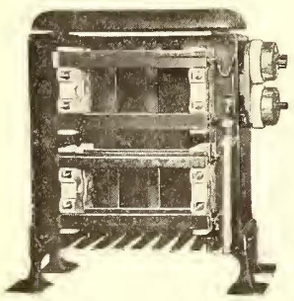


FIG. 2

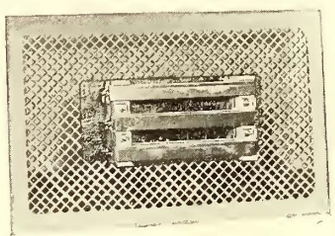


FIG. 4

porcelain bushing and a porcelain tube at the one end of the heater, as shown, where they are connected to copper lugs. So simple is the construction of the heater that the entire electric equipment can be taken out and replaced in ten minutes.

The Prometheus units each have a capacity of 100 volts, so that the total capacity of the heater is 800 watts. Each unit is 1¼ ins. wide x 12 ins. long x ⅛ in. thick, and consists of strips of mica upon which the conducting metal has been mechanically deposited, or, more strictly speaking, "fired."

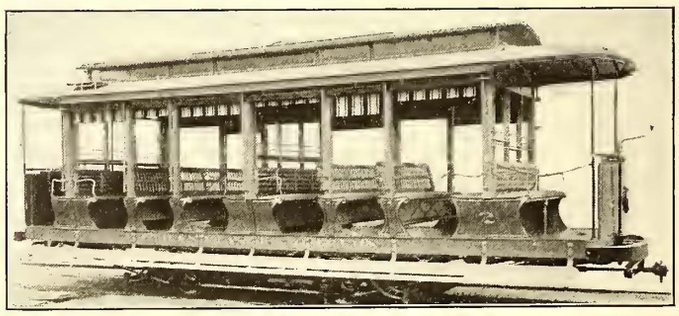
The heaters which have been adopted for use in the toilet rooms are shown in Figs. 3 and 4, the former showing the front and the latter the back of the heater. These wall plates, which measure 14 ins. x 28 ins., and which are finished in dull nickel, are attached to cast-iron boxes, built into the wall, in such a manner that after the heater is in place the front of it is flush with the slate covering of the walls.

The electrical construction of these heaters is similar to that of the ticket office heaters, the same parts being used for both types of heaters. A number of these wall heaters is equipped with six iron-clad units, giving a total capacity of 600 watts, and another set of plates is equipped with four units having a capacity of 400 watts. There are four of these heaters in each toilet room, and they are controlled by switches in such a manner that the heaters may be turned on and off in sets of two, or one-half of each heater may be used at any one time in conjunction with one-half of any other heater. The plate being of the grid pattern, permits of a thorough circulation of the air, preventing the overheating of the plate. These two types of heaters were specially designed for the Interborough Company by Max Loewenthal, electrical engineer of the Prometheus Electric Company.

INTERESTING OPEN CARS FOR TORREON, MEXICO

Among the number of open and closed cars lately furnished to the Tranvias De Torreon, Mexico, by the American Car Company, were several of the type shown in the accompanying illustration. It will be noticed that these cars have the unusual feature of a bulkhead at the center, the purpose of which is to divide the car into first and second-class compartments. The seats in the first-class compartment are covered with cane, and the seat levers are of bronze, while the seats in the second-class compartment have ash slats and malleable iron levers. The cars are for use in the city of Torreon, which is one of the principal commercial and railway centers of Northern Mexico.

The length of the cars is 28 ft. ¾ in. over crown pieces, and



A DOUBLE-CLASS OPEN CAR FOR THE TRANVIAS DE TORREON

20 ft. 1⅝ ins. over corner posts. The width over the sills, including the sill plates, is 6 ft. 3 ins., and over the posts at the belt, 7 ft. ½ in. The sweep of the posts is 5 ins., and the distance between the centers of the posts, 2 ft. 7 ins. The side sills are 3¾ ins. x 7 ins., with 7-in. x ½-in. sill plates on the outside. The corner posts are 3⅝ ins. in thickness, and the side posts, 2¾ ins.; height of steps, 17⅝ ins., and of risers, 16 ins. Among other furnishings of Brill manufacture are platform gongs, conductor's bells, brake handles, round-corner seat-end panels, angle-iron bumpers and draw-bars. The trucks are of the No. 21-E type, and have a wheel base of 7 ft. 6 ins., and 33-in. wheels. Two 35-hp motors are used to each truck.

A special car on the Dayton & Troy and the Western Ohio lines recently made a run from Dayton to Lima, a distance of 81 miles, in two hours and four minutes. The return run was made at night in two hours and twelve minutes. The first mentioned run was twenty minutes faster than the "Flyer" on the parallel steam road. The regular limited cars on the electric lines make this run in two hours and thirty minutes, which is claimed to be the fastest electric schedule in the country for the distance.

NEW CARS FOR THE UNION RAILWAY COMPANY, OF NEW YORK

The Union Railway Company, of New York, has recently received fifty cars of the type illustrated from the J. G. Brill Company for use on a section of the lines between the Harlem River and Mt. Vernon. The company operates all the electric lines in the Borough of Bronx and the lower part of Westchester County, connecting all the principal towns, including Tarrytown, White Plains, Mamaroneck, Yonkers, New Rochelle and Mt. Vernon. The system connects with the surface, elevated and subway lines of the Borough of Manhattan, and has done much to develop the territory between the Hudson River and Long Island Sound, to a distance of 20 miles north of the Harlem River. The population of this territory has increased enormously in late years, and the newer sections of the system have paid well from the first.

The new cars are similar in size and design to those built by the Brill Company for the Metropolitan Street Railway, and are mounted on the same type of truck, the "Eureka" maximum traction. Although the cars make long runs, the majority of the passengers carried are "short-trippers;" therefore the type is such as is best adapted to short headway and frequent stops. The figures which follow show that the car body is carried unusually low by the type of truck on which it is mounted, and, together with the longitudinal seating arrangement, facilitates the movement of the passengers in and out, and reduces the time of stops to the minimum. The cars are lightly constructed to economize power, but with a wide margin of strength over the maximum load. The upper truss rods are shouldered 19¼ ins. above the floor, and deep under trusses are used, which are carried over the cross joists at points close to the truck bearings and brought through the end sills, thereby serving as tie rods as well as under trusses. The interior of the cars is finished in ash, with ceilings of bird's-eye maple, making a bright and attractive appearance. The sash stiles are brass. The seats are composed of perforated veneer and covered with Wilton carpet.

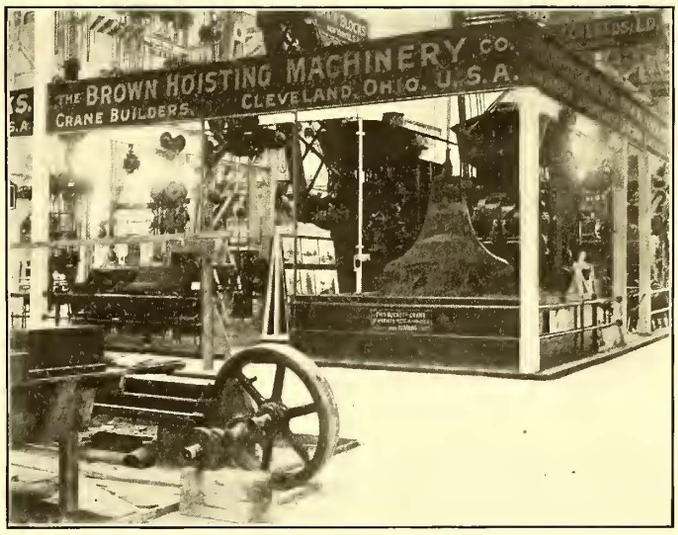
The general dimensions of the car are as follows: Length over the end panels, 28 ft., and over the crown pieces, 36 ft.; width over the sills, 6 ft. 6 ins., and over the posts at the belt, 7 ft. 6 ins. The height from the under side of the sill over the trolley board is 8 ft. 6⅞ ins., and the sweep of the posts, 6 ins.;

CAR WITH MAXIMUM TRACTION TRUCKS FOR SUBURBAN SERVICE IN NEW YORK AND VICINITY

centers of posts, 2 ft. 9 1-32 ins.; thickness of corner posts, 3¾ ins., and of the side posts, 2 1-16 ins. The side and end sills are 4¾ ins. x 6¾ ins. in size, and the center sills, 3½ ins. x 5⅞ ins., spaced 11¼ ins. from the side sills. The tread of the platform steps is 12⅞ ins. from the rail; from step to the platform, 12 ins., and from the platform to the car floor, 8¼ ins. The cars are equipped with angle-iron bumpers, ratchet-brake handles, folding gates and other specialties of the builders' make. The truck wheel base is 4 ft.; wheel diameters, 30 ins. and 20 ins.; axle diameters, 4¼ ins. and 3½ ins. The motors are 55 hp each. The weight of the car with trucks, but without the motors, is 18,390 lbs.

THE BROWN HOISTING MACHINERY COMPANY'S EXHIBIT AT THE ST. LOUIS EXPOSITION

The Brown Hoisting Machinery Company has a very interesting exhibit in Machinery Hall, showing two locomotive cranes, one of 15 tons and one of 10 tons lifting capacity. Both of these cranes were used by the Exposition Company in installing heavy exhibits, and will be used again when the Exposition is over for dismantling and reloading exhibits. The 10-ton locomotive crane has a 30-ft. boom, and is equipped with a



A VIEW OF THE BROWN HOISTING MACHINERY COMPANY EXHIBIT IN MACHINERY HALL, ST. LOUIS

Brown hoist two-rope grab bucket, and is shown in operation shoveling iron ore from a 12-ft. circular pit under the crane. The operation of this crane seems very interesting, judging from the large crowds which gather to see it in operation each day.

In addition to these two locomotive cranes, the Brown Hoisting Machinery Company exhibits at St. Louis a full line of its overhead trolleys and tramrail, including plain and geared trolleys and electrically operated trolleys, the latter in operation.

This company is also distributing to every one visiting its exhibit a pack of crane cards, consisting of sixteen colored cards in each pack, each card descriptive of a standard type of crane built by it. These cards were gotten up especially for the St. Louis Exposition, and are free to all who will call in person at the exhibit for them.

The Dayton & Western Traction Company has instituted a new limited service between Dayton, Ohio, and Richmond, Ind., to be known as the "Interstate Limited.' The car will have a schedule of one hour and twenty-five minutes for the 40 miles between terminal cities, and there will be three trips from Dayton to Richmond and two trips from Richmond to Dayton each day. The schedules are arranged to make connection at the terminal cities with cars for Indianapolis, Ind., and Lima, Ohio. Thus, the car leaving Dayton at 7:30 a. m. will reach Richmond at 8:55 and connect with a car for Indianapolis leaving at 9 and reaching that city at 12 noon, or four hours and twenty-five minutes for 108 miles. Leaving Richmond at 9:30, connection may be made at Dayton at 11:20, arriving at Lima at 1:52 p. m., making an actual regular schedule of four hours and twenty-two minutes for 120 miles. Thus a passenger from Indianapolis to Lima could cover the 190 miles in seven hours, with but two changes of cars. For this service the Dayton & Western Company has purchased from the Barney & Smith Car Company, of Dayton, a special buffet parlor car. On this car, which will leave Dayton at 11:20, a buffet luncheon will be served, removable tables being provided for this service.

NEW HOSE BOX FOR ST. LOUIS TRANSIT COMPANY

In the Street Railway Journal of Feb. 6, 1904, a complete account was given of the storage air-brake system installed by the St. Louis Transit Company for its entire equipment. One of the chief reasons given for the installation of this, rather than the independent motor compressor system, was the great economy of maintenance secured by the former system. A single weak point, however, served to rather increase this item.

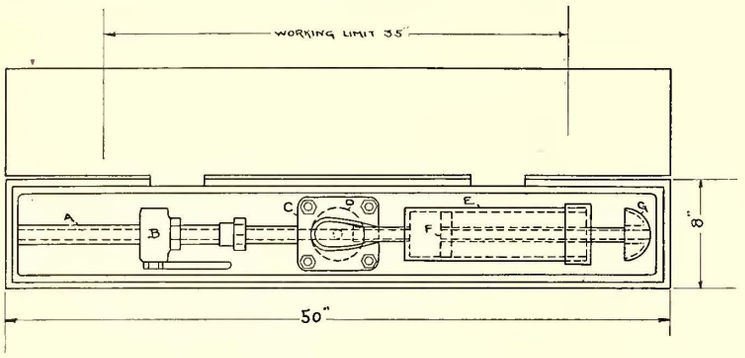


FIG. 1.—PLAN VIEW OF HOSE BOX

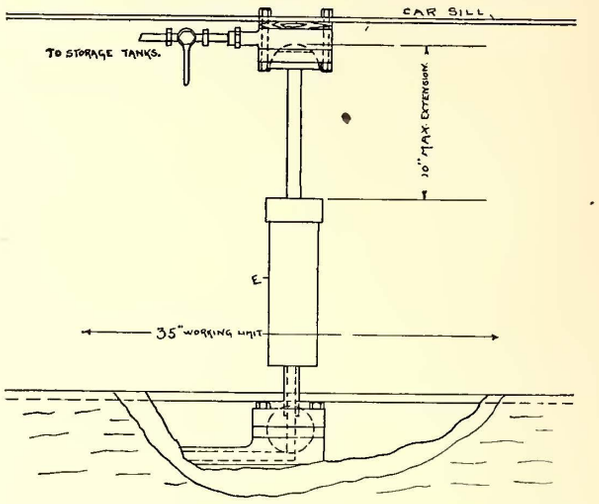
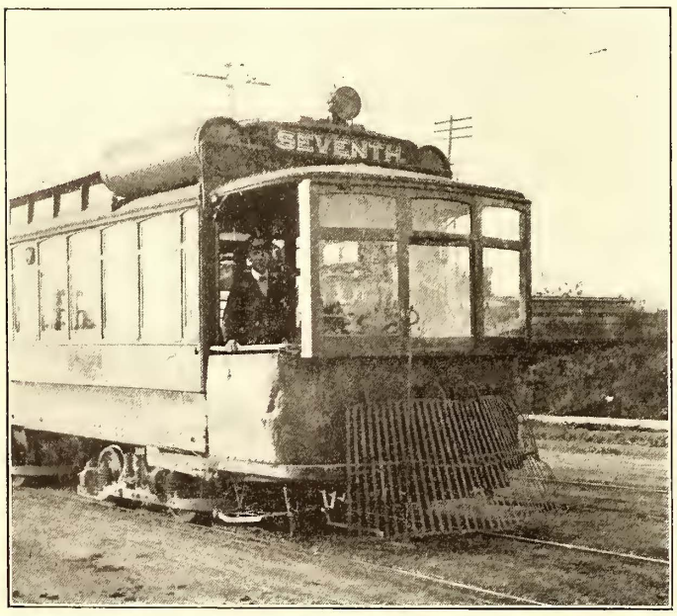


FIG. 2.—SIDE ELEVATION OF HOSE BOX, IN USE

Trouble was experienced with the rubber connections used in the hose box. Besides the expense due to the proverbial short life of the hose itself, there has been the loss occurring from bad leaks during rush portions of the day, before repairs could be made.

With an energy and ingenuity thoroughly characteristic of it, the Transit Company has succeeded in overcoming this difficulty and in providing a charging apparatus constructed entirely of metal parts in a way that insures long life and, as trial has proved, satisfactory operation.

Fig. 1 shows a plan view of the new hose box. A is a pipe



CAR ON SEVENTH STREET LINE, ST. LOUIS, WITH COMPRESSED AIR TANKS ON ROOF

from the storage tanks leading to the main valve B, and going thence to a packing box C, which contains the ball and socket joint D. In the position shown in this figure, air cannot pass through this joint, even when B is open, since the passage through the ball leading to the cylinder E does not connect up with the socket entrance port. When the cylinder is in a vertical position, however, air may pass through into E, forcing the piston F upward and rushing out at G. The operation may be better understood from an examination of Fig. 2. As the piston rises the semi-spherical head G enters a receiving box, bolted to the car sill and connected to the car tanks, as shown. After charging, the car and box valves must be closed as usual, when the cylinder may be dropped into the box by hand. If, as is often the case, a motorman after filling should turn off the valves, but forget to uncouple the connection, the apparatus will drop back into place of its own accord; an obvious advantage over the former method where a similar action would have totally destroyed a hose.

The arc of travel of the charging head and its variable extension permit a car to charge within a limit of 35 ins. This limit is marked on the box itself and on a suitable adjacent point. It may be noted in passing, that the average city motorman will consistently stop within 6 ins. either side of the central point.

The parts of the apparatus are of cast iron, with wrought iron piping, except the ball of the socket joint, which is made of brass. The design is such that the same patterns may be used for car and for hose box parts.

A first trial of the apparatus was made on the Tower Grove Park line Sept. 2, 1904. A few minor faults developed, which have since been corrected, and car 2600, equipped with the receiving box, is now running regularly over the route. After a month's service, Mr. O'Brien, master mechanic of the company, reported that the scheme was a decided success.

The third illustration shows an interesting disposition of the compressed-air tanks employed when sufficient space under the car body is not available for the compressed-air reservoirs. This car is one operating on the Seventh Street line of the St. Louis Transit Company, and, as will be noticed, the reservoirs are mounted on the roof.

A special car of the Dayton & Western Traction Company, carrying fifty stockmen, guests of the new Union Stockyards Company, of Indianapolis, left Dayton, Ohio, at 5:30 o'clock a. m., Wednesday, Nov. 2, and reached the Indianapolis terminal station, 108 miles distant, in four hours. The car was run over the Dayton & Western to Richmond, over the Richmond & Interurban to Dublin, and from Dublin to Indianapolis over the Indianapolis & Eastern Traction Company's line. A stop of thirty minutes had to be made at Richmond to remove the trolley from the top of the car in order to get under the C., C. & L. Railroad bridge over the tracks of the electric railway. The party was accompanied by E. H. Merrill, Jr., general passenger agent of the Dayton & Western. Lecturers were furnished by the Richmond & Interurban Company and the Indianapolis & Eastern Company.

FINANCIAL INTELLIGENCE

WALL STREET, November 9, 1904.

The Money Market

The money market this week was an extremely dull and uninteresting affair. The tone was decidedly easy, and in spite of the heavy loss in cash sustained by the banks, on account of last week's exports of gold to Paris, and their operation with the sub-Treasury, notes for all maturities continued to show a declining tendency. The demand for funds was confined to the call loan department, which was fairly animated at rates ranging from 2 to 2½ per cent, the average for the week being about 2 per cent. In the time loan branch business was practically at a standstill. The inquiry from stock commission houses and from mercantile sources was practically nil, notwithstanding the continued activity in the securities market and the marked improvement in the general business situation throughout the country. Sixty-day funds, which a week ago commanded 3¾ per cent, were obtainable at 3½ per cent, and accommodations for the longer periods were obtainable at the same rate. Offerings, however, especially for five and six months, were not larger, there being no disposition on the part of banks and trust companies to press their funds, in the hope of obtaining better returns after the national election. The commercial paper market was considerably less active. The supply of choice paper was extremely small, the demand from merchants having been pretty well satisfied. The inquiry for the choicest grades continued brisk, and all offerings were readily absorbed on the basis of 4 to 4½ per cent. The bank statement published a week ago made a decidedly unfavorable showing, but was just what the financial community had expected. Cash decreased $8,751,700, which was due in large part to the gold shipments, and which, together with a contraction in loans of $2,407,100, resulted in a decrease of $6,681,250 in the surplus reserve. The reserve is now $10,112,400, as against $16,793,650 the previous week and $5,394,225 in the corresponding week of last year. Sterling Exchange supplied a sharp reaction, prime demand bills declining 75 points to 4.864, thus eliminating the possibility of further gold shipments, at least for the present. Discount rates at all of the leading European centers remain steady and practically unchanged from those ruling at the close of a week ago. The indications at the close point for a continued easy market, in view of the return movement of currency to this center, which is now under way.

The Stock Market

There was no material change in the position of the stock market during the past week. The volume of business was somewhat smaller in the preceding week, and although the dealings were accompanied by more or less irregularity in prices, the undertone held remarkably strong. At the opening prices broke sharply, upon rumors of a possible clash between England and Russia, but subsequently the market removed from the heavy selling for European account. Later, prices continued to show an advancing tendency, reflecting to a great extent the improved traffic returns and the marked improvements in the general business situation. The industrials were the leaders of the market in point of strength, but in many of the railroad issues prices scored further sharp gains. Tennessee Coal and Iron was conspicuously strong, scoring a net gain of 9⅛ points, while the United States Steel Corporation reached the highest prices attained in more than a year. The common, after selling as high as 26⅛, eased off to 23⅞, while the preferred stock made a net gain of 2½ points. The rise in these issues was based upon the positive reports as to the revival of business in the iron and steel trade. The railroad and many of the speculations also showed pronounced strength. At the close there was considerable profit-taking, evidently with the intention to discount the result of the election, but, in spite of this selling, the closing was strong and near the highest prices of the week.

The local traction issues were fairly active and strong, under the lead of Brooklyn Rapid Transit, which scored a net gain of 3 points, to 68¼. Metropolitan Securities rose 1¼ and Metropolitan Street Railway enjoyed a similar gain. Manhattan Railway rose nearly 2 points on moderate dealings to 162⅛.

Philadelphia

New high records have been made by several of the Philadelphia specialties during the week. Consolidated Traction of New Jersey, on the purchase of 1300 shares, advanced from 75 to 77¾. There was nothing new in the affairs of the property to account for this rise; the transactions were set down for the most part to investment buying. Union Traction rose 2 points to 59, establishing a new high level also for that stock. Philadelphia Traction changed hands between 97⅝ and 97⅞. Rapid Transit was well bought between 16 and 16¼, the application to list the shares on the New York Exchange having considerable weight with speculative sentiment. American Railways advanced from 49⅜ to 50⅛ on fairly active trading. Philadelphia Electric reached 9 3-16, but later receded to 9. Philadelphia Company common continued conspicuously heavy, declining to 41¼ after an early rise to 42⅛. The preferred was steady around 47. There were sales of Railways General at 3 1-16 and 3, and Thirteenth and Fifteenth Streets Passenger at 306.

Chicago

The Metropolitan and Southside Elevated figures for October show a loss compared with the figures of the corresponding month last year, but the Northwestern showed an increase. The Metropolitan was expected to make an increase on account of the opening of its new down-town terminal, but its decrease, in spite of this, was on an average of 2800 fares a day. The fact that October this year had less special entertainments than a year ago was responsible for the smaller showing of the roads mentioned.

Judge Grosscup has entered an order authorizing the receivers of the Union Traction Company to replace $400,000 of the receivers certificates that matured Aug. 1, 1904, with new certificates for the same amount to run until Feb. 1, 1905, with the privilege of extension until Aug. 1, 1905. The original certificates took up $400,000 of the bonds of the Chicago Passenger Railway Company which matured Aug. 1 last. In July the receivers found themselves unable to cancel the certificates and petitioned the court to reissue them.

Trading in the Chicago tractions was very light during the week and confined to a few issues. All business in the Union Traction issues has apparently been transferred to New York, where the stocks have been rising sharply. In Chicago there were no dealings in them on the week. City Railway broke to 180 on the sale of 200 shares, but later rallied to 183. One hundred West Chicago sold at 45, after which 110 shares were taken at 47¼. An odd lot of North Chicago went at 75, and small blocks of Oak Park Elevated preferred at 26 and 25½.

Other Traction Securities

Tractions were comparatively quiet at Cincinnati last week. About 800 shares of Detroit United sold at 75 to 76½, closing at 75½. Cincinnati Street Railway showed a slight decline, a number of sales being made at 143, but strengthening at the end of the week to 144⅜; sales about 700 shares. Cincinnati, Newport & Covington preferred sold at 92½ and 93½, sales less than 100 shares. The common brought 31½ on a small sale, and the first 5s 110½ for $5,000 worth. A block of Indianapolis Street Railway 4s sold at 85⅛. A fractional lot of Toledo Railways sold at 25½, and there was a sales of 100 shares of Cincinnati, Dayton & Toledo Traction at 18¼, the first in many months, a point considerably lower than last sale.

Northern Ohio Traction & Light was again active in Cleveland and advanced from 16 to 16½. This stock is being sought for by permanent buyers, but those interested seem to feel confident that it will soon reach 20, and the comparatively small amount coming out would seem to bear out this belief. Several small lots of Cleveland Electric sold at 74¼ to 74½. Northern Texas Traction reached a new high mark of 40¾ on a small sale. There were a number of sales of Detroit United at 75⅛ to 75⅜ in sympathy with a rise in New York. Syracuse Rapid Transit common sold at 26¾ and the preferred at 76¼. Several lots of Western Ohio 5s sold at 67, while Northern Ohio 4s sold at 59½.

There was little reflection of the general market buoyancy in the Boston traction dealings. Boston Elevated was dull, selling at 153½ and 153. West End common sold as low as 91⅜ and as high as 92. The preferred advanced from 111½ to 112⅜. On the other hand, Massachusetts Electric issues were still depressed, the preferred declining from 57 to 55½, and the common ruling between 13 and 13½. In Baltimore, United Railways common stock sold at 7½, the preferred at 21½ and the 4 per cent bonds at 91⅜

to 91½. Other transactions included Norfolk Railway 5s at 89 to 89½, Macon Railway 5s at 91⅜, Lexington Street Railway 5s at 103½, Anacostia & Potomac 5s from 103¾ to 104¼, City & Suburban (Washington) 5s at 105, and West Hampton Park 5s at 90. Interborough Rapid Transit on the New York curb reflected at times a certain pressure to sell, although it was not very urgent. The stock changed hands between 154 and 152.

Security Quotations

The following table shows the present bid quotations for the leading traction stocks, and the active bonds, as compared with two weeks ago.

	Closing Bid	
	Oct. 25	Nov. 9
American Railways	48¼	50
Aurora, Elgin & Chicago	—	—
Boston Elevated	153	153
Brooklyn Rapid Transit	67¼	67⅛
Chicago City	178	180
Chicago Union Traction (common)	8¼	9¼
Chicago Union Traction (preferred)	—	—
Cleveland Electric	—	—
Consolidated Traction of New Jersey	74½	77½
Consolidated Traction of New Jersey 5s	110	110
Detroit United	73½	75
Interborough Rapid Transit	159½	152½
Lake Shore Electric (preferred)	—	—
Lake Street Elevated	3½	3¼
Manhattan Railway	161¼	162½
Massachusetts Electric Cos. (common)	12½	13½
Massachusetts Electric Cos. (preferred)	55	55
Metropolitan Elevated, Chicago (common)	23¼	22½
Metropolitan Elevated, Chicago (preferred)	66	66
Metropolitan Street	127	122
Metropolitan Securities	85	80⅛
New Orleans Railways (common)	10	9¼
New Orleans Railways (preferred)	28½	27
New Orleans Railways, 4½s	77	75
North American	95⅛	96½
Northern Ohio Traction & Light	—	—
Philadelphia Company (common)	42¾	41
Philadelphia Rapid Transit	15⅞	16¼
Philadelphia Traction	98	97¾
South Side Elevated (Chicago)	93¾	93½
Third Avenue	132½	130
Twin City, Minneapolis (common)	103¼	106
Union Traction (Philadelphia)	56½	58½
United Railways, St. Louis (preferred)	67½	66
West End (common)	91¼	91¼
West End (preferred)	111	111

Iron and Steel

The monthly figures of the "Iron Age" show that in October again the output of pig iron increased and still the stock on hand diminished. The month's production was 1,448,973 gross tons, as compared with 1,352,677 for September. On Nov. 1, however, the total reserve supply stood 529,033 tons, as against 555,447 on Oct. 1. This shows that consumption is still very actively running ahead despite the rapidly increasing outturn. There is some talk of an advance in steel billets, but official prices have not changed yet. Bessemer pig iron is quoted at $12.75, Bessemer steel at $19.50, steel rails at $28.

Metals

Quotations for the leading metals are as follows: Copper 13½ cents, tin 28 cents, lead 4⅜ cents and spelter 5 3-16.

THE QUESTION OF VENTILATION IN THE SUBWAY

The question of whether or not the air in the New York subway is impure and hurtful has been raised, and already an agitation has been started for the introduction into the tunnel of a system of ventilation that shall thoroughly purge the air of all the so-called noxious gases. Several analyses have been made of the air by experts, with varying results. The Commissioner of Health and several others are said to be of the opinion that the charge is well founded that the air is impure. By others the opinion is held that there is no need of raising the question at all, and that the air contains an amount of oxygen sufficient not to affect the average individual. Among those who hold to the latter opinion is Professor Alfred Spice, of Cooper Union, who, with two of his associates, Messrs. Borg and Enders, has analyzed samples of air taken at five different points along the route. Professor Spice is said to have found in crowded express trains a percentage of two-tenths of one per cent of carbon dioxide and in crowded local trains one-tenth of one per cent of carbon dioxide. There also was found a high percentage of humidity.

"The amount of carbon dioxide in the local trains," Professor Spice said, "brings the air only one-tenth of one per cent below normal. That, with the amount of moisture, however, might be unhealthful for persons whose lungs are weak, and they should not spend more than half an hour at a time in the subway. The percentage of this poisonous gas in the express trains would be felt more quickly by weak folk, but it would make practically no impression upon a strong person. Humidity is more to be feared."

Replying to the complaint that persons traveling in the subway are not permitted to ride in one direction to the nearest express station and take a local train in the opposite direction to the point they desire to reach, both for one fare, has been made by General Manager Hedley. He says he can see no reason why passengers want to change direction in their travels. As a general thing, he says, they would make better time by continuing in the same course. For example, if they wish to go to the theatre district from away up town, they would save time by taking an express to Seventy-Sixth Street and a local to Forty-Second Street and Broadway, as against an express to the Grand Central Station and a local train back.

OCTOBER TRAFFIC ON THE CHICAGO ELEVATED RAILROADS

Traffic on the Chicago elevated roads for October in general shows a decrease over that of the same month of last year. While the Northwestern had an increase of 2.4 per cent over the same period of the preceeding year, the other three roads show decrease of traffic. The celebration of Chicago day in St. Louis, this year is partly responsible for this. A statement of the traffic in daily average number of passengers carried for each month of the present year as compared with that of the year previous is given below:

METROPOLITAN ELEVATED

	1904	1903	Increase	Per Cent
January	112,413	112,721	*358	*0.31
February	119,073	116,000	2,983	2.57
March	122,507	116,717	5,790	4.96
April	121,924	117,597	4,327	3.68
May	114,372	109,330	5,042	4.61
June	110,923	111,613	*690	*0.62
July	102,142	102,057	85	0.08
August	103,519	102,971	548	0.53
September	107,907	112,993	*5,086	*4.50
October	114,572	117,387	*2,815	*2.40

SOUTH SIDE ELEVATED

	1904	1903	Increase	Per Cent
January	87,601	86,637	964	1.11
February	90,330	88,516	1,814	2.05
March	92,547	87,989	4,558	5.18
April	91,500	87,553	3,947	4.51
May	83,342	82,884	458	0.55
June	81,405	85,265	*3,860	*4.53
July	69,899	76,265	*6,337	*8.31
August	70,445	72,646	*2,201	3.31
September	75,120	81,754	*6,634	*8.11
October	83,291	85,788	*2,497	*2.91

NORTHWESTERN ELEVATED

	1904	1903	Increase	Per Cent
January	70,204	68,266	1,938	2.84
February	73,193	69,884	3,308	4.73
March	74,344	70,070	4,274	6.10
April	74,217	71,340	2,877	4.03
May	69,232	66,990	2,242	3.35
June	68,222	66,571	1,651	2.48
July	60,816	59,393	1,423	2.40
August	62,453	60,093	2,360	3.93
September	66,407	68,107	*1,700	*2.50
October	73,385	71,617	1,769	2.47

OAK PARK ELEVATED

Main Line—	1904	1903	Decrease	Per Cent
January	41,334	42,471	*1,137	*2.67
February	42,715	42,917	*202	*0.47
March	43,909	43,762	147	0.33
April	44,504	44,865	*361	*0.80
May	41,379	42,566	*1,187	*2.79
June	41,220	42,162	*942	*2.23
July	36,417	37,725	*1,308	3.47
August	37,955	37,794	161	.43
September	39,258	41,848	*2,590	*6.02
October	43,269	44,725	*1,456	*3.25
With Transfers:				
January	42,829	44,034	*1,214	*2.75
February	44,306	44,389	*83	*0.18
March	45,524	45,332	192	0.49
April	46,083	46,452	*369	*0.79
May	42,833	44,016	*1,183	*2.68
June	43,856	44,875	*1,019	*2.27
July	38,668	39,185	*517	*1.32
August	40,673	40,360	313	.78
September	41,909	44,724	*2,815	*6.29
October	45,054	46,518	*1,464	*3.14

* Decrease.

PASSENGER DEPARTMENT CREATED BY THE BOSTON & NORTHERN AND OLD COLONY

The Boston & Northern and the Old Colony Street Railways, of Boston, Mass., have created a new and important department in the form of a passenger department, with headquarters at 309 Washington Street, in the midst of all the steam railroad offices. Robert H. Derrah, who has for many years made a special study of the street railway development of New England, has been appointed passenger agent for the two companies. These two companies operate some 1000 miles of electric lines north and south of Boston, extending from Nashua, N. H., through the State of Massachusetts to Providence and Newport, R. I., serving some eighteen cities and sixty-five towns in the Bay State, with a population of over two millions.

Mr. Derrah was for ten years connected with the president's office of the West End Street Railway and the Boston Elevated, acting for five years as secretary to Hon. Samuel Little, president of the West End Company. He was the originator of the trolley trip from Boston to New York, a novelty which took immediately. He has also published maps of the States of Massachusetts, Rhode Island, Connecticut and New York, showing the existing and projected street railway lines. Some time ago he made a study of the opportunities for pleasure travel on all the lines between Michigan and Boston, and it is safe to say that he has done more to create pleasure travel on the electric lines in New England than any other person.

The two companies he represents not only touch some of the most beautiful spots on the north and south shores of Massachusetts Bay, but practically all the seashore resorts and historical sections; they also own and maintain many pleasure resorts and parks where entertainments are given during the summer months. There is no question but that the position which Mr. Darrah has accepted will afford him ample opportunities to study out the perplexities of his hobby, as he has for many years been an enthusiast in the matter of trolley trips, especially to seashore resorts, and there is no section of the country with a greater diversity of picturesque scenery, delightful seashore resorts, historical places and points of varied interest than has the territory reached by the lines of the Boston & Northern and the Old Colony Street Railways.

THE ELECTRIFICATION OF THE COLORADO & SOUTHERN

Reference has already been made in these columns to the organization of the Denver & Interurban Railway Company by Colorado & Southern Railway interests to carry out the work of equipping some of the lines of the latter with electricity. It is now possible, through the courtesy of the chief engineer of the company, H. W. Cowan, to give these plans here in outline as far as the details have been worked out. The present plan is to electrify the existing line of the Colorado & Southern between Denver and Boulder, a distance of 30 miles, for passenger service only. In the immediate future, it is proposed to build a line within the limits of the city of Denver on some of the principal down-town business streets, and later on, to apply for a general franchise for the city of Denver. Future plans are to make extensions into the farming communities north of Denver, and also to equip with electricity other Colorado & Southern lines running out of Denver.

The freight business will be done on the same line as well as Colorado & Southern passenger business, but the electric service will not interfere with the freight service to any extent, as 16 miles out of Denver there is a loop line, over which trains will run entirely independent of the electric cars and passenger trains. Further than this, about 5 miles of double track will be constructed, so that freight and electric service will only be on a common track for a distance of about 11 miles.

To provide for the operation of the lines by electricity, a power house will be built at one of the coal mines half way between Denver and Louisville, where lignite slack, worth 50 to 60 cents a ton, is available for fuel. Alternating current will be used, the difference of potential of the line to be 20,000 volts, while that of the trolley will be 3000 volts. The cars will be equipped with single-phase motors. The cars will be 55 feet long, carrying sixty passengers, and will weigh from 35 to 38 tons. It is intended to start with a half hour service out of Denver. Cars will branch at a point about 19 miles from Denver, one line running to Boulder and the other to Louisville and Lafayette and the mining districts. The 30 miles from Denver to Boulder will be made in fifty minutes, including eleven stops. Figures have been furnished by the electric companies for the construction of this part of the plan. The Colorado & Southern Railway Company is now ballasting its line from Denver to Boulder and putting it in first-class shape for the change of power.

SUBWAY CONDITIONS ABOUT NORMAL

Traffic in the New York subway now is about normal. Figures are not now being given of the number of passengers carried daily, but the management says that its estimate of what would be the ordinary volume has been reached. The terrible overcrowding of the tunnel on the first few days of its operation, with the delays in train operation caused by the overcrowding of sightseers on Sunday, Oct. 30, has already been noted in the STREET RAILWAY JOURNAL. Figures of this traffic are interesting. Opened on Thursday, Oct. 27, at 7 p. m., about 111,000 persons were transported between that hour and 12 o'clock m. On Friday, 319,000 passengers were carried, and on Saturday, 350,000. The Sunday traffic reached the total of 309,875, and this with the reduction in train service called for in the train schedule for Sundays.

It is, of course, impossible to tell just what the effect will be on the surface and the elevated lines of the operation of the subway. On some of the surface lines paralleling the subway there is a noticeable falling off in the traffic, while even on lines remote from the tunnel the effect is apparent of the better service the tunnel affords. On the elevated system, controlled by the same company that operates the subway, there is believed to have been a decrease in traffic on the east side lines for the first few days after the opening of the tunnel. The "Wall Street Journal," however, is authority for the statement that on Nov. 1 and 2, the elevated car-128,000 more passengers than for the same two days last year.

The placing of advertising signs in the subway stations is being criticised by the æsthetic public.

ORDER AGAINST BROWN BROTHERS MODIFIED

Judge Fisher, of the St. Louis Circuit Court, has modified his restraining order against Brown Bros. & Company, the St. Louis Transit Company, the United Railways Company and the National Bank of Commerce, issued a few days ago, so as to permit the plaintiffs in the suit, Louis A. Cella, S. W. Adler and C. A. Tilles, to pay $374,774.40 into the National Bank of Commerce, but has restrained the bank and other defendants from allotting the stocks, bonds and securities alleged to be due the plaintiffs, to any one else, or from disposing of them, until the case can be heard on its merits.

The decision was rendered at the termination of arguments made by H. S. Priest, representing the defendants, and Judge Henry W. Bond, for the plaintiffs. The hearing was on the motion made by the defendants to dissolve the injunction.

The sum to be paid by the plaintiffs represents 84 per cent of the $446,160 allotted to them by the syndicate, payment of which they claim should have entitled them to receive certain securities held by the National Bank of Commerce as trustee in the reorganization scheme of the Transit Company and United Railways Company, but that when payment was tendered the bank refused to surrender the securities, unless a certain contract was signed by the plaintiffs, which the latter claim they did not know was in existence.

The United Railways Company is now in full possession of the Transit Company's lines and will so remain, whatever may be the outcome of the suit. The painting of the new name on the cars has commenced. The words "Transit Company" have been obliterated from all transfers and from the employees badges, pending the arrival of the new United Railways badges and buttons.

Final and complete steps have been taken in dissolving the Transit Company and passing its property back to the United Railways Company, both in the operating and financial departments.

The terms proposed by Brown Bros. & Company, of New York, for reorganizing the traction property have been not only accepted, but complied with; the collateral trust notes for $5,600,000 due have been retired, and the $10,000,000 of improvement bonds will be issued shortly. These bonds are in lieu of the $20,000,000 bonds authorized last May.

While the fixed charges of the United Railways Company will exceed those of the Transit by about $80,000, it is contended that there will be no further need to borrow money at high rates of interest, which seriously crippled the Transit Company.

The officials of the Transit Company have entered the service of the United Railways without a change.

Since Captain McCulloch has had charge of the operating department of the property, it is stated he has not only operated it economically, but with far more satisfaction to the management and the public than ever before in its history.

It is believed that the October statement of the Traction Company will show the largest business in its history.

THE ELECTRIFICATION OF THE ERIE

Electric train operation on the New York suburban service of the Erie Railroad has given considerable prominence in local newspapers lately, but as a matter of fact nothing whatever has been done in the way of preparing even preliminary plans for such service. It is well known that among the improvements which the officials of the company have in mind is a reconstruction of some nature of the Jersey City terminal arrangements. The suburban traffic of the road, which centers at that terminal, is capable of much development, and it is manifest that the electrical operation of the trains on the suburban lines must be considered in planning any improvements of this nature. This self-evident fact has been pointed out by J. M. Graham, fourth vice-president of the company, and probably gave rise to the false report that plans for electric equipment were being considered.

THREE-CENT FARE FIGHT CONTINUED

The fight made by property owners against the Forest City Railway Company, of Cleveland, the so-called "3-cent fare company," to restrain it from laying its tracks on Denison Avenue, is being heard before the Circiut Court in Cleveland. The plaintiff claims the company did not secure the consent of a majority of property owners before it began to construct its tracks. The case was decided in favor of the railway company in the lower courts and was appealed to the Circuit Court. Work on the road has been tied up for many months as a result of the litigation.

SERVICE BETWEEN DETROIT AND TOLEDO—RUN FROM DAYTON TO INDIANAPOLIS

The Detroit, Monroe & Toledo Short Line last week ran its first cars into the center of Detroit, and beginning this week will give hourly headway between the two centers, the cars running direct to the Russel House in Detroit. For the present, the running time will be three hours, but after a few weeks this will be reduced to two and a half hours. Later limited cars will be put on which will make the 58 miles in two hours. These cars will connect with the limited cars on the Lake Shore Electric, and the through schedule for 175 miles will be six and a half hours, which is within one hour of the best trains on the steam road. The completion of this line marks an important epoch in the history of the traction lines of the Central West, since it connects the great systems in Ohio and Michigan, making possible a trip of 350 miles from North East, Pa., to Port Huron, Mich.

The Detroit, Monroe & Toledo Short Line is one of the finest high-speed interurbans in the country. It is built on private right of way 60 ft. wide, in accordance with the best steam road specifications, and is rock ballasted from end to end, and has no bad grades or curves. The road was completed to Monroe, Mich., several years ago, but the extension to Detroit has been held up by various causes, among which were questions concerning several steam railroad crossings. About April 1 the road was opened to Sibley, where connection was made with the Detroit United. Then by the completion of overhead crossings, with several steam roads and the construction of a steel bridge over the River Rouge, the cars were brought on private right of way within 2½ miles of the center of Detroit, which is reached over the Detroit United tracks with a comparatively short city run. A large party of Detroit and Toledo business men made the first through trip last week.

At about the time the first car was run through from Toledo to Detroit, thus connecting up the great systems in Ohio and Michigan a special car was operated through without change from Dayton, Ohio, to Indianapolis, marking an important mile-stone in the history of the Ohio and Indiana lines. The Dayton & Western Traction Company took a large party of butchers to witness the opening of the new stockyards in Indianapolis. Heretofore a through run has been impossible, owing to a low undergrade crossing at Richmond. In this case the difficulty was overcome by removing the trolley and pushing the car under the crossing. The special left Dayton at 5:30 a. m., and reached Indianapolis at 10:00 a. m., passing over the lines of the Dayton & Western, the Richmond Street & Interurban Railway, and the Indianapolis & Eastern Railway. The return trip was a most remarkable run. The car left Indianapolis at 7:55 and reached Dayton at 12:19. It is claimed that the actual running time for the 108 miles was three hours and fifty-four minutes. The last 40 miles were made in an hour and sixteen minutes. The grade crossing difficulty at Richmond is to be remedied by lowering the street, and it is expected that within a couple of months regular through limited cars will be operated between Dayton and Indianapolis.

NEW YORK CENTRAL TAKES ALL ONTARIO COMPANY'S POWER

In the last issue of the Street Railway Journal, Mr. Connette, of the Syracuse Rapid Transit Company, was quoted in regard to the use by that company and its interests of Niagara power within eighteen months. Now, in a statement made by Denison, Prior & Company, of Cleveland, Ohio, another clue is given to the interest of the New York Central Railroad, controlling the Syracuse system, in power development at Niagara as carried on by the Ontario Company. Messrs. Prior & Company, who are bankers, have purchased $1,000,000 of the forty-year 5 per cent sinking fund gold bonds of the Ontario Company, and announce that a contract has been made "with a responsible party for the sale of all the power it (the Ontario Company) can produce now," and that the company "has given an option on all it may be able to produce at any time where the plant is enlarged." That this reference to "a responsible party" is to the New York Central, there is no question.

The capacity of the new plant is to be 180,000 hp. A separate company has been organized to transmit the power, which, so an unofficial source says, will be carried as far east as Utica, and south through the country to the Pennsylvania State line. Power also will be carried to the west along the Michigan Central as far as Detroit, and along the Lake Shore to Cleveland, at any time the company has demands in the territory that makes the extension of the lines desirable.

TUNNEL FOR TROLLEYS FROM LONG ISLAND CITY TO NEW YORK

Soundings are being made in the interest of August Belmont for the construction of a tunnel from Long Island City to Forty-Second Street, New York, at the Grand Central Station. Mr. Belmont has in mind the operation into New York of cars of the New York & Queens County Railway Company, of Long Island City, in which he is interested. It is a prosperous and very promising territory through which the New York & Queens County Company operates, and the connections with existing means of transportation which the new tunnel would afford would help greatly to develop it. The tunnel will be built under a grant made to Mr. Steinway, of Long Island City, years ago.

OHIO INTERURBAN MEETING

The following announcement has been issued to members of and those interested in the Ohio Interurban Railway Association:

"Lima, Ohio, Nov. 3, 1904.

"Dear Sir: The next meeting of the Ohio Interurban Railway Association will be held at the 'Boody House' in Toledo, Nov. 17, 1904, meeting called promptly at 10:30 a. m. The subject, 'The Handling of Freight on Interurban Lines,' has been given precedence by the committee, and the discussion of this interesting subject will be taken up in all its phases by men who are operating an exclusive freight service on interurban lines. The secretary requests that you forward to him, or bring with you to this meeting, samples of rate sheets or any forms you may have in connection with the handling of freight as referred to in the subject. The association insignia, in the form of either pin or button, can be secured at this meeting. In order that the association records may be more complete, will each member kindly arrange to register at the headquarters of the secretary prior to entering the assembly room. It is the intention to make this meeting better than any of the previous gatherings, and it is hoped that each member will assume an individual responsibility to make this meeting of such interest that neither the old nor the new members will feel that they can afford to miss any of the monthly meetings which are to be held during the winter and spring months. On account of the central location and the ease of access, it is the hope of the executive committee to see a larger delegation of the Michigan and Indiana friends than has been our pleasure in the past, in order that they may share in the benefits to be derived from this association.

"H. P. Clegg, President.

"J. H. Merrill, Secretary."

The interchangeable coupon transportation books arranged for by the Ohio Interurban Railway Association have been issued and are now on sale at the ticket offices of fifteen Ohio roads that have become parties to the agreement. The officers of the association hope to secure the co-operation of a number of additional roads at the Toledo meeting.

MIAMI & ERIE CLAIMS PAID

In a recent hearing of the suit brought against the stockholders of the Miami & Erie Canal Transportation Company, Otto Miller, who represents a committee of stockholders who are trying to straighten up the affairs of the company, announced that out of an indebtedness of $105,459, claims representing $84,091 have been acquired by the committee, and that it is expected that the remaining claims will be acquired within two weeks. In view of this statement the hearing was continued until Nov. 14. Part of these claims are represented by H. R. Probasco, of Cincinnati, who represents interests that are working against the owners of the canal proposition, and it is not apparent how these claims are to be settled, as Mr. Probasco has all along refused to settle except on terms that were considered exorbitant. The Supreme Court last week overruled the application for a writ of mandamus made by Mr. Probasco, who has been endeavoring to force the courts to permit him to take depositions before a notary in order to show up the inner workings of the canal company, and in consequence, it is possible that Mr. Probasco may now be willing to settle his claims. The plan for a reorganization which will be submitted to the stockholders of the canal company calls for an issue of $400,000 first mortgage 5 per cent bonds, which is considered to be the wrecking value of the canal property. About half of these will be issued for the present, and they will be taken by the parties who have advanced the money to pay off the debts. When the debts are settled in full, the receiver will be discharged, and the officers will then ask the present bondholders and stockholders to pay an amount equal to $3 per share into the treasury of the company, for which payments they will receive at par the remainder of the new bond issue. This will provide funds to maintain the company and carry out its plans. The present bond issue will become a second mortgage, and the present stocks and bonds will stand as they are now.

FURTHER ST. LOUIS AWARDS.

The American Frog & Switch Company, of Hamilton, Ohio, has just received advices from the Superior Jury of Awards of the Louisiana Purchase Exposition, that it has awarded them the highest prize, a gold medal..

G. M. Gest, the expert subway contractor, of New York and Cincinnati, has been awarded by the jurors the highest award for conduit construction.

The Baldwin Locomotive Works, of Philadelphia, Pa., have received the following awards from the Louisiana Purchase Exposition: Grand prize for locomotive exhibit, gold medal for electric locomotives and electric trucks, gold medal for compressed air locomotives, gold medal for Standard Steel Works exhibit.

The following individual awards have also been granted: William P. Henszey, gold medal, for development and improvements in trailer trucks; S. M. Vauclain, gold medal, for the development and simplification of the balanced compound locomotive. Cornelius Vanderbilt, gold medal, for the development of the cylindrical tender.

NEW PUBLICATIONS

Mechanical Appliances, Mechanical Movements and Novelties of Construction, by Gardner D. Hiscox, M. D., 396 pages. Published by the Norman W. Henley Publishing Company, New York. Price, $3.

This is a continuation of the author's well-known "Mechanical Movements, Powers and Devices," which has passed through ten editions. It is divided into twenty-three sections and contains descriptions and illustrations of 970 different mechanical appliances. Thus under Gearing and Gear Motion, Section XIV., various types of worm gears, elliptic linkages, vibrating and differential gears are shown. The volume should prove useful to inventors and mechanics in indicating ingenious methods of securing many mechanical ends.

The Boston Electrical Handbook. 205 pages; illustrated. Republished by the McGraw Publishing Company, New York, by special arrangement with the Boston Reception Committee of the A. I. E. E. Price, $1; by mail, $1.12.

This is the first of the excellent series of handbooks which were published for the information of visitors from abroad attending the International Electrical Congress at St. Louis, in September. A reference to some of the statistics contained in the Boston Electrical Handbook has already been published in these pages, but until the present time the volume has not been available to the general public. The book is divided into fifteen chapters, of which that on the Boston Elevated Railway is by far the longest, occupying forty-two pages. Another chapter is devoted to the Massachusetts Electric Companies. The description of the Elevated Railway Company's surface and elevated system is well written and very complete, discussing as it does not only construction but the selection and training and general relation with employees. The power station statistics, referred to in a previous issue, are especially interesting.

THE ECONOMY OF GAS ENGINES

A prominent engineer of the Power & Mining Machinery Company gives the following interesting particulars concerning the economies of gas generating plants, as compared with steam plants.

The yearly records of eleven electric power stations, each serving a population of 5000 or less, and of forty-five stations, each serving 5000 or more, show:

Average B. H. P. developed	1,235
Average coal consumption per B. H. P. hour, pounds	5.5
Average cost of coal per ton	$4.30
Average cost of fuel per day of ten hours (33.96 tons coal at $4.30)	$146.02
Cost of fuel with gas engines and producers (7.72 tons coal at $4.30)	33.19
Saving per day	$112.83
Annual saving (365 days at $112.83)	$41,182.95

He states that the yearly record of six power stations of one of the largest street railway systems in America shows an average output of 15,610,934 B. H. P. hours per annum, with a coal consumption of 2.9 lbs. per B. H. P. hour. With gas engines the company guarantees to develop this power with a coal consumption not to exceed 1¼ lbs. per B. H. P., or with coal at $3 per ton, to make a saving of practically $38,600 per annum on each station, or a grand total of $232,000. The producers of the company work on hard or soft coal, wood or coke, and changes from one to the other can be made without interruption. The company is now building in its own shops the Crossley gas engine in all sizes and for all purposes. Over 55,000 of these engines are in operation.

STREET RAILWAY PATENTS

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

UNITED STATES PATENTS ISSUED OCTOBER 25, 1904

772,930. Vehicle Wheel; Benjamin Gastal, Pelotas, Brazil. App. filed Nov. 18, 1903. The rim of the wheel consists of a spoke-section, a tread formed of sections having correspondingly shaped inner faces and a plurality of cushions interposed and bearing between the spoke-section and the inner faces of the sections of the tread, thereby lessening noise and vibration.

772,965. Street Car Fender; Ernest H. Schulze, Kansas City, Mo. App. filed June 8, 1904. Details of construction.

772,987. Contract for Trolleys; Thomas F. Wetton, Newark, Ohio. App. filed Feb. 4, 1904. A contact shoe is so mounted upon the trolley pole as to bear against the tread of the trolley wheel, the shoe being counter-weighted to preserve good contact.

772,988. Brake; Frank H. White, Halloway, Ky. App. filed June 22, 1904. Details of construction of the operative parts whereby a maximum degree of braking action is attained with the exercise of a comparatively small amount of motive power.

772,991. Fire Hose Protector for Tracks; Frederick W. Wittkowski, Des Moines, Ia. App. filed March 22, 1904. An auxiliary track rail having circular openings extending transversely of each rail thereof, designed to admit a hose pipe, and tapered ends in said track, and a curved fish-plate design to secure the parts of each rail of the auxiliary track together.

772,998. Railway Switch; Horace Blanchard, Boston, Mass. App. filed July 29, 1904. Means whereby a single detent in the bed-plate will lock the switch-point in either of its two positions.

773,013. Tongue Switch; Herbert G. Isenberg, Johnstown, Pa. App. filed Oct. 5, 1903. A movable tongue or point having a laterally extending arm, provided with an abutment for one or more springs, a slide also carrying one or more spring abutments opposing that of the arm and an operating and locking device for slide.

773,080. Electric Signal for Railways; Wilbur C. Lamphier, Worcester, Mass. App. filed June 17, 1903. A signal for trolley roads in which lights of different colors located at ends of blocks constitute the signaling means.

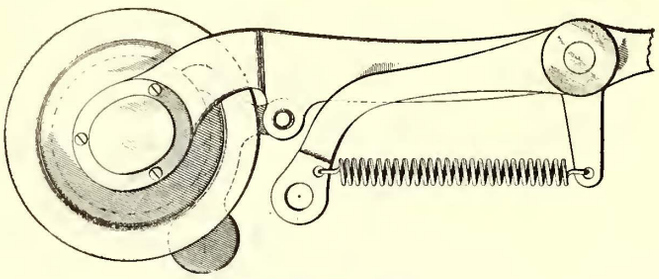
773,179. Switch-Shifter for Street Railway Switches; Joseph W. Ady, Jr., Colorado Springs, Col. App. filed March 7, 1904. Means for enabling the motorman to throw the switch from the platform of a moving car.

773,213. Electric Controller Attachment; Albert H. Mathewson, Thomsonville, Conn. App. filed April 7, 1904. An attachment adapted to be applied to an electric car controller for the purpose of requiring the motorman to dwell at each notch when throwing on power, but which will permit the controller handle to move freely when turning power off.

773,280. Trolley Harp; Thomas Egan, Muscatine, Ia. App. filed April 14, 1904. Two springs bowed toward each other are attached to the harp for the purpose of retaining the trolley wheel on the wire.

773,314. Trolley Catcher; Charles F. Davy, Mohawk, N. Y. App. filed June 20, 1904. Details of a spring drum and ratchet for controlling the trolley cord.

773,324. Track Switch Operating Mechanism; Charles F. Hopewell, Cambridge, Mass. App. filed Aug. 17, 1904. A pivoted switch-plate, two solenoids, armatures therefor, a cross-bar to which said armatures are loosely connected, a sleeve to which



PATENT NO. 772,987

said cross-bar is rigidly secured and means for connecting the sleeve with the switch-plate.

773,438. Electric Railway; George H. Thomas and Martyn J. Stone, Scranton, Pa. App. filed Oct. 14, 1903. Comprises side coverings secured to the rail and hinged top coverings carried by the side coverings.

773,459. Trolley; Martin L. Beistle, Ingram, Pa. App. filed Aug. 15, 1904. The trolley wheel is mounted in a frame which is pivoted to a harp, swivelled to the pole.

773,464. Electric Switch; Albert G. Bodine, Baldwin Township, Pa. App. filed Feb. 2, 1904. A trolley switch adapted to be actuated by a passing car.

773,519. Operating Device for Fare Registers; John F. Ohmer and Elmer H. Bridenbaugh, Dayton, Ohio. App. filed Feb. 6, 1904. By providing two operating rods, each adapted to move in two directions, four separate kinds of fares may be "rung up."

UNITED STATES PATENTS ISSUED NOV. 1, 1904

773,551. Tongue Switch; Israel K. Dixon, Johnstown, Pa. App. filed March 10, 1904. A hardened wear plate is seated in the heel portion of the switch tongue.

773,566. Switch Operating and Locking Device; James Hart, Johnstown, Pa. App. filed Dec. 26, 1903. Means whereby the switch point may be locked in either of its two positions, and which will also act to assist in throwing the tongue from one position to the other, also whereby the switch may be readily converted into a spring switch, with right or left-hand throw.

773,618. Portable Storm Front for Street Railway Cars; Hugh M. Adams, Washington, D. C. App. filed April 30, 1904. Comprises a curtain adapted to be reeled upon a suitable roller mounted in the roof of the platform of the car and readily detachable therefrom.

773,619. Car Fender; Hugh M. Adams, Washington, D. C. App. filed May 14, 1904. Details of construction.

773,620. Portable Storm Front for Street Railway Cars; Hugh M. Adams, Washington, D. C. App. filed Aug. 26, 1904. Improvements upon patent No. 773,618 contemplating the protection of the sides, as well as the front of the car platform.

773,621. Combined Trolley Wire Splice and Support; Alonzo B. Allison, Canton, Ohio. App. filed Feb. 15, 1904. An ear-plate having a curved flange of yielding material, a cap secured to the ear-plate and a trolley wire located upon the convex side of the curved flange.

773,652. Track Cleaner; Frank R. Larrabee, South Portland, Me. App. filed April 18, 1904. A gang of cutters and a scraper mounted in a vertically adjustable frame carried by the car to remove ice and snow from the track.

773,662. Brake; George H. Markillie and Joseph L. Srisler, Perth, Kas. App. filed March 8, 1904. An emergency brake consisting of a plurality of sets of chock-blocks adapted to be simultaneously thrown into engagement with the wheels and between the wheels and the rails, thus placing the car as a whole upon friction-runners.

773,694. Traction Means for Street Railways; Clark L. Varner, Santa Paula, Cal. App. filed April 28, 1904. A cable system consisting of an endless cable carried by a plurality of wheels rigidly mounted on axles; the car body rests upon and moves with the upper periphery of the wheels.

773,762. Railway Switch Operating Means; John F. McCormick, Churubusco, Ind. App. filed March 9, 1904. Consists of a switch point, a presser-head connected therewith, a spring normally holding the switch-point against a side of the rail, a guard rail arranged opposite to the presser-head, and an actuator arranged to pass between the presser-head and guard rail to move the switch point away from the main rail.

773,806. Register; John O. Morris, Richmond, Va. App. filed Sept. 24, 1903. A fare register so constructed and arranged that after a predetermined number of fares have been received a signal will be energized to notify the person paying the last fare immediately preceding the energizing of the signal that there is due him a prize in the form of cash or tickets.

773,832. Controlling System for Electric Motors; George Westinghouse, Pittsburg, Pa. App. filed March 18, 1903. Arranged in a circle around the central inlet for pneumatic pressure are the contact members of a number of switches, the contact members being controlled by electro-magnetically actuated valves, themselves controlled by a main governor switch.

773,833. Controlling System for Electric Motors; George Westinghouse, Pittsburg, and Louis M. Aspinwall, Wilkinsburg, Pa. App. filed May 1, 1903. Relates to control systems of the same kind as referred to in preceding patent and involves the use of an independent circuit and source of current for the governor switch.

773,893. Trolley Harp. Alson C. Ralph, Somerville, Mass. App. filed March 11, 1904. Carbon brushes mounted in the harp and pressed by springs against the trolley wheel to establish good contact.

773,895. Running Gear for Motor Vehicles; Emil B. W. Reichel, Steglitz, Germany. App. filed Aug. 17, 1899. The motor is so mounted upon a truck frame that circular adjustment of the motor about the driving axle may take place at all times.

773,932. Street Car Fender; Frank J. Fairchild, Toledo, Ohio. App. filed Feb. 1, 1904. Details.

773,974. Automatic Switch Operating Device; Danne Pamp, Philadelphia, Pa. App. filed June 15, 1904. Details.

774,001. Track Structure; Louis Steinberger, New York, N. Y. App. filed March 15, 1904. A third-rail insulator comprising a knob of insulating material covered by a metallic shield having a seat for the rail in which it is permitted to adjust its position slightly.

774,043. Trolley; William R. Cooper, East St. Louis, Ill. App. filed May 21, 1904. A trolley pole composed of two telescoping sections, the joint being packed to render the pole water-tight.

774,058. Monorail Traction; Charles E. Faroux, Levallois-Perret, France. App. filed April 2, 1904. Comprises a body supported by flanged wheels, a rail having inclined sides with which the wheel flanges engage at two points only, guide-wheels bearing on the upper edge of the rail, a track above the vehicle, and wheels carried by the vehicle and engaging the opposite sides of the last-named rail.

774,085. Trolley Pole Contact; John J. Lacknor and Andrew J. Curtis, East Williamson, N. Y. App. filed May 5, 1904. The wheel is swivelled upon a vertical axis so as to accommodate itself to inaccuracies in the wire.

PERSONAL MENTION

MR. ROBERT W. BLACKWELL, of London, is in New York on a short business trip.

MR. DAN R. HANNA, a son of the late Senator Hanna, has been elected a member of the directorate of the Cleveland Electric Railway Company, of Cleveland, succeeding Mr. George G. Mulhearn, who resigned as a director some weeks ago.

MR. EDWARD C. BOYNTON, formerly of the National Electric Company, has joined the forces of Mr. Albert B. Herrick, and will take charge of Mr. Herrick's New York office and supervise his eastern testing work. Mr. Boynton is now engaged in assisting Mr. Herrick in preparing a report of the physical condition of the railway properties of the Public Service Corporation, of New Jersey.

MR. ERNEST GONZENBACH, engineer of the Youngstown & Southern Railway Company, has been awarded the annual medal of the Western Society of Engineers for the most meritorious paper on an electrical subject presented to that society during the past year. This medal was given for the paper which Mr. Gonzenbach presented to that society on March 18, 1903, and entitled "The Third Rail for High-Speed Electric Service." This paper was abstracted in the Street Railway Journal for March 28, 1903.

MR. HORACE ANDREWS, president of the Cleveland Electric Railway Company, has announced that he has no intention of resigning the presidency of that company, and that he will remain in Cleveland. There have been numerous reports of late that he would leave Cleveland to go to New York and give his entire attention to the New York Central Company's traction proposition. Mr. Andrews will, as heretofore, devote a great deal of his time to the New York State electric railway enterprises with which he is identified.