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Locomotive Engineers for Motormen

We recently heard an interesting discussion by a number of prominent operating men over the policy adopted by an important high-speed interurban line of weeding out a number of its old motormen who have advanced from city lines, and hiring in their place men who had had experience as locomotive engineers. The superintendent of the road in question is an old steam road man, and he argues that all locomotive engineers have risen from the lower ranks, and for years have had instilled into them the obedience of orders, extreme

watchfulness, and the policy of safe running. There were six experienced interurban men in the party, and all of them disagreed with this superintendent on practically every point. It seemed to be the consensus of opinion that the class of locomotive engineers who could be induced to take positions at the wages offered by interurban roads would be those whose service had not been satisfactory for some reason. They also thought that the average engineer had had locomotive operation so instilled into his mind that he could not be properly educated into the details of the mechanism and the handling of an electric car, and that he would be likely to disregard important rules which applied only to the handling of such cars. Some of them believed that the city motormen who had experience with a lighter class of equipment, and who had learned careful operation in crowded city districts, made the best motormen, while others expressed the opinion that they preferred taking a green man from the country and giving him a thorough breaking-in before permitting him to take a car out alone. But not a man favored the locomotive engineer.

Air Reservoir Pressures

A recent speaker before a State electric railway convention advocated the idea that the air storage reservoir pressure carried on an ordinary interurban car should not be greater than the air pressure which could be applied in the brake cylinder without skidding the wheels. In other words, according to this theory, it would be possible for a motorman to apply the full pressure available to the brakes by throwing the motorman's valve wide open between the storage reservoir and the brake-cylinder without skidding the wheels. This, we believe, is not true in ordinary practice, as the storage reservoir pressure is usually very much more than could be applied to the brake cylinder without skidding the wheels. By thus carrying such a high pressure in the large reservoir, much larger storage capacity can be secured with a given size of storage tank. It must be admitted that, from an operating standpoint, it would be desirable not to carry a greater pressure than would skid the wheels, because, if the storage pressure was kept down to this amount, there would be less opportunity for a rattled motorman to put too much pressure into the brake cylinder in making an emergency stop, and by skidding the wheels, greatly increase the distance at which the car could be stopped. Until, however, companies are willing to put on additional storage capacity, or to introduce auxiliary tanks with reducing valves between the main storage tanks and the auxiliary tanks, the reservoir pressure on interurban cars equipped with motor compressors is likely to be carried considerably above the skidding pressure. In steam railroad practice with automatic air brakes, it is absolutely necessary to limit the maximum pressure that can be applied in the brake cylinders. In interurban railway practice with straight air brakes on a

car under the direct control of the motorman, it is not as necessary to limit the pressure, as any experienced motorman can tell when the wheels are skidding. Nevertheless, limitation of the possible brake cylinder pressure, even with a straight air brake, on an interurban car, is desirable, and if it can be accomplished without too much complication, it is worth some consideration by operating and manufacturing companies.

The Reorganization of the American Street Railway Association

The meeting of the executive committees of the American Street Railway Association and its allied associations in New York, last week formed the second step toward the ultimate reorganization of those bodies. The first was taken at St. Louis and was largely an expression of opinion only, on the part of the delegates present, that such a step was advisable. At the meeting at New York last week an actual plan was presented, and the opinions expressed in favor of the general principles of Mr. McCulloch's programme were so favorable that a sub-committee was appointed to examine into the details. The subject is of such vital importance to the street railway industry at large, that we feel confident the extended report of the meeting, published elsewhere in this issue, will be read with a great deal of interest. There were no dissenting voices at St. Louis in favor of a reorganization, but we believe that the arguments advanced at New York toward a unification of all the energies of the street railway companies in their association work will make it even more evident to all that the time has arrived for taking a radical step of this kind, and that those to whom this work has been entrusted are amply competent to provide a satisfactory working plan.

It is true that the need for a change is not quite so apparent in the cases of the affiliated organizations, the Street Railway Accountants' Association, the American Railway Mechanical and Electrical Association and the Claim Agents' Association, as in that of the parent body. The two former have done excellent work in the past, and the Claim Agents' Association, although of recent origin, has a full working organization, and is apparently prepared to carry out its particular work in an efficient manner. Nevertheless, the willingness of these three affiliated associations to co-operate in the general plan proposed indicates, in our opinion, a breadth of view which cannot but be commended by all who have the interests of the street railway industry at heart. Practically the only hesitancy on the part of the two older associations toward entering into the amalgamation proposed, was caused by a possible fear that their identity might be lost and certain features in their organization, by which the subordinate officers or heads of departments in a company now feel at liberty to participate in the meetings, would disappear, and that consequently their usefulness would be impaired. We concur with the general sentiment expressed at the meeting on Feb. 3, that these fears are groundless, and that under the plan proposed the opportunities for discussion at these meetings will not only be just as open as before to those who have contributed to their success in the past, but that the meetings should be much more largely attended and more fruitful even than ever before. Moreover, we believe that the prestige of being a section of such a powerful body as the American Street Railway Association is bound to become, will be much greater than that which an independent and smaller organization could possibly possess.

A great deal remains to be determined as regards the organization of the new body, the arrangement of meetings, the composition of the executive committee and the matter of dues. Whatever is decided upon, we sincerely hope and believe that arrangements will be made by which the technical men among the companies will be encouraged to take part in the meetings of their respective sections, and that the dues will be so arranged that it will be easy for small companies to join and obtain all the benefits possible from the association. There is no doubt that the former arrangement of various organizations, with separate dues, was looked upon as somewhat of a burden by the small companies which sent one or, at most, two men to the conventions; but with one membership fee for all of the sections, as we assume will be the plan, this feature will be eliminated.

One of the most serious problems before the organization committee is the question of a permanent secretary, and whether it will be necessary to have additional secretaries for any of the separate sections. A number of the executive officers of the companies who were present at New York spoke very strongly on the necessity of establishing a general bureau of information in charge of the permanent secretary, and several of the instances cited in its favor indicate the great benefit which such a bureau of this kind could confer. It may be interesting to note in this connection that the German Street Railway Association has recently taken the same step which is being proposed by the American Street Railway Association, and has changed from a secretary, who incidentally conducted this office, to one who devotes all of his time to its service, and whose principal duties are the collection and dissemination of information which is of value to the members. We understand that the results secured in this way have been most satisfactory, and that the establishment of the office has been shown to have been justified by the benefits derived. The qualifications of the permanent secretary were outlined in a very clear way during the discussion, and we believe that if an incumbent for the office could be secured who is able to carry out the work along the lines described, he would be of immense service to the member companies.

Master Mechanics' Records

The master mechanic's daily report of cost of maintaining equipment is the gage glass of success in the electric railway business. If the gage is neglected, or if it fails to indicate promptly fluctuations in the cost of repairs and maintenance, disastrous results are sure to follow sooner or later. There are those who cry "Too much red tape," when systematic detailed shop records are mentioned, but to them we suggest that the right kind of "red tape," properly applied, serves the same use as good insulating tape on an electrical conductor. It stops the leaks. And, although "red tape" may appear to be a trifle expensive, neglected leaks in the work of maintaining equipment are much more expensive, and they lead eventually to a bad "short-circuit" in the company's affairs. As a matter of fact, those who favor systematic records, claim there is no reason why it should cost more to keep up shop records systematically and in minute detail than it does to keep them in a half-hearted and slipshod manner. After a systematic system of this kind is once established, it takes no more clerk hire to maintain them up in a proper and readily get-at-able shape than it does to keep them in general and unintelligible form.

The Automobile and the Trolley

We do not want to pose as alarmists, and we are far from believing that the automobile is now or is likely immediately to become an active competitor of the trolley car, but the recent races at Ormond raise some very interesting questions. Of course the racing automobile is a dangerous freak at best, bearing about the same relation to ordinary traffic-carrying machines that a torpedo boat does to an ocean liner. Yet it certainly does get over the ground at a most astonishing pace. We wonder what the air resistance wiseacres think of a mile over the beach in less than 33 seconds, and of the 100-mile record, and a few other items of the season's sport. These performances are tremendously interesting as engineering feats, quite aside from all other features connected with them. They need not, however, cause the electric railway man any immediate worry, for if the cost of operation be figured out, it will rise to a sum per motor car mile that is something startling. We believe, however, that the automobile has come to stay, and while it just now represents, in the main, an acute phase of sport, it is steadily becoming more and more a factor in practical transportation. As regards passenger-carrying on a large scale, it has not yet taken a conspicuous place. Those who can afford to run automobiles are not, as a rule, large patrons of the trolley car, and, in fact, the latter probably gains quite as many patrons from those who now hesitate to use 'busses in an automobile-ridden district, as it loses from the automobilists themselves.

Nor is the automobile cab likely, we think, to cut any great figure in passenger transportation. Its uses are practically those of any other cab, supplementing, rather than tending to replace, the ordinary means of transportation. In New York surely the time made by express trains in the Subway is good enough to make even the most ambitious motor cab slip to the rear. There is, nevertheless, a phase of automobilism that may well cause the street railway man some concern. This is the menace that comes from the possibility of fast motor omnibus lines, a menace more moral than physical, perhaps, but still a real one.

A steady effort is undoubtedly being made by automobilists to break down all speed restrictions on the highways for their own particular benefit. They practically ask for a complete monopoly of the public roads, so far as fast running is concerned, and wax furious at any opposition on the part of the average citizen who pays for the roads. Each year the pressure grows heavier for the abrogation of restrictions, and the prospect of success grows brighter. But the electric railway, that runs alongside the highway, and not in it; that runs on a track entirely clear of vehicles, and thus keeps out of the way of ordinary traffic, must hold itself down to the most modest pace. That is, the public that builds the highways must creep along them in trolley cars, while the persons who sport automobiles spin by unrestricted. Now, take the case of that well-known suburb Boodleton-by-the-Sea. The P. & X. electric road has been making strenuous efforts for two years past to get a franchise for an extension to Boodleton for the accommodation of the several thousand people who live out in that direction and are very indifferently served by the steam line thereto. At each hearing the occupants of the villas turn out in force with eminent counsel and oppose. At first they delayed things merely, but now they suggest an automobile 'bus line, and show clearly that they can cut the electric car time down by nearly half. They have not the slightest idea of accommodating the public, and, in fact,

do not intend to put on the line at all, but merely to block the trolley. One trolley line, in fact, was compelled a few years ago to make a long detour around Boodleton, and now the imaginary 'bus line serves to keep it there.

And if the denizens of Boodleton really go ahead with their quasi public line, from the present outlook they can run at pretty nearly any speed that suits them. They pay nothing for the use of the road, but a part of the taxes near the terminal, and have almost an exclusive use of it. This is not altogether a fancy case, unfortunately. We could mention divers instances of electric roads blocked in an attempt to do a real public service by just this sort of opposition, and as time goes on there will be more. And beyond this there is possible real competition from motor 'busses monopolizing the highway that is denied to electric cars, and free to run at high speed. If any gentleman wants to set up an automobile and scorch the highways, we would be the last to say him nay, so long as he obeys the rules of the road. But we know of no reason why he should be allowed to run at illegal speeds because he wants to snip a few minutes off the record from Boodleton to New York, or, in fact, for any other purpose. The next time a bill to raise the speed limit comes up, we hope the electric railway men will get out in force and see that it is so amended as to apply to all vehicles, whether they run on tracks or careen promiscuously over the whole width of the highway. There is no reason why the law should allow one class of vehicles the advantage over another, and one that runs on a track and is driven by electric motors should have all the rights that belong to one that runs over the macadam beside it, driven by a gasoline engine. So far as public safety is concerned, one can keep off a railway track without difficulty, but no one, save a mind reader, can tell which way the automobile is going to wobble next. At all events, let us have the same sauce for both the goose and the gander. If it comes to unlimited speed on the good old plan of every one for himself and devil take the hindmost, we rather fancy that in the long run the electric car can give a good rub to anything on wheels.

The Freezing of Compressed Air Apparatus

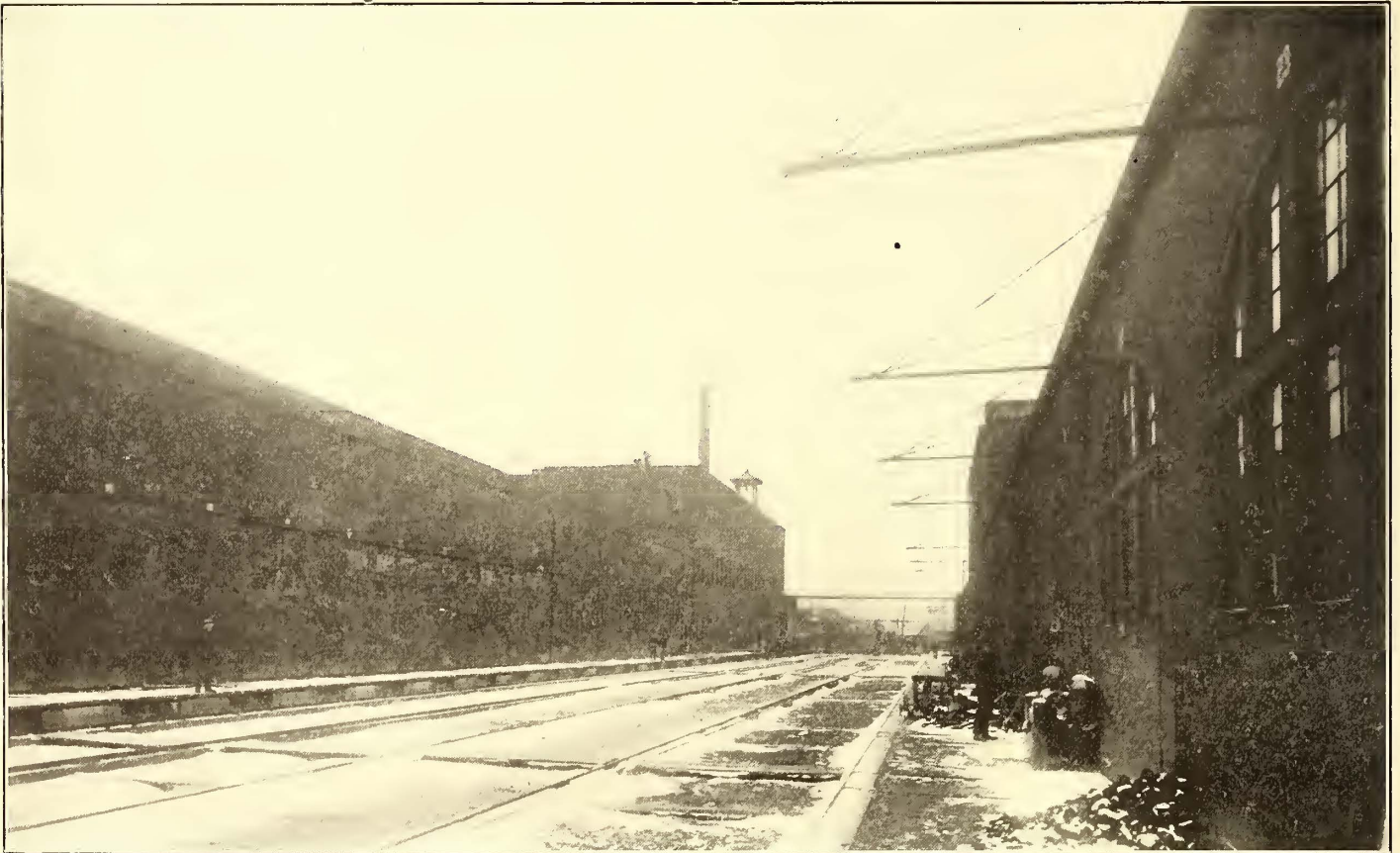
In view of some of the fears that were expressed by some conservative managers as to the working of the storage air-brake system on a large scale, it is gratifying to learn of the small amount of difficulty that has been experienced in the practical operation of this system at St. Louis during the cold weather. The difficulties so far encountered are strikingly similar to some of the small difficulties met in the early days of air-brake apparatus supplied from individual compressors on each car. One of the things which must be guarded against in piping the car, whether for a storage air-brake system or for an individual compressor system, is to avoid as far as possible all places where water will have a chance to collect and freeze so as to obstruct the action of the brakes in cold weather. That a certain amount of moisture will collect in compressed air apparatus is inevitable. The important thing is to see that it gathers where it can be drained off, and, further, to see that it is removed at frequent intervals. In the storage air-brake system, the reducing valve seemed to have been the first point of attack of Jack Frost, and it may be advisable in future installations to put this valve inside the car. In the individual compressor system it was early found that pockets where moisture could collect in pipes without a chance to drain off were to be avoided.

THE NEW REPAIR SHOP PLANT OF THE DETROIT UNITED RAILWAY

Electric railway practice in the city of Detroit, Mich., has, owing to the many important and valuable improvements in the methods of electric railroading originating there, come to be very generally regarded as representative of that which is best and most modern. Many innovations in mechanical branches of electric railway operation have been tried out and perfected by the Detroit United Railway Company which have materially influenced present conditions of street railway operation throughout this country. The storage air-brake system, for instance, originated upon one of the suburban lines now operated by this company, while the new standard style of extended rear platform of the company, so well known as the "Detroit platform," has been adopted for use in a large number of other cities. Also, Detroit is the birthplace of the

creased and new lines were acquired, the mechanical work leaped to such proportions that it was realized that a greatly increased repair shop plant would be necessary in order to properly cope with the increased and more exacting requirements of the repair work.

As a result of the progressive and energetic policy of the company in anticipating the ever-changing conditions in this field of work, it was decided in 1902 to make provisions for greatly enlarged quarters for the accommodation of the mechanical department. It seemed to be most favorable to entirely abandon the old Jefferson Avenue shops in favor of a new and more carefully designed plant throughout. The result of investigations made in reference to the site, plan, etc., for a new shop installation was the purchase of the factory site and buildings of a former car building plant, which happened to be conveniently located in the city and, furthermore, was available by purchase. This installation embraced the buildings



GENERAL VIEW, LOOKING EAST, IN THE YARD OF THE NEW SHOP PLANT OF THE DETROIT UNITED RAILWAY COMPANY, SHOWING TRANSFER TABLE RUNWAY AND CHARACTER OF BUILDINGS

wooden gear case for motor gears, and many styles of overhead line specialties, as well as also an improved trolley harp, were given to the public by experience there. In view of the interest thus naturally directed toward this progressive electric railway center, an account of the new repair shop installation of the Detroit United system and the methods pursued there will be of interest.

The announcement was made in these columns over two years ago of the purchase by the Detroit United Railway Company of a large passenger car building plant which was lying idle and appeared well adapted to the requirements of the electrical and mechanical work of the company. For several years previous, the mechanical department of the company had labored under the difficulties of inadequate facilities. Previous to the opening of the new shop the major portion of the work had been concentrated at the Jefferson Avenue car house shop, which had been increased in size from time to time, in a temporary manner, to provide for the rapid and unprecedented growth of the work. But as the traffic of the company in-

and grounds occupied by the old Detroit branch of the Pullman Palace Car Company, which, it will be remembered, was the scene of many important developments in railroad car building and the sleeping car service of this country; much of the earliest passenger car building in America was carried out in this old shop, but since the concentration of the work of the Pullman Company at its large plant in Pullman, Ill., active work had been abandoned in the Detroit branch, which had accordingly been standing idle for a number of years. This shop installation, although designed to meet the conditions in the building of heavy cars for steam railroad service and thus apparently not well adapted for repair work upon cars for street railway service, was found easily adaptable, by comparatively slight modifications, to the work in hand.

The character of the new shop organization, as adapted to the governing conditions at the old Pullman plant, is the natural result of a study of the varied and exacting requirements now made upon the mechanical department by the operating forces. With the present equipment of 218 miles of city lines

and 318 miles of interurban lines, radiating in all directions from the city, not only a very large but a widely scattered equipment must be taken care of. On account of the length of some of the interurban lines and the importance of conforming to schedule operating conditions, demands are made upon the mechanical department for the maintenance of the equipment in the best possible condition for insuring a minimum of delays.

The work required at these shops is somewhat differentiated in character from repair shop work upon other roads, on account of the varied assortment of the apparatus, both electrical and mechanical, which was bequeathed to the present operating company by the various lines which have been absorbed. The electrical equipments of the various component lines embraced many different types of apparatus, and in most cases the equipments of each line differed from those of the others; the result of this condition is that of imposing upon the maintenance department the care of widely varied classes of apparatus, with resulting increase of detail work in the shop and the necessity of maintaining a large supply of repair parts in stock. A similar condition of affairs was found in all mechanical features of the work; many different types of car body construction had formerly been used, while trucks, wheels, fenders and other details were of differing types of construction. The opportunity thus afforded for careful application to detail, and also to the introduction of new interchangeable standards, was found in the nature of almost a dire necessity.

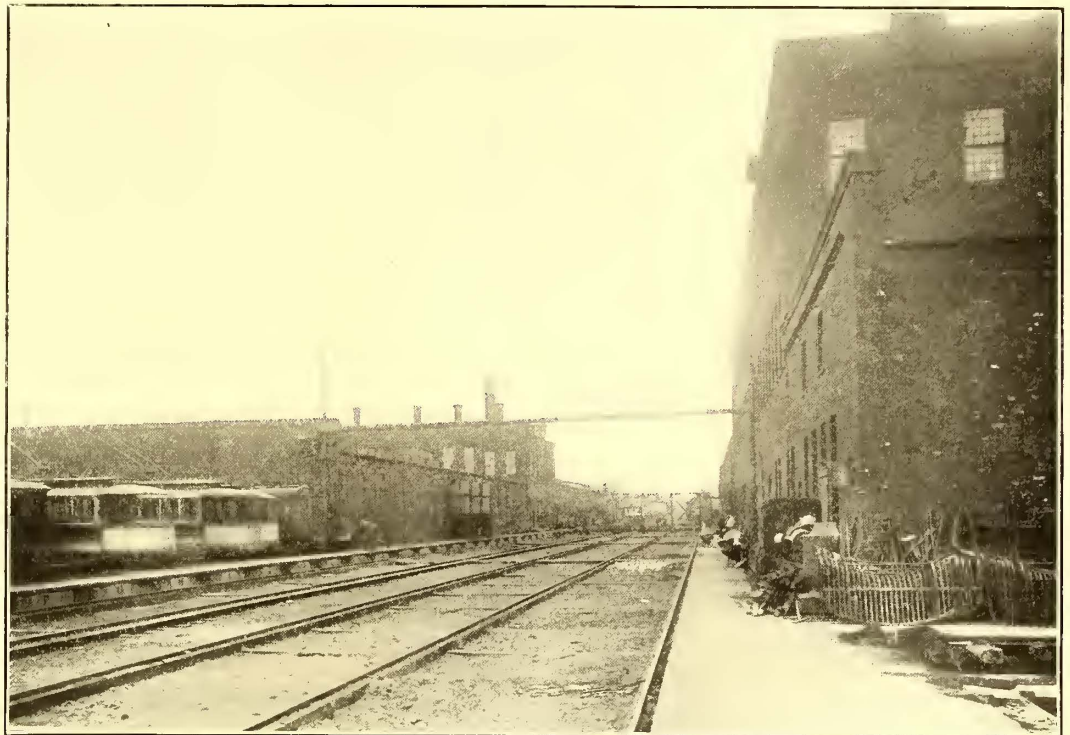
SHOP LAYOUT

The accompanying large plan drawing of the shop buildings and grounds illustrates the arrangement of departments and layout of tracks, etc., which is the result of the study that was made to adapt the requirements of the present mechanical work to the conditions and surroundings as presented in the original Pullman plant. It may perhaps be suggested that the original Pullman shop layout did not offer the most desirable arrangement for electric railway repair shop conditions; yet it will, however, be seen that the shop installation, as originally built, was well adapted for car repair work in particular, especially as it was of the transfer-table type, in favor of which much has been said of late for shops for street railways. The original Pullman shop was built in accordance with the transfer-table layout, which has for many years been in general favor for car shops under steam railroad conditions; this general arrangement of buildings and tracks has many advantages to offer for street railway work, although perhaps its adaptability to the latter class of service may not be shown to the best advantage in this particular case. The result which will be obtained in service with this arrangement will, however, be of interest and value in directing future work.

Perhaps one of the most important features of the transfer table arrangement is the economy of ground required by it for a repair shop plant of a certain capacity. The transfer table, by virtue of the facility with which it is traversed to any of the parallel tracks, eliminates the necessity of long lead tracks,

and consequent large yard space which would be required with the longitudinal arrangement of shop buildings with fewer tracks arranged lengthwise. The parallel arrangement of the tracks within the buildings renders every corner of the shop space available for work, and also makes access to the various cars in the shop most easy. Another feature which is worthy of mention is the ease and facility with which a car may be handled to or from any one of the various departments by merely shifting the transfer table opposite the track on which the car is located.

As may be noted from the large layout plan, cars enter the shop grounds by way of a receiving yard at the Monroe Avenue and St. Aubin Avenue corner of the plant. At this end of the yard there are fifteen tracks on the Monroe side and four tracks on the Macomb Street side, which are uncovered and are used for storage purposes, thus providing ample storage space for cars either awaiting repairs or ready to go into ser-



VIEW, LOOKING WESTWARD, IN THE SHOP YARD, SHOWING CAR STORAGE YARD AT THE LEFT

vice again. Two connections are made with the adjacent street tracks of the company's lines, as shown, the connection running downward upon St. Aubin Avenue being a cross-over connection to the westbound track of the Monroe Avenue loop line, cars passing east upon Monroe Avenue and west upon the street next below. Excellent connections are thus made with the city lines, and thence with the interurban systems. At the De Quindre Street end of the plant there is a side-track connection with the Grand Trunk Railway, which greatly facilitates shipping; freight cars are handled from there into any department of the shop by means of the transfer table.

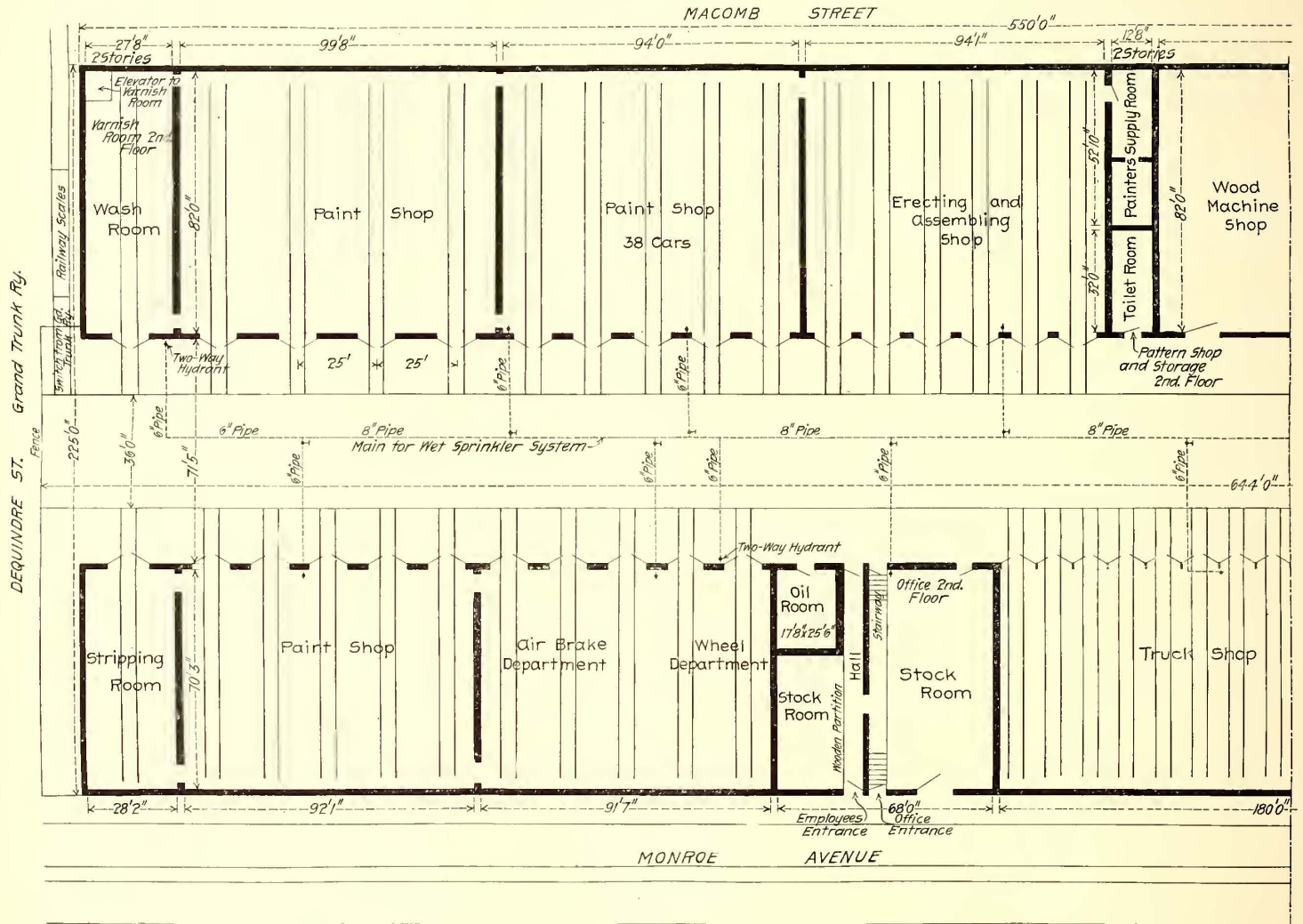
Cars are handled from the storage yard to any one of the various departments of the shop by the transfer table, the pit for which is indicated between the two long lines of the buildings on either side of the property. The transfer table is an electrically operated table, with special housing for the man in charge, as illustrated in the views between the buildings and of the transfer table. It is carried upon five lines of track, each of 60-lb. rail, the total span across the pit being 36 ft. The table has a total travel of 644 ft., reaching thus forty-two parallel tracks which enter the buildings, and sixty-two parallel tracks in all. The table is equipped with one track only, although a space is provided at each side to accommodate trucks,

wheelbarrows, etc., across from one side to the other. The current supply for the operation of the transfer-table motors, and also for supplying current to the trolley wire, which is provided upon the table and carried by the frame work shown upon it, is delivered upon a partly enclosed contact wire alongside of one of the longitudinal rail stringers in the pit. The table is of 60 tons capacity, and was built and installed by George P. Nichols & Brother, Chicago, Ill.

Cars may be moved across the table and into the buildings by their own power, if desired, as trolley wires are provided over nearly all of the parallel tracks, and also upon the transfer table, as indicated in the view. There is provided, however, a small electric pusher locomotive for moving disabled cars or those without power, into and out of the shops. This loco-

sprinkler system, which has recently been installed for more adequate fire protection.

In addition to the property west of St. Aubin Avenue above referred to, the company owns a plat 200 ft. x 95 ft. in area, extending eastward from that street to an adjacent alley, as shown. This plat is made use of for a storage yard, provision being made for storage of oil in one corner and for the storage of kiln-dried lumber in a lumber warehouse at the Macomb Street end. In this yard is also stored all the materials which can be kept out in the open air without detriment, and also the scrap of various kinds which naturally accumulates in works of this size. Both the store yard and the open spaces in the block occupied by the shops are surrounded by high fences or brick walls, the latter being used in nearly all cases. Gates are, of



PART YARD AND BUILDING PLAN OF THE NEW MONROE AVENUE REPAIR SHOP INSTALLATION OF THE DETROIT UNITED RAILWAY COMPANY

tive is shown upon one end of the transfer table. It is a single-truck car, 12 ft. long over all, equipped with two type O "Steel" motors, and is capable of exerting a very heavy draw-bar pull for a car of light weight. It is provided with a cab for protection of the control apparatus and motorman.

The relative arrangement of buildings and open space upon the grounds is indicated in the plan. The building upon the Macomb Street side of the property consists of a structure of a uniform width of 82 ft. and 550 ft. long, while that on the Monroe Avenue side is only 460 ft. long and 70 ft. in width. The space from the truck shop east to St. Aubin Avenue is devoted to storage tracks, and a space of 79 ft. east of the blacksmith shop is devoted to track space and a store house for gears, brake-shoes and other supplies. In this corner of the property is also located a large new underground tank, and also an elevated tower tank for use in connection with the wet

course, provided at the St. Aubin ends for facilitating the transfer of material to and from the store yard.

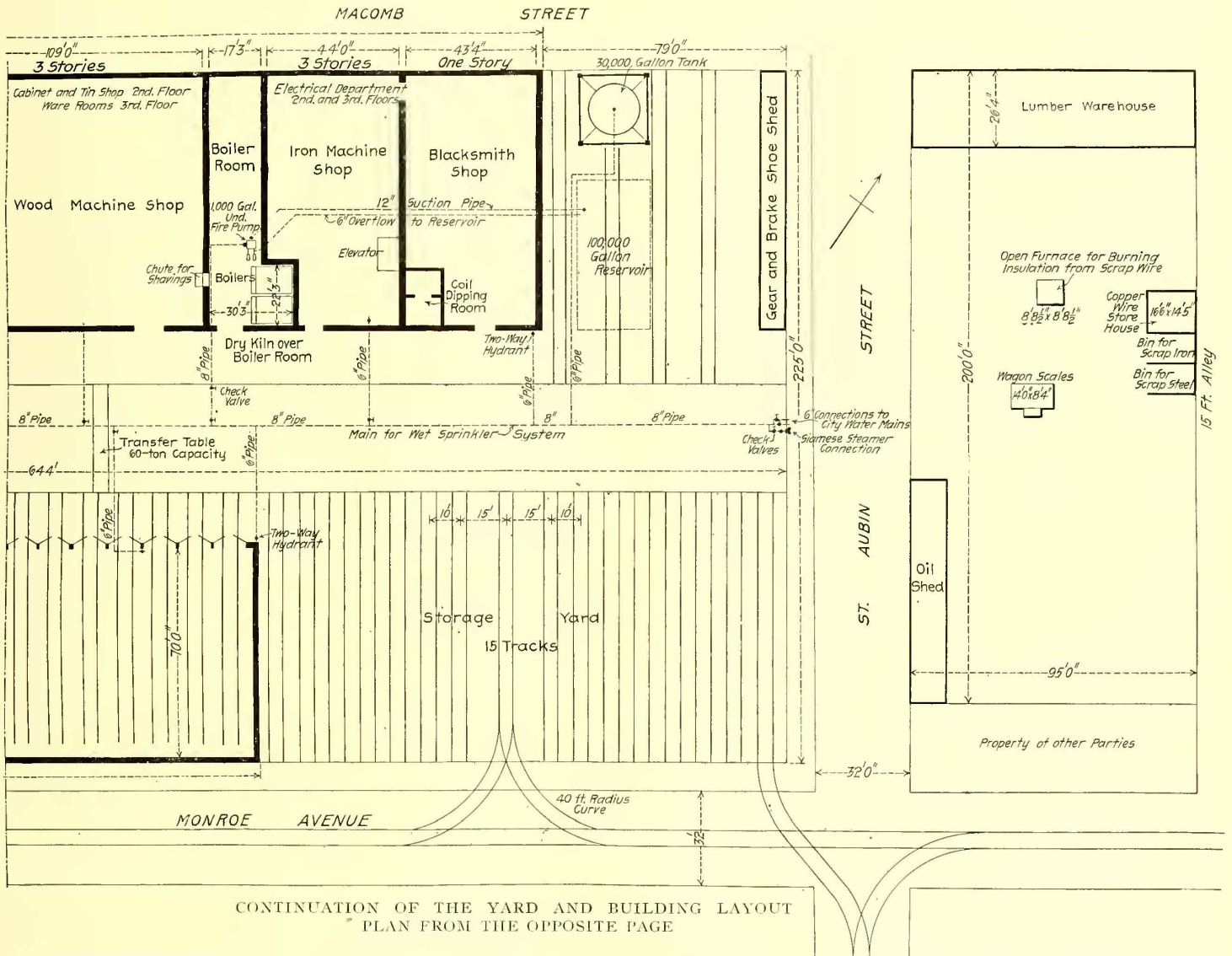
THE BUILDINGS

Few changes were found necessary in the arrangement or sizes of the buildings from those used by the Pullman Company, the original layout having proven well adapted to the requirements of the present work. Some slight changes in the arrangement of tracks in the truck, wheel and paint shops were made, which merely necessitated the rearranging of the large double doors leading to the transfer table, and also pits were built in several of the truck shop tracks. The blacksmith shop, however, was somewhat reduced in size, a building which formerly extended to the eastward from that department having been removed. Also minor changes in buildings were made in numerous instances to accommodate the particular work in hand, but no sweeping changes were involved.

The buildings are in general one story in height, although in sections they are raised to two and three stories. The offices, for instance, occupy the space above the stock room on the Monroe Avenue side, all of the rest of the building upon this side of the block being one story in height. Upon the Macomb Street side the portion of the building occupied by the wood-working shop and the machine shop is three stories in height, while the sections occupied by the paint supply room and the wash room are two stories in height. All the remainder of the structure upon the Macomb Street side is one story in height. The construction of the building is of the well-known mill type throughout, flat roofs with gravel covering being used in general. Skylights are provided in all of the one-story sections, in addition to the abundant side window lighting, for faci-

installation of the wet sprinkler system is the result of a very careful study which was made of the methods of protection from fire, not only under electric railway conditions, but under all conditions of factory operation, with the result that the prohibitive insurance rates formerly demanded were avoided and, in addition, the benefits of the insurance mutuals acquired. The contract was placed with the General Fire Extinguisher Company, Cleveland department, for the installation of a system of this type of the most improved construction.

The equipment as installed provides for the division of the buildings into eleven distinct and separate systems, each of which is supplied through an outside controlling valve in the shop yard, which may be used to shut off its system independently of the others. The idea of this provision of an out-



CONTINUATION OF THE YARD AND BUILDING LAYOUT PLAN FROM THE OPPOSITE PAGE

tating the work under good day-time lighting conditions. There is nothing novel in the construction of the shop buildings, although the use of the mill type of construction is of interest on account of its having been found best adapted for meeting the requirements of the insurance underwriters in electric railway car house and shop work.

FIRE PROTECTION

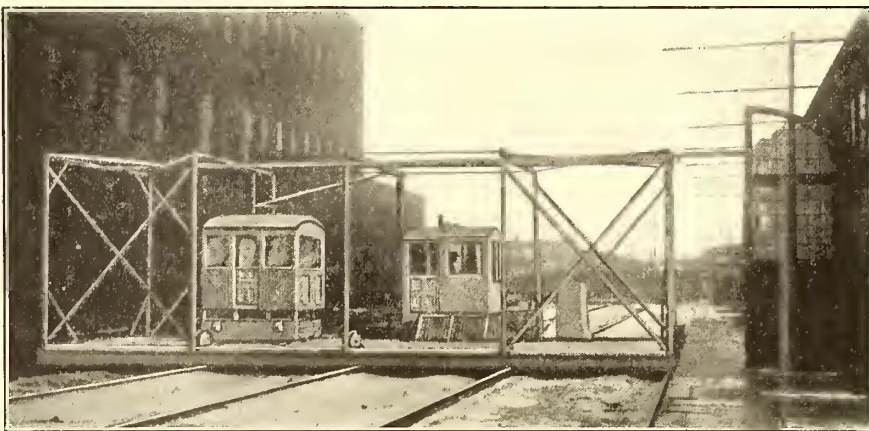
In compliance with the recent recommendations of the fire insurance companies, a wet sprinkler system has recently been installed throughout the shop plant, which, it is thought, will reduce the danger of fire to a minimum. As may be noted from recent tests of the wet sprinkler system in car house work, as recorded in the columns of this journal, the wet sprinkler system is, when properly installed, best adapted to the protection of the buildings and rolling stock under the conditions of electric railway operation of any of the protective systems. The

side shut-off valve is that in case of the necessity of anyone attempting to shut off the system in a department owing to a large fire there, they would not be driven away from the valve by fire and smoke, as would be the case if the shut-off valves were located inside the building. The sprinklers are distributed throughout the ceilings of every room and upon all floors of all of the buildings, each sprinkler being arranged to cover an area of about 60 sq. ft. The type of sprinklers used is the Grinnell sprinkler head, which was described on page 53 of the Jan. 7, 1905, issue of this journal.

The sprinkler system is supplied, in connection with the elevated tower tank, by a large steam pump of the fire underwriters' type, which has a capacity of 1000 gals. per minute and is capable of throwing four fire streams, maintaining a pressure of 125 lbs. on each stream. This pump is always kept under steam pressure and is equipped with an automatic gov-

error in the steam supply, which maintains a constant water pressure of the entire sprinkler system and hydrants of about 80 lbs. In case of fire in any part of the plant and the consequent opening of any one of the sprinkler heads, the release of pressure upon the sprinkler system operates through this automatic governor to start the pump in action at once; the pump will then, of course, continue working until water is shut off from the system. At the base of each of the eleven sprinkler supply risers in the various departments there is a special alarm valve which connects with an annunciator in the engine room. In case of fire in any one of the sections and consequent flow of the water, this annunciator operates an alarm gong, immediately notifying the engineer or watchman in charge in what section of the plant the fire is located.

The underwriters' pump takes its supply from the large underground reservoir, shown adjacent to the blacksmith shop, which has a capacity of 100,000 gals. The suction from this reservoir to the pump is through a 12-in. pipe, the pump delivering to the wet sprinkler line through an 8-in. connection, as



VIEW OF THE TRANSFER TABLE USED AT THE DETROIT SHOPS FOR HANDLING CARS, AND ALSO THE SHIFTING LOCOMOTIVE

shown. The immediate connection from the delivery line to the elevated tower tank above mentioned is made near the main reservoir through a 6-in. pipe line, as indicated in shop layout plan. This elevated tank is a wooden tank of 30,000 gals. capacity, located on a 65-ft. tower of structural steel construction. The effect of the pressure from the pump upon the delivery system is to maintain this tank full of water through the connections indicated, which serves as an additional precaution in maintaining pressure upon the delivery system; in case of fire and the flow of the water through the sprinklers, the tank naturally assists the pump in maintaining the pressure, and is, furthermore, obviously an important check upon the system in case of a possible failure of the pump or its steam supply.

In addition to the above methods of water supply for the system, there are two 6-in. connections with the city water mains upon St. Aubin Avenue, as indicated at the east end of the transfer-table pit; these are arranged to be easily and conveniently opened in case of failure of water supply elsewhere. A further supply source is provided in the form of a Siamese connection, which projects through the yard wall at St. Aubin Avenue, to which city fire engines can be connected so as to pump directly into the underground delivery system, if desired. This arrangement therefore provides in effect three separate and distinct sources of water supply for the system, with the additional precautionary check upon them in the form of the elevated tank.

An important auxiliary protection is to be noted in the arrangement of outside sprinklers, which are provided over each window on the two floors of the three-story shop building above the woodworking and machine shops. These sprinklers are arranged to be turned on by hand in case of fire in the one-story paint shop building adjoining, in which case they will

flood with water each of the windows on this exposed side, and would thus prevent the fire from entering the three-story building on that side. There is also provided one row of similar outside sprinklers on the two-story office building over each of the windows facing adjoining roofs, so that they may also be opened in case of a serious fire in the one-story section on either side.

THE STOCK AND SCRAP MATERIAL YARD

The material yard on the opposite side of St. Aubin Avenue has been referred to above, this plat of ground, 200 ft. x 95 ft. in area, being devoted to the storage of material and supplies of all kinds, and also for all classes of scrap which may accumulate in the shops. As may be noted, at the north end of this yard is located a dry lumber warehouse, 26 ft. x 95 ft. in size, in which is stored all the kiln-dried stock lumber for use in the woodworking shop. This building is a frame structure, one story in height, and is provided with racks for conveniently classifying the various grades and sizes of lumber. It is provided with doors not only into the yard but also opening to the adjacent streets, by which lumber may most easily be handled to the shops.

At the opposite end of the yard is located an oil storage building in which are kept the stock supplies of all classes of lubricating oils, and also the kerosene and gasoline used in the shop work. This stock is kept in a low building of light construction, which is confined to a portion of the yard where a minimum of damage would occur to adjacent property in case of fire. This building is, of course, kept locked at all times, and all possible precautions are taken to prevent this danger.

The scrap bins are located at the east side of the yard, those for iron and steel scrap being of open construction, while that for copper scrap is covered and kept carefully locked. In this connection an inter-

esting practice is in use here of burning all scrap copper wire, field coils, etc., to remove the insulation, so that in selling the scrap exact estimates may be had of the net weight of the copper. This is accomplished in the large open furnace indicated in the drawing at the middle of the yard; this furnace is a low chimney of brick construction, with a large opening on one side, and is arranged with a plain grate upon which to locate the coils and bundles of wire in burning. This practice is found very profitable in the selling of the copper scrap, as the work of burning is very inexpensive, owing to the use of wooden refuse, etc., from the shops; the knowledge of exact weights has been found a source of considerable profit over the former method of estimating the tare allowance for the insulation, which was usually much in favor of the junk dealer. The balance of the yard is devoted to the storage of iron and steel stock of all kinds, and also materials of metal construction which are not injured by outdoor storage, such as couplers, wheels, air-brake tanks, etc.

The excellent facilities which have been provided for the machine, blacksmith and woodworking departments of the plant, as well as also for the electrical repair work, will be referred to in another article to be presented in the following issue. Also some of the interesting operative methods pursued at these shops will be made the subject of an article in a later issue.

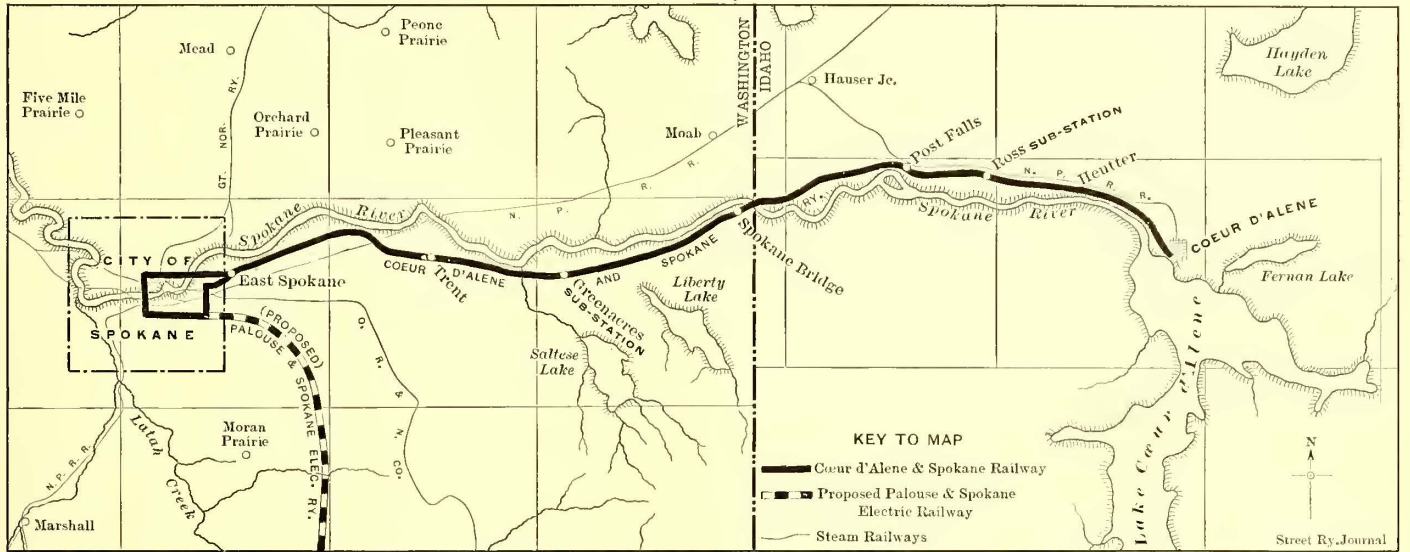
After lauding the Washington Railway & Electric Company, of Washington, D. C., for an expression of appreciation of the services of its employees, that took the substantial form of an increase in wages, the Washington "Post" pays a tribute to the efficient management that has made the system "modern in all respects and a credit to the Capital of the Nation."

THE COEUR D'ALENE & SPOKANE RAILWAY

Interurban railroading in the Western States has naturally not been developed on as extensive a scale as that upon which it has come to be operated throughout the East. The reason obviously is that the West has lacked large cities, small towns close together, and well-settled farming and residence communities, which warrant the heavy investments in this field of electric traction. However, those few interurban railways

parts of the lake as well as up the St. Joe and Coeur d'Alene Rivers. Over sixty steamers of various sizes regularly ply the waters of this lake.

Between the terminal cities of the road there is but little intermediary business that would seem to warrant the building of the line, the land being mostly arid and only partially under irrigation or improved. Post Falls, with a population of 600 and a few mills, is practically the only town on the way. Coeur d'Alene is connected with Spokane also by the Northern Pa-



MAP SHOWING THE TERRITORY TRAVERSED BY THE COEUR D'ALENE & SPOKANE RAILWAY

which have been built west of the Rocky Mountains, have found business profitable, and many more such roads are now projected or are already under construction. The conditions under which each is built are necessarily peculiar to that one, but in most instances the handling of freight plays a very important part in the success of the undertaking.

Such is accordingly true of the railway inaugurated less than a year ago by the Coeur d'Alene & Spokane Railway Company,

cific Railroad, through a branch from the main road, but this service seemed to invite rather than to discourage competition. After a thorough study of the situation, and a careful canvass of the probable business, F. A. Blackwell, of Coeur d'Alene, interested some of his Eastern friends in the project and the road was built. That the undertaking was a wise one is indicated by the facts that the operation is successful and that a profitable interest on the investment is already being returned.

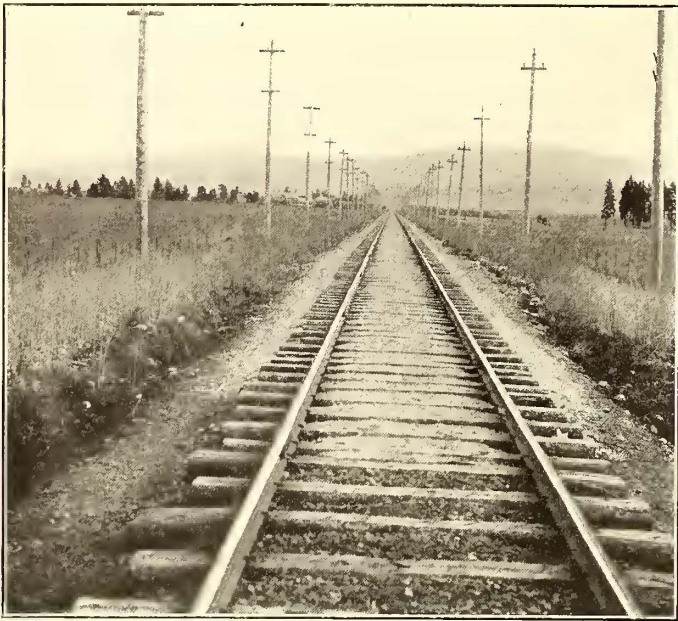


A FOUR-CAR TRAIN ON THE COEUR D'ALENE & SPOKANE RAILWAY

Limited, to run between Coeur d'Alene, Idaho, and Spokane, Wash., a distance of about 34 miles. Spokane, a very prosperous and growing city, located inland, draws its business chiefly from the great wheat lands in its vicinity, and also from the neighboring mining districts, which are rich. Its population numbers about 60,000, and there are no other cities of this size within a radius of 400 or 500 miles. Coeur d'Alene, the eastern terminus and headquarters of the electric railway, has a population of about 4000, and is beautifully situated at the northern end of Lake Coeur d'Alene. It is the chief shipping point of the Coeur d'Alene mines, with boats running to all

As shown on the accompanying map, the railway follows the valley of the Spokane River, which is the natural outlet of Lake Coeur d'Alene. About midway between the termini, the road crosses the river, 37½ ft. above the surface of the water, on a 600-ft. wooden truss bridge, and at the same time also crosses the dividing line between the States of Idaho and Washington. The track is of standard gage and is laid with 60-lb. standard A. S. C. E. section T-rail in 30-ft. lengths. The roadbed consists of hewn fir ties 7 ins. x 7 ins. x 8 ft., laid 2-ft. centers, and thoroughly ballasted with rock gravel. This ballast was nearly all taken from the right of way. The rails are con-

nected with angle-iron bars, the joints being suspended, and are bonded throughout with Brown plastic bonds. Whenever necessary, the track is drained with tile laid 8 ins. under the ties.



TANGENT TRACK $3\frac{1}{2}$ MILES LONG, SHOWING BALLAST AND GENERAL APPEARANCE OF TRACK NEAR CARDERS STATION, WASHINGTON

There is a gradual up grade from Spokane to Coeur d'Alene, averaging 0.15 per cent. The heaviest grade is 1.2 per cent, and the maximum curvature is 8 degs.

Side-pole overhead construction is used with 35-ft. poles, spaced 100 ft. apart. The trolley wire is No. 0000, figure 8, and is suspended 22 ft. above the track. Power is purchased from the Washington Water Power Company, being transmitted from that company's water-power plant in Spokane to two rotary-converter sub-stations, located at Green Acres and Ross, 14 and 25 miles, respectively, from Spokane. The transmission voltage is 22,000 volts three-phase. The equipment at each sub-station consists of one 200-kw rotary converter and three 100-kw oil-insulated transformers, the rotaries feeding onto the line through No. 000 and No. 0000 feeders. The company's business has grown beyond the capacity of the sub-stations, and there have been ordered two 400-kw rotaries and six 150-kw transformers, it being the intention to add one rotary and three transformers to the equipment of each station. Separate brick houses will be erected for the transformers, as the station buildings are of wood. With the new machinery installed, the large rotaries will be regularly used, the smaller ones being switched in on heavy loads. All the electrical machinery is of Westinghouse manufacture.

The company opened the line for traffic on Dec. 26, 1903, using temporarily two small street cars that were borrowed from the Washington Water Power Company. These cars seated but sixteen people each, but frequently had to carry

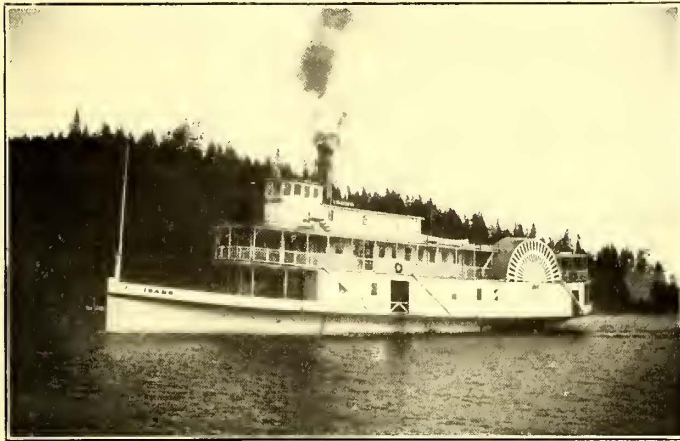


BRIDGE CROSSING SPOKANE RIVER; ALSO SHOWING THE IDAHO-WASHINGTON BOUNDARY LINE

The company has a private right of way, ranging from 60 ft. to 200 ft. wide, for 22 miles. Where the line crosses the Northern Pacific, an under-grade crossing is made by means of a concrete subway. Near Post Falls, a fill 51 ft. deep and 300 ft. long was necessary, and at another point, a 35-ft. cut was made.

forty. At that time neither of the sub-stations was completed, and the cars were operated the entire length of the line from railway voltage received at the Spokane end. It is needless to state that the voltage dropped to almost nothing at the eastern end, and the service could hardly be of the best. By the mid-

dle of January, the company's own cars were received, and by the 25th of that month, one sub-station was running, so that the service was greatly improved. On the 1st of May the other



STEAMER "IDAHO," ON RED COLLAR LINE, COEUR D'ALENE LAKE AND ST. JOE RIVER

sub-station was completed, and since that date the operation has been very satisfactory.

The rolling stock of the company comprises five combination passenger and baggage motor cars, two express motor cars and seven passenger trailers. The two larger combination cars are 40 ft. over all, and are equipped with four Westinghouse No. 76 motors and L-4 controllers. Each of the other three has four Westinghouse No. 56 motors and K-14 controllers. The express cars are equipped with two Westinghouse No. 76 motors and K-6 controllers. The combination motors each have a seating capacity of twenty-eight, and the trailers each seat from thirty-two to thirty-six. The cars were built by the American Car Company and are equipped with Westinghouse automatic air brakes. They are heated by Peter Smith hot-water heaters. The cars are always run in trains of two or three for passenger service, and occasionally four-car trains have been operated. The average maximum speed is 50 miles an hour, although a speed of 65 miles an hour is often attained on certain portions of the

lake, where the company owns 20 acres. Here are located the depot and general office building, the freight house, repair shop and car house. Two docks, extending out to deep water, are used for passenger and freight business in connection with the boat lines. At the Spokane end, the cars operate over the lines of the Spokane Traction Company, the depot being in the center of the city.

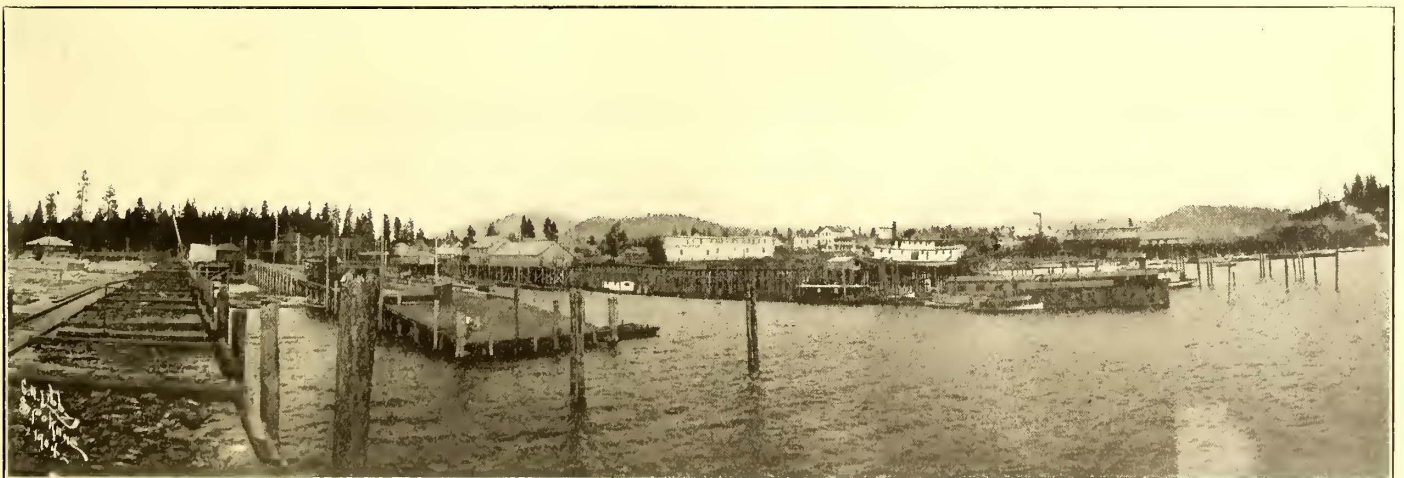
The regular train schedule provides for six daily passenger trains each way, and three baggage trains which also carry passengers. The passenger trains make the run with regular stops in eighty or ninety minutes, while the baggage trains generally take ten or fifteen minutes longer. There is one limited passenger train, called the "Shoshone Flyer," leaving Spokane at 7:40 a. m. and Coeur d'Alene at 5:30 p. m., which stops at Post Falls only, and makes the run in an hour and ten minutes. On Sundays as many as twenty trains have been operated each way, the service being regulated by the demands of the traffic. At Coeur d'Alene, regular daily connections are made with five boat lines for all points to the south on the lake and rivers.

In one of the accompanying illustrations is shown the steamer "Idaho" of the Red Collar Line, one of the six passenger boats plying on Lake Coeur d'Alene and the St. Joe River in connection with the electric railway. The capacity of the "Idaho" is 1000 passengers, and its cost was about \$40,000. The passenger business of the electric railway has shown an increase from 8000 carried during January last, to over 33,000 carried last



THE GREEN ACRES SUB-STATION OF THE COEUR D'ALENE & SPOKANE RAILWAY

July. The company gets practically all the local freight business between Coeur d'Alene and Spokane, on account of its splendid terminal facilities and frequent service. Its earnings



DOCKS AT COEUR D'ALENE. THE TWO ON THE LEFT ARE THE COEUR D'ALENE & SPOKANE RAILWAY COMPANY'S DOCKS

track. It is now planned to add two additional trains to the rolling stock, each to consist of one motor and two trail cars, to provide for the next summer's traffic. These new cars will be about 52 ft. long.

At Coeur d'Alene, the line terminates at the shore of the

from this source are about \$100 per day and are steadily increasing. Considerable business is done in hauling carload lots, principally of lumber, as there are several saw mills at Coeur d'Alene. Track connection is made at Spokane with the Oregon Railroad & Navigation Company's lines, and the loaded

cars are consigned directly to their destination. The heavy freight is handled chiefly at night, steam locomotives being used. The freight equipment of the road comprises two locomotives, twenty box cars and forty flats.

The railway is operated entirely under steam railroad rules and regulations. All motormen and conductors are required to have had three years of steam road practice, and the motormen must have been locomotive drivers. The wages of both motormen and conductors are 30 cents an hour, and this rate is paid from the time the men go to work in the morning until



PASSENGER DEPOT, FREIGHT HOUSE, CAR HOUSES AND MACHINE SHOPS AT THE TERMINAL YARD OF THE COEUR D'ALENE & SPOKANE RAILWAY

they are off in the afternoon or evening. The actual running time of each man is about six hours, but their day's work is about twelve hours long, the remainder of the time being given up to lay-overs at the terminals. Brakemen are required on the trailers, and they are paid 20 cents an hour. The entire line is operated by means of a telephone dispatching system in the usual manner.

Among the improvements planned for the new year is the expenditure of about \$10,000 in the development of a 20-acre park and pleasure ground which the company owns at Coeur d'Alene. The property includes the site of old Fort Sherman, and is picturesquely located on the shores of the lake. The company is also interested in the erection of a \$75,000 hotel at Coeur d'Alene. In the way of extension, a 2-mile line will be built from the east end of the system to Silver Beach on the northern shore of Lake Coeur d'Alene. A branch from a point near Green Acres to Liberty Lake is also a possibility in the near future. At the Spokane terminal, commodious passenger and freight stations are to be erected, the former in conjunction with the Spokane Traction Company.

The Coeur d'Alene & Spokane Railway Company, Limited, is incorporated under the laws of Idaho, with a capital stock of \$500,000. Its officers are as follows: President, F. A. Blackwell; first vice-president and general manager, R. F. Blackwell; second vice-president, Jay P. Graves; secretary, C. P. Lindsley; treasurer, William Dollar; assistant secretary and auditor, Ira H. Shallis; chief engineer, J. C. White; general counsel, E. H. Belden; traffic manager, Waldo G. Paine.

Boy bandits, armed to the teeth, recently terrorized Binghamton, N. Y. One of their daring deeds was to emulate the example of the doings of the men who carried out the famous car house robbery in Chicago. Their deed at the car houses of the Binghamton Railway Company was executed in the quiet of the afternoon. They broke into a room and secured tools with which they proceeded to cut through a partition in the supply room of the car house. A lineman discovered them, but he was promptly covered with a gun. The bandits then made good their escape. It was several days before the boys were all captured by the police, and restitution was made of goods stolen from those who had been selected as promising prey.

THE POWER-DISTRIBUTION SYSTEM OF THE LOUISVILLE RAILWAY COMPANY

An extensive polyphase power-distribution system has recently been installed at Louisville, Ky., by the Louisville Railway Company for its own lines, and also for the suburban roads out of the city of the Beargrass Railway Company, which, like the railway company, is controlled by the Louisville Traction Company.

The alternating-current system now in operation is almost completely independent of the direct-current plant. It consists of a power plant and three rotary converter substations. For the accommodation of the alternating-current generating plant an addition was built on the western end of the d. c. power station at Jacobs and Campbell Streets. Six 250-hp Babcock & Wilcox boilers equipped with mechanical stokers are installed in the new boiler room. The new and old boiler room, together containing sixteen 250-hp Babcock & Wilcox boilers, supply the same steam header. There are two 1650-kw a. c. generating units, consisting of Allis-Chalmers engines and Westinghouse generators. The engines are

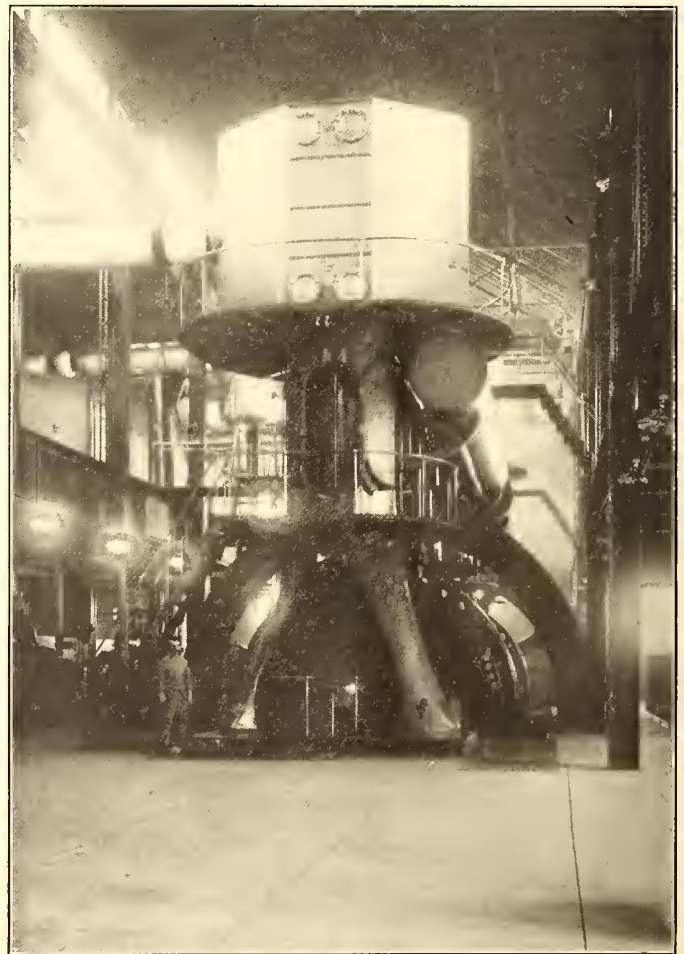


FIG. 1.—THE 13,200-VOLT GENERATOR AND VERTICAL ENGINE

of the cross-compound condensing, vertical type, with cylinders 40 ins. x 78 ins. x 60 ins. The unusually low speed, 63 r. p. m., is the result of a demand for such by the railway company, this being occasioned by the satisfaction obtained from previously installed direct-current units speeded to 60 r. p. m. Barometric condensers are employed, the pumps for these being located on

the main engine room floor. The condenser water is obtained from Bear Grass Creek, near by the station.

The generators deliver three-phase current at 25 cycles and 13,200 volts. Two exciter dynamos, one direct connected to a steam engine, the other driven by an induction motor, supply current to the revolving fields. The switchboard gallery is shown in Fig. 4. The switchboard itself consists of nine panels,

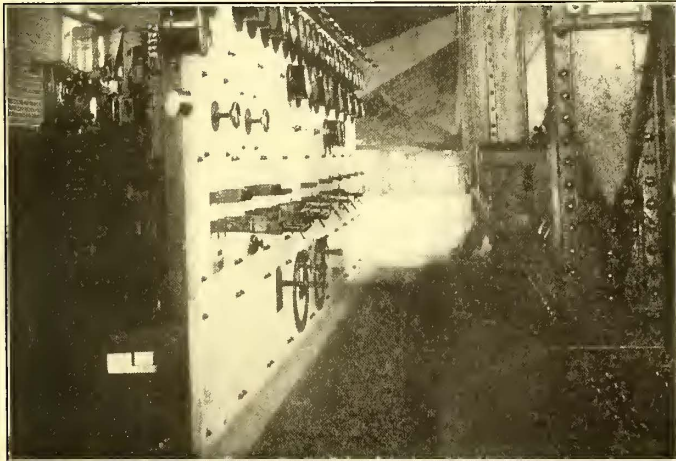


FIG. 2.—SWITCHBOARDS AND GALLERY

two generator panels, three for the exciters and four controlling the transmission lines to the three sub-stations, sub-station No. 3 being supplied by two sets of transmission lines. Behind the switchboard are the overload relays and electrically controlled switches for the high-tension circuits; cut-out switches are placed on either side of the controlling switches.

Of the three sub-stations, the one termed No. 3, located at Twenty-Eighth and Walnut Streets, in the western portion of the city, is nearest the station, it being 4 miles distant. Sub-station No. 2 is 8 miles southwest, while the remaining one is

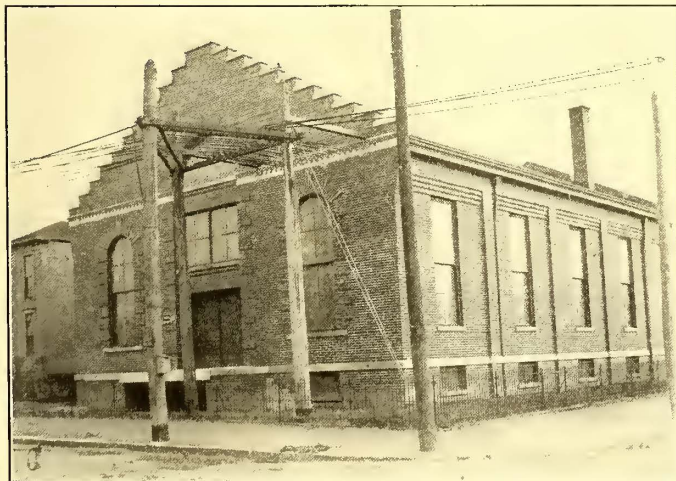


FIG. 4.—THE SUB-STATION AT JACOBS AND WALNUT STREETS

east, about 10 miles distant. To the latter two stations the transmission lines are carried overhead on pole lines, sub-station No. 1 being supplied by three No. 4 aluminum cables, No. 2 station by three No. 2 aluminum cables. In supporting these feeders, No. 3 Locke insulators were used. Before being installed the insulators were given a break-down test of 30,000 volts, the company having installed in the power house for insulator testing and other high-voltage cable tests a 50-kw testing transformer capable of variations of voltage up to 50,000 volts.

Between sub-station No. 3, in the western portion of the city and the power station the high-tension wires are carried in an underground circuit. The conduit system, which was constructed by the G. M. Gest Company, has double manholes, one

side for high-tension and the other side for low-tension 550-volt d. c. cables, separated from each other by a 6-in. wall of concrete. The conduit system was constructed with a much greater capacity of ducts than is at present demanded. On leaving the station there are six a. c. ducts, only two of which are occupied. There are also thirty-five d. c. ducts, which at present contain two positive cables and four ground return

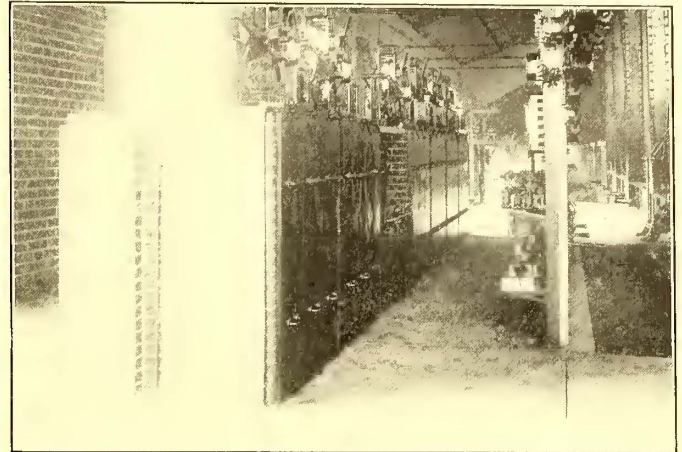


FIG. 3.—OVERLOAD RELAYS AND HIGH-TENSION OIL SWITCHES

cables of 1,000,000 circ. mil capacity. It is the intention, however, to place all of the d. c. feeders leaving the station underground, and for this reason the large number of ducts were installed. The two a. c. cables in the conduit go to the No. 3 sub-station at Twenty-Eighth and Walnut Streets. Each a. c. cable contains three No. 2 copper conductors. Paper insulation 5-16 in. thick surrounds each conductor, and jute fills the space between the wires. Paper insulation of the same thickness as that around each conductor covers the jute. The whole cable is enclosed in a lead sheath 9-64 in. in thickness. The

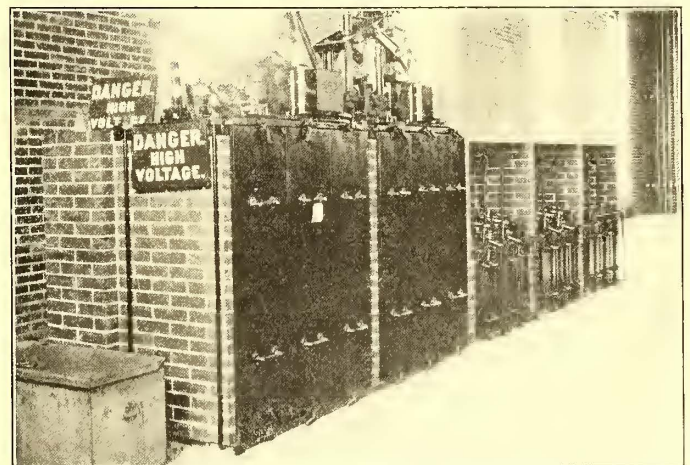


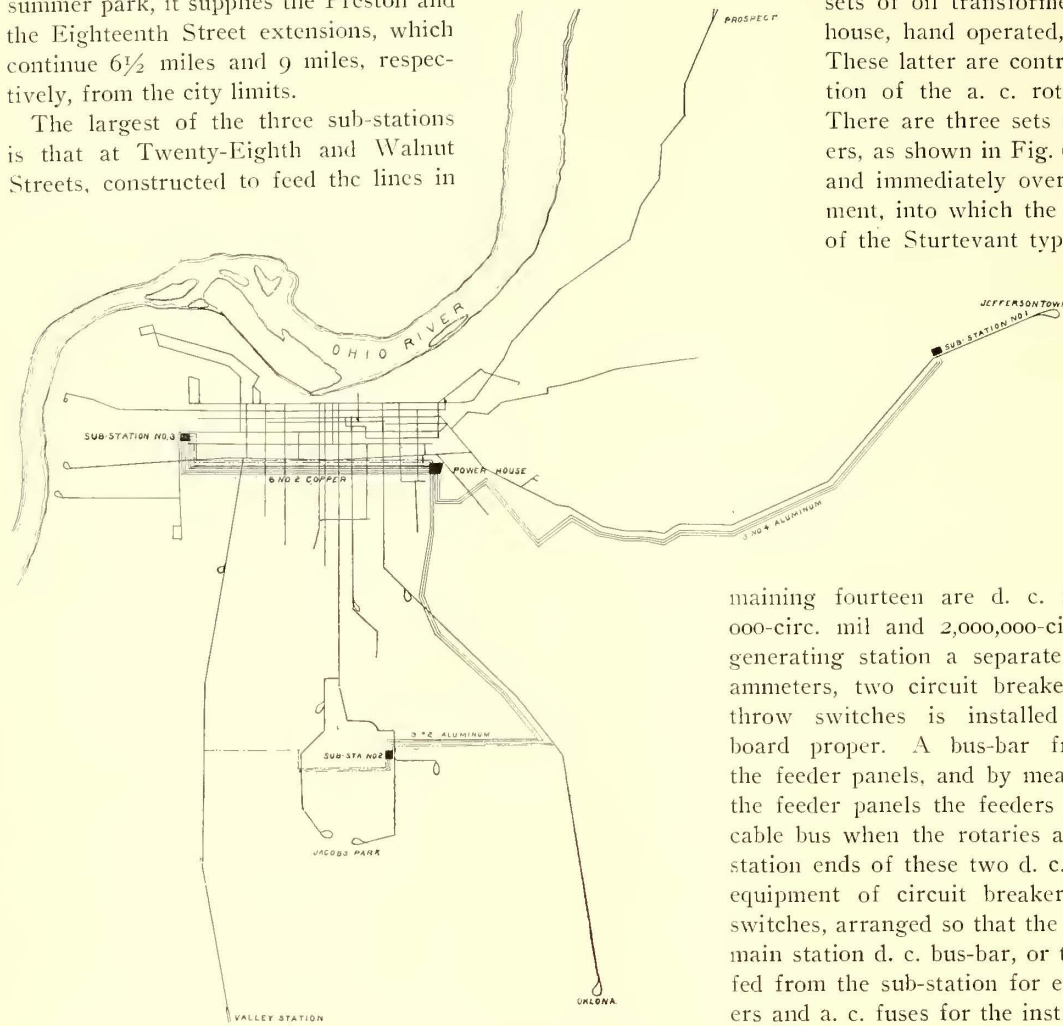
FIG. 5.—OVERLOAD RELAYS AND SWITCHES

two direct-current feeders are also carried from the power station to the sub-station at Twenty-Eighth and Walnut Streets, and were installed to supply the sub-station d. c. feeders at times when the load is not great enough to warrant running the a. c. generators and for emergency. One cable is of 1,000,000 circ. mil, the other of 2,000,000 circ. mil capacity. Both are lead sheathed and insulated after the manner of the a. c. cables, with 9-64-in. lead and 6-32-in. paper.

In general design the three sub-stations are similarly constructed. Sub-station No. 1, east of the station, is located on the interurban line to Jeffersontown, 2 miles from the terminal of the road and 10 miles from the generating station. The possibility of future extensions caused its location so near the terminal of the line. The station contains two 200-kw rotary

converters, with the necessary auxiliary apparatus. Sub-station No. 2, located on the Third Street line, south of the city limits, contains two 500-kw rotary converters. In addition to feeding the Third and Seventh Street lines to Jacobs Park, a summer park, it supplies the Preston and the Eighteenth Street extensions, which continue 6½ miles and 9 miles, respectively, from the city limits.

The largest of the three sub-stations is that at Twenty-Eighth and Walnut Streets, constructed to feed the lines in



FEEDER DISTRIBUTION SYSTEM OF THE LOUISVILLE RAILWAY COMPANY

the western portion of the city and the three parks, Fontaine Ferry Park, Shawnee Park and Riverview Park, located on

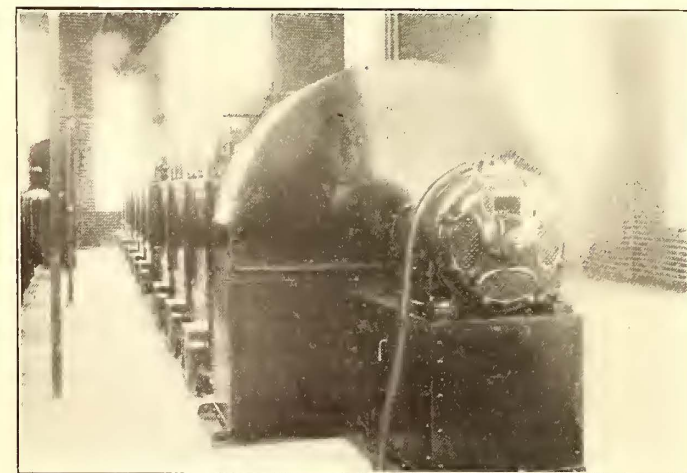


FIG. 6.—TRANSFORMERS COOLED BY BLOWERS DRIVEN BY INDUCTION MOTORS

slate, is carried on steel trusses. The conduits containing the high-tension cables enter through the basement, and the cables are carried up to the high-tension oil switches provided with overload relays, shown in Fig. 5. They then go to the three sets of oil transformer switches, type "E" Westinghouse, hand operated, shown in the same engraving. These latter are controlled by levers in the lower section of the a. c. rotary panels of the switchboard. There are three sets of 187-kw air-cooled transformers, as shown in Fig. 6. These are arranged in a row and immediately over a closed chamber in the basement, into which the blowers exhaust. The blowers, of the Sturtevant type, are driven by 6-hp induction motors.

The switchboard is made up of twenty-three panels, two of these being for the control of the entering high-tension transmission lines, one for the blower motor and the ground detectors, three control the a. c. side of the rotaries, three others the d. c. side, and the remaining fourteen are d. c. feeder panels. For the 1,000,000-circ. mil and 2,000,000-circ. mil d. c. feeders from the generating station a separate panel carrying two 1500-amp. ammeters, two circuit breakers and two single-pole double-throw switches is installed at one end of the switchboard proper. A bus-bar from these cables runs behind the feeder panels, and by means of double-throw switches on the feeder panels the feeders may be connected direct to the cable bus when the rotaries are not in operation. The main station ends of these two d. c. cables are supplied with a like equipment of circuit breakers, ammeters and double-throw switches, arranged so that the sub-station may be fed from the main station d. c. bus-bar, or the main station bus-bar may be fed from the sub-station for emergencies. All the transformers and a. c. fuses for the instruments are located in the basement.

The three 500-kw rotary converters are shown in Fig. 8. These are served by a 10-ton overhead crane, built by the Northern Engineering Works, of Detroit, Mich. For facilitating the cleaning of the apparatus there has been installed in

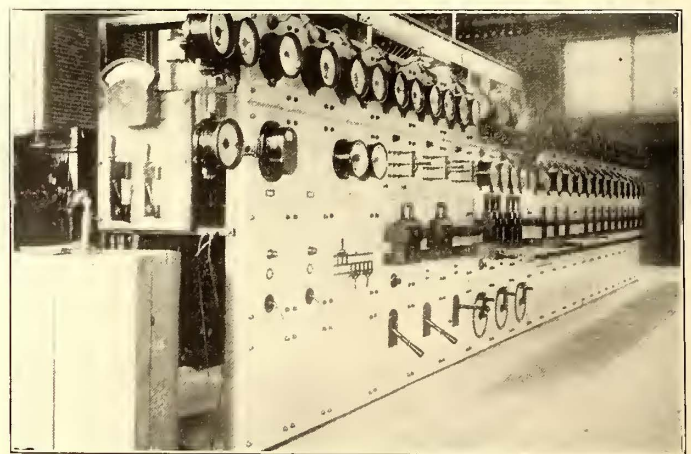


FIG. 7.—SWITCHBOARD IN THE JACOBS AND WALNUT STREETS SUB-STATION

the river. A description of this sub-station in general applies equally well to the two others, except in that they differ in capacity. The exterior of the building is shown in Fig. 4. It is a one-story fireproof structure, with floors of reinforced concrete. The roof, which is of cinder concrete, covered with

the basement a National Electric Company AA-1 Christensen motor-driven air compressor and an air-storage tank. From the tank a pipe is carried to the upper floor, and to this an air hose is attached when it is desired to blow out the machinery.

While the apparatus of the system was installed by the

Westinghouse Electric & Manufacturing Company, the alternating-current system was designed by the Louisville Traction

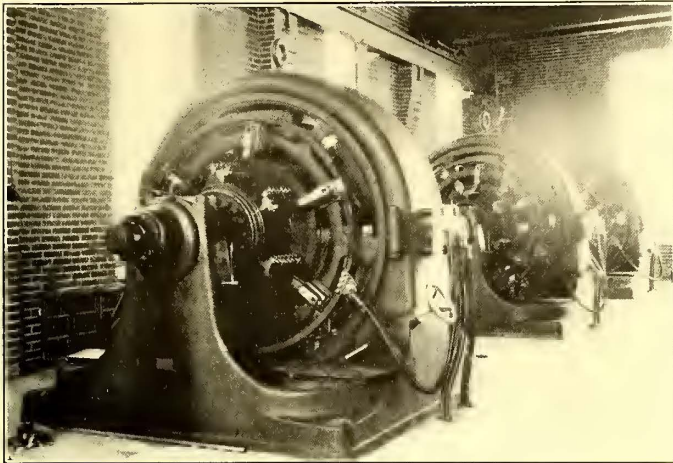


FIG. 8.—500-KW ROTARIES IN THE JACOBS AND WALNUT STREETS SUB-STATION

Company, for which F. H. Miller is superintendent of motive power.

FUEL, ASH AND GAS TESTING: II, APPARATUS

BY J. STANLEY RICHMOND

It is not within the limits of this article to give lists and descriptions of the apparatus required to equip the largest and the medium-sized laboratories before mentioned. For such laboratories would require a more or less competent chemist. And every chemist, naturally enough, prefers to select his own materials. Any company, however, requiring a larger laboratory, but only desiring to engage a college graduate to take charge of it, can easily arrange for some practical chemist to equip such and break the graduate in. The apparatus required for the smallest laboratory can be arranged under three heads—sampling and balance room and laboratory proper.

SAMPLING APPARATUS

Two hammers are required, one an ordinary machinist's chipping hammer and the other a flat-faced 4-lb. hammer with a face about 3 sq. ins. in area. Four sieves will be needed, having, respectively, meshes of $\frac{3}{4}$ in., $\frac{1}{4}$ in., $\frac{1}{8}$ in. and 1-16 in. One $\frac{1}{2}$ -gal. east-iron mortar and pestle, also one of wedgewood ware and about $6\frac{1}{2}$ ins. in size, are requisite for the final sampling. A few quires of strong but somewhat flexible brown paper sheets also come in very handy. A tapering flat-bottomed scoop with a handle, somewhat similar to those used by grocers, will prove advantageous to the sampler; also one hand-sweeping brush and two or three different sized sash paint brushes. Besides the scales and their accompanying weights, previously mentioned, a set of cheap grain weights will be required; also one 7-in. steel spatula. Two or three gross of round tin cans of such a size that one of them will hold about $\frac{1}{2}$ lb. of coal should be ordered; also a form of sample label gotten up and a few gross ordered from the printer. These cans are for the purpose of storing for a short time the remaining portions of each sample after the laboratory samples have been taken. Two cans should be filled from each sample and wrapped up in paper and sealed with the seal of the sampler. These are in case of any question arising between the buyer and the seller as to the results obtained by the chemist.

BALANCE ROOM APPARATUS

A mistake made by many embryo chemists taking charge of such elementary assay work as that which is to be described is the purchase of a much too sensitive balance. Such mistake,

of course, can be traced to the lack of practical laboratory training and the use of balances in colleges which have been obtained by the professors for their very advanced scientific work. Laboratories handling an immense amount of assay work and having all grades of balances use for nearly all their commercial work, even when considerable payments are made on the resulting assays, the least sensitive balance they have. A suitable balance for the smallest laboratory is that known as Becker's, price \$48. Such a balance is illustrated in Fig. 5. Inside this should be placed a 2-oz. beaker with a little sulphuric acid in it, and covered with a wire gauze top. This is to absorb the moisture from the air and thus prevent any rapid corrosion of the delicate parts of the instrument. A set of gramme weights graded from 20 grammes to 1 milligramme should be used.

One 8-in. desiccator will be sufficient for the limited amount of work to be undertaken. This should have some sulphuric acid in the bottom of it, and the edge of the glass cover should be greased with a little clean vaseline. Over the dish should be fitted a piece of wire gauze to serve as a rest for samples or assay apparatus. The purpose of the desiccator is to prevent the absorption of moisture by the material enclosed in it. An ordinary plain ruled ledger is suitable to enter the results in first, and they should be transferred afterward to a special ledger containing ruled and printed blanks. Some faddists believe that better work can be obtained with a balance if the weigher is not provided with a stool. This is not the case, however, for the writer tested this question by using a stool for several months and not using one for a similar time. The results were all in favor of the stool. The library should not be equipped with "Roscoe and Shorlemmer" books. Small treatises written by specialists, each treatise on the assay of one material, should be gradually collected as required, due to the perhaps increasing scope of the occupant's work. The desk should be of the roll-top order, for the assayer has to make frequent trips between the laboratory proper and such. He should be able, therefore, to close up his desk without the necessity to straighten out or put anything away. A small 3-in. steel spatula is satisfactory for the work in this branch of the work, and half a dozen camel-hair brushes are necessary. Both these articles are used in the operations connected with the weighing of portions from the samples for assay. In using the balance, matter should not be placed in either pan except when such are resting on the supports, and the final test as to accurate balancing should be made with the front of the balance closed.

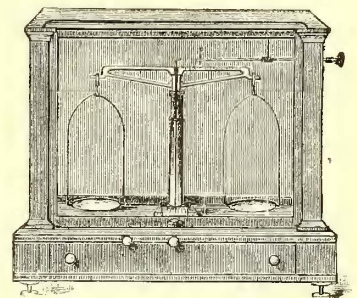


FIG. 5.—BECKER ANALYTICAL BALANCE

On no account should the balance be left with the front open. And just a word of caution at this point. The old-fashioned idea that the value of the work done in a laboratory by a chemist is in proportion to the amount of filth to be found in and about his surroundings is entirely exploded. There is no animal cleaner than the sewer rat. It has to be, if it is to live. The modern operating room of a hospital has to be very clean, if patients are to have a decent chance for their lives. Therefore, as the laboratory is a perfect hot-bed of filth and corrosive action, no chances must be taken—no putting off for even an hour what should be done at the minute; in fact, the laboratory should be like my lady's person, boudoir and reception room—spick and span, neat and trim, sweet and pretty.

LABORATORY PROPER

The water bath consists of a copper box within a larger one, the two being so brazed together that the inner one serves as

a small oven with a hinged door, while the outer one is provided on top with circular holes and covers. By removing one of the covers, therefore, a dish can be put in its place over the boiling water contained between the two boxes. Such is known as a double-wall water bath, and a suitable size is 10 ins. x 12 ins. This is heated with a Bunsen burner, with the flame low. The water-distilling apparatus is composed of a 3-gal. copper retort and condenser, as illustrated in Fig. 6, and one heavy 3-ft. flat-base retort stand with an 8-in. supporting ring. The heat should be supplied by a 5-in. ring burner fastened to the rod of the stand by means of a clamp, and the distilled water should be collected and kept in a 5-gal. glass jar. The first portion of the distilled water should not be collected and the

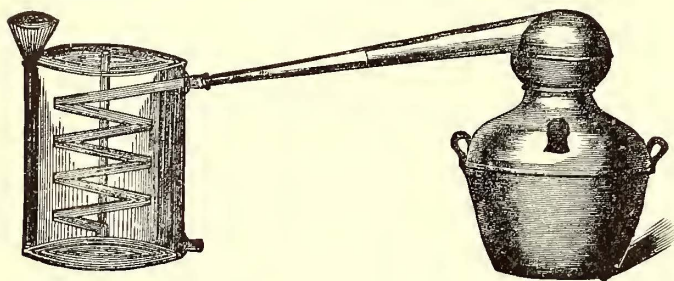


FIG. 6.—COPPER STILL AND CONDENSER

water in the retort should not be allowed to get too low. The jar should be provided with an outlet near the bottom, which should be fitted with a bored cork. Through the hole in the cork should be forced a piece of glass tubing with a short piece of rubber tubing inserted over its outer end. The rubber tubing should be plugged with a short piece of glass rod which has had its ends rounded in the Bunsen flame.

The furnace for the muffle is of fire clay, and a No. 4 Fletcher will serve all the requirements of the smallest laboratory. After the muffle is inserted, the joint should be made up with a little good fire clay. For this furnace, Fletcher's No. 4 muffles with their accompanying domes are used; and a few spare ones should be kept in stock, especially if the necessary heat is obtained by means of the dental apparatus before mentioned, a suitable size of which is No. 141, with a large tank. The burner placed under the furnace to heat it is of the type known as solid flame, the gas passages consisting of circular slots. The right size will be supplied by the firm from whom the furnace is purchased; also two fire-clay doors, which, when placed one on top of the other, serve to close up the front of the muffle when extra heat without the admission of air becomes necessary.

One dozen 1¾-in. porcelain crucibles and two dozen covers for the same should also be ordered. The extra dozen covers should have the little rings on top of them pinched off with a pair of pinchers, as they are intended for use in the ash determinations. To accelerate the burning of the coal in such determinations, a piece of glass rod, into one end of which, when heated in the Bunsen flame, one end of about 8 ins. of No. 22 B. & S. gage platinum wire has been sealed, is used. The stirring of the burning coal with the free end of the wire permits the free access of air to each and every particle, while the glass rod serves as a handle and prevents the fingers from being burnt. A couple of fire-brick tiles should be placed on the table near to the furnace. On these are placed the porcelain crucibles and covers when first taken out of the furnace, which, when somewhat cooled, are taken to the balance room and placed in the desiccator preparatory to final weighing on the balance. To handle the crucibles and covers, two pair of tongs will be required, which are illustrated in Fig. 7. One of these should be of iron, known as 36-in. cupel tongs; while the other pair should be 8-in. brass crucible tongs. The iron pair is intended for the muffle manipulations, and the brass pair for

carrying purposes between the muffle and the balance room.

The absorption apparatus for the gas tests is known as Dr. Elliott's apparatus for rapid gas analysis. This should be ordered complete—that is, the two tubes, the rubber tubing, the two small aspirators and the stand. An illustration of this apparatus will be given under the heading of tests.

One Winchester quart bottle each of ammonia, nitric acid, sulphuric acid and hydrochloric acid will come in handy. For the gas tests, about 2 lbs. of caustic potash (potassic hydrate), 2 ozs. of pyrogallic acid and ½ lb. of cuprous chloride should also be ordered. Six glass-stoppered 16-oz. liquid reagent bottles will be sufficient to start with.

Four cork borers, No. 1, No. 2, No. 3 and No. 4; about 25 ft. of heavy white gas tubing; about 12 ft. of 3-16-in. heavy black rubber tubing; about 1 lb. each of small and medium-sized glass rod and tubing; three Bunsen burners; two earthenware screens to protect the burners; corks to fit all the bottles and a few spare ones; two cast-iron triangles; three nests of beakers,

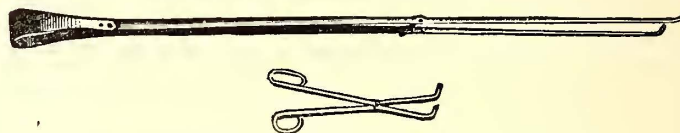


FIG. 7.—CUPEL AND CRUCIBLE TONGS

three in a nest of 2½ ozs. to 7 ozs.; two 20-oz. beakers; six glass covers, and about 2 sq. ft. of copper wire gauze should also be ordered.

A magnifying glass for examination of the coal should also be provided. For convenience, a tabulated list of the apparatus required is given:

- One Becker's balance, \$48.
- One set of gramme weights (20 gms. to 1 m. gm.)
- One steel spatula, 3-in.
- One desiccator bell cover, 8-in.
- One plate for same, 9-in.
- One acid dish for same.
- Three small camel-hair brushes.
- One flat-faced, 4-lb. hammer.
- One machinist's hammer.
- One tapered flat-bottomed scoop.
- Three quires of brown paper.
- One hand sweeping-brush.
- Three painter's sash brushes.
- One well-balanced Fairbanks scale, with pointer.
- One set of weights, 5 lbs. down.
- One set of cheap grain weights.
- One hundred and forty-four ½-lb. round tin cans.
- Printed sample labels.
- One brass seal.
- Sealing wax.
- One steel spatula, 7-in.
- One Fletcher's No. 4 furnace.
- Three spare muffles and dome for same.
- Three small fire brick tiles.
- One pair of 36-in. cupel tongs.
- One pair of 8-in. brass crucible tongs.
- Sixteen ins. of No. 22 platinum wire.
- One 3-gal. copper still.
- One condenser for same.
- One 3-ft. heavy, flat-base, retort stand.
- One 5-in. ring burner and clamp for same.
- One 8-in. ring for same.
- One 5-gal. glass bottle, plain bottom outlet.
- One 10-in. x 12-in. double-wall water-bath and stand.
- Three Bunsen burners.
- Two earthenware screens for same.
- Two cast-iron triangles for same.
- Twelve 1¾-in. porcelain crucibles (R. M.)
- Twenty-four porcelain covers for same.
- Three 32-oz. Woulff bottles, 2 necks.
- One 1-gal. aspirator.
- One ½-gal. cast-iron mortar and pestle.
- One 6½-in. Wedgewood ware mortar and pestle.
- Corks for all bottles.
- One bottle of C. P. ammonia.
- One bottle of C. P. hydrochloric acid (Sp.G. 1.124.)
- One bottle of C. P. nitric acid.
- One bottle of sulphuric acid.
- Two lbs. of caustic potash.
- Two oz. of pyrogallic acid.

Eight oz. of cuprous chloride.
 One lb. of small and medium glass tubing.
 One lb. of small and medium glass rod.
 One set of cork borers, Nos. 1, 2, 3 and 4.
 Three nests of beakers (3, 2½ to 7 oz.)
 Two beakers, 20 oz.
 Twenty-five ft. of heavy gas tubing, ¼-in.
 Twelve ft. of heavy back tubing, 3-16 in.
 One set of Dr. Elliott's gas apparatus.
 Tubing and aspirators for same.
 One stand for same.
 Six copper dishes, 1 lb. capacity.
 Six 32-oz. glass-stoppered liquid reagent bottles.
 One magnifying glass.
 One 100-c. c. measuring flask.
 One 1-pt. graduate.

RATES ON INTERURBAN ROADS

A number of interurban roads in the Central West have started on systematic campaigns for stiffening up their passenger rates. This is particularly true of Ohio roads. In that State no less than ten interurban roads have announced new tariffs taking effect in the near future. These steps are largely the result of informally comparing notes at the meetings of the Ohio Interurban Railway Association. A number of roads have found that they were actually losing money on certain classes of business and that their entire schedule of rates was too low to admit of reasonable profit on their investments. These roads were among the earlier ones, and they started out with rates which did not take into consideration a large number of expenses which modern methods of high-speed service have incurred. In several cases low rates between certain points were guaranteed to property owners and village municipalities by promoters who cared nothing for the future of the road. Certain roads are now confronted with these agreements, and apparently the only method of circumventing this situation is to retain the low local rate and increase the through rate, which, in effect, throws the increase upon the balance of the road.

It is the general sentiment in Ohio that local rates ought to average 2 cents a mile. Steam roads in this district retain the local one-way rate of 3 cents a mile and give a 10 per cent reduction on round-trip tickets. The mileage books of the Central Passenger Association give straight 2 cents a mile under very close restrictions. Compared with this the majority of Ohio roads are now selling the interchangeable coupon books adopted by the association. This gives 16⅔ per cent discount from the local rates, and where the latter are based on 2 cents a mile, it gives a rate of 1¾ cents per mile, which ought to be low enough to attract a great many traveling men.

The roads which have local rates in the neighborhood of 2 cents per mile have not, as a rule, gone below 1¼ cents per mile for commuters, and as these tickets or books are usually limited to sixty days, with no redemption for unused coupons, and as patrons frequently fail to use them up within the required time, it brings the average rate up to a point somewhat better than the rate mentioned.

On the other hand, a number of roads have been basing their local rates on 1½ cents per mile, with mileage books at 1¼ cents per mile and commuters' tickets at 1 cent per mile, and in many cases less than that figure. It is now obvious that no road can give good service and yield a reasonable return on the investment with such rates. Just at present the chief attention seems directed against the 1¼-cent mileage books. In several centers these books have been interchangeable on three or four roads. They have been good for several members of a family, and the restrictions placed against them have been loosely enforced. In the majority of cases it is the intention to replace these books with the standard form of the Ohio Association, giving a somewhat smaller discount and being good only for the owner, who must sign the coupon strip. The advantage offered

to the buyer is that the transportation is good over a large number of roads instead of over but two or three. Then, by increasing the local rates, the interchangeable coupon rate is also brought up to a reasonable basis.

The demand for the free checking of baggage is one of the points which has precipitated this campaign for increasing rates. As already outlined in these columns, it is obvious to all that interline business, which is now becoming important, cannot be made uniformly successful without some standard scheme of handling baggage. It will be impossible to develop this business and allow some roads to charge for baggage while others carry baggage free, particularly in view of the fact that all steam roads carry baggage without charge. The roads which have been getting good rates are uniformly the ones which have dropped the charge on baggage and, according to all reports, their business has increased enormously thereby, as they are able to get the business of the traveling men. Incidentally, it is opportune to reiterate that the majority of the most successful roads have reached a point where they are preparing to carry baggage on all cars, particularly on all limited cars. The offer to carry all baggage free of charge, as an offset to increased rates, is an argument which will appeal to many people, particularly when the possibilities for long-distance interline travel at low rates are pointed out to them.

Many managers are dubious about attempting to increase rates because of fierce steam road competition. Few steam roads have openly reduced their one-way local fares, but the scheme of selling round-trip tickets good in either direction, or for two persons going in one direction, at rates equal to or lower than those of electric roads, has become common with certain steam roads. There is little question, however, but that such business is carried at cost, if not at a loss, and it appears that where electric roads have boldly raised their rates the steam roads have speedily followed suit. It may mean a loss of business for a while, but in the long run it will work out satisfactorily, particularly as the electricians are enabled to offer a number of advantages which they did not have a year or two ago.

REMARKABLE STRENGTH OF A DENVER CAR

An accident that occurred in Denver, Col., last month, speaks well for the stability of the reconstructed and spliced cars of the Denver City Railway Company. A car of the company's construction, known as the "39-ft." type, while running at full speed took a switch and into a curve, left the track, mounted the curbing and crashed head-on into a brick building. The wall struck was 13 ins. thick, but the impact was so great that it was completely demolished where the car came into contact with it. No damage was done to the car beyond smashing the fender and breaking a light of glass in the vestibule. The motorman, although the debris was scattered in all directions, escaped injury. As previously stated, the car was built by the company in its own shops. It was made by splicing a 16-ft. closed body to an 18-ft. open trailer. It is 39 ft. 6 ins. over all, with sills of 7-in. I-beams, with oak filler. The forward part of the car is enclosed by a vestibule. The rear end, however, is open. The car bodies were originally built by the Woeber Carriage Company, of Denver.

The city of Canton has employed an expert to report on the number of cars and speed that would be required for the Canton-Akron Railway Company to maintain a given schedule on its city lines. The city is demanding that the company give a twelve-minute schedule, and if it is found that it is necessary it will change the city speed ordinance, enabling the company to operate with a maximum of 12 m.p.h. instead of 8 m.p.h., the present limit.

ANNUAL MEETING OF THE OHIO INTERURBAN RAILWAY ASSOCIATION

The Ohio Interurban Railway Association proved itself a young giant of great promise at its annual meeting held at the Algonquin Hotel, Dayton, Jan. 26. Two hundred and fifty members and invited guests participated in a magnificent banquet, at which the guest of honor was Gov. Myron T. Herrick, himself a traction man of long experience. The business meeting was one of the most important yet held, both from standpoints of attendance and interesting facts developed. The annual election resulted in the selection of a list of strong men for officers and executive committee, and the good work which has been started by the organization is bound to continue. The new men are as follows: President, Edward C. Spring, general superintendent, Dayton, Covington & Piqua Traction Company; vice-president, Warren M. Bicknell, president, Lake Shore Electric Railway; secretary, Fred W. Coen, secretary, Lake Shore Electric Railway; treasurer, Ralph E. DeWeese, superintendent, Dayton & Northern Traction Company. Executive committee: F. J. J. Sloat, Cincinnati, Dayton & Toledo Traction Company; F. D. Carpenter, Western Ohio Railway; J. R. Harrigan, Columbus, Buckeye Lake & Newark Traction Company; W. B. Tarkington, Detroit, Monroe & Toledo Short Line, and F. J. Green, Springfield, Troy & Piqua Traction Company; all general managers.

In his greeting at the morning session, President Harrie P. Clegg reviewed the brief history of the organization and stated that the membership and results accomplished had exceeded the fondest expectations of the founders. Eight months ago practically every manager in the State was working by himself, and few had an acquaintance or had been over other roads outside their own immediate neighborhood. Now all are acquainted and are working together with a concrete organization. Business is being interchanged throughout a wide district, and the results of the innovations introduced are now apparent in the earnings of all the roads interested. He said the good work had only been started and he felt sure it would continue.

Edward C. Spring, chairman of the committee on interline baggage, stated that on account of illness the major portion of the work had been turned over to F. J. Green, a member of the committee. Mr. Green was not present, but his views were outlined in a letter. He had had reports from a number of roads giving their views, but as there were such a diversity of opinions, and as all the roads had not been heard from, he requested that the decision of the subject be left open for another meeting. He stated that the roads in the northern part of the State all seemed in favor of carrying baggage free of charge, while the majority of roads in other portions of the State were in favor of making a charge for baggage, claiming that their rates were too low, and that in the majority of cases their cars were not equipped to handle baggage on all trains. He felt, however, that the sentiment in favor of carrying baggage free seemed to be growing. Mr. Green suggested that as a compromise a charge of 25 cents be made for 100 lbs. of baggage for any distance, with an excess charge of 15 cents per hundred over that amount, the receipts on interline business to be divided in proportion to the rates of fare. He thought it undesirable to attempt to carry baggage entirely free of charge, because he felt that the increased amount of this business, due to the growth of interline business, would necessitate having extra men in many of the stations and baggage men on cars, and he thought a slight charge would at least take care of these increased expenses. He suggested a double card check with a brass holder.

The subject was then opened for discussion.

President Clegg stated that while the Dayton & Troy had always charged for handling trunks, it had just arranged for a special train to connect with the Clover Leaf (steam) on busi-

ness for Toledo and St. Louis, and that on this train baggage would be carried free and checked through to destination, this being necessary to make the rates low enough to compete with steam roads. In Delphos there is a transfer of several blocks and a truckman is paid 5 cents a piece for transferring, the expense being divided between the roads interested. At Troy, where another connection necessitates a transfer, there is a similar arrangement with another road. There are four traction stations in Dayton, and the question of who shall pay for transferring baggage has never been adjusted, and the passenger was charged with it. The receipts from baggage amount to \$8 to \$10 per day on this road. Mr. Clegg thought the charge was a detriment in a good many cases. For instance, it had been found that traveling men had figured out that it was cheaper to pay them 25 cents on heavy trunks than to pay the excess on the steam road, and that they were shipping their trunks by electric line and then riding on the steam road themselves. He thought it a poor plan to take trunks under any consideration unless a passenger had a ticket, and that it should be charged against him on the ticket. The parallel steam road sells certain limited tickets, meeting the rates of the electric, but does not carry baggage on these tickets. His road is rebuilding all its cars to provide facilities for carrying baggage. He thought one of the most important points to be settled in connection with handling baggage, particularly interline baggage, was that all agents and conductors should have receipts and report blanks, so that baggage could be traced and liability placed in case baggage is carried past its destination. Each man who handles baggage should receive a receipt showing number of the check and time it was delivered. Few roads have such systems at present, and he said that all these points must be covered to make the interline business a success.

F. W. Coen, of the Lake Shore Electric, said they had always carried baggage free and on practically all cars. The steam roads between Cleveland and Toledo are selling certain classes of tickets at 2 cents a mile, or \$2.18 for the through trip, and charge for baggage. Their rate of \$1.75, with free baggage, solved the problem for them. During 1904 they carried 2,691,000 interurban passengers and checked 19,244 pieces of baggage, not taking into consideration a large number of pieces on which excess was charged. This represents one piece to every 139 passengers, or 1604 pieces per month carried free. In Toledo, where baggage is transferred, they pay the transfer on baggage which they deliver to other roads, and other roads do the same on baggage delivered to them. This applies to steam as well as electric roads. He said that in his opinion baggage must be carried and transferred without expense to the passenger to make interline business a success.

J. O. Wilson, of the Cleveland & Southwestern Traction Company, said they handled about 700 pieces of baggage a month free of charge. He said he felt satisfied they would lose a great deal of business if they attempted to charge. They interline with the Lake Shore Electric, and they frequently check baggage from Wooster to Toledo, 150 miles. H. A. Nicholl, of the same company, said he was fitting all cars with baggage compartments. While they give good service with three express runs and baggage compartments on every other car, he thought all cars should have facilities for handling trunks. He thought that the steam road practice of giving and taking receipts and keeping a record of all baggage handled should be put into force.

E. C. Spring, of the Dayton, Covington & Piqua, said his road charged 15 cents for handling trunks, and he said that they carried a large number. This charge is to cover transfers very largely, and in Dayton they transfer to other roads. He said his express compartments were so small that they could not afford to fill them up with a lot of free baggage and perhaps crowd out a lot of express matter upon which they received good rates.

S. S. Bradley, of the Scioto Valley, said that they had no combination cars, but that they carried many small pieces on their platforms and handled trunks on freight cars. Baggage is carried free.

C. C. Collins, of the Appleyard lines, said that they had combination cars on certain runs and carried trunks on freight cars at other times. On through baggage from Columbus to Dayton, where it goes over two roads, the same charge is made and the money is pro rated between the two roads. The agent at Springfield makes the transfer and the conductors are relieved of any responsibility. He thought that conductors had enough to do to take care of passengers and should not be compelled to keep a record of baggage and issue receipts.

Daniel Royse said that the Indianapolis & Northwestern handled baggage on limited cars and made a charge of 25 cents.

C. E. Hooven, of the Cincinnati, Lawrenceburg & Aurora, said that his road did not handle trunks. He admitted that there was some demand for such service.

A traction man who was a member of the United Association of Commercial Travelers said they had 350 members in Dayton. At several meetings of late they have discussed the use of interurban lines, and that the greatest objection to a wider use of such lines was that there was no uniformity in the matter of handling baggage. He thought the association would formulate a resolution asking that the interurbans carry baggage free on all trains.

Representatives of several roads stated that the standard interline tickets adopted at the Canton meeting in December were on sale and were working out most satisfactorily. The Clover Leaf (steam), which interlines with a number of the roads, has agreed to accept them with a slight alteration to provide for first and second-class tickets. One manager suggested that it would relieve agents of much work and guard against errors and possible dishonesty if the selling company would have its destination points printed on its tickets, leaving only the points on the foreign roads to be filled out by agents.

The secretary reported that the guide published by the Central States Guide Company, of Norwalk, Ohio, had been ordered by a number of roads for distribution among their conductors and agents. It is of great convenience for laying out routes and schedules for interline ticketing and for general information.

Mr. Clegg, for the committee on standard operating rules, stated that the new rule book recently adopted by the Dayton & Troy had been recommended and that sample copies were being sent to all members.

Mr. Spring proposed to amend the constitution to provide that the executive committee be composed of ten men, including the president, the past president, the vice-president, secretary, treasurer and three men to be chosen for two years and two men to be chosen for one year. This will be acted upon at the next meeting.

Twenty-five new members were admitted.

"Steam Power" was the subject for discussion at the afternoon session. Prof. E. P. Roberts, of the Roberts & Abbott Company, Cleveland, introduced the subject with a paper. He spoke from the standpoint of a consulting engineer, and brought out that a steam plant should be carefully designed to meet the special requirements of the road, and he mentioned several instances in which plants having excellent equipment, from a mechanical standpoint, were inefficient and expensive because they were not well balanced and were not designed for the work which they were expected to perform. His paper is referred to more fully in another part of this issue.

Hans Holzwarth, of the Hooven, Owens, Rentschler Company, of Hamilton, gave an interesting detailed description, illustrated with blue prints, of the features of the Hamilton-Holzwarth multiple-expansion steam turbine. This turbine was fully described and illustrated in a recent issue of this paper.

C. H. Weeks, of the Buckeye Engine Company, outlined some of the troubles of the engine builder. He said it did little good for a railway to buy expensive equipment and expect it to run itself. Too many roads pay large salaries for men to manage their properties and leave their power houses in the hands of inexperienced and inefficient engineers. Put brains behind your shovels and you will make money. Too many roads install just enough equipment to move their cars and keep their engines constantly overloaded. Others go to the other extreme and install equipment which is out of proportion to their requirements. If you have too much grate surface you must keep it covered or you will not secure the best results. Again, if you do have excessive grate surface and keep it covered, you burn up coal for which you do not get results. Such difficulties can only be taken care of by proper engineering. Again, we are troubled with too much engineering. Engineers send us specifications and require us to follow them, and expect us to guarantee the machinery and be responsible for it if it does not work out satisfactorily. A great many engineers make the mistake of fixing the ratio of the cylinders. If you make high ratio between the cylinders you are bound to cut down the rating. Recently he had a case where an engineer wanted an engine having a rating at economical point of 550 hp and maximum rating of 900 hp, and he demanded a ratio of 5 to 1 for the cylinders. It was a ridiculous proposition, which could not be met by any engine builder. Mr. Weeks reviewed the development of the direct-connected steam engine and said that the first direct-connected railway units were installed in Cincinnati and the second installation was in Dayton in 1893. Old engineers claimed that they would not be practical; that there was no elasticity in the method.

The election of officers which followed resulted as stated above.

The first annual banquet of the association, held in the banquet hall at the Algonquin, was a function which would have been a credit to a national organization. From 6:30 to 7 there was a reception to Gov. Herrick. The banquet hall presented a unique and beautiful scene. The tables, richly laden with flowers, were arranged in the shape of a huge star around a fountain, which was banked with palms.

Past President Harrie P. Clegg acted as toastmaster, and adjoining him were Gov. Herrick, President Spring, other officers of the association and some thirty invited guests, representing the leading electric railway associations of the country, officials of prominent city lines and a number of local and State public officials.

President Spring spoke, in part, as follows: "It is with feelings of appreciation that I speak to-night, as I am deeply sensible of the honor that has been extended to me. Of course, I realize that in my position it is incumbent upon me to take the organization practically in its infancy, as the retiring president. Mr. Clegg, slid out just in time to evade the duties of the future.

"Gentlemen, the traction interests of this State are about to turn over a new leaf. On Feb. 29 of last year a few hardy spirits gathered at the Hotel Phillips, of this city, and organized what has become the local end of the organization. It was no sinecure to perfect an organization of this kind, but strong in the faith, those pioneers proceeded along the lines that recent events have proved most satisfactory. By individual effort alone that embryonic body has become the foremost in the United States. In this, the greatest traction State of the country, there has been invested the sum of \$250,000,000, and it is in the making or breaking of those securities that we are banded together for weal or woe.

"I believe that the press and the public are bound together with indissoluble ties—that the interests of one are identical with the other. The public's interests are served by the newspapers, and vice versa. To this end, then, our efforts should

be directed. But a few years past the public regarded the traction road as an evil—as the grouping together of bandits and robbers whose interests would be best subserved by keeping the public blinded as to their best interests.

“Now, all this has changed, for the public has gained confidence in these great arteries of commerce, whose lines penetrate the innermost village and hamlet, which now find ready sale for their produce. The public has gained confidence, and instead of repelling the traction road as an evil unmitigated, now encourage the industry and buy stock. Let the traction road stop and everything ceases, for the traction road is an essential factor of our growth. Let us continue to keep the people alive to their interests, which are our own, and we will stand right.

“Before I close I must again voice my appreciation of the great honor that has been conferred upon me, and further bear witness to the acknowledgment that awaits Mr. Clegg for his interest in and devotion to the association during the time he acted as its chief executive. In behalf of his associate members and in recognition of his worth as an eminent chief executive, as a substantial tribute to his good offices and efforts that have had so much weight in making the Ohio Interurban Railway Association what it is, I present to him, on behalf of the organization, this loving cup, as a token of faith in his ability and integrity, the true worth he has shown to his office as president of the association.”

Gov. Herrick said he desired to speak first as a business man who had been identified with electric lines for a number of years. He reviewed briefly the history of steam road building in this country, and said that previous to the panic of 1893 the large majority of railway propositions had been floated in European money centers. It has only been within the past fifteen years that banks and conservative financiers of this country have been willing to take the bonds of steam roads. Now, however, they are recognized as among the best securities. Traction securities, he said, were improving, but the industry would have to go through the same transition that the steam roads have experienced before their securities would be on a par with those of the better steam roads. He said there was too much of a tendency to bond traction properties for more than they were worth and hold out stock as a bait to investors. “A better plan,” he said, “is to bond them for half what they cost and put in some of your own money, and you will have better properties. I know whereof I speak, for I have been through the mill. I know that a traction system properly financed and properly managed is a profitable proposition.”

Looking at the situation from a legal standpoint, Gov. Herrick said that he felt that certain legislation for the benefit of electric roads was most desirable, and as he did not wish to be misrepresented, he presented a written paper covering these points. Despite this precaution, however, Gov. Herrick was grossly misquoted by daily papers, and was said to have stated that he favored a State Railroad Commission to govern the affairs of interurban roads, something that he did not say, and something that the majority of interurban managers do not favor. In part, Gov. Herrick said:

“Interurban electric railways are getting closer and closer every day to the status, the business and the characteristics of commercial steam railways. In a number of recent cases the courts of Ohio have found it difficult to distinguish between these two classes of common carriers. In the early days of the horse cars, and even later, when electricity as a motive power was first introduced, street railroads were looked upon as conveniences for the cities alone. They were purely municipal institutions, and no one thought of carrying their work beyond the public streets. But within recent years the business of street railroads has been revolutionized. The urban has become the interurban. So far as the business of these com-

panies is concerned, municipal boundary lines have become obliterated. There is scarcely a street railroad line in Ohio that does not run into two or more municipalities; and if to-day we should seriously consider municipal ownership, the first question that would be asked with respect to nine out of ten of the street railroads in Ohio would be, ‘What municipality shall own them?’ So fast indeed has this business grown, and so active has been the genius and enterprise engaged in it, that the very growth it has enjoyed has perhaps settled for the present, at least, the question of retarding it by appropriation; for the number of cities and villages now reached by the interurban roads is so great that municipal ownership would only serve the purpose of destroying the continuity of the lines.

“But the progress of the business has gone even further. It has not only obliterated the boundaries of municipal corporations, but it has crossed with its network of tracks throughout the country the lines of counties and States. The interurban railroad has become the short-haul carrier for the people.

“Manifestly, therefore, we have lived past the day when these companies may be regarded as purely local conveniences and controlled solely by local authorities. The Legislature of Ohio in recent years has been recognizing with increasing assurance and conviction the ultimate sameness of all railroad companies, whether operated by steam or electricity, whether operated upon the highways or upon private rights of way, or whether called by one name or another. The General Assembly of 1902 granted to the interurban companies the power of eminent domain outside of municipalities. The General Assembly of 1904 granted the street and interurban railways, under certain conditions, the right of eminent domain within municipalities, and the same Legislature last winter provided for the taxation of property of interurban electric railway companies by a method identical with that in force with respect to the steam railway companies. Thus the two kinds of railways are coming closer and closer to mean one and the same thing. Peering into the future, it does not require mental field glasses to see the day when in fact as well as in law there will be one kind of railroad in this country, and when electricity, which is now coming more and more into use in the subways and by steam roads, will be the only motive power for all.

“Now, what does all this mean? Certainly I am not one of those who believe in taking away from the municipalities of the State the inherent right of home rule; and certainly I would not advocate any plan that would destroy the principle of local government in so far as it is necessary to protect local interests. But in so far as interurban railways have ceased to be the concern of a single city or a single locality, and have come to be the concern of the State at large, I believe the business in which they are engaged ought to be regulated and controlled by the State. As interstate commerce is the concern of the Nation at large, so intrastate commerce is the concern of the State at large; and any agency which thus unites, by bands of steel, the interests of urban and rural communities, and conducts a passenger, freight and mail traffic between different sections of the State, should be directed and controlled by some authority which would see that equal justice is done between all patrons of the lines, whether they live in the city or the country. Nothing has seemed to me more obstructive of general progress than the spectacle of an interurban railway line being, on the one hand, retarded in its work by the caprice or cupidity of local authorities, or, on the other, practicing discrimination in favor of the people of one community against those of another. I am not willing to take from the people of our municipalities the control of their streets or deprive them of the just return which should be made by those who use the streets for any public service business. But with respect to interurban railway lines, which run through a number of municipalities as well as counties, I believe that, for the protection of the people and for their safety and convenience, as

well as for the protection of investors in these enterprises, some just and equitable method should be devised for their control which will avoid the confusion that conflicting interests always entail."

J. Sprigg McMahon, a prominent attorney who represents a number of Dayton roads, said that Gov. Herrick's remarks about legislation were seconded by every traction lawyer in the State. What is needed is legislation to codify and simplify the existing laws. The Ohio statutes have laws governing electric railroads, street railroads, interurban street railways and several other classifications. They are contradictory and confusing, and there are dozens of cases hanging fire which it seems almost impossible to settle under existing conditions. The steam roads appreciate these facts, and they obstruct and delay us on numerous points. Dozens of cases have been carried to the Supreme Court of the State, and in nearly every instance the cases have been affirmed without report. He said he was looking for the man who has the nerve to force the Legislature to codify the laws so we will know where we are at. This association can accomplish great good in this direction if it takes the proper steps.

F. J. J. Sloat, general manager of the Cincinnati, Dayton & Toledo, said that a number of roads needed rehabilitating to bring them up to the standard of the fine high-speed lines that are now going after long-distance business. He thought the members would be interested in knowing that on that day his company had decided to spend \$1,500,000 in rebuilding their system. This is one of the pioneer properties of the State. It is carrying more than 5,000,000 passengers a year, and its earnings per track-mile exceed those of many city lines. Mr. Sloat touched on the enormous coal consumption of electric roads. With about 64,000 kw of railway generating apparatus in the State, and with an average of 5 lbs. of coal per kw-hour, it meant 320,000 lbs. per hour, 5,760,000 lbs. per day, 86,400 tons per month or 1,036,800 tons per year, representing 11,052 trains of thirty-two cars each.

Judge Dennis Dwyer, a pioneer who built several of the electric roads radiating from Dayton, told of the transporta-

some excellent opportunities for the foundation of interurban and city lines.

E. B. Grimes, of the Ohmer Fare Register Company, who has been dubbed the poet laureate of the association, read an original poem, in which fact, fiction, fancy and humor were admirably blended, and in which practically every prominent traction man in Ohio was referred to.

The New England Street Railway Club wired congratula-



F. W. COEN



RALPH E. DE WEESE

THE NEW SECRETARY AND TREASURER OF THE OHIO INTERURBAN RAILWAY ASSOCIATION

tions to Ohio on the election of Mr. Spring as president. He was formerly prominently identified with that body.

A party of twenty-five or more members from the northern part of the State came down from Lima on the parlor car "Theodore," through the courtesy of the Holland Palace Car Company. This car has recently been improved by the introduction of very comfortable reclining chairs.

The success of the banquet was due primarily to the work of John F. Ohmer, of the Ohmer Fare Register Company, who, as chairman of the supply men's committee, arranged for the entertainment of the members.

The details of the programme and entertainment were in the hands of Ralph DeWeese, superintendent of the Dayton & Northern Traction Company, and the complete success of all features of the meeting were generally commented upon.

THE NEW PRESIDENT

Edward C. Spring, the newly elected president of the Ohio Interurban Railway Association, is one of the most popular street railway men in Ohio. At the present time he is general superintendent of the Dayton, Covington & Piqua Traction Company of Ohio, and has held similar positions with the Newton & Boston Street Railway Company, the Wellesley & Boston Street Railway Company, the Norfolk Suburban, Norfolk Western, and Medfield & Medway Street Railway Companies of Massachusetts.

His experience in electrical work, extending over a period of seventeen years, starting with the Thomson-Houston Electric Company, has brought him in close contact with the electrical fraternity of the East and the Middle West. Mr. Spring has held the position of president of the New England Street Railway Club, and after moving to Ohio formed the Ohio Interurban Railway Association, and was its first vice-president. With Mr. Spring's energy and push, the association should have a most prosperous year.

Mr. Spring is a Boston boy, having received his education in the public schools and the Latin School of that city. His practical experience with electric railway work places him in the front ranks of operating street railway men, he having worked up to his present position from a motorman and conductor.



EDWARD C. SPRING



WARREN M. BICKNELL

THE NEW PRESIDENT AND VICE-PRESIDENT OF THE OHIO INTERURBAN RAILWAY ASSOCIATION

tion facilities sixty years ago, when he came to this section. Then it took two days to go from Dayton to Cincinnati by canal boat.

Dr. J. E. Lowes, another pioneer, told of his experiences with the old Vandepoele system of electric operation.

Gen. W. P. Orr, who built the Miami Valley, the second interurban line in the State, said it was built without a dollar of securities, that it had always made money and was now part of one of the best systems in the State.

Capt. George Wood, aide to Gov. Herrick, and who recently returned from the Philippines, told something about the street railway lines of Manila. He thought that the islands presented

STEAM POWER*

BY E. P. ROBERTS

In taking up the matter of "Steam Power" it is evidently necessary to consider: First, What is needed? Second, What is best for the conditions? I will follow this logical order therefore, and although, at the start, the reason for the first may not be apparent, I think it will be before the completion of the presentation of the second.

As this audience is mainly composed of men interested in the operating and financial, rather than the technical end, my talk will not be relative to technical features from the technical standpoint, but from the standpoint of the effect of modifications of such features upon financial results.

POWER FOR INTERURBAN ELECTRIC RAILWAYS

In Ohio, the prime mover is usually a reciprocating steam engine, although, in a few instances, a steam turbine is used. In some portions of the United States water-power is being largely utilized as the prime mover, but there are few, if any, economically desirable properties of such kind available in Ohio. Owing, however, to the recent developments in the line of gas and oil engines, there are situations where these engines should receive consideration.

To decide what prime mover is best for a specific case, considering type, number of units and size of each, all the factors affecting the case must be considered, and, generally speaking, in the following order:

First—Predetermination of the operating conditions.

Second—Estimate of first cost.

Third—Estimate of operating expenses, including financial charges.

Fourth—Comparative reliability, depreciation and repair account, and other matters which are largely questions of judgment.

Fifth—Combination of all the above, considered for each type of power plant, and a comparison of the results.

FIRST—PREDETERMINATION OF OPERATING CONDITIONS

This necessitates a decision as to the location of the track, and the curves and grades most economically desirable, and the predetermination includes the following:

A certain location of the road is taken as the standard for comparison, being generally that which will give excellent, though not necessarily the greatest, accessibility on the part of the public, and having such grades and curves as a general knowledge of the proposition indicates would be good practice. The size of cars and number of trains necessary to handle the anticipated passenger travel is decided, and train schedules and train sheets are prepared which show the schedule time between the terminal points, based on a stated average schedule speed in the cities and towns, and a stated average speed while the car is in motion in the country, with deduction from the latter on account of country stops, thereby obtaining the schedule speed in the country. The train sheet shows the trains in service at any moment and the location of such trains. The size of motors necessary to handle a car or train of the assured weight and speed is then calculated.

A study of the results as above obtained may indicate that it is preferable to employ a slightly greater schedule speed between the terminal points, so that, when operating on an hourly headway, the layover at the end be not too long. For example: The time of the tentative run may be two hours and ten minutes, which would necessitate a layover of twenty minutes when the cars are operated on hourly headway (starting from one end on the hour and from the other on the half-hour). This would require five cars in operation, whereas if the cars could make their run in one hour and fifty-five minutes, only four cars

would be needed. Such a reduction in the number of cars would reduce the expense of the train crews 20 per cent, and the greater schedule speed between termini would be attractive to the traveling public.

To accomplish such higher schedule speed, one or more of the following factors must be changed:

(1) Higher schedule speed in the cities and towns. This may not be practicable.

(2) Higher speed when in motion in the country. This would require larger motors and greater rapidity of acceleration, which would increase the first cost, not only of the rolling stock, but also of the entire power generation and distribution system, and it is the resulting increase in maximum and average power requirements which to-day especially interests us.

(3) Reduction in number of country stops. This may reduce the income, and whether it is advisable depends largely upon the character of the proposition, and also whether or not "limited" trains will be operated. Consideration must also be given to the time made by competitors, more especially between distant points.

(4) Change of location in the road so as to shorten the distance. This may necessitate giving lessened facilities to some localities, or may necessitate more expensive construction, or both.

(5) Such change of location as will allow higher schedule speed. This may be done by reducing the lengths of the runs on streets, or if the right of way is by the side of the highway and in front of buildings, changing same so that it is back of the buildings. Sometimes the best location is adjacent to a steam road.

(6) Reducing grades and curves.

Consideration of the above factors, individually and collectively, also necessitates consideration of comparative first cost and operating expense, and comparative gross and net income, and the study of all the conditions may result in a decision to operate at a slower schedule speed, and change one or more of the above factors in the opposite direction from that required to increase the schedule speed. If "limited" trains are to be operated this fact must also be considered.

The above relates to passenger service, but, in addition, express and baggage service may require consideration, as may also freight, using this word to mean the same as when applied to steam roads.

A specialist in the predetermination of what is the most desirable construction and equipment for any given proposition, may not, and possibly will not, work out in detail and with all possible modifications all these factors, but he will consider them, even though, to some degree, it may be unconsciously. The results obtained are frequently a surprise even to those who make it their business and who might be supposed to be able to state "off hand" what would be most desirable for any given proposition.

A striking proof of the lessening of the amount of power required, obtained by increased care in design, is shown by a statement made by A. S. Richey, in a paper read by him before the Indiana Electric Railway Association, Jan. 12, 1905,* in which he states that the same cars are used on the northern division of the Indiana Union Traction Company as on the other divisions, and power is furnished for the entire system from one power house; that the average distance of the substations on the northern division is 46 miles from the generators, and on the others 15 miles; also that 12 per cent of the power used on the other divisions is delivered directly from the power station without a c. transformer or transmission losses. Nevertheless, the power for the northern division, measured at the power house, is only 33 per cent of the total, although it represents 42 per cent of the total car mileage. He also states that the average schedule speed is slightly greater on the northern

* Paper read at a meeting of the Ohio Interurban Railway Association, at Dayton, Jan. 26.

* See STREET RAILWAY JOURNAL, Jan. 21, 1905.

division than on the balance, and that the result illustrates: "The general effect of a careful consideration of operating features in the engineering design and construction of a road, such as reducing curves and grades to a practical minimum, careful location of sub-stations with respect to their loads, and the economical distribution of copper."

The subject of this talk being "Steam Power," it may seem as though I had wandered far from the path, but all the parts of an electric road are so interconnected, financially and physically, that a proper decision as to steam power mechanisms can only be made after a study of the entire proposition, and in more or less detail depending upon its special features. For example: If power is very expensive, measured at the motors on the car, then, from this standpoint, a reduction of grades is economically advisable, as well as a reduction in the size, number and speed of cars; whereas, if power is cheap, the reverse is preferable.

All these factors are so interconnected that, in order to obtain the best plan for the given conditions, a tentative plan must first be prepared which will be in accordance with the engineer's best judgment, based upon a preliminary study of the general and special conditions, and then such plan must be modified and the effect of such modifications considered from every standpoint—first cost, operating expense and effect on gross and net income.

It is therefore evident that the decision as to the power plant necessitates predetermination, within a reasonably close limit, of the average output which will be required at different hours of the normal operating day and the maximum which may be required for any considerable period, and also the momentary maximum, the excess being taken care of by the momentum of the fly-wheel. It also necessitates a decision as to similar features on days other than normal, for example: Saturdays, Sundays, holidays, etc.

It may seem that the above is what is frequently termed "not practical," or, looking at it from another standpoint, that it is "impracticable," and for the reason that operating conditions vary so greatly from day to day that it might be considered impossible to predetermine all of them with such degree of approximate accuracy as to obtain results of any value. There is not now time for elaborate presentation of proof that careful and skilled predetermination of operating conditions pays, and, in fact, pays better than an equal amount expended in any other manner. I will merely present as an interesting example the comparative results obtained by two power houses, each using the same make of water-tube boilers, stokers and compound condensing engines, and the one obtaining the poorer results having generators of one of the best makes, and the other having old style Siemens & Halske generators, which were probably somewhat less efficient than the other. The generators were direct connected, and both plants furnished direct current and used the same quality of coal at the same cost per ton.

The plant obtaining the poorer results did not have the conditions predetermined, and the result was that the various units were not of the best proportion for their operating conditions, considered as a whole and in relation to each other. In the other case the character of the output was predetermined and the sizes of units considered with reference to each other, and although the load for this power house was more fluctuating than for the other, the coal and the cost per kw-hour output was materially less.

On the other hand, there is, of course, a difference between what may be termed calculations for commercial purposes and those made for scientific reasons. The basis of the former is generally only approximate and that of the latter is presumably exact, and it is evidently absurd to carry out calculations into fractions of 1 per cent when the basis is not known within 5

per cent, or, to use a mathematical simile, to "use eight-place logarithms on four-place data."

Having predetermined the average maximum power required from the engine, or engines, when operating on regular schedule, and also for special days, a tentative decision is made as to the number of units and the size of each, based on capacity.

The condition of operation of engines furnishing power to an interurban electric road is, except when storage batteries are used, one of rapid and excessive fluctuations of load, usually ranging from 25 per cent to 125 per cent of the rated capacity of the engine, and often from 0 per cent to 150 per cent, and sometimes momentarily up to 200 per cent.

I present the following as statements of facts:

For any engine supplied with steam at a definite pressure and quality and with a definite vacuum, there is a definite load at which it will operate at its greatest economy. Increasing the steam pressure, or superheating the steam, or increasing the vacuum will increase the maximum obtainable horse-power and, generally speaking and within limitations, the efficiency of the engine as a converter of heat energy into mechanical energy, but, considering the increased energy required by the engine auxiliaries, it will not necessarily increase the heat-energy efficiency, considered as a whole, and, even more important, it may even decrease the "dollar efficiency." The latter efficiency includes first cost and operating expense, and it is upon this efficiency, considering the entire road, that either dividends or assessments are declared.

We will now consider a few curves:

One of these shows the variation of coal per kw-hour with a varying load factor in a certain station. This curve is based on the daily records obtained during one year. The power house is the Avon Beach power house of the Lake Shore Electric. The results are old and were published several years ago, and I would apologize for presenting old material if it were not for the fact that I have not results from any plant in which the coal has been weighed daily for such a long period and under such variation of percentage of rated load. It should also be noted that at rated load the test showed 3.2 lbs. per kw-hour, which, for this station, may be considered as the theoretical limit. It should also be noted that a change of proportion of the individual mechanisms and of the size of such mechanisms relative to each other could have been so made as to have obtained better results at rated load of the generator, but inferior economic results under the average operating conditions.

The next shows the effect of grades on the fluctuating demand for power and the effect of a schedule requiring the simultaneous climbing of grades by several cars. In this connection it might be noted that a schedule which will allow climbing of grades with motors "in series" is much better for the power house than one which requires "hustle" from start to finish; but, of course, this is not the only standpoint, and there are too many interconnected factors now to follow up this train of thought.

Other curves are presented showing the probable approximate amount of water per indicated horse-power for various types of engines and at various loads, and similar curves for boiler horse-power.

The curves presented are old and should be considered only on account of their general features and not for the specific values shown. Nevertheless, they admirably illustrate the points to which I desire to call especial attention, which are:

(1) Comparative water consumption on rating is not the proper basis for decision when operating on variable load.

(2) Comparative values obtained by comparing results for indicated horse-power are not the same as for boiler horse-power.

The statement has already been made that engines for interurban electric railways normally operate with loads varying

from friction load to 100 per cent overload, but it should also be noted that the average load is generally, and practically always, below rating. Because of this, it follows that an engine should be mechanically designed so as to carry with safety excess loads, and, from the steam standpoint, so designed as to give maximum economy at a point below that which is ordinarily considered as its rating. The valve operating mechanism should permit the entrance of steam for as large a percentage of the stroke as is practicable, and the steam passages should be of as great cross section and freedom from bends as practicable in order that the steam may flow with the minimum drop in pressure. The cylinder, or cylinders, should not be any larger than necessary to give the required maximum of sustained power under the assumed conditions of steam pressure and quality, and of vacuum, including allowance for lessened pressure and vacuum when having a sustained load which is in excess of the normal.

Please note that I have here used the term "load in excess of the term normal," the common and more convenient term is "overload," but the latter term tends to convey the impression that the load is greater than that for which the apparatus is designed and that such load is injurious, which, for the case considered, is not only erroneous, but directly contrary to the fact.

What cylinder proportions, for any given case, are most desirable depends upon steam pressure, vacuum, etc., as well as ratio of average to minimum load, and in a paper presented by me at the New York meeting (December, 1903) of the Engine Builders' Association of the United States, I especially referred to the question of ratio of cylinder, diameters of compound condensing engine under variable load, and the advisability of reduction of such ratio as the percentage of maximum to average increases.

Evidently, for any given proposition, it is necessary to ascertain what will be the water consumption of the various engines it is desired to consider, and not only at rated load, but over a large range of load. This information for any given engine must be obtained from the manufacturer, but, unfortunately, statements sometimes made require investigation before being accepted.

Some engine builders know what the engine on which they submit a bid will do at rating and with stated steam pressure, quality of steam and vacuum. Fewer know the result which will be obtained at fractional loads. The engine builder does not know what will be the degree of variability of the load, nor the average load; it is his duty to furnish a certain mechanism to accomplish certain agreed upon results, but whether the operating conditions will allow such results to be obtained in practice he does not, and generally cannot, know. The actual result is often unfair to the builder and uneconomical for the purchaser.

As an example of the unreliability of data in bids, I present the following, which are taken from bids in our office:

Our specifications stated the steam pressure and quality of steam to be delivered at the engine throttle, the vacuum at engine exhaust, revolutions per minute, desired average indicated horse-power (ihp), desired lower limit of maximum sustained horse-power at stated steam pressure and vacuum (slightly less than specified for the average), and specified a maximum limit for the piston speed, and a maximum and minimum ratio of diameters of high to low-pressure cylinders. Fifteen manufacturers were invited to render bids, and there was considerable difference in stroke, cylinder diameters, etc., and a comparison of all brought to the same basis necessitates too complicated calculations and too many considerations to present to a non-technical audience. I have therefore merely chosen data from the bids from four Corliss engine builders, of better than the average standing, each of whom happened to choose the same diameters of cylinders and length of stroke, therefore

making the steam conditions the same for all except as modified by steam passages, clearance and control of steam by the valves. The comparison of all the bids showed differences far in excess of those here presented:

BIDDERS' STATEMENTS

Point of Maximum Cut off of Steam	Maximum Sustained Horse-Power, which I present as a Percentage of the Greatest
.75	79
.75	84
.75	72
.60	100

The lowest was approximately the limit stated in our specifications.

There might be a slight difference in the maximum horse-power obtainable, but that the engine having a maximum cut-off of .6 would give one-third more maximum power than the one cutting off at .75 is evidently impossible.

The importance of maximum obtainable power has already been stated.

We will next consider the difference of efficiency guarantees for the above four engines, and all on the same basis as to steam and vacuum. The order is changed from that in the previous table:

PERCENTAGE RATING

	50	100	150
No. 1.....	13.75	12.50	13.25
No. 2.....	12.75	12.50	13.50
No. 3.....	14.00	13.00	14.00
No. 4.....	15.00	12.75	14.00

If the above stated water consumptions are correct, and if, for this comparison, we consider the gross amount to be allowed annually for depreciation and repairs to be the same for all engines, then it is evident that the No. 1 engine is the best if the average load is above rating, and No. 2 if it is below rating.

How much more, based on cost of fuel, can we afford to pay for No. 2 than for No. 4 engine?

If the load for one-half of the time is approximately one-half of the load (for one-quarter of the time is approximately rated of the load), and for the final one-quarter of the time is approximately one and one-half of the load, or, say, an average of 88 per cent (and this is a very high average load for an inter-urban railway not using storage batteries), and the daily run is twenty hours, and the additional (not pro rata) evaporation be 8 lbs. of water per 1 lb. of coal, then the annual saving of No. 2 will be:

PER I. H. P. DAILY

10 hours at 2.25, equals.....	22.50
5 " .25, "	1.25
5 " .50, "	2.50
Total	26.25 lbs.

If the average indicated horse-power is 1000 hp then the pounds of steam saved annually is, in round numbers, 9,600,000 lbs.

Evaporation 8 to 1—Coal equals 1,200,000 lbs.

Tons equals 600 lbs.

At \$2 coal, we save each year \$1,200 (A).

At \$3 coal, we save each year \$1,800 (B).

Capitalizing "A" at 6 per cent, equals \$20,000.

Capitalizing "B" at 6 per cent, equals \$30,000.

It is natural to hesitate at paying \$20,000 or \$30,000 more for one 1200-hp engine than for another, nevertheless, on the guarantees, we could afford to do so. If the engine guaranteed as the more economical as to fuel is also better designed and manufactured, there is an additional reason for purchasing such engine even at a greater first cost, but how nearly do the guarantees represent the facts? The answer can only be a matter for the exercise of judgment, and considering technical features, standing of the bidder and proven results.

The foregoing shows the results which may be obtained by the investigation of only one feature, and also the importance of making comparisons on the basis of operating conditions, which latter, if not existing, must be predetermined.

The average load above considered is a high percentage of the rating, and if, in order to make the comparison over a greater range, we consider that No. 2 engine at 0.3 load would take 14 lbs. and No. 4 17 lbs., and that the load for

¼	time is approximately	.3	load.
½	“ “ “	.5	“
¾	“ “ “	rated	“
1	“ “ “	1.5	“

The daily difference in pounds of steam per indicated horsepower will be:

5	×	3	=	15
10	×	2.25	=	22.5
2.5	×	.25	=	.62
2.5	×	.5	=	1.25

Total..... 39.4 lbs.

which is 50 per cent more than the previous result, making

For \$2.00 coal.....	\$30,000.00
For \$3.00 coal.....	\$45,000.00

Probably there would be not less than two engines, and for the greater portion of the time only one would be in operation, if the average time of operation of two engines be simultaneously only one-fifth of that of one engine (one engine sixteen hours, two engines four hours), and the load conditions for each engine be considered as unchanged, then the total additional amount which we could afford to pay for the two more economical engines would be six-fifths of that for one, or at \$2 coal, \$36,000, and at \$3 coal, \$54,000.

If the comparisons were made at rated load, then the annual saving would be approximately one-fifth of that on the first assumption, the difference in value being only, for \$2 coal, \$4,000, and for \$3 coal, \$6,000.

The foregoing also shows that a consideration of comparative values must include the cost of coal; this fact is not always appreciated.

STEAM TURBINES VS. RECIPROCATING STEAM ENGINES

The same general considerations apply to the question of the comparative advisability of installing steam engines or steam turbines, as have been mentioned in connection with various engines, and there are some additional considerations, such as comparative space, cost of foundations, etc.

The writer should state at the outset, however, that he believes as good "coal per kw-hour results" can be obtained by using the highest grade of reciprocating engines, properly proportioned to the work, as can now be obtained by the use of turbines, and that, to a considerable degree, the better results reported where turbines have been installed are because the turbine plants have been of a higher grade than the engine plants with which they have been compared. Turbine plants generally have superheated steam, frequently at a higher pressure than the average reciprocating engine, and also with higher vacuum, and they do obtain better efficiency from the standpoint of water per kw-hour than the majority of the engine plants in interurban power houses. But it does not necessarily follow that reciprocating engine plants could not have been so designed as to have obtained equally high efficiency, nor does it follow that the plant which is most efficient from the standpoint of fuel is the most economical, everything considered. I believe in the steam turbine, but do not consider that it has the field to itself, but rather that each case must be considered on its own merits.

Many comparisons which have been published are misleading. For example: Some comparisons are made on the basis of rated load, which have been shown to be inaccurate when applied to a variable load; others are based on pounds of steam per kw-hour taken by the turbine or the engine, and without making allowance for the additional heat energy required to obtain the

higher vacuum for the turbine. In this connection it should be noted that the efficiency of the turbine is materially increased by an increased vacuum, whereas this is much less the case for an engine built on commercial lines. For the turbine it is wise to obtain high vacuum, but the cost must not be overlooked.

The steam for the turbine is also usually superheated, and, if the comparison is based on a difference in pounds of steam, it is evident that consideration should be given to the additional heat units in the steam and the cost of supplying such additional heat energy. When considering fuel economy the proper basis of comparison is the per cent of heat energy transformed into mechanical energy delivered by the mechanism, including the amount of energy required for the auxiliaries.

On this basis a recent comparison, which I made, between the guarantees of a turbine manufacturer and those of an exceptionally high-grade engine, showed such an exceedingly slight difference as to be practically negligible, and a comparatively small difference in operating conditions would throw the balance one way or the other, as would also a slight difference between guaranteed and obtained results. The difference, as tabulated, was slightly in favor of the turbine, with temperature of condensing water at 60 degs., and with 26 ins. vacuum for the engine and 28 ins. for the turbine, and with barometer at 30 ins., but if the condensing water was at a higher, though probable summer temperature, it would not be found economically desirable to endeavor to obtain at such time so high a vacuum, and therefore, during such time as this condition might exist, the result would be in favor of the engine. Assuming other conditions of operation, there would be a greater difference, and in favor of one or the other, depending upon the assumptions. Therefore for this case decision must be based on other grounds than comparative fuel economy.

A comparison should include at least the following:

- (1) First cost, including engine, turbine, generators for each of same, foundations, buildings, traveling crane, sometimes ground, piping, condensing system, superheaters.
- (2) Operating expenses, including fuel, oil, labor, repairs and depreciation.
- (3) Reliability.

The items under (1) and fuel and oil under (2) can be predetermined with sufficient accuracy for a decision. The other items under (2) and (3) are, for the present at least, largely questions for the exercise of judgment.

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OPENING OF UNION INTERURBAN STATION IN LOS ANGELES

Without a moment's delay and with the time schedule running smoothly, the magnificent new station of the Pacific Electric Railway Company and the Los Angeles Interurban Railway Company, in the Huntington Building, Los Angeles, was put into operation on the forenoon of Jan. 15. Thousands of passengers passed through the station during the day. To prevent confusion and injury to those not acquainted with the change of stations, a uniformed guard has been placed at the main entrance of the building near the tracks to warn the public of danger and to notify them where to get on and off the cars.

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 The suggestion of General Manager Schindler, of the Pacific Electric Railway Company, has been accepted by the Pacific Railway Amusement Company, that the summer resort which the latter corporation proposes building at beautiful Alamitos Bay be called Villa Carreta, meaning "village of little cars." There already have been established twenty-five of the old cable cars in use in Los Angeles several years ago. These cars have been made into houseboats, and are to be lighted with electricity and heated with gas.

MEETING OF THE EXECUTIVE COMMITTEES OF THE STREET RAILWAY ASSOCIATIONS

Important meetings of the executive committees of the American Street Railway Association and of its allied associations, the Street Railway Accountants' Association and the American Railway Mechanical and Electrical Association, were held at the Holland House, New York, on Feb. 3 and 4. As had been anticipated from the preliminary steps taken at St. Louis, the subject of the reorganization of the various associations was very fully discussed and a satisfactory arrangement was reached in referring the subject to a sub-committee.

Preliminary meetings of the executive committees of the Accountants' and Mechanical associations were held Friday morning, but were adjourned at 12 o'clock so that the delegates could attend the union meeting with the executive committee of the American Street Railway Association. Representatives of the Claim Agents' Association and of the American Street Railway Manufacturers' Association were also in attendance. Altogether the following gentlemen were present:

Representing the American Street Railway Association—W. Caryl Ely, Richard McCulloch, Howard F. Grant, Calvin G. Goodrich, Frank G. Jones, T. C. Penington and Walter E. Harrington.

Representing the Street Railway Accountants' Association—W. G. Ross, F. R. Henry, P. S. Young, J. W. Lester, Isaac McQuilkin and E. M. White.

Representing the American Railway Mechanical and Electrical Association—H. H. Adams, C. F. Baker, John Millar, S. W. Mower, J. S. Doyle and D. F. Carver.

Representing the Claim Agents' Association—W. A. Dibbs.

Representing the American Street Railway Manufacturers' Association—D. M. Brady, J. H. McGraw, W. H. Heulings, Jr., F. C. Randall, E. H. Baker, C. C. Peirce, William Wharton, Jr., Newcomb Carlton and F. S. Kenfield.

There were also present H. H. Vreeland, James F. Shaw, Prof. W. E. Goldsborough, Walton H. Holmes and a few others.

W. Caryl Ely, president of the American Street Railway Association, called the meeting to order on Friday at 12 o'clock sharp, and said that it had been considered desirable to assemble in a sort of general meeting to discuss the matters which interest all of the associations before taking these matters up in the respective committees. In order that all could have an understanding of the existing condition, Mr. Ely briefly referred to what had occurred during the last year, and especially to what had been decided at the St. Louis meeting, with regard to the reformation of the lines of work of the American Association and the different affiliated associations.

At the last convention at St. Louis, Mr. Ely said, a great deal of the time was taken up in discussing this matter of reorganization and reformation. The resolutions and remarks which are contained in the report of the proceedings of that convention, and the report of the committee on nominations, show conclusively not only a desire on the part of every one for a different form of organization, different lines of work and a raising up and broadening out of the work of the associations, but also a feeling that such a step is necessary. A most cursory examination of the proceedings of the convention also show that something had been committed to all present to be done and to be worked out.

Mr. Ely said that a year ago last fall he had been chosen president of the association at the meeting at Saratoga Springs, and that last fall, at St. Louis, after a year of talk and general agitation, and after the convention had been held at which ideas had been discussed and presented and new policies hinted at, he was re-elected president. It seemed to him that his election was not for the purpose of honoring him, nor for the purpose of establishing a new precedent, but that it was an ex-

pression, a unanimous expression on the part of those assembled there, that it was time something should be done, and that as the work had come to a head at that time, the re-election of the then existing president, no matter who he might have been, was the most significant manner and the most emphatic way of expressing the desire for a change.

Every one has been made conversant with the situation. To change things that have been growing for almost twenty-five years is a thing that is not without difficulty, and it will have to be proceeded with with great care and deliberation and in the broadest possible way; all must work together, and there must be a giving and taking. There are organizations to be dealt with that have done good work; they have officers, presidents, secretaries and executive committees, and in making changes due regard must be had for all the questions involved; but all, it seemed to him, must approach the proposition in the broadest possible way, with an open mind, so that the result which shall be the outcome of the deliberations will commend itself to every one. A great many of the men who are identified with some of the largest street railway companies in the country have expressed themselves as feeling that the present line and method of work did not justify their taking an active interest in the affairs of the association. The thing to do is to adopt some kind of a programme that will enlarge the field of work, give greater value to it, and commend itself to all to such an extent that the number of members and the revenues will be largely increased, so that skilled minds may be brought to the continuous discharge of the work throughout the year. In that way, and in that way only, will it be possible to get an organization that will produce such results as the leading technical societies bring about. With all the capital and all the brains that there are in the street railway business in this country, there ought to be an association second to none in the value of its work, and certainly there are great problems before the street railway managers of the country and all who are connected with street railway work. If the present association and its subsidiary organizations are properly organized in their relations to each other, and the method in which their work is conducted, so that the combined work of all the associations could be handled in the proper way, every one ought to get great value from this work.

Coming down to the real practical work that is before the executive committees, Mr. Ely said that his mind was entirely open in regard to the proper method to pursue. Nevertheless, he had certain concrete ideas that had been formulated during the past year and which he would like to elaborate. Of course, all know that it will be impossible for a large number of individuals to prepare the new lines along which the reorganization must be worked out, in such concrete form that they may be presented throughout the country to the managing officers of street railway properties and others who are interested in this work, for suggestion and criticism. It would seem that after full and free discussion, in which representatives of the different associations would take part, the real work should then be committed to a small sub-committee. It would also seem desirable that this sub-committee ought to have the assistance of some person of high standing, technical education, a ready writer, a man of good address, one entirely competent in every way to be of the utmost possible assistance. The procuring of such an assistant was authorized by resolution passed at the last convention, whereby the executive committee of the parent association was authorized to employ expert assistance and to fix the compensation therefor. Now, with a sub-committee properly constituted, with such an assistant, with the proper promulgation of the ideas that underlie the work, with a gathering in of suggestions and criticisms from prominent men and from all who are interested in our work throughout the country, that sub-committee ought to be able, within a reasonable time—because it should enter upon its work at once—to send

out and give general circulation to some kind of a plan. That plan would then be worked over again by the committee, and then after being submitted to the executive committees of the different associations and adopted, within a very few months, could be presented to the next convention. Then, if all were satisfied and the general opinion was favorable to the plan, possibly the next convention might be held along these lines, and at the next convention a redrafted constitution and by-laws could be adopted, and it would be possible to hand over to the association at the end of this year a completed plan and a going concern.

That was the line of action which had shaped itself in his mind, and he offered it merely as a suggestion and invited the presentation of the views of the gentlemen present. Of course, there is the American Street Railway Association, which is called the parent association; then there are the Accountants' Association and the American Railway Mechanical and Electrical Association, both of which have been formally recognized. Then there is the correlated association, the Manufacturers' Association, which has been organized within the last year, and which has also been recognized. Finally, there is the Claim Agents' Association, whose status he did not exactly know, but which ought also to be dealt with. These are the elements which must be considered. The questions that will come up to be finally determined were present to the minds of every one. He had sent out to all those whom he thought would be in attendance at this meeting, a suggestion of Richard McCulloch, of St. Louis, which had commended itself to his mind at the time of going over it as a very reasonable thing and one well calculated to meet the wants of all. Mr. McCulloch's suggestion follows:

MR. McCULLOCH'S PROPOSED PLAN

Before street railways attained their present importance, the president, manager, superintendent or operating head of the railway directed its every detail and was interested in every part of the work, from the care of horses and the construction of track to the accounting and financial problems. At that time he took part in the discussions at the general meetings of the American Street Railway Association because he felt familiar with all the questions there presented.

With the growth in size, importance and wealth of street railways, however, these conditions have changed, the different departments now being under the direction of specialists. The superintendent of transportation is no longer interested in accounting propositions, and the master mechanic does not care to sit through a discussion on transfers. This is shown by the fact that for several years there has been a poor attendance, a general listlessness, inattention and lack of discussion at the general meetings of the main association, while quite the reverse has been the case at the meetings of the accountants and mechanics.

To prevent the breaking up of the association by the further secession of organizations of specialists, and to enable the association to perform the good of which it is capable, the following plan of organization and meeting is proposed:

(1) The annual conventions shall combine general meetings of the American Street Railway Association together with meetings of certain sections to which the consideration and discussion of papers and technical questions shall be allotted. The following sections are suggested.

(A) FINANCE, POLICY, ORGANIZATION, LEGISLATION

It is presumed that the presidents, managers, directors, etc., would attend the meetings of this section, and if deemed advisable its meetings could be held in executive session.

(B) TRANSPORTATION

This section is for superintendents, and such questions as transfers, time-tables, inspection, etc., would naturally come before it.

(C) ACCOUNTING

This section would perform the work now done by the Accountants' Association.

(D) ROLLING STOCK AND CAR EQUIPMENT

This section would consider questions relating to the construction and maintenance of cars, trucks, motors, etc., which are now taken up by the Mechanical and Electrical Association.

(E) POWER PLANT AND POWER DISTRIBUTION

Matters regarding the construction and maintenance of power plants, high-tension distribution, low-tension feeders, overhead construction, together with the consideration of new systems for the supply of power would come before this section.

(F) BUILDINGS AND ROADWAY

This section would discuss building and track problems.

(G) CLAIMS AND DAMAGES

In the meetings of this section, those interested with the settlement of damage claims could get together and compare notes.

(2) The necessary changes in the constitution and by-laws of the association shall be made that the officers of the association shall consist of a president, vice-president, permanent secretary and treasurer. The permanent secretary shall be the executive officer, statistician, keeper of records, etc., performing similar duties to the secretaries of the various engineering societies.

The executive committee shall consist of the president, vice-president and treasurer of the general organization, together with the presidents of the different sections. This executive committee shall perform the work of the present executive committee and shall have the power to increase or diminish the number and scope of the various sections as it may deem advisable.

(3) Simultaneous meetings of the various sections may be held at the annual conventions, but meetings of related sections should be so arranged that a delegate who is interested in questions coming before more than one section may have the opportunity of attending the meetings of several sections. For instance, the manager who would attend the meetings of Section "A" should have his choice of the other sections. The meetings of the superintendents and roadmasters should be held at different times so that one delegate may attend both sections. The same arrangement should be made for the master mechanics and the power plant men, and for the accountants and claim agents.

A printed programme of the meetings of the various sections, together with the papers and topics to be brought up at each meeting, should be distributed in advance of the annual convention, and this programme should be strictly followed, so that a delegate may come to the convention knowing what questions he wishes to discuss and how to dispose of his time to the best advantage. There is no reason why the meetings of the sections should not begin at 9 a. m. and continue, with a recess for lunch, until 5 p. m., and if the business cannot be completed during the day sessions there is no reason why a certain section may not hold a night session.

There will be ample time for a delegate to examine the exhibits when his particular section is not in session, or the executive committee may assign a day for this purpose.

In order to illustrate the application of the scheme thus outlined, the following programme for the year 1905 is mapped out, the dates being chosen at random:

ANNUAL CONVENTION, A. S. R. A., 1905

Tuesday, Oct. 10, 1905

9 a. m. to 12 m. General Meeting of the Association.

Call to Order.

Address of Welcome.

President's Address.

Abstract of reports of Secretary, Treasurer and Executive Committee.

Reports of Committees.

General Business of the Association.

Appointment of Nominating Committees.

2 p. m. to 5 p. m.

Meeting of Section "B" (Transportation.)

" " " "C" (Accounting.)

" " " "D" (Rolling Stock.)

Wednesday, Oct. 11, 1905

9 a. m. to 12 m.

Meeting of Section "F" (Roadway.)

" " " "C" (Accounting.)

" " " "E" (Power Plants.)

2 p. m. to 5 p. m.

Meeting of Section "B" (Transportation.)

" " " "G" (Claims.)

" " " "D" (Rolling Stock.)

Thursday, Oct. 12, 1905

9 a. m. to 12 m.

Meeting of Section "A" (Finance, Legislation, etc.)

2 p. m. to 5 p. m.

General Meeting of the Association.

Unfinished Business.

Report of Nominating Committee.

Election of Officers.

Adjournment.

The following is a resumé of the allotment of time:

Section "A"—Finance, Legislation, Organization, etc.	3	hours
" " "B"—Transportation	6	"
" " "C"—Accounting	6	"
" " "D"—Rolling Stock and Car Equipment.	6	"
" " "E"—Power Plant and Power Distribution.	3	"
" " "F"—Buildings and Roadway.	3	"
" " "G"—Claims and Damages.	3	"

Total time spent in meetings of sections. 30 hours
 Time allotted for general meetings of association. 6 "

This division of work will give thirty (30) hours of section work during a three days' session of the convention, and allowing one hour and thirty minutes for the discussion of each topic or paper. There is time for the discussion of twenty (20) subjects, which about quadruples the capacity of the present organization. It is unnecessary to dwell on the fact that the topics would be discussed by men who are interested in the questions and that, as the meetings would be smaller, discussion is apt to be freer. The above outline is merely given as an illustration of what might be done under this scheme and without any intention to limit the sections to the time allotted to them, or to establish any arbitrary limit to the number and scope of the sections. This should be established by the executive committee of the association from time to time.

Precedents for this method of disposing of the business of large conventions exist among the educational associations, notably the American Association for the Advancement of Science, which has for a number of years conducted very successful meetings on this basis.

Continuing, Mr. Ely said that since the receipt of Mr. McCulloch's suggestion he had given the subject still further study, and that he had brought to the meeting a printed copy of a programme of the last annual meeting of the American Association for the Advancement of Science. A most cursory examination of this programme will show that that association is able, by its methods of procedure, to do about as much work in one year as the American Street Railway Association would do in five years. This plan of Mr. McCulloch seemed to him to be an excellent thing to serve as a basis to work from. If he should say that he thought it was all right, and that it was what was wanted, it would be entirely contradictory of his first announcement, which was that his mind is wide open. It is wide open, and is not committed to any plan. Whatever is offered as a basis would, of course, be lacking in certain details. The National Electric Light Association has made great advancement in the last few years, and a very excellent provision has recently been adopted in that association, namely, that of creating associate memberships and also individual memberships. It struck him that that feature would be worthy of consideration in reforming the American Street Railway Association. It appears too bad that a man who has been the managing officer of a company should lose his membership in any one of the street railway associations simply because he went out of the street railway business, and this applies, of course, equally well to the members of the affiliated organizations. It is unfortunate that one who has occupied a prominent position in the association should not be able to retain membership in the association, and in that way keep in touch with its progress, should be so desire. If arrangements were to cover this feature, an additional source of revenue would also be provided. There are many things like that which will come up. He then said that he would be glad to hear from any one in regard to the general subject, and suggested that some one connected with the Accountants' Association might make some remarks.

W. G. Ross said that he would like to hear first from some of the members of the executive committee of the parent association, if it made no difference, although the Accountants were prepared to speak if that was the general wish.

Chairman Ely then called upon Richard McCulloch.

Mr. McCulloch said that he did not want to impose his views, but that it might be of interest to discuss in general terms the plan which he had proposed to Mr. Ely. It was founded upon the plan which the American Society for the Advancement of

Science pursues in its meetings. This association is composed very largely of college professors and people interested in university matters. They are men who in the present day tend to give their attention largely to specialties. There will be one professor who is interested in physics, another in mathematics, another in astronomy, etc. In the smaller colleges, some of these professors are also interested in and teach several of the different branches, so that in their meetings they have arranged a plan by which men can attend meetings of the sections in which they are interested, and they have also arranged so that sections in which subjects that are correlated are considered, meet at different times, so that a man interested in physics and mathematics also can attend the meetings of the two sections, or as many sections as are related to each other.

Mr. McCulloch said that he had sketched out in a general way the different branches into which the specialties in the street railway business might be divided up; for instance, we might start with the heads of the companies, the presidents, directors and managers, of whom, it might be said, as an illustration, that they are more particularly interested in finance, organization, legislation and things of that sort. Then there are the accountants, who have a specialty. Then there are the men who attend to the transportation—the superintendents and their assistants. Then there are the men who attend to car repairs and the electrical repairs. Then there are the men who attend to the power plants and the transmission lines. Then there are the engineers who attend to the track, and perhaps the buildings and bridges. Finally, there are the claim agents, who are interested in claims and damages. These could be divided up into a number of different sections and the meetings so arranged that in a small road the man who perhaps was the superintendent might attend the meetings of the Transportation Section and also the Track and Roadway Section. Again, on some of the small roads one man is the head of the repair shops and also of the power plant. The meetings of these sections might be arranged so that one man could attend both. It would be largely a matter of arranging the hours at which the sections met, so that they would not conflict.

The general plan which he had proposed was that the parent organization should be the leader in all these matters; that when the conventions were called to order there should be first a meeting of the general association, at which there should be the president's address, the address of welcome from the Mayor, the report of the secretary and treasurer, the reports of committees on subjects relating to the business of the association and the appointment of a nominating committee, and that all the general business could be transacted in the morning session, perhaps between the hours of 9 and 12 o'clock. Immediately after that, the various sections should have their meetings, and they should meet morning and afternoon for perhaps two days. On the third day the parent organization could meet again and finish up whatever business there was before it.

As to the details of the management of the association, that would involve changes in the constitution and by-laws, which he had not attempted to figure out. That probably would have to be done by the executive committee. The general arrangement would be that the organization should consist of a president, vice-president, a treasurer and a secretary, which latter official should be a permanent officer and should be the executive member of the organization and do the work which is usually done by the secretaries of the technical societies. They should constitute the members from the general organization. The different sections, of course, should have some representation on the executive committee of the general association. His idea was that the president of each of the sections should be a member of the general executive committee. As stated, he had not figured out these details, but he had no doubt that something of the sort could be done. He had sketched out the amount of business that could be transacted in a three days' meeting, which

is the time now devoted to the meeting, and found that under this arrangement there could be six hours for meetings of the general association and thirty hours for meetings of the sections. Calculating one and one-half hours for the reading and discussion of a paper, time would be provided for the discussion of at least twenty papers, which is four or five times greater than the volume of work which is now accomplished.

Chairman Ely then called upon W. E. Harrington.

Mr. Harrington said that he had read Mr. McCulloch's suggestion very carefully. As a plan of organization, he thought that without any question it approaches as nearly to that which is in the minds of different members with whom he has spoken in regard to the matter as any plan he has seen presented. The plan of the American Association for the Advancement of Science is one that is very complete, but hardly applies in its essential details to the requirements of the street railway associations. The plan that Mr. McCulloch has advanced has taken the best elements of the programme of the American Association for the Advancement of Science, and the matter now seems to resolve itself into the adjustment of detail, which could only be done by the committee as proposed by the president. The arrangement of the detail is the essential work before the association, following out Mr. McCulloch's plan, and Mr. Harrington said that he could only voice the sentiment of the chairman, that the matter be referred to a sub-committee to work out the details.

Howard F. Grant, upon being called upon, said that being a new member of the executive committee, he had come to the meeting in the same state of mind as the chairman, absolutely receptive. He had had time to give but very little thought to the details of the proposed organization, but had been very much interested in listening to Mr. McCulloch's outline of a plan. It seemed to him that if the association and the allied associations are to be of the greatest value to the companies represented in the associations, it is very necessary to have some sort of an organization along the lines suggested, and that as soon as possible. It also seemed that the association should be so organized that there would be a man at headquarters, an executive officer, who would gather all manner of detail in relation to the business, having it on file, getting it from the best authorities and the best practice, and that that data would be available for all members of the association and the allied associations. He would like to hear the matter discussed by gentlemen present who had had greater experience than himself, and who had given more thought to this matter than he had done. He thought that it was necessary to appoint a sub-committee to take up these matters in detail, thresh them out and make recommendations covering the proposed reorganization. If it was possible to get an expression from the gentlemen who had had experience in controlling the other associations, it ought to assist very materially in bringing about a good working organization.

Chairman Ely said that he had invited Mr. Vreeland, James F. Shaw and several other gentlemen who had been officially connected with the association in the past to attend this meeting, because they had given quite a good deal of attention to the matter and were thoroughly in touch with the situation; but he would call upon them for the summing up. He then asked W. G. Ross, of Montreal, president of the Accountants' Association, to address the meeting.

Mr. Ross said that the accountants think that Mr. McCulloch's plan has a good many features of value, but that they were opposed to any change whereby their association would lose its identity or its name. The Accountants' Association has been in existence since 1897, and its members think that it has accomplished a great deal of good work. The accounting methods at the time of its organization were in a very crude condition, but are now very complete. The association still has many important questions before it for discussion, the latest

being the question of accounts for interurban electric railways, and there are many others. The Accountants' Association has also accomplished excellent work in connection with the State Railroad Commissioners. He did not think anything should be done which would offset the position which has thus been reached. He quite agreed with Mr. Ely that the subjects at the meetings are not followed as closely as they might be, on account of subjects coming up which do not interest every one who is at the meeting. The street railway business has reached the stage now where it is necessary to have associations to take up the different departmental work in the street railway field and discuss the questions in connection therewith more thoroughly than has been done in the past. Many believe that the American Street Railway Association should deal with subjects which relate to the management of the company rather than the practical operation of the road. Mr. McCulloch's outline in that respect is very good. Mr. Ross, however, did not agree with Mr. McCulloch as regard the general secretary having full control of all the sections of the association, because there is a great deal of work in each section; this is certainly true as far as the Accountants' Association is concerned. In fact, in that association there is just as much work for the secretary as one man can handle, and he doubted if it would be a success to have one secretary for six or seven sub-associations or sections. In the Accountants' Association there is first the general work of the secretary; then the association has exhibits of forms and blanks, which are continually sent all over the country. To keep track of these forms and keep them up to date entails a great deal of work. Then there is the question of subscriptions for the purpose of maintaining these associations. Of course, it will be necessary, if the associations are changed into sections, being part of a general association, that there will be only one subscription. While there are many advantages in this plan, there are, at the same time, certain disadvantages, and one is that the subscription might have to be so large that it would keep out a great many of the smaller companies, and there might be a loss, instead of an increase, of members. Another important matter to be taken into consideration is the question of individual membership. Mr. Ross approved of the suggestion that a sub-committee be formed to study the matter further and submit a satisfactory plan.

Chairman Ely suggested that in regard to the different classes of membership and the question of dues, it might be possible to have a graduated scale of dues. This plan is followed in the New York State Street Railway Association, so that small companies can become members at a much lower fee than the large companies. He believed this matter could be adjusted in such a way as to increase the membership and revenues of the association very largely. It seemed to him that if the work of the association commended itself to the great corporations in New York, Boston, Chicago, in fact, to the street railway corporations generally of the country, those in charge of these corporations, recognizing the benefits, would be willing to pay more than they do at the present time, and that the lowest admission fee could be adjusted at such an amount as to make it very desirable even to the smallest street railway company in the country to become a member of the association.

Frank R. Henry, upon being called upon as another representative of the Accountants' Association, said that he agreed with Mr. Ross. The accountants all feel that, on account of the good work they have done in the last seven years, they do not wish to have the value of their work imperiled. He thought the accountants could do better work if some scheme could be devised whereby the individuality of the association could be maintained. That was the primary thing they had in mind. The other matters of details could be worked out altogether satisfactorily.

Chairman Ely then asked some of the mechanical engineers to express their views.

C. F. Baker said that the Mechanics' Association differs from the parent association or the Accountants' Association, in that it is more an association of engineers, independent in a way from the parent association. The Mechanics' Association, although a little over a year old, is almost self-supporting, but it needs more assistance to make it the benefit the members would like to see it to the railroad companies and to its members. All the members of the association, of whatever class, are assessed, and the dues at present are as large as is consistent with the income of the average railroad man. Most of the members belong to other organizations, so that the members are taxed for dues, reports, etc., about as much as they can stand. The association, like the Accountants' Association, wants to keep its identity; it wants its own secretary, and this secretary should be a technical man, familiar with the lines of work dealt with by the Mechanical Association, and should give his undivided time and attention to its work. A president, holding office for one year, cannot give the association the time necessary to make it what it should be, and the work will necessarily devolve largely on the secretary. He agreed with the other speakers in the desirability of referring the matter to a smaller committee.

H. H. Adams, also a member of the Mechanical Association, brought out one point in connection with the days of the session. Mr. McCulloch's plan called for the sessions being held during three days. Mr. Adams recalled the fact that at the last two conventions the Mechanical Association met two days in advance of the main association. This seemed desirable, in connection with the number of men who can get away from a road at one time. It is often impossible, on some of the smaller roads, for all the heads of departments to be away at the same time. For that reason the Mechanical Association set its meetings two days in advance of the main association, so that its members could attend the meetings and get back to their work, if necessary, before the president or general manager was obliged to leave for the meeting of the main association. As Mr. Baker suggested, the Mechanical Association is in a position where, if it had a greater revenue, it could increase the value of its work, and one of the principal efforts of the association has been to increase the revenues. If any financial plan could be put forth to put the association on a better basis it would be of great assistance. In connection with the suggestion made by the chairman about grading the dues, Mr. Adams said that one of the principal objects in forming the Mechanical Association was to let the small man have his say. The idea was to let the foreman, if necessary, get up in the meetings and give his experience, without having him feel that he had his general manager around and did not want to talk; and the dues have been kept very low, and there are several grades of dues. The members feel that the association should maintain its individuality in order to accomplish the things which they started out to do. One of their principal objects is to have their association opened to every man who is employed in the mechanical or electrical department of a street railway company.

Chairman Ely said that these remarks were all interesting and to the point. They show what is to be dealt with, and he said that he would be glad to have the presentation of views go on. He then called upon a representative of the Claim Agents' Association to state his views.

W. A. Dibbs, who represented that association at the meeting, said that it was formed in October, and has a president, vice-president, secretary and treasurer, and an executive committee. There are so far between forty and fifty members. The dues are small. One of the principal objects of the association is to help the members in detecting "repeaters," who go around the country and make it a business to mulct the roads wherever they get an opportunity. The secretary of the association is advised by any member who comes across a case of that kind. The secretary has a pamphlet printed, which is sent to the dif-

ferent members, advising them to look out for such persons. The association so far has had several of these cases, and has saved its members a great deal of money. Another feature of the work of the association is to assist the members with their out-of-town cases, such as if facts or a witness are to be looked up, or an examination made. Mr. Dibbs said further that he had not had an opportunity of consulting any of the other members of the association on the subject, under consideration and therefore could not give any expression of their views. He was quite sure, however, that the members did not want the association to lose its individuality.

H. H. Adams called attention to the arrangement of dues in the Mechanical Association. There is first an associate membership which consists of the membership of the roads themselves. They pay \$20 a year. Then there is the active membership of the heads of departments, who pay \$5 a year. Then there is a junior membership, which takes in such men as foremen and mechanical and electrical workers generally, and they pay \$3 a year. He brought out these points as illustrating a method which might be pursued in the financial arrangement of the new body, if it should seem desirable.

Chairman Ely said that while many of the matters which had been discussed related to details which would naturally work themselves out, it was very desirable to have them presented at this time, so that all could get an idea of the things that are to be met and could offer suggestions as to the manner in which to meet them. It was obvious, he said, that if the companies recognize the value of the work, it being taken for granted that what shall be produced will be valuable to the companies, the burden of the support of the aggregate association should rest primarily on the companies. That would relieve just such situations as had been mentioned. Then an arrangement of associate membership would provide for individuals, and those membership fees need not be any greater than those described. If the street railway interests of the country would come forward and take up the association as a valuable adjunct in their work and ally themselves with it, the revenues which would be derived would be sufficient to carry on the work in the very best possible way, according to the estimates he had made. He then invited D. M. Brady, president of the American Street Railway Manufacturers' Association, to discuss the question.

Mr. Brady said that the welfare of all the organizations connected with the street railway business was a matter of great interest to his association. As manufacturers, it is their first duty to be pleasant to all their patrons. His association would be glad of the privilege of being represented in whatever organization was decided upon, and he suggested that if they were given representation on the executive committee their representation might be made that of associate members. He meant by this that they would have no vote on the question of the expenditures of money, or the standardization of the properties, but on all questions which pertained to exhibits and other matters of detail in connection with conventions, they would be fittingly represented. Mr. Brady said that from 1877 to 1883 he had been the secretary of the Master Car Builders' Association. That was during the period in which the present association was built up. That association has what is known as a road membership; each road pays \$5 per year for each 1000 cars, or the major part of 1000 cars, which it may own. For example, if the Pennsylvania Railroad Company owns 100,000 cars, or 99,600 cars, it pays a membership fee of \$500 per year. In addition to that, the individual members pay an annual fee of \$5. All of that money is expended for the legitimate purposes of forwarding the work of the association. As is generally known, they have a secretary who is a man of considerable capacity, who devotes his entire time to the work of the society, and there is no doubt but that in the matter of the interchange of cars and the matter of standardization of equipment they have saved the steam railroads of this country in

the last twenty-five or twenty-six years many millions of dollars. In the year 1874 it was not possible for a freight car to leave the city of Boston, en route for Chicago, and arrive in Chicago without passing twenty-one different sets of inspectors. It is easy to imagine what a constant snarl the interchange of cars was in those days. To-day there is a joint inspector at Albany, Buffalo, Detroit and at every important point, who represents all the companies, and there is not the slightest difficulty under this present system in shipping freight from an extreme Eastern point to an extreme Western point. He commended the proposed plan of Mr. McCulloch, although he suggested that more time might be necessary than that allowed in Mr. McCulloch's programme.

Chairman Ely then called upon James H. McGraw, of the STREET RAILWAY JOURNAL.

Mr. McGraw said that he considered that the psychological moment for reorganization in the history of the American Street Railway Association and the allied associations had arrived. He said the question of reorganization had been discussed for about four or five years, quite strenuously in some quarters. The first efforts of this kind were at the Montreal convention, in 1895; and the thought of making changes in the methods of work of the association has been uppermost in the minds of some of its members for at least five or six years past. As the chairman had very truly said, the men who manage the railways of this country have brains and ability, and it is simply a question of their rising to the opportunity which now presents itself. In his opinion, the American Street Railway Association ought to be one of the foremost, if not the foremost, among the technical and scientific bodies in the United States. There was no reason why it should not be, and the time had come to put the methods into operation which will bring that about. There was a need for it; there was a great work to be accomplished, and he believed that the association was now finally on the right lines to bring about these results. Of course, the work would have to be done in a broad-gaged way, but the foundations had already been laid. The association has a history behind it now of some twenty-one or twenty-two years, and a great deal of good work has been accomplished as a whole. Of course, the conditions in the street railway business have entirely changed in the last ten years. It is true that there have been some conventions that were not up to the mark set by other conventions, but at the same time much good has been accomplished, and the foundation is here now upon which to build a superstructure, and that superstructure should now be built. He had not gone into the matter as to how the plan should be worked out in detail, but he had read with much interest the suggestions in the paper of Mr. McCulloch, and they seemed to him to be along right lines. It seemed to him, also, that it was not necessary for the Accountants' Association, the Mechanical Association and the Claim Agents' Association to lose their identity in becoming a section or integral part of the American Street Railway Association. He felt sure that the committee, which had been suggested by the chairman, when it is appointed, could so work out a plan that the different allied associations will be perfectly satisfied. He would not for a moment think it wise to curtail the work of the very important Accountants' Association or that of the Mechanical Association or the Claim Agents' Association. They have done most excellent work. The Accountants' Association is to-day recognized throughout the whole country as having done a work in systematizing and putting in shape the accounts of the street railroads of the country, which is of the very greatest value. These accounts are now kept in very different and very much better shape than they were when that organization was brought into existence. He felt that these matters of reorganization could safely be left with the committee which it was proposed to appoint, and said that the technical press would be glad to do all it could in the way of co-operation to the end sought. As a

member of the executive committee of the Manufacturers' Association, he said that, as this association was simply one of the aides to the American Street Railway Association, the policy laid down by the latter would, of course, be followed by the former body.

William Wharton, Jr., and C. C. Peirce also spoke briefly for the Manufacturers' Association.

Chairman Ely then invited Mr. Vreeland to speak.

Mr. Vreeland first asked Mr. McCulloch if it was his intention that there should be any loss of identity by the various affiliated associations. Mr. McCulloch replied that that was not contemplated in his plan.

Mr. Vreeland then said that he had discussed the broad proposition of reorganization with different members of the executive committee of the association for a number of years. He thought the present work of the association was not of such a character as to be of the most value to the members. He had once said that street railway companies had departed from horse car methods in their business, but not in their association—that there had been no change in the method of conducting the business of the association since its organization. One great need is to have a center of information in connection with the operation of the street railways of the country. As an instance, Mr. Vreeland said, he would receive one day a type-written form from the West, on which a request was made that certain statistics should be given. It would be referred to one of his departments and the information would be sent. The following day he might receive a request from the East for information bearing upon the same subject, and the next day he might get a similar request from Canada. These requests for information relate to the subject of transfers, general mechanical questions, the use of steel wheels and topics of that character. That is something that never occurs in connection with steam railroad work, for the reason that steam railroads have a center of information where such questions can be answered officially. That was his first recommendation in connection with the work of the association—that there should be some central point, with a secretary who was properly equipped technically, and had a statistical turn of mind, to gather this information instead of the railroads writing all over the country and asking for it, and frequently telegraphing for it. He had had a man telegraph to him a "rush" message, answer at his expense, from the West, as follows: "Common Council meets to-night; do you advise that we go into a general transfer system? Answer quick." Within the last two weeks he had received another telegram about as follows: "We are about placing an order for wheels. Will you please say whether we shall adopt steel-tired or the chilled wheel? Answer at our expense at once." Questions of that kind coming up in connection with this business impressed upon him the necessity of there being some central point for this information.

So far as the question of how this new method shall be proceeded with and how it shall be worked out, he did not see where there is any danger of any of these various organizations that now have a separate identity losing anything they have by an arrangement of this character. There is nothing novel in the idea. One of the greatest organizations ever formed in the history of labor is based exactly on this plan, and in its formation the organizers acted upon the advice of some of the most expert men in the United States. There is one central organization, which is the executive head, and there are any number of branches. Mr. Vreeland said he, himself, was chairman of a branch that takes in practically the whole of the United States—it has its own name, but it is a branch of the main organization. There are now five branches throughout the United States, every one of them a part of the main organization; they are presided over by chairmen, and each one of the chairmen is a member of the executive committee of the main association. The same thing is true about steam railroad work. Does any

one who has any knowledge of the workings of the Master Mechanics' or Master Car Builders' Association think there is any loss of identity in their case because they are known as a part of the American Railway Association? There could not be any loss of identity of the street railway allied organizations, in his opinion, through a closer affiliation with the parent association, and it seemed to him that unless some method was devised by which the contributions of the railroad companies should be given to a central organization rather than a number of independent organizations, there was a possibility of the railroad companies drawing the line at one association and saying that if their men want to be members of various organizations they will have to take such membership as individuals, independently of the railroad company.

Mr. Vreeland said that he had thought a great deal on this subject and had discussed the matter with a number of gentlemen many times during the last three or four years, and that he felt that the time had come in the history of the American Street Railway Association when it either had got to go forward or backward. In his opinion, the committee which it is proposed to appoint can arrange a satisfactory scheme of organization through which the American Street Railway Association will be the principal body, but these branch associations, departments or sections, or whatever they are called, will preserve their identity exactly as they have existed in the past few years. In fact, they will have a great deal better standing among the railways of the United States because they are a part of the American Street Railway Association rather than independent organizations. He did not think that he would care to devote his time, or have the men connected with the technical departments of his company devote their time, in going on with the American Street Railway Association unless there was to be a complete change in its methods of handling its business; nor did he think he would care to have the mechanical and technical organizations with which the heads of departments of his company were connected split up into independent bodies, each working on its own hook, any more than he would care to have all the departments of his company working independently of the president of the company.

Chairman Ely then invited James F. Shaw to discuss the subject.

Mr. Shaw said that he had listened with a great deal of interest to the remarks which had been made, and that it seemed to him that there was an air of business about the meeting which he had never seen before, either in a meeting of the executive committee or of the association. He had read with a great deal of interest the plan outlined by Mr. McCulloch, and thought it had a great deal of merit. He also thought that the views as expressed by the members representing the several auxiliary associations were entitled to a great deal of consideration. He believed that the plan suggested by the chairman, in having this matter referred to a sub-committee, would be the means of working out something which will be satisfactory to all interests and bring forth the results which all are looking for—that is, that which is for the best good of the operating companies.

Chairman Ely said that he had received a letter bearing upon the subject which showed how deep the feeling is that there is need for a change in the association methods. He believed that everybody considers, as Mr. McGraw said, that the psychological moment has arrived when the change should be made. He thought that all were fully impressed with the importance of the situation, and he was sure that some plan would be evolved that would meet with the approval of all concerned. He then referred to the letter on this subject which he had received, and which he said was from one of the most eminent men in the business. He read some extracts from the letter, as follows:

"With many others, I have been entirely dissatisfied with the general results obtained during the last few years and cordially

welcomed at St. Louis any suggestion which seemed to point towards reorganization.

"In the first place: I think the organization of so many associations—such as the Mechanics' Association, the proposed Maintenance of Way Association, the Claim Agents' Association, the Accountants' Association as it now stands—is unnecessary and unfortunate. It diverts attention and time from the main work of the association at its annual convention, and it creates a burden for support in the dues of the several organizations and the expense of delegates, which few companies can afford. When all is said and done, the conventions resolve themselves into a half-hearted attendance, combined with whole-hearted spirit of junket; a presentation and discussion of papers of no more importance, and frequently of much less importance than similar discussions and papers presented at other street railway associations, such as the New York State Street Railway Association, the New England Street Railway Club, and many others.

"My thought in regard to the association is that it should really be a National Association, that it should foster the growth of the local associations of merit of whatever kind and wherever located in the United States or Canada; that its secretary—in accordance with the new plan which was adopted at St. Louis—should be a custodian and disseminator of information upon the papers and discussions of these numerous local associations, his office a bureau of information to which all members of the association could apply. Our national annual convention should perhaps not be devoted at all to papers and their discussions, of the sort heretofore undertaken. If, however, such discussions are deemed necessary, could they not in some sense represent the cream of the year's work of the local associations, so as in a manner to centralize the work of the year and bring forward its most useful results for the consideration of the convention?"

Mr. Ely then said that he thought there had been enough discussion upon the question, as it was apparent that all were substantially in accord. He then recommended the appointment of a committee which, while large enough to be representative, should be small enough to do business, and thought that the members of the committee should be located territorially so as to admit of their being gotten together with the least expense.

After some discussion it was decided to appoint four members from the parent association and one from each of the other associations, the latter committeemen to have an alternate to attend in case the regular member found it impossible to be present. In conformity with this motion, the following gentlemen were announced as composing the sub-committee to devise ways and means for the reorganization of the American Street Railway Association and to determine the manner in which the subsidiary organizations should be affiliated, the committee to report later:

For the American Street Railway Association—E. C. Foster, New Orleans; Richard McCulloch, St. Louis; C. G. Goodrich, St. Paul; W. E. Harrington, Camden, N. J.

For the Accountants' Association—W. G. Ross, Montreal, and Frank R. Henry, St. Louis, alternate.

For the Mechanical Association—H. H. Adams, Baltimore, and E. W. Olds, Milwaukee, alternate.

For the Claim Agents' Association—W. A. Dibbs, New York, and W. H. Renaud, New Orleans, alternate.

For the Manufacturers' Association—W. H. Heulings, Jr., Philadelphia, and William Wharton, Jr., Philadelphia, alternate.

On motion, Mr. Ely, president of the American Street Railway Association, was requested to act as chairman of the joint committee, ex-officio.

On motion, the matter of making arrangements for expert assistance, to serve the committee, was referred to Mr. Ely.

On motion the meeting then adjourned.

Friday evening, upon invitation of Mr. Ely, the gentlemen in attendance were entertained at dinner at the Manhattan Club, and afterward attended the theater in a body.

PHILADELPHIA AS THE MEETING PLACE

At a meeting of the executive committee of the American Street Railway Association, held on Saturday, Feb. 4, it was decided to hold the next convention at Philadelphia during the

week commencing Sept. 24. The Bellevue-Stratford was selected as the headquarters, and W. E. Harrington and W. H. Heulings, Jr., with the president and secretary, were appointed a committee of arrangement. A committee on membership was also appointed, but the names of its members were not made public.

THE SAN FRANCISCO GAS-ENGINE ELECTRIC PLANT

As already announced in this paper, the California Gas & Electric Corporation, which owns and operates the Bay Counties electric power transmission line, which is the longest in the world, has recently entered into a contract with the United Railways Company, of San Francisco, to supply the electricity for running the entire street railway system under the control of that company. Current will be supplied normally from the

been constructed in the United States to be used directly connected to alternating-current generators operating in parallel. The engines, of 5333 hp each, three in number, will be constructed by the Snow Steam Pump Works, of Buffalo, N. Y., and are known as the Snow gas engines.

The Snow engine is of the 4-cycle, horizontal twin-tandem, double-acting type, giving two impulses to each crank per revolution. The equipment of the station for the present is to consist of three of these engines. They will be of 5333 hp each, will run at 88 r. p. m., and will each be directly connected to a three-phase, 4000-kw, 25-cycle alternator, manufactured by the Crocker-Wheeler Company. There will also be two motor-generator frequency changers, built by the Stanley Company, having an output of 4000 kw each, and designed to run at 300 r. p. m. These frequency changers will take 60-cycle, three-phase current at 11,000 volts and deliver three-phase, 25-cycle current at 13,200 volts. Connected with these machines will be two banks of 60-cycle transformers of 1500 kw each, with a spare transformer, making a total capacity installed in transformers of 10,500 kw for transforming from 50,000 volts or 60,000 volts to 11,000 volts for the motor-generator frequency changers. The exciter for the motor end of the frequency changers will be equipped with a special regulating device, so that changes in the railroad load will not affect the main line pressure of the transmission lines.

To furnish exciting current for the 25-cycle generators there will be two 340-kw motor-generator exciter sets, either one of which is large enough to excite the entire station. Each of these exciter sets will have a pulley, from which may be driven compressors which will supply air to storage tanks for starting the gas engines. There will also be a storage battery for emergency exciting current.

High-tension switches for the two 60,000-volt transmission lines which will enter the station will be installed in fireproof compartments. A fireproof compartment construction will also be used for the 11,000-volt, 60-cycle switches and the 25-cycle, 13,200-volt switches. The 25-cycle switches will be in duplicate, there being a duplicate set of bus-bars arranged so that any feeder or any machine may be worked on either set. This will give ample facility for keeping everything in first-class shape.

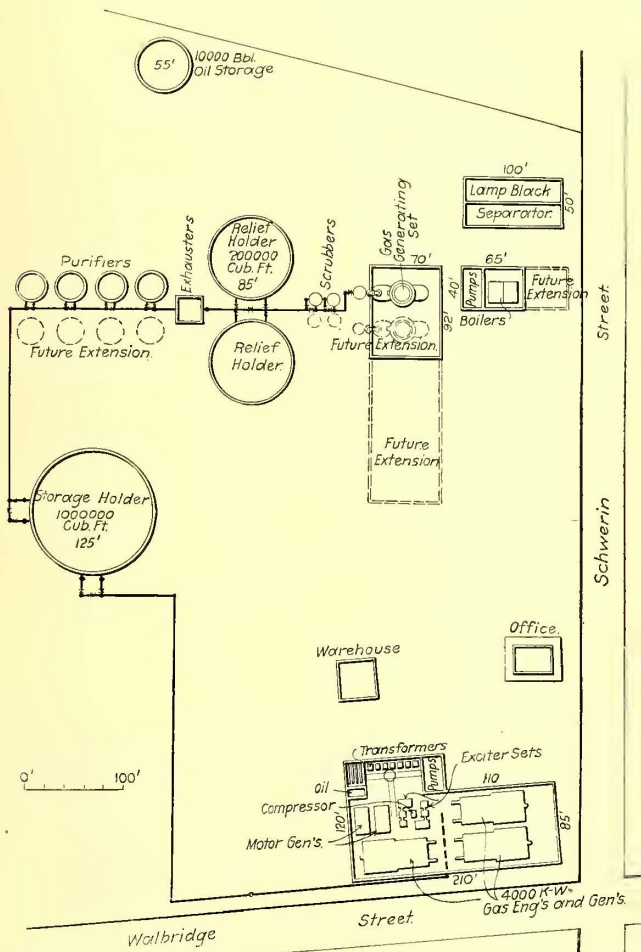
The main building of the power station will be 200 ft. in length x 90 ft. in width. This will accommodate three engines, motor generators and exciter sets, and will also give room at one end for a machine shop, tool room and office rooms, etc. On one side of the main building there will be an addition 36 ft. wide x 80 ft. long, in which will be installed on the first floor a storage battery, high-tension transformers and pumping apparatus for cooling water for the gas engines; on the second floor the 60,000-volt switches, all of the 11,000-volt and 13,000-volt switches, and also the general operating switchboard of the station.

Outside of the main building there will be arranged storage tanks, cooling tanks and other apparatus for the cooling water of the engines.

In connection with the gas engine station, there will be a thoroughly modern oil gas plant, consisting of generators 16 ft. in diameter x 18 ft. in height, connected to superheaters 16 ft. in diameter x 40 ft. in height, and especially designed wash boxes for removing the by-product, lamp black. The works will be fitted with modern scrubbers for washing the gas, and two relief gas holders having a capacity of 200,000 cu. ft. each. There will be four cylindrical purifiers 30 ft. in diameter and a storage gas holder of 1,000,000 cu. ft. capacity.

The plans of the works are now finished, construction work is about to begin, and it is anticipated that this plant will be the most modern and economical of its kind in existence.

The low cost of crude petroleum of California makes it possible to produce a gas of high heating value at a cost which is



PLAN SHOWING GENERAL ARRANGEMENT OF SAN FRANCISCO GAS ENGINE-ELECTRIC PLANT

hydro-electric transmission system, but to provide against interruption of service, it was considered desirable to arrange for the installation of an auxiliary power plant to pick up the load quickly, if necessary, and so insure constant service to the street railway company.

Steam engines and steam turbines were considered, but the fact that they require that their boilers shall be under constant fire for immediate operation was considered to involve too much attendant expense. The engineers, therefore, decided upon the introduction of large gas engine units, which are ready for instant use, and with which the interest on the cost of the engine plant is the only fixed expense.

The California Gas & Electric Corporation, in addition to its other work, has been the pioneer in California in the manufacture of an excellent quality of low cost oil gas, and is now proposing to introduce the largest gas engines that have ever

impossible in other parts of the country. It is the endeavor of the corporation to complete the gas plant by Sept. 1, 1905, and the managers hope to have one of the engines installed at that time and that the complete installation will be finished before Jan. 1, 1906.

The accompanying ground plan of the power generating and gas generating plant will afford some idea of the general locations of the buildings and their particular arrangement, by which economy and space has been gained for present operation, with advantages of extensions in the future. The site selected is in San Mateo County, a distance of about $4\frac{1}{2}$ miles from the center of the business district of the city of San Francisco, and is particularly ideal, being located upon the bay of San Francisco, where oil can be readily delivered, and where salt water for all purposes in the manufacture of gas can be obtained in unlimited quantities.

The construction of the power plant, including buildings, and the gas engine units, together with the high-potential transmission lines, which will connect the power station with the seven water-power plants of the corporation, will be in charge of F. G. Baum, transmission engineer of the corporation, who has achieved a wide reputation for his knowledge in this branch of electrical science. The erection of all of the gas plants and all of their equipment will be in immediate charge of E. C. Jones, gas engineer of the corporation, who is a well-known authority on the construction of gas works and in their economic operation.

GABLE-BOTTOM COAL CAR FOR THE ATLANTIC SHORE LINE RAILWAY COMPANY

As a number of electric railways are now operating coal cars and others are contemplating like action, a description of the type used on the Atlantic Shore Line Railway, Kennebunk, Maine, may prove of some value. This car, which has a capacity of 17 tons steam coal, was built for the railway company by the Laconia Car Company Works, Boston, Mass. It is self-dumping through the bottom; there is a suitable slant both from the ends and from the center to two traps, one on each side, between the outside and intermediate sills, 18 ins. wide and 9 ft. 6 ins. long. In raising the traps, they are operated by the Laconia pump-handle motion attachment which winds onto a 2-in. rod, two cable chains to each trap. Chains are attached to the rod and to the trap by eye bolts. Each trap is operated independently. To drop the trap the lock weight has to be raised and the panel lifted to allow the ratchet wheel to revolve, the trap then dropping to allow the car to unload by gravity.

The draw-gear is of the Laconia Car Company Works standard M. C. B. type, and the couplers have flexible heads. The car is equipped with hand brakes operating on all the wheels of both sets of trucks. There is a brake wheel at each end of car. The trucks are of the diamond frame, and the bolsters are of the sandwich type, made of wood and steel plates. The wheels are Laconia double plate, 33 ins. in diameter, weighing 550 lbs. each. The brake beams are inside hung.

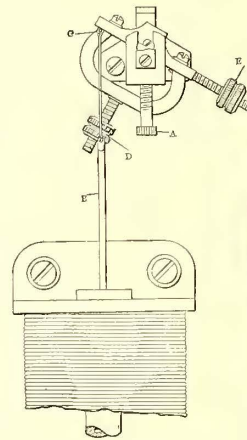
The main dimensions of this car are as follows: Length over sills, 28 ft.; length over body, 24 ft.; width over side sills, 8 ft.; width inside, 7 ft. $9\frac{1}{2}$ ins.; height above floor, 4 ft.; height top of rail to top of floor, 4 ft. $1\frac{1}{4}$ ins.; bolster centers, 19 ft.

It is interesting to see from the foregoing that the use of special cars is increasing to such an extent that railways find it worth while to have them constructed by car companies rather than to build such cars themselves of old material.

NEW TYPE OF VOLTMETERS AND AMMETERS

There has been a strong demand upon makers of electrical instruments for reliable voltmeters and ammeters for switchboard work that could be supplied at a price in keeping with that of the other apparatus. To fulfil this demand the Westinghouse Electric & Manufacturing Company offers a new line of instruments known as the type K for use upon either direct or alternating currents. This is a development of one of the Lord Kelvin patents controlled by the Westinghouse Company, and the construction is strictly modern to satisfy the most exacting requirements of present practice.

In shape, size, finish and general appearance the type K instruments harmonize with the other round pattern switchboard types of the Westinghouse manufacture. The face has a matted surface with raised letters and a pleasing ornamental design in low relief, the entire case being finished in black enamel. Their principal distinguishing characteristic is the



DETAIL VIEW SHOWING ADJUSTING WEIGHTS



TYPE K AMMETER IN CASE

simplicity of their construction. There are but few parts, none of which are complicated, and the adjustments are easily made. In effect, the mechanism consists of a stationary coil, through which the measured current flows, the voltmeter measuring the



SIDE VIEW OF COAL CAR USED BY THE ATLANTIC SHORE LINE RAILWAY COMPANY

current which flows through a high resistance. The coil acts on a movable core or plunger, which is connected with a steel beam mounted upon knife bearings and carrying the indicating pointer. There are no springs, the action being controlled by gravity.

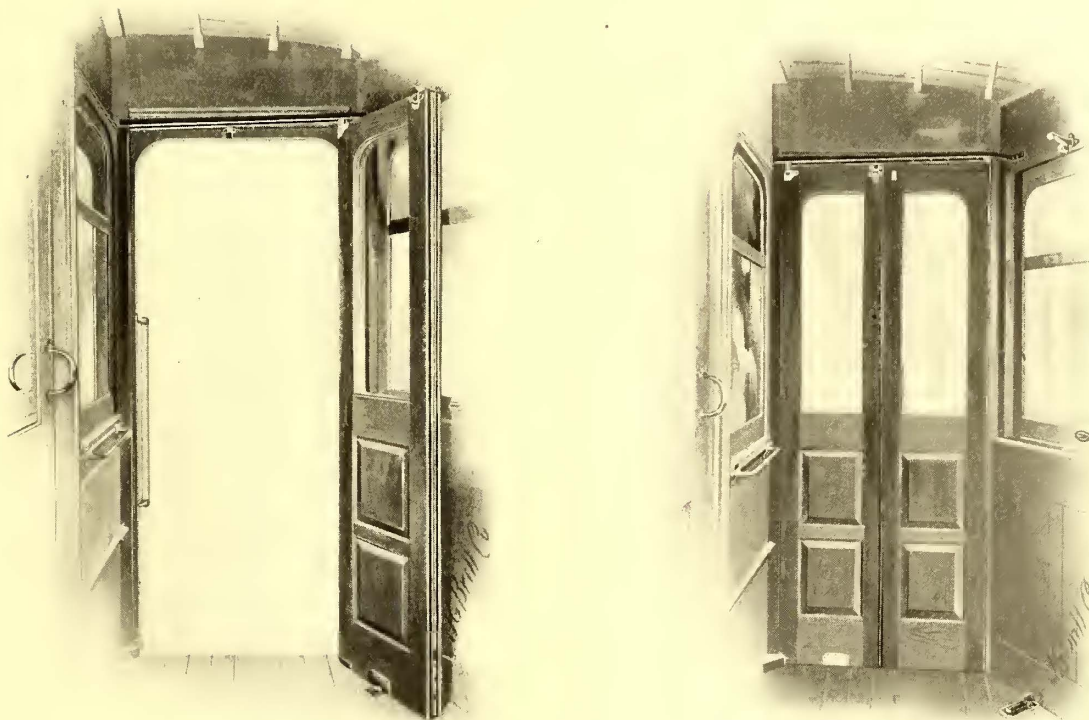
In other instruments in which a solenoid is employed, the residual magnetism has seriously affected their accuracy. In the type K the core is so constructed that it is saturated with a very small amount of magnetic energy, such as that of one-twentieth full scale deflection, and thus for any load the at-

traction upon the plunger is directly proportional to the current, making the error due to residual magnetism commercially negligible and the scale almost uniform, commencing with zero. On alternating currents its action is not appreciably affected by changes in frequency. External fields do not influence the performance and temperature errors are negligible.

The instruments are dead beat in their indications, the steadying effects of a dash pot being obtained by inserting the lower end of the plunger in a glass tube filled with oil. The opening in the solenoid is made small and the plunger is a piece of fine iron wire, flexibly connected to the movement by means of a strong silk cord. The only point where friction could be

A NEW DEVICE WHICH CONTROLS THE SWING OF VESTIBULE FOLDING DOORS

The close attention to every detail of car construction and the constant watchfulness to improve every part to the smallest accessory has always been a notable characteristic of the J. G. Brill Company. To the long list of patented specialties invented and manufactured by the company has recently been added a device for controlling the movement of folding doors of car vestibules, two positions of which are shown in the accompanying illustrations. The device consists of a roller mounted vertically on the upper corner of the outer leaf of the



OPEN AND CLOSED POSITIONS OF VESTIBULE FOLDING DOORS CONTROLLED BY ROLLER AND SPRING LATCH

looked for is at the two knife edge bearings which support the beam, but, in fact, no frictional effects are perceptible, as the weight is exceedingly light and the controlling force very great. Movable weights, shown at *D* and *E* in the accompanying illustration, afford a means for adjustment. The scale has large open divisions, which are practically uniform in size and legible at all points. The sector illustrated at *A* corrects inequalities by keeping the leverage the same in all positions. It will be seen that the simplicity of construction gives the type K instruments an unusual degree of strength, coupled with exceedingly accurate performance. There is nothing in their mechanism to affect the permanence of calibration, and they are easily repaired and adjusted.

Ammeters are regularly made of capacities to and including 1000 amps and voltmeters to 750 volts for use without transformers. For larger capacities, transformers are supplied. Switchboard builders find them of decided advantage in connection with moderate priced panels where high accuracy is desired, such as combination panels for a single generator with its feeders and small boards for isolated plants.



The Frisco Railroad and the Southwest Missouri Electric Railway, which compete for interurban passenger business between Carthage and Webb City, Joplin, Mo., and Galena, Kan., have announced advances in fares. Since 1898 the fare between Carthage and Joplin has been 20 cents. The new rate will be 25 cents and 30 cents, according to destination.

folding door, and which moves between a guide rail attached to the middle of the door and a guide rail parallel to it. A spring catch at the top of the door near the center locks it in its closed position, and when released the spring hinges open the door part way, and with a light push with one hand it is folded back and held by neat clasps, the lower one having a spring buffer and the upper utilizing the same spring lock which fastens the door when closed. To close the door, the spring lock at the top is drawn down and the lower catch is pressed down by a small toe piece. The Brill Company is using the device on all of its cars having vestibules with folding doors, and in every case it has met with great favor.

One can readily appreciate the advantage over the former method of allowing the folding doors to swing free with liability of striking against passengers, and by a sudden movement of the car be violently closed or opened, resulting in broken glass and wrenched frame. The extensive use of the dividing rail on vestibule Detroit platforms makes such a device absolutely necessary to prevent defacement of the woodwork of the door by swinging against the railing. The manufacturer believes it to be a simple and efficient arrangement that is destined to be widely used.

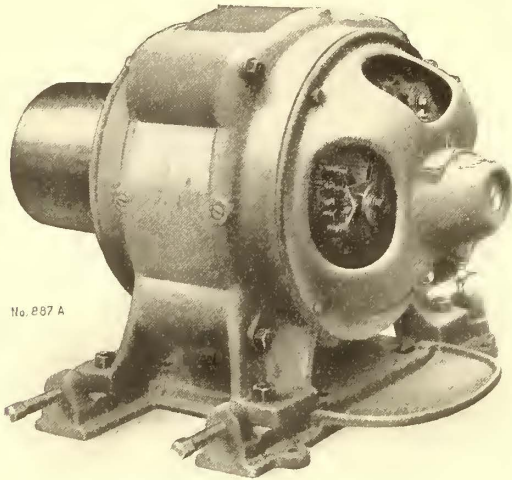


A meeting is to be held of representatives of the United Railroad of San Francisco and a committee of the union of employees to settle the question of whether the present working agreement between the company and the men shall be renewed for one or two years.

A RECENT DEVELOPMENT IN DIRECT-CURRENT MOTOR CONSTRUCTION

The National Electric Company, of Milwaukee, has brought out a new line of Lundell motors whose entry in the direct-current field is coincident with a radical development in the art of construction. It will be quickly realized from the following description that the component parts have been proportioned and combined to produce motors remarkable for their efficiency, low temperatures, compactness and rigidity of structure.

The cast-iron frames or housings, which contain the lami-



VIEW OF MOTOR READY FOR SERVICE

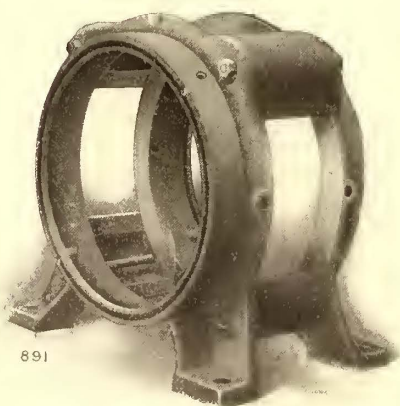
nated yoke rings and support the bearing brackets, consist of a rigid open casing made in two parts (front and rear). The rear has four hollow extension arms of strong cross section, accurately bored to engage and support the laminations assembled therein. The front frame is identical with the rear frame, except that the extending arms are omitted. Bolts pass through these arms, securing the frames together, insuring the

current motors and generators, as this insures an absolute uniformity of the magnetic circuits, a greater flexibility of speed control, quick field regulation and a more compact structure. In fact, it represents the finality of design, because laminated mild steel for the entire magnetic circuit in yoke, pole pieces and armature and armature body, and copper for the conductors, embody the most desirable materials for their respective purposes. The Lundell laminated yoke is built up of punched mild steel rings secured and accurately centered in the rigid frame just described. The outer and inner diameter of these rings are absolutely concentric.

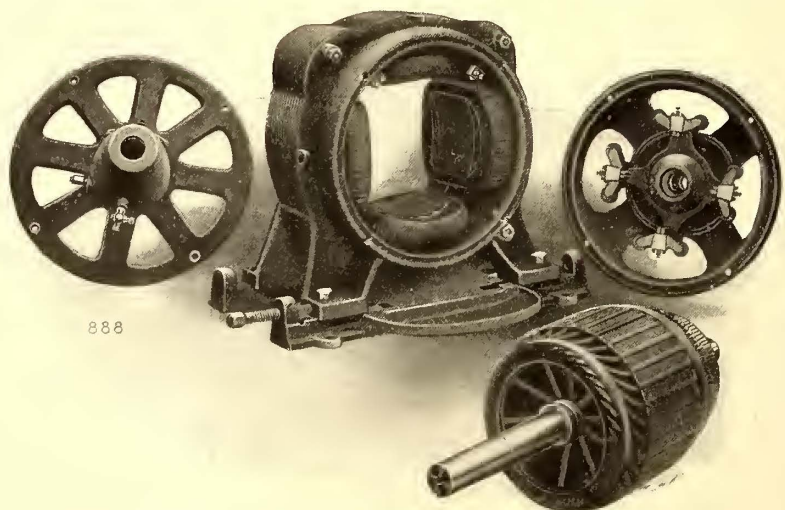
The pole pieces are separately punched from the same material as the yoke rings. These pole pieces are provided with end plates so constructed as to provide ventilating ducts to carry off the heat generated in the field coils. Ordinarily this idle space has not been made use of. These end plates are tapped and retaining bolts pass through the frames, accurately seating the pole pieces, causing the same to make perfect contact with the inner diameter of the yoke rings. By removing these bolts the pole pieces and field coils can then be readily taken off.

In machines up to 60 hp it is not necessary to introduce ventilation into the center of the armature, as the losses are exceptionally low in this new line of machines. The foregoing is peculiar to the Lundell universal motors, which save the space, while other types have to provide for these ducts in the length of the armature core. The extremely low losses make it possible to enclose these motors at lower temperature rises than is possible with other motors in which the losses are greater, and consequently the temperature higher, unless additional ventilation is relied upon in order to bring the temperature within established limits. The armature-coils are all form wound and are separately insulated independently of slot insulation, the insulation of the coils being assured from the start. These coils are of standard proportions and provide for ample room at both the back and the front ends. Supporting rings cast in one piece with the end plates of the core serve to hold the ends of the armature coils firmly in place.

The commutators are built on the lines of standard street



THE FRAME SKELETON



DETAIL PARTS ILLUSTRATING SIMPLICITY OF CONSTRUCTION

most rigid construction. These frames or housings, when bolted together, possess exceptional stiffness, which is in no way dependent upon the use of the laminations; in fact, it makes no difference to the stability and perfect alignment of the machine whether the yoke laminations are in or not. At the same time, the over-all dimensions (height and width) of the magnet yoke are not exceeded, an objectionable feature to be found in all previous attempts at making a rigid laminated yoke motor.

It has long been desired to use laminated yokes in direct-

railway practice, giving a rigid support to the bars, which are made of hard-drawn copper insulated by selected mica. The commutator shells are ventilated through their centers, which construction aids in bringing about the remarkably cool running of the commutators.

A new principle is involved in the brush device of this apparatus. It has not only important commutation features, but has an operative bearing upon the running of the brush, securing a performance never before equaled. In the past it has been customary to see the brushes on a stud placed side by side

in a line parallel to the commutator bars and mica. With this apparatus, one brush is placed directly in front of the other (in tandem). The total brush surface is the same as is the commutator space occupied by the side-by-side brushes, and each brush has its independent tension spring. With the old style brushes any irregularity of the commutator surface causes both brushes to jump together. This instantaneously opens the circuit at that point as each irregularity passes a brush stud. With the Lundell tandem brush the irregularity (if there should possibly be any) strikes only one brush of a stud at a time, so that while one may rise its mate is making contact and the circuit is always closed for that stud. In practice it has been found that this one fact materially reduces the temperature of the commutator and gives it a much better surface, as well as an excellent bearing surface to the brushes themselves. Where field control is used to obtain broad ranges required by variable speed work, or where conditions of service call for special commutating conditions, the brush at the leaving edge is made of high resistance carbon to take care of the sparking conditions, and the other brush of high conductivity to carry the current. In this manner both conditions of service, which are ordinarily opposed to each other, are successfully performed by this dual brush in a manner not possible with the single brush.

The magnetization losses in the iron, and resistance losses in the winding, commutator and brushes are so low, due to the economical proportioning of these parts, that the motors run cool independent of forced ventilation. The proof of this is to be found in their performance. When running under full load continuously, the temperature rise is so low that the quality of the insulation is not impaired in the least. In fact, the motors have such ample temperature margins as to permit of heavy overloads being carried for long periods without injury. Full loads are carried continuously without sparking, and because of the peculiarities of the Lundell tandem brushes, heavy overloads are carried without injury to the commutator or the brushes. One important feature of this type of brush holder is that the commutator is given a fine high polish, while the face of the brushes is always worn down to a true bearing surface. Pig tails are not necessary to carry off the current from the Lundell laminated brushes because they have twice as much contact surface against the holder as the ordinary solid brush. Because of the high class material used throughout and the



LAMINATED YOKE CONSTRUCTOR

economy secured by the design, it is possible to obtain the highest efficiencies for these motors.

Variable speeds of standard fixed speed motors, obtained by field control, are permissible within certain limits. For broad ranges of speed, motors of properly selected capacities are used. A range of speed, the lowest and highest points of which are represented by a ratio of 3 to 1, meets most practical cases, and is recommended as the ratio of speed to be obtained by field control. These variable-speed motors are remarkably

compact and have ample margins for carrying overloads even when working under most difficult conditions of commutation.

These motors are particularly short between bearings, because of the high quality of the material itself and the ingenious design. The armature shaft is made of cold rolled steel, and is of large diameter, combining stiffness and strength, particularly because of the short distance between bearings. The bearings are of large area, and oil rings are provided to conduct the oil from the wells to the armature shaft. Cast-iron covers of liberal dimensions, directly over the rings, permit of inspection, and a special oil plug prevents an overflow of oil into the motor when the bearing boxes are filled.

POWERFUL LOCOMOTIVE AND BAGGAGE CAR FOR JOLIET, PLAINFIELD & AURORA RAILROAD

The American Car Company, of St. Louis, has lately delivered to the Joliet, Plainfield & Aurora Railroad Company the baggage and express car shown in the illustration, which was ordered by the Fisher Construction Company, the engineers and



THE JOLIET, PLAINFIELD & AURORA RAILROAD COMPANY'S NEW EXPRESS CAR

contractors. Passenger cars for this line built by the American Car Company were described in this journal of Dec. 10, 1904. The lines which were opened last year have had a good paying business from the start, and there has been a pressing demand for facilities for handling baggage and express, to meet which the company has ordered this fine car. The latter is mounted on 27-E trucks, capable of very fast service.

The car is divided into two compartments, one 14 ft. 1½ ins., and the other, 29 ft. 10½ ins. Its length over the crown pieces is 44 ft.; over the bumpers, 46 ft., and the width over sides, 8 ft. 10 ins. Two 4-ft. 6-in. sliding doors are on each side of the car. The longitudinal slat seats, seen in the illustration, are arranged to fold up. The interior is sheathed and painted, and the ceilings are carline finish. As the car is intended for carrying very heavy loads, the bottom framing is unusually substantial, and includes four 6-in. channel iron center sills, and the side sills are 5 ins. x 7¾ ins. The angle-iron bumpers, gongs, sand boxes and brake wheels are of Brill manufacture, and the signal bells, pilots and other furnishings are of the builder's make. The wheel base of the trucks is 6 ft., and the wheel diameter, 33 ins. Heavy couplers of M. C. B. type are at either end, in addition to radial channel iron couplers, and enable the car to be used as a locomotive for drawing trains of freight cars from steam roads.

Two bills have been introduced in the Indiana Legislature to do away with the issuing of gratuitous transportation to officials. One bill makes it unlawful for a State, county or city official, or legislator or judge of a court to accept a pass over a steam or interurban road. The other bill makes it unlawful for a railroad or interurban company to issue passes to the above named officials, and adds penalties for violation.

FINANCIAL INTELLIGENCE

WALL STREET, Feb. 8, 1905.

The Money Market

There was no appreciable change in the money market this week, despite the losses in cash sustained by the banks as a result of the recent heavy exports of gold and the preparations making for the flotation of the various new issues of railway bonds. The demand for funds was somewhat larger than in the preceding weeks, but the supply of money was at all times in excess of the inquiry. Consequently, borrowers experienced no difficulty in obtaining necessary requirements at the low rates recently quoted. The only activity was displayed in the call money department, a fairly large business being transacted at rates ranging from 2 to 2½ per cent, the average being about 2¼ per cent. A very moderate business was reported in the time loan branch. In the absence of offerings by Western institutions, local lenders were inclined to hold rates firm on the basis of 3½ per cent, but the amount of money placed at that figure was extremely small, borrowers generally declining to make contracts at that figure. In some instances maturing loans were liquidated. Toward the close of the week, however, the tendency became easier, and offerings were quite liberal at 3¼ per cent for four and five months' maturities. Mercantile paper was fairly active, the inquiry for high-grade material being largely in excess of the supply. Prime endorsed bills were readily discounted at 3¼ to 4 per cent, while choice single names found a ready market at 4 to 4¼ per cent. A feature of the week was the sharp advance in the price of sterling exchange at Paris to 25 francs 18 centimes, and a decline of 30 points in sterling here, which puts shipments of gold coin to that center out of the question, at least for the present. The exports of gold bars, however, are likely to continue on a small scale for some time to come. In addition to the consignments to Paris, substantial amounts are center out of the question, at least for the present. The exports of gold bars, however, are likely to continue for some time to addition to the consignments to Paris, substantial amounts are likely to be sent to Cuba in payment of the last instalments due on the Cuban bonds, and to Argentina. The bank statement published last Saturday was about as expected. The loss in cash, amounting to \$5,349,700, was due largely to the heavy gold exports. The increase of \$12,443,600 in loans reflected the syndicate operations in connection with the Southern Pacific bond issue. Deposits increased \$7,151,700, resulting in a decrease in the surplus reserve of \$7,137,625. The surplus is now \$19,841,925, as against \$21,842,775 in the corresponding week of last year, \$18,545,675 in 1903, \$17,896,225 in 1902, \$20,362,625 in 1901, and \$27,897,575 in 1900. There was no material change in the discount rates at the principal European centers. At London the rate was 2½ per cent, at Paris 2 5-16 per cent, and at Berlin 2 per cent. At the close the situation was free from disturbing factors, and indications point to a continuance of the present easy conditions for some time to come. It is pointed out that while the demands upon the local institutions will be heavy in the near future, on account of the various railway and municipal bond issues, the banks are in an extremely strong position, and are well able to meet all demands without causing any material hardening in money rates. Gold exports are also likely to be made upon a much smaller scale after the present week.

The Stock Market

Considerable activity developed in the stock market this week, and although the dealings were accompanied by more or less irregularity, as the result of profit-taking sales, the general tone of the market was strong. The overshadowing feature of the week has been the large and constant demand for investment securities, resulting largely from the remarkable ease in the money market. In fact, investment bonds have not been in equally good demand in many years. At the close of last week \$75,000,000 Southern Pacific refunding 4 per cent bonds were brought out, and it is understood that orders in advance for them exceeded the entire amount before the subscription books were opened. The flotation of this issue was all the more remarkable in view of the fact that the exports of gold coin to Europe last week were the largest in any single week, and the loss of bar gold promises to be unusually heavy during the present week. The demand for high-grade stocks from investors was also extremely heavy. This

condition of affairs more than offset the thorough dissatisfaction in railroad circles over the insistence on the part of the President in the face of Congressional opposition, to the passage of a law that would give to the Federal Government the right to make railroad freight rates. On Tuesday trustworthy information from Washington was to the effect that there would be no legislation in this matter at the present session of Congress, and prices advanced sharply. There were renewed rumors of peace negotiations between Japan and Russia, and, although this was a minor influence, it helped to maintain prices.

The local traction stocks were active and strong on persistent rumors of a merger of the various lines in New York City. Metropolitan Securities and Metropolitan Street Railway were conspicuously strong, the first-named closing at 83¾, a net gain of 4½, while the latter ended the week at 122½, an advance of 6¼ points. Brooklyn Rapid Transit and Manhattan Railway also scored substantial gains.

Philadelphia

The Philadelphia Company has declared a dividend of 2½ per cent on the preferred stock, payable on March 1, to stockholders of record on Feb. 10. The company has also sold \$1,500,000 5 per cent serial notes, the proceeds to be used upon extension of pipe lines in West Virginia, which will considerably increase the company's supply of gas. The notes will be paid off out of current earnings, at the rate of \$300,000 per year.

Announcement is made that the Philadelphia Rapid Transit Company has sold \$10,000,000 bonds of the Market Street Elevated Railroad Company to Drexel & Company at par. The bonds, which are 4 per cents, mature in fifty years. They are secured by a first mortgage upon the property of the Market Street Elevated Railroad, and are guaranteed by the Philadelphia Rapid Transit Company. Of the total amount only \$5,000,000 will be called for at once, the balance to be drawn upon from year to year, as it is wanted, for the building of extensions to its properties. Announcement is also made that work upon the Market Street Elevated road and upon the underground system will be pushed as rapidly as possible.

Dealings in the traction shares were fairly active, and prices generally ruled firm. United Gas and Improvement was the active feature, several thousand shares changing hands at from 108¾ to 108¾. American Railways advanced 1¼ points to 49¾, on the exchange of odd lots, and Railways General sold at 3 15-16 to 37¾. Philadelphia Traction rose a point to 101, but subsequently the price eased off to 100½. Philadelphia Company Common rose ¾ to 41½, while the preferred brought 47. Philadelphia Rapid Transit was active and firm, with all transactions at 24¾ and 25. Union Traction brought 59 to 58¾, United Companies of New Jersey 27¾, and Union Railway 74¾.

Chicago

All indications point to a speedy unraveling of the local street railway tangle. The deposits of City Railroad stock during the past week have exceeded the expectations of the members of the syndicate, and it is expected that by Feb. 15, the time limit for receiving deposits, practically the entire outstanding stock of the company will have been deposited. At the close of business on last Saturday, 124,000 shares of stock had been turned in, or 33,000 shares more than a majority. Since then considerable more stock has been turned in, the smaller holders evidently not being inclined to constitute a minority interest.

It is said that the new interest in the company will make decided improvements in the public service. The improvements will of necessity be limited on account of complicated conditions of the franchise rights, but efforts will be made to give the patrons of the South Side system a much better service in every respect. John Spoor is said to be slated for the presidency of the City Railway. The franchise question is receiving more or less consideration at the present time. Mayor Harrison early in the week sent a communication to the City Council recommending that no traction legislation be passed until after the April election. Traction interests, however, are awaiting the decree of the court in the franchise case, which is expected in the coming week, and it is said that according to the present plans no further important developments in the local traction situation need be expected until the court's decision is handed down. If the decree is favorable to the Chicago Union Traction

Company, it is probable that rapid progress will be made in working out the entire traction problem.

The committee of the City Council is considering an ordinance permitting the Metropolitan Elevated to build two new tracks on the Barfield branch, and permitting the Aurora, Elgin & Chicago cars to come over the Metropolitan tracks down town.

The traction stocks were active and strong, prices generally responding to the progress made in the plans to consolidate the various street railway properties. Chicago City Railway sold at 199. Chicago Union Traction common rose $1\frac{3}{8}$ to $13\frac{7}{8}$, while the preferred sold at 51 to 50. North Chicago advanced sharply to 99, while West Chicago jumped from 66 to 72 on moderate purchases. The Elevated Railway issues were comparatively quiet but firm, especially Metropolitan Elevated, which advanced to 64, despite the reported intention of the directors to defer the resumption of dividends on the stock until after the close of the fiscal year. They sold at 22. Chicago & Oak Park common sold at $6\frac{1}{2}$, and the preferred at 24. South Side advanced nearly 2 points to $95\frac{1}{4}$, and Northwestern sold at $24\frac{3}{4}$.

Other Traction Securities

The Boston market was extremely dull and devoid of noteworthy features. Boston Elevated was not materially changed as to price, several hundred shares being transferred at prices ranging from 155 to $155\frac{3}{4}$, the final transactions taking place at $155\frac{1}{2}$. Massachusetts Electric common was strong with sales at from $14\frac{3}{4}$ to $15\frac{1}{8}$, but the preferred lost a point to 60. West End stocks were irregular. Early in the week the common dropped 2 points to 94, but rallied at the close to $95\frac{3}{4}$; the preferred advanced a point to 115. The feature of the Baltimore market was the activity and strength in United Railway incomes, about \$300,000 selling at from 52 to $55\frac{3}{4}$. There was no news to explain the rise in this issue. The 4 per cent bonds were quiet at 95, while the stock was practically neglected, about 1000 shares bringing $14\frac{3}{4}$. Other transactions included Norfolk Railway & Light 5s at $95\frac{3}{4}$ to $95\frac{1}{2}$. Washington City & Suburban 5s at $105\frac{3}{4}$ to 106. Baltimore City Passenger 5s at $107\frac{1}{4}$. Macon Railway & Light 5s at $98\frac{1}{2}$ and 99. On the New York curb Interborough Rapid Transit continued its erratic movement upon an extremely heavy volume of business. Upward of 22,000 shares were dealt in at from $202\frac{1}{2}$ to 225, an extreme gain of $22\frac{1}{2}$ points for the week. Just at the close there was considerable profit-taking, which carried the price off sharply to 215. Stop loss orders were uncovered at the way down; the close was at 217. There was absolutely no news to account for the sharp advance in price. Numerous rumors were in circulation, but all of them lacked official confirmation. Washington Railway & Electric preferred sold at 87, and American Light & Traction preferred brought 101. In bonds the trading was fairly active and included \$60,000 Jersey City, Hoboken & Paterson 5s at $79\frac{3}{4}$ to 80, \$100,000 United Electric of New Jersey 4s at $77\frac{1}{8}$ to $78\frac{1}{8}$, \$20,000 North Jersey Street Railway 4s at $80\frac{1}{2}$, and \$50,000 Public Service 5 per cent notes at $97\frac{1}{2}$ and interest.

Security Quotations

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

	Feb. 1	Feb. 8
American Railways	49	$50\frac{1}{2}$
Aurora, Elgin & Chicago (preferred).....	--	--
Boston Elevated	$155\frac{1}{2}$	155
Brooklyn Rapid Transit	$61\frac{1}{4}$	$62\frac{1}{2}$
Buffalo Con. 5s.....	--	109
Buffalo Deb. 6s.....	--	104
Chicago City	--	198
Chicago Union Traction (common).....	13	$12\frac{3}{4}$
Chicago Union Traction (preferred).....	--	51
Cleveland Electric	--	81
Consolidated Traction of New Jersey.....	80	80
Consolidated Traction of New Jersey 5s.....	109	109
Detroit United	77	$77\frac{1}{2}$
Interborough Rapid Transit	$208\frac{1}{4}$	$217\frac{1}{2}$
Lake Street Elevated	--	--
Manhattan Railway	$169\frac{3}{4}$	$171\frac{1}{4}$
Massachusetts Electric Cos. (common).....	$15\frac{1}{8}$	15
Massachusetts Electric Cos. (preferred).....	$60\frac{1}{2}$	$59\frac{1}{2}$
Metropolitan Elevated, Chicago (common).....	21	$21\frac{1}{8}$
Metropolitan Elevated, Chicago (preferred).....	$59\frac{3}{4}$	60
Metropolitan Street	$117\frac{1}{4}$	$120\frac{1}{2}$
Metropolitan Securities	$78\frac{3}{4}$	$81\frac{1}{8}$
New Orleans Railways (common).....	$3\frac{1}{2}$	$3\frac{1}{4}$
New Orleans Railway (preferred).....	12	13
New Orleans Railways, $4\frac{1}{2}$ s.....	76	79

	Feb. 1	Feb. 8
North American	$103\frac{1}{2}$	$103\frac{1}{4}$
Northern Ohio Traction & Light.....	--	--
North Jersey Street Railway	--	22
Philadelphia Company (common).....	$41\frac{3}{4}$	$41\frac{3}{4}$
Philadelphia Rapid Transit	$24\frac{7}{8}$	$25\frac{3}{4}$
Philadelphia Traction	$100\frac{1}{2}$	100
South Side Elevated (Chicago).....	--	$94\frac{1}{2}$
Third Avenue	125	130
Twin City, Minneapolis (common).....	$105\frac{1}{2}$	$105\frac{3}{8}$
Union Traction (Philadelphia).....	$58\frac{1}{2}$	$58\frac{3}{4}$
West End (common)	$94\frac{1}{2}$	$95\frac{1}{4}$
West End (preferred)	114	115

Iron and Steel

The "Iron Age" says that the monthly blast furnace statistics show that in January the production of the works in the United States beat all records, having been 1,776,000 tons, exclusive of charcoal iron, which would carry the production close to 1,800,000 tons, or at the rate of 20,700,000 tons per annum. Yet the furnaces have not been in full swing in January, since the weekly capacity has advanced from 377,879 tons per week on Jan. 1, to 404,292 tons on Feb. 1. In spite of the heavy production, the stocks of merchant furnaces declined from 403,000 tons on Jan. 1, to 372,000 tons on Feb. 1, thus indicating a rate of consumption of fully 21,000,000 tons a year. That such figures should be reached in mid-winter is astounding.

THE CHICAGO CITY RAILWAY COMPANY CHANGES HANDS

The Chicago City Railway Company on Feb. 3 passed into the control of a syndicate headed by J. P. Morgan & Company and represented in Chicago by Marshall Field, P. A. Valentine and John J. Mitchell. The syndicate has offered for some time to purchase Chicago City Railway stock at \$200 per share, provided enough stock could be secured to assure control of the company. Under this proposition, stockholders depositing their stock with the syndicate were to have received pay after March 31, but enough stock having been deposited to secure control, payment has been made in full. The change in the control of the company is the first step toward the unification of the Chicago City Railway Company and the Chicago Union Traction Company.

WHAT THE LAKE SHORE & MICHIGAN SOUTHERN IS DOING WITH GASOLINE—AN OFFICIAL STATEMENT TO THE STREET RAILWAY JOURNAL

Reports have been published in newspapers that the Lake Shore & Michigan Southern Railway Company had been experimenting with gasoline cars, and that contracts had been placed for 100 equipments with the intention of placing gasoline cars in operation on branch lines in competition with electric cars. A STREET RAILWAY JOURNAL representative called on W. H. Marshall, general manager of the Lake Shore, relative to the matter, and was referred by Mr. Marshall to H. F. Ball, superintendent of motive power. Mr. Ball stated that his company is interested in the subject of gasoline cars, and that it has seen a number of experimental machines, but thus far it has not found anything that it considers would meet the requirements. He denied that any order for such cars had been placed, or that such a thing had even been considered. He said he thought such a car might be made serviceable for short branch lines, but he did not think it could compete with modern high-power electric cars. Mr. Ball is of the opinion that the most satisfactory scheme for designing such a car would be to generate electricity by means of a gas engine and mount motors on the trucks, thus operating the car electrically.

WESTINGHOUSE SALES MEETING

The annual meeting of the traveling salesmen of the electric railway and lighting department of the Westinghouse Electric & Manufacturing Company drew about seventy-five representatives to Pittsburg during the past week, one of the largest gatherings being at the dinner at the Hotel Schenley on Thursday evening. C. S. Cook, manager of the railway and lighting department, acted as chairman at the various meetings. The general sentiment of the convention was that there were busy days ahead in the electric railway field, the successful introduction of the electric motor into suburban traction service in the past few years having brought many of the great railroad companies to an appreciation of the future of the electric railway in interurban traffic. The meeting of the past week at Pittsburg was particularly valuable in the opportunity afforded not only for a close study of the latest shop developments in new motor types, but also for the discussion of the conditions and problems that have recently been encountered and solved in many important long-distance installations.

McKINLEY INTERESTS BUY ILLINOIS COAL COMPANY

The McKinley syndicate, which has such large city and interurban railway interests in Illinois, has purchased the Kelly Coal Company, one of the largest coal mining companies in the vicinity of Danville, Ill. The move is an important one, as with the aid of its interurban lines the syndicate is now in a position to mine and sell its own coal at Danville, Champaign, Urbana and intermediate points. Several 25-ton capacity coal cars have been purchased, and an electric locomotive has been built for hauling coal from the Danville mines to Urbana and Champaign, for use in the company's power house and for general sale in those places.

A HIGH-SPEED LINE BETWEEN PATERSON AND WEEHAWKEN

The announcement was made in New York the latter part of last week that a company had been organized to build a high-speed electric railway from Weehawken to Paterson, N. J., which is about 17 miles northwest of New York. The company that will carry out the project will be known as New York & North Jersey Rapid Transit Company, and according to information given to the *STREET RAILWAY JOURNAL* by one of the officers, the plans for building are pretty well matured.

To be exact, the line will be 13.6 miles long, extending from Paterson, through Passaic and Rutherford, to Weehawken at a point near the West Shore Railroad ferries in that place. In construction the road will be an air line. Its 13.6 miles of track will compare to advantage with both the Erie and the New York, Susquehanna & Western mileage between New York and Paterson, the distance by the former being 17 miles and by the latter 23 miles. The present electric routes compare quite as unfavorably with the proposed line, and they, of course, are not to be considered as a means of rapid transit.

The construction will follow closely the standard set in interurban railway work by the Lackawanna & Wyoming Valley Railway, a third-rail line whose plant and equipment were described in detail in the *STREET RAILWAY JOURNAL* of June 13, 1903. The car equipment will, however, differ materially from that of the Lackawanna road, chiefly because conditions of service will not be the same. In this detail it has been decided to follow the practice of the Interborough Rapid Transit Company, operating the elevated and the subway lines in New York, whose subway car will be used as a model by the new road. Service will be given by multiple unit trains of six cars each. Both local and express trains will be operated. The running time of the express trains is estimated at 20 minutes, while that of the locals is placed at 30 minutes. One hour and one-half is the time it takes to make the trip from the Weehawken ferry to Paterson by trolley.

The terminal of the road in Paterson will be within one block of the City Hall, on private property which has already been acquired. From that terminal through Paterson the line will be elevated. It will also be elevated through Passaic and through Rutherford. Grade crossings through the country between these places will be entirely eliminated. In building from Rutherford across the meadows the company will follow the practice of the steam railroads operating in the same territory. A double-track tunnel will be driven through Bergen Hill for a distance of 4700 feet.

The decision of the company in determining to build to Forty-Second Street, New York, is strictly in keeping with the knowledge that has come of recent years, that the center of New York no longer is "down-town."

The population immediately along the line of the road is approximately 225,000, and within the 3-mile limit at which earnings per mile are usually based, the population is 600,000. There must, of course, be added to these figures the population of the terminal city, New York, with its 3,500,000 persons.

Connected with the company are railway men known the country over, and financiers whose prestige would assure the success of any enterprise with which they might become identified. Foremost among them is William Barbour, president of the company, who also is president of the Linen Thread Company. Mr. Barbour is a man experienced in electric railway work. He formerly was the principal owner and the vice-president of the Paterson Railway Company, which property he and his associates sold to the North Jersey Street Railway Company. M. R. McAdoo is the vice-president of the company. Mr. McAdoo is well known to the street railway world. He was associated with Mr. Barbour in the conduct of the Paterson Railway Company, being at one time general manager of the property. The executive committee of the company is William Barbour, M. R. McAdoo and the Hon. John W. Griggs, ex-attorney-general of the United States, and ex-governor of New Jersey.

A PETITION TO LEGISLATURE FOR A BOSTON SUBWAY

A petition to the Legislature, backed by H. P. Bowditch, H. L. Higginson, Lawrence Minot, A. T. Lyman, C. S. Packermann, R. H. Dana, E. H. Gay, and about one hundred other citizens or taxpayers of Boston has recently been drawn up, with the object of securing an enactment authorizing a rapid transit subway under Beacon Hill from Scollay Square to Massachusetts Avenue. The proposed route is under the Charles River embankment, Mount Vernon Street, Ashburton Place, and Pemberton Square to Scollay Square, connecting at grade with the East Boston Tunnel. Stations have been suggested at Dartmouth Street, between Brimmer and Charles Streets, at Louisburg Square, and at the State House. The advocates of the measure claim that the rapid transit facilities of the Back Bay, Allston, Brighton and the Newtons would gain much by such a subway; that a tunnel under Beacon Hill can be built under favorable conditions, owing to the slope of the hill, the depth of the tunnel and the sub-structure of blue clay which is easy to work and sufficiently firm to withstand pressure from above; that quicker time could be made between the Back Bay and the north and south stations than by present methods, and that the cost of such a subway and tunnel would not be over \$3,000,000.

The object of pressing the matter at the present time is stated to be the desirability of locating such a subway under the Charles River embankment, before the space is laid out with shade trees and filled with pipes and conduits, coincident with the progress of the work on the Charles River Basin. The route is now being surveyed, and detailed plans will be presented to the Legislature when the matter comes up for a hearing.

INDIANA INTERURBAN MEN PROTEST AGAINST THE CODIFICATION BILL—THE RAILROAD COMMISSION BILL

A large number of interurban men appeared before the legislative committee of the Indiana Legislature last week and protested against the passage of the bill on municipal corporations. Their chief objection is to the provision which grants City Councils power to condemn city railroads, the contention being that such power will also permit cities to condemn interurban lines within city limits. They pointed out the predicament in which their systems would be left by the condemnation of their property in one or more cities as the limitations expired. They said it was possible to be left with various disconnected strips of rails which would be valueless, and insisted that the twenty-five-year limit to city franchises is unfair to interurban companies because they are expected to compete with steam roads, which hold their rights in perpetuity. Such a provision would defeat competition and work directly to the disadvantage of the public.

A committee representing the same interests, headed by A. W. Brady, president of the Indiana Union Traction Company, appeared before the legislative committee and complained that the Railroad Commission bill, as amended, ought not to become a law for the reason that it contained no provision by which the proposed commission would have power to compel steam roads to turn over loaded freight cars to electric lines. Mr. Brady claimed that it had been the understanding that the commission would have this power, and for this reason the electric lines had favored a railroad commission. Mr. Brady admitted that the traction interests preferred to be left out of the commission entirely. He said that the interurban business in the State is now in the experimental stage, and that it is not pleasant to contemplate the possibility of having developments and investments hampered by rules of the commission without corresponding advantages. He insisted that if the Legislature give the railroad commission power of supervision over the traction lines, it would be at least fair to give the commission power to compel steam roads to turn over loaded cars to the electric lines when, in the judgment of the commission, it is necessary and equitable for them to do so. Mr. Brady said the electric lines were not asking for unconditional exchange of freight between steam and traction lines. "We are not ready for that," he said. "But there are times when we need loaded cars on the steam lines, consigned to points on our lines, and at such times the commission should have power to compel the interchange of traffic. If you leave traction lines out of the bill entirely we will not complain, but if you do include them, then do not leave them without the advantages of interchange with the steam lines under proper conditions."

Both the interurban and the steam line interests appear quite willing to leave the interurban roads out of the jurisdiction of the bill, but the Legislature is not likely to acquiesce in this. Since the steam roads oppose the compulsory interchange of freight between the steam and interurban lines and the latter insist on the commission having power to compel such interchange, the passage of the bill may be delayed.

CINCINNATI, DAYTON & TOLEDO LEASED

Reference was made in a recent issue of the *STREET RAILWAY JOURNAL* to the terms of a proposed plan for leasing the Cincinnati, Dayton & Toledo Traction Company to the so-called Widener-Elkins syndicate, which controls the Cincinnati Traction Company and other Ohio properties. This lease was effected under the terms outlined at a recent meeting of the stockholders of the Cincinnati, Dayton & Toledo Company. The leasing company, known as the Cincinnati Northern Traction Company, has been incorporated with W. Kesley Schoepf as president. The capital stock is \$500,000. Under the conditions of the lease, the new company is to spend \$1,500,000 in improvements within two years, which means the practical rehabilitation of the property, bringing it to high-speed standards. Five hundred thousand dollars will be spent in the erection of a central power station at Hamilton, thus eliminating the four direct-current stations with which the road is now operated. F. J. J. Sloat, general manager of the company, who will continue actively in charge of the property, states that while the matter has not been definitely decided, it is not likely that the much-talked-about single-phase system of transmission and car propulsion will be adopted.

ST. LOUIS & SUBURBAN CHANGES

The St. Louis & Suburban Railroad has called a special stockholders' meeting for Feb. 9, to elect six additional directors and change the by-laws of the company. The increase in the membership and the contemplated changes are a part of the general plan providing for an increase of \$1,500,000 in the capital stock voted at the annual meeting, Jan. 9. The new stock issue is being marketed through a construction company, organized to take over the stock in payment for extensive improvements to be made next summer. A syndicate composed of twenty of the principal stockholders has underwritten the new issue at \$60 per share.

The board of directors announce that a complete revision of the existing by-laws will be followed by the adoption of new by-laws better adapted to the present needs of the company. The stockholders will first vote on the proposition to increase the board, and will then elect the new members. These will be members of the underwriting syndicates who have not heretofore figured prominently in the affairs of the company. The old directors were re-elected at the recent annual meeting. There was some opposition from minority stockholders at this meeting, who voted against the majority programme, but the opposition vote was small.

The period for subscriptions to the stock issue expired Feb. 1. The officers state that the issue has been oversubscribed at the \$60 figure. A small amount of the stock is scattered, it is stated, but the bulk of it is in the hands of the syndicate members. The terms are a payment of \$15 down and the balance at intervals to Sept. 15, 1905, to the Mississippi Valley Trust Company, as agent of the construction company. The terms of subscription provide that all stock must be deposited under the suburban voting trust agreement, made June 25, 1902, and trust certificates will be issued in lieu of the stock.

As previously mentioned in the *STREET RAILWAY JOURNAL*, the Florissant Construction, Real Estate & Investment Company has been organized to take the improvement contract, with a capital stock of \$5,000. The improvements are to cost about \$900,000, it is stated, and will consist chiefly of double-tracking the suburban lines in St. Louis County and building new car sheds on Manchester Avenue. H. S. Ames, president of the St. Louis & Meramec, a part of the suburban system, is also president of the construction company, and holds forty-eight of the fifty shares of stock.

TRACTION MATTERS IN NEW YORK

Traction matters in New York received considerable attention from the municipal authorities and the public of the city last week. On Feb. 1 there was a hearing in the Kings County Court House, Brooklyn, by the State Railroad Commissioners on transportation in Brooklyn. Commissioners Dickey and Baker were present; Mr. Dunn, of the commission, being kept away through illness. A general statement was made by the company of betterments, since the recommendations of the commission about 2 years ago. Practically all of these improvements have been described in detail in the *STREET RAILWAY JOURNAL*. Suggestions were offered by various trade organizations and citizens in the interest of the public weal. President Littleton, of Brooklyn Borough, said he thought a solution of the problem of relieving the congestion of traffic lay in the proper utilization of the two bridges. He favors the plan of building the proposed elevated loop between the Manhattan terminals. As a means of immediate relief he suggested allowing

people to cross the ferries free in the rush hour and making an allowance to the ferry companies for that service from the money they owe to the city. Commissioner of Public Works Brackenridge expressed the same ideas as Borough President Littleton regarding the loop. The hearing was continued Tuesday afternoon and evening, without important developments. Meanwhile the Brooklyn Rapid Transit Company officially put itself on record as favoring the elevated line between the terminals of the Brooklyn and the Williamsburg bridges in New York. The estimated cost of this structure is \$3,000,000. The company has agreed to bid for the construction and operation of this structure, and to pay 4½ per cent required by law.

On Thursday, Feb. 3, the Rapid Transit Commissioners held a hearing on subway matters. The most important thing brought out at the meeting was the offer, on behalf of a number of capitalists in the Gates Avenue section of Brooklyn, including the Bedford, Stuyvesant, Bushwick and Brownsville districts, to lease and operate a Gates Avenue subway, providing a franchise was granted, for a fare of three cents. A. Stewart Walsh made the proposition. The proposed line would start from Flatbush Avenue and Fulton Street, where connections could be made with the subway now building under the East River to Brooklyn, and run through Gates Avenue to Broadway, and thence to East New York, ending at some point in the Brownsville district, probably Belmont Avenue.

The plan for this extension was worked out by Peter A. Nosstrand, a Brooklyn engineer, who estimated the cost of construction and equipment, ready for operation, at between seven and eight million dollars. The route, he said, would accommodate about one-third of all the inhabitants of the present borough of Brooklyn. It would be through a thoroughly built-up district, serving actual residents in a district where there is scarcely a plot of vacant land. He thought that if a spur was built from this line down Broadway to the Williamsburg bridge, and possibly extended further out toward Brownsville, it would make a perfect line for connection between the Williamsburg bridge and Jamaica, if extension into Queens Borough should be deemed desirable.

On Tuesday, Feb. 7, the Aldermen passed an ordinance for a franchise for the construction of the proposed tunnel in Sixth Avenue, New York. The New York & New Jersey Railway Company is to build this line as an extension of the road it is constructing between New York and New Jersey, under the Hudson River.

IMPORTANT CHANGES IN ALLIS-CHALMERS SALES OFFICES

The Allis-Chalmers Company is making important changes in the organization of its sales offices throughout the country. These changes are brought about because of the broadened scope of the company's operations since it acquired the Bullock Electric Manufacturing Company, of Cincinnati, which has now become the electrical department of the Allis-Chalmers Company. Hereafter the rule will be that each Allis-Chalmers district sales office will represent all the company's lines of manufacture in prime movers, as well as in saw mill, flour mill, mining, crushing, cement and other machinery and the electrical interests. This policy involves the opening of a considerable number of new Allis-Chalmers offices, and in many places the consolidation with those of the Bullock offices heretofore maintained in the same centers. Some recent changes brought about by following out this policy are as follows:

St. Louis, Mo.—An Allis-Chalmers district sales office has been opened in St. Louis in the Chemical Building. The Bullock Electric Manufacturing Company's offices, formerly in the same building, have been consolidated with them. H. P. Hill, formerly district manager for the Bullock Company, is the manager for the consolidated offices.

Cleveland, Ohio.—An Allis-Chalmers Company district sales office has been established in Cleveland, in the New England Building, where the Bullock offices formerly were, and the two offices have been consolidated under the management of Franklin Wharton, formerly district manager for the Bullock Company.

Pittsburg, Pa.—A Bullock office has been opened in the Frick Building, in Pittsburg, and consolidated with the Allis-Chalmers office under the management of H. Wiedeman Murray, who has for years represented the Allis-Chalmers Company in that district.

Kansas City, Mo.—The Allis-Chalmers Company has established a new office in Kansas City in the Dwight Building. George W. Mattison, who has been connected with the company for a considerable time in other capacities, is in charge.

Buffalo, N. Y.—An Allis-Chalmers district office, with temporary headquarters in the Ellicott Square Building, has been opened in Buffalo, under the management of George W. Pulver. Mr. Pulver is well known throughout the district of which Buffalo is the center, having been for a number of years with the Westinghouse Electric & Manufacturing Company at its Syracuse office, and acting manager of that office until recently.

MORE ROADS JOIN THE CLOVER LEAF

In an article on "Limited Service and Interline Business," which appeared in the STREET RAILWAY JOURNAL of Feb. 4, considerable space was devoted to the manner in which the Clover Leaf Railroad (steam) is interlining business with the electric railway of Michigan, Ohio and Indiana. This road extends from Toledo to St. Louis and heretofore it has been one of the weak roads so far as passenger business is concerned. Lately, in open defiance to the roads in the Central Passenger Association, which refuses to recognize electric roads, it has made alliances with nearly all the electric railways in the States mentioned. Tickets for St. Louis are being sold by electric railways as far east as Zanesville and Cleveland, while roads in southern and western Ohio and all over Indiana are selling to both St. Louis and Toledo. Similar arrangements with Michigan roads bring Detroit and numerous other Michigan cities into the Clover Leaf's field. The low rates of the electric railways make the through rates considerably lower than by all steam routes. A recent report of the Clover Leaf indicates that its passenger business has increased about 100 per cent, largely the result of these alliances. The company has changed the time of its best train for St. Louis so that it now makes connection with a limited from Cleveland over the Lake Shore Electric. This renders it possible for a passenger to leave Cleveland at 1:30 p. m. and reach St. Louis early the following morning. A remarkable example of the possibilities for such service was shown last week when the Lake Shore electric agent at Cleveland sold a ticket for Denver, Col., over this route, the rate being lower than could be made by any of the steam roads.

Mention was made in the last issue of the special service instituted by western Ohio roads for business between Dayton, Toledo and St. Louis. The Springfield, Troy & Piqua Traction Company, which connects with the Dayton & Troy at Troy, is now a party to this arrangement, and is selling tickets from Springfield to all points on the Clover Leaf. It has a car which makes close connections in both directions with the Dayton & Troy "Clover Leaf Special," giving Springfield and surrounding towns practically the same service and rates as are given from Dayton. A situation has been created by the Clover Leaf which seems likely to break the embargo placed against electric railways by the steam railroads.

STREET RAILWAY PATENTS

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

UNITED STATES PATENTS ISSUED JAN. 24, 1905

780,496. Resilient Link; Karl E. Elers, Pittsburg, Pa. App. filed May 18, 1904. A link for connecting a railway-motor armature with one of the truckwheels which comprises a coil-spring, a sheath having an attachment device at one end and a connecting rod having an attachment device at the opposite end, said parts acting to compress the spring when the attachment devices are forced away from each other and also when they are forced toward each other.

780,502. Third Rail; Alfred H. Hopkins, Chicago, Ill. App. filed Nov. 18, 1904. An inverted T-rail supported at the upper end of a bracket by bolts passing through the web.

780,531. Car Wheel; Isidore H. Sampers, New York, N. Y. App. filed Sept. 26, 1903. The wheel is provided with an elastic tire of greater width than the bearing face of the rail, and a keeper for the tire fastened to the rim, extending down the outer side of the tire and curved inwardly over the outer edge thereof.

780,541. Car Wheel; Romeo P. Tomassek and Isidore H. Sampers, New York, N. Y. App. filed Dec. 16, 1903. A car wheel provided with elastic tires located upon opposite side of its guard flange.

780,542. Car Wheel; Romeo P. Tomassek and Isidore H. Sampers, New York, N. Y. App. filed May 25, 1904. A wheel having an elastic tire on its rim in which is moulded a holding-flange, the flange being radially disposed with respect to the face of the wheel and the tire normally projecting outwardly beyond the periphery of the holding-flange.

780,568. Method of Controlling Electric Railroad Brakes; John S. Lockwood, Kansas City, Mo. App. filed April 16, 1903. An electro-magnetic brake in which the magnetic field is rapidly and successively increased and decreased, to prevent locking of the wheels.

780,620. Trolley Wire Finder; Joseph P. Reed, Muncie, Ind. App. filed Sept. 17, 1904. Details.

780,698. Electric Railway; Frank Anstett, Wilkesbarre, Pa. App. filed Aug. 9, 1904. The third rail is of L-shaped construction and is engaged by an upwardly spring-pressed contact shoe.

780,767. Electric Railway Trolley; Russia R. Weeks, Cincin-

nati, Ohio. App. filed April 14, 1904. The upper ends of the arms of the harp are turned inward to form guard fingers.

780,852. Station Signal; John L. Wrenn, Washington, D. C. App. filed Nov. 24, 1903. A signal to be set by a prospective passenger, the signal being automatically restored after a given time by an hour-glass arrangement.

UNITED STATES PATENTS ISSUED JAN. 31, 1905

780,977. Trolley; George J. Cook, Pittsburg, Pa. App. filed Aug. 3, 1904. Retaining arms on either side of the trolley wheel having flanges overlapping the wire in the groove of the wheel, the arms being spring mounted.

781,134. Interlocking Device for Controllers; Edward H. Dewson, Edgewood Park, Pa. App. filed June 9, 1903. Where the "running" and "braking" controllers are separate, a connection is provided between them to operate the interlocking devices and which permits the controllers to be set at odd positions with respect to each other.

781,151. Street Railway Switch; Leon B. Murray, Williamstown, Mass. App. filed March 29, 1904. A locking device for the free end of the switch tongue, consisting of a gravity pin adapted to engage the bed-plate when moved to operative position.

781,268. Underground or Conduit System for Electric Railways; William Cope, Birmingham, England. App. filed May 24, 1904. Details.

781,316. Guard and Finder for Trolley Poles; William P. Underhill, Brooklyn, N. Y. App. filed May 21, 1904. Comprises means for securing the head to the upper end of the trolley pole, and means on which the wheel and finders are journaled.

781,359. Trolley; Leonard O. Pullen, Augusta, Me. App. filed March 26, 1904. A pawl and ratchet arrangement controls the pole when it leaves the wire.

781,390. Fender Support; Peter Best, Elizabeth, N. J. App. filed Feb. 26, 1904. Provides a support that is adjustable vertically to raise and lower the end of the fender from or to the rail, and one in which there is also a tilting mechanism, so that the angle of the fender can be altered at will.

781,404. Trolley Pole Support; Thomas J. Cope, Philadelphia, Pa. App. filed Oct. 29, 1904. Details.

781,431. Electric Railway System; Frank E. Kinsman, Plainfield, N. J. App. filed Dec. 8, 1903. For purposes of safety the track rail furthest removed from the third-rail conductor, is the only one that carries the return current, the other track rail being divided up into disconnected insulated sections.

781,623. Railway Switch; Wilber K. Smith, Denver, Col. App. filed April 28, 1904. A boxing arranged between the track rails and having a slot through its top, a rod arranged in the boxing and having connection with the switch-tongue, a plate mounted to slide on the boxing and having connection with said rod and divergent ribs on opposite sides of said sliding plate, the edges of the plate being sharpened.

PERSONAL MENTION

MR. L. S. WELLS has been appointed electrical superintendent of the Long Island Railroad by Mr. W. F. Potter, who succeeded the late Mr. Baldwin as president of the company.

MR. PERCY CLIFF, formerly master mechanic of the Washington, Alexandria & Mount Vernon Electric Railway Company, of Washington, D. C., has been appointed assistant superintendent of the company. Mr. Edward Groves will succeed Mr. Cliff as master mechanic.

MAYOR TOM L. JOHNSON, of Cleveland, who has been seriously ill with grip and who was threatened with pneumonia, has been unable personally to observe the results of the three-cent fare zone plan of operation which was experimented with by the Cleveland Electric Railway at his instigation.

MR. JOHN BLAIR MACAFEE has been elected general manager of the Pottstown & Reading Street Railway Company, of Pottstown, Pa. This company has recently leased the Pottstown Passenger Railway Company, which it is now operating. Arrangements have been perfected and franchises procured for the building of about 30 miles of additional road this spring. Work will be begun as soon as the frost is out of the ground. Mr. John P. Pope, of Mr. MacAfee's staff, has been made acting superintendent of the company.

MR. ROBERT T. GUNN has resigned as general superintendent of the Norfolk Railway & Light Company, of Norfolk, Va., to become general manager of the Lexington Railway Company, of Lexington, Ky., with which he formerly was connected. At Lexington Mr. Gunn will succeed Mr. T. J. Fitzgerald, who has accepted the position of first assistant to the vice-president of the Cincinnati Traction Company. Mr. Gunn, as general manager of the Lexington Street Railway Company, will be in control of all the public utilities of that city, which are under one management.