THE STREET RAILWAY JOURNAL

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Cincinnati Street Railways.

Our readers are already familiar in a general way with the transit facilities of this progressive city. All the leading systems of traction are employed, including electric traction by the single and double trolley, with motors of all the leading types; cable traction, both by the grip and incline plane systems, animal traction, for which both horses and mules are employed. Electricity, however, is taking the lead, and soon the horse and mule will retire from the street railway field. Not only is rapid progress being made in the development of transit facilities, but it is interesting to note that nearly all the work on various lines is being done by home talent and labor.

In our January, 1891, issue we gave a brief description of the Hunt Street power station, then being built. We now take pleasure in illustrating the same, and describing its equipment. The engraving (Fig. 1) on this page presents a very good idea of the exterior of the station. Fig. 2 on the following page is a view of the interior of the engine and generator room, while Fig. 3 shows to the reader the appearance of the boiler room.

The engine room of the power station is 200 x 60 ft.; boiler room 200 x 40 ft. The steam equipment consists of three 1,000 H. P. Babcock & Wilcox boilers and four engines. Three of the engines are of the Corliss type, manufactured by Lane & Bodley, of Cincinnati, two of them have 28 x 60 ins. cylinders and one 24 x 60 ins. The fourth is a 100 H. P. engine manufactured by the Buckeye Engine Co., Salem, O. The present electric equipment consists of sixteen 80 H. P. T.-H. generators, of which thirteen are in daily service, to operate the three lines, known as the East End, Norwood and Avondale. The fly-wheels are twenty-two feet in diameter, with fifty inch faces, and the three belts, furnished by the Bradford Belting Co. of Cincinnati, O., are forty-eight inches wide, and lead to six foot receiving pulleys. This power house was the scene of the recent accident when one of the heavy fly-wheels burst, doing great damage to the building. This has since been repaired and a new fly-wheel manufactured by the Walker Manufacturing Co. of Cleveland, O., substituted. The Hoppes feed water heater is used.

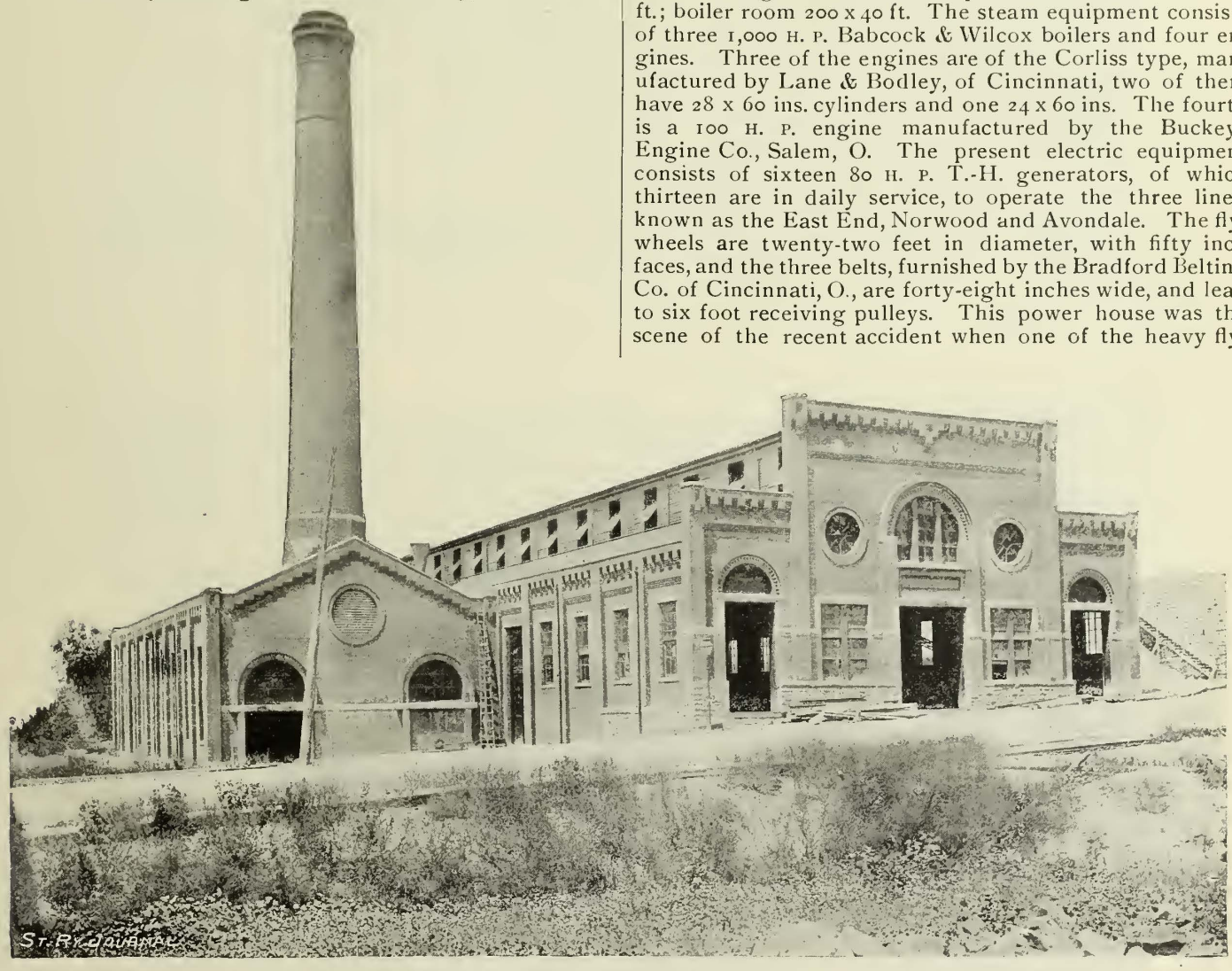


FIG. 1.—EXTERIOR OF HUNT STREET STATION—CINCINNATI STREET RAILWAY CO.

One of the most interesting sections of the city to a street railway manager is the corner at Fifth and Walnut Streets, near Fountain Square, shown in Fig. 4. Here 300 cars per hour pass, including the cars of the Walnut Hills and Vine Street cable lines; East End, Avondale, Colerain Avenue, and Norwood and Eden Park electric lines, double trolley T.-H. system; Main Street electric, single trolley, Edison system; Cincinnati and

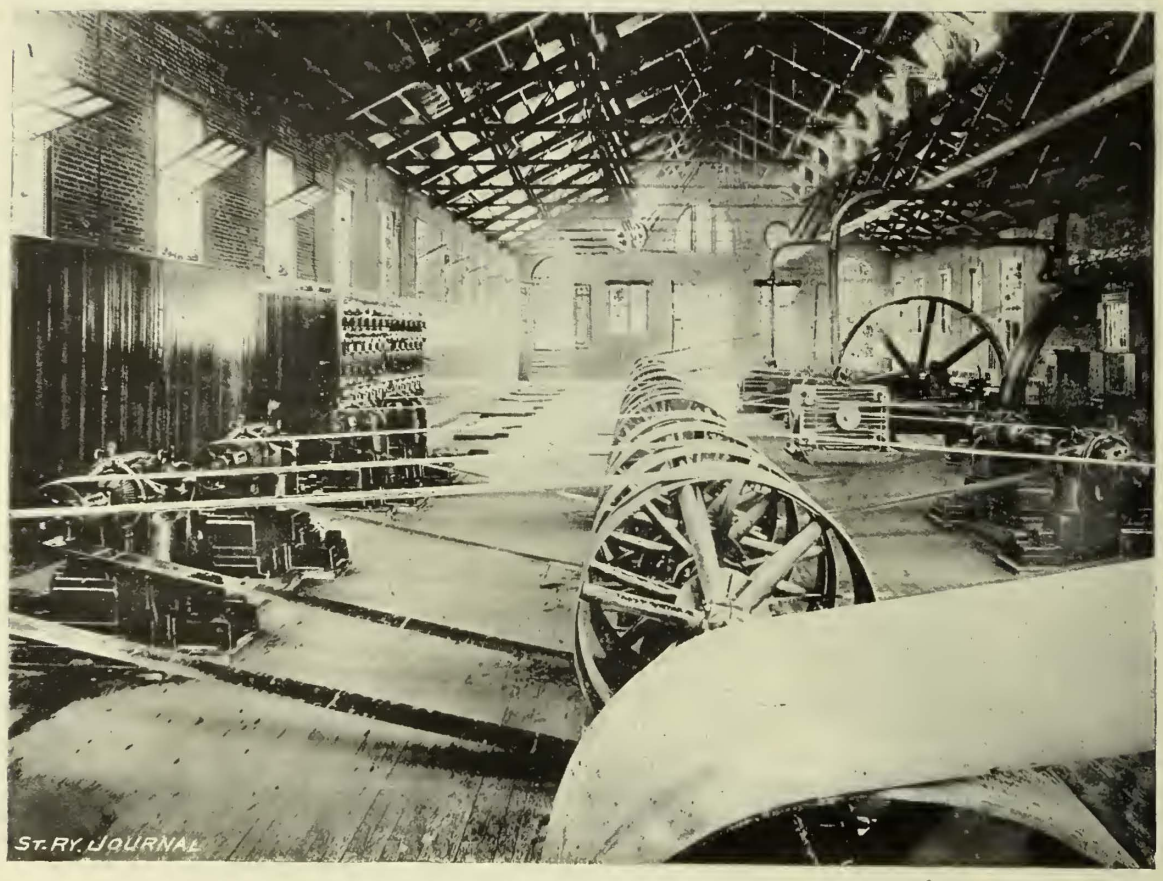


FIG. 2.—INTERIOR OF STATION—CINCINNATI STREET RAILWAY.

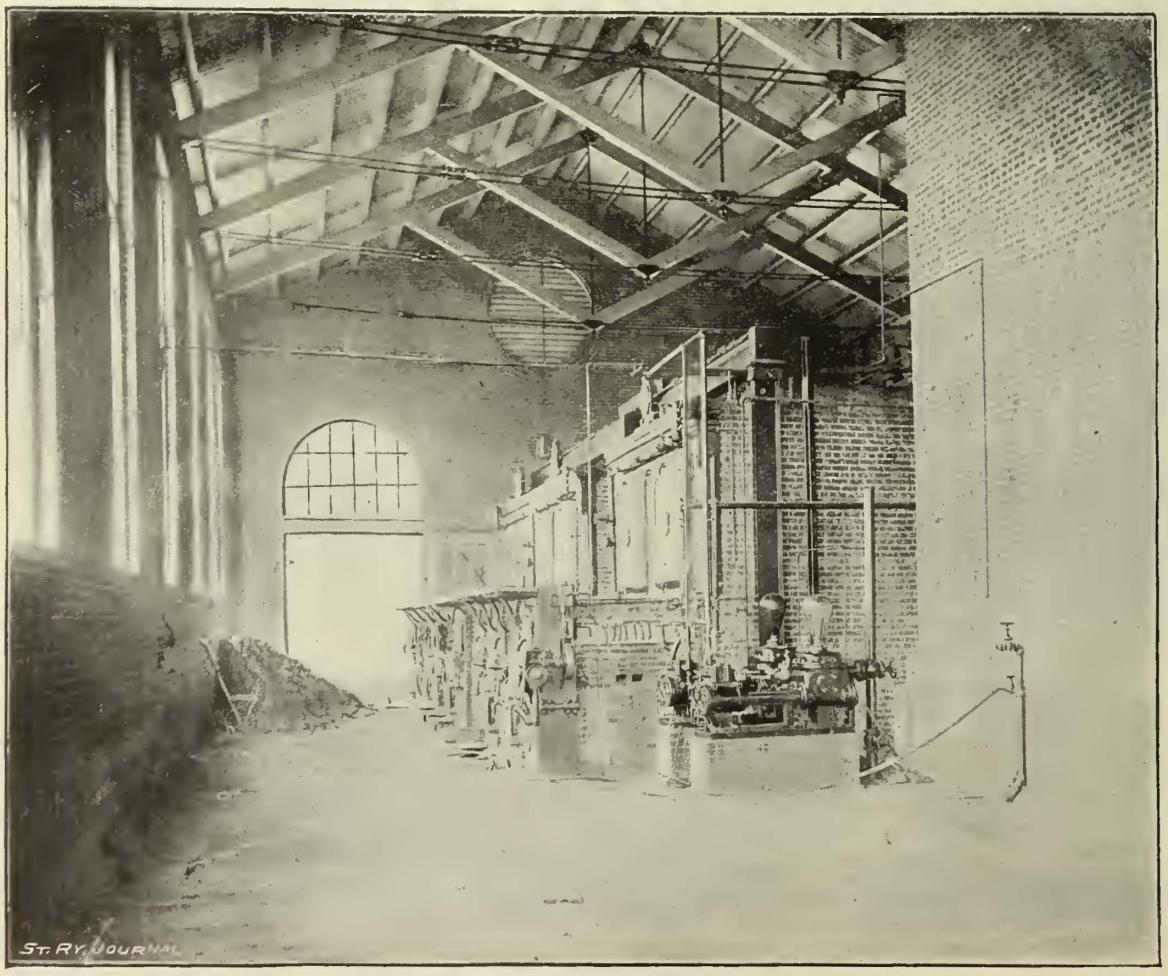


FIG. 3.—INTERIOR OF BOILER ROOM—CINCINNATI STREET RAILWAY.

South Covington electric double trolley, Short system, and the horse cars of the John Street, Fifth, Sixth and Seventh Streets, Clark Street, Farmount and Newport divisions.

That portion of single track on Walnut Street in front of the Apollo Building, where the offices of the Cincinnati Street Railway Co. are located, as shown in the engraving, probably does service to as diversified a traffic as can be found anywhere. It is constructed for a cable line, but, in addition to the cable cars, over it pass the cars of three horse lines and two electrical lines, one operated by the single trolley and the other by a double trolley. For these two lines the wires are arranged so that the single conductor is placed between the other two.

Fig. 5 illustrates a double trolley electric car ascending the Mt. Adams & Eden Park Incline, on board the platform of one of the incline cars. By this means the electric cars operate over different sections of track located in the business portions of the city and on the heights.

Fig. 6 illustrates the foot of the Cincinnati Incline Plane, and shows an electric car just boarding the incline platform. An interesting fact in connection with this arrangement is, that the approach of the electric line to the foot of the incline is upon a grade, for a short distance, of thirteen per cent. A full description of the different Cincinnati inclines having been given in previous numbers of the STREET RAILWAY JOURNAL, we omit further notes in this connection.

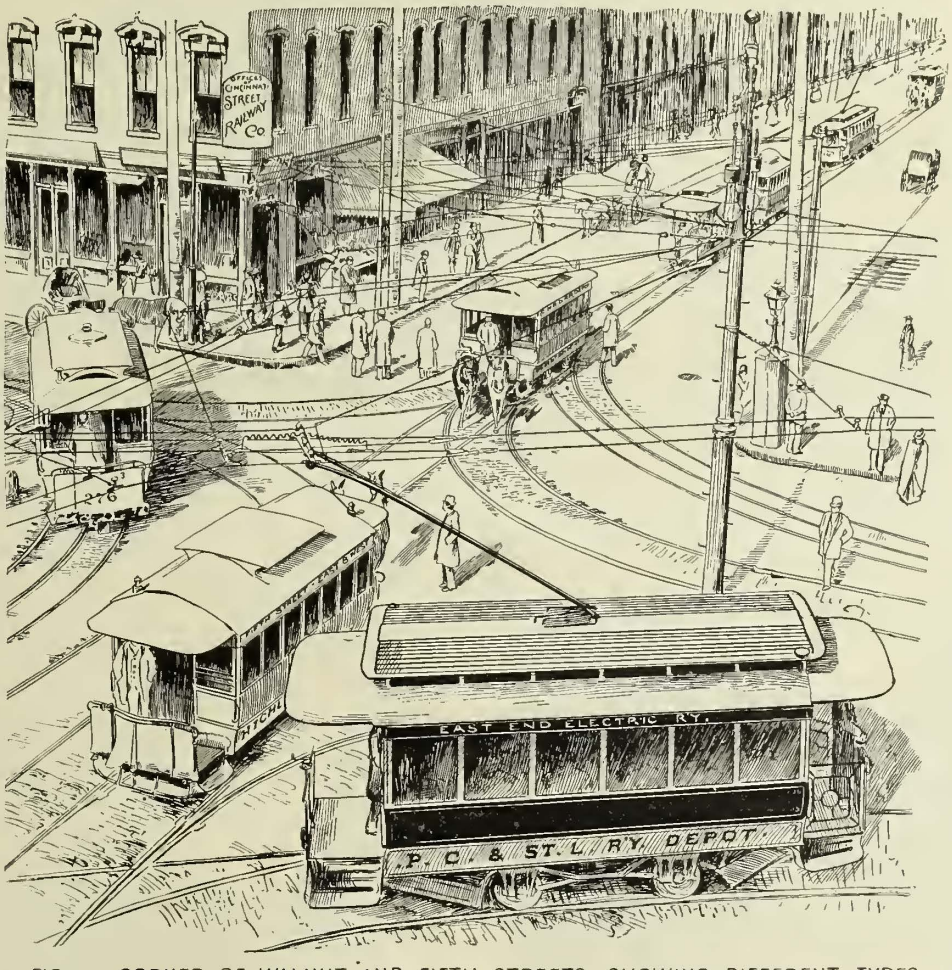


FIG. 4.—CORNER OF WALNUT AND FIFTH STREETS, SHOWING DIFFERENT TYPES OF STREET CARS.

A FOUR wheel wagon for hauling street railway cable reels has been built for the Cleveland City Cable Ry. Co., of Clevelaud, O. The weight of the wagon empty is 9,000 lbs., and its guaranteed carrying capacity is 100,000 lbs. or fifty tons. The length of the bed between axles is thirteen and a half feet and is composed of four ten inch "I" beams hung under the axles. The side beams are drawn in at the front so that the front wheels can have room to cut in when the front axle is turned. The bed is five feet two inches wide, covered with four inch oak plank.

The axles are five by six inches in diameter, of steel, and the two weigh 1,360 lbs. The wheels are forty-four inches in diameter, with nine inch tread, tire being one and one quarter inches thick. The front axle is shorter than the hind one, so that the wheels do not run in the same track, the object of which is to distribute the weight more evenly over the surface of the street to avoid cutting through pavements. The wagon can be hauled by team, traction engine or capstan, as may be desired. This wagon, which is considered to be the heaviest one ever built was supplied by the Miller-Knobeck Wagon Co., of South Bend, Ind.

The New Broadway Cable Cars.

The John Stephenson Co., Ltd., report that the Broadway, New York, cable cars will have a length of body of twenty-one feet, and length over all of thirty feet. A four wheel truck, having a nine foot wheel base, will be used. All will be box cars, and the seats will run lengthwise of the car, and will be covered with Wilton carpet. The interior will be finished in white ash, and the ceilings will have panels of birdseye maple. There will be nine high windows on each side. The cars will probably be painted with body of cadmium.

Rope Driving for Cable Roads.

Rope driving has been in use for years for the transmission of power, but until a comparatively recent date it had not been brought into use to take the place of gear driving. The system, we believe, was revived by Comb, Barber & Comb, eminent machine makers of Belfast, Ireland. Several small installations were put down by that firm in the northern part of Ireland not many years ago. From there it was introduced into Dundee by William Bamber, cotton spinner. It was soon afterwards adopted by other firms, and quickly became a very popular system for the transmission of power in England, and for the last ten years, it is said, hardly any other method has been applied for use in English cotton mills. Not only is this the case, but an extra number of conversions from gear driving have taken place. One of the largest rope drives in England, at Darwen, in the India Mills, furnishes a striking example of such a conversion. These mills containing 85,000 spindles, are run by an engine of 2,000 indicated H.P. A thirty foot fly-wheel carrying thirty Lambeth cotton ropes one and three-fourths inches in diameter, with a rope speed of 5,100 per minute, transmits the power noted. The weight of the fly-wheel is upwards of sixty-five tons.

Until within a very few years in the power stations of the cable roads in the United States the power was transmitted from the engine to the large drum by spur gears, and on the large drum shaft was the initial drum, carrying the steel cable, but the continual noise and vibration even with the adoption of wooden teeth, made a power station in a thickly settled part of a city not a very desirable neighbor.

Belts could not be introduced to advantage on account of the low speed and small driving wheels, and would be extremely expensive ; the width of belt required to transmit the desired power, traveling at the slow rate

that is necessary under these circumstances, would be out of all reason, and doubtless would be a cause of more or less uncertainty. For these reasons cotton ropes have been introduced very extensively to take the place of gear driving. In the new systems of cable roads, by the introduction of rope driving, we find on the crank shaft of the engine a small balance wheel, where, under the old system of spur gearing, a very heavy one was necessary, and the saving in this item and gears alone almost pays for the ropes, while the latter give practically as positive a drive as the gears. Another point in the favor of ropes is that they furnish an elastic medium between the driver and the cable shaft drum, and take easily any sudden changes of loads. Again, while with gearing there is no warning before a complete stoppage takes place, with rope driving there is a warning by the fraying of the rope. Never, it is said, in the history of rope driving, in what is called the English system, has any accident happened where one of these ropes broke and became entangled in the others.

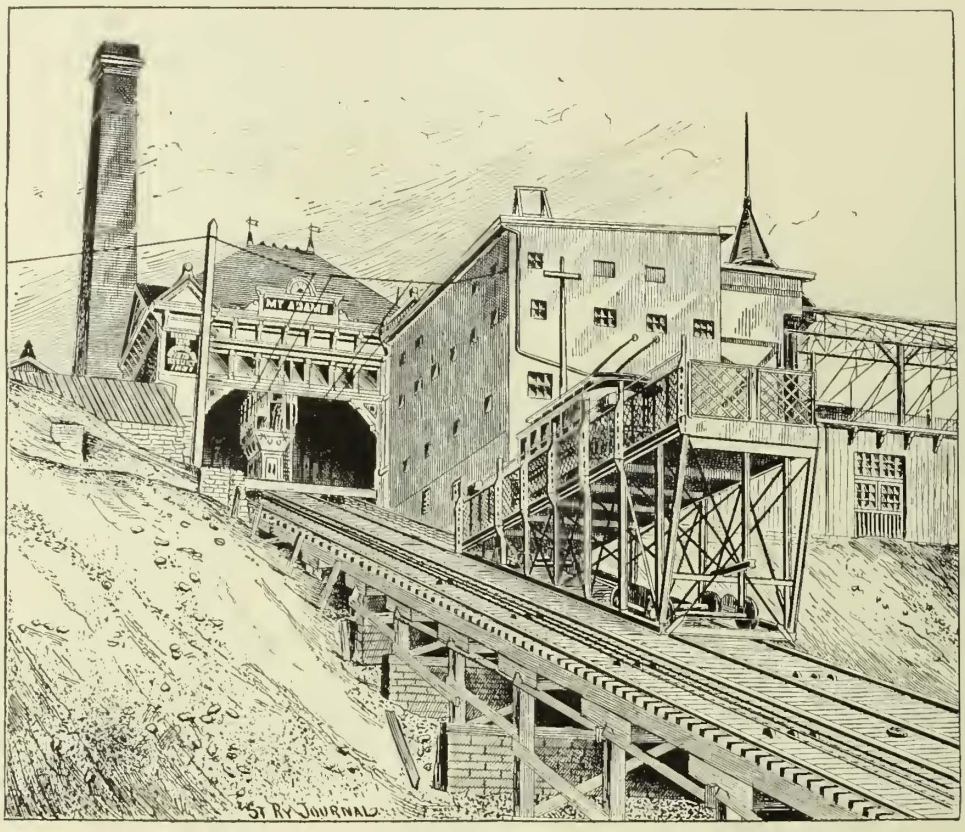


FIG. 5.—CAR ON INCLINE—MT. ADAMS & EDEN PARK RAILWAY.

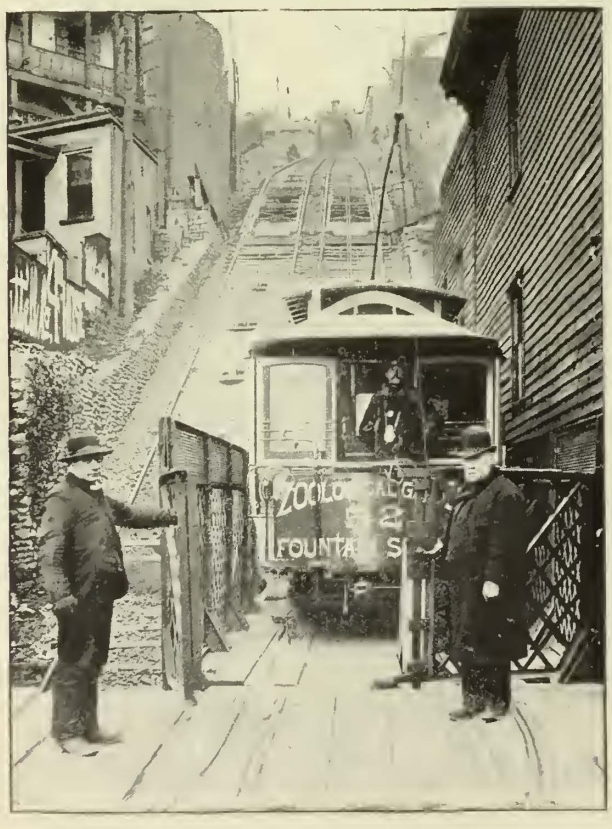
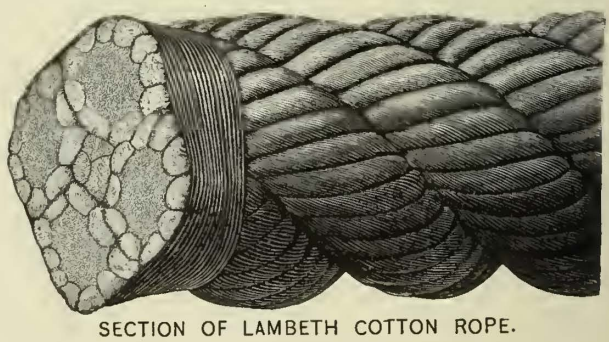


FIG. 6.—CAR AT FOOT OF INCLINE—CINCINNATI INCLINE PLANE.

Although each rope runs independently it is not necessary that all the ropes on one pulley should have just the same tension, but it is of great importance that the slack side should be on top, and that the ropes should be short enough not to bring the slack side in contact with the tight. The durability of ropes when properly stretched and spliced has not yet been ascertained, but, judging from power transmitted by ropes in some of the largest textile mills in Europe and this country, taking into consideration the speed and power transmitted, there is no reason why cotton ropes for the main driving of a cable road should not last many years. The ropes should be looked after and carefully treated, as one would treat leather belts under similar conditions.

A section of the Lambeth cotton rope is well illustrated in the accompanying cut. This rope is designed upon strict scientific principles, with due regard to the requirements of the purpose for which it is intended. These purposes demand tensional strength, elasticity and flexibility, the combination insuring durability. From some recent tests made with this rope, it was shown that a rope one and a half inches in diameter broke clear of its fastenings with a weight of 9,722 lbs. A rope of the same diameter, with a strain of 2,000 lbs., stretched five and a half per cent.

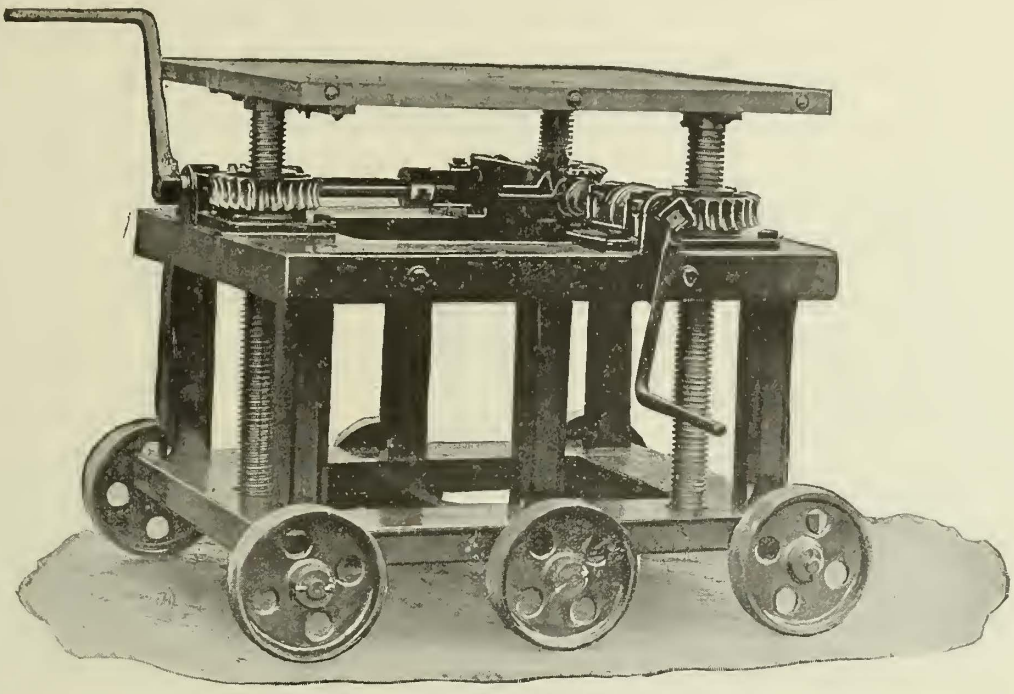


SECTION OF LAMBETH COTTON ROPE.

and when this load was removed the rope returned to its original length, showing an element of elasticity of great advantage in rope transmission. This rope, in practice, at a speed of 4,000 ft. per minute, transmits twenty-two H. P. and has a strain upon it, which can be easily figured, of only 182 lbs. With this margin of safety no appreciable stretch can take place. This particular rope is used in many of the cable plants in this country, among the number being those at Providence, Third Avenue of New York, Baltimore, West Chicago, Denver and Salt Lake City. Arthur A. Bingham, 186 Devonshire Street, Boston, Mass., is the sole agent in this country for the Lambeth cotton ropes and to him we are indebted for some of the foregoing facts.

Motor Dismounting Table.

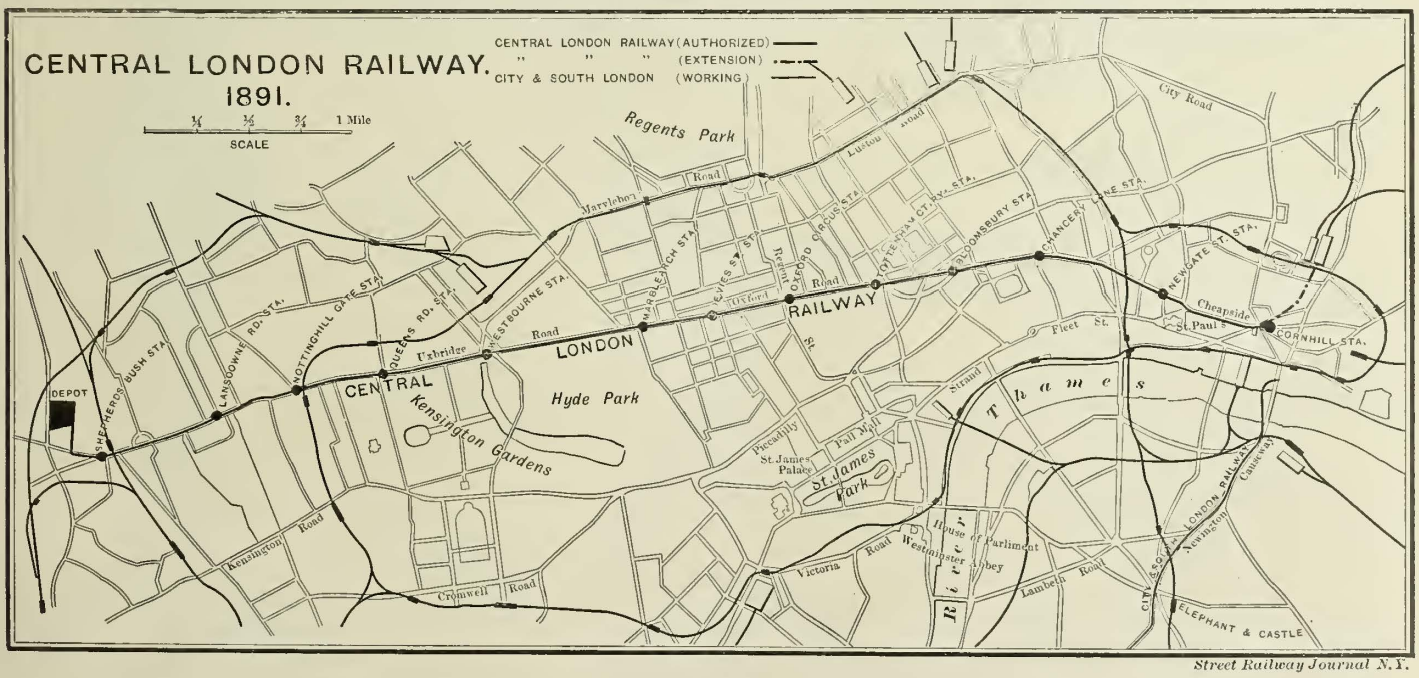
A new labor saving machine for the use of street railways in mounting and dismounting railway motors is being manufactured by the Edison General Electric Co. The device, which is illustrated on this page consists of a table and strong frame mounted on wheels. The table can be raised or lowered by means of worm and wheel gear, which is arranged underneath it and is operated from crank handles, that can be placed on three sides of the frame. The table is put into the car pit and run below the car and is then raised by means of the crank handles, until it takes the weight of the motor. The fittings are then unshipped and the table and motor lowered clear of the wheels, when it can be run under a crane and the motor removed, or a second table carrying a new motor can be run in position for remounting on the truck. Two men can in this manner handle motors with ease, and, furthermore, the method of removing the motors from underneath is much quicker than removing the car body from the truck. Tables can be made of any widths to suit special car pits, and, if desired, can be arranged to run upon rails. The following are the particulars of tables already constructed: Wheel base, 4×4 ft.; size of table, 36×42 ins.; least height of table from floor, three feet two inches; greatest height of table from floor, six feet two inches; weight of frame and table complete, 1,270 lbs.



EDISON MOTOR DISMOUNTING TABLE.

Underground Electric Railways for London.

The operation of the City & South London Electric Railway in London has been in many respects so successful that several new projects, similar in character, have been formed. The Londoners have great faith in underground roads, especially when electricity is employed as motive power. At the next session Parliament will be called upon to legisiate on four underground electric railway schemes. They are: 1. A railway to be called the Great Northern & City Electric Railway, which is intended to commence by a junction with the Finsbury Park and Canonbury branch of the Great Northern, passing underground and terminating in Finsbury Pavement. 2. A railway to be named the Waterloo & City Electric Railway, running underground and passing beneath the bed of the Thames from Waterloo station to the Mansion House. 3. An underground railway commencing in the vicinity of New Street, Upper Baker Street, and passing via Langham Place, the Quadrant, by the County Fire Office in Regent Street to Waterloo. 4. An extension of the City & South London Railway from the City Road to Islington.



Street Railway Journal N.Y.

sponding periods twelve months ago. In view of providing for a further increase, the directors of the company have instructed Messrs. Mather & Platt to design and construct another locomotive of considerably greater power and speed than the present locomotives. Owing to the exigencies of the traffic and the rolling stock being in consequence considerably heavier than was originally anticipated, and for which the present locomotives were not designed, they have been required to do far more work than that for which the makers constructed them, although some of them have run over 20,000 miles with the unexpected load without repairs of any nature whatever being required. Many of the delays which have occurred from time to time, may be attributed to the overloading of the locomotives.

SCENE ON OTTAWA STREET RAILWAY.

At the general meeting of the company, held February 2, the chairman stated that the great fault of the line was the want of traffic and of sufficient receipts. The present receipts per train mile are 2s. 1½d., and expenses per train mile have been only 1s. 7¾d. The success of the motive power can be determined from the fact that the last figure is 1s. 1¼d. less than the expense of an ordinary English steam railway.

Snow Fighting in Ottawa, Ont.

The problem of keeping a railway in operation during snow storms is one of especial interest to managers of electric roads, in places where a heavy fall of snow is likely to occur at almost any time during the winter season.

The arrangements and facilities of the Ottawa Electric Railway Co., for battling with and removing the heavy snow falls are of the most complete character, and one of the most satisfactory features of the company's system consists in the fact that the streets are left in excellent condition. Sleighing is better than upon the other streets of the city. This continued success in the face of frequent and long continued snow storms has been most carefully watched by other Canadian cities in about the same latitude.

The snow is swept from the tracks by an electric sweeper supplied by the Lewis & Fowler Manufacturing Co., of Brooklyn, N.Y. Two Walkaway snow plows drawn by horses follow the sweeper and remove the snow bodily to the curb; a third Walkaway shoves the snow between the double tracks to the unswept track which is immediately traversed by the electric sweeper and in turn is followed by the Walkaways. In this manner snow falls of nine to twelve inches have been handled in half a night throughout the whole length of the line. The snow is then shoveled into large boxes mounted on double runners and drawn away. A second Lewis & Fowler sweeper will be in readiness in a few days. Preparations for winter were commenced as early as August, and all the ordinary platform cars were in turn neatly, though temporarily, vestibuled to make them comfortable for the motormen who are suitably clad and provided with fur caps. Conductors are very neatly uniformed with special provision for the severe northern weather. Heavy duck canvas is fixed all around the trucks and almost reaches the rails. This prevents snow from reaching the motors and contributes to the comfort of the car. Special track sweepers and brooms are used on each car. The successful and profitable operation of a winter electric railway service has been so convincingly demonstrated that the influence upon other Canadian cities will, no doubt, be immediately felt Much of the success of the road, especially under the severe conditions of the present winter, is due to the efforts of the superintendent, Mr. J. E. Hutcheson, a former employe of the Canadian Pacific Railway. The excellent construction of the Westinghouse motors has contributed to no small extent to the regularity and success of the service.

Multiple Distributing Station Electric Railway.

At the Coney Island end of the Brooklyn & Coney Island Electric Railway a half mile of track has been equipped to test the electric railway system of the American Engineering Co. of New York. This system is introduced with the idea of obviating the necessity of overhead wires and the trolley. A test of the system was recently made, and the trial was extremely successful. Whether the multiplication of electro-magnets rendered necessary by the construction will interfere with the continued operation is a question which can be answered only when a considerable length of road is in operation. The characteristic features are shown in the accompanying illustrations.

FIG. 1.—MAGNET BOX, MULTIPLE DISTRIBUTING ELECTRIC SYSTEM.

In this system a wooden trench for receiving the transmitting main is located in the centre of the track. On the cappings are located every twelve feet iron blocks, of very solid construction, which serve as contact plates or terminal heads. These latter project above the pavement about three-quarters of an inch, the edges being beveled. Under the car, as Fig. 2 shows, is located a metallic brush long enough to extend from one plate to another. Each head is connected to a wire running to its own automatic switch in a distributing station, located in the centre of each block. The car is started by throwing the

current by means of a switch operated by hand into one or more of the heads. The connection is then so arranged that each head is automatically connected with the main as the car is passing over it, and the only portion of the line alive is the head directly under the car at any time. The distributing boxes which are located about every 400 ft., may be arranged in the hollow part of a lamp-post, making such a construction as shown in Fig. 2. All feeders and mains are carried in the trench with the wires that are laid from the heads. At each junction box or elbow, where the wires from the heads go to the distributing station a tap is taken from the main feeder and run to a binding post on each switch. An armature, part of each cut-out or switch, by an up and down movement cuts in and out the main line with the head connected to that armature by being actuated by a magnet.

It is absolutely impossible, it is claimed, that the main line should be thrown into any of the heads without the magnet of the cut-out being first made active and drawing up the armature. In order to draw up this armature it is necessary to send down through the magnet from the head a current which will be sufficient to draw up the armature and throw it into contact with the main line. By no other means can this armature be drawn up.

Should the car be derailed the car can be started again after it is on the track, by the motorman who can go to the distributing box and raise the armature of the electro-magnet corresponding to the head on which the car is located.

The operation of the car on the experimental line at Coney Island is a severe test, inasmuch as the road has six curves, one of forty foot radius, several grades, switches and crossovers. The officers of the road are C. C. Bowen, president, Henry Keim, vice-president, J. S. Zerbe, manager and Joseph Sachs, electrician.

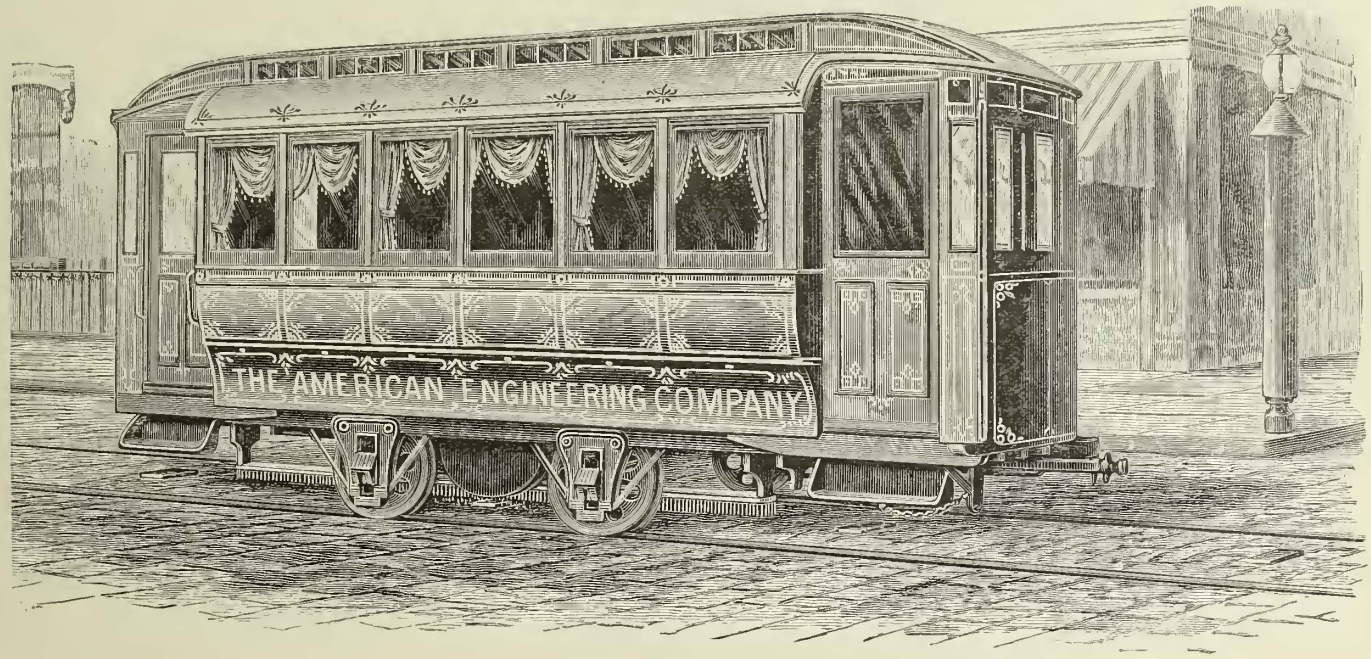


FIG. 2.—CAR OF MULTIPLE DISTRIBUTING RAILWAY SYSTEM.

A director of the Chicago City Railway Co. recently said: "The Illinois Central is asked to raise its tracks at Jackson Park so as to admit street car and other traffic into the grounds. The railroad company is asked to contribute $150,000 toward the expense of raising the tracks. As we have little to gain by this move we thought $150,000 too much, and three weeks ago I proposed and secured the passage of a resolution offering $50,000. The majority of directors were not in favor at first of offering anything at all, because they did not see how it could benefit our company, but I persuaded them to offer the $50,000. I do not know whether the Illinois Central people will accept this or not. As far as I know they have not as yet taken any action upon it."

Passenger Elevator and Viaduct at Weehawken.

An extensive elevator and viaduct designed for passenger traffic has recently been built by Otis Bros. & Co., of New York, at Weehawken, N. J. While not yet entirely completed, the structure is nearly finished and a very good idea can be obtained of its general arrangement and appearance. It will be ready for traffic by April next.

The viaduct is 873 ft. 6 ins. long from centre of east bend of the east tower to centre of end pin on west abutment and one end rests against the well known Palisades. Transportation from one end of the viaduct to the other will be by steam, and the structure is designed to carry in addition to its own weight a train consisting of a seventy-two ton Mogul locomotive followed by 2,000 lbs. per lineal foot on each track. In addition, sidewalks are provided for foot passengers and designed for a maximum live load of eighty pounds per square foot.

The base of the tower is near the ferry houses of the West Shore railroad where ferry boats connect with West Forty-second Street and Jay Street, New York City.

The tower is sixty feet in width at the base, and twenty-four feet at the level of the railroad; its extreme height from the top of the foundation to the ridge of the station roof on the top of the tower is 194 ft. 2 ins. Passengers are lifted a vertical height of 148 ft. Three elevator cars are provided, each 21 ft. 6 ins. × 12 ft. 6 ins., and each having a capacity for 130 persons standing. The elevators are designed for a speed of 400 ft. per minute, but it is not expected that their working speed will exceed one-half the above. At this rate the time of passage for the 148 ft. is forty-five seconds, and as the elevator cars are provided with wide doors at each end so that passengers can enter at one door while others are leaving by the other door, it is estimated that thirty seconds only will be required at either top or bottom for transferring passengers. The cars run independently of each other and all can ascend at the same time. The total weight for each car loaded is 34,000 lbs.

Hydraulic power is employed for operating the elevators. The hydraulic cylinders have an internal diameter of thirty-eight inches and an external diameter of forty-two inches, are thirty-five feet long, and are built in four sections. The water pressure employed is 185 lbs. per square inch. Water is delivered through a fifteen inch cast iron pipe from a pressure tank at the top of the tower, which has a capacity of 10,000 gals.

The element of safety is carefully attended to. Each car is provided with two governors of the usual pattern for controlling the speed. Each is automatically connected with grips which act on the sides of the hard

wood guides in which the car runs, and in case the speed increases above a certain amount will hold the car. Either governor will set the grips, and two are provided in case of the failure of one of them to act. The hoisting

VIEW LOOKING TOWARD PALISADES—WEEHAWKEN VIADUCT.

cables, of which there are six to each car, are connected with equalizing levers which force the grips into action in case of the breakage of any one of the cables. At a special test made at the shop of Otis Bros. & Co., a car was loaded with 34,000 lbs., equipped with the actual grips used on these elevators and was then cut loose from the ropes. The car passed a distance of only three and three-fourths inches before coming to rest. The power station, situated directly at the base of the tower, contains two Worthington compound condensing pumps, with eighteen inch stroke and sixteen and thirty inch diameter steam cylinders and twelve inch diameter water cylinders. The discharge tank at the base of the tower has a capacity for 10,000 gals.

The viaduct towers have a width of nineteen feet at the top and sixty feet at the bottom. The foot of each column rests upon a steel pedestal casting which in turn rests upon a wrought iron base plate two and one-fourth inches in thickness. One corner of each tower is anchored against moving while the other three are free to move both transversely and longitudinally upon the sliding surfaces between the cast pedestal and the wrought iron base, but are secured against lifting. Trusses for the span are placed nineteen feet between centres, and are twenty feet deep between centres of chords.

The piers for all the towers rest upon bed rock, with the exception of the two easterly towers. The foundations for the latter were secured by piles driven in the bed rock. The metal superstructure was manufactured and erected by the Passaic Rolling Mill Co. of Paterson, N. J. The designs for the structure were supplied by the engineer for Otis Bros. & Co., Mr. Thomas E. Brown, Jr, who designed the elevators for the Eiffel tower.

The Rochester Railways.

Improvements are being made on these lines so fast that one needs to visit the city two or three times a year to keep track of them. About forty-seven miles are now being operated by electric traction (Short system) and thirteen miles by horse power. The present car equipment consists of 100 vestibule motor cars, manufactured by the Gilbert Car Co., and sixty horse cars of Stephenson and Pullman make. The cars are mounted on the Bemis and Peckham trucks, and recently a truck equipped with the Peckham radial box has been added. The company are now building a private car, which will be equipped with the Short motors and a Dorner & Dutton brake. At the last monthly meeting of the executive committee of the Rochester Railway Co. it was decided to equip the remaining horse car lines for electric traction, and for this purpose the tracks will be relaid with fifty-two pound Johnson girder rails, on stone foundation with stone ballast, the same construction practically as was adopted on the other electric lines which have now been in service since October, 1890, and are standing up well under the traffic.

Thirty sixteen foot open platform cars will be ordered for the new electric lines, and some of the horse cars will be employed for trailers. The vestibule type of cars are not in high favor with the management, owing to their

VIEW FROM RIVER—WEEHAWKEN VIADUCT.

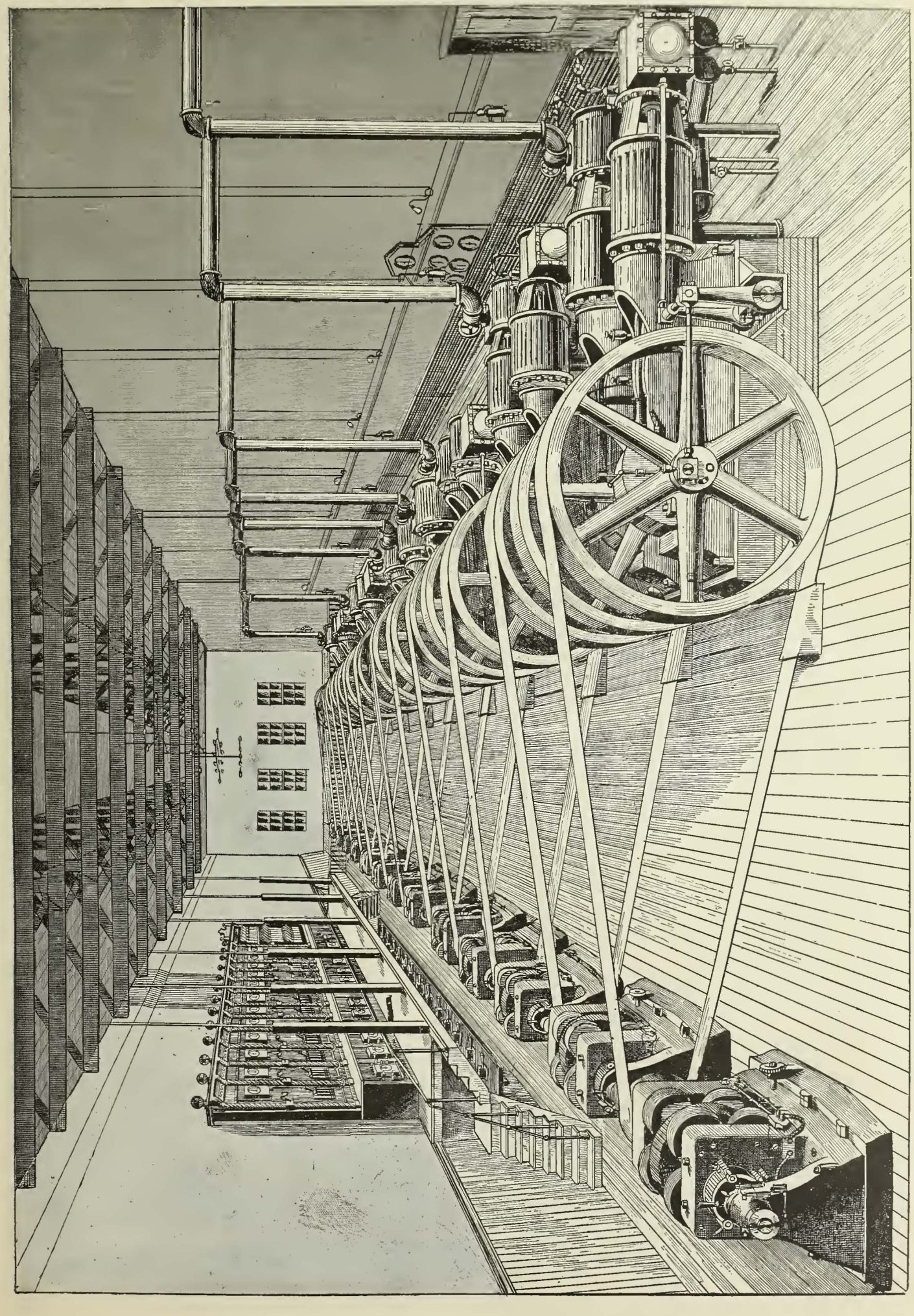


FIG. I.—INTERIOR OF POWER STATION, SHOWING ENGINES, GENERATORS AND SWITCHBOARD—ROCHESTER ELECTRIC RAILWAY—SHORT SYSTEM.

being heavy, liable to damage from collision with street vehicles and awkward for the reception and discharge of passengers. It is expected that the entire system will be operated electrically by early summer.

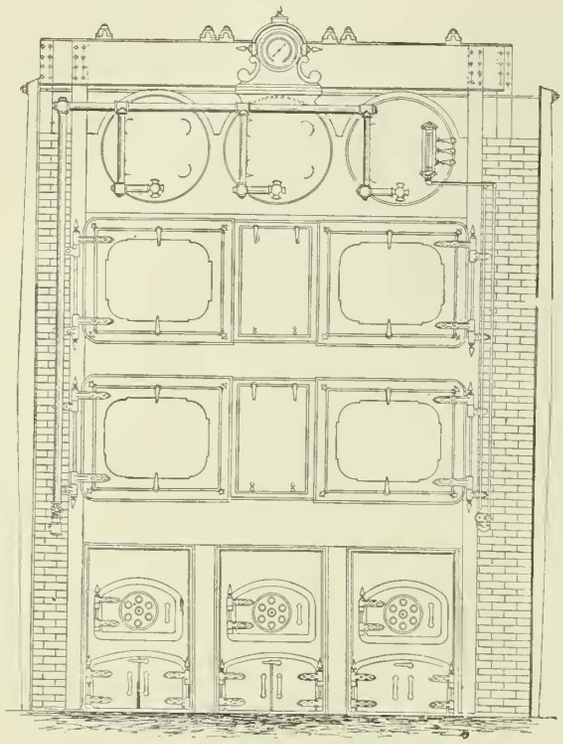


FIG. 2.—FRONT ELEVATION OF BABCOCK & WILCOX BOILER ROCHESTER ELECTRIC RAILWAY.

A number of changes have been made in the power plant since it was illustrated in our April, 1891, number, and we now take pleasure in presenting a second illustration showing the engine room as now equipped. The current is generated by ten 150,000 watts(Short)generators of the latest multipolar compound wound type which are giving the best of satisfaction and have the hearty endorsement of the management. The commutators of these machines consist of 200 segments, and are made hollow to provide for a free circulation of air. The journal bearings are of the self oiling ball type, and require filling only once in about six weeks. The terminals are all connected to cross bars, making it impossible for any of the inside connections to work loose. These machines have stood up well under the heavy service that has been imposed upon them during the severe winter weather, and have run cool under all conditions. Three more generators of the same type have been ordered, and will soon be installed.

The position of the switchboard has been changed and is now located on a gallery which has been provided for it. The board is a very handsome affair, the upper portion being of solid mahogany, divided into sections by carved pillars and having a shelf of highly polished marbleized slate. The gallery is seven feet wide, of nicely furnished hard wood and is placed about eight feet above the floor. The fuse board is of marbleized slate and is placed underneath the gallery as shown in the illustration. Through this all the feeders pass and underneath are lightning arresters of the Wason type. Ajax switches are employed both on the switchboard proper and the fuse board.

The present power equipment consists of eight engines all of which were manufactured by the Ball Engine Co., of Erie, Pa. Two of these engines are 300 H. P. four cylinder, trip'e expansion, three are 300 H. P. cross compounds and three are 150 H. P. single non-condensing. Each engine, with the exception of the three non-condensing, drives two generators to which they are coupled direct by sixteen inch, two-ply belts. From practical tests it is found that the entire plant is running on about twenty-two pounds of water per horse power.

Most of the belting was manufactured by the Jewell Belting Co. and is giving excellent service. A perforated belt, manufactured by Chas. A. Schieren & Co., has recently been put in service with the new equipment and also two or three of the Cross belts.

The original steam equipment consisted of four Heine safety, water tube boilers of 200 H. P each, fitted with the Gallagher furnaces. Last May a 416 H. P. Babcock & Wilcox boiler was added (Figs. 2 and 3.) It is proposed to make a competitive test to determine the relative merits of these two types of boilers, and when this is decided on additional equipment will be made.

The auxiliary steam equipment consists of two 1,000 H. P. Worthington independent condensers, which are located in the end of the engine room near the triple expansion engines. There are also three Worthington 500 H. P. feed pumps and three Berryman 500 H. P. feed water heaters. The building has recently been rewired, and is now lighted by ten light electroliers and rows of gooseneck side lights extending the entire length of the room.

The company have recently increased the pay of employes, and the following is the scale of prices for motor-drivers and conductors: Fourteen cents an hour for the first three months, sixteen cents an hour for the next nine months and eighteen cents an hour thereafter. A mutual benefit association has recently been formed among the employes.

A NEW storage battery, the invention of Professor Main, has recently been tried in Brooklyn for operating a storage battery car built by the Lewis & Fowler Manufacturing Co. Eighty-four cells are used, which are stored under the seats. A single multipolar motor is geared to both axles. It is claimed that the car, motor, battery and all will not weigh over 3,500 lbs., and that the cars will run twenty miles without the necessity of recharging the batteries.

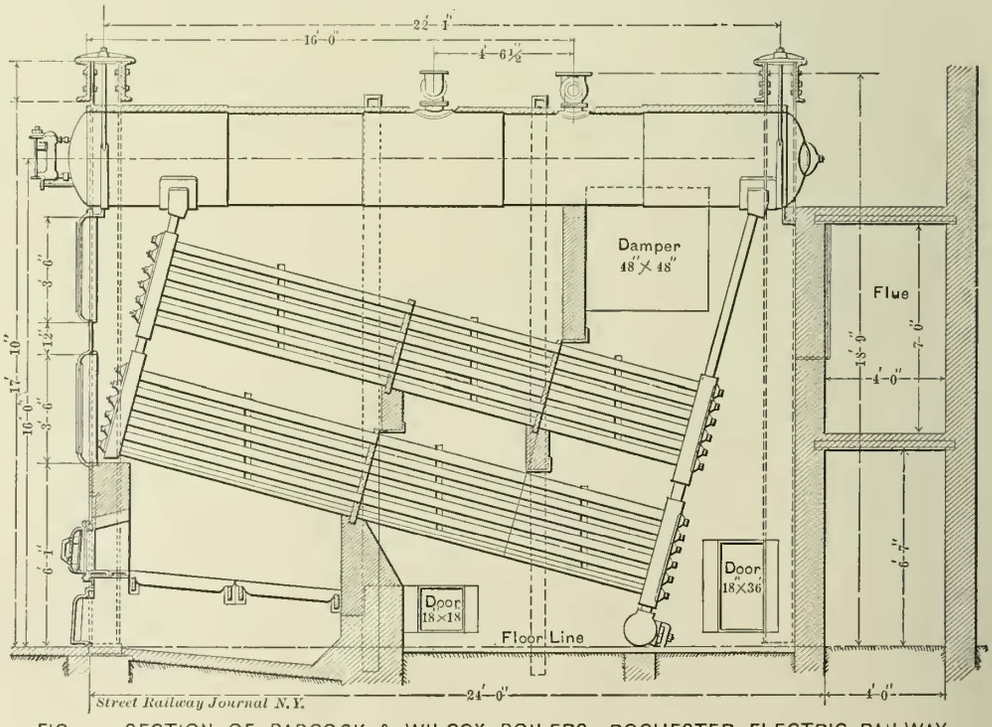


FIG. 3.—SECTION OF BABCOCK & WILCOX BOILERS—ROCHESTER ELECTRIC RAILWAY.

Love Underground Conduit Electric Railway in Chicago.

The Love Electric Traction Co. have just equipped, with their underground system, the Fullerton Avenue loop of the North Chicago Railway Co. This line, which is a little less than a mile and three-quarters in length, has four curves of different radii, two double and one single track crossings, and eleven switches. Every care has been exercised in the construction of the underground work, in order that a thorough test of the value of the system might be made.

The construction of the Love company is somewhat similar to the conduit used for cables. The yokes are twenty inches deep, and are placed four feet apart, a cast iron lining being used between the yokes. The conduit is fifteen inches deep and nine inches in width. A special feature in the construction is a rolled steel slot rail with depending flanges to carry off the surface water. The rail is fastened by means of a clamp having a lateral adjustment. By the removal of the clamp and rail, access may be had to the conduit at any point along the line. The track is laid with Johnson girder rail, weighing from seventy-eight to eighty-five pounds to the yard; on the curves a 100 lb. rail of the same manufacture is employed.

The electric circuit is entirely metallic. The two line wires, which are No. 000, B. & S. gauge, are held in the conduit by insulators in jaws. Contact with the wires is made by means of a four wheel trolley device, so arranged with springs, that it yields to every motion of the car above. Contact is made and broken by means of a lever similar to that employed on a cable car. Power will be furnished from the Lincoln Avenue cable station, where an Eddy generator and a McIntosh & Seymour engine are located.

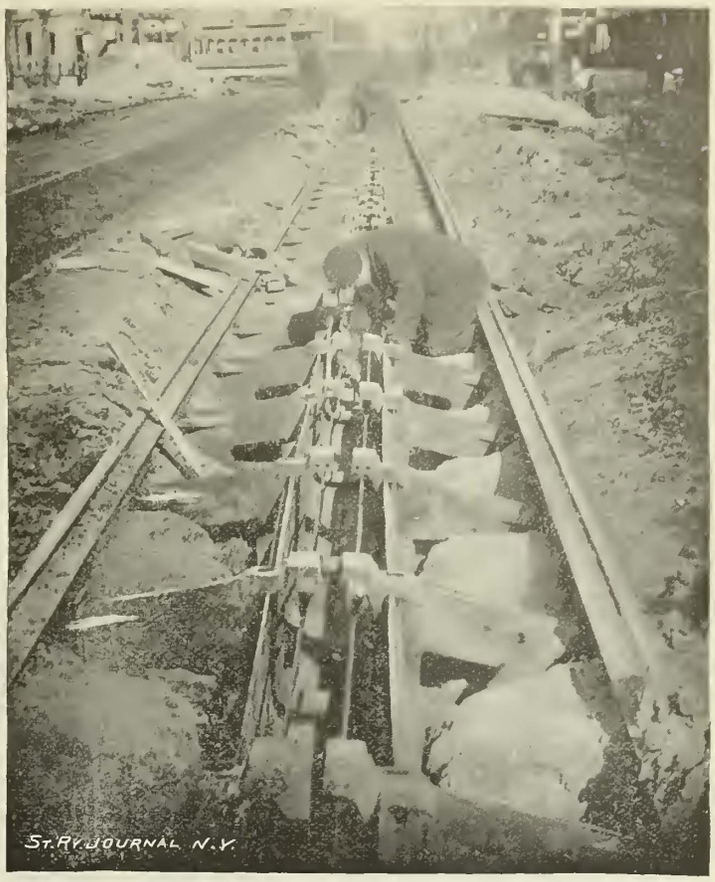


FIG. 1.—STREET SCENE—CHICAGO UNDERGROUND ELECTRIC SYSTEM.

FIG. 2.—STREET SCENE—CHICAGO UNDERGROUND ELECTRIC SYSTEM.

The cars to be used on the line were built by the Pullman company. Westinghouse electric motors and McGuire steel trucks will be used. The electrical construction work was done under the supervision of Professor Barrett, city electrician of Chicago, and the track construction was directed by the engineers of the North Chicago Railway Co.

The Rochester (N. Y.) Railroad Co. have decided to offer $1,000 in prizes to the conductors and motormen. $200 will be given to the conductor making the best record in neatness of personal appearance, good condition of car, courtesy to passengers, strict observance of rules, freedom of car from accidents, and prompt service. A similar first prize will be given to the motorman making the best record in a similar way, except that he will also be given credit for care of motors under his control. There will be second prizes of $150, third prizes of $100, and fourth prizes of $50, for each. The prizes will be awarded at the end of the year.

It is reported that it is the intention of the government to establish at the Exposition grounds a complete post office, equal in capacity to that required by a city of 200,000 or more inhabitants, and to operate it, not only during the Fair but for several months previous to the opening and after the closing. A government post office inspector is now on the grounds perfecting plans and estimates. It is believed, that the number of exhibitors will be between 150,000 and 175,000. To these mail will be delivered hourly.

Street Railways of Toledo, O.

Toledo is peculiarly fortunate in possessing enterprising street railway companies. To them the city owes not a little of its prosperity. They have provided the most approved rapid transit facilities, and they are constantly increasing the efficiency of their service. They have been greatly instrumental in making Toledo a desirable place of residence. The two companies cover the city thoroughly, so that it is possible to reach almost any point within the municipal limits quickly and conveniently. They provide rapid transit; one of them at the present time operates all its cars by electricity; the other company employs the same power for running the great majority of the cars. Within a year horses will be abandoned on all the lines.

FIG. 1.—MEKARSKI COMPRESSED AIR MOTOR CAR—TOLEDO CONSOLIDATED STREET RAILWAY CO.

TOLEDO ELECTRIC STREET RAILWAY COMPANY.

The Toledo Electric Street Railway Co. occupy sixteen and a half miles of street, on which are laid twenty-four and a half miles of track.

The power house of the company is located on Water Street between Oak and Adams Streets. The building has a frontage of 100 ft. and it is 165 ft. in depth. It is one story in height, but it is an exceedingly high building for a one story structure. When one visits the plant he is struck first of all by the wisdom of the owners in providing an abundance of room for increase in capacity.

Twice the amount of power now generated may be required on the road, and the necessary machinery can be located in the building, with an abundance of room to spare. So many electrical plants have outgrown their quarters, especially those intended for lighting, that this characteristic of the Toledo company's station may be referred to as an especially commendable feature.

The boiler room is located in the front of the building. The boilers now installed are four in number; they are tubular, and were manufactured by Stewart & Sons of Worcester, Mass. Two, and at times three, boilers generate the steam for the engines.

Coal is now used as fuel. Natural gas was used until November 1, when the general supply was not sufficient to meet the requirements of consumers in the city. Manufacturers and owners of steam plants were forced to use other fuel. About the first of April, when the demand from residences is much less, the company will resume the use of gas.

The power house was constructed with a view to securing solidity and freedom from vibration. The walls rest on 800 piles; 700 piles were driven in the space inclosed by the walls. All the machinery in the engine and generator room, that is, the engines, counter shafting and dynamos, rests on exceptionally massive masonry. The floor is covered with concrete to the depth of from one to four feet. The entire interior is perfectly free from moisture. The two engines were manufactured by C. & G. Cooper & Co., of Mount Vernon, O. They are of 450 and 500 H. P., but upon occasions they have developed 600 and 700 H. P. respectively. They are cross compound condensing. Water for condensing is secured from the Maumee River directly in front of the power house. The flywheel of the large engine weighs 55,000 lbs. and that of the smaller 42,000 lbs. Belts made by the Jewell Belting Co. are used throughout.

Eight generators supply the current. Six of these are Thomson-Houston machines of eighty H. P. each. The other two are Westinghouse four-pole machines of 200 H. P. each.

In operation the plant proves extremely economical. From six to eight men, including firemen, engineers and generator men, operate the plant for the entire twenty-four hours.

Until the recent fire, described in our last issue, which destroyed one of the car houses containing a considerable part of the equipment, the company operated forty-four Westinghouse single reduction motors of twenty H. P. each, six Thomson-Houston S. R. G. motors and ten double reduction Thomson-Houston motors of thirty H. P. each. Two special motors built by the company were also operated. The machines are somewhat different from the ordinary type. The fields are run in series, and, it is stated, excellent results both in speed and power have been obtained. Brill cars and trucks are used exclusively on the road.

The company has had two car houses. One of these has just been finished at the corner of Ontario and Galena

Streets. It has a frontage of 125 ft. and is 175 ft. in depth. It has ten tracks, and is provided with pits for the examination of motors. It is a well lighted and well arranged structure. The company's other car house on Canton Avenue corner of North Street, was recently burned.

Heating on some of the cars is effected by an electric heater constructed on the company's own design. It is extremely simple. Imagine a four-foot section of water spout constructed of zinc, and little need be added to the description. This cylinder is heated by passing a current of electricity through it. The bare metal is covered with asbestos cloth and then with canvas, and treated with a coat of shellac. Four of the heaters are placed in the car; they are hung just far enough below the seat so that passengers may rest their feet against them.

The officers of the company are David Robison, Jr., president; L. S. Baumgardner, vice-president and James J. Robison secretary and general manager.

TOLEDO CONSOLIDATED STREET RAILWAY CO.

The Consolidated Street Railway Co. of Toledo has an extensive system. Its twelve lines aggregate sixty-five miles, of which forty are operated by electricity at the present time; the remainder is traversed by horse cars. The company proposes to utilize electric motors on all its lines, and within the next year all the horses will be out of employment. It gives an admirable service. All the lines are now laid with heavy girder rails with the exception of fifteen miles on which a substantial steel tramway construction was built within the last four years. Seven-eighths of the lines are paved; indeed, thirteen miles of paving was done last year. During next year the company will build four miles of track in new territory, and will put in double tracks on several old lines.

The main station of the company is located at the corner of Water and Monroe Streets, fronting on the latter street. Its dimensions are 110×240 ft. The front part of the structure on the ground floor is used as a car shop. It is conveniently arranged with pits so that motors can be readily inspected. The repair shops are also located here. Directly overhead is the winding room, and excellent work in winding armatures and coils is done.

The power station is in the rear of the building. This portion of the building is entirely fireproof. The boiler room contains four Wharton-Harrison boilers, each of a capacity of 150 H. P. Crude oil is used as fuel. The Reed oil burner, furnished by the Standard Oil Co., is employed. Until within a short time natural gas was used; when the supply was cut off the resort to oil was made, and the change has proved so entirely successful that it is questionable if a return will be made to gas. The boilers are arranged for either kind of fuel. The oil is stored in a reservoir located on a dock in the rear of the building. It is brought to that point from the railroad yard in a small tank car which the company runs over its lines. The live steam purifier which is used is set below the water line of the boilers. It is of the type manufactured by Stilwell & Bierce, of Dayton, O. A Dean pump is used for forcing the water into the purifier and thence into the boilers.

On the same floor are located the engines, which are the Hamilton-Corliss, compound condensing, of 500 H. P. each. Water for condensing is taken from the river. In the same room is located the air compressor used in connection with the Mekarski compressed air motor shown in Fig. 2.

The generator room is directly above, the engines belting to a line shaft. The main belt, which is forty-eight inches in width, was made by Charles Munson & Co., of Chicago. Current is generated by two Edison machines of 250 H. P. capacity and five Thomson-Houston 80,000 watt machines.

The company are operating at the present time thirty-nine double reduction Thomson-Houston motors of fifteen H. P. each, and five Eickemeyer motor cars; four of these latter are double connected and the other is single connected. The capacity is thirty H. P. each. These motors, which were built by the Western Electric Co., of Chicago, are giving entire satisfaction. Six additional motors of this type will soon be put in operation. The electrical equipment of the road is working excellently and to the satisfaction of the residents of Toledo. There are several points in the road where, owing to the branching of several lines at one point, there has been some complicated construction, but all problems have been satisfactorily solved. The officers of the road are: Norman B. Ream, Chicago, president; Albion E. Lang, vice-president and general manager; William E. Hale, Chicago, treasurer; Charles L. Wight, secretary.

FIG. 2.—AIR COMPRESSOR—TOLEDO CONSOLIDATED STREET RAILWAY CO.

The Mekarski American compressed air motor car shown in Fig. 1, is in use on the road; it has been in operation a little over three months. It is giving satisfaction and as this is the first car of the kind built in this country, those interested are greatly encouraged by reason of the record that the car has made. It is twenty-two feet over all. The eight cylinders which contain the compressed air are located below the floor. They are made of steel plate three-eighths of an inch in thickness. The air pressure is 600 lbs. to the square inch. The compressed air engines are two in number, each of fifteen H. P. with cylinders 5 × 8 ins. The engines, with all their gearing, are encased in wrought iron with two doors opening on the side. The under frame of the car is of wrought iron or steel. On the front platform is placed a reservoir containing hot water, through which the air passes on its way to the motor cylinders. The reservoir is fitted with a valve, which regulates the air so that it can be used at any pressure desired. At the right hand of the driver is the ordinary lever for working the link motion. The brake is formed by two vertical cylinders placed on either side of the car between the wheels, a small pipe coming from the three way cock carries the compressed air under the piston for working the brake. The car will run between eight and nine miles without recharging, and is handled with ease and promptness, all the motion being under

perfect control, and requiring but a slight expenditure of physical force on the part of the driver. Its speed varies, at the will of the driver, from three to twenty-five miles per hour. It can be brought to a dead stop, it is claimed, in less than its own length.

Foreign Street Railway Notes.

By Our Special Correspondent.

THE ELECTRIC STREET RAILWAY IN HALLE, GERMANY.

The ancient city of Halle on the river Saale, is one of those German towns which, in consequence of its situation, large industries and trade, have become important railroad centres and has shown a rapid growth during the last twenty years.

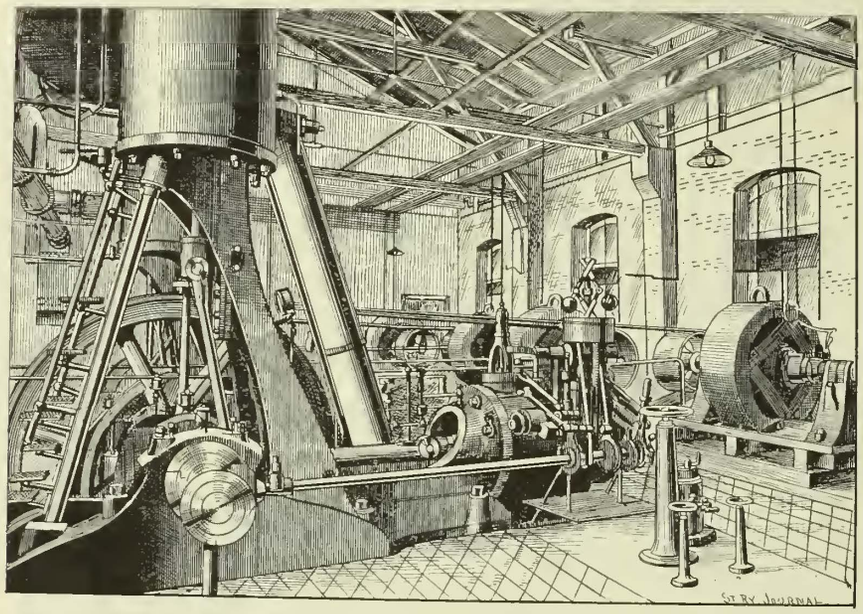


FIG. 1.—INTERIOR OF POWER STATION—HALLE ELECTRIC RAILWAY.

The intramural traffic of Halle has until recently been cared for by two street railways. The first of these was built in 1882 by a private corporation, and still employs horses as a motive power. The other, called the Halle City Railway was built by the municipality of Halle in 1888, and operated by a contractor who employed horses until a short time ago, when the road was leased to the General Electric Co., of Berlin. This company represent the Edison interests in Germany and have recently equipped the line with electric power.

The situation of Halle, is upon a number hills, so that there are on the line of the road a succession of grades, the greatest of which is about five per cent. The minimum curve radius is about forty feet. The line is single track 4.8 miles in length with turnouts at distances of about 1,500 ft. apart, and is shown in plan in Fig 3. The gauge is one metre or about thirty-nine inches.

The construction of the roadbed is shown in Fig. 2. Each of the four girders constituting the rail and guard has a weight of 23.14 lbs. per yard, and between each pair are cast iron blocks of forms shown in the engraving. The rails, blocks and tie bars are held by bolts and nuts. The total weight of the track, including the four girders, blocks, bolts and other parts is 119 lbs. per yard. The rails are laid on broken stone ballast mixed with sand and gravel.

The generating apparatus is installed in a building formerly used as a stable house, but which has been reconstructed for power station purposes. The steam generating plant consists of three Steinmüller water tube boilers, each having 1,301 sq. ft. of heating surface. Two of these are regularly employed for the operation of the road, the third being kept in reserve in case of the necessity of repairs to either of the other two. The steam is generated at a pressure of 150 lbs. The engines, which are of 200 H. P. each, are compound and three in number, two being sufficient for the needs of the railway, the third being kept as a reserve engine. The two cylinders of the engines are at right angles with each other, the high pressure cylinder being horizontal and the low pressure cylinder vertical. The former has 13.4 ins. diameter and 21.6 ins. stroke. The latter has a twenty inch diameter and 21.6 ins. stroke with working pressure of thirty pounds. The speed of the driving wheels is 180 revolutions per minute. Each engine is belted to two 60,000 watts multipolar generators. The engines were supplied by the Goerlitz Engine Construction Co., of Goerlitz, while the generators and all the electrical plant were furnished by the General Electric Co. The motors are of the Edison railway type. Fig. 1 shows the interior of the power station.

The rolling stock consists at present of twenty-five motor cars and twenty-five trail cars, each of the former being equipped with two fifteen H. P. double reduction Edison motors. The speed of the cars is limited by city ordinance to nine kilometres or 5.59 miles per hour, and they run during the busy portion of the day on a headway of six minutes. Each car is equipped with a sand box.

The zone or graduated system of fares, so common in European cities, has not been adopted on this road, but instead, the American system of a single fare for any distance traveled is in force. The fare charged is ten pfennigs or two and a half cents. Fare boxes are used.

The introduction of electricity on this road has resulted in the discharge of the former stock of 115 horses and has been followed with very gratifying results. The citizens of Halle seem to be very well pleased with the new motive power, and the traffic on the Halle city railway is reported to have increased twenty per cent. since the introduction of electricity. The road has attracted very much interest in Germany and has already been visited by a large number of engineers from different sections of the country.

THE ANNUAL REPORT OF THE BERLIN STREET RAILWAYS.

The report of the inspector of public works, etc., of the City of Berlin for the year 1890-91, gives the following facts: The street railways of Berlin are operated by three companies, the Great Berlin Horse Railway Co., the New Berlin Horse Railway Co., and the Berlin-Charlottenburg Horse Railway Co. Extensions have been made during the past year as follows: The Great Berlin Horse Railway Co., have built 5,905 ft. of single track and 10,498 ft. of double track. The New Berlin Horse Railway Co. have built 820 ft. of single track and 5,905 ft. of double track.

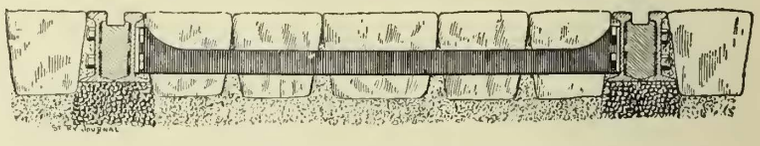


FIG. 2.—TRACK CONSTRUCTION—HALLE ELECTRIC RAILWAY.

According to their franchises the Berlin street railway companies are compelled: First, to pave within their rails and thirty nine inches on both sides of the track with a good quality of paving stones and ballast, as ordered by the inspector appointed by the municipality. Second, to pay a certain fixed annual rental, depending on the area of streets occupied by their tracks. Third, to make an additional payment to the muncipality of a percentage of their gross receipts.

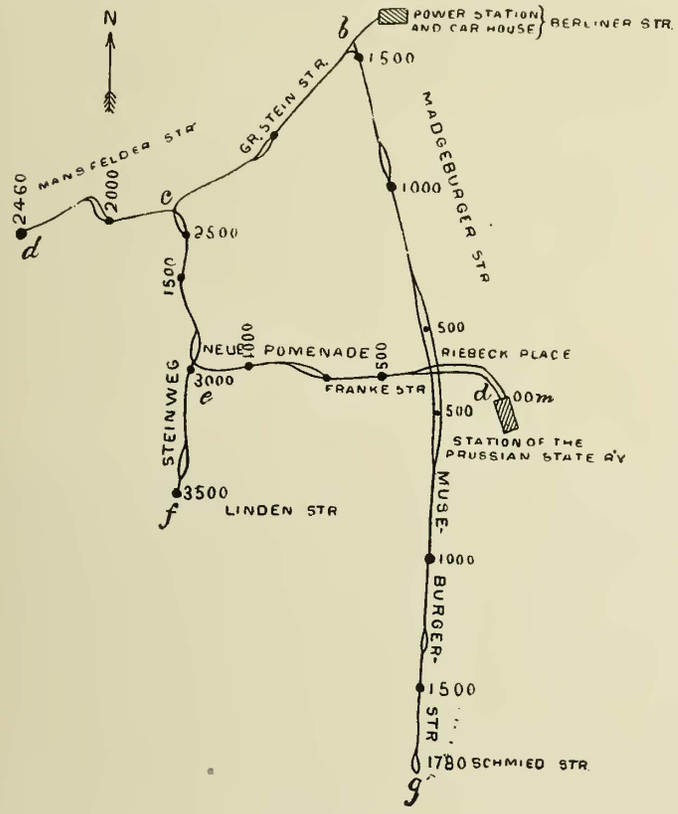
The following table shows the amounts which have been paid by the street railway companies during the years 1889 and 1890 in fulfilling these conditions:

	To Fulfill Conditions 1 and 2.		To Fulfill Condition 3.	
	1889	1890	1889	1890
Gt. Berlin Horse Railway.....	219,625	219,784	985,645	1,045,537
New " " "	42,693	42,693	62,553	65,000
BerlinCharlottenburg Horse Ry	17,623	17,623	12,342	20,187

All the amounts are expressed in marks, the German standard coin. The mark is equal to about twenty-four cents in American currency.

OMNIBUS LINES IN BERLIN.

When the street railway system of Berlin was extended recently so as to give easy communication between most of the suburbs and the centre of the city, the future of



The numerals indicate distance in metres from the Prussian State Railway station.

FIG 3.—ROUTE OF HALLE ELECTRIC RAILWAY.

the old omnibuses seemed to be very hopeless. These vehicles were of very old type, badly constructed within and without, and were not furnished with brakes or many conveniences.

New omnibuses have been built, however, which are comfortable, clean and attractive looking, to take the place of these old vehicles, and these are doing quite an extensive business. Fares are cheap, and a considerable speed is maintained. The employes are better paid than formerly, and are consequently of a better class and more polite. During the past winter a number of omnibuses have been lighted by electric light supplied by accumulators carried on the vehicles. Next summer a number of open buses will be put into service. The following table shows the number of passengers carried by the two prinpal omnibus lines of Berlin, the General Berlin Omnibus Co. and the New Berlin Omnibus Co. during 1889 and 1890 :

	1889	1890
General Berlin Omnibus Co.	17,319,814,	19,193,192.
New Berlin Omnibus Co.	6,841,292,	6,928,488.

The figures for 1891 have not yet been published, but they are known to indicate a large increase in the traffic over last year.

STEAM STREET RAILWAYS IN ITALY.

Many suburban street railway lines which in America would employ cable electric or horse power, are in Italy operated by steam dummies and this motive power in the past has been very popular. The lines referred to are entirely distinct from the main trunk transportation lines, and the tracks are laid in the highways, but at the side of the street. The entire length of road in Italy operated in this way is 1,578 miles. Of this, eighty-seven miles are laid on streets belonging to the govenment, 1,070 on streets belonging to provincial administrations, 221 mileson streets belonging to local administrations, and 200 on ground belonging to the street railway companies.

The average speed on these street railways is eleven and one-half miles per hour and nearly all are laid standard gauge. The rolling stock is light to avoid heavy roadbed construction and the cars resemble the American long double truck street cars more than the ordinary European railway coach. Trains of three or four cars are usually run. Owing to the comparatively high speed maintained there would seem to be considerable danger of collisions with carriages and other users of the street, but as the railways are not allowed to extend into the more populated parts of the cities accidents are not as frequent as they otherwise might be.

COMPRESSED AIR IN PARIS.

The Compagnie Générale des Omnibus of Paris have decided upon the adoption of compressed air as a motive power upon the lines between Paris, St. Cloud, Sevres and Versailles. Locomotives will be used, each of which will be capable of hauling a train of three cars, each car to have a seating capacity of fifty passengers. The construction of the power station will be commenced at once, and it is expected that the system will be in operation by the end of the present year. There are now in operation by compressed air two railway lines in France, one at Nantes, the other connecting Paris, Vincennes and Ville Evrard. There is also another in Switzerland, at Berne.

Proposed Underground Electric Railway for Berlin.

The population of Berlin has greatly increased within the last decade, and the present means of urban communication have become entirely inadequate. To provide for the increasing demand for transportation facilities the General Electrical Co. of the city propose to build a system of underground electric railways similar to the City & South London road. It is proposed to divide the city into quadrants by two main lines crossing each other at right angles, which are to be connected by an inner circle line built at an average distance of two kilometres from the centre crossing point. Ultimately, it is stated, an outer circle line with a radius of four kilometres will be constructed. It is proposed to build the main north and south line first ; this to be followed by the east and west line. It is intended to run trains at three-minute intervals at a speed of fifteen miles an hour. The trains will consist of three coaches and an electric locomotive. The rolling stock will be similar to that used on the London road. The cost of the first line will be about $3,000,000.

Fare Receipts as Tickets.

A novel method of interesting the public in taking care of fare receipts has been adopted by the Belt Electric Line Co. of Lexington, Ky. This company issue packages of printed receipts to their conductors, each conductor being obliged to give a receipt to each passenger for fare collected. The receipts are numbered, and at the end of the week seven numbers are selected by lot, one representing a ticket issued on each of the preceding days, and the holder of each receipt thus numbered can, upon presentation of the same within a week at the offices of the company, obtain a package of twenty-four tickets therefor.

This method is said to be extremely popular with the public and results in the preservation by passengers and others of the receipts which were before thrown away.

The Practical Side of the Electric Railway.

Chapter II.—Continued.—Overhead Construction.

By J. H. Bickford.

City councils generally require railway companies to use something that will present a better appearance than the ordinary cedar or chestnut pole. A straight painted pole is not so unsightly. No doubt the objection to the overhead system in many cities has arisen from the fact that members of the council have visited places where crooked and unsightly poles had been erected. They instinctively concluded that such were not suitable ornaments for their own streets, and forthwith declined to grant franchises.

It seems to me that a railway company contemplating the using of electricity as a motive power cannot afford to employ ordinary wood poles for its overhead wires. Because the telegraph and telephone companies use them there is no excuse for railway companies to do likewise. The latter have twice the number of poles in the street, ought to make their lines as unobjectionable as possible, therefore, and for their own good they should use the best material obtainable

It may be said that cedar or chestnut poles cost less, and it is not businesslike to invest more money in a line than is necessary. This is sound reasoning if we do not care for appearance, but appearance goes a great way in these days. A little finish that is pleasing to the eye is just as necessary in line construction as trimmings are to a building. Both are in the street, and are before the eyes of the public continually. Build your line, then, in harmony with its surroundings and please the public ; and when you do this you benefit yourself.

I would recommend the use of steel poles only because of their looks, and when wooden ones will not be allowed. The leakage in wet weather must necessarily be greater, and the double insulation required entails an additional expense for maintenance. The first cost is many times that of wooden poles if the proper size is used, and where heavy lines of feeders are run, both the positive and negative being on the same poles, the liability of short circuits is increased. A hard pine pole similar to

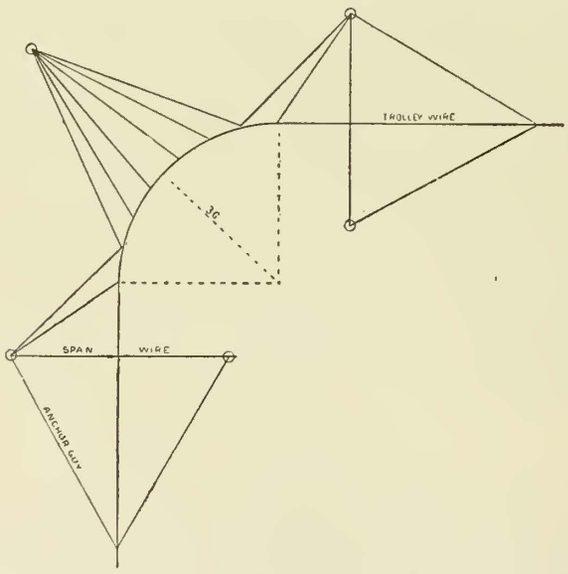


FIG 1.

that described above is not objectionable, and, everything considered, is the best pole to use.

We have said that our lines were constructed badly at first, and that we have found it necessary to reconstruct them since. Some reasons for poor construction have been given, but one other thing is worthy of notice. The contractor or constructor is not wholly to blame for the present reconstruction. The railway companies have been negligent in the maintenance of their lines ; some of them took it for granted that when the line was once built that it would last forever without attention But they became convinced after awhile this was not the case, and they began to make repairs. But alas ! such repairs ; they made no repairs at all, as a matter of fact ; they merely patched up here and there, and they kept on patching until the original garment was all covered with patches ; then when the line would not stand up any longer they concluded they must rebuild.

The line should be inspected every day just as regularly as the motors or any part of the equipment. All

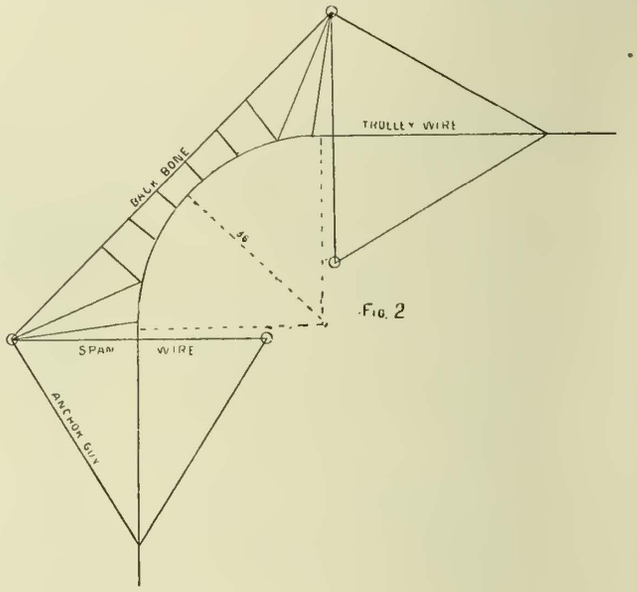


FIG. 2.

parts found defective should be immediately removed and something of a more substantial character should be substituted. If your insulators, pull-offs or any other device gives you trouble continually, do not buy more of the same kinds and thus keep putting up defective apparatus. Look about for something better, and if you cannot find it in the market, make it ; you should not be content till you have eliminated all faults. There is a great amount of line material on the market to-day that is not suitable for the purpose; the reason is easy to find; much of it was designed by persons who have had no experience whatever in the business, and who offer their wares for what there is in them and without particular regard for their stability. Buy nothing but the best, as none of it is too good.

Let us look for a moment at the most important points of construction which have not already been considered.

The height of the trolley wire is an important feature. It should be as high as practicable, for two reasons : There is less wear and tear to both line and trolley wheel, and the appearance of the line is enhanced. The trolley wire itself should be at least nineteen feet above track. In order to obtain this height the span wires should be placed about twenty-one feet high in streets of an ordinary width ; this will allow for the insulator and sag. As to the best kind of material for span wires there is great difference of opinion. I prefer, however, stranded wire as it will not break as easily as a solid wire. Seven strands of No. 12 steel galvanized wire formed into a cable make a strong and durable support ; its life will be prolonged by coating it with some good weatherproof paint. This can be easily done from the tower wagon after the wire is in position.

A special grade of silicon bronze wire has been used for span wires with good success, and is preferable in cities where the atmosphere is filled with sulphurous gases.

Guard wires are a necessity ; they protect the railway lines as much as they do the telephone and telegraph wires. The grounding of the trolley wire by low tension wires falling upon it is of frequent occurrence on roads not provided with guard wires. Electric light wires by this means are prevented from coming in contact with the trolley wire, thus lessening the liability of trouble to

dynamos and possible shocks to the employes. In sleety weather guard wires are of immense benefit if properly put up. They should be placed on a separate span wire at least twenty-four inches above trolley wires, and should have no connection, insulated or otherwise, whatever with the latter. Nothing short of a No. 9 or No. 10 steel galvanized wire should be used, and each wire should be placed about fifteen inches laterally from the trolley wire. I presume, a silicon bronze wire of the size mentioned would be preferable in smoky cities. In all cases a wire that has great tensile strength should be used, and it should not be capable of stretching to any extent.

The clip or fastening between the trolley wire and insulator on the span wire should be such that the bottom of the wire is left perfectly smooth for the trolley wheel to pass. If it projects below the wire even one hundredth of an inch, the wheel will partially break contact with the wire and an arc will be drawn, burning the trolley wire in all cases where it is the positive side of circuit. There are several clips on the market which obviate this trouble.

Feeders are an important factor. Few roads have enough of them. Our motors are designed for 500 volts and we should be able to get this amount on all parts of the line. Instead, we generally find anywhere from fifteen to thirty per cent. drop. This is decidedly wrong. In lighting circuits the drop is very slight at any point, the distributing wires being of ample capacity. Why should not this be the case with our railway circuits? If we expect our cars to run properly our potential must be constant and the same at all points on the line.

There are various ways of constructing right angle curves. Many are built on four poles and I have seen some built on three poles. In order that the shape of a curve may be preserved, I believe it should be supported by five poles, the apex pole being extra heavy and arranged to take the greater proportion of strain, similar to the annexed diagram, Fig. 1. Of course, circumstances sometimes interfere and a variation from this form must be made; but in nine cases out of every ten this plan can be followed. It will be noticed that the strains are direct and that each pull-off wire has a rigid terminal fastening to the pole, whereas, with a so-called backbone curve the trolley wire is fastened by pull-off wires to a second wire which runs from pole to pole and which is more or less yielding, making it almost impossible to hold the trolley wire in position over the track. See Fig. 2. The pull-off brackets should be so placed that the angle of pull will be sufficiently large to allow the trolley wheel to pass without striking the goosenecks. Undoubtedly the proper way to build a curve is first to get its radius and then to lay it out on paper, locating the poles and arranging the pull-offs to the best advantage. In other words a little engineering can be worked in here quite well. Generally there is too much guess work about line construction.

I find in practice that the trolley wire on curves if placed about eight inches from the centre of track toward inside rail, will receive less wear than if placed at any other point. Anchors should be placed each side of each curve as shown in diagrams.

As stated above, I believe the small silicon bronze trolley wire is preferable to larger sizes of copper wire and am led to this belief by experience.

Roads of any size should have the overhead system set apart into divisions, one entirely independent from another and each controllable from the power station by separate feeders. The current may then be turned on or off at will on any division of the road without interfering with any other section. System is everything and it should find place in the overhead wires. Provide for emergencies, such as fires, or the falling of the trolley and then the public will not become "shocked," and will have no chance to cast reflections on the already heavily laden "trolley system."

One word about switches or frogs. I have never yet seen a perfectly satisfactory one. But as they are very necessary adjuncts to the line, we must give them consideration. Undoubtedly the best form is what is termed the pan switch made right and left handed. It is usually made of cast composition metal and can be put up without cutting the trolley wire, which is a decided advantage. The tongues or approaches to the pan should be not less than twenty inches long, making a gradual slope for trolley wheel. If possible all switches should be placed directly under a span wire to insure them from tipping.

There are many switches with movable parts, but generally they are unsatisfactory, especially in winter, as snow and sleet prevent them from working properly, or the parts are broken by constant passage of the trolley. The simplest form will give the best satisfaction as a general rule. On short roads with many turn-outs two trolley wires running parallel the entire length will give better satisfaction than switches. Switches to work well should be placed from six to ten feet back of the heel of the track switch. This arrangement gives the car a chance to pull the trolley to one side enabling it to take the switch easily.

The parts of the overhead system are numerous, that space will not permit of considering them all; in fact, it has been possible to refer only to the most important points. I will only add that managers of roads should take into consideration the construction above the streets and make all repairs in the most thorough manner, so that the depreciation will be light. Close inspection and the best material are the most essential features. Do not wait for trouble to happen, but rather anticipate it and thus prevent disaster.

The Rights of Private Ownership in Railways.

By J. M. Batchelor.

The late Justice Bradley of the United States Supreme Court, in a decision rendered a little over a year ago, said: "When a railroad company is chartered it is for the purpose of performing a duty which belongs to the state itself."

Article 14, section 1, of the Constitution of the United States reads: "No state shall make or enforce any law which shall abridge the privileges or immunities of citizens of the United States, nor shall any state deprive any person of life, liberty or property without due process of law, nor deny to any person within its jurisdiction the equal protection of the laws."

The remark of Justice Bradley be it noticed, is an opinion only, and not the law itself. While it does not conflict with the Constitution, as above quoted, it is somewhat ambiguous; and in consequence has led many well meaning people astray. For the inference has been drawn from it that a railway charter when obtained is a tacit admission that the company obtaining it has more or less surrendered to the state its rights of private property control. This erroneous assumption is at the base of the anti-railway legislative movement which has so widely prevailed throughout the different states during recent years, and which has done so much harm to needed railway construction, and prevented many railways obtaining sufficient money to carry on their legitimate affairs. It has largely contributed to the distrust in the minds of investors regarding the desirability of investing in any form of securities where the right of property control is questioned by the legislatures of the various states; and this injury to the placing of railway securities has extended itself to Europe, where foreign investors have had their doubts of rectitude in our legislative assemblies, and in consequence they think it advisable to largely let "Americans" alone until the times get more settled.

In several decisions of the United States Supreme Court which relate to the issue before us, while the verdict was in favor of the rights of private property control, the decisions were handed down with a majority of one, gentlemen like the justice quoted, handing in a minority opinion, taking exception to the court's decision. For some reason not fully explained, these exceptions have been more widely accepted as the correct interpretations of the law than the decisions themselves. But this may be explained as the effect of the widespread desire of the masses to subject all large business organizations to the

people's control regardless of the private rights of property. However this may be, there are many reasons for saying that the encouragement of this view is highly likely to result in serious mischief, for by and by it may become difficult to draw the line where this ignoring of the rights of property may well cease. Either a man has a right to the control of his own property under the law or he has not. The Constitution distinctly says he has such a right, and further, that no state can deprive him of it. Then the issue before us rests upon what a franchise is, or what a contract obtained from a state and named a charter, really means.

The origin of the corporation laws of all states is confined to the idea of dividing a firm into parts whereby a larger number of capitalists can be brought into union than is possible under the ordinary ways of firms, and to limit the liability of such partners to the amount of money they invest in the business. Since then many laws have been made governing corporations in different businesses, railways having special laws of their own which only in part apply to other businesses; but in no case do these special laws interfere with the original purpose of corporation organization, as described, except in those states where the anti-railway movement of recent years we have alluded to, has taken attitude which directly conflicts with the Constitution as above quoted. But aside from the constitutionality of these adverse laws, there is an element of grave injustice in their breach of contract with all railway corporations which invested their money under laws giving the property owner the right of property control. To make a law destroying the rights of private control after a corporation has invested its money with the understanding that it would not be deprived of its property rights is virtually confiscation, a matter which the constitution expressly prohibits. While such a law against property rights might properly have due weight in warning all organizations who organize after the law was made, or with those organizations whose term of existence has expired and require a renewal, the application of it to past organizations contains an element of gross injustice, an injustice which must reflect upon the honest intent of the people of the United States.

The error at the root of these adverse laws is in the erroneous supposition that the state gives away something when it gives a franchise; but this view is not sustained by the facts; the state gives nothing in exchange for the registering of a corporation's papers; it merely records the papers, like a mortgage; the state never yields up any exclusive territory to a railway company; should another railway company come along the next day, and file corporation papers to do precisely the same business and in the same place, the state would grant another franchise, except that the privilege asked for come under the head of a nuisance or interfered with the criminal laws in some way. With street railways, too many railways on one street might be deemed a nuisance, and because of this and other objections appertaining to laws entirely outside of the corporation laws, such as the public health, etc., a special permit, in the shape of a legislative law, is required to get permission to build such railways. But this permit must not be confounded with the idea that the state has given anything away, for it has not. Except to the injury of existing property which the law is supposed to protect, another railway corporation could get a permit to build another railroad directly alongside of the first. This has been done repeatedly in different cities, and an instance of it may be seen in West Fourteenth Street, New York, which clearly shows that the state, in granting the first railway occupant of that street the privilege of constructing a railway, granted nothing which it would not grant to later comers.

In regard to a state or a city selling outright the privilege of constructing a railway in certain streets, that is another question, and not a part of the one before us. A bargain or a contract is one thing, and a breach of contract is another. Our purpose here is to show that a contract should not be broken when once made in compliance with the law. That a contract has been entered into by the state when it grants a charter, cannot be questioned; that contract is that the incorporators, so long as they comply with the law, shall be protected in their privileges; not from competition, but from any attempts to deprive them of their property, without due process of law.

Engineering, vs. Word Painting.

By Walter C. Kerr.

We hear much from time to time about "established practice," "consensus of opinion among leading engineers," "the results of broad investigation," etc., etc., all meaning something. But what? In the abstract these expressions may be credited with useful interpretations, but as commonly used they simply fill in where nothing more definite is at hand. When applied by way of argument, usually without backing or even illustration, they are an impediment to reason and contribute no facts. Their danger lies in their influence in diverting from facts and reasons which are specific, and the whitewash that they brush over definite circumstances and practical conditions needing consideration.

In engineering, whether of construction, purchase or advice, the most difficult part of a decision lies in the holding of one's mind to the conditions under which the decision must be made, the tendency being to judge what one would do were things slightly or wholly different. When one starts out to learn something, whether it be how to build, what to buy or how to remedy defect or trouble, he generally finds there is more knowledge at hand than he has any use for, and correspondingly little that he can make available.

Let us suppose that he is to erect a large power plant, and at once he has before him the several problems above referred to: How to build, what to buy and how to avoid the defects observed in other plants.

Generalities come in fast; A advises low steam pressures and B advises high; slow speed engines only are fit to use, while again, nothing but high speed will answer; the building must be large, substantial and put up for all time to come, or barely sufficient at the least expense to house the plant. Conservative advisers urge the use of nothing that has not been tried to a conclusion, while bolder voices impress the necessity of taking advantage of every latest improvement. And over all this is ladled the glib reference to "established practice," "consensus of opinion" etc., etc.

Let all this verbiage be cleaned out, and let word painting be relegated to the Seventeenth or some other back number century. Let merit, old or new stand for what it is worth in the service proposed, and let every consideration bear directly upon the purpose for which the enterprise in hand is created.

In illustration, and in keeping with the objects of the Street Railway Journal for which this is written, let us examine the power plant of an electric railway, or, that we may not occupy to much space, take the engine alone.

One may have a somewhat reasonable impression that in this day compound engines only are to be considered. Soon however, he hears that this is a serious matter, and is advised that compounding is not advantageous under varying loads; that unless condensers are used, compounds are even less economical than simple engines; that very high steam pressures are essential to their efficiency; that to be advantageous each engine must be designed especially for the particular load and steam pressure under which it must operate; and finally, that this represents the "consensus of opinion among leading engineers" on the lines of "established practice." All this seems very complicated, and shrouds the compound engine in a mantle of doubt not anticipated.

The limitations enumerated are to the intending purchaser bad enough in their way, but it is the "consensus of opinion" and the "broad investigation" that particularly stick in his crop. It is therefore refreshing to find that he has been treated to a bit of word painting as a finish to certain facts, which, like the fundamental im-

possibility of dividing the electric current in multiple arc, were facts once but are facts no longer. Any compound engine that ever was built will do good service under certain conditions. But invention is never content, and it now transpires that irrespective of conditions his varying loads can be economically handled at any steam pressure, not only condensing but non-condensing, and by engines not especially built for a fixed load or pressure ; all of which results have been created since the information he first received became "standard practice." He now begins to perceive that "consensus of opinion" has much less to do with making money by running street cars, than the engine that will do the business.

Then there is the old story of slow speed *vs.* high speed, the arguments over which have been worn down until they need more repair than the worst engine of either class. Slow speed came first—it usually does—and that higher speed should follow is neither chance nor design ; it is the inevitable result of requirements—specific requirements—and could no more be held back or permanently obstructed than can electric railway service. Its presence does not discredit the virtues of slower running engines, and only time can gently force each type into the service for which it is best adapted.

The advantages of high rotative speed need not be argued here ; they belong elsewhere ; but it is pertinent to ask: What is high speed? and to observe that it depends wholly upon the service in which it is employed. That is, high speed and low speed are entirely relative terms. Which is the high speed engine? One that at sixty or 100 turns per minute flinches under the shock or partial stoppage from the accidental reversal of electric currents and whose flywheel bursts from the momentary speeding up due to tardy regulation when the "lightning arrester" is induced to cut off the load? Or, one that at 250 or 300 turns can be repeatedly stopped and reversed by a balky dynamo without injury, or that can let fly its whole load in an instant without harm ?

Very few who confess to a prejudice against high speed engines can give detailed reasons for their opinions. Specifically they do not charge that a piston speed of 600 ft. per minute divided up in an engine running 300 turns is any different from the same 600 ft. in another running at seventy-five turns. Nor do they insist that there is danger in a well lubricated shaft revolving 300 turns per minute, in generous bearings. Their dread of lost motion disappears before the principle of single action, and so on through the list. Their false impressions arise partly from the fact that the high speed engine is the product of the present generation, thus enabling the average man to know more about the difficulties attending its development than he possibly can of the even greater troubles that attended the creation of the slow speed type, and partly to the word painted mottoes "safety of slow speed," "slow and reliable," and other idle expressions too persistent to be easily discarded and too vague to be convincing. The sooner that speed is seen to be what it really is, merely an incidental feature in engine design and not a characteristic, slow when one kind of service demands and the design allows it, and high when another service requires and the type employed permits it, the sooner its significance will be understood and wisely employed.

There is no abstract virtue in any engine such as the word-painter attributes. Its merits must be concrete and definite. They are to measured wholly with reference to the service to be performed. To the old types many virtues are commonly attributed that would not stand the searching criticism to which newer forms are subjected. In the blind belief that what has long existed, and about which conventional expressions have accumulated, must be the most able for all purposes, it is frequently found that some with otherwise discerning minds exhibit a confidence only equaled by that of the small boy who, looking at a circus poster showing an elephant balanced on the tip of his tail on a wine glass, was asked whether he believed that, answered : "Why I don't think there aint nothing what an elephant can't do."

This is hardly a discourse on engineering; it scarcely attempts to instruct, much less to argue. If, however, it should cause anyone to reflect on the futility of many stereotyped expressions that pass as current engineering gospel and cast them aside to make room for specific facts and approved reasons, allowing definite relations between means and ends to occupy that clear and important position they deserve, the engineering atmosphere will seem to be less hazy to those whose duties occasionally fall within its boundaries.

The Street Railway Situation in Chicago.

The report of the commission, consisting of aldermen, citizens and representatives of the street car company, appointed by Mayor Washburne to investigate the intramural transportation problem in Chicago, was presented to the City Council on February 9. The findings of the committee are not radical. Its recommendations to a great extent coincide with the views of railway men of Chicago. That it was not more revolutionary and that it did not attack the surface roads was unquestionably disappointing to the press of the city, which had opposed the companies so bitterly.

The report commences with a reference to the contracted business section of Chicago and then attacks incidentally the custom of hitching horses to curbstones, a practice so persistently followed in Chicago that the available width of roadways is in consequence materially reduced. The committee then asks the question : "Why can not wagons going in one direction be compelled to take one street and those going in another direction to take another street."

In regard to the need of intelligent policemen, the report says :

> The policing of the streets in the heart of the city is a very important matter and should be done with officers who are able to judge of the necessities of the traveling public. They should be instructed to see that the streets are kept free for the movement of cars and vehicles and that nothing should interfere with this. All vehicles should be forced to draw up alongside of the curb and none be allowed to back in. If it is unhandy for parties to load the teams in that position, they must so contrive their wagons that this can be done. The placing of building material should be so regulated that while it may take up some room on the street it must not interfere with travel. The greater point to be obtained is to prevent blockades and everything should be subservient to that end. We consider this one of the most important matters—fully as much as by increasing the number of cars, for the reason that even though the number of cars might be increased, if there are not proper facilities for moving them, the increase would be of no avail.

The committee thinks no West Side car lines should pass east of State Street. It also suggests that the council and the department of public works take steps to put Clark Street in such condition that it can be made a suitable thoroughfare for traffic. It is now so covered with railroad tracks near Sixteenth Street that traffic is rendered almost impossible. This brief reference is then made to the necessary growth of Chicago :

> Relief cannot be obtained until surface roads are not supplanted, but supplemented, by elevated roads. Your committee being of the opinion that the growth of Chicago will continue at the astounding rate of not less than 50,000 inhabitants per annum, believes that the surface roads, even if every concession be granted them and the maximum number of cars be run, yet in the not distant future will not be able to satisfy the demands, for the transportation demands of a city of 2,000,000 inhabitants are in proportion much greater than those of a city of a million and a quarter.

The actual recommendations of the commission are contained in the following list :

1. That the ordinance allowing cable trains to consist of only a grip and two trailers be changed so as to allow three trailers. This would of itself be an increase of at least fifteen per cent.
2. That the additional loop asked for by the South Side company be granted. This, according to the statement of Mr. Wheeler, would increase the carrying capacity of the road fully fifty per cent. There can be no doubt but what during the rush hours the present loop is taxed to its maximum carrying capacity.
3. That the Madison Street loop, as asked for by the West Side company be extended to State Street and that the cars return on Washington Street, thus greatly relieving Randolph and LaSalle Streets.
4. That the loop through the Van Buren Street tunnel be granted as far eastward as Dearborn Street, which would relieve the Washington Street tunnel fully twenty-five per cent., and which, with the increased capacity of the enlarged Madison Street loop, would increase the capacity of the West Side cable system fully sixty per cent.
5. That franchises for crosstown lines be granted wherever they

would relieve travel in certain districts, which in turn would help the main lines.

6. That the number of cars on all cable lines and the main horse car lines be increased not only during the rush hours, but also during other hours, as at present the accommodations certainly are inadequate.

7. That more trippers be run during the rush hours on all lines (on some they can only be run when better loop facilities are afforded).

8. That more night cars be run, especially during the winter season.

9. That waiting rooms be erected at the principal points in the outlying districts where crosstown cars connect and where transfers are given.

10. That all double fares ought to be abolished.

11. Transfers ought to be given on all intersecting lines.

12. Experience teaches that fully one-half of all delays in Chicago on the street car system is caused by vehicles either breaking down or getting stuck for some little time in attempting to turn out of the track. This also causes great expense to the owner of the conveyance. Much annoyance, a great deal of time and vast expense could be saved by adopting the flat rail system which works so perfectly in the city of Berlin.

13. Stopping at only every second corner, would, we think, be no inconsidable saving of time. This plan works admirably in every European city.

14. The changes in reference to street car loops will in our judgment be sufficient to relieve our streets from their overburdened condition for at least several years, when the city is in its normal condition in reference to population. But what shall we do upon the opening of the Columbian Exposition? If no changes in our street transportation are made, we venture the opinion that when the Exposition is running in full blast no woman, child, old man, feeble or sick person will be safe within the area bounded by Harrison, the South Branch, the river and the lake. We are, therefore, of the opinion that as a measure of permanent relief all cars and tracks must be excluded from the business centre. The area between Harrison Street and the river, the lake and the South Branch is not one-fourth part the size of the territory supplied by the elevated roads in New York City. We never hear complaints of the walk at the end of the elevated roads from our New York friends. For this purpose we would recommend the immediate construction of auxiliary loops outside of the territory above mentioned.

ELEVATED ROADS.

Chicago is peculiarly fortunate in having alleys parallel with our great thoroughfares in all parts of the city. We have examined the South Side Elevated Passenger Railway now under construction, and are convinced that elevated roads constructed on the plan that this road has adopted would not seriously damage property, would not be objectionable in appearance and would combine all the requirements of a first class road for the purposes for which it was designed.

The committee states very emphatically its belief that all steam roads entering the city should be elevated, and concludes its report as follows:

Your committee would, therefore, suggest the appointment of a committee of experts representing the various interests involved, and that said committee be empowered to collect data on which to base an emphatic report as to the most practical system to adopt, and believe that a report covering the whole question should be prepared at a date as soon as practical, to the end that if the present surface system is to remain the viaducts now in course of construction may be completed and the further construction of safety appliances, viaducts, etc. etc., may be commenced and completed without delay.

Believing electricity to be one of the great motive powers of the future, this committee cannot see any objection to an overhead wire system in the outlying districts. In a word, this committee believes that on the North Side, with all these foregoing recommendations adopted, the facilities of the surface roads would be increased fully sixty per cent., even during the rush hours, on the South Side fully 100 per cent. and on the West Side about the same.

TAXPAYERS' ASSOCIATION.

The committee of the Taxpayers' Association, appointed to investigate the local transportation question, and to recommend means by which rapid transit facilities could be increased, has presented an interesting report. The document was read at a meeting of the Association at Farwell Hall. It commences by stating that the committee's study has been confined to the rush hour between 5:30 and 6:30 P. M. If this period was provided for no trouble for the remaining hours need be entertained. The committee states that on the South Side the twelve steam roads transport about 13,000 passengers during the busy hours, while it is thought they should carry 20,000 or 25,000. The street cars designed to carry twenty-four to twenty-eight persons were made to hold from sixty-five to ninety. The report continues:

"If the South Side Street Car Co. will adopt double deck cars, overhead electric wire system on their long lines until a better system can be invented and the suburban trains will double their carrying capacity, the problem of transportation for the South Side will be solved."

The committee makes a suggestion of great interest for the North Side. The two main cable lines running on Wells Street might be operated, the former as an express and the latter for short hauls. The report says:

"A partial separation of the short travel from the through travel can be made on certain lines, especially on the North Side. It seems entirely practicable to devote the Wells Street cable to travel bound north of North Avenue so that no stop need be made between that avenue and Illinois Street, the short travel being handled by the Clark Street cable, and by present or future electric or horse lines with a liberal system of reciprocal transfer. This would shorten the time to Lincoln Park and points north several minutes and leave other lines less crowded. Mr. Yerkes has said that this would be entirely practicable.

"It is quite worth considering whether a similar separation of long and short travel may not be effected on the South Side by devoting the Wabash Avenue cable to through travel with no stop between, say, Van Buren and Twenty-second Street."

For this distance the Wabash Avenue and State Street cables run within a block of each other.

The committee also suggests a loop for the Wells Street line on Kinzie Street, which is the first street north of the river. This idea of making people walk from the places of business on the South Side to the cable on the North Side will be unpopular, as the committee readily foresaw, and it sought to anticipate the objection in these terms:

"It seems probable that passengers would walk from this line to the South Side as readily as 20,000 or 30,000 people now walk daily to and from the various steam trains."

The committee says there is a prospect of the operation of the South Side Alley L road, which will give great relief. It recommends the passage of the ordinance giving a franchise to the Chicago & Jefferson Urban Transit Co. in order that relief may be given to the West Side, and commends the Chicago & Evanston electric railroad.

The committee mailed a circular to the mayors of several hundred cities, asking for a report on the trolley system. The replies, which were received from seventy cities, were in the main highly favorable. Samples of the letters are given in the following summaries:

Toledo, O., T. R. Wickenden, city engineer—Two companies operate overhead wire trolley systems, and the people favor it. Our ordinance might be interpreted to provide for a removal of overhead wires. No persons have been injured or killed.

Dallas, Tex., W. C. Connor, mayor—We have fourteen miles of overhead electric road and no other system. No persons or horses have been killed or injured. People objected when the line was laid, but all objection has since ceased. Property abutting and served has been greatly increased.

Lynchburg, Va., Robert D. Yancy, mayor—We have four miles overhead electric system, which is a grand improvement upon the horse cars. It has increased the value of property everywhere.

Ann Arbor, Mich., reports that it has five and a half miles of the Sprague-Edison overhead system, that no persons or animals have been injured, that it has increased the value of abutting property, and that the people are pleased with it.

Washington, D. C., city engineer Capt. G. J. Fieberger—This city has 9.4 miles of electric road, of which 8.3 is overhead and 1.1 storage battery, and four miles of cable, with four and a half miles additional in process of construction. Congress has passed a law preventing the further erection of any overhead wires of any kind whatever. Property, especially that in the suburbs, is increased in value. Overhead wires are preferred to cable or horse cars, except from a standpoint of beauty.

Denver, Colo., reports thirty-nine miles of cable road and seventy-nine miles of overhead Thomson-Houston electric road working satisfactorily.

Salt Lake City, mayor George M. Scott and city engineer Samuel Paul—There are seventy miles of the Edison, Westinghouse, and Thomson-Houston overhead wire system here. There have been no fatalities connected with the system. The people are in favor of extensions, and the substitution of electricity for mules has greatly enhanced the value of property abutting and property served. Our running speed is twelve to fifteen miles an hour, or eight to ten miles schedule time, including stops. The speed of electric cars being regulated individually, they are enabled to make up time lost by frequent stops and to avoid the bunching common on cable roads during the rush hours. Breaks in the trolley system seldom cause delay of more than a few minutes.

Detroit, Mich.—H. S. Pingree, mayor, reports favorably as to the Healy noiseless steam motor, and states that attempts to establish a suburban line with the underground wire proved unsatisfactory and was changed to the overhead system.

St. Paul, Minn., through its mayor, Robert A. Smith, reports eighty-five miles of Thomson-Houston overhead system and fifteen miles of cable.

Milwaukee, Wis.—We have sixty miles of single track operated by the Edison overhead system and fifteen miles by the Thomson-Houston, and people generally favor these lines strongly, as no accidents have happened and property has been greatly enhanced in value. The work of substituting electric for horse car lines is going rapidly on, and by next December we will not have a horse car in the city. The people are anxiously looking forward to this change.

McKeesport, Pa.—We have four miles of Edison overhead system in use, with no competing systems. No accidents have happened and property along the route has been increased in value.

Joliet, Ill., P. C. Haley, mayor.—We have sixteen miles of the Thomson-Houston overhead system. Our people favor the electric road, as it has caused a marked increase in the value of all property served. We have no cable or other systems and do not want them.

The Mt. Generoso Inclined Railway.

Mr. Roman Abt, in the *Schweizerische Bauzeitung*, gives a description of this rack rail mountain road which commences at Capolago, on the shores of Lake Lugano, in Italy, and ascends a spur of Mount Generoso, one of the principal Alpine peaks intervening between the lakes of Lugano and Como. It has been constructed entirely for tourist traffic, as the prospect from the Generoso embraces extensive views over the Alpine range northwards, and of the plains of Lombardy to the south. Its length is 5.6 miles, and it terminates at Vetta, a point close to the Italian frontier, at a height of 5,235 ft. above sea level, or 4,326 ft. above Capolago. The line was completed and opened for traffic on June 22, 1890, or sixteen months after work was commenced. The fare charged at present is $1.56 single, or $2.00 for the round trip. Personal baggage up to eleven pounds is allowed free, and an extra charge of ten cents up to twenty-two pounds, and one cent for every additional two and one-quarter pounds.

The commencement of the line at the St. Gothard railway station is close to the landing stage of the Lake Lugano steamers, and its course for a distance of a quarter of a mile is parallel to the main line; it then rises and crosses over the latter by a skew-bridge of sixty-one feet span and passes under the main road from Capolago to Mendrisio, whence, winding along the mountain slope at a distance of 1.67 miles, it pierces the rocky shoulder by a tunnel of 180 yards in length (on a gradient of one in five, and a curve of 263 ft. radius) and, doubling back, its course from here to its termination at Vetta is almost directly the reverse of the first portion. Near the upper end of the above mentioned tunnel is the station of St. Nicolao, at 2,288 ft. above sea level. The other intermediate station—Bella Vista—occurs at 3.9 miles, and is at a height of 4,075 ft. above the sea. Besides the above, there are four other tunnels of seventy-eight, seventy-one, forty-four and twenty-seven yards in length. The quarter mile at the commencement is on the level, and the rise from thence to cross the Gothard line is one in 16.6. Beyond this the grade for a short distance is only one in 33.3; but at the end of the first half mile begins to sharpen, and soon changes to one in five, and a maximum of one in 4.54, which latter grade occurs on the line for a length altogether of 3,630 ft.

The grade given by the whole length of the line divided by the height would be one in 6.82, or two-thirds of the steepest grade adopted. There are no reverse grades on the main line.

The vertical rounding off at the changes of grade varies from curves of 1,640 ft. to 3,280 ft. in radius; the former is recommended as a minimum where such sharp grades are adopted. On account of the heavy works, especially on the lower half of the line, and the desire to make the line as economically as possible, the gauge adopted was two feet, seven and one-half inches. The minimum radius of curves originally contemplated, was 197 ft., recurring frequently, but in construction this was altered, except in two instances, to 263 ft.

The extreme width of the rolling stock being six feet seven inches, the width of cutting and embankment at formation level was fixed at thirteen feet nine inches; in the latter there are no side drains cut, but these are formed by the space left between the ballast, which is built vertically at the edges and the foot of the slope of the cutting. The extreme width of the tunnels is eleven feet ten inches, and the height fifteen feet nine inches.

The sleepers are of cast steel, five feet eleven inches long, the ends being bent downward; they each weigh 55.3 lbs. The rails are of steel, weighing 40.3 lbs. per yard run, and are four inches deep. The joints of the rails are provided with fish plates, and the attachment to the sleepers is by nuts and bolts and spring washers

The rack rail running along in the centre of the track is attached to the centre of the cast steel sleepers by nuts and bolts and spring washers. It is formed of a specially rolled iron stool, to each side of which is bolted a dentilated plate, the teeth of one breaking joint with those of the other, so that the toothed wheel of the engine, which is made with a corresponding double-break joint cogging, is always in full grip with the rack rail. The weight of metal in the complete permanent way varies according to the thickness of the dentilated plates, from 202 to 222 lbs. per yard run.

The "creep arresters" for the permanent way on the inclines are formed in some cases of steel rails set on end, and let into holes bored into the bed rock and cemented, their tops reaching slightly above the sleepers which rest against them; in other instances, stone blocks and a rail laid transversely, are used for the same purpose. These creep arresters are laid at distances varying from 219 yards to sixty-six yards apart, according to the steepness of the incline.

Six locomotives are in use, constructed on the system designed by Mr. Abt. There are two axles, on each of which are keyed a toothed traction wheel, and a third trailing wheel axle.

The speed, both on the up and down journeys, is three and three-quarters miles on the heavy grades, and five to six and one-quarter miles on the lesser inclines per hour. The length of the wheel base of the

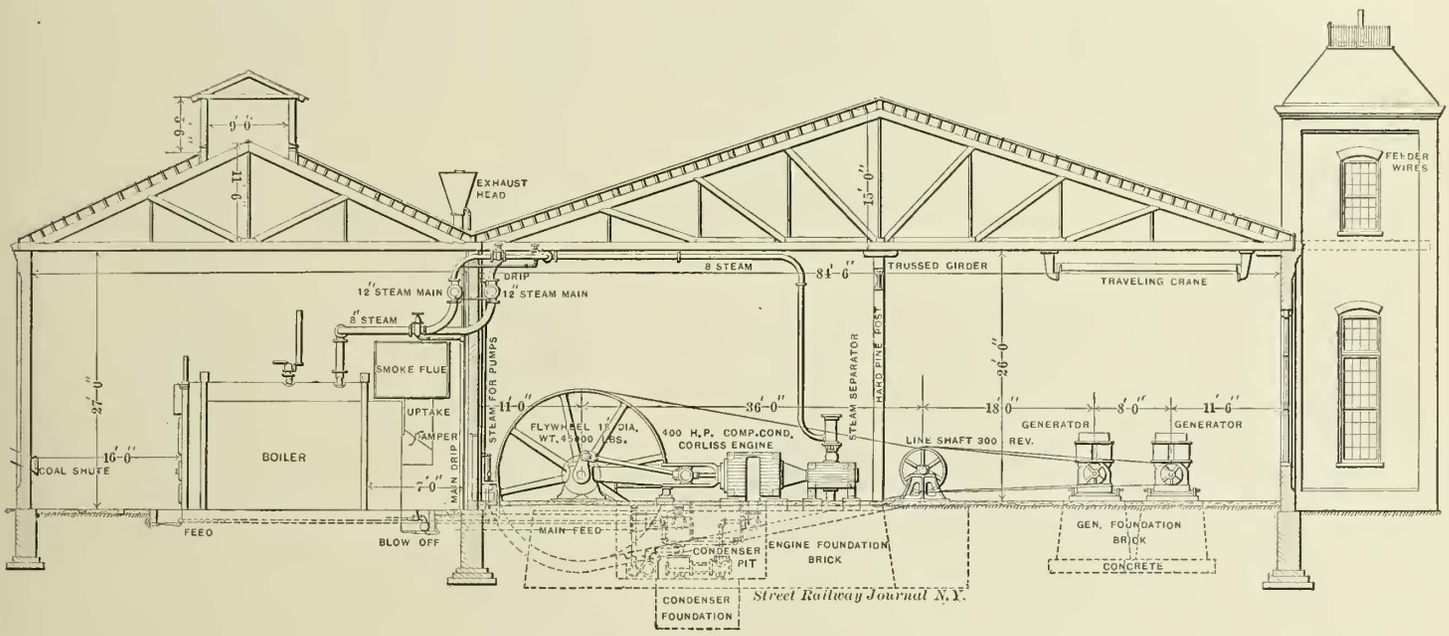


FIG. 1.—SECTION OF MODEL POWER STATION.

engines is nine feet three inches, and the weight in full running trim is fourteen and one-half tons. The remaining rolling stock comprises five open cars, each for fifty-six passengers, and two closed cars of the American pattern, for forty-eight passengers. The freight cars are capable of carrying six tons net.

The cost of the construction of the line, including engineering, land, rolling stock and workshops, together with tools, was $352,020, or $62,933 per mile, and the receipts for the fraction of the year 1890 (149 working days), during which the line was opened, were $17,788.

Power Plants for Electric Street Railways.

J. H. BICKFORD.

The essential features of a power plant for electric street railway work are stability, reliability, economy of operation, small expense for maintenance, capability of enlargement at small cost of building, accessibility to all parts, convenience of arrangement, compactness, but not at sacrifice of more important features; moderate first cost and a moderate amount of style.

Plants for this work are generally divided into two classes, according as the engines operate at high speed or low speed. In the early days of electric roads the high speed engine played a very important part, as only a few hundred horse power were required, but at the present time when large roads are equipping their entire systems and installing anywhere from 1,000 to 5,000 H. P., the question has arisen in many minds whether the high speed type is the most desirable.

It is a well known fact that the Corliss type of engine has a reputation for economy, both in operation and maintenance, and as these are two of the essential features many have turned their attention to this kind of engine. It was discovered at first, however, that these engines did not govern quickly enough to respond to the varying loads always existing in street railway work, but recently they have been so improved that they are considered by many to be the most reliable, as well as economical and substantial.

The accompanying illustration, Fig. 1, represents a plant employing these engines and arranged to develop 1,200 H. P., or, with a slight change in building, 1,600 H. P. can be installed. A brief description

of the most important points may be of interest to those about to erect a plant.

It will be noticed that in this particular plant only a portion of the 1,200 H. P. is to be put in immediately, the dotted lines showing the future increase in present building, additions being made as needed.

If, when it becomes necessary to install the third engine, it is ound that 1,200 H. P. will not meet all demands of the future, an 800 ent ones could be put in. Thus, it will be seen, that the future increase can be taken care of with but slight expense as regards change in buildings.

The boilers of the plant shown in Fig. 1 are of the water tube type, but differ in some respects from those generally sold. They are arranged in pairs forming batteries of 500 H. P. each. In order to secure a large amount of steam space, three drums, thirty-six inches in

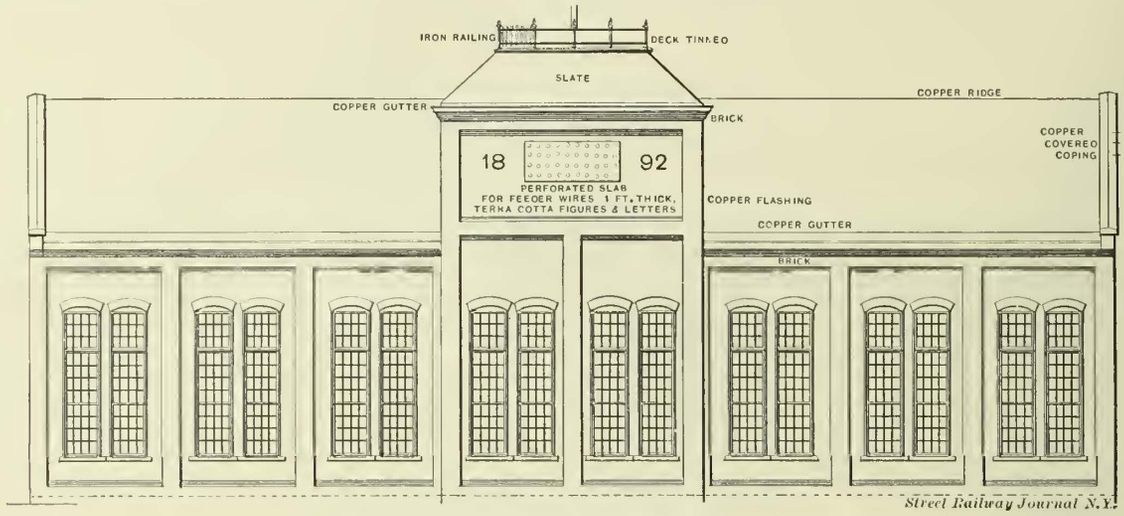


FIG. 2.—ELEVATION OF MODEL POWER STATION.

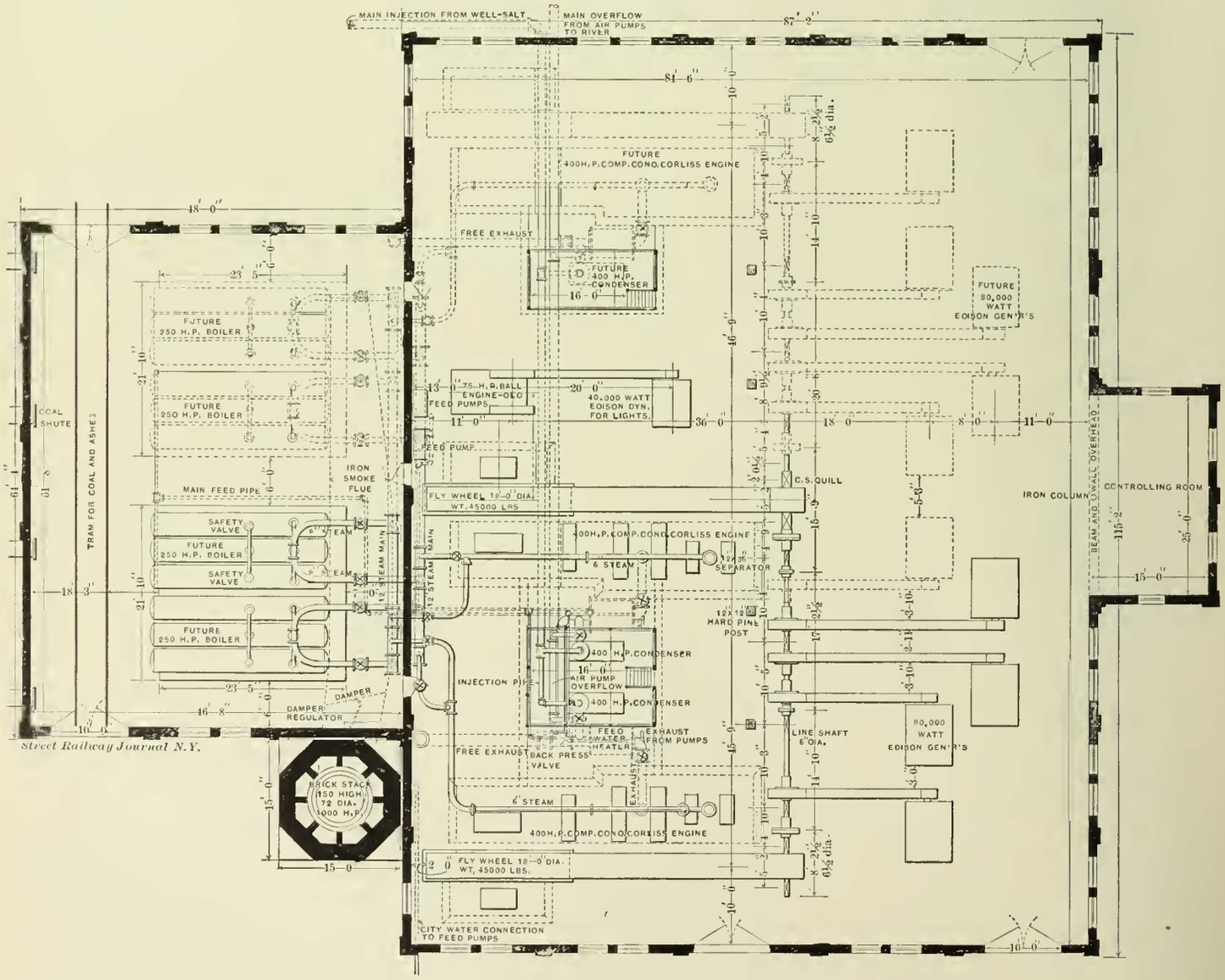


FIG. 3.—GROUND PLAN OF MODEL POWER STATION.

H. P. engine can be installed and easily be made to work on the same shaft, the space in the engine room being adequate. To obtain more boiler capacity, the end of the boiler room could be taken down and moved out sufficiently to install another battery. If the present chimney would not take care of all the boilers, a small one could be erected on the side of boiler room opposite the present stack. To obtain larger dynamo capacity, machines of double the capacity of the pres-

diameter and twenty-one feet long, are placed on each boiler, making six to each battery. These drums have wrought iron heads and each one is provided with a manhole in front. The boilers proper are suspended on iron columns entirely free from brick work and are free to expand in all directions. All sides are readily accessible for cleaning and repairs. The ordinary setting is used, the writer believing this to be quite as good as the so-called patented furnaces. The boiler room

is provided with plenty of light, and with appliances for removing ashes; in the rear is a coal pocket provided with chutes for delivering coal directly in front of boilers. The main smoke flue is built of No. 10 tank iron and has a damper controlled automatically, also each uptake from boilers is provided with separate hand damper.

Particular attention has been paid to steam piping, to avoid water being drawn into the engines. About four feet extra in height was added to the building in order to arrange the piping as shown. This may seem to some an unnecessary expense, but, as this is one of the vital parts of the whole plant, it cannot be too well arranged. Throughout the piping the tendency is for the water to run back to boiler, except where the pipes descend to engine, and to provide against any trouble at this point, a separator has been employed. To add further to the safety of the engine, each main valve is provided with a drip as well as the mains themselves, and, to insure against shut downs, the main steam pipes are all duplicated. Instead of elbow joints, pipe bent to a radius is used and freedom of expansion secured. All piping is arranged to carry a working pressure of 150 lbs. per square inch, all joints being packed with soft sheet copper, no fibrous packing of any nature being used. Pumps are arranged in duplicate and to feed the boiler directly or through heaters.

The engines are of the Corliss type, tandem form, compound condensing, built extra heavy, and are of a capacity of 400 H. P. each, with 125 lbs. of steam at seventy revolutions, and one-quarter cut-off. Sizes of cylinders are: Low pressure, thirty-four inches; high pressure, eighteen inches. Length of stroke, forty-eight inches. The fly-wheel is eighteen feet in diameter, forty inches face, and weighs 45,000 lbs. The engines have safety attachments to prevent running away in case of breaking of governor belt or too sudden change of load. Engines are connected to independent jet condensers, direct acting, and are so arranged that, with two of the engines, either one will work with either condenser. A feed water heater is placed between the low pressure

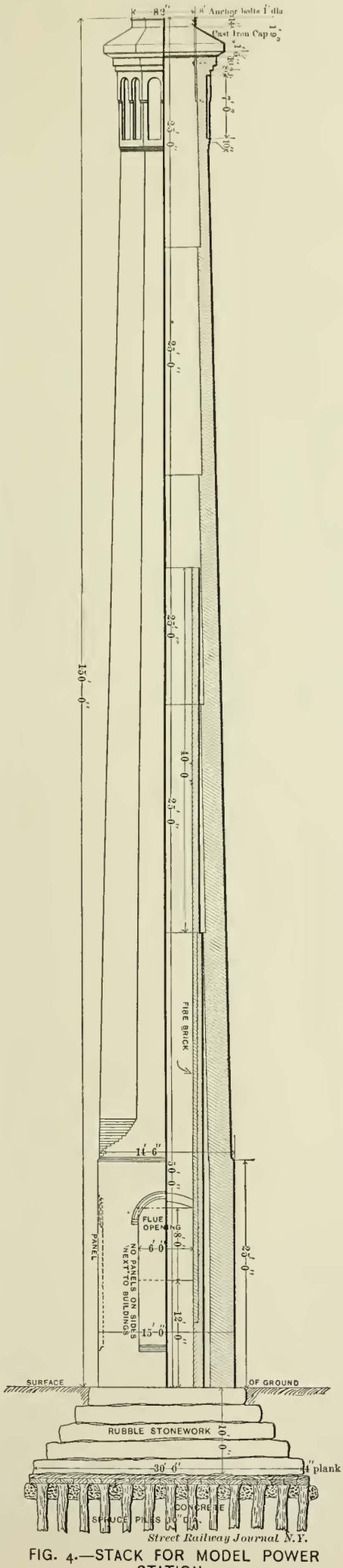


FIG. 4.—STACK FOR MODEL POWER STATION.

cylinder and the condenser on each engine. The exhaust from condenser and pumps is also passed through heaters and into condensers. If water is not heated sufficiently by this method, an auxiliary heater may be placed in the condenser pit and the exhaust from condenser and pumps passed through it to the open air exhaust. It will be noticed that the condensers have been placed in very close proximity to the engines so that full economy of vacuum may be obtained.

The arrangement of engines and dynamos is such that all belts have the slack side on top, giving greater contact to the pulleys.

The counter shaft is six inches in diameter and makes 300 revolutions per minute. Each engine is connected to shaft by cut-off couplings and either one can be connected or disconnected with shaft running. The centre engine is connected by means of a quill or hollow shaft. Each dynamo is connected to shaft by means of a friction clutch, and one or all can be thrown on or off while shaft is running. The shaft is in two sections and can be connected by means of a friction cut-off coupling. It will be noticed that the arrangement of the machinery is such that either engine can be made to turn a portion or the whole of the shaft.

A small traveling crane is arranged over the dynamos. These latter are of 80,000 watts capacity each and make 650 revolutions per minute.

The building is of brick with wooden trusses. The engine and dynamo room is 84 x 112 ft., boiler room 46 x 64 ft., and each twenty-six feet post.

Special provision has been made for the circuit feeders. A tower 15 x 25 ft., and thoroughly fireproof, has been erected, as shown on the diagram, opening directly out of the engine room, and forming a sort of bay window or alcove. The feeders enter the upper story passing through a perforated stone in the front, suitable insulators being placed in the perforations. Inside the tower they are secured to a stout structure and then drop down behind the switchboard which runs lengthwise of the tower in the lower story. The leads from the dynamos are carried in fireproof conduits through the concrete floor to the switchboard. It will be seen that by this arrangement the wires are all concentrated at one point which is fireproof, and the liability of fire from the wires destroying the building is very slight. Any fire which might start could be extinguished before it had done any damage. Heretofore but little attention has been paid to bringing the wires into a power plant. This is a mistake, however, as the wires are just as important as any part of the plant and should have proper consideration.

The building is provided with plenty of windows, the upper portions of which are transom hung so as to secure good ventilation and to prevent dust from being blown in as is the case where windows are open from the bottom. The chimney is of brick, octagonal shape, is 150 ft. high and has a seventy-two inch flue. The first 100 ft. has an inside shell, and the first fifty feet in this shell has a lining of fire brick. The top has a cast iron cap. A special engine and dynamo has been placed in the plant to supply lights only; this is done principally to avoid running the large engines at night and also to ensure steady lights.

While, perhaps, this station has no features strikingly new, yet it will be seen that the arrangement is such that all the essential features named at the beginning are obtained. The writer is well aware that a loss exists in transmission of power by counter shaft, which loss does not occur in a station supplied with direct coupled engines and dynamos. But looking at this question in its true light, the question arises whether is it practicable in all cases to use direct coupled apparatus. There are certainly some disadvantages as well as advantages. For stations of 1,500 H.P. and under, it seems to me that the direct coupled apparatus has no great advantage. For instance, in a station such as I have described above, the engines are of 400 H. P. each and but two are to be put in at present. If they were direct coupled then there would be but two units of generation, and in case one became disabled one half of the entire installment is thrown out of service, as the electrical portion is of no use unless the steam portion is in running order, and *vice versa*. If we put in more units and retain the same capacity each unit must be smaller and we lose the economy of the slow speed engine and increase the first cost and number of wearing parts. If the units remain large and lightning destroys the dynamo the repairs become great and difficult, and would in most cases necessitate sending the apparatus to the original manufacturer to be repaired. Whereas with the plant just described the units for generating the current are of good size, the engines are sufficiently large to secure good economy, and any damage to dynamos can be repaired at small cost and on the spot.

One other thing in regard to direct coupled apparatus. The sudden change in load will undoubtedly cause severe shocks to the engines, more so than where power is transmitted through belting there being a certain elasticity in the latter method.

For stations of a large number of horse power the direct method is a step in the right direction and when fully developed will form the ideal method for such roads as operate a large number of cars and are fitted to take care of such repairs as might occur.

THE ordinance recently introduced in the Chicago City Council providing that Chicago street railway companies be compelled to conform to the principle of "no seat no fare," was defeated January 18.

IT is rumored that some Boston capitalists contemplate purchasing the entire system of electric lines owned by the Chattanooga Electric Railway Co. This includes the St. Elmo, Ridgedale, Market Street, Montgomery Avenue and East Ninth Street lines.

Car Building.

From Advanced Sheets of "Street Railways" (Trams).

By C. B. Fairchild.

The present American styles of street cars are a natural and legitimate product of American ideas. They differ greatly from the passenger vehicles of the first street railroads, for these retained to some extent the form and arrangements as well as the name of the omnibuses and stage coaches which they superseded; and, naturally, for the mechanics of that day were only familiar with the construction of coach bodies. For instance, the form of the lower portion of the sides was made concave, a form necessary with an omnibus in order to provide space for its large wheels, but with the street cars having small wheels which are placed wholly under the body the concave form is found to be unnecessary, and the tendency now is to build with sides vertical or nearly so, the concave form of the lower panel being retained for the sake of strength and appearance, and because it allows of passing street vehicles more readily where those stand in close proximity to the track, for the hubs of the latter, in case they extend slightly beyond the plane of the vertical sides, do not interfere with the concave panel.

Notwithstanding the many changes in the styles of cars which have been brought about during the past few years by the change in motive power, the ideal car that will meet all the conditions of rapid transit under any one kind of motive power is not to be expected, for different lines need different equipments. For instance, the style of car best adapted for use on narrow streets, with large traffic, where passengers are continually getting on and off the cars, from one end of the line to the other, would in some points be unfitted for the business of a line in a city having a large suburban travel, where the passengers are mostly taken on and let off near the termini. The time will come, doubtless, when the type of car best suited to the requirements of certain conditions of traffic can be named. This desirable result can be reached only after a large number of street railway companies in widely separated localities shall have each expressed an opinion as to what style or type of car would be best suited for their respective needs, when the car builders can put the suggestions into practical form.

Thus, it is apparent at the outset that an attempt to describe in detail the different styles of street cars now in use, with particulars of construction and material, would swell this chapter into a volume, or even many volumes. This is not desirable, but in order to supply a long felt want we shall attempt to give an outline of street car construction, noting here and there the essential points that must be observed in the making of any style of car, that the product may have the combined attributes of beauty, lightness and strength. Let it not be expected that this chapter will prove instructive in all particulars to those who have long been engaged in street car building, either for the trade or for personal use. It is not a treatise on the methods which will be employed in works devoted to street car building in the next century, but the practice of the present day, so that all the particulars must necessarily be familiar to some one somewhere.

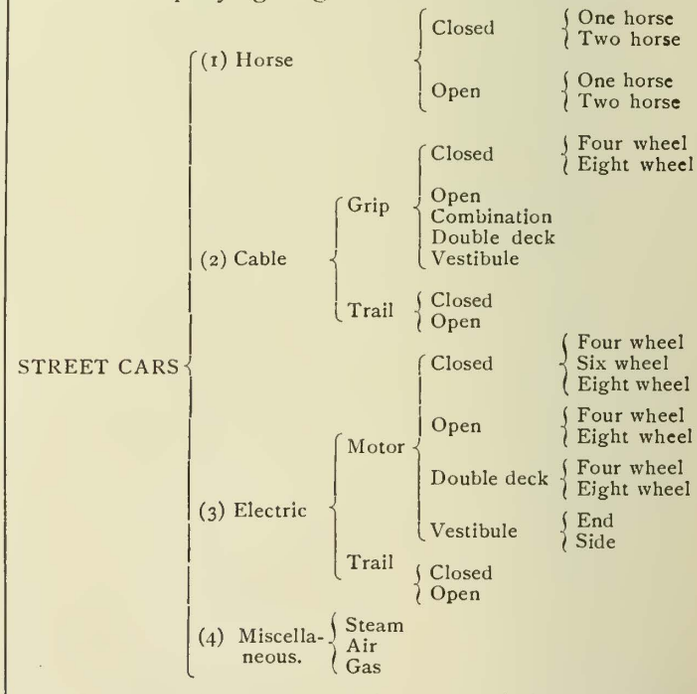
Different car works have each some special characteristics; not that they are larger, and differ in form, color or situation; but in the adaptation of means to ends, in the utilizing of labor saving appliances, in the styles of cars turned out, there are differences, and no one is so perfect that it cannot be made better by adopting some of the characteristics that are to be found in each of the others.

No one can study the designs of cars and methods of construction now in vogue and not be convinced that the business is still in its infancy, that the room for improvement is larger than the improvements already made, so that innumerable, marvellous and fruitful discoveries await the future workers in the line of street car building. The increased patronage awarded to "steam palace cars" and lavishly furnished great hotels, strikingly illustrates the curious tendency of modern travelers to demand luxuries and showy trappings in public conveyances and hostelries greatly beyond what the most of them enjoy or would enjoy in their own homes. This tendency is spreading to the street car, and as the character of the cars is improved, so much more will people ride. The love of ornament is inherent in human nature, and for this reason those who provide means for comfort should at the same time administer to their love of beauty. But in the combination of the æsthetic with the useful, good judgment and care must be exercised. Carvings and upholstery that are easily broken or soiled or that will accumulate dust and soon look dowdy should be avoided. Elements of beauty, however, may enter largely into ceiling and deck light finish, and since the art of manufacturing the materials for this purpose (three ply veneer and ornamental glass) has reached so high a state, this line of decoration is plentifully and cheaply supplied. Not only should a reasonable amount of decoration be provided in cars which are patronized wholly by a cultivated class of people, but in all cars, for by this means the comforts and solaces of fine art will be brought to a large number of lives and hearts that cannot afford to provide them in their own homes.

This chapter, it is believed, will prove helpful, in some particulars, to the veterans in the business, to new men engaging in this line of work, and also serve as a medium by which men engaged in the operation of street car lines may communicate intelligently with commercial car builders, or with the men employed in their own repair shops, while it gives to the general reader a "speaking acquaintance" with this particular industry.

KINDS.

In present practice we find four distinct types or kinds of street cars each of which is subdivided according to the accompanying diagram:



To properly construct these cars it is necessary to consider the particular work they have to do, and where the principal strains will come, depending upon where the power is applied.

The horse cars and trail cars should be light, strong and durable, with as little heavy lumber as possible, unless a change of motive power is contemplated, when they may be built heavier and so framed as to be readily changed and adapted for mechanical power.

The cable car must have a strong under frame, put together with heavy timbers, and a neat and strong body, avoiding as much as possible a clumsy look.

The electric car must have a strong under frame, with cross timbers so arranged that portions of the floor may be removed to give access to the motors, and if it is operated by the overhead system the roof should be provided

with iron rafters or carlines to support the trolley stand and the weight of the workmen who are required to adjust or repair the same, while the extra weight at the top, increased speed and lurching, require that the framing throughout be stronger and heavier than on other types of cars.

INCEPTION.

The purchasing officers of street railway companies either furnish drawings and specifications of the cars they may desire to have built, or they merely state the dimensions and general style of the car they desire, after having examined the drawings or photographs of different styles of cars that have been previously built, with which most shops are supplied, or after having visited the works of the manufacturer and studied the different types in process of construction, when the chief designer of the shops where the cars are to be built, after full conference with the parties desiring to purchase, makes detailed drawings and full specifications. After these have been approved and accepted, and the contract has been closed, the manager of the shops receives written directions quoted from the specifications, with drawings which are numbered and known as shop orders for a particular lot of cars.

These drawings usually show, first, an elevation of side and end of a car frame (Figs. 1 and 2), then, in detail, the sills and floor framing and all matters relating to the floor (Figs. 3 and 4). The drawings of the side framing show the side posts and side bracing and side panels Another set of drawings exhibits the details for the deck, including everything above the side frame, such as carlines, deck posts, deck sills, deck plates, and side plates, beginning at the top of the posts. There are also drawings showing the ceiling finish or headlining. There are full detail drawings of hoods, platforms, carvings and even of the bronze trimmings, however small. Some of these details rank as "standard," and go into all kinds of street cars built at the shops. The following are copies of actual shop orders, which will give some idea of the amount of detail incident to the business:

Description of One Closed Electric Street Car.

Plan	310-U. Length over sills, sixteen feet. Width over sills, five feet eleven and one quarter inches; over all, seven feet ten inches. Height over all ten feet four inches.
Roof	Three iron carlines, strengthened and arranged for trolley.
Hoods	Removable.
Framing	Closed street car. Height from top of sill to under plate five feet, ten inches.
Outside	Paneled with white wood.
Flooring	Yellow pine.
Window sash	Mahogany.
Blinds	Mahogany frames and basswood slats.
Glass, windows	Crystal sheet.
Glass, doors	Crystal sheet.
Glass, decks	Embossed.
Mirrors	Plate glass beveled.
Inside finish	Mahogany.
Ceiling	Burl oak, decorated with gold.
Lamps, centre	Two, one (1) light.
Heater	One coal stove placed in a zinc lined box.
Seats and backs	Spring seats placed longitudinally.
Seat covering	Wilton carpet.
Trimmings	Bronze.
Bells	One at each end with leather bell cords.
Gongs	One under each platform.
Door catches	Placed on each door.
Fare registers	One.
Fare boxes	One.
Lenses	Red glass at each end in upper deck.
Change gates	In each door.
Floor matting	Standard diamond.
Body Grab Handles	Bronze.
Steps	Steel steps, Stanwood pattern.
Platforms	Standard, open at sides.
Dash boards	Iron, closed centres.
Dash grab handles	Bronze.
Brake handles	Bronze, adjustable.
Brakes	Operated by hand on all wheels from platforms.
Track brake	To be applied for use on grades and for sudden stoppages.
Sand boxes	Four.
Platform gates	Four folding, iron.
Life guards	On each end of truck.
Track cleaners	To be applied in front of each wheel.
Headlights	One arranged for electricity.
Draw bars	Standard radial.
Running gear	Four wheel gear, as selected by purchaser.
Motors	As selected by purchaser.
Gauge	Four feet eight and one half inches.
Wheel base	Six feet.
Wheels	Cast iron, thirty inches in diameter, with two inch tread and five-eighths inch flange.
Axles	Steel, three and one-half inches in diameter.
Painting	May be what is known as "Standard Broadway," which is a light yellow.
Decoration	To correspond with body color.
Lettering	"LIDGERWOOD" on sign boards, "WASHINGTON" on main panels.
Number	1
Electric light	Car to be lighted by electricity.

Specifications of a Closed Motor Double Truck Street Car.

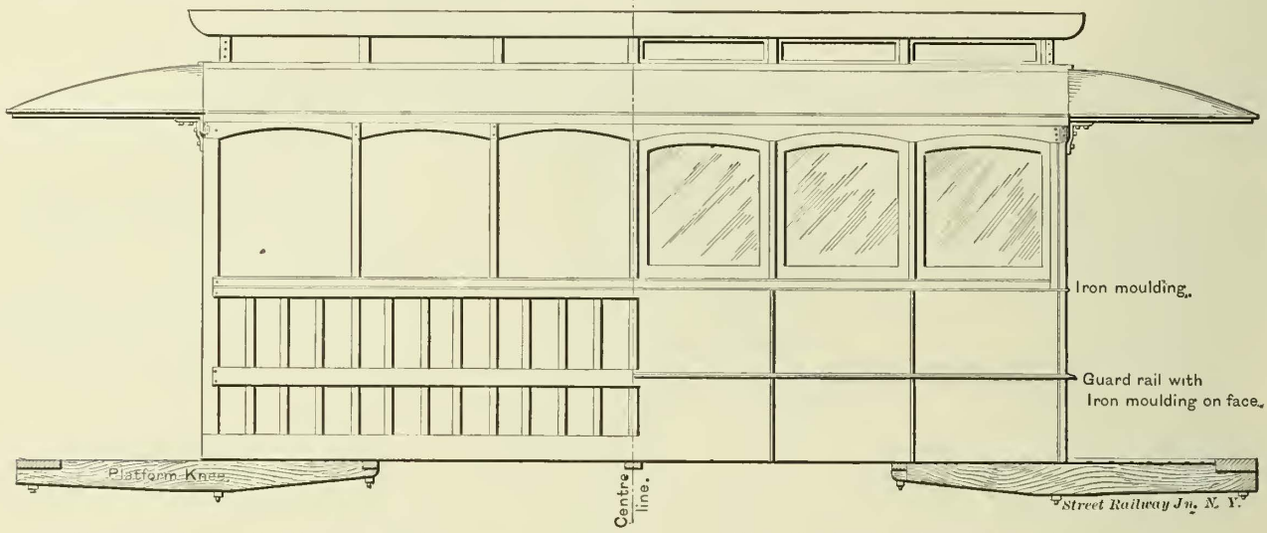
Plan	831-B. Length, twenty-two feet ten and three quarters inches over body; twenty-nine feet two and one-half inches over car, and thirty feet five inches over all. Width, seven feet one and one-eighth inches over all.
Roof	Strengthened with five iron carlines, and arranged for trolley.
Hood	Detachable on rear end.
Framing	With straight post. Height from top of sill to under plate, five feet eight and one-quarter inches; over all, eleven feet two inches.
Outside	Ceiled (or sheathed) with white wood.
Flooring	Yellow pine.
Window sash	Cherry.
Blinds	Cherry frames and basswood slats.
Glass windows	Double thick French.
Glass doors	Double thick French.
Glass decks	Ruby colored glass.
Mirrors	Beveled plate glass.
Inside finish	Cherry.
Ceiling	Maple.
Centre lamps	Two two (2) light.
Seats and backs	Ash and red birch slats, covered with Wilton carpet.
Trimmings	Bronze.
Bells	One at each end.
Gongs	One under front platform.
Door locks	One on cab door.
Fare registers	One per car.
Floor matting	Applied.
Body grab handles	Bronze.
Steps	Stanwood steel, double tread.
Platforms	Arranged with cab on front end and rear end, open on one side only.
Dash boards	Iron, on rear end only.
Brakes	Hand brake on both trucks, operated from platform.
Brake handles	Cast iron brake wheel in cab and bronze brake handles on rear end.
Air brake	Sessions patent.
Sand boxes	Two per car.
Life guards	On front truck.
Headlights	One, arranged for oil.
Draw bars	Radial on rear end and buffer on front end.
Running gear	Four wheel double trucks.
Gauge	Five feet two and one-half inches.
Springs	Coil.
Wheel base	Four feet six inches.
Wheels	Thirty inch steel, two-inch tread.
Axles	Iron, three and three-eighths inches in diameter.
Motors	Two fifteen H. P. per car.
Painting	Light yellow, with carmine panels.
Lettering	"CENTRE & NEGLEY AVENUES" on each side of car at centre.
Number	55.
Electricity	Cars equipped with electric light.

The above method of providing drawings and specifications is recommended for use in large shops, and in some modified form in all works, whether engaged in building for the trade or in constructing home-made cars, as it will be found to save time and insure the perfect fitting, when assembled, of such parts as are prepared by different gangs of workmen. It is the practice in some shops, however, to make all the detail drawings full size on large boards, which are placed in a convenient position so that the workmen have access to them, and from which they make their own measurements. The full sized drawings, it is claimed, insure a better fitting of parts.

MATERIALS.

Storehouses and yards are provided for the different classes of material which is usually kept in stock, and includes lumber, glass, wrought, cast, malleable and sheet iron, steel, paint, varnish, cloths, plush and other uphols-

tery goods, nails, tacks, screws, hinges, catches, locks, and other small hardware and metal goods (trimmings) that are too numerous to mention. Some large car building establishments manufacture their own veneers, trimmings and, in fact, everything entering into the construction, even the paints and varnish. Others purchase from manufacturers trimmings, etc., ready finished for their place in the car; while a few street railway companies, which build their own cars, purchase everything, even woodwork, in which case the work of car shops consists merely in fitting the parts, painting, furnishing and decorating.



HALF ELEVATION, SHOWING FRAMING. FIG. 1. HALF ELEVATION, SHOWING BODY COMPLETE.

LUMBER.

The enormous strains to which the frames and covering of street cars are subject, make it absolutely necessary that they should be made of the best lumber prepared in the best manner. Hence, to insure durability and long life, great care must be exercised in the selection and seasoning of the lumber.

In the selection of any particular wood its appearance should not always govern, but the region in which it grew should also be considered, for the locality has much to do with the texture of woods of the same name. In some cases, however, the supply has been exhausted in the regions which produce the most desirable qualities, so that in this respect no choice is left, and a change of wood for the same purpose is sometimes rendered necessary.

The woods principally used in car building are of both native and foreign growth. The native woods include ash, white, Norway and yellow pine, hickory, basswood, poplar (whitewood), birch, butternut, cedar (both green and mined), cherry, cypress, gum, elm, white oak (second growth), burl oak, maple and sycamore. Of the foreign woods, mahogany, satin wood and teak constitute the principal kinds employed in this industry.

The seasoning process should occupy two years or more, and much of it requires to be kiln dried in addition. The lumber having been purchased, it is piled with the ends toward the prevailing winds in open order in the lumber yard, or, better, under sheds when these can be provided. It is also of advantage to cover the ends of all boards and stocks of timber, as soon as the lumber is piled, with some kind of heavy paint to prevent season checking.

The kind, size and condition of the stock determine the time the material should remain in the drying kiln; for heavy sill timbers, from three to four months where the temperature, ranging from seventy-five to one hundred degrees, should be regulated to suit the conditions, care being taken not to destroy the life o' the wood. In case, however, the structure is designed for service in high and dry latitudes, it is often necessary to continue the seasoning process till all moisture is expelled, or otherwise checks will appear and the car will soon go to pieces. After leaving the kilns, the material, if not needed, should be stored in closed sheds.

In large establishments, the work of car building is usually subdivided, and several gangs of men do the work in successive stages. The lumber, when ready, is delivered to the wood-working shop, usually on trucks, the yards and shops being provided with trucks for their accommodation. It is then cut into proper dimensions and then passed to the planers when the further work to be done upon it is laid out from templates by the foreman. It then goes to the shapers and mortising machines, and the small pieces are put through scrapers and sand papering machines and made ready for the blind builders and cabinet makers.

The economy exercised by the manager or shop foreman in laying out and utilizing all the building material, and the nicety with which just the number of pieces of all kinds are made which are required for a given lot of cars, frequently covers the margin of profit in certain orders.

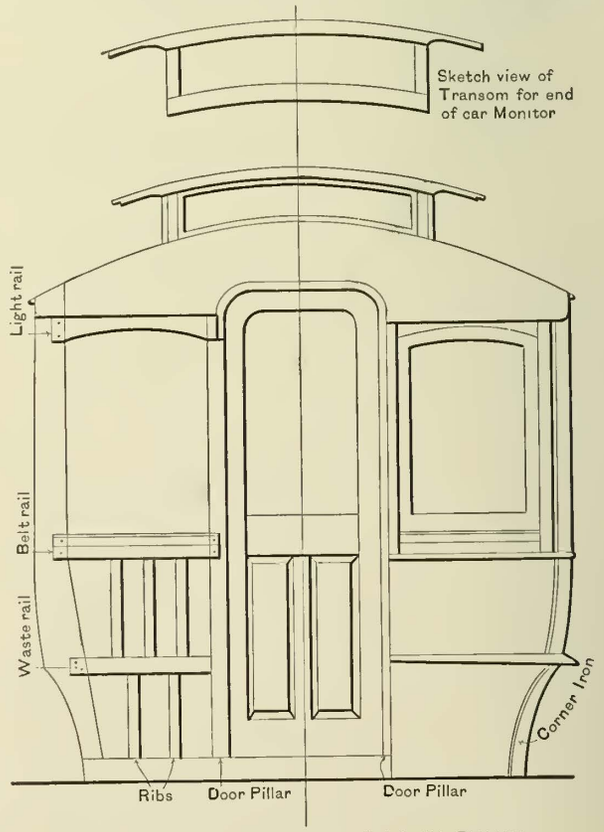


FIG. 2.—END ELEVATION, HALF IN FRAME.

As the work progresses through the different departments it should be carefully and repeatedly inspected by the manager to see that the work of each gang is properly done. Even with the most careful supervision it will sometimes be found that the different cars of the same

order when finished vary in real value a good many dollars, owing to the superior skill, or want of it, on the part of the different gangs of workmen, although the material for each was the same and prepared in the same manner.

The material ready prepared is now delivered to the erecting stop. The sills, cross ties, bracing, flooring, iron tie rods and angle irons go to the gangs whose duty it is to frame the bottom and lay the floor. In some cases this work is done by the same men that construct the body.

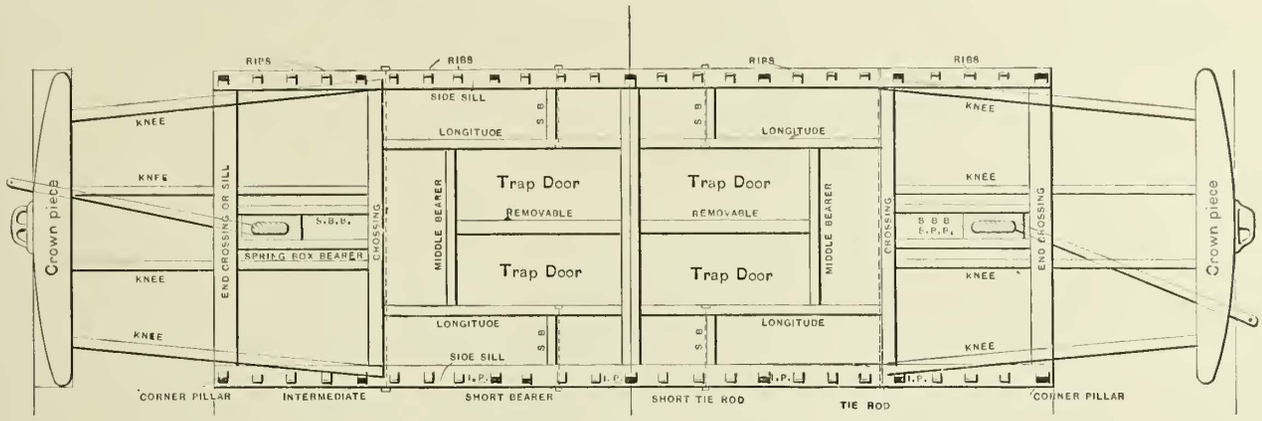


FIG. 3.—FLOOR FRAME FOR ELECTRIC CAR.

If it is a sixteen foot electric car that is building, we have two side sills, two end sills, two first crossings, centre crossings, four longitudes, two cross longitudes, two movable bars, eight platform knees and two crown pieces or platform bumpers (Fig. 3) Yellow pine is usually employed for the side sills and flooring. Oak is also used for side sills, and usually for the cross and end sills, although ash is sometimes employed for cross sills, and the crown sill of platform is sometimes made of elm. The side sills are usually 4 × 5 ins., and are sometimes strengthened by the addition of a thin steel plate bolted to the outside. In some practice the sills are veneered with some light colored wood which offers a better surface for paint. The end sills are of the same dimensions, laid flatways and framed to lap on the side sills or may be mortised in. All mortises and tenons should be covered with white lead to prevent the access of moisture. The cross or middle sills may be framed to lap the side sills or may be mortised. The middle crossing should be the heaviest and have a tie rod through the centre. The platform knees, usually of ash or hickory and strengthened sometimes with steel plates, should lap the first cross sill. The cross framing should be arranged to provide for traps in the floor to give access to the motors. The traps may be hinged so as to turn up or they may be lifted out altogether. If built quite long the same form of trap will suit a number of different motors. If we were building a long eight wheel car the framing would be different, and the traps would come at each end of the platform floor. It is quite important, before designing the floor framing for electric cars, that the type of truck to be employed should be specified. The diameter of wheels, wheel base and dimensions of trucks vary so much, that the framing for one will not suit another.

For flooring, hard pine or maple boards may be employed. The material should be straight grained and free from knots. It is usually dressed on one side to about seven-eighths of an inch in thickness, grooved or jointed and fastened with screws to the cross ties and braces, all the top surfaces of the latter having first been given a coat of white lead. The platform knees and end timbers or crown pieces are conveniently put on by turning the frame upside down. This is not necessary, however. The crown pieces should be two or three inches thick, and of sufficient length to come out as far as the side sills of the car, and the outside knees should be set back far enough to make room for the side steps, and also spaced to provide for placing the rheostat under the platform, if one is to be employed. The platform is usually so connected that it may be detached from the body. The platform floor is commonly laid with oak, but may be of the same material as the car floor.

The platform is now delivered to the body builders where it is supported, preferably, under the middle by a low two or four wheel truck, upon which it can be moved about the shop as the work progresses. Low horses, a trifle higher than the truck, are placed under each end so that the frame will sag a little in the middle as it helps to strengthen the car and prevent the ends when finished from drooping, as they are liable to do with heavy loads, if built straight and mounted upon trucks with a short wheel base.

The side post (pillars) (Fig. 5), which have previously been grooved by machinery to provide runs for the window sash and blinds, are next set up in mortises cut in the side sills, all mortises and joints being covered with white lead before the union is made. These posts are usually of ash (dark colors being employed for closed cars and light colors for open cars), 1⅛ ins. to 1½ ins. thick. Being set in the mortises they are firmly held in place by strap bolts which come up through the sills with the strap portion extending up several inches on the inside of the lower end of the post. The corner posts come next, and these should be 3½ × 5 ins. at least (Fig. 6.). Door posts should be heavy enough to allow of a groove down the centre for a tie rod which fastens the head rail and pillars down to the end sills, and groove for electric wire which leads through to the roof. The end may be put together on the bottom of the car and then raised into position.

Erect temporary scaffolding on which to stand and put on the plate, and fasten stretchers across the top, making the sides the same width at the top as at the belt rail. Square everything true and put on the belt rails which are commonly halved on the posts. The work on the belt rail, if laid out from the mortises in the sills, will bring the space between the posts of the same width all the way up. Add the convex and concave ribs, according to the curvature of the sides, then the drip rail and the

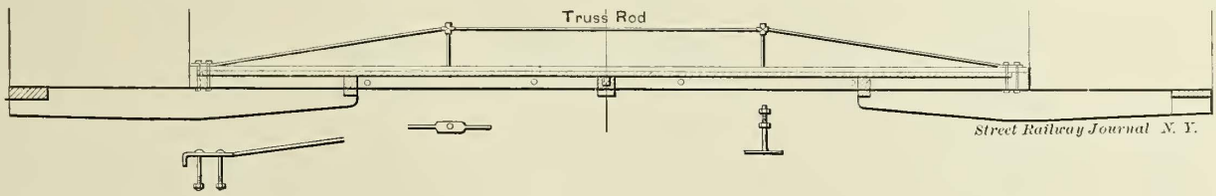


FIG. 4.—TRUSS ROD END PLATFORM SILLS.

letter board. The sash rails, light rails, strainer rails, straight ribs and head rail of the ends are next added and the frame is made ready for the panels. These are usually made of whitewood, and having previously been bent to proper shape and dried, are put in place, the lower outside first, after which the ends of the car are paneled up, care being taken that the panels are all up to the ribs. The whole inside is then covered with scrims put on with hot glue and painted, when it is left all night to set. Next morning the panels are all dressed off and sand-papered, when the painter gives them a coat of oil priming and the work is left to stand over night. The braces and stretchers are now taken out and the car is ready for the roof.

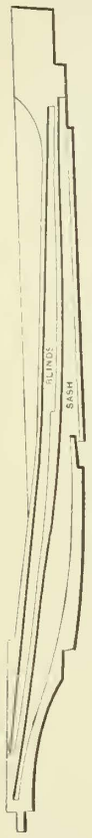


FIG. 6 CORNER POST.

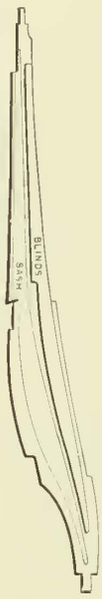


FIG. 5. SIDE POST

The above applies to cars in which a truss rod is employed to strengthen the under frame. In some shops a different method of construction is followed for double truck cars and which is designed to do away with truss rods. As shown in Fig. 7, the bracing consists of angle pieces of boards (*a*) bearing partly on the side posts, sash rests and side sills, and secured by glue and clinch nails to longitudinal pieces (*b*) of the same material. The longitudinal pieces extend the full length of the car and have a shoulder rest on each post by means of a groove one-eighth of an inch deep. The outside sheeting (*c*) consists of narrow pieces of boards put on vertically, with white lead in the joints and glued and nailed to the longitudinal pieces. Before applying this trussing the middle of the car should be slightly arched as before described, and the structure will be found to have great strength.

The roof, which may be made plain or after some one of the monitor or Bombay types, is usually prepared in the cabinet shop, or may be made by the body builders who work on it at intervals. The frame, which may be of ash or oak, depending upon the proposed inside finish, should be strong, with at least three compound carlines to support the weight of the trolley stand and prevent the sides from bulging. Compound carlines are usually made of flat wrought iron or steel strips which, being reinforced on each side with half round wood, bolted through, have the appearance when finished of the ordinary wooden carlines. Instead of employing compound carlines for supporting the roof, some builders frame the ventilator rails and uprights in an arched form which is strengthened by means of truss rods running from end to end of the car immediately under the bottom ventilator rails. The roof covering may consist of half inch ash boards, beveled or rounded on the under edges, or of three-ply veneer, depending upon the proposed inside finish. Oak or birdseye maple veneer, firmly fitted on top of the carlines, makes a very strong roof for carrying trolley stand, and being decorated makes a fine inside finish, especially where oak carlines are employed to match the oak veneer. The roof being in place, it is slightly shored up in the middle, when the ends are fastened to the head rail, and the carlines to the eaves-plates which have been previously mortised to receive them. The edges are then dressed off, when the roof is given a priming coat, the nail holes filled with putty, and after drying, the roof cloth, which consists of heavy canvas (laid in white lead), is put on, stretched very tight and tacked under the outer edges. The eaves moulding is then put on and the car is ready for the hood which is really an extension of the roof over the platforms, but so put on as to be readily removed for convenience in shipping. In vestibule cars, however, the hood constitutes the roof of the cab and is framed with it. The hood is made on a form in the shop, and covered with a canvas the same as the roof, when it is put up and bolted to the head rail. The water table is then added and the entire roof is covered with a coat of mineral paint.

The scaffolding being removed, work on the body is resumed. A moulding of half oval iron is next put on over the top panel joint, which extends around the corner posts to the door posts. This is usually put on with screws, and the heads being filed off it makes a neat looking job. Next a fender rail is added, which is placed over the joint between the upper and lower panels, and being finished with an iron moulding as described above, serves to protect the panels from coming in contact with street vehicles. A plain flat band moulding covers the end joint of the upper panel and a corner iron the joint of the lower or concave panel. One or two flat vertical mouldings of wood or strap iron on a line with the side posts may be added, which divide the side into panels of different sizes and improve the appearance. The iron dash posts, dashers, brake staff, bumpers and controlling stand are next put in place and all iron work given a coat of paint. The dashers are usually made of sheet iron, but in some cases wire is employed.

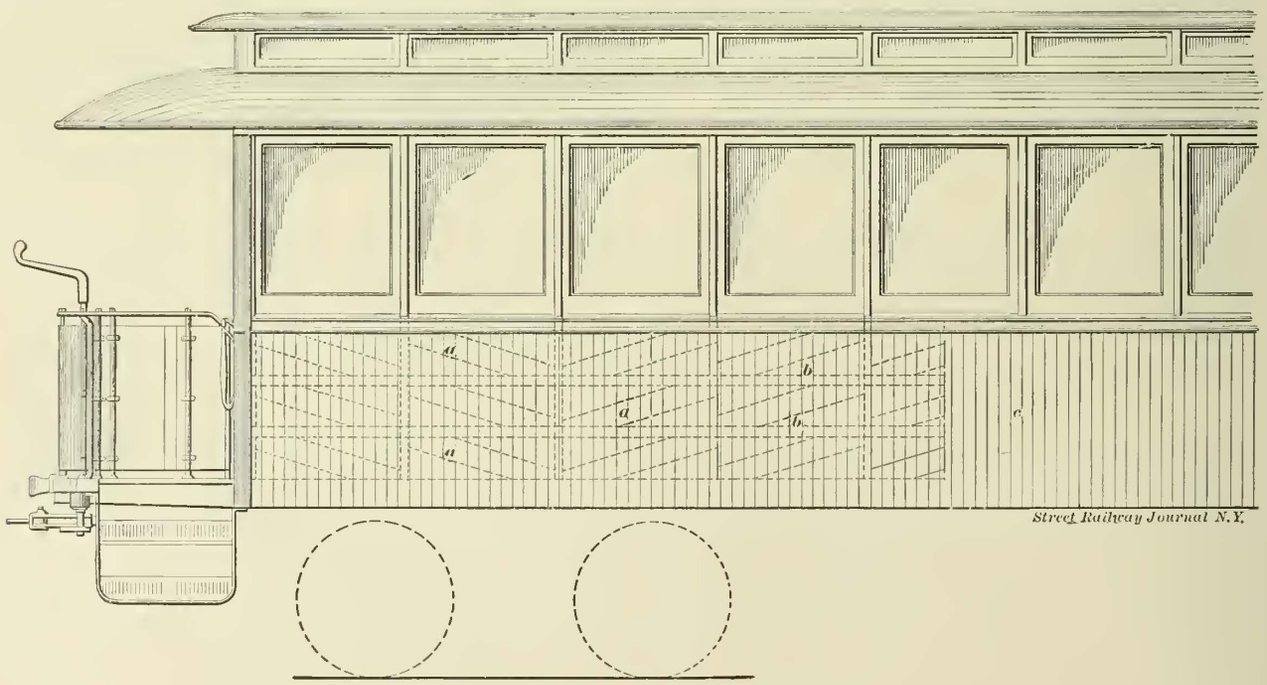


FIG. 7.—FRAMING WITHOUT TRUSS ROD.

The sash doors and blinds which have been made in the cabinet department, are next fitted each to its place, numbered and given the car number, when they are sent to the paint shop for finishing, after which the glass is set and the sashes are rubbed down and varnished.

The overhead and bottom tracks for doors are next laid down, door guards put on, doors hung, head linings fitted, also end panels, heel boards, seat rails, stove box, mouldings and curtain fixtures. Then, all parts being numbered, they are taken out and sent to the paint shop for finishing. To produce a carline finish in case veneer is not employed for the roof, the ceiling between the carlines is covered with veneer. Oak, birdseye maple and birch veneer is employed, and may be left plain or perforated and decorated. Matched boards of different colored woods are also used for ceiling finish, and sometimes the entire heading is of veneer, fastened to the carlines, arched and brought down to the top of the plates.

The body now goes to the paint shop, where a rough coat is first put on, the entire surface scoured down, and the car is made ready for the electric wires which are put in by experts, which work should be done before the inside finish is applied to the car. The tinners also put in the end lamps and flues, stove pipe, thimbles, and the piping, if the cars are to be lighted with gas. The sash doors and blinds are now put back and the car is left with the painter to finish and decorate.

PAINTING.

The painting department should be assigned to commodious quarters, carefully partitioned off to exclude dust and insects, and the room should be constructed to provide ample light all around, and in order to facilitate the work, should be warmed in winter to an average temperate of seventy-five degrees. The method of mixing the paints and the time allowed for the different coats to dry, depend upon the time limit for filling the order. When durability and high finish are sought, time is an important factor. To meet both conditions we give two methods of practice, the first when haste is important, as in filling large orders, and the second when time is not a condition.

The foreman must keep a sharp lookout for all new work as it advances, and order the priming coat put on, which can be done in an hour, but will often advance the work at least a day. A good priming coat consists of pure lead mixed with two parts boiled oil, one part raw oil, a little elastic japan, and sufficient turpentine to cause it to work freely under the brush. This should be thoroughly brushed into the pores of the wood, care being taken to introduce the color into the nail and screw holes, unless these are too large, in which case they should first be filled with wood buttons or with a mixture of sawdust and glue. Where putty is employed for filling large holes, it is apt to crack and fall out after the car is put in service. After drying, the priming is sand-papered lightly, when the first coat is laid on. This may consist of pure lead (ten pounds) mixed with one pint of boiled oil, one pint of elastic japan reduced with turpentine. All nail and screw holes are now filled with putty, and in doing this care should be taken to so introduce the putty that all the air will be excluded, for should there be a bubble of air confined by the putty it will expand and bulge the surface. To produce a good job the puttying should be done at two operations. At the first, the hole is not entirely filled, but the filling is scooped out with the corner of the knife, and left slightly below the surface. After drying a short time more putty is added, until the surface is uniform. This being rubbed down the second coat of paint (mixed the same as the first) is applied.

Two or three coats of rough stuff, consisting of English or American filling, are next laid on, not over two coats a day, however, and better only one if there is time. When sufficently dry the entire surface is thoroughly rubbed down with pumice stone, or better, with Schumacker's rubbing brick which is manufactured in different grades, fine medium and coarse. After being surfaced and washed the body should be left at least twelve hours to dry, before the next coat is added.

The surface is now ready for its final color. If this is to be a transparent color the surfaced panels must receive a preparatory coat, which should be as near the desired color as possible. If it is to be finished in an opaque color this can be applied at once, and consists usually of a japan or quick drying color which is laid on in two coats and followed with clear varnish, or color and varnish.

The surface being flattened, it is prepared for striping, lettering and ornamenting. After this work is done the body goes to the varnish room, where two coats, one of rubbing, one of finishing varnish are applied, the first being carefully rubbed down.

When the time is not limited the following formula and practice may be followed for a first class job: The priming coat may consist of keg lead with pure raw oil mixed to about the consistency of milk, this being well brushed into pores, screw, and nail holes is left to dry three or four days, when it is sand-papered lightly. The first coat, consisting of keg lead mixed with raw oil two parts, japan one part, with enough turpentine to make it work easily is next laid on, and after two days the holes are carefully filled with putty which is made of dry white lead mixed with equal parts of japan and rubbing varnish. After the putty is dry the surface is again sand-papered. The body is now ready for the second coat which may consist of one part keg lead, two parts raw oil mixed thick with japan and then thinned with turpentine. The rough places are now filled with soft putty and after this becomes dry it is smoothed off and the surface is ready for the next coat which consists of keg lead mixed thick with turpentine, to which is added a little oil, japan and and rubbing varnish to bind the coat well. After drying, three or four coats or enough to fill the work are next laid on. These coats consist of English filling three parts(light for light grounds, and dark for dark grounds) dry white lead two parts, keg lead one part, mixed with japan two parts, rubbing varnish one part, and turpentine to thin properly. This being rubbed down and cleaned the colors are applied until the surfaces are properly covered. Rubbing varnish is next applied and being thoroughly rubbed down with pumice stone, the lettering and ornamentation may follow, and this is usually done by another class of workmen. After being rubbed down well, finishing varnish is applied. If each coat has dried properly, paint applied in this manner will last for years without cracking, peeling or fading. To produce the smooth ivory-like finish which some fine cars present, it sometimes requires as many as fifteen coats of paint and varnish. The outside decoration should be solid, plain and neat; too many large scrolls sometimes spoil the beauty of a car.

The inside finish is now put on by another class of workmen, and in some respects this is the most particular work on the car. The ornamentation may be plain or rich as the taste may demand. The headings are often finished in hand painted designs, including landscapes, figures of men and animals, wreaths of autumn leaves spring flowers and vines, or they may be ornamented with stencil work or covered with stucco. The woodwork is sometimes finished dull and sometimes in bright colors. If dull finish is wanted, the surface should be flattened. All woodwork after filling may be treated with rubbing varnish.

The appearance of a finished car will depend largely upon the skill and taste that have been exercised by the head painter in making the designs for letters and ornamentation, and in so blending the finishing colors that they will harmonize. Care must also be exercised in selecting the colors, that when faded even, some degree of harmony will be preserved.

In the direction of car ornamentation there is a broad field in which a painter can exercise his ingenuity. No set designs for copying can be given, but a few are presented in this connection which may suggest to the thoughtful painter other conventional forms which he can introduce with pleasing effect.

The seats may be upholstered with hair or rattan cushions, or seats and backs may be made of perforated veneer covered with Wilton carpet. In some cases build-

ers have seat carpeting woven in special designs. If window curtains are employed, they should be of durable material (Russia leather) and mounted on self acting stop rollers with brass guide rods. In some climates, neither curtains, cushions nor carpeting can be employed, owing to their furnishing a harbor for insects.

The floor may be covered with matting made of wood, wire or jute. A very durable floor finish, known as the Everett system, consists in reinforcing the plank with narrow wooden strips, about half an inch apart, laid lengthwise in closed cars, and crosswise in open cars and fastened with screws. To prevent warping, the strips should be divided into sections of three or four feet. In some cases the floors are first covered with linoleum before the strips are put down.

The bronze trimmings are next put on, and include the end window guard rods, window lifts, strap pole brackets, bell bushings and bells, fare wickets, brake handles, etc.

The body being sufficiently elevated the truck is run under, body lowered and sills attached to the truck. The spring box, radiating draw bar, and carriers are now added, all wires connected, trolley stand put in place, when the car is run out and is ready for the road or for shipping.

(*To be continued.*)

Legal Intelligence.

ELECTRIC RAILWAY—INTERFERENCE WITH TELEPHONE COMPANY—INJUNCTION. In an action to enjoin defendant from operating an electric railway, wherein the referee dismissed the complaint, and the plaintiff appealed.

Held, 1. That a grant by the legislative and municipal authorities to a street railway company, to use electricity as a motive power, though it does not designate the particular system by which the power is to be supplied, does not give the company a right to use a system by the use of which the electricity will pass from the street and interfere with the current of a telephone company, which has previously lawfully erected its poles and wires on private property, where there are other systems which might be used by the railway company at a greater expense, but at less additional expense than would be required by the telephone company to change its system.

Held, that where a street railway company is about to use electricity as a motive power, to be supplied by a system which will allow the current to escape to the wires of a telephone company, erected on private property, and to continuously interfere with and injure the business of the telephone company, an injunction will lie, there being no adequate remedy at law.

Hudson River Telephone Co. v. *Watervliet Turnpike, etc., Ry. Co.* N. Y. D. C, Oct., 1891.

Note: This decision is contrary to the holding of the Ohio Supreme Court in the case of the *Cincinnati Inclined Plane Ry. Co.* v. *City & Suburban Telephone Co.*, decided June, 1891. There it was held that the dominant purpose for which streets in a municipality are dedicated is to facilitate public travel and transportation and, in that view, new and improved modes of conveyance by street railway are by law authorized to be constructed and a franchise granted to a telephone company of constructing and operating its lines along and upon such street is subordinate to the rights of the public in the streets for the purpose of travel and transportation. No priority of right can be given the telephone company, and if its operation is interfered with by the improved mode of travel, the remedy of the telephone company will be to readjust its methods to meet the condition created by the introduction of electro-motive power upon the street railway.

CONDEMNATION PROCEEDINGS — CORPORATE EXISTENCE — PRIVATE OR PUBLIC PURPOSE—JOINT USE OF ANOTHER COMPANY'S TRACK. In a proceeding by plaintiff street railway company to condemn the right to use equally and jointly with defendant street railroad company certain street railway tracks in the City of Toledo, the court *Held:*

1. That proof of the corporate existence of plaintiff is made out by placing in evidence its articles of incorporation, its certificate of subscription to the capital stock and the record books of the company showing the election of officers, etc.

2. The right of the plaintiff to make the appropriation is shown by establishing that the appropriation is for a public and not merely a private purpose.

3. The inability of the parties to agree as to the compensation for the property taken is established by proof of *bona fide* attempts to reach a settlement and not merely colorable, formal efforts; no special or set forms of words is necessary, and acts showing a desire and effort to agree may be as convincing as speech itself.

4. The necessity for the appropriation by one street railway company of the joint and equal use with another company of street railway tracks laid in a public street in Toledo by the other street railway company will not be defeated by proof that no physical impossibility exists to prevent the plaintiff company from operating a slightly different route. The discretion conferred upon Council to first pass upon the necessity and need for a street railway is not to be disregarded by the Court.

Seniority of rights in a street confers no priority of right, and a junior street railway company is entitled to take a joint and equal use of tracks with a senior company.

Proof of a street being a business centre where the people largely seek to go, will establish the necessity for such appropriation. And the people of one portion of the city will not be given a greater opportunity to go there by street railway than those of another portion. The police powers of the city are ample to regulate the joint use of the track by the different companies.

Toledo Electric Street Railway Co. v. *The Toledo Consolidated Street Railway Co. et al.* Lucas County, Ohio Probate Court, November, 1891.

STREET RAILWAY CO.—INJURY TO PASSENGERS—EVIDENCE. In this action against the defendant company for personal injuries where it appeared that plaintiff while standing on the side step of a crowded car on defendant's road, was, without fault on his part, struck and injured by another car going in the opposite direction on the adjoining track. There was evidence that at the place of the accident the tracks were nearer to each other than at other places along the road, and also that, by the sinking of the inner rails on the tracks, the cars pitched toward each other, making the position of a person standing on the steps dangerous.

Held, that a verdict for plaintiff, on the ground of defendant's negligence, was warranted.

Gray v. *Rochester City Street Ry. Co.*, N.Y., S. C. Oct. 23, 1891.

INJURY TO PASSENGER—ALIGHTING FROM MOVING CAR. The plaintiff set forth in his declaration, that he boarded defendant's car, paid his fare to a certain place, and ordered the driver to stop and let him off when he reached that point. Supposing his instructions would be obeyed, he got on the rear step, and, as the car did not stop, he was thrown violently to the ground, and received severe injuries for which he asked $500 damages. The defendant demurred to the declaration, which was sustained and the plaintiff appealed.

Held, That a declaration which alleges that plaintiff boarded defendant's car, paid his fare to a certain place, and ordered the driver to stop, and let him off at that point, and, supposing that the car would stop, went to the rear step, and, as the car did not stop, was thrown to the ground and injured, states a cause of action and requires an answer, and does not show contributory negligence. Judgment reversed and remanded for new trial.

Bowie v. *Greenville St. Ry. Co.*, Miss. S. C., Oct. 1891.

THE Brooklyn City Railway Co. have recently ordered fifty-five new eight wheel, thirty-four foot, open cars for their South, or Fort Hamilton division. These orders were placed as follows: Twenty cars with the Lewis & Fowler Manufacturing Co.; twenty cars with J. M. Jones' Sons, and fifteen with the J. G. Brill Co.

Important Leases in New York.

During the last month negotiations have been commenced by which the Metropolitan Traction Co., which already control a number of the most important lines in New York City, will secure possession of two more extensive systems, and while the contracts at the time of going to press had not been actually signed, matters had been carried so far that the result is practically assured. The lines which will thus pass under the control of the Traction company are the Sixth Avenue and the Ninth Avenue lines. The life of the lease in each case will probably be put at 999 years.

The nominal lessor in the case will be the Houston St., West St. & Pavonia Ferry Railway, of which D. C. Lamont, a leading member of the Traction syndicate, is president, the reason being, it is said, on account of a clause in the charter of the Traction company which prevents it making contracts of this kind. Both lines will probably be cabled soon. There has been quite a rise in Traction stock since the announcement of the proposed leases.

The Boston Rapid Transit Question.

It is most interesting to watch the various phases of the rapid transit problem in Boston as they approach solution at the hands of the Rapid Transit Commission. The latter is a very able body, and has applied itself to its enormous task with commendable industry. Its work comprises three distinct features: The improvement of our present system of surface transit by street railway; the rearrangement of the terminals of the steam railways, and the better organization of their suburban service and the establishment of a system of urban rapid transit.

It is evident that the entire problem cannot be satisfactorily solved within the brief period assigned the commission to complete its work, but the plan will be pretty well outlined in its permanent features, and it seems now likely that its elaboration and extension will be entrusted to a permanent commission.

The proposed constitutional amendment permitting cities and towns to take land for public improvements in entire properties is viewed with general favor. It will allow improvements to be made at much less expense than is now possible, for more land can thus be condemned than is absolutely needed for the improvement, and the rest can be either resold or leased.

Some impatience is felt at the slowness of the process of constitutional amendment, for as a passage by two successive legislatures and then a submission to the people is required, after which laws necessary to make the amendment effective must be passed, something over two years must go by before any steps can be taken under it. The actual work of selecting a desirable rapid transit system is a problem most difficult to deal with owing, to the complications introduced by Boston's narrow streets and Common, the public being extremely jealous of entrenchment upon the historic pleasure ground.

The features of the urban rapid transit system proposed and already described in these pages, are a ring or circuit line connecting all the steam railway terminals with the exception of the Boston, Revere Beach & Lynn, and running through the congested district, with radiating lines to the outlying sections. This system will consist partly of an elevated railway and partly of an underground railway. The operation of the line by electricity will make the transition between elevated and underground an easy matter.

Besides a "shuttle line" to the East Boston and Chelsea ferries, the radial lines will run to South Boston, Roxbury, Cambridge, Somerville and Charleston. With such a system trains can be run very easily from any given outlying section by way of the ring line through to any other outlying section with easy facilities for transfers. For instance, a train starting from South Boston would run over the westerly side of the ring line through to Cambridge or Somerville, and the next train from the same section might run over the easterly side of the ring line through to Charleston.

How the line shall be built, is one of the most important questions. Although a report upon this matter will probably not be made for some time to come, it has become pretty generally understood that the commission has practically decided to recommend that it be constructed under public auspices, for the reason that it is considered an undertaking too large to be entrusted to private enterprise, which could hardly be induced to take hold of it except under conditions which could hardly be sanctioned by public opinion. It is held that the cost of building the system by the public would be much less than by a private corporation, for the reason that money for the purpose could be obtained by the city or the state on much more favorable conditions than by private enterprise. Moreover, in the former case, by the establishing of a sinking fund, the capitalization would eventually be wiped out, leaving only the operating expenses and maintenance to be met from the earnings, while in the latter the capitalization would remain, with the necessity of permanently earning dividends upon it. These are understood to be the reasons that will actuate the commission in its report. Mayor Matthews, who is chairman of the commission, holds that it is possible to devise a method of constructing the system by public authority as economically as it could be done by private enterprise so far as the work itself is concerned; with the advantage, besides, of obtaining the necessary funds at a low rate of interest. It is not likely that the state itself would take the work into its own hands, although, of course, the state is largely interested, by reason of the effect upon its great city, and as the proposed system goes beyond the city limits into at least two other municipalities it would not be a work for the city of Boston alone. The plan that appears to meet with approval is to constitute a "metropolitan rapid transit district," which shall issue bonds for the purpose, that shall be guaranteed by the state, after the method now commonly pursued in Australia, and which was recently adopted by Massachusetts in establishing the metropolitan sewerage system for Boston and the surrounding cities and towns.

It has been strongly urged that the principle of public operation, as well as construction, of the system be adopted, but the commission appears hardly ready to go to that length yet; it is likely, therefore, that the leasing of the line for a term of years to a private corporation will be recommended, perhaps with a proviso that upon due notice and under certain conditions the lease may be terminated by the city, or district, as the case may be.

The street railway companies are much interested in a bill which was introduced into the Legislature last year, but has since been referred to the commission. As it definitely fixed the status of the street railways for thirty years at least, even though it subjected them to certain obligations in the way of taxation, etc., from which they are now free, Mr. Whitney favored it, since it would make the companies so secure in their relations with the state and the municipalities that capitalists would invest the sums needed for carrying out important improvements upon terms much more favorable to the companies than can now be obtained. But there is a strong public sentiment against such action, on account of fear of the consequences of tying up the city with a corporation for so long a term.

Mr. Whitney defined the supplying of transportation as a function belonging to the same order as the supplying of water, sewerage, or any other necessary business of the community. The West End company was blamed, he said, for being so often at the State House, but it had to go there in self defence when so many measures were brought up aimed at the integrity of its property. While favoring the proposed law, with its provision for a thirty years franchise, since it would protect the company from interference and thus assure cheap capital, he seemed to recognize the strength of the objection to it, for he expressed his willingness to accept a provision that the city could buy the property at any time it chooses, paying simply the value of the securities in the market for five years before the time the purchase may be demanded. He desired some law by which the company could get the cheap money needed; he would, therefore, have the charter properly fixed, let the stock be sold at auction, and provide in some such way as stated that the city might purchase the property. He wished laws that would give investments in the transportation system the same security as those made by the city of Boston, and if they would provide for the proper application of the revenue, and for the examination of the books and accounts it would meet the views of the company. With the company's present means the change of motive power from animal traction to electricity could not be made so rapidly as demanded. They were now running 275 electric cars and wanted 800; the people wanted them right off, but as limited by present conditions they could only go a certain distance year by year.

The cities and towns now served by the West End company have at present the right to take possession of the property, although there is no direct provision to that effect in the charter of the company. But in the charters of the original companies out of which the West End was formed, provisions were made for municipal ownership on payment of the par value of the stock together with ten per cent. dividends on the same from the beginning, after deducting the amount of dividends already paid. The charter of the West End provided that that company should assume all the liabilities and obligations of the companies out of which it was composed. It would not only be a very complicated matter to estimate the sum to be paid in event of the change to public ownership, owing to the various issues of stock by so many companies and the varying rates of dividends thereupon, but a dismemberment of the system would be necessitated by reason of its existence in so many different municipalities, and without further legislation it would be hardly possible for all these municipalities to act in unison upon the matter.

Mr. Whitney's proposition to pay the market value of the stock for five years previous—that is, its average value for that period—would greatly simplify the problem of assuming public ownership, particularly if coupled with a provision for this being done by the suggested metropolitan rapid transit district.

Although the West End company proposed to construct the elevated system and still has a charter for that purpose—now held in abeyance pending the report of the Rapid Transit Commission—Mr. Whitney says that the company now does not care to take hold of it, having enough to do to look after the surface system. He thinks, however, that some means should be agreed upon by which the surface and elevated systems can be operated in harmony.

If the elevated system is to be constructed by the public and then leased, the West End company would, on that account, doubtless be the most suitable lessee.

The question of the steam railway terminals and their suburban service remains for consideration. The Rapid Transit Commission has as yet made no report upon this subject, but it is understood that a thorough and radical rearrangement of the terminals would be recommended.

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THE STREET RAILWAY JOURNAL

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We heartily invite correspondence upon all subjects of interest to street railway men. Information regarding changes of officers, new equipment, extensions, etc., will be greatly appreciated for our official directory and news columns. We especially invite the co-operation of all interested to furnish us particulars that the directory may be correct and of the greatest possible value.

Address all communications to
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Position Gives Power to Do is a trite saying, and one that eminently fits the STREET RAILWAY JOURNAL. But at the same time, this power is not utilized by the street railway fraternity in the direction, or to the extent that it might be. We have no means of knowing just what knowledge is of most worth to certain individuals in certain localities, unless they inquire for it; and it does not seem to be generally understood that we are in a position to act as an information bureau in almost all matters relating to the business. We are daily in receipt of letters asking for information regarding the success attending the use of certain appliances; from what parties other appliances may be purchased; the durability of track construction in certain localities; copies of patents; capital stock; bonded indebtedness, or income of certain lines; how to prepare exhibits for the World's Fair and secure space for the same, and many other matters, all of which we take pleasure in answering by letter or through the JOURNAL, so far as we are able to give the information desired. And when we do not know, we undertake at once to inform ourselves. We desire it to be more generally understood that this is our position, and that it is not a burden but a pleasure to give attention to matters of this kind. Not that we claim to know everything, but such questions indicate to us what we need to know, and enables us to conduct the paper in the direction of the best interests of the business at large. We have but one aim, and that is the betterment of the street car service, by helping in every way those who are engaged in it, by promoting a better acquaintance among the fraternity, by serving as a ready and best medium of communication between the manufacturers or dealers in supplies and the consumer, and also by encouraging the use of new inventions and bringing the inventor's work to public notice. If a better paper is wanted by those engaged in the business, they can obtain it by helping along in the lines above indicated.

The Introduction of Dynamite as a factor in the settlement of disputes between employers and employes is a subject which calls for more than passing notice. Strikes on street railway lines are, unfortunately, common. Two having more than the ordinary dimensions were in progress last month in this country, one being at Allegheny, Pa., the other at Indianapolis, Ind. In both, the original cause was the same; the question whether law abiding citizens should be permitted to manage their own property in their own way. In both the use of violence as an argument of the justice of their demands was freely employed by the strikers, and in both, this kind of logic met only the half-hearted remonstrance of the general public and municipal authorities. Only in Pittsburgh the strikers or their sympathizers went a step farther, placed a dynamite bomb on the track at night and blew up a car loaded with passengers. It is gratifying to know that the authorities are making vigorous attempts to discover and punish the perpetrator or perpetrators of the dastardly act, but it would be an interesting question whether the local government could not be held responsible in this and similar cases for damage to property resulting from violence which they had failed to prevent. The old English law of "hundreds" made the inhabitants of each city district pecuniarily responsible for every act of destruction or robbery occurring within its limits, on the theory that if they had afforded the necessary protection no violence would have occurred. The same claim was recognized by the Pennsylvania Supreme Court after the extensive riots of 1877, when, aided by an early statute, some of the sufferers recovered from Allegheny County the value of the property destroyed by the mob. Nothing would rouse the people and authorities to the justice of defending the property rights of a street railway company against a lawless band of strikers so much as the knowledge that they would be held liable for any lack of protection, and this thought would often change a silent acquiescence into a determined stand for order.

The Victory of the Ottawa (Ont.) Electric Railway in its fight with the snow is a fact of no little significance. It demonstrates that an electric street car service can be maintained successfully in spite of all the rigors of a Canadian winter. Whether such a result could be accomplished has been questioned. When the project of applying electricity in Montreal was broached it was rejected, we believe, for the reason that it was claimed that the continued operation of street cars during severe months was impracticable. The distance between Montreal and Ottawa is about sixty miles only, and the climatic conditions are in no wise different. While it was not denied, in the former city, that plows and sweepers would keep the tracks clear, still it was maintained that they would pile the snow in such shape on the sides of the streets that they would be impassable for sleighs. To remove the snow wholly from the streets was considered out of the question on the score of expense. During the winter months, therefore, in both the cities referred to, the cars were housed and passengers were carried in sleighs. When the new electric railway was installed in Ottawa the projectors expressed entire confidence in their ability to cope successfully with the severest storms, and to maintain their service. They studied the problem thoroughly, secured statistics from cities in which similar, though not as severe, conditions were found, and then made their plans. The result has been entire suc-

cess. Although it is found necessary to remove the snow wholly from the streets through which the cars pass in order that sleighing may not be interfered with, still the service is as regular as in warmer months. While the expense account is high during the periods of snow fall, still we understand that the item for labor is by no means so high as to prove disastrous. The significance of the victory lies in the fact that the experiment has been watched with the keenest interest by towns throughout Canada. There are a great many of the smaller places throughout Quebec and Ontario which are possessed of great natural advantages in the way of water power, and which are wholly without local transit facilities. Now that the proof is no longer lacking that roads can be operated throughout the winter, there arises a great probability that the water power will be harnessed and that the demand for street car service will be satisfied. Capitals are, usually, not enterprising cities, but by its victory in the snow combat Ottawa has earned a reputation, and Canadian cities generally may emulate to advantage the example of the capital of the Dominion.

The Toronto Experiment has been extensively referred to as proving the desirability of municipal ownership of street railways. The conditions under which the present contractors operate the street railway lines in Toronto have been so widely mis-stated, and so many false assumptions have been made from these erroneous statements that a resumé of some of the conditions existing in Toronto would not be amiss. The city owns all the street railway lines within its limits and leases them to contractors. It furnishes the roadbed, keeps it in condition and does all necessary paving and repaving and has agreed to purchase from the contractors at the expiration of the lease the entire operating outfit at a fair valuation, thus guaranteeing the safety of the capital invested. All that the contractors or lessees have to do is to provide for the operation of the road. The length of the lease is thirty years. In return, the city receives a certain percentage of the gross receipts during the period of the lease. These conditions must have been favorable to the lessees, otherwise these gentlemen, who have wide experience in the operation of street railways in many cities would not have accepted the contract; but this does not show that street railway companies in other cities can afford to pay equally large amounts to their city treasuries under other conditions for the simple use of streets. Many roads have, in advance of demands of actual traffic, laid lines in unsettled localities which have been operated at a loss with the expectation that future earnings would more than repay the amount expended. These suburban lines have been of the greatest benefit to the localities which they have helped to build up and the municipal authorities can well afford to allow them to reap some of the benefits which they were largely instrumental in creating. But even where the privileges enjoyed by the street railway company are exceptional and the traffic so great that some return to the public seems justified or is demanded for the right to build new lines, it is an open question whether some more equitable plan could not be adopted than that of paying certain sums or percentages into the city treasury. This practice, though somewhat common has one result only, that of lightening the tax assessment, and hence, is a discrimination in favor of the property owner. In other words, a benefit to which are all entitled is perverted to benefit a class and a class which least needs financial aid. A fairer method would seem to be no taxation of the street railway company beyond that paid by other corporations or individuals for defraying the expenses of the city government, and to make any added concessions from the railway company lie in the line of reduced fares or more frequent service. This would bring the benefit of valuable railway franchises to those who use the cars and to whom the entire value of any street railway franchise is due.

The Best Design of a Power Station for an electric railway has not been agreed upon. Men who have carefully studied the question with the sole object of reaching a correct conclusion, without interest in any class of machinery or desire to promote the sale of a particular kind of apparatus, have reached extremely different results. The proper sizes of engines and generators, the best method of connection, and the most advantageous arrangement of a station generally, for example, all involve questions concerning which engineers of the broadest experience and ripest judgment entertain radically different opinions. But there are certain matters on which we all agree. Of these, most essential is the elementary principle that a station should be built on a general plan. At no time would the necessity of conformity to such a principle have been denied, yet it has been disregarded in a vast number of instances, and, until recently, perhaps, its great importance has not been adequately emphasized. Stations have in many cases been well built, and each of the several departments, has, perhaps, been well designed, yet unity in the entire plan has been lacking and the result has been decreased efficiency and increased cost of operation, in addition to the host of minor evils which may be classed as inconveniences. The time has now come when more and more are railway men coming to regard their generating stations not as composed of several substantially separate departments but as units. Those who have followed articles bearing generally on station building which have appeared in the Street Railway Journal will realize how persistently this matter crops out and how important it is now regarded by the best engineering talent. If the design of the station be a good one, and if those engaged to plan each department be compelled to subordinate their particular part to the harmony of the whole, the result will be a station from which the more ordinary faults, at least, will be eliminated. There is one other point to which attention should be called, although the subject has been treated so frequently that it is rather hackneyed; still, the danger of fire is ever present, and the necessity of adopting precautions can never be too strongly emphasized. The fact that within the last few weeks three electrical stations in Chicago have been utterly destroyed by fire makes a reference to the matter especially timely just now. The day of installing costly electrical apparatus in tumble down buildings is, fortunately, passed, even in the electric light business. Some hard lessons have been learned, and heavy losses have been sustained by reason of the installation of plants in buildings wholly unsafe, and unfitted for the purpose. The electric railway companies have not suffered as bitter experiences for they have not sinned so heinously in locating plants; still their losses have been sufficiently high to prove instructive. In the design of new stations, perhaps, the matter of protection against fire should come first, and when the station is built the necessity of exercising the utmost care that the

danger may be kept at a minimum should never be forgotten.

The Street Railway Situation in Chicago has formed the topic for several articles which have appeared in these columns during the last few months. It has been stated that the surface railways on which the people have to depend wholly for intramural transportation, have been fairly overwhelmed by the tremendous demands made upon them. The public demand for increased facilities became so imperative as the result, perhaps, of the unreasonable and outrageous attacks of the press upon the surface companies, that Mayor Washburne, realizing that the approaching World's Fair would make matters much worse, appointed a committee of Aldermen, citizens and representatives of the street car companies to take the whole matter into consideration and make recommendations which might improve the situation. Their report has just been made public, and an abstract is given elsewhere in this issue. The document is extremely conservative in character and exceedingly mild in tone. It does not enter into the subject generally, but the suggestions it contains relate almost wholly to minor changes which may result in a speedy improvement of the street car service. It suggests that blockades in the business district might be made less frequent if teams be compelled to traverse one street when going in one direction while those going in another direction take another street. The duties of the police in preventing blockades are alluded to, and the committee also refers to the unloading of wagons, which is such a vexatious source of delay to street cars in Chicago. This matter was considered in our columns last month, and the committee reached the same conclusion that we did, that policemen should see to it that the streets were kept clear. Perhaps the most important suggestion that the committee makes is that the cable companies be granted additional loop facilities hitherto denied them. Certainly this is a decided victory for the companies. It was also suggested that the city ordinance providing that cable trains should not consist of more than a grip and two trailers be amended so that another car could be added. The most striking suggestion in the report is the recommendation that during the World's Columbian Exposition street cars be excluded entirely from the business section of the city. Such a radical change is demanded, the committee thinks, on the ground of safety. We do not think such a plan would be popular, although under the existing conditions there is much to commend it. The business district is so small that if the cars remained just outside the most crowded portion no one would have far to walk. What we have referred to thus briefly covers the greatest part of the report. If the ideas are adopted, the committee thinks that the transit facilities will be very greatly improved. A committee of the Chicago Tax Payers' Association has been investigating the same question, and its report is more radical than that to which reference has just been made. It makes some suggestions which are novel, and, on the face of them, commendable. For example, the proposition that certain cable lines be operated exclusively for express trains seems under certain limitations a very admirable suggestion, as especially on the North and South Side of the city such a plan, it would seem, could be arranged without any great difficulty. The suggestion that electricity be employed as a motive agent is not so valuable. In handling the traffic it is perhaps a very serious question if electricity would give as good service as the cable in the downtown streets in Chicago. Certainly only the overhead system is at present available for such service, and ærial wires are not permitted in Chicago at the present time. Electricity on the cross lines undoubtedly will be adopted, and will greatly add to the general efficiency of the service. Both the reports are well worth studying as they deal with a subject which is exceedingly complex, and of which some aspects most street railway men are obliged to study at one time or another.

Legislative Breaches of Contract with transportation companies have been common in the past, and at present form one of the chief dangers to which such companies are exposed. It is now generally conceded that one of the largest, if not the largest, conditions favorable to the industrial progress of a people is a rapid, convenient and confortable means of intercommunication, and that the rule holds as well for city and suburban traffic as for a communication between distant cities. No people realize this fact better than new communities who, in other localities, have tasted its benefits. So great is their anxiety on this point, that they frequently grant large concessions to any responsible parties in the shape of lands, freedom from taxes, guarantees of interest on the investment and in numerous ways, to encourage the employment of capital for such purpose. Often such investments in new communities are unprofitable for some years after they are made. Only in thickly populated districts is there any reasonable surety of immediate and profitable returns; and because of this general experience, the main reliance of the promoters of such undertakings is frequently confined to holders of real estate along the line, or to those whose property is likely to be improved by such a road. It is a very common experience among such communities after a number of street railways have been constructed under the described conditions, that the benefits derived are such an every day matter, that the people forget how hard it was to induce capitalists to enter the business, and in such forgetfulness they form meetings to restrict the growth of these "monopolistic" street railways, and through legislative enactments do what they can to restrict such "monopolistic" privileges. Capitalists will not invest their money without reward in one shape or another; it is folly to expect it. Consequently, if a community seeks the aid of capitalists, it must grant a profit in some way. Of course, any community can build its own railways, and in such ownership do what it pleases, but a pretty large experience in this field does not show much profit in it to the community. It has generally been found that private enterprise can make a good profit, where a road in the people's hands cannot make both ends meet. This result is due to a good many reasons, the main one being, in the case of a public road, that there is a lack of personal interest in the minds of both the management and in the employes. All of these workers go through their duties in a sort of perfunctory way, which means a great waste of resources. To conduct any business properly, and make a profit out of it, necessitates a watchfulness in details, and a strict economy in the entire management, a matter which is rarely, if ever, attained when the business is entrusted to public hands. Not that a publicly conducted business cannot be done at a certain cost, and at the same time be done well; but no instance has yet been shown where private enterprise could not do

the same business equally well in all particulars for considerably less cost. If it be conceded that private ownership can render the same service at a lower cost—and we could cite many examples to prove that to be a fact beyond all question, if space permitted—the next point to be considered is, the rights of such private owners. No man invests his money in a business when he has reason to suppose that the right of control of that money is to be taken from him after he has invested it. This can be set down as a fact beyond dispute. Conceding this, when a capitalist is invited to invest his money on a certain understanding that certain privileges are accorded him if he will put his money in it, and he invests his money with that understanding, it becomes a breach of trust on the public's part if, after the money is invested, it sees fit to alter the contract without the consent of the capitalist. It always takes both parties to an agreement to make any just alteration in its particulars. Merely because a public is the stronger party, does not justify it in ignoring the rights of contract, nor the rights of property. And further than that, it is not a safe proceeding for any republic to put into practice. In truth this very issue was the cause of the foundation of our republic, viz., a determination to be rid of feudal or government confiscation without due process of law. Now, can we in safety ignore all this past and vast experience of the misery consequent to ignoring property rights, and in the shape of legislative enact ments break contracts merely because the power exists to do so? A contract should not be broken without due process of law. In fact, the Constitution of this country does not permit it. If the public wishes to retain any part of the profits belonging to any franchise it grants, let all such provisions be incorporated in the contract when it is made. The public can no more justifiably break a contract to which it is a party, then the public can without process of law confiscate the private property of any individual composing it. Both acts are precisely the same thing. If a public franchise is worth anything, let a bargain be struck beforehand, and give public notice of it; then if capitalists can be found to put their money in it under the advertised conditions, well and good; and if the right is reserved by the public to alter the contract at will and without the consent of the capitalists, by means of legislative enactments, let it be so stated in the contract or franchise. In that way only, may later adverse laws be made which will accord with the Constitution of the country. But in so doing we venture the prediction that there will be remarkably few capitalists to accept the proposition. Usually investors do not do business that way. We merely suggest its being done, in order to convince the public that there is an element of injustice in attempting to do, after a contract has been made, what could not be done before.

Correspondence.

Communications on all subjects of interest to street railway managers are solicited. Names of correspondents may be withheld from publication if desired, but must be known to the editors. The correspondent alone is responsible for his statements and opinions, not the editors.

Cable and Electric Motor Power on Street Railroads.

February 15, 1892.

Editors Street Railway Journal:—

A letter writer in the Street Railway Journal, for February, says: "It would be interesting to know what reasoning finally induced the clear headed men" who control the principal street railroads in Brooklyn, to decide in favor of electricity (instead of the cable) for their lines.

A general survey of the press makes one wonder that cable railways continue to be built at all.

The magazines give us popular accounts of the progress of electricity; the big dailies have their electric column; the street railway journals are under a heavy electric pressure, and electric pamphlets, papers and paragraphs fill all the gaps. The presses are generously fed by the wealthy corporations, and numberless individuals immediately interested in the electric boom. Bonfires are lighted everywhere and nothing escapes the rake that can be made to blaze for the glory of electricity. There is more evidence offered for the efficacy of electric traction than sufficed to make a bonanza of Perkins' Tractors.

And who speaks for the cable?

Day after day we read the cable road costs nine times as much as the electric; its operating expenses per car mile are as 14.12 to 11.02 cents, or, with interest added, as 20.91 to 14.05; the cable road burns three times as much coal as the electric; the cable has an "efficiency" of fifty per cent.; electricity has an efficiency of eighty-five per cent.; operating expenses per passenger .05488 for the cable, against .04736 and so on.

You will recognize the figures. I did not invent them.

Some of us know better, and some wonder why cable roads are built; but the electric man has the next word, and it is: "As these figures have not been questioned by any authority upon the subject, they may be accepted as substantially correct."

It seems natural that some of the "clear headed men" who control street railroads should make the Brooklyn blunder. The mass of evidence is overwhelming.

Occasionally some one of these "clear headed men" suspects its one-sided nature. Perhaps he asks how it is that cable roads operating at such an enormous disadvantage pay, in the "twenty seven principal cities," 10.15 per cent. dividends against 5.59 per cent for the electric; and why in the census table of "eighty-one per cent. of the operating roads" the cable shows a net surplus $557,749, against $30,820 for the electric; and why cable road stocks are high and electric low; and why this electric road with a business of $1,500 per day cannot sell its bonds from San Francisco to London, while that cable road offering $2,000,000 at 9 A. M. has $2,500,000 called for by 2 P. M.; and why the papers are almost silent about some thirty-five miles of cable road to be built this year in a neighboring city while every mile of half-built electric road with its two cars is paraded in every possible way.

And having got this far he may chance to hear for the first time of cable roads operating for 9.5, 8.5, 7.4, 7.2 and 6.6 cents per car mile (exclusive of interest on bonds only); and of others for from fifty-five to forty-two per cent. of gross receipts; and of others for 2.75 to 1.50 cents per passenger; and he may be shown that the cable road burns one pound of coal to the electric three (instead of three for one), and that if fifty per cent. is a good figure for the "efficiency" of the cable road, no electric road can show forty per cent., or thirty per cent., and few, if any of them, twenty per cent. measured in the same way, and other unsuspected things.

If he himself "cables" he may give thanks, but he does not roar with a loud voice, and there is no "authority" in the shape of organized boomers of "systems" and of patents by the thousand, to drag him into the chorus.

I merely wanted to suggest why some cable roads are *not* built, and to explain the seemingly greater anomaly why some *are*.

Cable Railways.

New York, February 23, 1892.

Editors Street Railway Journal:—

My attention has been attracted by a communication in your last number signed "Civil Engineer," touching the reasons that have induced the hard headed business men who control the Brooklyn street railways to adopt the trolley system instead of cables. As your correspondent seems to be sincere in his desire for information I trust that the following explanation of the present status

of electric and cable roads will show the course of reasoning that inspired the wise decision that has been made:

As regards the quality of the service furnished the public, one may frankly state that, either system installed and operated in accordance with the best recent practice leaves little to be desired. The cable road possesses certain advantages that are unquestionable—the ability to surmount extraordinary grades, and a very high efficiency *when under particularly favorable conditions.* On the other hand the electric road also has its own characteristic properties—great flexibility as regards variations of speed, invaluable when a continuous line operates both in the city and the suburbs, the ability to back cars, very useful in crowded streets, and a comparatively high efficiency at light loads.

Either system is quite capable of giving thoroughly reliable service when properly managed. The electric road now and then is afflicted with a short circuit, the effects of which may easily be limited to a section of a few hundred feet in length, while if a cable breaks, the whole line is temporarily crippled, for it is utterly impracticable to subdivide it to any considerable extent. Fortunately a break does not occur frequently and a duplicate cable permits traffic to be soon resumed, provided the broken cable does not entangle its mate. Still, a failure in cable service is serious, as the Brooklynites had occasion to notice last summer when an accident on the bridge system blocked traffic for three or four hours in the busiest part of the day.

As to danger, little need be said. Accidents will happen on any rapid transit system whatever. The electric car, however, can be stopped or backed with great facility, which gives it a certain advantage in working its way through crowded streets. With cable cars there is always the unpleasant possibility of a broken strand catching the grip, in which case nothing but good luck can avert an accident. No street railway line is entirely guiltless of casualties, but I know of none with a bloodier record than some of the Chicago cable lines.

Your correspondent is apparently under the erroneous impression that the current from the trolley wire is capable of killing or maiming the passer-by in case of a break or a cross with another wire. In this connection I need only say that, having investigated every report of such kind during the past two years, I am able to state positively that up to date no human being has ever been killed or seriously injured in such manner. Furthermore, I have personally, like hundreds of others who have been engaged in electric railway work, received divers shocks from the trolley wire under conditions ensuring considerable severity, and while the experience is somewhat disagreeable, it is far from dangerous. The present standard voltage (500 volts) was chosen with public safety in view, and the event has proved the selection to have been a wise one.

Now, as to the commercial features of the case,: Did the conditions involve a comparatively short, straight line with continuous grades of above ten per cent., operating in a densely populated district, the cable would be chosen without hesitation. But street railway systems seldom operate only in regions of dense traffic, grades are very generally slight, curves are usually unavoidable. It is highly desirable to have continuous lines reaching from the suburbs to the heart of the city, fulfiling the conditions of rapid transit in the former, closely limited in speed in the latter. The system which adapts itself to all conditions economically is naturally the one to be chosen. So far as grades are concerned, any road that is commercially practicable for horses can well be operated by electricity.

Your correspondent desires exact data as to the cost of construction and operation of electric roads. These I am happy to furnish, and by way of comparison I have before me detailed reports from the officials of eighteen cable roads, giving the facts of cost, efficiency and operating expenses, and besides these a detailed estimate for a three mile double track cable road prepared by a well known authority on tramways, approved by several cable road contractors of wide experience. On these I shall base a comparison.

First, as to the general facts about electric roads. Details obtained from twenty-two trolley roads, in many cases coupled with examination of the books, gave the following averages: Total cost of construction and equipment, $555.60 per mile of double track; total cost of operation including maintenance and repairs of whole system, 11.02 cents per car mile; cost of power, including fuel, wages, and all power supplied, 1.96 cents per car mile. The average efficiency of these roads, reckoned from indicator card to car wheel, is, estimating from the known efficiencies of the several parts of the system, probably thirty-five per cent. This figure is readily attainable even with conditions somewhat unfavorable. The lowest recorded efficiency for an electric road of old and poor design is twenty-five per cent.

Now, as to the reports from cable roads: Average weight of rail per yard (eighteen roads) fifty-four pounds. Cost per mile of double track exclusive of power house and special features, (ten roads) $107,142. Cost of power per car mile (eight roads) 5.22 cents. Efficiency (thirteen roads) forty-one per cent. Three roads confessed to an efficiency of seventeen per cent., a figure I hope and believe unequalled by any electric road in existence. The highest efficiency noted was seventy-one per cent. and in this case it is stated elsewhere in the report, that the whole road is now being changed to the overhead electric system on account of expense and difficulty of operating cable by reason of the number and sharpness of curves. All these averages are taken from all the reports made on the given topic. Four roads only gave operating expenses (average 17.18 cents per car mile) a number too small for valuable conclusions.

Following are the estimates for a three mile, double track road, on both cable and electric systems. Figures for cable are drawn from authority named. Figures for electric drawn from the *Electric Railway* (Crosby & Bell), allowing, however, the same cost of track construction as given for the cable system:

ELECTRIC.		CABLE.	
Track	$111,000	General street construction	$301,396
Allows heavier rail if necessary, by reason of less paving expense.		(Track and paving, $111,000.)	
Bonding	3,600	Special street construction	28,500
Poles (set)	9,000	Ground, and power and car house, including chimney	40,000
Trolley and feed wire in place	8,700	Power plant, &c.	62,000
Station (can be placed irrespective of line, where real estate is cheap)	40,000	Rolling stock, 15 grip and 15 tow cars	33,000
Steam plant	15,000		
Electric plant	12,000		
17 Motor cars	59,500		
17 Trailers	20,400		
Total investment	$279,200	Total investment	$467,896

The accuracy of these figures can be easily verified by any contractor for either system. For operating expenses the authority mentioned, supposing each cable train to make 110 miles per day, fifteen being in operation, gives 8.4 cents per car mile. With interest added this reaches 10.5 cents per car mile

For the electric railway the cost per car mile of a motor car (the *Electric Railway*) on a conservative estimate is 11.33. Allowing about six cents per car mile for a trailer, a figure in accordance with fact, the cost of operation per car mile becomes 8.6 cents, or, with interest added, ten cents. Thus for the same line, with same high cost of track and doing the same service the electric service appears to have the advantage by about 0.5 cent per car mile—$6,000 per year. The accuracy of the figures for the electric road is attested by the average of the twenty-two roads referred to, and also by the facts that with trailers in use several roads are actually operated on about eight cents per car mile. The trailer is a material advantage as the cable men have found.

From the foregoing, it appears that even assuming the same conditions, a well managed electric road can compete on at least even terms with an economically built and operated cable road, while under more usual conditions when the electric road can be built and fully equipped for about $60,000 per mile as against $150,000 for the cable, the advantage of the former is marked. Possibly these facts may have entered into the minds of the gentlemen from Brooklyn and moved them to adopt the trolley system, instead of the undoubtedly efficacious, but too expensive cable.

Louis Bell.

February 19, 1892.

Editors Street Railway Journal:—

The paper on the "Relative Advantages of Cable and Electric Power on Street Railways," published in the February number of the Journal, is one of great interest to every one in the street railway business; but while the rates of variations there given in the cost of motive power may be applicable to the two roads considered, they will not apply in case of any great variation in the car mileage or to any other road. A more rational way would be to separate the individual items of cost into their constituent parts, and determine what are fixed and what will vary with the load or car mileage.

In an electric system, a car can make only a definite number of car miles in a day, and consequently any increase in car mileage necessitates a corresponding increase in the dynamo, engine and boiler capacity, and consequently in the number of engineers, assistants and firemen; the cost of engineers alone being constant.

Repairs of engines and machinery, and oil and waste for engines and dynamos, may be constant up to the capacity of the engines and dynamos, but increase directly as the number of engines and dynamos in use.

Part of the fuel and water is used in overcoming the friction of the engines and dynamos, and is constant for each engine and dynamo; and the remainder is used in overcoming the resistance of the line and in moving cars, and varies nearly as the car mileage.

Repairs of dynamos vary directly as the number of dynamos, and in a small ratio as the car mileage up to the capacity of the dynamo, it being evident that the more work is put upon it the more repairs it will need. Repairs of motors, line and trolleys, and lubricants vary directly as the car mileage.

In a cable road the conditions are similar to those of an electric. The cost of engineers is constant for all car mileage, while that for the assistants and firemen is constant up to the limit of the capacity of the cable, and beyond that increases in a ratio as the number of cables; the increase in the amount of machinery and boiler capacity necessitating a corresponding increase in the number of oilers and firemen. Repairs of, and oil and waste for, engines and machinery, are practically constant for each set of winding drums and engines Lubricants for cables and pulleys vary directly as the length of the cable or line. Part of the fuel and water is used in overcoming the friction of the machinery and engines, and is constant for each cable; the remainder varies directly with the loads hauled or its equivalent, the car mileage. The cost of the renewals and repairs of cables is made up of two parts; the first depending on the character of the road, the number of curves, and the details of construction; and the other depending on the loads hauled.

If careful tests were made of the existing cable and electric roads to determine the different items of cost as indicated above, and a comparison made of the results, formulæ might be made that would indicate very closely the cost of motive power for any car mileage on any length of road. Further, the total cost of operation, including the interest on the capital invested, can also be obtained, provided the cost of the different items of construction does not vary greatly in the different roads.

In both a cable and electric road, the cost of operation and the cars themselves are proportional to the car mileage; and the cost of repairs of road bed bears a ratio to the car mileage and the length of the road. The cost of the road bed is proportional to its length, while the cost of the plant is, in an electric road, nearly proportional to the car mileage; and in a cable road, is made up of three parts, one proportional to the car mileage, another to the length of the road, and the third dependent on the character and alignment of the construction.

If, then, in any street road—

L, miles long, and making

M, car miles, and

A, represents the fixed cost of superintendence and engineers.

a, cost per car mile for engineers, assistants and firemen.

B, part of total cost of repairs, and oil and waste for engines for a cable road.

b, cost per car mile of repairs of, and oil and waste for, engines.

C, cost of part of the fuel and water used, in overcoming the friction of the plant.

c, cost per car mile and the car mileage.

c', cost per mile of road of same.

d, cost per car mile of lubricants for dynamos and motors, and repairs of line and trolleys; and

d', cost per mile of lubricants for pulleys and cables.

e, cost per car mile of repairs of dynamos and motors.

e', cost per car mile of renewal and repairs of cable.

e'', cost per mile of road of same.

f, cost per car mile of cars and of operation.

g, cost per car mile of repairs of road bed, and

g', cost per mile of same.

h, cost per mile of road bed.

I, a fixed cost, depending on the character of the cable road.

i, cost per car mile of an electric plant, and

i', cost per car mile of a cable plant, and

i'', cost per mile of same.

Then the cost per car mile for any car mileage will be, for an electric road:

$$\frac{A + M\,(a+b+c+d+e+f+g+.06\,i) + L\,(g'+.06\,h)}{M}$$

And for a cable road:

$$\Big\{A+B+C+.06\,I+M\,(a+b+c+e'+f+g \\ +.06\,i')+L\,(c'+d'+e''+g'+.06\,h.+06\,i'')\Big\} \div M$$

Mechanical Engineer.

Track Brakes.

Boston, Mass., Feb. 12, 1892.

Editors Street Railway Journal:—

In answer to your inquiry as to the best form of track brake, I must say that I know of none that I would recommend; in fact I have never heard of one that was as efficient as a good wheel brake. It goes without saying that the only reason for having two sets of brakes on a car is in case the regular wheel brake mechanism should give out there is some other form of brake to hold the car.

My advice to all railroad companies would be to have a double set of wheel brakes; and they will find that they will have better results from a wheel brake than they will from a track brake. It is true, I must confess, that it prevents the flattening of the wheels; but as an emergency brake it is not in the race, particularly on electric cars.

All forms of track brakes have been attached to the side bars of the trucks. When applying a brake of this description I have observed that the resistance against such a brake would be the weight of the car, less the weight of the wheels, axles and motor equipment. If one stops to think for a moment he can readily see that the weight of the motor, wheels and axles, remains on the track and furnishes traction for the revolving armature, which will result in carrying the car some distance before it can be stopped with the track brake; whereas, the wheel brake resists the revolving armature.

I wish to say that our general manager, about a year ago, was impressed very strongly with what he heard of track brakes, and at his request I visited a neighboring city where track brakes were employed on a line having an eight per cent. grade. The track was in just the condition I desired, being covered with slush and snow. The superintendent of the railroad was present and assisted in making the test. The hill that runs toward the river was selected as the place for making the test. The motorman was ordered to run down the hill a little faster than usual and to stop with the track brake on receiving one bell. He applied the track brake with all his power, but the speed of the car increased as it descended the grade; when the speed became dangerous orders were given to apply the wheel brake, which was done, and the car came

to a stop about as quickly as it possibly could be done by stopping the wheels; and I tell you we would have gone into the river if we had not applied the wheel brake, for the track brake would never have stopped the car.

On my arrival home I reported what my experience had been with the track brake. The manager then instructed me to purchase one and apply it to some one of our short cars with the Bemis 6 A truck. When it was put on, the manager and others came out to see it in operation.

Our method of making the test was as follows: We applied the track brake with all the power that one man could give it; then we gave the motorman instructions to start up the motors and as a result the car would crawl right along with the track brake. In order to stop the car we had to apply the wheel brake. Our next order was to release the track brake and apply the wheel brake with all the power possible, which was done. The motorman's next order was to turn on the power and see if the motors would carry the car along, but they failed to do so; the fuse would blow first.

I wish to emphasize the fact that there is no sense in applying a track brake to any street car, horse, cable and particularly electric. After the power is turned off the electric car has considerable force which is entirely different from a horse or cable car. The only propelling force in the two latter is the momentum of the car, whereas, in an electric car there exists also the revolving armature. Then again, with the track brake a motorman might be careless and apply it in going over crossings and curves when it would be likely to catch on the guard rail.

I call to mind that on starting the cable road in New York City, the superintendent of that line devised, as I consider it, a very efficient track brake and applied same to cars. This was to be used only as an emergency brake. The time arrived when, as we may call it, the "emergency brake" was to be applied. On account of not being operated continually, it worked stiff; but for all that, the brake was applied and did not work very satisfactorily. The superintendent at once saw the weakness of same and ordered them from the cars, and instead applied an extra set of wheel brakes.

If railroads could depend upon brake mechanisms; that is, to have everlasting qualities, I do not see any reason to apply an emergency brake, for as long as the brake mechanism holds, the car can always be stopped. If the wheels and axles should break there is no necessity for applying a brake, for the car will stop of its own accord.

L. PFINGST,
Master Mechanic West End Street Railway Co.

Electric Traction Abroad.

CHICAGO, ILL., February 13, 1892.

EDITORS STREET RAILWAY JOURNAL:—

It affords me great pleasure to supply you with some particulars regarding my trip abroad. The object of my trip was to examine and investigate the workings of four electric conduit railways, operating in Buda-Pesth, Austria. As you will remember, the great firm of Siemens & Halske have been the pioneers in the electrical field. They built and successfully operated an overhead line four years before we had any similar road in the United States.

In 1883 we first began our efforts in the United States to build an electric railway, carrying the electricity under ground. This first line was built in Cleveland, O., under the Bentley-Knight patents. From that day to this, six different lines have been built, to my knowledge, at an expense involving many thousands of dollars, and I believe every one, without a single exception, has been abandoned, owing to the impossibility of successful working.

Some time ago, Siemens & Halske turned their attention to the construction of an electrical conduit, and we, having heard that they had succeeded in the problem undertaken, and that they had a road in successful operation in Buda-Pesth, were desirous of seeing same in operation. Our Mr. Meysenburg, when abroad last summer, visited Buda-Pesth, and was so much pleased with what he saw, that as soon as I could close down on our cable work, I went to Buda-Pesth. I found that the working of the first line had been so successful from an electrical and from an economical point of view, that three other lines had been completed, and that all four were giving entire satisfaction, and several other lines under the same system are now contemplated.

The construction of this road was so fully illustrated in the July issue of the STREET RAILWAY JOURNAL, that little remains for me to describe. In all the cities that I visited in Europe, I found the grooved tram rail in use. I did not see a buggy during my trip abroad. The tires on all the wheels are so wide that they do not enter this groove. Owing to this fact, the opening (which we call the slot rail in cable railway construction) is made where this groove would come, and it is made the same width as the groove in the ordinary rail, viz., one and three-eighths inches, a width that would not be permissible in American cities, where buggy tires are so very narrow. Having the slot under one rail, they necessarily made the conduit under the same rail. The other rail is held to gauge by means of tie bars, and carried on concrete. This construction would have to be changed in America for an ordinary open slot in the centre of the horse path.

I was particularly struck with the magnificent results achieved by the Siemens & Halske electrical machinery. They are building dynamos far in excess of American practice, some being 1,000 to 1,500 H. P. each. These being built directly upon the engine shaft, are driven at a considerable saving in power. I found the cars in Buda-Pesth being operated with one-third the amount of power used by an overhead electric line, of which I had some knowledge in the United States.

The construction of such a system in the United States would necessarily be expensive, for the reason that in building any substructure to sustain an open slot, we are compelled to build with reference to the street strain, rather than our car traffic; therefore, this road would cost about the same as a cable railway, but its advantages in operation are obvious. In the first place, the power will be directly as the number of cars operated. If we build a cable railway, say, ten miles long, we are compelled to expend 150 H. P. in operating the cable alone. We have to maintain all the carrying sheaves and curve pulleys. Of course, the larger the number of cars operated, the less the expense per car. We are also dependent upon the one form of transmission of power, the cable itself. If, through the carelessness of one of the gripmen, the rope is cut, all the cars on that line are stopped. In the electric road we have all of our machinery in the power house in duplicate, so that there is nothing to stop the line there. If anything happens to an individual car along the line, the next succeeding car can push it out of the way. I believe, therefore, that the electric conduit railway has a great field before it in the United States. It is used in Buda-Pesth, under similar climatic conditions to a great portion of the United States, and is successful from a mechanical and financial standpoint, as demonstrated beyond peradventure. I hope that it will be introduced into the United States within a few months, when those interested can have an opportunity to investigate its workings without making the trip of 10,000 miles as devolved upon me.

Regarding the street railway interests in general, your pages contain so many and such admirable articles upon the construction and work, that little is left for me to say.

I was pleased with the condition of the tracks generally, and the beautiful curves and switches. The rolling stock does not compare with ours in style and finish. Most of the horses appeared in admirable condition, and I found the employes polite and obliging, without a single exception. The zone system as used in Berlin, I believe could be introduced into America with greatly increased profits to our trunk lines. Mr. Whitney, in his very able address, which appeared in the June issue of the STREET RAILWAY JOURNAL demonstrated how largely the earnings of the West End company would be increased, could they apply the same rate of fare. Where a passenger gets

upon one of our lines, and is carried its entire length for a nickel, and sometimes, in Chicago, riding ten miles, it goes without saying that there is no money in it for the company. The person who has a long distance to ride, will be sure to get on the car, to the exclusion of the short rider, who would prefer to walk than to "hang on." If the fare were in proportion to the distance, I think we should have many hundred thousand more short distance riders.

If there is any additional information you would like, please command me.

Augustine W. Wright.

Concerning the Infringement of Corporate Rights.

New York, February 14, 1892.

Editors Street Railway Journal:—

Mr. G. Hilton Scribner, at each of the three last meetings of the American Street Railway Association, read an important paper relating to railway franchises and corporation taxes. His first paper was a masterly production, and was so recognized by the members of the Association who heard it; although in the last paragraph, relating to taxation, he was, I think, slightly in error. Mr. Scribner displays an unusual reasoning power all through his writings, and his ability in that particular belongs to a high order; and because he overshoots the mark in his last two papers on the New York State taxation issue, it is due to lack of knowing a few facts, rather than to any weakness of his logical ability.

Concerning the popular prejudice against corporations, especially those engaged in railway affairs, he most truthfully makes the following statement: "A corporation no sooner enters business than its stockholders, directors, and officers are made to feel in many ways, through the agency of the press, too frequently, and always by first contact with public officials, that it lives by sufferance; that its birth and being, though reluctantly permitted, is not approved by the public or by the state; that its methods and purposes are in some way inimical to the public, and that the rights of every other citizen making up the great public have been and are being infringed, in just the proportion that the corporation is prosperous; and lastly, that a very profitable business on the part of the corporation is a downright robbery of others, especially of those who are not engaged in the same line of business."

This is, indeed, an excellent summary of the railway situation so far as its relations to the public go, but it more particularly applies to the situation as it has been manifested in Western legislatures than in the State of New York, which his argument more particularly dwells upon. At the same time this feeling is prevalent enough even in New York, but it has not yet manifested itself in legislative action in the same degree, which particular takes away the edge of this issue in Mr. Scribner's argument. He quotes the New York *Tribune* in the following way: "It is not equal taxation to tax all the property of a company twice, once upon the entire value of securities representing it, and again upon the real and personal property which the securities represent." This is a sound view of the tax business, but Mr. Scribner misapplies it to the corporation taxation of New York. It does apply, however, to the taxation of real estate, and a second taxation of a mortgage on that same real estate, which indeed is a most unjust and burdensome matter. But it is not real estate which Mr. Scribner refers to; therefore he is in error by presuming the existence of a double taxation in the case of corporations, and basing a long argument on that presumption. Taxes are levied on corporations in as nearly a just manner as possible, except in one important particular, viz., where the corporation is permitted to "swear off" its liabilities against the assessment, regardless of the corporation's wealth; but this particular is against the state rather than against the corporation; or it may more properly be said, it is a premium upon a fraudulent evasion of taxation.

When corporations are assessed in this state their officers have a right to go to the tax office and make a declaration there of a true condition of their affairs; that done, all property they own which has been assessed and subject to taxation in another state, or is exempt from taxation under the laws of the United States, may be deducted from the assessment, which deduction comes under the head of "swearing off." The law of this state is very lenient in this regard, therefore there seems to be no great point in Mr. Scribner's denunciation of the injustice of the New York law in singling out corporations for unjust taxation when other owners of property are exempt. As a matter of fact other property owners are just as subject to the personal tax law as corporations; the latter are not singled out in any way in particular; every individual in the state is subject to the same taxation under the same law; although many individuals in the state do escape personal taxation, merely because the assessor cannot find out the existence of such taxable property, but this is an abuse of the law and has nothing to do with justice in dealing with corporations.

A large part of Mr. Scribner's second paper, and nearly all of his third paper, is based upon the imaginary injustice above described, which is a particular that makes an otherwise strong argument partially abortive. Of course the question of the propriety of any kind of a personal tax law does not enter the argument; that is an outside question; the statement made here is merely that the law as it stands does not discriminate against corporations. But his argument exceedingly well applies to the situation in numerous Western states, and in view of that application, if he would so put it, what he has to say is calculated to do a great deal of good; for in the West great harm has been done within recent years against all railway interests in the shape of special laws which are neither more nor less than modified forms of public confiscation of private property. In connection with this particular Mr. Scribner said a very wise thing, viz.: "But the ill treatment of corporations is also repeated with every session of legislature and court, with each issue of press and political platform, and, therefore, continual protest on our part, though that protest shall often but rehearse the story of kindred and like wrongs inflicted and borne before cannot be amiss. Petition and protest, patient and persistent, has often secured a hearing and effected a removal of undeserved political and social disabilities." That is a most true saying, and a matter which the press generally takes into too little consideration. The rule in such cases too frequently prevails, that when a protest has been once clearly stated, it is old news to say any more about it. This course of procedure highly pleases the malevolently inclined, who by persistence in their mischievous ways finally gain their purposes. Of course only important matters concerning large interests are alluded to, and this subject of public confiscation of private railway property, whether in the shape of taxes or adverse legislation, is one of them. I do not exactly agree with Mr. Scribner when he says in his third paper: * * * "that the majority would permanently hold the government and enjoy all its advantages, not the least among which would be this parasitical power of keeping its hands in the pockets of that minority class in which the prudent and thrifty are always found." While Mr. Scribner does not distinctly say that he believes the majority will develop into such parasites, in other words, that the country is going to the "demnition bow-wows," he hints that his fears lead to that conclusion; but I disagree with that supposition, because the history of the world shows conclusively that the inherent honesty of the people finally predominates over all other sentiments when the general public understands the true situation. History clearly shows that more crime is done because of ignorance on the part of the masses, than to any direct intent on their part to do unjust acts; and in this view the future security of the nation mainly rests in the publicity given of all wrongs and oppressions by the press of the country. When these wrongs are fully comprehended by the whole people, the days of the existence of those wrongs will be short lived.

J. B.

Accounts and Records.

In answer to the many inquiries we receive for simple and systematic methods of keeping accounts, we continue the lessons in book-keeping by presenting the following forms, which will be found admirably adapted for the purposes specified. These forms have been kindly furnished us by the superintendent of a railway company whose lines are remarkably well managed.

(A)

X. Y. Z. RAILWAY COMPANY.

BROWNSTOWN, *February 6th*, 1892.

Mr. *Samuel Jones*,

Foreman *First* Ave. Division.

Place bearer, Mr. *Paul Geary*, on with *Peter James*, *John Smith*, and *Henry Robinson*,

for instructions in the duties of *Conductor*.

B. G. Smith, Sup't.

To Sup't X. Y. Z. Railway Company:

Bearer *Paul Geary*,

has been under instructions with the undersigned for the number of days set opposite our names.

He is familiar with all rules and regulations, and with the streets along this route.

He is also familiar with all switches, curves and turnouts about the station, and the various branches connecting with this division, and I recommend him.

On with	*Peter James*	2	days.
"	*John Smith*	3	"
"	*Henry Robinson*	2	"

(B)

BROWNSTOWN, *February 13th*, 1892.

I, *Paul Geary*,

Born in *Brownstown*,

Age 30 Married.

Residence 2900 *Hill Street*,

Desire employment with the X. Y. Z. Railway Company as *Conductor*,

at *First* Avenue Division.

I have been furnished with a printed copy of the rules and regulations governing motormen and conductors of this company, have carefully read the same, and agree to cheerfully comply with all of said rules, regulations and conditions contained therein.

Occupation during last two years as follows:

Driver, Suburban & Eastern Railway Co., 8 *months; Conductor, People's Railway Co.*, 16 *months.*

Respectfully,

[Signed.] *Paul Geary.*

Recommended by *Frank Brown of Sub. & E. Ry. Co., Thomas Smith of People's Railway Co.*

Deposit made and badge furnished.

Thomas Hall, Sec'y.

Mr. *Samuel Brown*, Foreman:

Please assign Mr. *Paul Geary* to a place on the "Extra" List.

B. G. Smith, Supt.

Reported for duty, *February 15th*, 1892.

Sam'l Brown, Foreman.

Record of Employes.

The following blank (form A), note size, is handed the applicant when he is engaged, and he is also furnished with a copy of the Rule Book, and with a copy of instructions to motormen, if he is to operate an electric car. When this form is returned and the report is favorable, form B is furnished the applicant, which, after it has gone its rounds, is returned to the superintendent's office, and the two forms are attached together with mucilage and filed away alphabetically in a case provided for the purpose. When an employe leaves the service he is required to present to the secretary and treasurer, a note from the superintendent (form C), and which, when it is returned, is attached to the other slips relating to the case, and thus a complete record is kept of the dates when the party entered and left the service, and also shows where the party may be found after leaving the service.

Accident and Damage Records.

A book of blanks (forms D 1 and D 2) is provided for the conductors, one of which he is required to

(C)

X. Y. Z. RAILWAY CO.

BROWNSTOWN, *Aug. 1st*, 1892.

JOHN JONES, Treasurer:

Please pay (between the hours of 2 and 3 o'clock P. M.) *Paul Geary* the amount due him to date.

B. G. Smith, Supt.

Resigned to go to Chicago, Ill. Address, 541 Dearborn St.

(D1)

ACCIDENT REPORT BLANK.

Brownstown, January 1st, 1891.

On our 7:40 P. M. trip going East, at Broadway and Market Streets, a lady stepped off the car before the same was stopped. The bell was rung for the crossing, but she jumped off on the West side and fell. I stopped the car immediately and went back to her, but she was not hurt. Gave her name as Mrs. A. S. Goodmin, No. 3490 Belton Ave.

Witnesses: *N. Robins, 708 N. John Street.* *G. J. Martin, 1240 Broadway.*

W. Jones, Motorman Car No. 20.
A. Smith, Conductor " "

(D2)

REPORT BLANK.

Brownstown, January 1st, 1891.

On our 8:10 A. M. trip going East, at Twelfth and Martin Streets, we collided with a wagon belonging to the Thompson Commission Co., of 1130 Jefferson Street, in charge of John Hopkinson, damaging the same slightly and bending the dash of our car, No. 84. The driver pulled directly in front of us, within ten feet of the car, not giving the motorman time to stop.

Witnesses: *Jas. Wright, 102 N. Fourth Street.* *A. Peters, 4128 S. Broad Street.*

A. Wilkinson, Motorman Car No. 86.
P. Herbert, Conductor " "

fill out in case of an accident to persons or damage to property, the same blanks being used in both cases; the two forms, however, may be printed on different colored paper. When filled, it is torn from the book and sent to the superintendent's office. On being received at the office, type written copies are made, one of which is pasted to a manilla file wrapper having an item blank on the back. This being filled out, it is filed away for reference. The second copy is sent to the claim agent of the company, and if it is thought necessary for him to interview any of the witnesses at once, such names are indicated by a check mark.

(F)

..... 189

MOTOR REPAIRS.

Shop Foreman's Daily Report of Motor Cars turned in for Repairs.

Car No.	Motorneer.	Cause of Damage.	Remarks.
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....

Remarks. — Some Motormen take too many chances, thereby necessitating reversing motors to avoid collisions; others totally disregard Rule 1, of the Rule Book, relative to movement of switch handle, which, if moved too quickly, strains the armature. Foreman must note particularly, in each case, if damage is brought about by either of the above causes.

Method of Checking Armature Repairs.

The following (form E) is a copy of an eyelet tag which is provided for use as per directions on the reverse side. At the office a book properly ruled is kept, in which contents of card are copied. By this means the cause of damage is recorded and an accurate account is kept of all armatures repaired and by whom rewound.

Shop Foreman's Daily Report.

Form F is a blank for shop foreman's daily report. The blanks are about 9 x 12 ins., and are ruled with fifteen or sixteen lines.

Daily Power House Report.

The power house daily report is shown in Form G, and the sheets may be made of sufficient size to conform to the number of generators and engines in use. The foreman is also required to make a report of supplies drawn each day.

A large sheet is also provided (form H), on which is printed the names of all electrical parts, classified, and small car parts, on which the storekeeper of the motor repair department makes his report to the superintendent.

Window and Door Glass Record.

Form I is a blank 10 x 12 ins., which is designed not only for keeping a record of broken glass, but also for reducing breakage, and since this form was adopted on the above line the glass breakage, we are informed, has been reduced fifty per cent.

(Reverse—E.)

A tag must be attached to each Armature taken out, by the Foreman or some person designated by him, who must fill out the first six (6) lines.

The seventh and eighth lines must be filled out by Armature Winder repairing same, who must return the tag, securely attached, to the Armature.

The tag must be left on the Armature until the same has been placed in some car, when the Shop Foreman must fill out the last two lines and return the tag to the Superintendent's office.

B. G. Smith,
Superintendent.

(Front—E.)

1. Armature No. ..... 6342 .....
2. Extent of Damage *Bands on outside loose, also damaged commutator.*
3. Date Damaged *Feb. 5th*, 1892.
4. Cause of Damage *Worn out brasses.*
5. From Car No. ..... 5 .....
6. Motorman ..... *H. Smith.* .....
7. Repaired by ..... *Thomas Brown.* .....
8. Time Consumed ..... 8 ..... Hours.
9. Placed in Car No. ..... 6 .....
10. Date same was replaced *Feb. 10th*, 1892

(G)

December, 1891.

Machine No. 1. Time.			Machine No. 2. Time.			Machine No. 3. Time.			Voltage.	Average Amperes.	Average El. H. P.	Remarks.
On.	Off.	Run.	On.	Off.	Run.	On.	Off.	Run.				

Engine No. 1. Time.			Engine No. 2. Time.			Engine No. 3. Time.			Steam Pressure.	Average Eng. H. P.	Pounds Coal Received.	Remarks.
On.	Off.	Run.	On.	Off.	Run.	On.	Off.	Run.				

(H)

BROWNSTOWN, ... 189

B. G. SMITH, Sup't X. Y. Z. Railway Co.:

I herewith report the following material furnished from storeroom.....Avenue Division, this day and date.

Material.	Quantity.	Size.	Description.	For Car No.	For Car No.	For Car No.	For Car No.	For Car No.	For Car No.	For Car No.	For Car No.	To Whom Delivered.	Quantity Old Material Returned.
(1) Armatures:													
" Pinions													
" Pinion Keys													
etc.													

(I)

GLASS RENEWAL SLIP.

Day..... Date..... 189

Car No.	Conductor. Name.	Conductor. No.	Door Glass.	Side Windows.	End Windows.	Dome Glass.	Cause of Breakage.

REMARKS.—The foreman in charge must fill out car number and glass replaced, which information must be furnished him by the carpenter replacing same. This slip must then be posted in the conductors' waiting room not later than 5 o'clock A. M., and must be left there until 9 o'clock P. M. Conductors must fill out their name and number and cause of breakage.

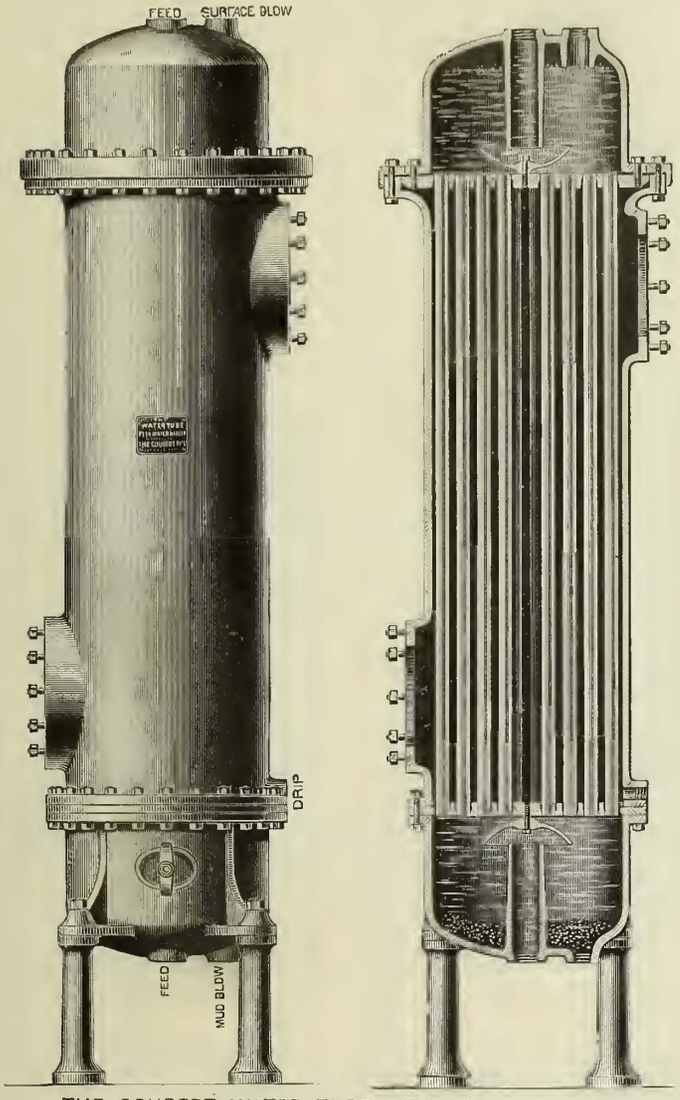
Statistics for Great Britain.

The following table gives the particulars of the street railways in Great Britain for the year ending June 30, 1890. By way of comparison the corresponding statistics for the year ending June 30, 1878, are also given.

	England and Wales.		Scotland.		Ireland.		United Kingdom.	
	1878	1890	1878	1890	1878	1890	1878	1890
Capital authorized (including stock, loans and debentures)	£4,657,663	£14,398,692	£1,189,462	£1,687,223	£739,016	£1,717,166	£6,586,111	£17,803,081
Capital issued (including stock, loans and debentures)	3,121,268	11,136,027	613,504	1,275,269	431,510	1,232,416	4,035,464	13,502,026
Length of line in miles	194	753	43	84	32	111	269	948
Number of Horses	6,269	21,681	2,122	4,126	831	1,912	9,222	27,719
Number of Locomotives	6	534	8	19	.....	22	14	575
Number of Cars	802	3,030	210	423	112	348	1,124	3,801
Number of Passengers carried	89,442,108	418,399,936	47,680,256	76,008,545	8,878,859	31,960,847	146,001,223	526,369,328
Gross receipts	£791,677	£2,573,535	£253,011	£417,350	£100,777	£223,858	£1,145,465	£3,214,743
Working expenses	579,471	1,932,444	212,960	296,493	75,884	173,863	868,315	2,402,800
Net receipts	166,012	641,091	40,051	120,857	24,893	49,995	230,956	811,943

The Goubert Water Tube Feed Water Heater.

The Goubert water tube feed water heater shown in the accompanying illustrations is composed of two cast iron water chambers connected together by a cluster of



THE GOUBERT WATER TUBE FEED WATER HEATER.

seamless drawn brass tubes, rigidly secured at their ends to the tube plates by means of a roller tube expander, in the same manner that boiler tubes are secured to the heads. These are the only parts of the heater under pressure. The lower water chamber rests on legs on the floor while the upper water chamber is free to move vertically as the tubes expand or contract.

The tubes are surrounded by a cast iron shell provided with inlet and outlet nozzles, to which are connected the exhaust pipes. This shell is bolted to the lower water chamber, but is free to expand independently of the tubes, its only connection at the top with the upper tube plate being made by means of a flexible corrugated copper expansion plate. This serves to close up the space between the upper tube plate and the shell, and has no pressure to withstand but that of the exhaust steam, although it is protected and backed up in such a manner as to easily resist any pressure that may come upon it.

At the extremes of temperature this corrugated copper expansion joint never has to spring more than three sixty-fourths of an inch either way and is practically indestructible.

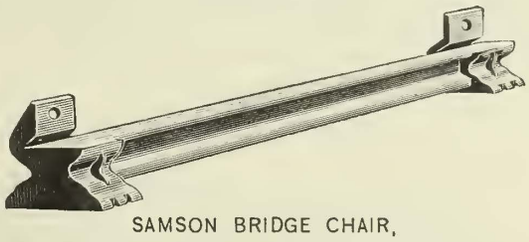
The water inlet and outlet pipes are made to project inside of the water chambers, and opposite them are placed dish shaped deflectors, the purpose of which it is to deflect the current and thereby promote the separation of scum and sediment. Suitable surface and mud blows and also a hand hole are provided for cleaning.

Among the advantages claimed for this heater may be cited the following :

The tubes are made of brass and free to expand ; the pressure being from the inside they cannot collapse, neither can they leak at the ends, as the greater the pressure the tighter it makes them. By simply removing the head all the tubes can be easily cleaned. The area for the passage of the steam between the tubes is from eight to sixteen times as large as that of the exhaust pipe, and consequently, it cannot cause back pressure. The water being divided up into small columns and in immediate contact with the heating surface, is quickly heated to the highest point. Being made entirely of cast iron and brass, it does not pit or corrode.

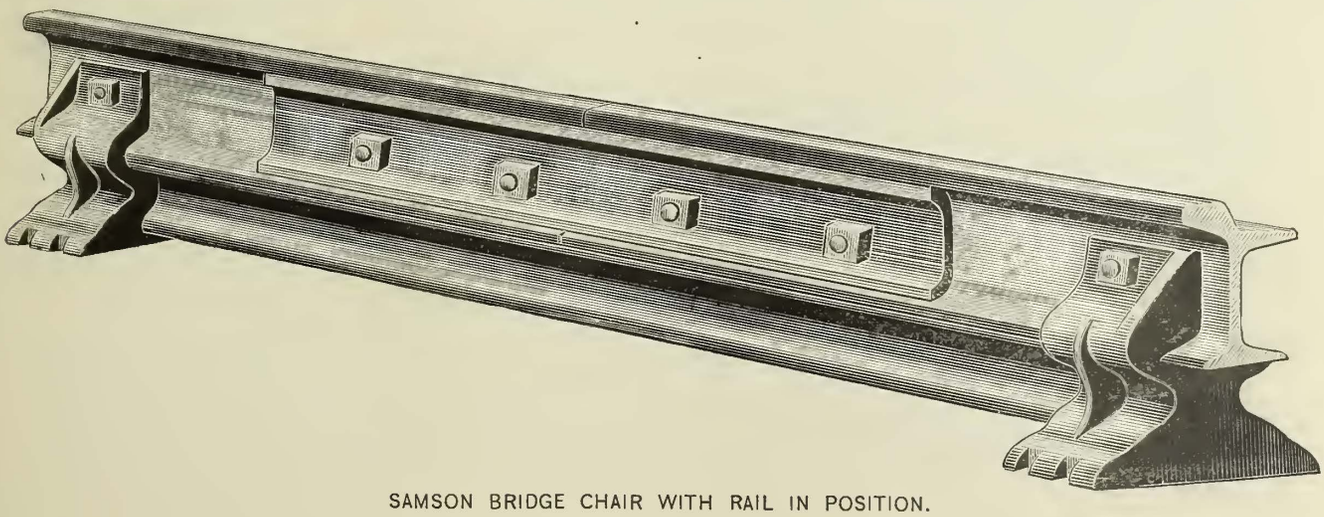
Samson Bridge Chair.

Many devices designed to support joints on street rails have proved ineffective because they have been too complicated or too light in construction. In designing



SAMSON BRIDGE CHAIR.

the bridge chair illustrated in the accompanying cuts, the Tramway Rail Co. of Pittsburgh, endeavored to reach a construction from which these objectionable features were eliminated. In the manufacture, a piece of T rail of sufficient length to reach from tie to tie is placed in the mould and upon each end is solidly cast of semi-steel the brace chair shown in the cut. In the form shown in the illustration this length is three feet. The semi-steel in cooling shrinks upon the ends and the result is a long bridge chair actually in one piece, with nothing whatever



SAMSON BRIDGE CHAIR WITH RAIL IN POSITION.

about it to work loose or break. Holes are left in the brace portion of the chair through which bolts pass for holding the rail securely against the brace and for preventing any lateral motion or tipping of the girder rail.

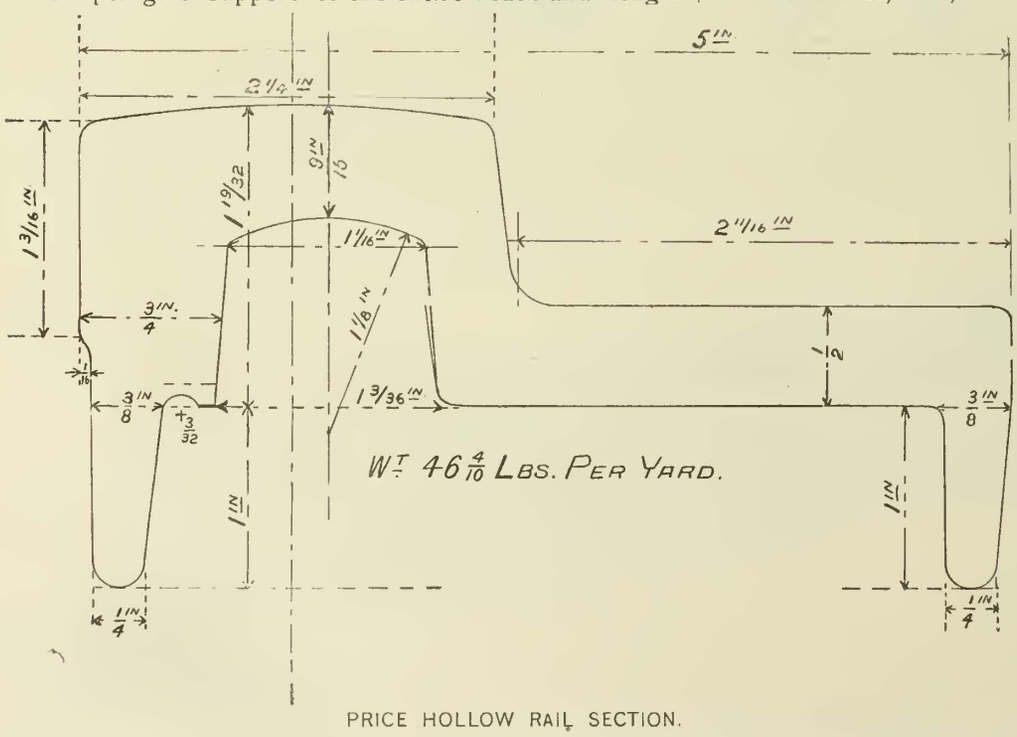
In practice the usual extra wide ties placed under the joint to receive the customary seven inch joint chair are done away with, and the ties are spaced precisely as if no joint existed. When the rails are placed in position the ends of the adjoining rails are caused to come in the centre of the bridge, and the heavy splice, having either four or six bolts, is adjusted precisely as if there were no chair underneath. The piece of T rail which forms the bridge of the chair being turned upside down furnishes a wide, level and unyielding support to the ends of the rails, and when the splice bar is properly bolted to its place it would be impossible to concentrate a sufficiently heavy weight on top of the girder rail to cause it to sink.

Great strength and simplicity are claimed for the chair, and the makers speak of it as an extremely economical device, because it takes the place of two ordinary chairs at no greater expense, and the use of the wide tie under the joint is rendered unnecessary.

The Price Hollow Rail Construction.

In this issue we present to our readers a new section of rail which, we understand, is about to be placed on the market by the Price Railway Appliance Co. of Philadelphia. In his anxiety to still further reduce the excessive proportion of ultimate waste in "scrap," Mr. James M. Price has widened the head of his solid rail weighing fifty-six pounds and so hollowed out its base as to reduce the weight of the rail by nearly sixteen pounds per yard. At the same time the arch which this section presents gives a strength equal, practically, to that of a solid rail, while a distinct increase of elasticity results. The hollow space beneath the head of the rail may find use as a channel to hold insulated wires.

It will be noticed that at the left the base of the rail is grooved. In this groove the upper edge of a plate of steel seven feet long is fitted. As with the Price solid rail construction described in our May issue of last year, these plates face each side of a wooden sleeper, and together with the sleeper give support to the entire width and length of the rail. Through the flanges of the rail frequent oblong oval holes occur coincident with others near the upper edge of these plates. Spikes through these bind together flange and plate, while a lower series secures the plates themselves firmly to the sleeper.



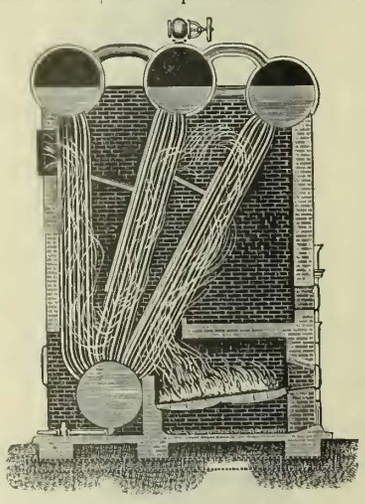
PRICE HOLLOW RAIL SECTION.

The inside face of the rear flange of this rail is not vertical but slanting. The purpose of this shape is to compress the top of the wooden sleeper and place the head of the rail almost directly over its centre, contributing much to the steadiness of the track. As with the solid rail, knees are used for securing the sleepers to the cross ties. These knees are for the most part short and touch neither plate or flange, thus avoiding concussion. Between the ends of the plates taller knees are used which fit the slant of the sleeper and with the braces act in lieu of tie rods.

It will be observed that this rail will tighten upon its supports as stringers wear, because of their wedge-like shape.

The Stirling Water Tube Boiler.

The claims made for the Stirling water tube boiler are durability, efficiency, and ease of operation. The general arrangement of the water tubes is shown in the accompanying illustration. As will be seen, there are four main drums, and the action of the fire is upon the tubes connecting these drums. The water is fed into the back upper drum, and during its passage to the lower or mud drum it comes in contact with the heated gas currents and becomes heated itself to a temperature of over 300 degs. At this temperature all the carbonate of lime, sulphate of lime, and other impurities are separated from the feed water and deposited in the mud drum where they are easily blown off, thus avoiding scale in the tubes exposed to maximum heat. As a result of this operation the two front banks of tubes are always filled with chemically pure water.



STIRLING WATER TUBE BOILER.

The tubes, also, are always practically clean on the outside as on the inside, because they are set at such an angle as to make it impossible for any amount of soot to collect on them.

The material for the drums and heads is made of the best open hearth flange steel. The material for the tubes is made of the best mild steel or the best charcoal iron. New tubes can easily be put in place if necessary.

The increase of traffic on the State Street line, Albany, N. Y., per day during 1891, over 1890 was about 1,000 passengers. Christmas week gave the largest receipts that the Albany Railway Co. have ever taken in a week, with the exception of one week during the bi-centennial of the city. The record of Christmas week showed nearly 2,000 passengers more a day carried for the seven days than for the corresponding week the preceding year.

Ten new motor cars have been recently received by the Albany Railway Co. from the Gilbert Car Manufacturing Co.

A Milwaukee Street Car and Tower Wagon.

A private vestibuled car, Fig. 1, has recently been put in operation on the line of the Milwaukee Street Railway Co., which is attracting much attention on account of its handsome appearance. It is twenty four feet long over all, seven feet nine inches wide and ten feet six inches high. The main body of the car is sixteen feet long, and it has a seating capacity for thirty people. The windows are heavy beveled edge glass, and the transom lights are cathedral glass of artistic design. Heavy nickel trimmings have been used both inside and outside, and the gates are also nickel plated and handsomely designed.

On the interior and in the vestibules beveled edge mirrors have been used to heighten the effect of the high polish finish, and the result is striking. Full length mirrors are so placed at the ends of the car and smaller mirrors above the windows in the vestibules as to reflect the interior of the car. The latter is finished with birch paneling and mahogany trimmings, with quartered oak head linings. The cushions are covered with mahogany colored Brussels to match the trimmings, and a Brussels carpet covers the floor. The car is lighted by three electroliers, the lamps being hung in fluted milk glass globes, with elaborate nickel trimmings. Single lamps hang from the roof in the vestibules. The windows have parlor car curtains and twisted nickel handle bars. An idea of the careful attention which has been paid to the finish in detail may be got from the fact that the hand straps are of embossed leather and the stove pipe is encased in mahogany strips.

FIG. 2.—TOWER WAGON—MILWAUKEE STREET RAILWAY CO

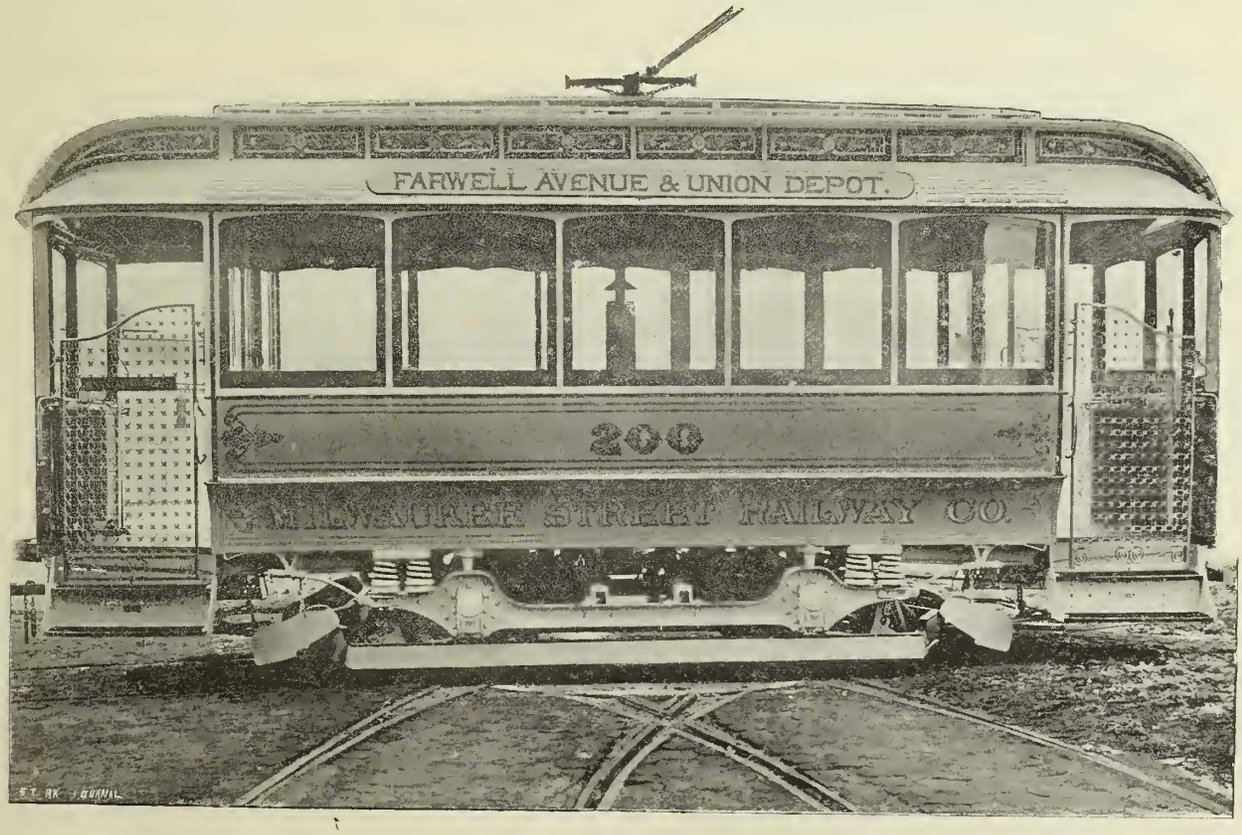


FIG. 1.—PRIVATE VESTIBULED CAR—MILWAUKEE STREET RAILWAY CO.

The same company have also in operation on their line, a neat tower wagon (Fig. 2), which is equally strong and durable. The lower part is rigid and is made of angle iron, which is also the material of the ladder. The cross piece at the top of the latter is very heavy, and the portion of the tower above that point is made of hickory and fits inside of the iron part of the tower so that it can be lowered like a telescope when not in use. The wooden part of the tower is manipulated by means of a crank and

the pulley which depends from the crosspiece. When the tower is raised to its full extent it is fifteen feet high.

Both the car and tower wagon were built by Superintendent Alex. Lynn of the railway company.

The Transportation Building at the World's Fair.

The extensive edifice now being erected at Jackson Park for the transportation exhibits at the Columbian Fair is now partially completed, and an idea of its massive proportions can be obtained by the visitor. Its appearance at present is shown in Fig. 1.

FIG. 1.—PRESENT APPEARANCE OF TRANSPORTATION BUILDING AT JACKSON PARK.

The main portion of the building measures 960 ft. front by 250 ft. deep. From this extends westward an enormous annex, covering about nine acres. This is one story only in height and in it will be placed the more bulky exhibits. The building is back of the Park and lies between the Horticultural and the Mines Buildings. Facing eastward it commands a branch of the lagoon.

The main entrance called the Golden Door will consist of an immense single arch enriched to an extraordinary degree with carvings, bas reliefs and mural paintings. The interior of the building is treated much after the manner of a Roman basilica, with broad nave and isles.

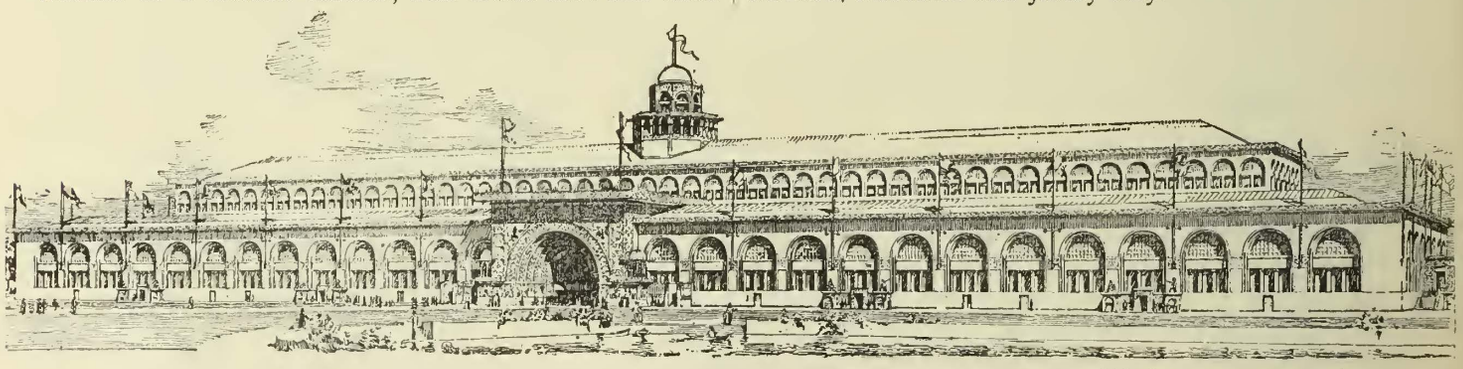


FIG. 2.—APPEARANCE OF COMPLETED TRANSPORTATION BUILDING AT WORLD'S FAIR.

The cupola, placed exactly in the centre of the building and rising 165 ft. above the ground, will be reached by eight elevators.

The Coming Convention at Cleveland.

A meeting of the Executive Committee of the American Street Railway Association was recently held at Cleveland. Subjects which will be brought before the October convention, were thoroughly discussed. The fact that preliminaries have been so carefully canvassed, will doubtless tend to make the convention of even greater interest than any previous meeting. None of the hotels in Cleveland has a hall sufficiently large for the sessions of the convention. The local committee on arrangements and the Executive Committee, considered the matter, and it was decided to engage Chase Hall for this purpose, which is a block distant from the Hollenden Hotel, the headquarters of the Association. For the exhibits, another hall, a block and a half distant from the hotel, was secured.

Cleveland will be an exceedingly interesting place for railway men to visit Besides the cable roads, at least three electric systems are in operation. The Cleveland railways are enterprising in trying new devices in connection with their roads, and many novelties are to be seen.

A New Jersey Street Railway Combination.

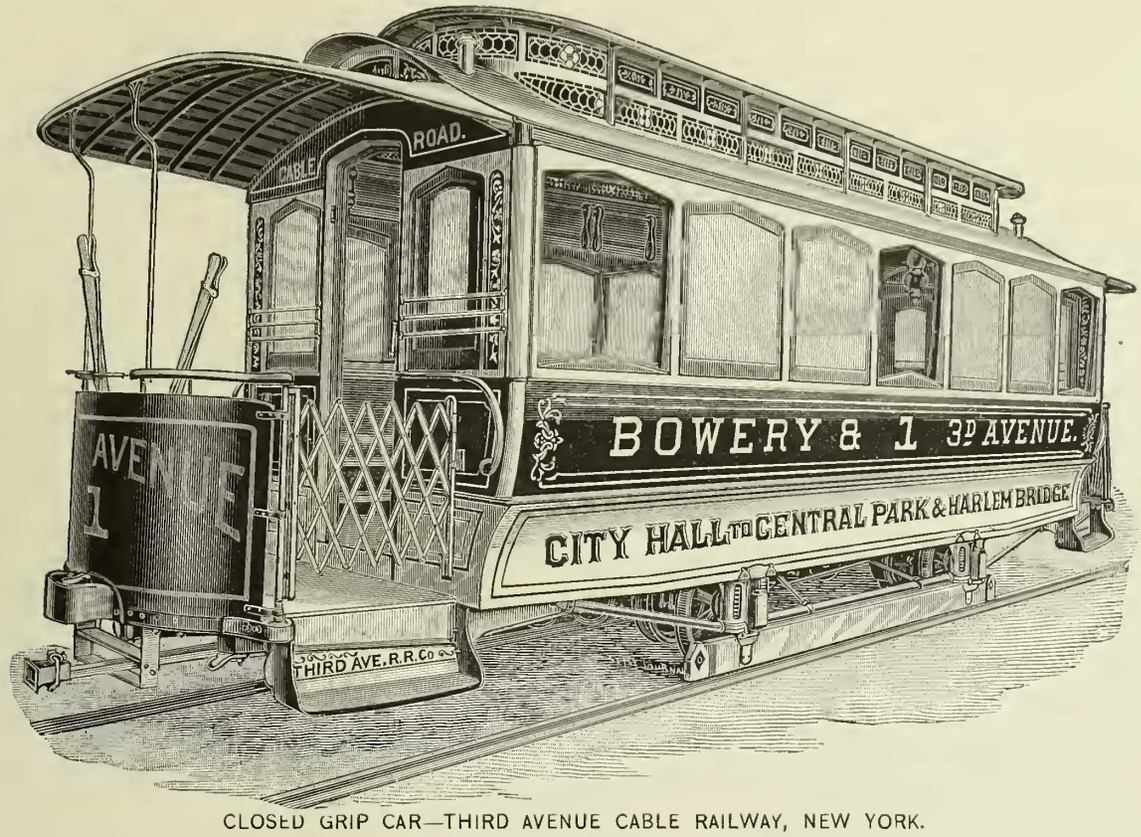
At a meeting of capitalists, held late last month, at the Essex Club in Newark, the New Jersey Traction Co. was formed, and under it all the street railroad companies in Essex and Union Counties except the South Orange li e of Newark will be consolidated. The new company will take charge of all lines and guarantee the stock and interest. The company is organized under the laws of New Jersey with a capital stock of $500,000, all of which has been subscribed. Among the cities affected are Newark, Elizabeth and Jersey City.

The special purpose of organization at present is to acquire control and possession of the entire Newark passenger railroad system, including any rights it may obtain in the operation of the new electric railroad to Jersey City, and to more fully equip and extend those lines and to operate them under one central organization. Stock in the new concern has been taken by the following, among others :

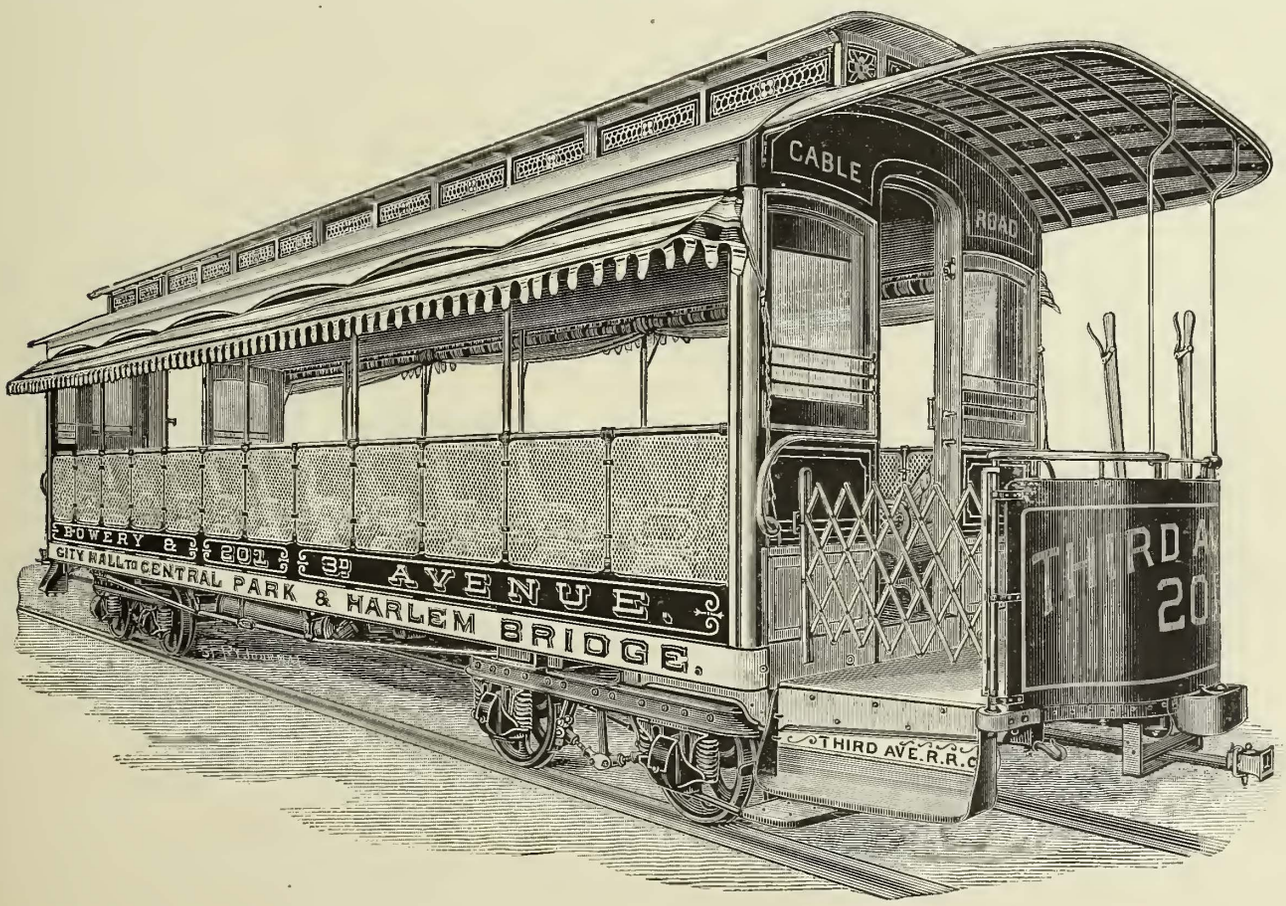
Benjamin F. Tracy, Secretary of the Navy ; John J. Waterbury, President of the Manhattan Trust Co. of New York ; Frederick Frelinghuysen, George A. Halsey, Bernard M. Shanley, Gottfried Krueger, Chandler W. Riker, Peter Hauck, Thomas C. Barr, A. Q. Keasbey, John H. Ballantine; Edward E. Denniston, Edward J. Moore, Philadelphia.

Third Ave[redacted]Cable Cars.

We take pleasure in presenting in this issue views of the two grip cars built by the Laclede Car Co., of St. Louis, for the Third Avenue Railway Co., of New York, and which were fully described in our last issue. The cars immediately impress the observer with their durable and handsome appearance, and reflect great credit on their manufacturers. Of the entire order of 375 cars, 200 will be closed and 175 open.



CLOSED GRIP CAR—THIRD AVENUE CABLE RAILWAY, NEW YORK.



OPEN GRIP CAR—THIRD AVENUE CABLE RAILWAY, NEW YORK.

A New Pinion for Electric Railways.

For street railway service every conceivable kind of pinion has been tried, including those cast from iron, steel and bronze, or gun metal; those with teeth cut from blocks of cast iron, steel and bronze; those made of rawhide treated in various ways; those made of rolled steel plates, bolted or riveted together, and those made of alternate layers of steel plates and rawhide, or some other non-resonant material, bolted or riveted together. Cast

pinions have given way to cut pinions, and of cut pinions, bronze, solid steel and steel plate or laminated pinions are about the only forms of metal pinions which survive; rawhide is largely used. Bronze, while having the merit of being the most quiet of all-metal pinions, is costly and the shortest lived. Cast steel lasts longer than bronze and costs less, but it is noisy.

Steel plate or laminated pinions have been found to outwear any other form of all-metal pinions, but they are almost as noisy as solid steel and about as costly as bronze, without its advantage—a market for the old metal.

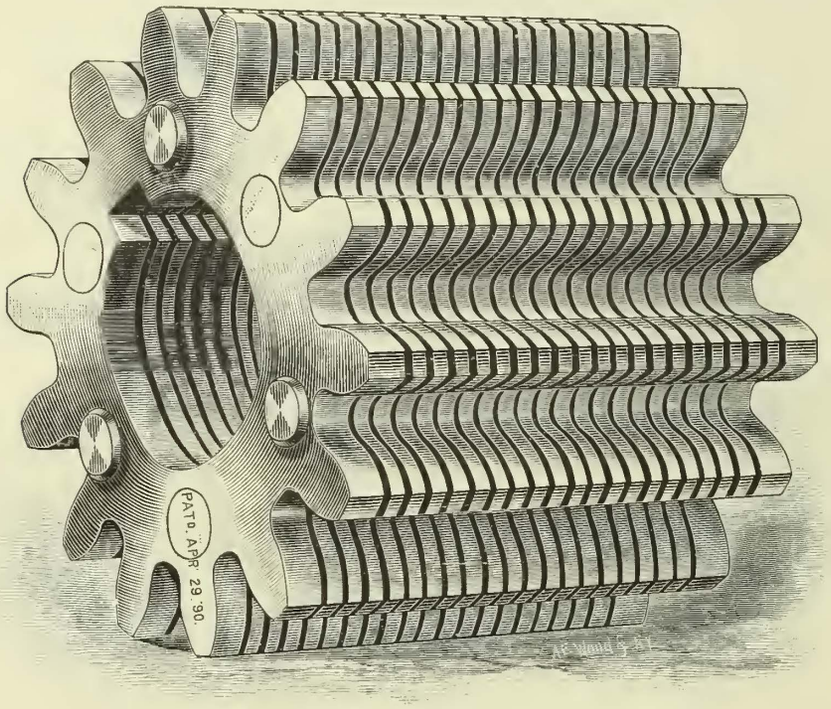


FIG. 1.—COMPOSITE PINION—SIDE VIEW.

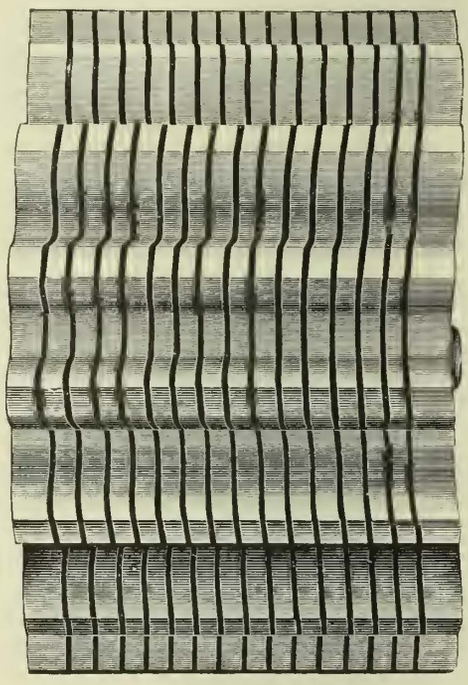


FIG. 2.—COMPOSITE PINION—FULL FACE VIEW.

At the beginning of active electric railway work (in 1888), composite pinions, made of rolled steel plates interposed with rawhide and closely riveted or bolted together, were largely used. They combined the strength and durability of the steel plates with the noiseless feature of the rawhide, and were thought to be all that could be desired, but they were abandoned after a time, owing to the fact that, the plates being flat and at right angles to the axis, the steel portions of the teeth traveled constantly in the same plane, gradually wearing grooves into the face of the intermeshing gear and the ridges thus left upon the gear in turn cut into and destroyed any new pinions used.

To obviate this uneven wear, the Chamberlain composite wave pinion has been put on the market. The invention is the outgrowth of a large practical experience in electric traction and the result of many painstaking experiments looking to the preservation of the well-known noiseless feature of the composite pinion, and the elimination of its tendency to cut and groove the intermeshing gear. It is made of rolled steel plates interposed with a non-resonant, fibrous material, closely riveted together under a hydraulic pressure of 4,500 lbs. to the square inch The non-resonant material is treated with oil so as to be impervious to moisture; it is compressed over fifty per cent. and will neither expand nor contract in use. The plates, instead of being flat, are crimped so as to present the appearance of having been warped or bent into three elevations and three depressions, radiating from the centre, like the spokes of a wheel or the blades of a screw propeller. This crimping or bending shapes the edge or periphery of the plates (on which the teeth are cut) into the form of a reverse curve or sinusoidal line.

The assembling of these crimped plates, with alternate layers of non-resonant material, will, as it may be readily seen, produce a pinion which, in its revolution, will present to the engaging gear, at any given point of contact, the surface of a metal plate and the surface of the non-resonant material three times each in one revolution. The metal and the non-resonant material, both describing a sinuous or wave line, produce on the engaging gear the same effect as though the pinion, while revolving, traveled at the same time laterally back and forth on the face of the gear with a wave motion.

The invention may be said to consist of a pinion so constructed that it will present to any given point on the engaging gear different parts of the pinion laminations; so that, in effect, each pinion lamination travels back and forth over a portion of the surface of the gear.

Figs. 1 and 2, full face and side views taken from photographs of one of the standard sizes, show the sinuous or wave lines.

Fig. 3 has been introduced to show the principle. In this, however, flat plates are shown to simplify the description. This is a sectional cut, the shaded spaces representing the metal plates, and the white spaces representing the non-resonant material. It will be noticed that the metal plates are slightly canted to the left (A, A). Now, if the pinion be given one-half a revolution, the metal plates will be inclined or canted to the right (see dotted lines B, B). It will readily be seen that a pinion constructed on this principle will, when in motion, present to any given point on the engaging gear with which it is in contact the surface of a metal plate and the surface of non-resonant material alternately, once in each revolution, and at the same time produce the same effect on the engaging gear as though it traveled laterally back and forth. The plates as manufactured are, however, so crimped that they present metal and non-resonant surfaces three times each in one revolution.

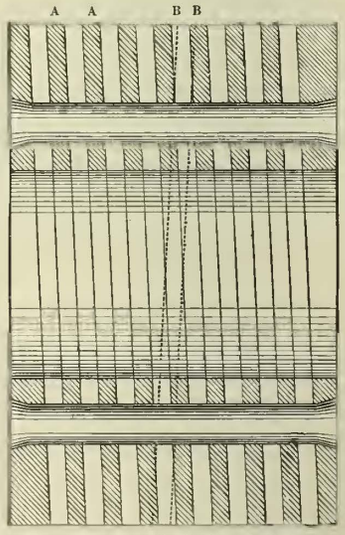


FIG. 3.—COMPOSITE PINION—SECTION.

It has been demonstrated by actual use, that a pinion constructed in this peculiar manner distributes the wear evenly over the entire surface of the intermeshing gear, so that the teeth of the gear are worn perfectly smooth and straight faced, all grinding action is absolutely avoided,

and wear, both of the pinion and gear, reduced to a minimum. The life and efficiency of the gear is increased, the whole face of its teeth being available as long as the gear is used, and the non-resonant fibre makes the pinion less noisy than solid metal; it has the superior wearing and strain-withstanding power of rolled steel presented edgewise to the work, and, it is claimed, comes nearer than any other form of pinion to filling all the requirements of the arduous service for which it is designed.

The Davis & Cowgill Iron Works, of Omaha, are the manufacturers of this pinion, and supply the Western trade. J. C. Chamberlain & Co., of New York, supply the Eastern trade.

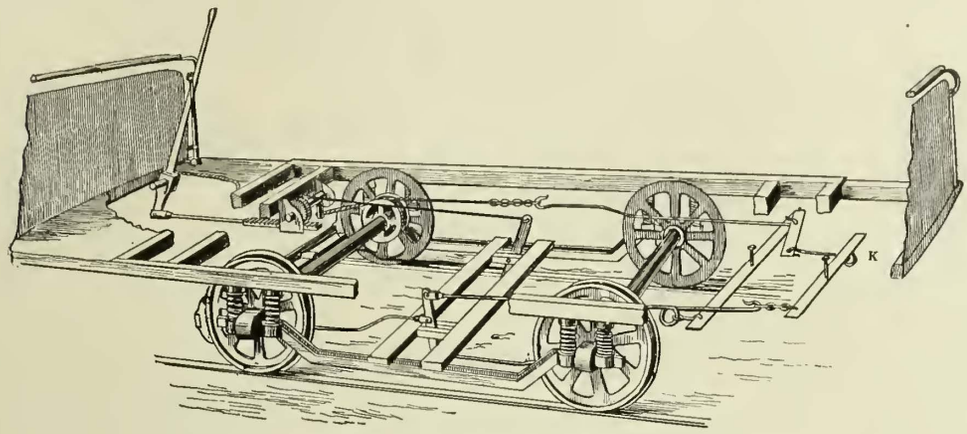


FIG. 1.—TRUCK EQUIPPED WITH CROSSLEY FRICTION BRAKE.

The Crossley Friction Brake.

A new brake which is claimed to be effective, and at the same time cheap to install and keep in repair, has recently been put on the market by the Crossley Friction Brake Co., of Cleveland, O. This brake has been in use on the Broadway & Newburg Street Railway of Cleveland since November 27, and the officials of that road speak of the results attained by it on their motor cars in the highest terms. The weight of the brake equipment complete is only 150 lbs. per car.

As will be seen from the engraving, one axle of the car carries a drum or spool about which a turn is taken of a tarred manilla rope. The outer end of this rope is connected with a simple mechanism under the car platform, shown in Fig. 2, by which the rope can be tightened about the spool by moving a lever on the front platform. The other end of the rope is fastened to a short lever at the centre of the same side of the car as the spool which operates the brake shoes in the ordinary way.

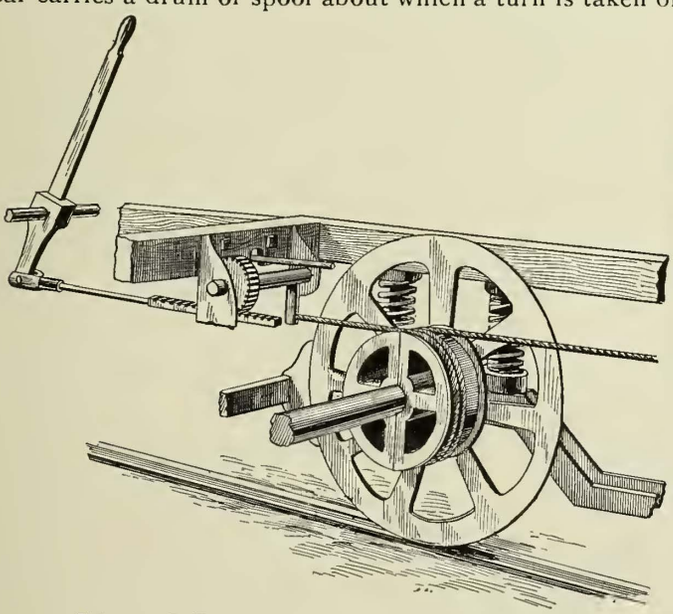


FIG. 2.—DETAIL OF CROSSLEY FRICTION BRAKE.

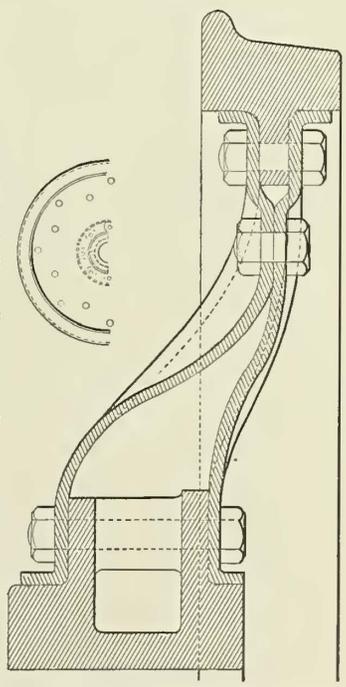
The equalizing lever, which is under the back platform of the car, has pivoted to one of its ends a short lever to which is fastened a rod or chain K. This rod, when a trailer is in use, is connected with the brake mechanism of the rear car, which is equipped like the motor car in every respect, except that there is no platform handle. On the end of rod K is a hook, so that, if there is no trailer, the rod can be hooked into the under side of the second lever under the back platform at the extreme end.

The operation of the brake will now be readily understood. When the brakes are not in use the rope lies loosely around the spool and there is no tendency to tighten. When, however, the motorman moves the platform lever and takes up the rope slack, the momentum of the car helps to set the brakes on the wheels. The same movement of the brake lever will set the brakes on the trailer, if one is in use, by moving the rod K—in this case the second lever under the back platform is not in use. The brake makes no noise in setting or letting off, both of which movements can be done quickly and with a single movement of the platform lever.

It might be supposed that the rope would wear out rapidly, but during a service on the Broadway cars at Cleveland of over two months, the ropes have shown no appreciable deterioration. The cost of replacing a worn rope is only about twenty cents.

Boies Steel Wheel.

The combination wheel which is illustrated diagrammatically in the cut was designed to insure constant contact of metal under all strains, and thus to prevent unnecessary wear and consequent looseness of parts. The wheel is so constructed that the rolled steel tire is joined to the cast hub by two corrugated steel plates of such shape as to oppose an elastic resistance in every direction. The fracture of the plates is prevented by the tensile strength and elasticity of the metal. It is claimed that the vibrations caused by the continual pounding of the tread of the wheel on the rails are absorbed in the spring of the curves, and that, therefore, one of the most potent causes of the crystallization of axles is eliminated. The curve in the plates takes up the expansion upon the application of the brakes and the subsequent contraction. It is, therefore, stated that the bolts do not become loose, and the strength of the wheel is not impaired. The tire is shrunk on and is firmly bolted to the plates by an internal flange so that it cannot be forced off the wheel by accident. This construction not only makes unnecessary the weakening of the tire, by grooves or slots, but, it is claimed, reinforces it to such an extent that it can be worn or turned down to the extreme limit of service, and in case it should break, the parts would still be held firmly in place by the bolts. The inner or central flanges of the plates are shrunken on each end of the hub supporting the weight, and there are also steel bands strengthening and binding the hub to the axle. The thrust of the axle is expended upon an arched spring of a strong curve in the



BOIES STEEL WHEEL—SECTION

opposite plate. The wheel is composed of only four principal parts, the tire, two plates and the hub. The tires are rolled from open hearth steel, and are matched in pairs of the same metal, so as to wear equally, and when worn out can be quickly and easily replaced in any properly equipped shop. The plates are of mild steel, formed hot by hydraulic pressure and annealed. The wheels have been used on cars of the People's Street Railway Co., of Scranton, Pa., and the management speaks of them in the highest terms. The wheel is made by the Boies Steel Wheel Co., of Scranton, Pa., and the New York selling agents are Coolbaugh, McMunn & Pomeroy.

High Speed Electric Railway Between Chicago and St. Louis.

A company, organized to build an electric line, connecting the cities of Chicago and St. Louis, has been incorporated in the latter city, under the title of the Chicago & St. Louis Electric Railway Co. The plan proposed is to install a high speed passenger service, by which 100 miles per hour can be attained. Three alternate routes have been proposed, as shown in Fig. 1, all of which show a straight or nearly straight line. Important towns near the line of route are provided for, connected with the main line by means of sidings. A sketch of the principal points of the proposed road, furnished by Dr. Wellington Adams of St. Louis, is as follows:

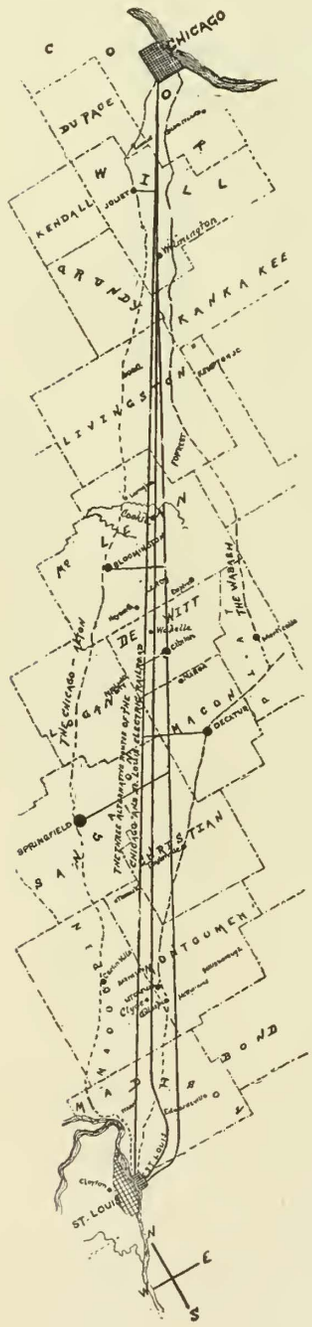


FIG. 1—CHICAGO - ST. LOUIS RY.

By the schedule time the trip from Chicago to St. Louis can easily be made in from two and one-half to three hours. It will not be necessary to travel at night, therefore no through passenger cars will be run after nine o'clock P. M., the tracks being reserved at night for high-class freight, mail and express matter. This does away with the necessity of running Pullman cars, and the expense to the company as well as the traveling public.

The character of the electric carriage or car is shown in Fig. 2. It is long, low, compact, light, but strong, having two pairs of driving wheels, each driven by a separate and distinct electric motor. The whole weight of the car with its passengers and of the two electric motors comes upon these two pairs of driving wheels and is, therefore, all available for traction or adhesion between the rails and the wheels, through the agency of which the car is propelled. The top of the car stands only nine feet from the rail, which is three feet lower than the ordinary street car. This brings the centre of gravity very low and near to the track. It has a wedge-shaped nose or front for cutting the air, which has the effect of decreasing the air resistance (a most important factor in high speed locomotion) and of helping to keep the car down upon the track. The motorman stands immediately back of this wedge-shaped point, and between his department and the rear wheels is the compartment for the accommodation of passengers. In the rear of this is a separate compartment for mail and high class express. The driving wheels are six feet in diameter and are capable of making 500 revolutions per minute. The weight of the entire car, with its motors, is but ten tons, while a steam engine to make the same speed, if it were practicable, would have to weigh ten times ten tons.

These electric cars will be both illuminated and heated by electricity, and will contain all modern conveniences for comfort. There will be no conductors or brakemen. It will be possible to stop the cars within half a mile by means of the motors themselves and auxiliary brakes. "Through" cars will be run at intervals of an hour, or oftener, as the requirements of traffic demand. Accommodation cars will run every half hour, stopping at all points along the line. The "accommodation" cars will be differently constructed from the "through" cars, the same requirements not being necessary.

One central power station, six or eight miles from Clinton, De Witt County, Ill., will operate the whole road. It will be at the mouth of a coal mine owned and operated by the company by means of electric mining locomotives, electric drills, electric cutters and electric lights. This plan greatly cheapens the present cost of mine operating.

A number of prominent St. Louis capitalists are said to be back of the enterprise.

Committees Appointed.

At a meeting of the Executive Committee of the American Street Railway Association, recently held in Cleveland, three special committees were appointed, as directed by the convention at its last meeting. The following are the subjects and names of the committees, with the exception of the names of the first committee:

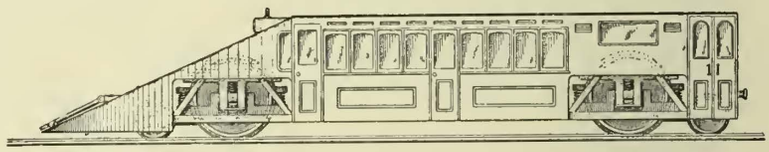


FIG. 2.—CHICAGO - ST. LOUIS RAILWAY.

ON STANDARDS.—Committee to be announced later.

ON POWER HOUSES AND ENGINES.—T.W.Wrenne, president of the United Electric Railway, Nashville, Tenn.; L. H. McIntire, engineer, Harlem Bridge, Morrisania & Fordham Railway Co.; F. S. Pearson, engineer electrical department, West End Street Railway Co. of Boston.

ON RELATIVE COST OF OPERATING HORSE, CABLE AND ELECTRIC ROADS.—Wm. M. Ramsey, superintendent, Federal Street & Pleasant Valley Railway Co., Pittsburgh; F. R. Greene, secretary, Chicago City Railway Co.; John L. Heins, superintendent, Brooklyn City & Newtown Railroad Co.

The regular subjects and committees will be announced later.

A resolution was passed at the meeting asking Mr. D. F. Longstreet, of Denver, Colo., to prepare a paper to be read at the next convention, on the history of events leading up to the organization of the American Street Railway Association.

While in Cleveland the committee conferred with the local committee regarding arrangements for next meeting, and secured a hall in the Case block, for holding the meeting, and also a building with ample space for exhibiting the supplies. Headquarters of the Association will be at the Hollenden, and the usual rates only will be charged.

The World's Fair Committee of the Association are making some progress in their work, and will soon issue a circular to supply men in regard to exhibits. Space for exhibits is to be free, and all exhibits are to be classified, so that all appliances of the same kind, from whatever nation, will be in one department.

Employe's Badge.

A neat type of employe's badge is shown in the accompanying cut of one manufactured by V. H. Blackinton & Co., of Attleboro Falls, Mass. The badge is made with black enamelled figures on a gold plated ground and is designed for roads having less than 100 men. The cut shows the exact size.

EMPLOYE'S BADGE.

A New Roller Bearing.

There is probably no one in the mechanical world who has not, at least once in his life, had his attention called to roller bearings, so that the general principles of roller bearings are quite well understood. A roller bearing which has a number of novel points, however, in regard to the position of the rollers, their shape, and the use of balls, has recently been put in the market, and is illustrated herewith.

As will be seen by Fig. 1, the axle is entirely surrounded at one end by a rigid cage containing the rollers. These rollers are placed at regular distances from each other, and are held in place by means of spindles which pass through the centre of each. The place of contact between the axle and the rollers is a continuous line, extending throughout the length of the roller, and as the axle revolves the rollers turn upon the axle, giving only a rolling friction. The axle is tapered where it comes in contact with the rollers, the latter being also tapered, a form of construction which greatly facilitates adjustment. The rollers, it will be observed, are counter-bored, and in the spaces thus formed are placed a number of balls, which are made of hardened steel and are practically perfect spheres, ground to the smoothness of glass. These

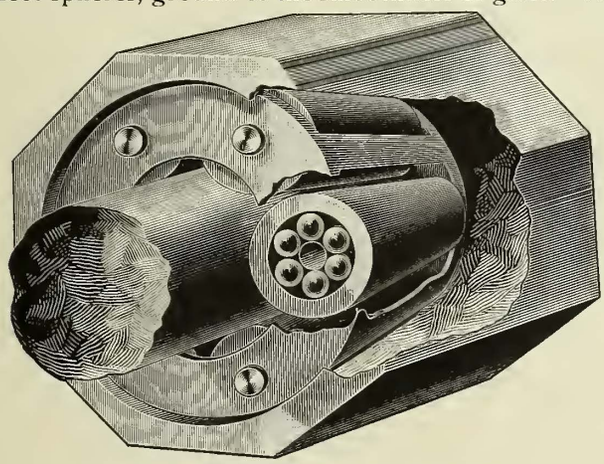


FIG. 1.—MOFFETT ROLLER BEARING.

balls surround the spindle at each end, thus giving a perfect ball bearing for the roller to play upon, and preventing a sliding friction between these two parts. The only other place where a sliding friction is possible is between the ends of the rollers and the sides of the cage, but this difficulty is overcome by allowing the balls to project slightly beyond the rim of the rollers, and so coming in contact with the cage. Fig. 2 shows how the end thrust is taken up and how adjustment is obtained. The end thrust of the axle is caught upon the tapered rollers, the latter, as has already been stated, being truncated cones. The result is that the rollers take the end thrust from the axle, the box takes it from the rollers, the box being held firmly by its housing. The adjustment is obtained through forcing the box against the rollers by the turning of a screw, as shown in the engraving. It must be admitted that there is a slight friction on the balls in the counter-bore at the ends of the rollers, which would be serious enough to require lubrication were it not for the fact that at no time do the balls or the spindle support any weight except the actual weight of the cage, the weight of the car being transmitted directly through the roller to the axles.

Among the claims of this device to popularity over all others are the following: That it is mechanically perfect; economy of expenditure, as it requires no lubrication of any kind and if applied would be detrimental; a great economizer of power, the saving claimed in case of electric motor cars being fifty per cent. in starting and thirty per cent. when the car is in motion; that the bearing is adjustable, and that it can be easily applied to any of the present types of street cars.

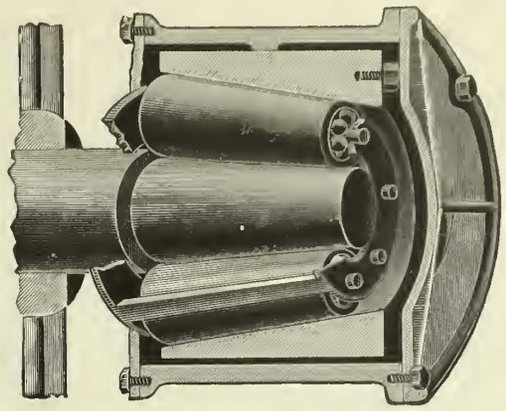
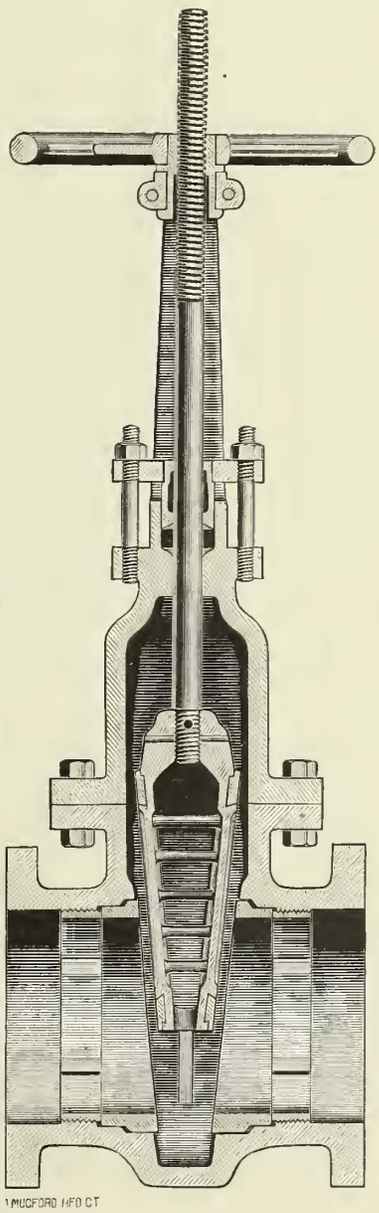


FIG. 2.—MOFFETT ROLLER BEARING.

This bearing has been tried practically on a passenger car of the Burlington Railroad, where it has run 29,000 miles successfully. From four to five hundred of them have also been running for a year, and are still in use on cars at the Madison Car Co's works, at Madison, Ill. It has also been in use on the Lindell Electric Street Railroad at St. Louis, Mo., with most satisfactory results. The manufacturers are the Moffett Journal Bearing Co., 516 Phœnix Building, Chicago.

The Chapman Valve.

Recognizing the large demand for a strictly first-class valve, to withstand the hard service incident to plants carrying from 150 to 200 lbs. steam pressure, or more, the Chapman Valve Manufacturing Co., of Indian Orchard, Mass., have recently patented and put on the market a line of steam valves for extra heavy pressure and superheated steam, with a removable bronze seat and extra heavy shells, so constructed as to avoid all tendency to springing, thus overcoming the difficulty incident to expansion and contraction of long lines of pipe under high pressure.


THE CHAPMAN VALVE.

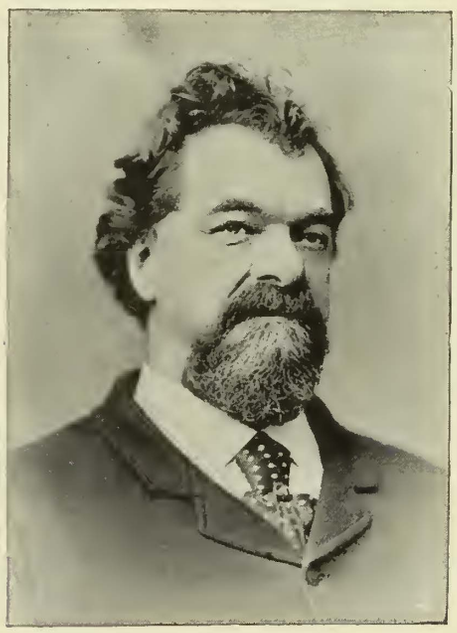
The construction of these valves, as will be seen by sectional view, comprises the following cardinal features: A plug or gate in one piece, guided closely in body of

shell by means of the ribs or splines and taking all strain upon the splines instead of coming in contact with the faces of the seats until the plug is seated, thereby insuring a true and easy vertical movement of plug, as against any other form of plug. The seats are made from hard gun metal bronze for steam, or from any other metal for gas, acids, etc. These seats are pressed into their proper positions in the body of shell, and are held to their exact line by means of the screw gland inserted through the pipe ends, which can be worked forward and back by means of spanner, coming in contact with splines in the inside of screw gland.

These seats are interchangeable and removable. By means of taking off the cap and removing the plug, the seats may be forced toward the inside of valve by means of the screw gland until they are released and another can be inserted, and is the only valve built with metal seats that are strictly removable.

Calvin A. Richards.

We are pained to record the death, on February 15, at his home in Boston, of Mr. Calvin A. Richards, fourth president of the American Street Railway Association, ex-president of the Metropolitan Railroad of Boston, and one of the best known street railway men in the country.



THE LATE CALVIN A. RICHARDS.

The cause of his death, which was instantaneous, was heart disease, from which he had long been a sufferer.

Mr. Richards was born in Dorchester, Mass., March 4, 1828. His boyhood was passed in and around Boston, and he received his education in the public schools of that city. At the age of thirteen he went into business with his father, and early exhibited the wonderful executive ability which was so powerfully shown throughout all his after life. On February 17, 1852, he married Ann R. Babcock, daughter of Dexter Babcock of Boston. Two children were born of this union, a son who was instantly killed by lightning in 1863, and a daughter who survives him. In 1861 he commenced business for himself, and during the next ten years amassed the bulk of his fortune.

In 1875, at the solicitation of directors and stockholders of the old Metropolitan Railroad, who felt that a radical change in the policy of the road's management was necessary, Mr. Richards assumed the direction of the road's affairs, and by his prompt and vigorous policy, and the energy he displayed in the improvement of every department of the service, he succeeded in re-establishing the former success and prestige of the Metropolitan company. He remained at the helm until the Metropolitan road was assimilated by the West End Railroad, when, after a short period of further service as general manager of the new company under President Whitney, he resigned his position and established an office in the Richards building on State Street, making a specialty of the construction and equipment of street railways with cable, electric or horse power. He was also interested in the Boston Steam Heating Co. and several other enterprises.

Mr. Richards was also a member of the Common Council of Boston in 1858–59 and '61, and in 1862 was an alderman. This parliamentary experience he valued and he was a most energetic after dinner speaker, being always eagerly sought for by all dining clubs, and he could easily move a large assembly to tears or laughter as was his wish, but his rare wit was always present.

In 1885 he became president of the American Street Railway Association, and it is in this capacity that he is probably best remembered by our readers. He was a strong believer in the Association, was most regular in his attendance at the annual meetings, and made himself a power by his executive ability and foresight, with which was joined a keen sense of the humorous. He was one of the first to predict the success of electric power for street cars, which he did in a thrilling speech at the Convention banquet held in the Fifth Avenue Hotel, New York, in October, 1884, which those who were present will not soon forget.

The following is a quotation from the address delivered by Mr. Richards as president upon the opening of the 1885 convention at the Southern Hotel, St. Louis:

The convention to which you have been summoned, presents to us among its many benefactions nothing richer, nothing better, and nothing of deeper import and more lasting value, than the opportunity it offers for the permanent enrichment of those social bonds that have in the past, and will in the future, do so much to encourage, cheer and benefit in every way these toilsome lives of ours. Indeed, I may say, that in the cluster of advantages that frame these annual gatherings, the social ties that are formed are more productive than anything else of good work in which we are engaged. Let me hope that the cordial and friendly greetings you have exchanged together, and the kindly emotions of friendly fellowship, will remain with you as the most pleasant events of this occasion. It has seemed to me, the last few hours, that the severance between the rails of all our companies are now connected, and the electric current from the batteries within our breasts had flashed from rail to rail, until we are all united in one grand and glorious network of brotherhood, each and all glad and ready to receive and impart the teachings of our experiences during the time that has passed since our last parting words were said.

The street railway is a domestic institution; it is used around and about our homes; it needs no exhaustive inquiries to ascertain its prosperity or its adversity. The public contribute to its gains every day, and all days, as they go from their homes to the scenes of their daily employment. The constant dropping of the regular and ever increasing receipts into the treasury can be seen, contributed to, and understood by all. Again the street railway comes as a benefactor; its mission is to create, not to destroy. It is the pioneer which causes the outlying and waste places to spring up into life. It furnishes an incentive for the ambition, and goes hand in hand with the progress of every city and town—hand in hand, did I say? No, not that, it marches ahead of the column and flourishes, with drum-major pomp, its invitation to follow. It beckons on the twin brothers, prosperity and progress.

The day has passed and vanished forever into the dark night of error, when our business can be derided and put aside. It now belongs to all classes, and especially to the poor. It needs not greater age than mine, nor of the majority of you here to-day, to recall the early history of the street railway car. In those days a ride for a poor man was almost unknown; its cost banished it from amongst his pleasures or his necessities. Even the rich rarely rode then for pleasure. Locomotion other than walking was the exception, never the rule. Look at the difference to-day; the horse car has been well named; it *is* "the poor man's carriage." The poor, aye, the very poor can now ride for pleasure. The introduction of the open car has developed and opened the door, and has given to the poor man a blessing that comes into his everyday life, to bestow a benificent privilege. No longer must he and his family be shut up in the hot and crowded city, away from all those sweet and health giving blessings that Nature has so freely given for his welfare.

Is there a man here to-day who can contemplate that phase of his business and not feel that he is assisting, as an instrument, in the design of a kind Providence, who careth for and provides for the poor and lowly, as well as for the rich and prosperous? Often have I felt this emotion as I have been riding out into the country on a pleasant spring Sunday, and have seen the seats of the car filled with the class of people I have spoken of. Here was the father, toilworn and careworn; here the mother, sickly and shrinking from the unaccustomed situation; and here the little family of children, clean, neat, and oh! so happy, all so pleased to simply see the green grass and the blue sky; to hear the birds sing, or to gather the simplest wild flower of the field. Proud, pleased, and gratified beyond measure was I that the means were thus provided that this pleasure, and this health giving privilege, are within the reach of all. And I repeat, it is because of this and the many other advantages to the daily life and wants of the whole community that makes the street railway a grand factor in the prosperity and progress and perpetuity of our modern civilization.

National Electric Light Association.

The annual convention of the National Electric Light Association attracted a large gathering to Buffalo, February 23, 24 and 25. The convention was interesting and profitable, and from the point of view of business, President Huntley said it was, without doubt, the most successful meeting in the history of the organization No general exhibit of apparatus was made, but in the rooms about the Hotel Iroquois samples of different kinds of electric merchandise were displayed.

In his opening address President Huntley made this remark about franchises: "I have had time enough to observe that the whole vast industrial development that has added so enormously to the comfort and happiness of life has come from the investment, under public franchises, of private capital, skill and enterprise. The public has thus been made the partner in all the great works of the age, and has thus gained infinitely more than it could have secured if it had raised an equal amount of money by taxation, and had placed the proceeds in the hands of a vast body of office holders for the same purposes."

J. R. Craven, of Buffalo, read a paper, an abstract of which is given below, on

UNDERGROUND CONSTRUCTION OF THE BUFEALO RAILWAY CO,

Underground construction for railway use is becoming every day a more prominent feature of railroad construction. Overhead mains and feeders will not much longer be tolerated, especially in the larger cities, where already the common councils are making it part of a railroad franchise that feeders, at least, shall be buried. The trolley wire, being bare, is of necessity left overhead, as safer and more economical, but it behooves us to meet this popular demand of placing all wires possible below the surface, otherwise we may be compelled to put the trolley wire itself there. Such an order would put the electric railroad industry back for quite a number of years, for not only would it be expensive, but, to my knowledge, no commercial underground trolley system has yet been put on the market.

Underground construction for railroad use brings us many problems to solve. Whilst not using a high tension current, we have one side of our system always grounded, so that between the many miles of cables in use and the earth we have a difference of 500 volts; thus you see at once the necessity of having and keeping up the highest insulation possible. This question of ground return requires that the insulation resistance of a railway circuit be twice that of an arc or incandescent underground system, where you have a metallic circuit; then there are the constant and excessive strains that one does not meet either in arc or incandescent lighting, due to the throwing off and on of the cars. It is almost impossible to figure your feeders to carry the maximum current, so that at any time you are liable to have your cables overloaded, bringing very heavy strains upon them.

Another question is the one of connecting overhead with underground wires. This brings lightning to the field to be guarded against, for the large surface of trolley wire offers an attractive path for lightning, and how to protect the underground feeders and mains has been quite a problem. Lightning has little regard for insulation, seeming to want a path only to earth; this path is offered by the underground cables, so that we have to introduce some arrester at the junction of the underground and overhead wires to give it some other path.

The lightning arrester is placed inside a watertight box on the top of a pole whenever a tap is made with overhead wires. The box also affords a good place where overhead and underground wires can be connected and keep moisture from the cables; this is accomplished by wiping a three inch lead cup on to the lead of the cable and filling it with insulating compound.

We have in this city about eleven and one-half miles of subways divided into two trunk lines which branch off, carrying feelers to the outlying districts. Our conduits are laid in cement, thirty inches below the surface of the street. They are crowned in the centre, so that the water will drain to the manholes, which in turn drain to the city sewers, with a bell trap to prevent sewer gas coming back.

Lately, on account of natural gas finding its way into subway and manholes, we have found it necessary to attach a blower at the station, which ventilates the whole system. Manholes we have placed every 400 ft., and have tried to make that distance standard, as pulling a greater distance brings an excessive strain on the cable when drawing in.

After careful consideration before this work was started, we decided to depend upon our cable for insulation, not on conduits made of insulating material. To me it seems impossible to prevent moisture from penetrating the latter system, thereby lowering the insulation. We depend on our ducts for mechanical protection alone.

The cables in use here are lead covered, provided with an exterior fibrous jacket or covering saturated with pitch, the purpose of which is to protect the cables whilst being drawn in the duct. We have some forty-five miles of cables, which have been in use since July last. These are of two classes: One for insulation depends on pure Para rubber, the other on a composition, our shortest feeder being two and a half miles in length, some of the longer ones reaching a distance of eight miles, yet the insulation on none at the present day is below 120 megohms, the short ones testing as high as 1,100 megohms. In laying this cable all tests were made in the testing room at the station; this was made feasible by the use of a telephone circuit throughout the underground system, so that a workman making a joint in a manhole was in communication with the man making the test and could always find out if his work was satisfactory. The joints made were the standard joints used by the companies from whom the cable was bought.

We are obliged to test at night, when the load can be thrown off one feeder and on to another; then it is disconnected by means of a switch where it connects to the overhead, and the test is then made. It is rather a slow process, but the only one left open to us.

Thus far we have looked upon the difficulties and disadvantages of the underground system. No arguments have been advanced in its favor, but I think you will agree with me that it has some. First, it does away with the public objection of disfiguring the streets, obstructing firemen in their duties, and, in the case of high tension currents, a menace to life itself; and then the liability of wires falling, causing a suspension of traffic, and, in case of a storm, causing a delay and loss of thousands of dollars to the company themselves.

Charles A. Schieren read a paper on

FROM THE TANNERY TO THE DYNAMO.

It may be of interest to engineers, and the electric light fraternity in general, to learn something of how leather is tanned, and the various processes through which a hide passes before it is tanned and curried ready to be put into belting. Naturally, the first question will be, "Where do all the steer hides comes from?" Principally from Chicago, because within its city limits there are four large slaughtering establishments where thousands of cattle are slaughtered daily, the hides of which are carefully taken off and assorted for whatever purpose they are best suited. The hides which are heaviest and most perfect in point of freedom from cuts, brands and other blemishes, are selected for belting leather. These hides are put up in bundles, packed into a freight car, and shipped to the tannery.

We propose to follow one of these freight cars loaded with belting hides to its destination. After a journey of about 600 miles, the car arrives at the little station of Adamsburg, Pa., right in the mountain region, a spur of the Alleghenies, where the tannery is situated.

Oak tanneries are generally placed near the bark region of the mountains, where the rock oak tree predominates, the bark of which is universally conceded to be the best for making the finest grade of leather. It is interesting to watch the mountaineers fell the huge oak trees, and skin the bark from the same. This is generally done in the spring time, and tanners have to purchase their year's supply during the bark peeling season, which is from the middle of May to about the middle of June, according to the condition of the weather; the season seldom lasts over six weeks. If the sap rises into the leaves the bark cannot be taken off, and, therefore, oak trees are only cut down in that period.

The peeling of the bark is done wherever the trees are felled; the bark is gathered together in small stacks and covered to protect it from getting wet; it must also be carefully guarded against mildew.

However, our car of belting hides has arrived at the station, and we will watch the process of tanning. The hides are examined and weighed, and put into the shed; an equal number of hides are taken out daily (whatever the capacity of the tannery may be), and placed in a large vat of pure cold water, generally good spring water. After the hides are thoroughly soaked and the dirt washed out, they are laid across a beam and, with a blunt fleshing knife, the surplus fat or meat still remaining is taken off; then they are placed in a vat of weak lime-water, and are hauled up daily and the lime strengthened until the hair gets loose, which action takes about eight days. After this the hides are cleansed once more in pure water and placed over the beam and, with a blunt knife, the hair is removed; this part of the work is done in what the tanners call the beam or lime house, and very much depends upon the successful liming process in making good leather.

After the hair is off the hides are washed again and thoroughly cleansed and purified, to remove every particle of lime, after which process they are taken into the handlers. These are composed of large vats about seven by nine feet, and six feet deep. The hides here are laid across sticks side by side, as close as possible, and hung about three inches below the top of the vat. These vats are generally connected so that when the first vat is fed the tannin liquor will pass through every vat until they are all filled, and cover the hides completely. In the handlers the hides receive their first bath of tannin liquor, which is very weak at the start, and gradually strengthened. During this first stage of tanning the hide plumps up, and is prepared for the lay-aways; this process also opens the pores and swells the hide, which gives thickness and firmness to the leather. If the hides cannot be made thicker at this period of the tanning, they will never be made heavier afterward; this is the critical point and has to be watched closely; much depends upon the character of the tannic acid; if too strong, it tends to make the leather brittle and harsh; if the tannic acid should be too sour, it tends to make the leather soft and flabby.

Some tanners use a rocking process to keep the hides in motion, thereby opening the pores of the hide quicker to receive the tannic acid: however, opinion differs as to the utility of the rockers; some claim (and justly) that the rocking motion loosens the fibre of the hide, and softens the leather too much. The best process is to simply hang them in the vats and cover them with the tannin liquor, and raise them a few times during the day, or draw the liquor through them, which some tanners are now doing with success.

The tannic acid in the handlers generally has a strength of from five to fifteen, very seldom over twenty, degrees. The hides remain in that process from ten to twelve days; they are then taken up and, if they are to be used for belt leather, the flanks (bellies) and heads of the hides are cut off and tanned separately; the remaining butt part

receives an extra layer of bark to tan it more thoroughly and make it firmer.

From the handlers the hides are packed away in vats, called lay-aways; these are large vats seven by nine feet, and six feet deep, having a capacity of from fifty to seventy-five hides each. The vats are not connected with each other, but only with the pump to change the liquor. The hides are laid nicely one on top of another, and loose ground bark spread between each hide, and when the vat is full it is filled with tannin liquor of from twenty-five to thirty degrees in strength. The hides intended for belting receive at least six layers of bark, or in other words, are changed six times in the lay-aways; the first time they are changed after lying ten days, and then five days are added after each layer, so that the hides in the last or sixth layer will take forty days to absorb the tannin liquor and penetrate the leather. Each time fresh ground bark is spread between the hides and then covered with tannin liquor.

The leaching and grinding of the bark is an important factor in a tannery. The large pieces of bark taken from the oak tree are thrown into a hopper-shaped mill or grinder, which resembles a coffee grinder on a large scale. The ross on the outside of the bark creates a great deal of dust, and contains little or no tannin, but it cannot be severed from the rind which really contains the acid; from the bark mill the ground bark is elevated into large tubs which have false bottoms, or receivers underneath to take up the tannin liquor. After a tub is filled with ground bark, a rotary sprinkler is set in motion to saturate the bark with a spray of water or liquor, which percolates through the ground bark, and on its way to the bottom catches up the tannic acid contained in the bark; at times warm water is used to facilitate the operation, also weak tannin liquor is used sometimes with good effect; however, old school tanners prefer cold water, which they claim makes purer and sweeter tannin liquor. After the receivers at the bottom of these tanks are filled, the contents are pumped into large supply tanks, from which the liquor is distributed through the tannery as required.

The leaching process is the most interesting and valuable operation in the tannery, and upon its skillful management depends the financial success of the business; opinion differs very materially as to the best method. The large, round leach tubs, such as described, are the most popular now in use; however, many tanners still adhere (and some with success) to the old square pressed leach tubs, in which the ground bark is simply soaked or steeped in water and left for a length of time, until the tannic acid is extracted from the bark. Opinion also differs as to using steam or hot water; however, all have their merits.

Very strange and erroneous ideas prevail among those who use leather, and have no knowledge of the art of tanning; certainly it is an art, and one of the oldest handed down to us. The general opinion prevails that leather made in "ye olden time" is superior to ours of the present time, but such is not the case; in fact, the fundamental process of tanning to-day is precisely the same as that of a thousand years ago, except that we enjoy improved machinery and appliances which further the process and improve the material. What took our forefathers from fourteen months to about two years, we accomplish in from four to six months, and the quality of leather is as good, if not superior to the leather made a hundred years ago; with the aid of steam and power we can facilitate the process and shorten the length of time to produce the leather. The "olden time tanneries" had the lay-away vats in the yard exposed to the elements, and in rainy and inclement weather, as well as during the winter, the tanners could not do any work, and left the leather lying in the vats; generally to the detriment of the stock. In our present improved and model tanneries everything is done under cover; even the bark is put under sheds to keep it dry, and good leather is tanned within four months; however, belt and prime harness leather generally takes six months.

When the leather is taken from the last layer of bark, it is oiled on the grain and hung up in a darkened room to dry; to obtain a nice clear russet color the place must be kept at an even temperature, and very little heat used. After the leather is thoroughly dried it is put up in rolls containing five butts (hides) each, and whenever a car load is ready it is shipped to New York; here it is again examined and weighed, and all butts not suited for belting are thrown out and finished into sole leather for shoe purposes.

The perfect hides for belting are soaked in warm water, and the centre part cut out and used for prime belting; the waste or offal is finished and rolled for shoe purposes. When the pieces are thoroughly scoured and cleansed they are oiled on the grain and hung up to dry, and when in a semi-dry condition, they receive a coat of stuffing made of equal parts of cod oil and beef tallow. This is done to preserve the leather and make it pliable for the transmission of power. After the stuffing has entered the pores, which takes about twenty-four hours, the leather is subjected to great strain in large stretching machines; great care and good judgment must be manifested in this part of the process; each piece of leather must receive an equalizing strain because of the peculiar formation of the hide, the fibres being very fine and closely knit together on the back of the animal, and running coarser and thicker towards the flanks. It is of the highest importance, for belts intended for electric light plants, to have an equal tension over the entire surface of the belt; therefore, the stretching process of belt leather needs the utmost care, and should receive the closest attention. After the pieces of leather are thoroughly stretched, they are worked smooth on the grain side, and both by hand and machine labor are set down as solid and compact as possible; then they are put into a drying room and thoroughly dried. Afterwards one edge of the pieces is straightened, and they are then cut into whatever width of belt they are best suited for; the pieces of each width are matched accurately as to thickness, and then the laps (joints) are cut by a machine, the edges of the laps are feathered, and the joints cemented (glued) together, and pressed under a hydraulic press, which pressure is considered the best by all first-class belt makers.

Rivets are now rarely put into belts; a double belt well cemented is good for all ordinary purposes, and rivets are superfluous; however, certain fastenings, such as endless copper wire screws, which do not obstruct the surface or unnecessarily stiffen the belt, are a benefit; especially when the belt comes in contact with water or too much oil, this fastening prevents the belt from coming apart, and holds the leather firmly together.

All main driving belts over forty inches in width have to be made in sections, consisting of two or more pieces of leather cemented together; the average hide for belting does not contain more than forty inches in width of solid leather suited for belting, very rarely over that; therefore, wide main belts are made in sections. Ordinarily the pieces are not lapped parallel, but simply butted. For example, a sixty inch double belt receives two thirty inch pieces for the first layer, laid side by side, and a thirty inch piece over the centre of the two lower pieces to break the joint, and two fifteen inch pieces on top of each edge of the lower layer to complete the width; thus the belt is cemented together. However, for electric light plants where belts are run at high speed and with variable power (which produces sudden strain), the seam of these butted joint belts, in several instances, broke, doubled up and destroyed the belts completely. To guard against such a calamity it is considered advisable to make wide main driving belts with parallel joints. For example, a sixty inch double belt will be made of two thirty-three inch pieces joined parallel, with a three inch lap, making one solid piece sixty inches in width, and on the upper part put a thirty-three inch piece in the centre, and two eighteen inch pieces on the edges, all joined with parallel laps; this cemented together will make a sixty inch double belt with unbroken surface, and as one solid piece of leather having a uniform tension and able to withstand an equal strain over the belt transversely as well as parallel, and thus will prevent such large, heavy driving belts from collapsing at the parallel joints. Every one must admit that main belts made on this plan are superior, and more reliable, and would come into general use if it were not for the additional cost of labor and material in making them.

Leather being by nature an absorber of moisture, belts must be guarded against exposure to oil. In electric light and power plants much mineral oil is used, and the great velocity at which the belts are run seems almost imperceptibly to suck or draw the oil from the journals of the engines and dynamos, and allow it to be absorbed by the belts, which get completely saturated with oil, and in a short time rot and destroy the fibre of the leather. Various methods have been used to overcome this difficulty, One of the most successful is a certain composition or belt dressing which is rubbed over the surface of the belt, and closes the pores of the leather. No foreign substance can penetrate a belt treated with this compound, and the belts last much longer and give better service. With perforated belts this compound does not seem to be so effectual, because the perforations naturally expose the inner part or the heart of the leather, which is very porous; however, the surface of the belt being covered it shields that part of the leather which comes in contact with the pulleys, and the current of air passing through the perforations protects the belt to a certain extent, and that class of belt runs smoother, with less friction and is more reliable.

And now, gentlemen, we have reached the point where another curious and erroneous idea prevails among many engineers, namely, that belting should be made of pieces only four feet in length, as if all hides were of the same length and texture. It will surprise these men to learn that there are no two hides alike; they vary in some particular point. Hides exist which will make almost six feet of sound solid leather below the shoulder, and again, some hides will not make four feet of solid length; the only safeguard is to specify belting made of leather cut below the shoulder of the hide, irrespective of length.

The following is an extract from a paper read by Allen R. Foote on

MUNICIPAL FRANCHISES FOR QUASI-PUBLIC CORPORATIONS.

How supremely ridiculous a city council would appear that should vote that a street railroad company might use horses to draw their cars, but should not use the best horses they could buy. How strange it would seem if a state legislature should enact a law that a company might generate and distribute gas for the purposes of light, heat and power but they should not adopt the best gas making methods. * * * These things are all as consistent as laws providing for the supplying of municipal needs by mentioning the methods to be used and thus limiting municipal franchise corporations to the use of the methods named instead of requiring them to adopt the best known methods at the time of the incorporation or that may thereafter become known. How strange it appears in the light of the requirements of true economic science that municipalities have supposed they could obtain a supply for a perpetual need requiring expensive plants, conductors through all streets, service connections to make the supply available in every building, and have the service wholesome, reliable, safe, and rendered at the lowest possible price in the way in which they have undertaken to secure these advantages. They have limited the right to do business to a comparatively short term of years. They have allowed others to build, as it were, on the same piece of real estate. They have limited the methods to be used so that when the discoveries of science and invention have made better methods available, existing corporations could not use them, thus compelling the organizing of other corporations and a duplication of plants. * * *

The services rendered by municipal franchise corporations are assistants to industry, promoters of comfort and inducers of prosperity. Any unnatural restriction placed on them is as fatal to the welfare of society as an unnatural obstruction to the inhaling of air, or taking of food is to the health of the physical body. Any tax levied upon them

is as fatal to the best interests of industry as the extraction of blood is to the physical strength. Obstructions and taxes laid upon quasi-public services are like rust upon a plow or a hole in a grain sack. * * *

A perfect franchise is the exact equivalent to a perfect title to real estate; it conforms fully to the conditions that give economic value to all property. It is in accord with ethical and economic laws that proclaim and establish the dignity and freedom of labor. It conveys and guarantees unrestricted, exclusive and perpetual possession, subject to such use and control as shall best serve the public welfare.

Notes on the Short Railway System.

The Short Electric Railway Co. are now pushing their shops to the utmost on large factory orders for gearless and single reduction motors, which have been recently received. Shipments of single reduction motors have been made to Wilkesbarre, St. Louis, Ashtabula and other places, and a large consignment will be made shortly to Trenton. The gearless motors will begin to come from the factory about the first of March, and shipments to Minneapolis, St. Louis, Grand Rapids, Brooklyn and elsewhere will then be commenced. The thirty H. P. single reduction motors are well under way, and shipments will be made to Jamestown and elsewhere before the first of April.

The shops are now far behind on generator shipments, owing to the unusually large demand for the new types, the advantages of which have met with instant recognition. Ten of the new 200 H. P. generators are now in operation in Rochester, and three more will be shipped shortly to provide for large extensions to this road, to be made in the spring. The management of the Rochester railway speak in the highest and most unqualified praise of these generators. Their high efficiency is shown from the fact that the wire system runs almost cold, the brushes work without a spark on the immense commutators, and the machines are as fine specimens of generator work as has ever been turned out. Four of these machines are to be shipped to Trenton, others to Johnstown, East Liverpool, Wilkesbarre, etc.

The new 300 H. P. generator is nearly completed, the first shipment to be made to Jamestown, N. Y., and it is confidently expected that these will prove as much of a success as the 200 H. P Some idea of the character of these machines may be had from the statement that the armature is fifty inches in diameter, and the commutator thirty inches, while the whole machine stands in a space 5 ft. 3 in. × 9 ft. The pulley is forty-eight inches in diameter, with a thirty-seven inch face, and the machine is run at a speed somewhat less than 300 revolutions per minute.

COL. LEWIS PERRINE, of Trenton, is making vigorous efforts to get his road into operation by electricity. He expects to start up in April. The station is well under way, the pole line is nearly completed, the Short company are about to ship the motors for the equipment of the trucks at the Brill works, and have promised the generators for the first of March. The road will start up with fifteen cars, equipped with the Short single reduction motors and four 200 H. P Short generators.

THE Short Electric Railway Co. have equipped the Harvey road in the city of Chicago, which is running perfectly and with the utmost satisfaction to the railway company. The cars are thirty feet in length, with double trucks, and at present are equipped with the Short double reduction motors, which will later be exchanged for the gearless.

THE Atlanta & Chattahoochee Street Railway Co. are building their new lines as rapidly as the weather will permit, and will soon order forward the Short single reduction motors and generators, which are to form the equipment.

IT is stated by authority that the Short Electric Railway Co. are not included in the consolidation of the various electrical interests, but maintain their present independent position.

THE Ninth Ave., (N. Y.) Railway Co. have recently renovated and painted up twenty-one of their cars, an improvement which is noticeable and appreciated by the residents along the line.

A Dinner to Street Railway Employes.

Through the courtesy of Mr. C. Harvey Herring, traffic manager of the Birmingham (Eng.), Central Tramways Co., Ltd., we are enabled to give in this issue some particulars of the annual dinner given February 5, by the company to their employes. The latter number 750 men, a large proportion of whom were present. Besides the employes there were at the tables a number of guests and officials of the road, among whom were: Mayor of Birmingham, Lawley Parker, Joseph Ebbsmith, chairman of the Birmingham Central Tramways Co., and who presided, W. Carruthers-Wain, managing director and president of the Tramways Institute, Lieut. Harvey Herring, A. Dickinson, and W. E. Whytehead.

The proceedings were of a thoroughly festive character, the hall was decorated with the flags of all nations, the police band played in the balcony, ladies graced the occasion with their presence, and a thoroughly good time seems to have been enjoyed by all.

Perhaps, the most interesting observation made in the course of the fulfillment of a lengthy toast list was the remark of the chairman, after alluding to the loyalty of the company's servants, to which he attributed a large amount of the success, that though not quite so large a financial success as was first thought, the Birmingham Central Tramway Co. had been converted from a disaster to a success, until at the present time it ranked excellently among the tramway systems of England.

Sydney Tram Roads.

With two exceptions, all the tram roads of New South Wales are operated by steam motors. The exceptions are the Waverley and Randwick, single track roads a mile and a half in length, on which the Thomson-Houston overhead system has been installed, and the North Shore cable system which is a mile and a half long. In Sydney and its suburbs there have been laid thirty-three and one-half miles of track which includes the electric road, but not the cable line. In addition there is a line connecting Newcastle and Plattsburgh, seven and one-half miles in length, which makes the total forty-two and one-half miles. All the lines are owned and operated by the government and are under the control of a board of three commissioners.

The roads are divided into sections, on some of which the fare is a penny, and on others two-pence by ticket, or two-pence and three-pence cash. Trains are composed of one, two or three cars, each with a seating capacity of seventy passengers, five to each seat. Stops are made only at prescribed stations. Electric and cable cars make stops wherever desired.

Entrance to the cars is on each side from a step running the whole length similar to that on an American open car, but the cars are much more cumbersome and heavy and are run on two bogies. Their weight is from six to seven tons. Until recently a large number of double decked cars were used. These have been gradually replaced and are now used only on rush days.

The steam motors, most of which were supplied by the Baldwin Locomotive Works, weigh about ten, twelve and fourteen tons, and are fitted with vacuum brakes.

The total cost of the lines open for traffic was £1,004,212, upon which amount they earned interest last year of 5.32 per cent. against 4.81 per cent. the year previous.

The rolling stock for the year ending June 30, 1891, consisted of 106 steam motors, 198 cars, sixteen freight trucks and five water tanks. North Shore cable: Eight grip cars and fourteen trailers. Electric railways: Three motor cars and one trail car.

Electric cars were installed in November, 1890, as an experiment. The track is the worst in the whole system, having eighteen curves in one and one-half miles and gradients as high as one in sixteen. The single stretch of level straight track is only 300 yards in length. The Thomson-Houston system is employed, and at the power station is one eighty H. P. generator, and an Armington & Sims 100 H. P. engine running at 300 revolutions with a

steam pressure of 110 pounds, supplied by two old locomotive type boilers.

The cars, which were built by the John Stephenson Co., are operated by two fifteen H. P. motors. So far not an armature or a field has been lost, and the electrical repairs have been almost nothing.

At present the government is not in a financial condition to extend the system of tram lines, but in two years the subject will be brought up again and extensions will be made. Either electricity or cable will be probably adopted as motive power on the steam lines.

Street Railway News.

General.

Albany, N. Y.—The Watervliet Turnpike & Railroad Co. have leased their road to the Albany Railway Co. The lessees guarantee the payment of the interest on the first mortgage bonds and the interest and principal of the second mortgage bonds, and pay a rental equivalent to a dividend of one-half of one per cent. upon the stock. Ten extra large excursion cars similar to those in use on the West End road in Boston, will be placed on the line next summer. The tracks will be relaid, and the distance from State Street, Albany, to the intersection of Congress and River Streets, Troy, be covered in thirty five minutes, including stops. Motors will run every fifteen minutes. The present power house on South Pearl Street will be made the central station, the plant on Broadway being held in reserve.

Alexandria, Va.—Work will soon be begun on the Alexandria & Fairfax Passenger Railway. Electric power will be used, and the road will be ten miles in length.

Albany, Ga.—The last legislature of Georgia passed an act providing that separate accommodations should be provided on street cars for white and for colored persons. It has not been rigidly enforced, but a local paper says its provisions will now be carried out.

Ann Arbor, Mich.—By the decision of the Supreme Court of Michigan the Ann Arbor & Ypsilanti Street Railway has stopped operations. The employes have been discharged and the rolling stock stored. Mr. Charles D. Haines of New York, is largely interested in the line, and about $60.000 has been invested. The cars were put in operation about a year ago, and since that time a large number of passengers have been carried over the lines. In securing the right of way the consent of all the property owners was obtained with the exception of that of the heir of one estate. This heir, Mrs. Dr. Granger, petitioned the Circuit Court for an injunction, claiming that the road injured her property, but an injunction was refused by the Circuit Court. Upon appeal to the Supreme Court the decision was reversed and an injunction served on the railway company to stop operations. It is generally considered to be an attempt to blackmail the company, as the petitioners for the injunction refuse to sell the property except at a much higher price than its market value.

Auburn, N. Y.—At the meeting of the directors of the Auburn City Railway Co., held in this city February 1, Chas. E. Eddy of Boston was elected president instead of G. F. Wells, resigned, and Geo. Underwood of Auburn was elected vice-president instead of G. W. Allen, resigned.

Baltimore, Md.—The City Passenger Railway Co. have awarded the contract for cabling the Blue line to Contractor E. Saxton, who guarantees the completion of the road before the end of the year.

THE Walker Manufacturing Co. of Cleveland, O., have secured the entire contract for the cable driving machinery for both stations of the Baltimore City Passenger Railway Co., including five sets of machinery, in all of which the Walker differential winding drums will be employed.

CONSTRUCTION work on the Curtis Bay electric railway is progressing rapidly, after a suspension of operations due to the bad weather last month.

THE Johns Hopkin's University trustees and the Belt Railroad Co. have finally come to an agreement over the price to be paid for a portion of the Clifton property condemned for the use of the railroad; about fifteen acres were taken for which the sheriff's jury awarded $40,250 damages. The trustees excepted to the award. By the terms of the agreement the railroad company was to pay the trustees $65,000 for the land taken. The trial of the case has been in progress since January 19, before Judge Duffy without a jury. The agreement was reached while the argument was in progress and put a sudden stop to the proceedings.

Beatrice, Neb.—The Beatrice Rapid Transit & Power Co. have purchased all the privileges and property of the Beatrice Street Railway Co.

Birmingham, Ala.—The Birmingham Railway & Electric Co. have put into service cars which they have recently received of the J. G. Brill Co.

Bowling Green, Ky.—The scholars and teachers of day schools and Sunday schools have had issued to them tickets which cost only one cent a ride.

Bucyrus, O.—The bid of the Suburban Electric Railway Co. for the construction and maintenance of a street railway was considered at a recent meeting of the City Council, and the contract was awarded to them.

Charlottesville, Va.—The car stables of the Street Railway Co. were destroyed by fire early last month, and six mules and all the cars were burned. The loss was about $1,200.

Chicago, Ill.—The Illinois Electric Material Co. made an assignment February 8, to Frank Hamlin. The assets and liabilities were said to be about $10,000 each. H. S. Winston was president of the company and Ernest Horfer, secretary.

Two cartridges were placed on the car track on Randolph Street near La Salle Street on February 1, by a lad. A car wheel caused one of them to explode, and a passenger, Mrs. Sigmund, was wounded by the bullet, but not seriously.

CHARLES W. RIGDON has commenced a suit against the Chicago City Railway Co. He is a stockholder in the company, and in his bill he asks for the appointment of a receiver to take possession of $500,000 of bonds and 38,530 shares of the stock of the Chicago & South Side Rapid Transit Railroad Co. which was purchased by the Chicago City Railway Co. He complains that the investment is illegal. He was defeated in a similar proceeding before Judge Horton recently, the court deciding that the Chicago City Railway Co. had a right to purchase bonds but not stock; that buying stock of another corporation was against public policy and also in violation of its charter. But Rigdon is now insisting that both the purchase of stock and bonds is unlawful, and he wants them sold and the proceeds distributed among the stockholders.

THE Calumet Electric Street Railway Co. have accepted the ordinance of January 18, giving them the right to extend their line on numerous streets south of Seventy-fifth Street. Perkins Bass has just brought suit to enjoin the company from building under the ordinance. Mr. Bass represents that he owns property fronting Sixty-seventh Street on the north, Stoney Island Avenue on the east and Madison Avenue on the west, and he says the company never obtained his consent to construct a railroad. He claims that the City Council passed the ordinance without securing a majority of the property frontage, and that, therefore, the ordinance is void.

The West Chicago Street Railway Co. have sent a check for $4,587.18 to City Collector Amberg in payment of the license of $12.50 a quarter collected by the city for every street car operated by the company. The payment shows that the company are running eight cars fewer daily than during the corresponding quarter a year ago. The Chicago City Railway Co. paid $4,330, a decrease of six cars, and the North Chicago Street Railway Co. $2,451.25, an increase of twenty-three cars.

Cincinnati, O.—The Cincinnati Street Railroad Co. have paid something over $18,000 into the city treasury upon what they estimated to be the car license for 1892 and the two and a half per cent. on the gross earnings for the quarter ending December 31, 1891, as they estimated them.

Cleveland, O.—The City Council has passed an ordinance forbidding the use of salt on the tracks.

IT is shown by the lists filed with the City Clerk that this year the East Cleveland company will pay $2,000 and the Woodland Avenue & West Side Co. $1,110 for street car licenses. Last year the total for the two companies was $1,200.

Columbus, O.—The House of Representatives has passed the Llewellyn bill which provides that whoever willfully disturbs by disorderly conduct, obscene language or otherwise unlawfully interferes with the peace and comfort of passengers upon any passenger train or street railway car, shall be fined not more than $25 or imprisoned not more than ten days or both.

Dayton, O.—The ordinance extending for a period of fifty years, the ordinance of the Dayton Street Railroad Co. has been adopted by the Council.

Decatur, Ill.—The two street railways have been consolidated, and are now operated by the City Electric Railway Co.

Dubuque, Ia.—J. H. Rhomberg, of the Dubuque Street Railway Co., is in the East inspecting the different types of railway motors and the company contemplate electrical equipment on the overhead system soon. In the meantime they continue to operate their present storage battery cars. Iron poles with brackets will be used.

THE United States Electric Light & Power Co., have been awarded the contract for 200 arc lamps for city lighting. This company commenced tearing down their old power station last month to make room for a more modern type of station. This will be equipped with two Corliss engines 250 H. P. each, to be supplied by E. P. Allis & Co. The company have recently filed a bond for $1,000 as guarantee to the acceptance of the proposal.

Erie, Pa.—The Erie Electric Motor Co. have purchased two new generators of the Edison company and have ordered thirteen new open cars. The Erie City Iron Works will furnish the boilers for the new power house and the Ball Engine Co. will supply the engines.

Fond du Lac, Wis.—Haines, Bros. & Co., of Kinderhook, N. Y., have bought the horse railway system of Fond du Lac, and will change it to an electric line.

Galt, Ont.—The Galt & Preston road, which at one time was strongly agitated, will probably not be built for some time at any rate.

Hamilton, O.—The Hamilton & Lindenwald Electric Transit Co. have driven two four-inch wells, which have been put in adjacent to the power house, and the company, in addition, propose to immediately sink, at least, five or six other similar wells in the same locality. This done, the people will be amply supplied with water, and in a measure protected against fire.

Hartford, Conn.—A new schedule has gone into effect on the

Wethersfield electric road, which provides thirteen additional trips daily.

Holyoke, Mass.—The directors of the Holyoke & Westfield railroad have elected Timothy Merrick, president; James W. Clark, vice-president and C. F. Smith, treasurer.

Hot Springs, Va.—In all probability the "Happy Hollow" street railroad will be in operation some time in March.

Kansas City, Mo.—The Kansas City Cable Co. will use a cable which they have imported from Hull, England.

The Kokomo, Ind.—The Kokomo Street Railway Co. have made a special rate of three cents for laboring men between 6 A. M. and 7 A. M. and 5 P. M. and 6:30 P. M.

Lansing, Mich.—Commissioner of Railroads Whitman, has issued a circular addressed to street car companies calling their special attention to the Act 222 of the laws of 1889 requiring drivers of street cars to bring cars to a full stop before going upon a street railway crossing of the tracks of a steam railroad, and to make sure that no engine or cars are approaching such crossing before they proceed to go upon the same.

Lebanon, Pa.—Jacob M. Shenk has been elected president, Samuel L. Brightbell and George D. Rise treasurer of the Labanon & Myerstown Street Railway Co.

Lima, O.—William M. Brown of Newcastle, Pa. Mr. Hazzard of Cleveland, Mr. Kimble of Cincinnati and Mr. Townsend of Pittsburgh have bought the Lima, O., electric road.

Los Angeles, Cal.—On September 15, 1890, the bank of California advanced $12,000 to the Pacific Railway Co. to pay the coupons due that day on $838,000 of first mortgage bonds issued by the Los Angeles Cable Co. The embarrassment of the Pacific company prevented the payment to the bank, which is the owner of about $150,000 of the bonds. Recently the bank filed a petition with Judge Wade, asking him to order the receiver to pay the $12,000 out of the funds in his hands. The Court directed the receiver to file an answer to the petition, in the course of which he says: "We allege that it is absolutely impossible out of the earnings of the road to pay the interest due on the bonds issued under the deed of trust hereinbefore mentioned, and thus prevent a foreclosure in the near future of one or the other or both of said deeds of trust; and to pay at this time the amount asked for by petitioner would render it impossible for the receiver to carry on the business of the road and keep the property in repair without borrowing money."

Lowell, Mass.—The street railway company have placed an order for ninety-five tons of trolley wire with the Washburn & Moen Co. Work upon the power house is being pushed rapidly forward. The roof is already on the building and the laying of the foundations for the eighteen engines and generators has been commenced. The company propose to extend their track to the Yellow Meeting House in Dracut as soon as the grade of Bridge Street, near the town line, is established.

Lynn, Mass.—Work is now progressing satisfactorily on the new power house of the Lynn & Boston Co. Three 400 H. P. engines have been purchased. It is expected power will be furnished from the new power station about May 1. Ground has been broken in Chelsea, on the wharf property purchased by the Lynn & Boston road, just this side of Chelsea Bridge, for another power house which will be fitted up and be capable of furnishing 5,000 H. P. This will give the road power enough to operate all their lines by electricity.

Manchester, Va.—James F. Bradley has been elected president and W. C. Seddon secretary and treasurer of the Richmond & Manchester Railroad Co.

Marietta, O.—H. B. McMaster has assumed the position of superintendent of the street car line.

Massillon, O.—W. J. McClymonds has been awarded the contract by the Council to build an electric road on the principal streets and to Canton.

Memphis, Tenn.—Electric cars have replaced the mule cars on the Shelby and Madison Street line.

Milwaukee, Wis.—The Milwaukee & Wauwatosa Rapid Transit Co. have elected the following officers: President, Charles Stickney; vice-president, Julius Wechselberg; secretary and treasurer, Gustav Pabst; general manager, E. D. Hoyt. Manager Hoyt reported that the roadbed had been completed and that bids had been received for equipping the road.

Natick, Mass.—J. F. Shaw has recently equipped the Natick Electric Street Railway with Burton heaters.

New Haven, Conn.—The following officers were elected at the annual meeting of the West Haven Horse Railroad Co., President, Israel A. Kelsey; secretary and treasurer, Samuel A. Stevens, superintendent, W. W. Ward.

New Orleans, La.—The suit of the New Orleans City & Lake Railroad Co. against the city of New Orleans, La., has been dismissed by the court, and judgment rendered in favor of the defendants. The question involved was whether certain franchises of the plaintiff were exclusive and the court answered it in the negative.

AN ordinance was recently introduced in the City Council providing that it shall be unlawful for any street railroad company to run any car on the streets of the city unless it is provided with ventilators affording a ventilation of at least four square feet.

New York, N. Y.—A bill has been introduced in the legislature by Assemblyman Roche which provides that one road may use the tracks of another for the purpose of connecting with a ferry.

CITIZENS of Washington Heights recently met and adopted resolutions to the effect that the elevated road should be extended to accommodate them.

AT the annual meeting of the Sixth Avenue Street Railway Co. the old directors were re-elected.

Newark, N. J.—A bill to secure the Newark Passenger Railroad Co. from all interference with their electric overhead system was introduced in the legislature. The bill seeks to nullify the decision of the courts in the suit brought by George A. Halsey. It sets forth also that the Board of Works of Newark may, by a two-thirds vote of its members, give authority to run cars by electricity, chemical motor or grip cable, say where and how poles shall be placed and direct other necessary details.

Newburgh, N. Y.—At the annual meeting of the Newburgh Street Railway Co. the directors of last year were re-elected. M. H. Hirschberg was elected president and John C. Adams vice-president.

Newport, R. I.—It was stated at the annual meeting of the Newport Street Railway Co. that 808,150 passengers were carried by the line during the past year, against 781,038 during the year previous.

Norfolk, Va.—On February 13 a disastrous fire occurred at the stables of the Norfolk City Railway Co., by which the stables were burned to the ground. Ninety of the best animals perished. The loss is estimated between $40,000 and $50,000 and said to be covered by insurance.

Oakland, Cal.—The following officers were elected at the annual meeting of the Oakland Consolidated Street Railway Co.: G. W. McNear, president, and J. E. McElrath, vice-president; R. C. Beggs continues as secretary. The rumor that the Southern Pacific company have tried to secure possession of the property is denied by the company.

MAYOR CHAPMAN has signed the ordinance permitting the Oakland Railroad Co. to use electricity on their Telegraph Avenue line.

Orange, N. J.—The electric line running between Orange and Newark was opened February 1. The officials of the road met to celebrate the event, and a pleasant evening was passed.

Palatka, Fla.—At the annual meeting of the directors of the Palatka & Heights Street Railway Co., held last month, W. P. Craig was elected president; Marcus Loab, superintendent; W. C. Snow, treasurer and general manager, and H. B. P. Calhoun, counsel.

Peoria, Ill.—Capt. John Hall, president of the Fort Clark Railway Co., has recently made a formal announcement to the effect that he has made a contract with the Thomson-Houston company for the equipment of the system with fourteen electric cars. He expected to use storage battery cars, but he is convinced, he says, that the expense to maintain them is prohibitory. Work has commenced, and the road will possibly be in operation by the latter part of May.

Philadelphia, Pa.—The use of the electric trolley system by the Traction company in the operating of street cars was determined upon recently at a meeting of the stockholders of the Twenty-second Street & Allegheny Avenue Passenger Railway Co., held at the office of the Traction company on Walnut Street.

SPEED on several of the cable lines has recently been increased.

THE Philadelphia Traction Co. in January paid into the city treasury $28,200 for licenses for 517 cars to be run this year on the various divisions, as follows: Catharine and Bainbridge Streets, fifteen; Philadelphia & Gray's Ferry, seventeen, Philadelphia City (Chestnut and Walnut) fifty-five; Union, 267; West Philadelphia, 130; Empire (Twelfth and Sixteenth), thirty-three. The sumpaid last year was $22,578.13.

Pittsburgh, Pa.—The power house of the West End Electric Railway will be located on West Carson Street. The car sheds will be near the Luckey school, in the Thirty-fifth ward. The company are anxious to commence changing the motive power to electricity as soon as possible, and work will be commenced in a few weeks. A great effort will be made to have the cars running by electricity by July 4.

The Central Traction Co. will have their Centre Avenue branch in operation as an electric line by April 1. Poles have been put up along Centre Avenue and down Wylie to High Street and thence to Grant.

Portland, Ore.—It is understood that all opposition against the construction of the G Street electric line will be withdrawn by the property owners who were preparing to sue the company for damages.

The Multnomah Railroad Co. have just placed six forty foot new cars on their line. These cars are furnished by the J. G. Brill Co.

THE Suburban company expect to have their Third and G Street lines in operation by May 1.

Pottsville, Pa.—Officers and directors of the Schuylkill Electric Railway Co. have been elected as follows: President, J. K. Sigfried; vice-president, F. G. Yuengling; secretary, J. H. Zerbey; treasurer, J. F. Zerbey; superintendent, Luther K. Hannum; electrician, Chas. E. Swan.

Racine, Wis.—The Belle City Street Railway Co. have filed a bond of $10,000 with the city clerk, as a guarantee that they accept the new ordinance and that they will carry out all its provisions.

Redlands, Cal.—The new track to Terracina has been built and cars are running.

St. John, N. B.—A consolidation of the electrical interests in this city has been effected by the organization of a new company known as the Consolidated Electric Co., Ltd. This company have taken over the Eastern Electric Co., Ltd., the New Brunswick Electric Co., Ltd. and the St. John City Railway Co., and so become one of the largest companies in Canada. The new company will have a ca-

pacity of 6,000 incandescent lights and 300 arcs. They have the contract for the lighting of the city, and anticipate a large increase in both lighting and motor business. The officers of the company are John F. Zebley of New York, president; H. B. Zebley of New York, secretary and treasurer; Chas. D. Jones of St. John, manager, backed by a strong board of directors composed of New York and St. John gentlemen.

St. Joseph, Mo.—Dr. James W. Heddens resigned his position as president of the road January 26, and James T. Gardner was elected to fill the vacancy.

ON January 22 incendiaries made an attempt to burn the Frederick Avenue barn of the People's Street Railway Co.

St. Louis, Mo.—The directors of the St. Louis County Street Railway Co. have elected the following named officers: M. B. Greensfelder, president; George Autenreith, vice-president; J. B. Greensfelder, secretary; F. W. Rauchenstein, treasurer; Eugene Benoist, superintendent. They expect to extend their tracks from the present terminus at Eden over Lucas and Hunt Avenue to Normandy during the coming summer.

San Francisco, Cal.—It is stated that the preliminary work of grading along the line of the new electric road of the Market Street Co. through the Heights to South San Francisco, will be completed about July 1, when track laying will be begun.

CARS will be running on the extension of the McAllester Street cable line by the middle of march.

Saratoga, N. Y.—To satisfy a judgment on foreclosure in favor of the American Loan & Trust Co., the Saratoga Electric Railroad Co. was sold at public auction last month to C. E. Arnold of Albany, who represented the Union Electric Railroad Co., for $35,000. The Union company intend to run a new line to Saratoga Lake and through several of the streets about town.

Savannah, Ga.—An agreement has been reached by the Electric Railway Co. and the Savannah, Florida & Western Railway in reference to the Gwinnett Street crossing, whereby the electric railway will cross at grade. The electric line assumes the cost of making the crossing, and also assumes all liabilities resulting from any accident that may occur on account of crossing at grade.

Rome, Ga.—The contract has been let to the Thomson-Houston Electric Co. for the construction of the Rome electrical street railroad.

Shenandoah, Pa.—The construction of the M. C. S. G. & A Street Railway is progressing rapidly toward completion. The cars have arrived and one of the large generators is in place. The line will probably be opened for traffic between Shenandoah and Lost Creek by March 1. C. R. Eberle is general manager and A. W. Gilbert has charge of the electric works for the Thomson Houston company. The line when completed will be twenty miles in length.

Staten Island, N. Y.—Judge Cullen has granted an order permitting James D. Van Hoevenberg, receiver of the Staten Island Belt Line Railway Co., to discontinue the operation of the road and sell the horses.

Toronto, Ont.—The mayor has received an important letter from James Gunn, secretary of the Toronto Street Railway Co. in which the writer states that the street railway company are anxious that the city should take action in regard to the proposed measure allowing them to install an overhead electric system. The proposals under which the company undertook the operation of the road were with the understanding that overhead wires should be installed, and as delay results in pecuniary loss to the company, the purchasers look to the city to indemnify them against all loss.

Washington, D. C.—The annual report of the Capitol, North O Street & South Washington Railroad Co., was presented to the Senate recently. The receipts from passengers for the fiscal year ended April 30, 1891, amounted to $125,768.57; receipts from other sources brought the total up to $157,567.86. Total expenditures, of which $27,909.19, were for permanent improvements, aggregate $156,380.22. During the year 2,808,027 passengers were carried.

SENATOR HANSBROUGH by request has introduced a bill to require the Washington & Georgetown and the Metropolitan railroad companies to inaugurate an all-night car service, the cars to run in each direction every half hour between the time for stopping and beginning the regular service. In view of the approaching use of cable and electric power on these two roads the bill will provide that on these "night liners" horse power may be utilized.

Wilmington, Del.—The Front & Union Streets railway has been leased by the Wilmington City Railway Co. for a term of years, and hereafter the entire railway system of the city will be under the same management.

Yonkers, N. Y.—The Yonkers Electric Railway have awarded to the Edison company the contract for two generators. The cars will be supplied by the John Stephenson Co., the motors of the Eickemeyer type and the boilers of the Stirling type.

Extensions and Improvements.

Asbury Park, N. J.—The officials of the electric railway company have agreed to spend $75,000 on improvements and to pay $3,000 per year to the borough during the life of the present franchise and at its expiration to pay $4,000 per year if the franchise is satisfactorily extended.

Baltimore, Md.—At a special meeting of the directors of the City Passenger Railway Co. it was decided to cable the Blue Line immediately. This was recommended in the president's report at the annual meeting, but was not acted on before on account of the absence of of Director Clark who owns a large amount of the stock of the company.

ON account of the Baltimore Traction Co. having secured a controlling interest in the North Baltimore Passenger Railway Co., the main lines of that system will probably be cabled, and electricity adopted on the subsidiary lines.

Beatrice, Neb.—The Beatrice Rapid Transit & Power Co. will extend their electric road to all the leading parts of the city, including the West Side, soon. The company have also made arrangements for a complete electric light plant.

Berkeley, Va.—In the spring the Berkeley Street Railway Co. will extend their line three-quarters of a mile, build new barns, and purchase new cars. Thirty pound T rail will be used on the extension.

Biddeford, Me.—The Biddeford & Saco Railway will probably be equipped with electric motors in the spring. Poles are already erected.

Bridgeport, Conn.—The Bridgeport East End Railway Co., will install four open eight bench cars shortly.

Brookline, Mass.—The West End Railway Co., of Boston, have petitioned for right to extend their electric system over a number of streets in this town.

Butte, Mont.—The Butte Consolidated Railway Co. contemplate extensions in several directions the coming spring.

Centralia, Ill.—The Centralia & Central City Street Railway Co. will lay another mile of track the coming spring and purchase more cars and mules.

Charlottesville, Va.—The Charlottsville & University Street Railway Co. will probably soon extend their line.

Cleveland, O.—A request from the Broadway & Newburgh Street Railway Co. for permission to relay their tracks on Broadway from Davies Street to Union Street has been referred to the Department of Public Works.

THE Alliance Street Railway Co., will probably add trailers to each car in the spring.

Columbus, O.—An ordinance has been passed by the Council giving the Columbus Consolidated Street Railway Co. the right to extend their tracks from High to Fourth on Chestnut and thence north over the Fourth Street viaduct to Chittenden Avenue. The ordinance provides that the company shall pay to the city $250 a year for the franchise. The company will begin work, at once, on the extension.

Dayton, O.—The Oakwood Street Railway Co. expect to substitute this year a sixty pound, or heavier rail, for their present thirty pound rail. They will extend their line about half a mile, and make other improvements.

Defiance, O.—The Defiance Light & Power Co. will build one or two miles more of track in the spring.

Denver, Colo.—The Tramway company are reported to be planning some important extensions in the spring.

Ft. Wayne, Ind.—The Citizens' Street Railway Co. have asked for the required permission to operate their lines by electricity.

Hamilton, O.—The Hamilton & Lindenwald Electric Transit Co. expect to build one and one-half miles of extension during the spring.

Holyoke, Mass.—The stockholders of the Holyoke Street Railway Co. have voted to approve the recommendation of the directors that the lines be extended to Springdale in South Holyoke, and to Oakdale by the way of Sargeant Street. The directors have been also authorized to lay heavier rails on about three miles of the present roadbed where the old fashioned strap rail is now used. A new power house will be built.

Jamestown, Va.—The Jamestown Street Railway Co. are doubling their power capacity and have added six new cars. It is also thought the line will be extended from Lakewood through to the Chautauqua Assembly grounds, for which surveys were made last fall.

Kansas City, Mo.—The L road will probably extend in the spring. The adoption of electric power is being discussed.

Lancaster, Pa.—The street railway company have asked for right to make extensions on certain streets.

Lansing, Mich.—The Continental Trust Co. of New York, several months ago acquired a controlling interest in the Lansing City Railway Co. A. G. Davids has been selected to take charge of that company's interest.

Lewiston, Me.—The Lewiston & Auburn Horse Railroad Co. are said to be contemplating the construction of a connecting line between Main and Cedar Streets, along Lincoln.

Louisville, Ky.—Some improvements are contemplated by the Louisville Railway Co. in the near future.

Lynchburg, Va.—The Rivermont Electric Railway Co. have an extension under contemplation, it is said.

Mansfield, O.—The Citizens' Electric Railway, Light & Power Co. propose to make extensions involving three or four miles of new lines, connecting their system with the Sherman-Heineman Park and the Ohio Reformatory.

Marlboro, Mass.—The Marlboro Electric Street Railway Co. have petitioned for leave to extend their tracks to Westboro and Hudson.

New Haven, Conn.—At the annual meeting of the West Haven Horse Railroad Co. it was voted to extend a branch line from Congress Avenue through Howard Avenue to Sea Street in the spring.

THE West Haven Street Railway Co. have petitioned for the privilege of using electric power, and hope to have cars running this summer.

Newark, O.—The Newark City Railway Co. have made application for right to extend their road on a number of streets.

Norwich, Conn.—The Norwich Street Railway Co. have contracted with Henry Lyon of Lisbon to furnish them 700 poles and 6,000 ties for the building of the electric road. The managers hope to have have the trolley system in operation on the main line by the first of May.

Oakland, Cal.—A franchise has been granted by the Board of Supervisors to the Oakland Railroad Co. giving them the right to construct an electric road on Telegraph Avenue. The county surveyor has been instructed to establish the grade on the avenue at the expense of the corporation. It is said the work of changing from horses to electricity will soon be commenced. The competition of the Oakland & Berkeley Rapid Transit line makes this necessary.

Quincy, Mass.—A petition has been submitted by the Quincy & Boston Street Railway for the privilege of extending their tracks into Boston, Weymouth, Braintree and Milton.

San Francisco, Cal.—The Geary Street cable line will be extended soon. The gauge is to be changed so as to conform with the Market Street system in order that the cars can continue on from the present stopping place on Kearney Street down Market to the ferry landings.

AN order before the Board of Supervisors, granting the Metropolitan Railway Co. a supplementary franchise allowing of the extension of the road along Eddy Street between Powell and Mason Streets, has been passed.

THE Presidio cable line is being extended.

THE Metropolitan Railroad Co. have applied to the supervisors for additional privileges of erecting poles to maintain electric wires east of Van Ness Avenue; also for an extension of franchise on Eddy Street, between Powell and Mason. The road is now partly constructed.

Springfield, Mass.—The street railway directors are not content with the seven mile extension already proposed and mentioned in these columns, and have decided to recommend to the stockholders other extensions of six miles, one line on Liberty Street to the Camp Ground, and another line on State Street to Indian Orchard.

Washington, D. C.—The Eckington & Soldiers' Home Railway Co. have applied to Congress for permission to extend their line.

Wilmington, Del.—The Wilmington City Railway Co. have petitioned the Street and Sewer Department for permission to lay tracks for an electric railway from Ninth and Market Streets to Church, to Eleventh, to Walnut, to Ninth, a distance of about a mile. The Maryland Avenue cars are to cover the route.

Winnipeg, Man.—At a meeting of the Civic Works Committee last month the tenders for the electric street railway franchise, submitted by the Ross-McKenzie company and the Winnipeg Street Railway Co. were fully discussed, and it was decided to recommend to the Council that the offer of the Ross-McKenzie company be accepted.

York, Pa.—The York Street railway company have been granted permission to equip with electric power.

The York Street Railway Co. have been granted permission by the Council to use electric power.

Youngstown, O.—The Youngstown Street Railway Co. may extend their line to Poland, provided the right of way can be secured without taxation or litigation.

New Roads.

Americus, Ga.—It is stated that a company is to be organized here for the construction of a street railway within the next sixty days.

Atlanta, Ga.—The Atlanta, East Lake & Decatur Street Railway Co. will soon build three or four miles of road. The president of the company is A. C. Bunce.

THE Peachtree Electric Street Railway Co. have been organized by H. L. Harralson, P. H. Harralson, P. B. Lawrence, W. S. Turner and others. Burton Smith is attorney for the company. They have petitioned the City Council for privilege of using Pryor, Church Cain, Williams, West Peachtree and other streets. The lines, as planned, will run almost parallel to the consolidated lines in North Atlanta.

Baltimore, Md.—It is said that an elevated road will be built here by the North Avenue Electric Railway Co.

APPLICATION for an electric railway franchise has been made by the Baltimore, Canton & Point Breeze Railway Co. The incorporators are: Robert Baldwin, John S. Lusk, W. R. Cole, J. V. Campbell and H. W. Rusk.

Brigham City, Utah.—An electric line between this city and Hot Springs is being strongly agitated. A committee composed of Jacob Jensen, A. E. Box, Wm. Horsley, C. W. Knudson and L. P. Johnson has been appointed to promote the road.

Bridgeton, N. J.—The proposition for an electric road in this town is being revived. Mr. Oberlin Smith, of the Ferracute Machine Co., is interested.

Brooklyn, N. Y.—A certificate of organization of the Coney Island, Fort Hamilton & Brooklyn Railroad Co. has been filed with the Secretary of State. The road will be a double track street surface railroad for the transportation of passengers and freight. The capital stock is $500,000, and the principal office will be in New Utrecht. The directors include Patrick H. Flynn, Peter E. Tynan and Michael Murphy of Brooklyn; Richard Bergen of Patterson, N. J., and J. K. Sherwood of Glenhead, L. I.

Carbondale, Pa.—An effort will be made, it is said to re-equip the abandoned road between Carbondale and Jermyn.

Catlettsburg, Ky.—The County Court has granted a franchise for the construction of an electric road between this place and Ashland, a distance of five miles.

Champaign, Ill.—The Champion Rapid Transit Co. have been incorporated to operate a street railway. Capital stock, $50,000. Incorporators, C. C. Rush, S. A. Power, John Ahern.

Chicago, Ill.—The Chicago Central Construction Co., with a capital stock of $500,000, was incorporated last month. In a general way it was organized to construct street railways, surface and elevated, to be operated either by horse, cable or electric power. No detailed plans of the company have yet been made public. Robert S. Hill is one of the incorporators.

THE Siemens & Halske Electric Co. of America, with headquarters in Chicago, have been incorporated to manufacture electrical devices; capital stock, $300,000; incorporators, O. W. Meysenburg, Edwin F. Bayley and Otis H. Waldo.

AN ordinance granting a franchise to the Chicago & Evanston Electric Railway Co. was introduced in the City Council February 1. The road is to run north to Evanston from the intersection of Southport Avenue and Clybourne Place. The overhead system will be adopted if the franchise is granted. Permission has been given the company to put up at the intersection of Lincoln and Southport Avenues two sets of poles similar to those intended to be used by the new company. The company propose to erect the poles so that those who are objecting to the construction of the line on Southport Avenue may see how the structure would look.

THE Chicago Central Construction Co. have been formed to build surface and elevated street railways; capital stock $500,000; incorators, Judson G. Sherman, Arthur Cox and Robert S. Hall.

THE Chicago & Plainfield Overland Electric Railroad Co. have been incorporated; capital stock $600,000; incorporators, Daniel W. Gale, Edwin A. Moulton and William Cummings.

Clarkesville, Tenn.—The new Providence & Clarksville Street Railroad Co. have petitioned for right of way. The incorporators of this new company are Wm. McDaniel, H. C. Merritt and E. C. Morrow of Clarksville, and J. J. Garrett, I. T. Gold and R. J. Ellis of New Providence.

Columbus, Ga.—New York capitalists have signified their willingness to build an electric car line from Marietta to the Chattahoochee river, provided citizens of Marietta contribute about $12,000 and the citizens along the line will contribute land to the amount of $35,000.

Connellsville, Pa.—Work on the Connellsville Electric railway will be begun May 1.

Covington, Ky.—A street railroad has been projected, to connect with the proposed College Hill & Mt. Airy Electric Line at Cumminsville.

Detroit, Mich.—A petition for a street railway franchise has submitted to the City Council by Fred. C. Whitney, E. A. Rouff, Augustus Rouff, John Pfeffle, George Dingwall, Matthew Finn, C. W. Casgrain and J. H. Lesher. The streets for which they ask a franchise are Larned Street from Woodward Avenue to the easterly city limits; Russell, from Larned north to Canfield, and Canfield to the city limits. They offer a three cent fare.

Grand Rapids, Mich.—Percy T. Cook has filed a petition for a franchise for a street railway. His route, as asked for, covers Ionia, Spring, Monroe, North Division, Pearl and Coldbrook Streets and Plainfield Avenue.

Greensboro, N. C.—The Greensboro Street Railway Co. have had a survey of their road made, and construction will probably be begun soon.

Hamilton, Ky.—The Hamilton Electric Street Railway Co., Ltd., have applied for incorporation. Among those interested are: George Roach, J. M. Lottridge, Robert Thomson and J. V. Teetzel, of Hamilton, and H. M. Pellatt, of Toronto. The purpose is to build a street railway from the city to Barton.

Hamilton, Ont.—The Hamilton, Grimsby & Beamsville Electric Railway mentioned last month, is to be twenty-four miles in length. The capital stock is $200,000. A forty pound T rail will be used. Adam Rutherford, Edward Mitchell and Stuart Livingston are interested.

Hopkinsville, Ky.—An electric road is to be built here in the spring.

Indianapolis, Ind.—Joseph R. Robinson has sent a communication to the Board of Public Works making a proposition for a street railway franchise on all the principal streets of the city.

DR. LIGHT and other citizens of Broad Ripple have asked the Board of Commissioners for a new franchise to build an electric line to Broad Ripple.

Kansas City, Mo.—Articles of incorporation of the South Suburban Railway Co. were lately filed. The stockholders are Ira C. Hubbell, Clarance A. Ross, D. J. Haff and Robert E. Shryock of Kansas City, and George K. Wheeler of Chicago. The capital stock is $2,000, all paid.

A NEW street railway company, the Stock Yards & Northwestern, are seeking a franchise to build a road from the stock yards to the

northwestern part of the city. It is understood to be an extension of the West Side electric line.

Two belt line projects are also up for consideration before the Council. One of these is the old McAlpine scheme which has been discussed often. The project is about as far along as it was two years ago. The E. L. Martin belt line also want a franchise covering practically the field the McAlpine project would like to fill The company are apparently in deep earnest, as a branch switch is now being constructed back of Fowler's to connect the Second Street depot with the Northwestern and Maple Leaf roads and give them entrance to the other side, and possibly to the Union Depot.

Knoxville, Tenn.—The route of the South Knoxville Street Railway is being surveyed by J. K. Payne and construction will probably be commenced soon.

Lebanon, Pa.—The Lebanon & Myerstown Street Railway Co. with a capital stock of $100,000 have filed an application for a charter. The charter members include the following: J. M. Shenk, Lyman Nutting and C. Shenk, of this city; H. H. Kreider and S. L. Brightbill, of Annville, and Adam Behny, of Myerstown. The route will be on Walnut, Fourth, Guilford and Front Streets and the turnpike to Myerstown. The new company is not antagonistic to the Lebanon & Annville Street Railway, but is intended as a feeder to the former. The charter members, with several exceptions, are interested in the former. This line will be ten miles long and will operate eight cars.

Lima, O.—W. L. Parmenter, Wilbur Fisk, Thomas Duffield, Theo. D. Robb and F. Langan, have asked for a franchise for an electric railway.

Lynchburg, Pa.—The Lynchburg Edison Electric Co. with P. J. Oley, R. L. Miller, F. P. Christian and others as incorporators, have applied for a charter. The company are authorized to construct and operate electrical railroads.

Manchester, Va.—A bill to incorporate the River View & South Side Railway Co. has been introduced in the State Senate. The incorporators in the bill are James H. Dooley, W. G. Taylor, R. B. Chaffin, H. C. Beattie, W. L. Moody, J. H. Middendorf, Thomas Barry, E. A. Saunders, Jr., Matthew Gilmore, and others. The company desire a charter to build a bridge across James river above Manchester. The object is to have a belt line street railway through Richmond and Manchester. The erection of such a bridge as is proposed, would mean the connecting of the River View Street Railway of Richmond with the Richmond & Manchester Street railway.

Mauch Chunk, Pa.—The Carbon County Electric Railway have been chartered, with a capital of $60,000, to connect Weissport, Packerton, Mauch Chunk and Glen Oaks. The incorporators include Ambrose B. Clemmer, Richard Greenwood, Barnabas Dewitt and Harvey Barton, of 338 N. Water Street, Philadelphia.

McKeesport, Pa.—The Union Passenger Railway Co. have been organized to build four miles of double track, which will reach from the centre of McKeesport to outlying districts, Christy Park, Riverton and the hill district. The charter has been granted, and the line, it is stated, will be built in the summer.

Meadville, Pa.—F. R. Shryock and others have presented a petition asking for a franchise along Water Street and the Terrace through Vallonia to the driving park and then to add other routes. The Water Street line they hope to have in operation by May.

Mobile, Ala.—James H. Wilson, of this city proposes to establish three lines of electric railway and has asked for the necessary franchises. He has agreed, in consideration for the franchise, to furnish to the city of Mobile 200 arc lights of 2,000 C. P. each, the lights to burn all night and every night—bright moonlight nights excepted—at the rate of eighty-five dollars per year for each light for the term of five years. Others interested in this project are John Wilson, president of the Western Manufacturing Co., of Leavenworth and G. C. Rogan of the Waco (Tex.) Electric Light Co., and who lives in Waco.

Montgomery, Ala.—A. W. LeBron, Phares Coleman and R. P. Dexter, have been granted a franchise to build an electric railroad.

Mt. Holly, N. J.—An electric railway, two and one-half miles long, is proposed. $15,000 has been raised to carry out the project.

Nashville, Tenn.—F. W. Hunter & Co. are interested in the construction of a new line to Glendale Park.

New Berne, N.C.—The proposed electric road here will probably be built this spring. Wm. C. Clark of Wakefield, R. I., is interested.

Newton, Mass.—The Newton & Boston Street Railway Co. hope to have their line in operation the early part of July. The company contemplate an extension to Newton Highlands, and have already petitioned the aldermen for location through Walnut Street to Lincoln Street, Newton Highlands.

Olympia, Wash.—The recent sale of the Olympia Light & Power Co's bonds will, should the company meet with the expected support of the people, insure for Olympia a well equipped line of electric railway.

Pasadena, Cal.—George H. Riggs has asked for a franchise on certain streets.

Petersburg, Va.—Those interested in the Richmond, Chesterfield & Petersburg Street Railway Co., say the road will certainly be built. Electricity will be used.

Phillipsburg, Pa.—An electric street railway, connecting this place with the mining districts, is under consideration.

Pittsburg, Kan.—The construction of an electric road is now assured, and the projectors are figuring on the cost of materials.

Pittsburgh, Pa.—The Granview Traction Co. will begin work on their ten miles of road in the spring. On one mile of the road, where there is a heavy grade, cable will be used, and on the remainder electric power will be employed. The electric system is not yet decided upon. W. B. Lupton is president of the road, and F. R. Gordon, secretary.

WORK will commence on the proposed new incline from South Tenth Street to Allentown in the early spring. H. Sellers McKee is the president of the company.

Plainfield, N. J.—City Clerk Frank W. Runyon, has been authorized by the Common Council to advertise for proposals to construct an electric railway in Plainfield.

Pueblo, Colo.—B. F. McDaniel has applied for a street railway franchise between Pueblo and Overton.

Punxsutawney, Pa.—A charter has been issued to the Punxsutawney Street Railway Co. of Jefferson County, to connect Punxsutawney and Clayville. Capital $18,000. J. K. North is the president.

Redlands, Cal.—I. N. Hoag has asked for a street railway franchise on Orange and other streets.

Richmond, Va.—The Richmond, Chesterfield & Petersburg Street Railway Co. have applied for a charter. The incorporators include J. M. Harris, Freeman Epes, E. A. Catlin and C. A. Epes. The company are required to commence the construction of their railway within two years from July 1, 1892, and complete three miles of same within five years thereafter.

Rockland, Me.—Geo. E. Macomber, of Augusta, and W. B. Ferguson, of Boston, with others, have purchased the street railway franchise here and propose to build an electric road from the railroad wharf up Mechanic Street, Main and other streets to Camden, work to begin as soon as the frost is out of the ground. Thomaston will probably not be reached this year. The charter requires the construction of a mile and a half of road in the city by July 1, 1892. Bids for construction and equipment are wanted. Nine and one half miles will be built. Address Geo. E. Macomber, president.

Salem, Ore.—E. F. Parkhurst and associates have been granted the right to operate a railway line on the county roads leading from Salem to Jefferson, Lake Labish, Silverton, the Blair-Forward coal mines in the Waldo Hills. The franchise gives permission to maintain either a single or double track, the passenger and freight cars being hauled by electricity or other motive power. Mr. Parkhurst is the recent purchaser of the Salem Street Railway Co.'s franchise, and his associates are Eastern capitalists.

San Francisco, Cal.—J. W. Hartzell of the San Francisco & San Mateo Railway Co., with others, has asked for an elevated railway franchise. Electric motors are to be used. The petitioners agree to pay the city two per cent. of their gross receipts and ten dollars a year license fee for each car used. The franchise is to last for forty-nine years, two miles of the road to be constructed in two years and all of it in three. At the end of forty-nine years the city is to have the right to purchase the system at an agreed price.

Scottdale, Pa.—An electric railroad between Scottdale and Broad Ford, in Fayette County, seems assured. The estimated cost is $30,000 nearly all of which is subscribed. N. Miles is president of the company, J. E. Byrne secretary and W. N. Porter, treasurer. The line will be five miles long and the gauge five feet two inches. The projectors hope to have the road in operation by July 1.

Springfield, O.—John A. Blount has made application to the Council to construct an electric railway.

South Bethlehem, Pa.—The projectors of the South Bethlehem & Saucon Electric Street Railway Co. are confident that they will secure sufficient encouragement to assure the construction of the proposed road.

South Norwalk, Conn.—A project for building an electric railway to Wilson Point, Bell Island, Roton Point and Five Mile River, is under discussion.

Tacoma, Wash.—Col. Frank C. Ross expects to build a line to Sumner this summer.

Waltham, Mass.—A stock company is being organized to construct an electric street railway between Waltham and Watertown. Those most prominently interested are Francis Buttrick, of Waltham, and S. S. Gleason, of Watertown.

Washington, D. C.—The district commissioners have recommended the incorporation of the Northeastern Street Railway Co., the Washington & Brookland Railway Co., and the Washington Central Railroad Co.

West Memphis, Ark.—The West Memphis Railway Co. have been incorporated at Little Rock, Ark., with a capital stock of $10,000. The company propose to construct a railroad one and one-half miles in length, in the town of West Memphis. The incorporators are Chas. H. Organ, Chas. B. Bryan, Chas. W. Hunter, John S. Toof and Wm. Randolph.

Wheeling, W. Va.—The Mozart Park Association are said to be considering the construction of a street railway to Mozart Park.

Winnipeg, Man.—The electric railway franchise, which has been long under discussion, was finally awarded last month to a company, of which the following are provisional directors: W. C. Van Horne, James Ross, Montreal; William McKenzie, Toronto; Peter McLauren, H. Morrison, Montreal; George H. Campbell, Winnipeg. Work on the railway is to be commenced immediately.

Worcester, Mass.—William P. Searles, president of the North End Street Railway Co., has petitioned the Clinton selectmen for right of way in that place. The proposed route of this road has recently been surveyed by A. W. Woods, civil engineer.

Obituary.

We regret to announce the death last month of Henry Church, manager of the Phœnix Iron Works, Meadville, Pa. Mr. Church was born in Meadville in 1842, and at the time of his death was in his fiftieth year. He had been connected with the Phœnix Iron Works for the last twenty years, was business manager of the company for a long period and had a wide circle of friends.

Transmission of Power by Electricity.

The transmission of power in mills by means of costly belting, pulleys and shafting, and, in hundreds of cases, by steam pipes radiating from a boiler house to scattered auxiliary engines has long been considered a costly and more or less unsatisfactory method. This consideration is becoming stronger and more widespread as the adaptation of electricity for the transmission of power progresses towards further development and becomes better known. The problem is of especial interest to the street railway manager on account of his exceptional opportunities to distribute electric current for power purposes. The Edison General Electric Co. seems to have the honor of being the first to solve the problem in a comprehensive manner. The transmission of power from one central power house, containing all the boilers and engines, to the forty and more different buildings which go to make up the Schenectady Works of the Edison company and at which over more than 3,500 men are employed, has attracted attention from all sides. A New York publication, *Power*, chiefly devoted to mechanical interests, considers the matter of so great importance, that, in its February issue, it gives a full and graphic description of the manner in which the elimination of the various defects, mentioned above, is effected.

The power house is situated almost in the middle of a piece of land twelve acres in extent, and is surrounded on all sides by the different buildings to which it supplies the necessary power. This house contains a battery of boilers of over 2,000 H. P. capacity, the necessary engines to drive the electric generators and the generators themselves. Radiating in all directions run the conductors through special underground tubes to the different buildings, where they are connected to Edison motors, which in turn are connected by belts to the shafting serving to operate the machinery. By the adoption of this method the general aspect of the interior of the buildings is entirely changed. The power engine connected by steam piping to the boiler house is now replaced by a small electric motor, switchboard and a regulator occupying, perhaps, less than one-fourth the space. One throw of a small switch lever, the motor is running noiselessly, and the whole machinery is in motion. There is no trouble, no engine on centre, no steam, no smell and no dirt. The attention required by the motors is very slight.

Electricity is also conveyed along the wires to the different testing rooms, where all kinds of electrical power apparatus is continually under delicate test. In addition, the two largest machine shops, properly so called, where the big Edison dynamos and their smaller brothers are assembled, and the foundry, are each equipped with traveling cranes, which are operated exclusively by means of electrical motors.

In addition, *Power* gives the following facts in figures: The power plant comprises an Armington & Sims 10 × 11 engine of 150 H. P., driving on 100 kilowatt railroad generator and two 100 kilowatt standard generators, and another Armington & Sims engine of same proportions, in reserve, coupled to one fifty kilowatt and one 100 kilowatt generator. A small engine of same make of twenty-five H. P. drives three 8.5 kilowatt generators. There are also two 300 H. P. Edison triple automatic engines, each driving two of the new Edison 100 kilowatt multipolar dynamos, and a 150 H. P. triple automatic engine driving two sixty kilowatt generators of former standard Edison type. The boiler battery consists of three boilers of 500 H. P. each, and three of 250 H. P. each, making a total of 2,250; this will eventually be raised to 3,000 H. P. when the three additional 250 H. P. boilers are put up. The present generator or dynamo capacity is about 1,000 kilowatts. This will be increased to 1,400 kilowatts as soon as possible and the normal capacity of the power station will then be 1,900 H. P. The normal output is about 950 H. P. at the present moment, but this is increasing as the new shops go up. The present floor area of the Schenectady Works is 11.84 acres. Current is distributed to forty-three motors of standard Edison type which would represent a capacity of 1,324 kilowatts if run to their full capacity. About 20,000 ft. of single conductor wire is used to convey the power from the central house to the motors and this does not include the wiring of the buildings or the conductors laid in Edison underground tubes. The voltage of the motor circuit is 250 volts, the lights running on 125 volt circuits. The loss of power in transmission is small when compared with the enormous loss when steam was conveyed to the small independent engines in the scattered buildings.

The Wilmington (N. C.) Street Railway.

Work on the electrical equipment of the street railway is being pushed rapidly forward by the contractors, J. G. White & Co. of New York, and will probably be finished by April 1. The present rolling stock of the company consists of seven closed and four open cars, and the line is four miles in length, laid with thirty-three pound girder rail. One mile of forty-five pound Lewis & Fowler rail is being laid, and the overhead system is being constructed for the five miles of track. The company are also building one and one-half miles of freight track in which sixty pound rail is to be used, and a steam dummy. Six open and two closed electric motor cars have been ordered and the company will retain four of their present open cars as trailers.

The contract has been let for two 100 H. P. boilers and two 150 H. P. Ball engines. The location of the power station, car sheds and offices is at the corner of Water and Orange Streets. The capital stock issued and fully paid is $100,000. All the old issue of bonds is now in the company's treasury. The architect of the power station is Clarence S. Luce.

Detroit Railway Equipment on the Merrimack Valley Road.

In the summer months the Andover and Lawrence branch is the most popular line of the Merrimack Valley Street Railway Co. The line was patronized so extensively last Summer that a record was made of 140 fares collected on an open car designed to seat forty persons. The equipment was furnished by the Detroit Electrical Works. Each car is provided with a forty H. P. standard motor.

The road is one in which the Detroit company take no little pride. For four months, they state, these unusually heavy loads were carried without the loss of armature or field coil. The statement holds good up to January 1. The mileage of the car was then over 110,000. The clean record was made in the face of obstacles. The road is almost a continuous grade, which averages seven per cent.; but at points it is nine and one-quarter per cent. On account of the small feeder capacity and the great increase in the service beyond the original plan, the loss on the line was extremely great. The average voltage at the steepest grades was, it is claimed, not over 250, and at times it ran down to 190.

Electric Consolidation.

The consolidation of the Edison General Electric Co., and the Thomson-Houston Electric Co. in regard to which negotiations were commenced several years ago, but were afterwards broken off, seems now certain of consummation.

It is proposed to form a corporation with a capital stock of $50,000,000, divided into 500,000 shares of $100 each, of which not more than 20 per cent. may be preferred stock. The preferred stock is to be entitled in each year to receive dividends amounting to 7 per cent. cumulative, but without any further right of participation in the profits, and without preference as to principal.

Shares of the stock of the Edison company are to be exchanged in full payment for shares of common stock in the new corporation, share for share.

Shares of preferred stock of the Thomson-Houston company are to be exchanged in full payment for shares of preferred stock of the new corporation, at the rate of four shares of the old stock (par $25 each) for one share of the new (par $100 each).

Shares of common stock of the Thomson-Houston company are to be exchanged in full payment of common stock of the new corporation at the rate of five shares of the old stock for three of the new.

This provides for a total stock of $33,400,000 and a balance of $6,000,000 preferred, and $10,600,000 common stock in the treasury.

Each subscriber is to deposit with the New York Guaranty & Indemnity Co. of New York, or the Old Colony Trust Co. of Boston, his stock in exchange for suitable trust receipts, which are to be surrendered upon the issue of new stock.

This plan of consolidation is to be carried out under the direction of the following committee: J. Pierpont Morgan, D. O. Mills, H. McK. Twombly, Frederick L. Ames, T. Jefferson Coolidge, and Henry L. Higginson.

It was first said that C. A. Coffin of the Thomson-Houston company would be general manager of the new company, and that H. McK. Twombly would be its president. Later rumors state that Mr. Twombly has declined to serve as president and that office will be filled by Mr. Coffin.

Annual Report of the Edison General Electric Co.

The third annual report of the Edison General Electric Co. given to the stockholders last month showed among other things that the gross business of the company was $10,942,640, on which the profits, including the $271,592 written off against the cost of the manufacturing plants, were $1,666,535. To this amount must be added the general receipts at the main office, $83,013, making total net earnings of $1,749,549.

Deducting from the net receipts of the company, exclusive of those of the Edison Electric Light Co,, the sum of $271,592, charged off on manufacturing plants, and $286,477 charged off against liquidation, materials in stock and experimental account, there remain $1,191,479 as the net result of the year from the business of the Edison General Electric Co. alone. Adding $1,100,432, surplus profits carried over from the preceding year, we have a total of $2,291,912 profits available for distribution. After paying $1,031,845 in dividends, $1,260,067 is carried forward into the new year.

The Edison Electric Light Co. received during the year $631,672 in bonds and stocks as license fees from licensee companies, worth at a moderate valuation, say, $500,000, of which the General company is entitled to over ninety per cent., or, say, $495,000, which is equal to, say, 3.16⅔ per cent. additional on the capital stock.

The general balance sheet shows a footing of $21,507,284 for 1891, against $17,958,852 in 1890, an increase of $3,548,431.

The gross sales of the company reached nearly $11,000,000; the bills and accounts receivable increased only $261,663 during the year, showing the promptness with which the collections were made.

In regard to their electric railway department the report of the second vice-president to the president states: During last summer we were compelled to put on the market a single reduction motor to meet the demands of the street railway companies for a motor, the wearing parts of which would not suffer such rapid deterioration. While a great deal of experimental work had to be done to bring this new motor up to the high standard attained by our double reduction (Sprague) apparatus, we happily passed that period some months ago, and our single reduction motor is, we have reason to believe, from tests made by our customers, of very substantial construction and more economical of operation than any similar apparatus now offering. There is every indication that there will be a large increase of business in this department also.

The same officers as before were elected with the exception of S. Spencer, trustee, in place of J. B. Williams, trustee. In his letter accepting the presidency Mr. Villard stated that he accepted the office only on the understanding that the appointment was temporary and that he would be allowed to resign before April 1.

Personal.

Mr. L. E. Meyers, special agent of the Detroit Electrical Works, is located at 431, the Rookery, Chicago.

Mr. Norman McD. Crawford, has been appointed electrical engineer of the Jersey City, (N. J.) & Bergen system.

Mr. M. C. Sullivan has accepted the position of New York agent for the New Process Raw Hide Co. of Syracuse, N. Y.

Mr. Francis G. Daniels, formerly of the Short Electric Railway Co., is now connected with Messrs. Barry & McTighe of New York.

Dr. Louis Bell has resigned as Editor of the *Electrical World* of New York. He will be succeeded by Prof. Carl Hering of Philadelphia.

Mr. C. J. Field, of the Field Engineering Co., gave a talk on "Electric Railway Construction" at Sibley College, Cornell University, February 12.

Messrs. Augustin W. Wright and H. M. Kibby, cable engineers, of St. Louis, have recently made a visit to New York and Boston, for the purpose of studying transit problems.

Mr. J. S. Sloan and Mr. D. S. Taylor, representatives for Europe of the Short electric railway system, have opened an office in the Gresham Buildings, Basinghall Street, London.

Mr. Gilbert Wilkes has resigned as the district engineer of the Eastern District of the Edison General Electric Co,, in order to take charge of the electrical work at the Detroit Electrical Works, as chief engineer.

Mr. D. F. Lewis, president, and Mr. E. W. Bliss, director, of the Brooklyn City Railway Co., have recently returned from an extended trip which was made for the purpose of inspecting the methods of electric traction in different cities, with a view of selecting the best system and appliances for the equipment of their extensive lines with electricity. The route included the cities of Pittsburgh, Cleveland, Chicago, Minneapolis, Buffalo, Rochester and Boston.

Mr. George W. Pierce, superintendent of the Concord (N. H.) Street Railway Co., was a welcome visitor at the office of the STREET RAILWAY JOURNAL during the last month. Mr. Pierce reports that the lines carried last year over 365,000 passengers, the population of the city being only 17,000. Notwithstanding the fact that good sleighing has prevailed in the city since a week before Christmas, the electric cars have not missed a trip on account of snow.

Mr. H. S. Farquhar, connected with the engineering department of the Baltimore City Passenger Railway Co., has recently been in New York inspecting the work of the Broadway and Third Avenue cable lines. Mr. Farquhar confirms the report that the above company have decided to cable their Blue Line during the coming season, in addition to the work already under way. This will require two additional power houses, and will make an aggregate of twenty-six miles of cable construction.

Mr. Alexander B. Allen, representative of George Cradock & Co., wire rope makers, of Wakefield, Eng., having completed his tour around the world in the interests of his company, is again on a visit to this country, presenting to street railway men the merits of the Lang lay rope. Mr. Allen is confident that when our people learn how to splice and handle this type of rope that it will be extensively adopted by cable railway managers. Referring to particulars, Mr. Allen states that with a seven wire rope it is highly important that the rope be carefully inspected, and as soon as a broken wire appears the exposed ends should be cut off, for the wires being large and strong are apt to catch on the grip, and may result in pulling the car along or loosening a strand of the rope.

Mr. M. W. Hawks, representative of the St. Lawrence Ropery, Newcastle-on-Tyne, Eng., has recently arrived in this country from Australia, and is now engaged in interesting cable railway men in the merits of the Lang or long lay rope. Mr. Hawks is spending some time in Providence, R. I., where one of the ropes manufactured by his firm is now in use, and is instructing the manager in the method of splicing and care of the rope. One secret in the splicing in this type of rope, we are told, is untwisting the strands at the point where they cross before tucking, in which case, the wires being straight, pack close together and prevent any enlargement of the rope at this point. Mr. Hawks reports an interesting fact in relation to the driving of ropes by the figure 8 method, as employed on the Melbourne, Australia, lines. The winding drums being lined with wooden blocks the rope is sometimes liable to slip, but by cutting a slit in the bottom of the groove with a saw the tendency to slip is entirely obviated.

New Publications.

The Electrical Railway Inventions of George F. Green, is the title of a pamphlet which has just been issued by Oliver S. Kelly, of Springfield, O., who owns the Green patents.

Decennial Number of the Electrical Review, published in honor of the Buffalo Electric Light Convention, by the *Electrical Review* Publishing Co., N. Y. This issue celebrates the tenth anniversary of our contemporary's birthday and chronicles the progress of electrical industries during that time, as well as giving much interesting and pertinent matter about the present convention and convention city. The number is finely illustrated and printed, and reflects great credit upon its publishers.

The History of the West End Street Railway, etc. Edited and published by Louis P. Hager, Boston. Price, $1.00. In this volume are collected, together with a history of the West End Street Railway, sketches of the early street railways of Boston and account of their consolidation, a number of the speeches of Pres. H. M. Whitney, and notes on different supply houses. A number of advertisements are also included. There are also a number of illustrations. To those interested in the road the volume has many attractions, giving, as it does, the fine record in the line of advance made by the road in the past. To all the book presents much valuable matter, and many will appreciate the convenience of finding in handy form the important addresses of President Whitney.

Annual for 1892. Published by the Merida, Yucatan, Street Railway Co. The Street Railway Co., of Merida, Yucatan, has a capital of $400,000, thirty-eight cars in daily operation and a length of line 25,375 metres. Their method of publishing annually a "Directorio," would in this country be considered quite an innovation. The pamphlet is a small paper covered volume containing sixty-two reading pages with about the same number of advertising pages, and gives a sketch of the history of the road, time table of operation and names of officers, as well as considerable lighter reading such as acrostics, puzzles, proverbs, and short pieces of poetry. To interest the readers still further in the local advertisements a short notice at the end of each acrostic or riddle informs the reader at the store or office of which advertiser the solution can be learned upon inquiry.

Practical Electrical Engineering: A Complete Treatise on the Construction and Management of Electrical Apparatus as Used in Electric Lighting and the Electric Transmission of Power. By W. W. Beaumont, C. H. W. Biggs (editor), C. Capito, G. Kapp, A. Reckenzaun, P. Sellon, J. Swinburne and H. Swan. London, Biggs & Co.; New York, J. A. Penman. Published in 18 monthly parts, 10 x 13 ins. Price, 75 cents per part, and in two vols. at $7.50 per vol. The purpose of this treatise, of which the first nine numbers have been issued, completing Vol. 1, is to consolidate the knowledge that applies directly to the production and use of electric light and power apparatus. With this end in view, in addition to the general principles of electrical generators and motors, the laws governing the generation of steam in boilers and the transformation of its latent powers into mechanical energy in the steam engine are carefully treated, with an accompanying chapter on heat. Assuming then that the engines, boilers and dynamos are in order, the subject of switches and switchboards is taken up in Chap. XII, and several plans are given of latest types of switchboards installed by English engineers in lighting stations. Methods of measurements are taken up in Chap. XIII, and Electric Light Mains is the subject of Chap. XIV. The section on Tramway or Street Railway Work will appear in the second volume, and will be contributed by Mr. A. Reckenzaun, who will also write upon secondary batteries and their applications. The work is fully illustrated and handsomely printed.

The Tramway and Railway World.—A monthly review of current progress in steam, electric, cable and other traction, Vol. 1, No. 1, published monthly by the Tramway and Railway World Publishing Co., 53 and 54 Chancery Lane, W. C., London, Eng. We are pleased to chronicle the issue of the first number of the *Tramway and Railway World*, a paper devoted to the street railway interests of Europe, a prospectus of which we have already published. The management of this paper is in the hands of Mr. Frank X. Cicott, a gentleman already favorably known to street railway and electrical fraternity in this country and abroad by his contributions in the STREET RAILWAY JOURNAL and otherwise, and who is eminently fitted for the task he has selected, the publication of a high class periodical relating to street railway affairs. The first issue contains many handsome illustrations and much interesting reading. Among the principal subjects treated are, Electric Rapid Transit in Rochester, the Mt. Vesuvius Cable Railway, Electric Traction at Leeds, Walker's Patent Differential Drums and Two New Forms of Tram Cars (the Sessions and Pullman double decked). The object of the paper will be "to introduce to the notice of engineers and others in England the many improvements both in system and appliances which have for some time been successfully operated in other countries, and especially those methods which are likely to be introduced into the English market to meet the requirements of local conditions." That the paper is regarded with commendation in its chosen home and that it fills a long felt want is evidenced by the many favorable notices which it has already received from the British press.

The Electric Railway in Theory and Practice, by Oscar T. Crosby and Louis Bell, Ph. D. Published by W. J. Johnston Co., Ltd., New York. Price, $2.50: We are often asked by our readers for some work from which they can learn the cost and details of construction and operation of electric street railways. We take pleasure in referring them to the above work recently issued. It is true that the answer is not altogether satisfactory, or rather, some of the chapters are not written in a style to be read with facility by the average street

railway man, but a reader who seeks practical information on the essential features of electric traction (and there is no manager or electrical engineer who should not), and is willing to read slowly and thoughtfully and with study, will find in the "Electric Railway" a very serviceable treatise. It will not so much give him a "ready-made" system, as it will enable him to study out the best practice to be adopted under the peculiar conditions with which he may have to contend. That is not always the best book that thinks for one, but that which makes one think. This is practically true of the above work.

The matter is divided into twelve chapters with five appendices. The chapters relating to the Line, Track, Station and Commercial Efficiency, are the most important, and are exceedingly interesting and practical. We suggest to the purchaser not to begin reading the work at the first chapter but rather at the fourth, seventh, or ninth, for there is a certain indefinable difficulty with the style of the first chapter that is likely to discourage the reader so that he would lay the work aside and thus remain ignorant of the very valuable matter contained in the subsequent chapters. The character of this chapter, we suspect, is deliberate and intentional—the result of a purpose to make clear to the constructing electrical engineer only the essential line of practice to be followed to produce an efficient generator or motor. It presumes a large previous knowledge of the fundamental principles of electricity.

Both authors by their study and practice have become eminently fitted for the production of such a treatise. Mr. Crosby has had actual experience in constructing and operating electric railways, and his position as manager of a great electrical company has given him a rare opportunity of becoming familiar with the advantages, as well as the shortcomings of electric traction. Notwithstanding the fact that Mr. Crosby is interested in the manufacture of particular motors, there seems to be, throughout the book, an unbiased expression of opinion regarding the merits of different motors. Dr. Bell, late editor of the *Electrical World*, is a thorough student in electrical matters, and his position has also brought him in frequent contract with the managers of electric lines, so that he has been able to confirm his opinions by the experience of others. No one interested in the operation of an electric line, and no one who contemplates adopting this method of traction can afford to be without this work.

The book contains 400 pages, and 179 illustrations, is well printed, handsomely bound, and carefully indexed.

Equipment Notes.

Haines Bros. & Co., of Kinderhook, N.Y., have bought the horse railway system of Fond du Lac, Wis., and will change it to an electric line.

The Pennsylvania Iron Works Co., Philadelphia, have opened offices at 11 Wall Street, New York, and in the Drexel Building, Philadelphia.

The R. D. Nuttall Co., of 179–189 Grant Avenue, Allegheny, Pa., have just issued a calendar for 1892 which is extremely ornamental and tasteful.

H. N. Bates & Co., of Boston, Mass., have just issued a new edition of their illustrated catalogue and price list. It is a handsome volume of nearly 200 pages.

The Bridgeport Machine Tool Co., E. P. Bullard, proprietor, are receiving a large number of orders for their special tools. Among the customers are electric manufacturing companies and street railway companies.

Westinghouse, Church, Kerr & Co., have issued a small pamphlet, recently, on power plants, which contains much valuable information. A larger pamphlet will probably be issued by the same company within the next year.

The U. S. Steam & Street Railway Advertising Co., Carleton & Kissam, proprietors, have added twenty more cars of the Newark Passenger Railway Co. to the long list of cars in which they already control the advertising privileges.

The Wright Engine Works, of Newburgh, N. Y., will be located in their new quarters in the northern part of the city in the early summer. The new plant will be complete in every respect, and will greatly increase the facilities of the company.

Beecher, Schenck & Co. are the successors of Beecher, Schenck & Benedict, managers of the American Casualty Insurance & Security Co., of Baltimore, Mr. Benedict having withdrawn from the firm. This company are making a very satisfactory record in insuring street railway property.

The Pratt & Whitney Co., of Hartford, Conn., have recently completed a number of gears for sweepers for the Thomson-Houston Electric Co. They are also making a number of large milling machines. The extensive factory of the company is crowded to execute the large orders recently received.

The Eddy Manufacturing Co., of Windsor, Conn., owing to the large demand for their motors in New England, have opened a branch office at Oliver St., Boston, which will be in charge of Edwin R. Gilbert. Mr. Gilbert has had an excellent experience both in the manufacturing and selling departments of the motor business.

The Thomson-Houston Electric Light Co., of Pittsburgh, Pa., have moved their office from the German National Bank Building to 44 Wood Street, where they have the entire building of five floors and basement, 30 x 120 ft. in dimensions, and where a complete stock of electric lighting, railway and power supplies is kept on hand.

Barbour, Stockwell & Co., of Cambridgeport, Mass., manufacturers of track material and supplies for street railways, switches, frogs, gutters, knees, tie rods, and the Dowd gravity track cleaner, have opened an office in New York at Room 149, *World* Building. Mr. H. R. Luther will have charge of the New York business of the firm.

The Gilbert Car Works, of Troy, N. Y., have recently been obliged, on account of large orders, to enlarge their shops. They have therefore decided to convert the sheds at the back of Cannon Street into a workshop, where partly constructed cars can be finished. They have also recently completed an addition to their foundry.

The Tripp Manufacturing Co., of Boston, number among recent shipments of their standard roller bearing trucks, a number to the Central Electric Railway Co., of Sacramento, Cal. The operation of these trucks has been so satisfactory that a neighboring road, the Oakland, San Leandro & Haywards Railway of Oakland, have ordered twelve similar trucks.

The Mather Electric Co., of Manchester, Conn., have recently closed a large contract with the Blatz Brewing Co., of Milwaukee, Wis., for the equipment of their new works with electric power apparatus complete, 350 H. P. of generators and 400 H. P. of motors. The generators will be of 175 H. P. each, and the motors will range in size from ten to fifty horse power.

The Goubert Manufacturing Co., of New York, will hereafter be represented in Pittsburgh by Mr. W. A. Giles, with headquarters at 416 Lewis Block. Mr. Giles is a prominent contracting electrical and mechanical engineer of that city. His territory will include eastern Ohio, western Pennsylvania and Virginia. A large sale of the company's feed water heaters is expected.

The Stratton Separator Co., of New York, have received an order from the Columbia Iron Works & Dry Docks Co., of Baltimore, for several large separators for use on the new cruisers, Nos. 9 and 10, now in course of construction for the government. These separators will be of the naval type especially constructed for the United States Navy and will have steel shells and brass heads.

A. & J. M. Anderson, of Boston, have recently received orders from the West End Street Railway Co., of Boston, for several thousand pieces of their well known Ætna insulating devices for overhead line work. The same company have also received several recent orders of ample dimensions from the Newark Passenger Railway Co., the Paterson Street Railway Co., and the Trenton Railway Co.

The Stratton Separator Co., 32 Cortlandt Street, New York City, have recently furnished to the Columbian Iron Works & Dry Dock Co., of Baltimore, Md., several large separators for use in the new cruisers Nos. 9 and 10 which the latter company are now constructing for the government. These separators are of the naval type, especially constructed with steel shells and brass heads to meet the requirements of the United States Navy.

Charles A. Schieren & Co., of New York, have, through their Chicago agent, E. A. Burrell, secured a large order for belts for the Benton-Bellefontaine Railway's new power house at St. Louis. Two fifty inch, double belts, each 116 ft. long, will be installed in this power house. The same company have also recently closed a contract with the Columbus Consolidated Street Railway Co., of Columbus, O., for four thirty-four inch, double electric belts, each 100 ft. long.

The Interior Conduit & Insulation Co. of New York, are making large shipments of their new Johnson switches to their agents and the principal central stations in the United States. They are already some thirty days behind time with their orders. One illuminating company have ordered 1,100 of their well known switches in two days. The company have in preparation a handsome illustrated catalogue, setting forth the good qualities of this switch. This catalogue will be issued together with a revised edition of their well known No. 4 catalogue, in the course of the next ten days or two weeks.

The Standard Underground Cable Co., of Pittsburgh, in their annual report show that the capacity of the company's factory at Sixteenth Street and Allegheny Valley Railroad is equal to turning out $1,000,000 to $1,250,000 worth of product per annum, if run night and day, while with day turn alone a capacity of from $600,000 to $750,000 worth is assured. The machinery of the company is of the most modern style, and is made almost exclusively from designs and patterns made at the company's works, and under patents owned by the company. The financial statement was very gratifying and is given in another column.

The Lewis & Fowler Girder Rail Co., of Brooklyn, have much favorable testimony from managers of roads where their girder rail has been installed. Among other places where it has been used is on the Winston & Salem, N. C., railway, where it has given such satisfaction, that Mr. E. L. Hawks, who is interested in that road and is also president of the Wilmington, N. C., railroad, has adopted the same rail on the latter, on account of the satisfactory results attained in Salem. In a recent report made by Mr. J. C. Wrenshall, of the Union Railway Co. of Baltimore, upon the Winston & Salem road, Mr. Wrenshall also speaks in the highest terms of the Lewis & Fowler rails.

The Providence Steam Engine Co., of Providence, R. I., whose engines for electric light and railway service have been adopted in many cities, have recently completed a compound engine which runs at 108 revolutions a minute, and develops from 500 to 1,000 H. P. This engine will be installed at the Thomson-Houston Works in Lynn, and will be used in the testing room of the large dynamos which are being constructed by that company for the West End Railway Co., of Boston. The Providence Steam Engine Co. have also installed recently a number of their engines for electric work with a number of companies, including the following: The United States Electric Co., Washington, D. C.; West End Electric Co., Philadelphia, Pa., and the Diamond Electric Co., of the same city.

The New Process Raw Hide Co., of Syracuse, N. Y., send us a copy of a letter recently received by them from A. H. Underwood,

secretary of the Auburn City Railway Co. of Auburn, N. Y., written under date of Feb. 4. In his letter Mr. Underwood says: "We wish to state to you our approval of the patent raw hide pinions furnished by you and now running on our motors here. We had a nine months experience with them and find they fill all requirements. Motors equipped with them run much more quietly, and with ordinary care the gears outlast the metal gears used. They require to be kept free from oils, and the ordinary car equipments can be kept much cleaner in that respect in consequence. You are at liberty to use our recommendation and may refer any parties to us whom you may see fit."

The Ball Engine Co., of Erie, Pa., write us that the Hygeia Hotel, Old Point Comfort, Va., is just installing a sixty horse power Ball engine, being the third furnished this hotel by the Ball Engine Co. The 150 H. P. engine furnished the Kittanning Electric Light, Heat & Power Co., Kittanning, Pa., was started a few days ago by F. R. Dravo & Co., Pittsburgh agents of the Ball Engine Co. The engine gives universal satisfaction. Lockport Gas Light Co., Lockport, N. Y.' have added another 100 H. P. Ball engine to their present very complete electric light plant. The same company have recently shipped to the Westminster & Vancouver Tramway Co., Vancouver, B. C., three 150 H. P. engines, and to the Commonwealth Iron Co., Commonwealth, Wis., a thirty-five horse power engine.

The Boies Steel Wheel Co., Scranton, Pa., have received a letter from J. H. Vander Veer, general manager of the People's Street Railway Co. of Scranton, Pa., in which the latter says: "In reference to the steel wheels of your make in service on our road, would say that the first pair, put in service Sept. 1, 1889, under a thirty foot car, six feet wheel base truck, is now running against the fourth pair of 250 lb. chilled wheels. This pair of steel wheels is wearing true and bids fair to last two years yet. This past summer we equipped twenty sixteen foot cars with your wheels, and are more than satisfied with them. I consider the traction qualities better with the steel wheels, aside from the fact that the car does not lose time from having to haul it off to replace wheels every eight or ten months."

The Joseph Dixon Crucible Co., of Jersey City (established in 1827), who own the largest graphite works in the world, and whose reputation as manufacturers of graphite, plumbago, and black lead is world wide, make a silica graphite paint which they particularly recommend for roofs, wood or iron bridges, car houses, fences, etc. This paint has been in the market for over twenty years, and during that time has proved its efficiency and desirability for the work mentioned. Tin roofs well painted with this substance are said not to require repainting for ten or fifteen years. The paint is equally useful for the other uses mentioned and has shown equally good records there. The same company manufacture a graphite grease for wire ropes, cables, gears, car boxes, etc., which is reported to be giving very good satisfaction.

The John Stephenson Co., Ltd., of New York, have in their shops at present, among other cars, a number of the order of twenty cars which they are finishing for the Fourth Avenue line in New York City. These cars are being painted a handsome wine body color and present a striking appearance. The order for 100 cars for the Broadway line which, as mentioned in our last issue, was awarded to the Stephenson Co. will add to the already large number of Stephenson cars which are in operation in this city. Some details of this order are given in another column. The grip cars recently built at the factory of this company for the Washington & Georgetown Railway Co., have been shipped to Washington and are giving great satisfaction. Among other orders recently received by this company is one from Yonkers, N. Y., for cars to be fitted with Eickemeyer motors.

The Edison General Electric Co., of New York, have closed, among other orders, two in Uniontown and Erie, in Pennsylvania. The former is with the Uniontown Street Railway Co., and is for 275 H. P. dynamo and station outfit complete, as well as motors for six cars. The Edison system was in use before the fire which destroyed the previous plant of this company. The second order is for two railway dynamos aggregating 560 H. P. capacity. The Edison company have recently put upon the market a constant current transformer or motor-generator. This is wound for any two voltages, and the manufacturers think will find wide use in street railway circuits where it can be operated from a 500 volt circuit, and will give currents of lower voltage for lighting, electro-plating or other service where electric current is useful, but where a 500 volt circuit could not be used.

Alfred F. Moore, of Philadelphia, Pa., has for many years occupied a leading position in the insulated electric wire business which is famlliar to "old timers" in the electrical field. But the rapid growth of electrical industries of all kinds, bringing into the field men from all sections of the country, makes it necessary to continually remind the various interests that efficient results cannot only be obtained by the use of the highest grade of materials. How well the trade generally has appreciated the efforts of this firm to raise the standard of all insulated wires and cables, and also the success that has attended their efforts is well shown by the large sales and high reputation of their wires. On another page attention is called to several classes of their goods which should be as well known to the electric railway companies as they are to the electric light companies.

The Interior Conduit & Insulation Co., of New York, in order to meet a demand for a tube that will not disintegrate when placed in cement under tile floors and in like places, be less liable to mechanical injury during the construction of a building, and also be proof against fire arising from external sources, are now manufacturing their well known insulated tubing covered or armored with metal. Where electric wiring is to be introduced in a finished building, this brass covered tube (polished), they think, will be found especially desirable for and applicable to surface or exposed wiring, and they accordingly furnish their appliances brass covered to match. To avoid the possibility of careless or ignorant handling of their interior system by contractors or others, they have issued a set of specifications which they supply to customers and architects, to assist in the work of installation.

The Reliable Manufacturing Co. of Boston, Mass., have shipped their ratchet brake handles and sand boxes to the following companies during the past month: Newburyport Car Manufacturing Co., Newburyport, Mass.; The Norwich Street Railway Co., Norwich, Conn.; Citizens' Street Railway Co., Wheeling, W. Va.; Eastern Electrical Supply Co., Boston; Thomson-Houston Electric Co., San Francisco, Cal.; New York & Harlem Horse Railway Co., New York; Suburban Rapid Transit Street Railway Co., Pittsburgh, Pa.; Central Electric Railway Co., Sacramento, Cal.; Lamokin Car Works, Chester, Pa.; New Haven & West Haven Street Railway Co., West Haven, Conn.; Merrimac Valley Horse Railway Co., Lawrence, Mass.; Lynn Belt Line Street Railway Co., Lynn, Mass.; Worcester Consolidated Street Railway Co., Worcester, Mass.; Lynn & Boston Street Railway Co., Lynn, Mass.

The Morton Safety Heater Co., of Baltimore, on February 6 made a test of their system on a train of passenger coaches of the Baltimore & Lehigh Railroad Co., running from Baltimore to York, Pa. The train started from Baltimore on the coldest day of the season. It was seven degrees above zero outside, and nine degrees higher than that inside the cars. Steam was turned on for half an hour, when the temperature was seventy-two degrees. During the trip to York, which occupied four hours and twenty minutes, steam was turned on for only twelve minutes in addition. During the return trip steam was turned on for twelve minutes. Stops between the termini were made at forty-two stations where doors were opened for passengers to enter and leave the cars. During both trips the average temperature was maintained at seventy degrees. After the initial heating of the cars steam was applied only when the train was on the down grade so that the boiler was not robbed of steam. That portion which would have been exhausted was utilized. This system of stored heat in earthenware tubes has been since employed regularly on the road and it is giving entire satisfaction.

The Billings & Spencer Co. are furnishing their patent drop forged commutator bars to electrical companies and to companies using electrical apparatus. Among those who have ordered supplies of this kind from the company are the following: Edison General Electric Co.; Elektron Manufacturing Co., of Springfield, Mass.; Schuyler Electric Co., Middletown, Conn.; Mather Electric Co., Manchester, Conn.; Thomson-Houston Electric Co., Lynn, Mass.; National Electric Manufacturing Co., Eau Claire, Wis.; Standard Electric Co., St. Johnsbury, Vt.; Broadway & Newburg Street Railway Co., Cleveland, O.; Brush Electric Co., Cleveland, O.; Brosius Motor Sewing Machine Co., Atlanta, Ga.; Baltimore Car Co., Baltimore, Md.; Brooklyn Street Railway Co., Cleveland, O.; Manuel Balbis, Cienfuegos, Cuba; Eureka Electric Co., New York; Federal Street & Pleasant Valley Passenger Railway Co., Pittsburgh; Wightman Electric Manufacturing Co., Scranton, Pa.; Key City Electric Street Railway Co., Dubuque, Ia.; Minneapolis Street Railway Co., Minneapolis; Queen City Electric Co., Cincinnati, O. The company are selling to electric companies linemen's vises, carbon tongs, eye bolts, and forgings of all kinds.

The Berlin Iron Bridge Co., of East Berlin, Conn., recently closed a contract with the Chester Pipe & Tube Co., of South Chester, Penn., for their new building. This building will be fifty-two feet in width by 170 ft. long, and will be built entirely of iron, no wood work being used about the construction. The same company have taken a contract for a new boiler shop for the dry dock engine works at Detroit, Mich. The building will be sixty-eight feet in width, by 201 ft. in length, and will be designed and constructed entirely by the Berlin company, who not only furnish the iron work but the foundations, brick work, in fact, the whole building complete for the machinery. They have also closed a contract to supply an iron building for the True Blue Marble Co., of Rutland, Vt., to replace the mill of the company which was lately destroyed by fire. The building will be composed entirely of iron and marble, and will be eighty feet in width by 254 ft. in length, the side walls being of iron and marble and the roof of corrugated iron. Not only will the entire building be of iron, but the framework inside for carrying the gang saws, shafting, etc. will be of iron, so that there will be no woodwork about the building in any way to take fire.

Warren Webster & Co., of 491 North Third Street, Philadelphia, the sole licensees of the Williames vacuum system of steam heating, whereby they guarantee to heat buildings without back pressure upon engines and increase the efficiency of the heating surface, put the system in on trial. During the past few weeks they have booked a large number of orders. They furnish a descriptive catalogue of the Williames vacuum system, and send representatives to any part of the United States, at their expense, to examine plants and to explain to intending purchasers the advantages which they claim over the pressure system steam heating. During the past month, the same firm have received large orders for the Webster vacuum feed water heater and purifier. They have sent eighteen vacuum exhaust steam economizers to Sherman & Co., 71 Rempart du Lombard, Antwerp, Belgium, and through the good results shown they have sold all their foreign patents, which cover its manufacture in Great Britain, Germany, France, Belgium and Austria. All the economizers are sold on trial, with the guarantee to heat the feed water to the highest temperature with a less quantity of exhaust steam and with the greatest relief of back pressure. Other advantages are enumerated in the catalogue, which will be sent on application.

The Robinson Electric Truck & Supply Co., of Boston, added to their order book in a single week in February, orders for twenty-six more Robinson radial trucks. This company have about fifty

radial trucks in the works, to be completed for early spring delivery. The Robinson radial is so thoroughly and substantially built that in the hundreds now in use there has never been a break in any part of any truck through fault in design and construction, and only a break in two individual minor castings through violence. On one occasion, in a collision between a Robinson radial and an eight wheeled car, the radial knocked the eight wheeled car off its trucks into the street. The radial was uninjured, except that the controlling stand was broken. A new controlling stand was put on and the radial was again in regular service in less than an hour. The eight wheeler was in the repair shops for over two weeks. Not only is the radial most substantially built, but the framing of the car body for the radial truck is said to be stronger and more substantial even than the framing of coaches on steam roads. The popularity of the Robinson radial truck is shown by the fact that where it has been used orders for additional trucks are being sent forward to the Robinson company, and in not a single instance has a radial truck ever been discontinued where it has been put in operation.

The Page Belting Co. of Concord, N. H., report a very promising opening for the year 1892. Among the orders filled recently are complete new mill outfits for George O. Sanders, Nashua, N. H.; G. H. McDowell & Co., Cohoes, N. Y.; J. G. Bryson, Brazil, Ind., and Chattanooga Powder Co., Tenn. They have also equipped the electric light and power plant of the Peninsula Electric Light & Power Co., at Newport News, Va. This outfit included four "Acme" link belts and two "Eureka Dynamo" belts. They also furnished the complete outfit for the Penacook Electric Light Co., Penacook, N. H. Among the main belts shipped in the past month or so, they mention the following: A twenty-one inch, three-ply, for Madison, Me.; a thirty-six inch, for Muskegon, Mich.; a twenty-six inch, for North Leominster, Mass.; a twenty-four inch, for Detroit, Mich. They have done a very large business in their special electric belts, the "Acme" link, "Eureka Dynamo" and dynamo double. Some of the recent orders are: Of the "Acme," one to Bristol, Conn., three to Chicago, one to New York, and two to Presque Isle, Mich. Of the "Eureka Dynamo," two to Shamokin, Pa., two to Plymouth, N. H., one to Oswego, N.Y., one to Galveston, Tex., one to Cincinnati, O., one to Laredo, Tex., one to Raleigh, N. C., one to Wyoming, Mass., one to Bristol, Conn., one to Norfolk, Va., two to New York City, and one to Boston. Of the dynamo double, three to North Abington, Mass., four to Washington, D. C., one to New Orleans, one to Meyersdale, Pa., two to Chicago, one to New York, one to Boston, and one to White River Junction, Vt.

The Syracuse Tube Co. recently received an order from their representatives, the Engineering Equipment Co., of 143 Liberty Street, New York City, for a sample standard Syracuse pole for railway purposes, with the request that the same be "rushed." The company have every facility and the ability for the rapid execution of large or small orders for poles, as was illustrated by the following performance: The order mentioned above was received Wednesday and work was delayed until Thursday in order to employ some exceptionally fine skelp which was expected on that day. Upon its arrival on Thursday morning the skelp was taken into the mill and made into pipe, which in turn was used on the spot in the manufacture of the sample pole. The pole was then painted and shipped; all of which was accomplished by 12 o'clock noon. The pole was delivered in New York the next morning at 9 o'clock, as desired. The means and the amount of labor required to accomplish these results may not be apparent at first sight but some idea of the facilities and system required may be obtained when it is remembered that the pole contained three sections of pipe, each section of different size and length, and that the skelp had to pass through the ordinary process involving time and delays incidental to the manufacture of iron pipe and be completed before the making up of the poles could begin. The distinctive feature of the Syracuse pole is the exceptionally mechanical and strong manner in which the joints are made. The joints are the strongest parts of the Syracuse pole. They are made by inserting the smaller of two pipes into the larger and then swaging down the larger pipe while hot so that when shrunk upon the smaller pipe the joints are as strong as the original pipes themselves. This part of the process is facilitated by the use of dies under a steam hammer. The Syracuse Tube Co. have recently added to their space and equipment with the view to filling with despatch the large orders already booked and to be expected for the coming spring deliveries. The average capacity of their works is 600 poles per week, or 100 poles per day, which can be pushed to 800 poles per week when necessary to fill "rushed" orders. At these times a large stock of pipe of the sizes needed for pole manufacture is kept on hand and delays such ai might enter into the making of the special pole just described are avoided. Viewed in this light the above performance may be regarded as somewhat remarkable.

WESTERN NOTES.

The Brownell Car Co., of St. Louis, will erect additional buildings in the spring to provide additional facilities for their business.

F. W. Cushing, of 225 Dearborn Street, Chicago, will be the general Western agent for the Day Kerite insulated wires and cables.

The Hill Clutch Works have received contracts for furnishing machinery for the Benton & Bellefontaine Street Railway Co. of St. Louis, and the St. Louis & Suburban Railroad Co.

Chas. J. P. Heim, of St. Louis, Mo., whose portable fire hose bridge for cable railways has been described in this paper, writes us that he is willing to dispose of the patents covering its construction.

The Electrical Supply Co., of Chicago, report large sales of Wood's span wire ratchets, construction tools and railway material in general. They also carry in stock a complete line of parts and repairs for the Boston trolley and other goods.

Frank B. Rae has opened an office at 302 Hammond Building, Detroit, and will transact business as an electrical engineer. He will contract for the complete installation of street railway, electric light and power plants, and will supervise the construction work. He also is prepared to make reports on plants already installed, and to design new machinery.

The Short Electric Railway Co. of Cleveland, O., have recently closed an order for twenty forty H. P. gearless motors, to be used on the lines of the Consolidated Street Railway Co. of Grand Rapids, Mich. The contract was awarded to the Short company after a very careful inspection of a number of lines in different cities, on the part of the managers of the railway company.

The Walker Mfg. Co., of Cleveland, have secured the entire contract for the cable driving machinery for both stations of the Baltimore City Pass. Ry. Co., including five sets of machinery, in all of which the Walker differential winding drums will be employed. The same company have also secured a sub-contract from the Otis Bros. Elevator Co. for the Catskill Mountafn cable road. Length of incline, 7,000 ft.; elevation, 1,580 ft.

The Northern Car Co., of Minneapolis, are building the finest electric car ever turned out of their shops. It is being built for the Thomson-Houston company and will probably go to Sioux City. It measures about thirty-five feet over all, has ten windows on each side, and is mounted on double trucks, with thirty inch wheels. The body is paneled like a railroad coach and the finishings are neat and handsome. The interior is finished in polished light woods, and at night time will be brightened with eight large electric globes.

The Pullman Palace Car Co., of Chicago, report much interest and many inquiries concerning their new double decked, centre vestibuled car which has been described in these pages. These cars have been in use in a number of cities, and in every place have given excellent satisfaction, and several have already been ordered by street railway companies in different cities. The Pullman Palace Car Co. also report an order for twenty cars from the City & Suburban Railway Co., of Portland, Ore., and another from the Jacksonville, Ia., Electric Railway Co.

The Laclede Car Co., of St. Louis, are, at present, building some handsome cars for the Walnut Hills Electric Railway. The large order which this company received from the Third Avenue (New York) cable road for 375 cars is to be executed between now and midsummer. The first delivery of cars to the railway company is to be made in April and the last in July. The sample car sent to New York has been satisfactory to the Third Avenue management in every respect; 200 of the cars are to be closed, twenty-two feet in length, and mounted on four wheels, and the remaining 175 open but mounted on two four wheel bogie tracks.

The International Register Co. have opened an office at 435, The Rookery, Chicago, where A. H. Englund, formerly secretary and treasurer of the Electric Merchandise Co., is in charge as secretary and manager. The company have purchased the Pratt patents on conductors' fare registers, and have equipped a very complete factory for manufacturing these devices in both portable and stationary forms. Mr. Englund has a large acquaintance in the street railway field, and the prospect for a good trade is bright. The officers of the company are: President, A. S. Littlefield; vice president, W. J. Cooke; secretary and treasurer, A. H. Englund; superintendent, Charles E. Pratt.

The Falls Rivet & Machine Co., of Cuyahoga Falls, write us that they are very heavily loaded with work for electric plants at the present time, and are now erecting machinery at the following places: Wheeling Street Railway Co., Wheeling, W. Va.; The Powelton Electric Light Co., Philadelphia, Pa.; Louisiana Electric Light Co., New Orleans, La.; Edison Electric Illuminating Co., Easton, Pa., and are now erecting in their factory machinery for the following plants, and which they expect to ship at an early date: Utica Electric Light Co., Utica, N. Y.; Clinton Gas Light & Coke Co., Clinton, Iowa; Portsmouth Electric Light Co., Portsmouth, Ohio; Eckstein Building, Cincinnati, Ohio; Columbus Consolidated Street Railway Co., Columbus, Ohio.

The Stirling Co., Pullman Building, Chicago, manufacturers of their well known type of water tube safety boilers, have recently closed contracts with the following well known companies: Carnegie, Phipps & Co., Pittsburgh, Pa., 1,200 H. P.; San Francisco & San Mateo Railway Co., San Francisco, Cal., 1,250 H. P.; Los Angeles Consolidated Electric Co., 1,500 H. P.; Pacific Rolling Mills Co., San Francisco, Cal., 1,500 H. P.; Braddock Wire Co., Braddock, Pa., 600 H. P.; Cincinnati Wire Works, Cincinnati, O., 1,200 H. P.; Cold Storage Co., Chicago, 1,800 H. P.; Minneapolis Street Railway Co., Minneapolis, Minn., (second order), 2,000 H. P.; Toledo Water Works, Toledo, O., 1,500 H. P. This company have sold over 100,000 H. P. in the last three years, all giving satisfaction.

The American Car Co., of St. Louis, are very busy at present. In order to fill their many orders a night force and a day force have to be worked. As their paint shop is not yet finished they have rented the western portion of the large Cotton Compress Building not far from the works, and also situated on the railroad tracks. The company's present capacity is five cars per day. Among the large orders on their books may be mentioned 180 cars for the Washington & Georgetown railway, of which sixty are to be grip cars, sixty open and sixty closed trail cars; also 150 closed cars, twenty-two feet in length, with nine windows on each side, for the West Chicago Street Railroad, and fifty cars for the North Chicago Street Railroad. All work turned out by this company is first class in every respect, and needs no better recommendation than that it is supervised by Mr. Wm. Sutton and Mr. Emil Alexander.

The Brownell Car Co., of St. Louis, Mo., have received a large number of orders lately and report business as very brisk. Among their recent customers they mention the Baltimore Traction Co., for whom they are making a number of grip and trail cars for use on the Gilmor Street cable line, and the Consolidated Street Railway Co., of Grand Rapids. For this latter company they are building twenty summer car bodies which will be fitted with the Brownell improved trussed trolley bridge. This device has recently been patented by the Brownell Co., and its object is to strengthen the car roof while it supports the trolley. The Accelerator car manufactured by them is now in New York City and attracting much attention on account of its novel features. Mr. H. H. Littell, of Buffalo, who was recently in New York, rode on the car and expressed himself as much pleased with its principle and operation. The managers of the car company have much favorable testimony on the car and are justly pleased with the results attained by it.

Annual Report of the Louisville Street Railway Company.

The annual report of President T. B. Speed of the Louisville (Ky.) Street Railway Co. for the year ending December 31, 1891, and given to the stockholders last month, shows gross earnings $1,188,822.00, operating expenses $782,791.53, and net earnings $406,030.47. The increase of gross earnings as compared with 1890 has been $50,328.27, and as compared with 1889 has been $196,433.52. The increase of net earnings as compared with 1890 has been $24,314.58, and as compared with 1889 has been $63,198.65. The interest on the funded debt for the year was $314,180, leaving a surplus of net earnings of $91,850.47. The total mileage for the year 1891 is 8,153,618 miles, or an average of 22,338 miles per day. The average earnings per car mile on all lines for 1891 has been 14.57 cents; for 1890, 15.60 cents.

Expenses per car mile for 1891, 9.60 cents; for 1890, 10.40 cents. Net earnings per car mile for 1891, 4.97 cents, and for 1890, 5.24 cents.

The slight reduction in net earnings per car mile was caused by the additional number of cars run in 1891, as compared with 1890, principally trailers on the electric lines. The additional mileage has been 880,709 miles.

The funds arising from the sale of the bonds of the company have been exhausted in the improvements and extensions of the past year, and further money is necessary. The company are to continue to substitute electrical equipment on the remaining lines for animal power. No floating debt has been created by the company with the exception of a temporary loan of $20,000. The company have already equipped and in operation forty-one miles of electric roads, and there remains operated by animals ninety-two miles of road. The plan was therefore proposed of changing $1,000,000 common stock of the Louisville Railway Co. into preferred stock, allowing any stockholder to make the change upon payment of the market value, about $50 per share, in into the treasury of the company. The capital stock at present is $6,000,000, of which $1,000,000 is five per cent. preferred. It is thought that the plan will be adopted.

Annual Report of the Federal Street & Pleasant Valley Railway Co.

At the annual meeting of the Federal Street & Pleasant Valley Passenger Railway Co. of Pittsburgh, Pa, the report of the treasurer showed gross receipts for the year $388,505.39; expenditures, including salaries, labor, repairs, interest on bonds and general expenses, $300,601.02; net earnings, $87,904.37; dividend No. 33, paid in July, 1891, $39,000; surplus carried over to new account, $48,904.37. Dividend No. 34, of three per cent., payable January 25, was then declared on the earnings of the last six months. The president, D. F. Henry, in his report to the stockholders, after referring to the successful results obtained with electric traction and the satisfaction of the manngement in the same, stated that during the last year they had completed four and a half miles of new track laid with the improved Johnson girder rail, also three miles of new track laid with T rail and had replaced six and a half miles of old iron tram rail with heavier and better steel rail. The power plant had also been increased by the addition of one Westinghouse compound condensing engine of 250 H. P., and three Edison dynamos of 150 kilowatts each. The rolling stock had been increased by the addition of ten motor cars and three electric snow sweepers. Two car houses also had been built during the year. As a summary of the work of the preceding year Mr. Henry gave the following facts: "Passengers carried, 7,770,108; car miles run, 1,345,149, as against 6,612,913 passengers and 1,223,600 miles for the previous year, showing an increase of seventeen and a half per cent. in passengers carried, and about ten per cent. in the mileage run. Gross receipts, $388,505.39, or 28.88 cents per car mile, an increase of $56,604,59, or over seventeen per. cent. Gross expenses, including interest on funded debt, amounted to $300,601.02, being 22.35 cents per car mile. Excluding interest, and charging only operating expenses, we find 19.79 cents per car mile as the cost and show $122,279.37 net earnings, or 9.09 cents per car mile. In the past twelve months we have been quite free from delays, the greatest being about thirty or forty minutes, caused by an electric light tower being thrown down by a severe wind storm, thereby grounding our wires. And in conclusion, would add that notwithstanding the different roads we operate along narrow streets, with hundreds of curves, numerous steam, cable and electric railway crossings, and heavy grades, it is certainly very gratifying to be able to state that having handled over 14,000,000 passengers and run over 2,500,000 miles on our various roads in the past two years, not a single passenger has been injured while on board our cars."

List of Street Railway Patents

ISSUED BY THE U. S. PATENT OFFICE, JANUARY 26, 1891, TO FEBRUARY 16, 1892, INCLUSIVE.

JANUARY 26.

Car Brake, Edgar Peckham, Kingston, N. Y. 467,896
Carbon Brush Holder, Cyprien O. Mailloux, New York, N. Y. 467,542
Cushioned Car Wheel, Benjamin F. Haugh, Indianapolis, Ind. 467,721
Electric Railway, Warren B. Hutchinson, Passaic, N. J. 467,699
Motor Car, Charles Lancaster and John Sturgeon, Chester, England 467,741
Motor Mechanism for Street Cars, Rich'd W. Thickins, Minneapolis, Minn. 467,693
Sand and Water Distributing Cylinder for Cars, Thomas A. Herrington, St. Louis, Mo. 467,809
Street Car Replacer, James Findlay, Toronto, Canada 467,763
System of Electric Distribution, Nelson W. Perry, Cincinnati, O. 467,897
Trolley Wheel for Electric Cars, Levi A. Simons and George R. Root, Omaha, Neb. 467,583

FEBRUARY 2.

Cable Grip Adjusting Device, Henry H. Linch, San Francisco, Cal 468,064
Car for Use upon Inclined Railways, Jacob Messner, Calumet, Mich. 467,945
Combined Chair and Fish Plate Joint for Railways, William Wharton, Jr., Philadelphia, Pa. 468,162
Conduit Electric Trolley, Malone Wheless, Nashville, Tenn. 468,166
Conduit for Electric or Cable Roads, Clarence H. Bates, Minneapolis, Minn. 468,314
Electric Fare Register, Willard H. Gilman, Boston, Mass. 468,172
Electric Railway, Malone Wheless, Nashville, Tenn. 468,165
Electric Railway, Malone Wheless, Nashville, Tenn. 468,164
Electric Railway, Malone Wheless, Nashville, Tenn. 468,163
Electric Motor Regulation, Francis O. Blackwell, New York, N. Y. 468,128
Electric Railway Motor, Henry M. Byllesby, St. Paul, Minn. 467,969
Insulator, Charles T. Lee, Boston, Mass. 467,941
Rail Joint, Charles H. Jenne, Indianapolis, Ind. 467,935
Railway Switch, Samuel T. Mock, Milwaukee, Wis. 467,948
Side Bearing for Car Trucks, Melville V. Mullen, Chicago, Ill. 468,057
Street Railway Tunnel and Method of Constructing the same, Theodore G. Gribble, Yonkers, N. Y. 468,282
Trolley Wire Hanger, Charles T. Lee, Boston, Mass. 467,940
Truck for Vehicles, David L. Barnes, Chicago, Ill 468,146

FEBRUARY 9.

Adjustable Guard Rail for Street Cars, Daniel Catarleus, Brunswick and Augustus S. Crable, Lansingburg, N. Y. 468,454
Adjusting Device for Cable Grips, Clarence L. Anderson and George H. Fairchild, San Francisco, Cal. 468,555
Car Wheel, Henry F. Mann, Allegheny, Pa. 468,675
Car Wheel, Henry F. Mann, Allegheny, Pa. 468,676
Electric Motor, James T. Wilson, Tyrone, Pa. 468,716
Electric Railway, Charles W. Thomas, Jersey City, N. J. 468,708
Electric Railway System, William J. Ogden, Baltimore, Md. 468,575
Elevated Electric Conduit, Charles O. Newton, Homer, N. Y. 468,368
Elevated Railroad Car, William T. Shaffer, Evanston, Wyo. 468,699
Motor Gearing for Electric Cars, Elbert B. Phillips, Cleveland, O. 468,526
Railway, Alexander G. E. Westmacott and James P. Hutchinson, Newtown, Pa. 468,608
Railway Joint, William A. Guthrie, Durham, N. C. 468,518
Trolley Wire Support, Jonathan P. B. Fiske, Lynn, Mass. 468,336

FEBRUARY 16.

Automatic Passenger Register, Daniel L. Tower, Brooklyn, N. Y 468,845
Cable Railway, Wm. C. Metzner and Gustavus E. Buschick, Chicago, Ill. 468,813
Car Step, Michael B. Ryan, St. Louis, Mo. 468,899
Car Truck, William A. Dutton, Cleveland, O. 469,011
Converter System for Electric Railways, Thomas Edison, Llewellyn Park, N. J. 468,949
Double Traction Motor for Elevated Railroads, George A. Stephenson, Los Angeles, Cal. 468,842
Electric Railway, Frank J. Sprague and Patrick F. O'Shaughnessy, New York, N. Y. 468,959
Electrically Propelled Car, Harry E. Dey, Brooklyn, N. Y. 468,948
Elevated Railway Structure, George A. Stephenson, Los Angeles, Cal. 468,841
Motor for Street Cars, Alonzo J. Painter, Pasadena, Cal. 468,824
Signal for Electric Railway Systems, Frederick A. Cheney, Elmira, N. Y. 468,787
Track Cleaner, James M. Taylor, Omaha, Neb. 469,103
Traction Device for Tram Cars, Walter B. Wright, Chicago, Ill. 468,860
Trolley for Electric Cars, John W. Beebe, Waterloo, N. Y. 468,779
Turn Table Connection for Electric Railways, Rudolph M. Hunter, Philadelphia, Pa. 468,912

We will send copies of specifications and drawings complete of any of the above patents to any address upon receipt of twenty-five cents. Give date and number of patent desired. Street Railway Publishing Company, World Building, New York.

The Accelerator.

The Accelerator car, exhibited at Pittsburgh by the Brownell Car Co., has since been running on the lines of the North Chicago Railroad Co. (cable) Chicago, the Twenty-third Street line (horse), and Broadway line (with horses), of New York City.

President Yerkes, of the Chicago lines, says of the car: "Every promise made regarding it has been fulfilled," and he has purchased the right for its use on all his lines. The car has been carrying large numbers of passengers in New York, and both railroad managers and traveling public seem satisfied with results.

QUOTATIONS OF STREET RAILWAY STOCKS.

BOSTON STOCKS.—Corrected by R. L. DAY & Co., 7 Exchange Place, Members of Boston Stock Exchange. Feb. 18.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
West End Pref	50	$6,406,000	J. & J.	4	1887	84¾	85
West End Com'n	50	$7,150,000	J. & J.	5	1890-1891	73	73½

PROVIDENCE STOCKS.—Corrected by CHACE & BUTTS, Bankers, Providence, Feb. 18.

Company	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
Pawtucket St. Ry. Co	100	$270,000	New.	...	Oct., 1887	90	95
Union R. R. Co., Prov	100	2,000,000	Q.—J.	2	1862-1863	190	192
Providence Cable Tramway ..	100	300,000	Owned by Union Railroad Co.				

HOLYOKE STOCKS.—Corrected by J. G. MACKINTOSH & Co., Bankers. Holyoke, Mass. Feb. 18.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
Springfield Street R. R. Co	100	$360,000	J. & J.	4		200	225
Holyoke Street R. R.	100	150,000	J. & J.	4		190	200
Northampton Street R. R.	100	50,000				25	50

CHARLESTON STOCKS AND BONDS.—Corrected by A. C. KAUFMAN, Charleston, S. C., Feb. 18.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Charleston City Ry. Co	50	$100,000	J. & J.	3			65
Enterprise Ry. Co	25	250,000					8

BONDS.	Date of Issue	Amo'nt Outstanding.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Charleston City Ry. Co		100,000	J. & J.	6	1915		
Enterprise Ry. Co		50,000	J. & J.	5	1906		

NEW ORLEANS STOCKS AND BONDS.—Corrected by GEORGE LE-SASSIER, 174 Common Street, New Orleans, La., Feb. 18.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Carrollton R. R. Co	100	800,000	Quart.	1½	1867	120¾	123
Crescent City R. Co	100	1,150,000	"	1¾	1866	90	90½
Canal & Claiborne R. R. Co..	40	240,000			1888	22	26
New Orleans City & Lake Co.	100	1,500,000	Quart.	1¾	1860	130½	
Orleans R. R. Co	50	185,000	"	2	1868	72	
St. Charles Street R. R. Co..	50	600,000	"	1½	1866	89½	92

Bonds.	Date of Issue	Amount Outstanding.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Canal & Claiborne Sts. R. R.	1879	150,000	A & O	6	1887	101¼	
Crescent City R. R. 1st Mort.	1883	100,000	M & N	6	'93-'99		
do do new	1886	40,000	M & N	6	1896		
N. O. City R. R. Co	1879	495,200	J & D	6	1903	118	
N. O. & Carrollton R. R. Co..	1882	300,000	F & A	6	'92-'06	113½	
St. Charles Street R. R. Co...	1881	165,000	J & D	6	'89-'01		

NEW HAVEN STOCKS AND BONDS.—Corrected by H. C. WARREN & Co., Bankers and Brokers, New Haven, Conn. Feb. 18.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
F. Haven & Westville R. R. Co.	25	$300,000	J. & J.	4		140	
State Street Horse R. R. Co....	25	23,000	J. & J.	3		100	
New Haven & W. Haven R. R. Co	25					20	
New Haven & Cent'lle H. R. Co.							
Whitney Ave. Ry. Co	50	25,000				7	
Bridgeport Horse R. R. Co	100	140,000					
Hartford & Westfield Horse R. R. Co	100	200,000	J. & J.	3		125	

BONDS.	Date of Issue	Amo'nt Outstanding.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
State Street Horse R. R. Co...	1874	20,000	J. & J.	7	Jan., 1894	105	
New Haven & W. Haven R. R. Co	1889	50,000	J. & J.	5	July, 1899	100	
Bridgeport Horse R. R. Co		50,000		6			
Hartford & Wethersfield Horse R. R. Co., Deb. Series A	1888	100,000	M. & S.	5	Sept., 1908		
Hartford & Wethersfield Horse R. R. Co., Deb. Series B	1890	100,000	M. & N.	5	May, 1910		
Hartford & Wethersfield Horse R. R. Co., Deb. Series C. (Not yet issued)		100,000	M. & N.	5	May, 1910		

BROOKLYN STOCKS AND BONDS.—Corrected by C. E. STAPLES & Co., 215 Montague Street, Brooklyn, Feb. 18.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Atlantic Avenue R. R. Co	50	1,250,000	Q.—J.	1½		107	108
Broadway R. R. Co	100	525,000	Q.—F.	2		185	
Brooklyn City R. R. Co	10	6,000,000	Q.—J.	2		176	
Coney Island & Brooklyn R. R. Co	100	500,000				125	

BONDS.	Date of Issue	Amount Outstanding.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Atlantic Ave. R. R. Co., 1st mort		140,500	M & N.	7	May, 1894	104	
Atlantic Ave. R. R. Co. Cons.		900,000	A. & O.	5	Oct., 1909		106
Broadway R. R. Co		350,000	J. & J.	5	6 m. notice	100	
Coney Island & Brooklyn R. R. Co., 1st bonds		300 000	J. & J.	5	Jan., 1909		103
Coney Island & Brooklyn R. R. Co., certificates		300,000	J. & J.	6	July, 1894	101	
South Brooklyn Central R. R. Co., 1st		125,000	F. & A.	7	Aug., 1897	107	
South Brooklyn Central R. R. Co., 2d		150,000	F. & A.	6	July, 1941	103	
Brooklyn City R. R. Co., 1st		3,000,000	J. & J.	5	July, 1916	108	

ALBANY STOCKS AND BONDS.—Corrected by SPENCER TRASK & Co., Bankers and Brokers, corner State and James Streets, Albany, N. Y., Feb. 18.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Albany R. R. Co	100	750,000	Q Aug.	1½	1890	112	117
Watervleit Turnpike & R. R. Co	100	240,000			1863	10	12

BONDS.	Date of Issue	Amount Outstanding.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Albany R. R. Co., 1st Mort	1865	40,000	J. & J.	5	1905	103	
" " " 2d Mort	1873	20,000	M. & N.	7	1893	102	
" " " 3d Mort	1875	28,500	J. & J.	7	1895	105	
" " " 4th Mort	1880	11,500	M. & S.	6	1905	105	
" " " 5th Mort	1888	50,000	M. & S.	5	1913	105	
" " " Consol Mtg	1890	350,000	J. & J.	5	1930	103	104
" " " Debenture	1891	200,000	M. & N.	6	1901	112	114
Watervliet Turnpike & R. R., 1st Mort	1889	350,000	M. & N.	6	1919	105	
Watervliet Turnpike & R. R., 2d Mort	1889	150,000	M. & N.	6	1919	75	

NEW YORK STOCKS AND BONDS.—Corrected by H. L. GRANT, 26 Broad St., New York, Feb. 18.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Bleecker St. & Fulton Ferry	100	900,000	J. & J.	¾		25	27
Broadway & Seventh Avenue..	100	2,100,000	Q.—J.	2		205	205
Brooklyn City	10	2,000,000	Q.—F.	2		165	170
Brooklyn Crosstown	100	500,000	A. & O.	4			
Cen'l Park, North & East River	100	1,800,000	Q.—J.	2		164	168
Christopher & Tenth	100	650,000	F. & A.	1¾		115	116
Central Crosstown	100	600,000	Q.—F.	1¾		125	130
Dry Dock, E. B'way & Battery.	100	1,200,000	Q.—F.	2		125	135
42d & Grand St. Ferry	100	748,000	Q.—F.	3		230	240
42d St., Manhat. & St. Nich. Av.	100	2,500,000				37	40
Eighth Avenue	100	1,600,000	Q.—J.	2		105	110
Houston, W. St. & Pav. Ferry. Leased to B'way & 7 ave	100	1,000,000	Q—F.	2		160	
Second Avenue	100	1,862,000	J. & J.	5		95	100
Sixth Avenue	100	1,500,000	M. & S.	3		130	1 0
Third Avenue	100	2,000,000	M. & N.	4		290	305
23d St	100	600,000	Q.—F.	2½		220	230
Ninth Avenue	100	800,000		3		90	95

Bonds.	Date of Issue	Amount.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Bleecker St. & Fulton Ferry		700,000	J. & J.	7	July, 1900	110	
B'way & 7th Ave., 1st mort		1,500,000	J. & D.	5	June, 1904	105	107
2d mort		500,000	J. & J.	5	July, 1914	105	106
Broadway Surface Guaranteed		1,500,000	J. & J.	6	July, 1924	106	107
Additional		1,000,000	J. & J.	5	July, 1905	93	95
Brooklyn City		200,000	J. & J.	5	Jan., 1902	105½	107½
Brooklyn Crosstown		200,000		5	1902	107	109
Cen'l Park, North & East River		1,200,000	J. & D.	7	Dec., 1902	114	116
Christopher & Tenth		250,000	A. & O.	7	Oct., 1898	112	114
Central Crosstown		250,000	M. & N.	6	Nov., 1922	118	120
Dry Dock, E. B'way & Battery. 1st mort		840,000	J. & D.	7	June, 1893	104	106
Scrip		1,200,000	F. & A.	6	Aug. 1914	98	100
42d & Grand St. Ferry		236,000	A. & O.	7	April, 1893	110	112
42d St. Manhat. & St. Nich. Av 1st mort		1,200,000	M & S.	6	Sept., 1910	112	114
2d mort		1,200,000	J. & J.	6	1915	38	39
Eighth Ave., Scrip		1,000,000	F. & A.	6	Aug., 1914	105	110
Houston, W. St. & Pav. Ferry.		250,000	J. & J.	7	July, 1894	109	111
Second Avenue		1,600,000	M. & N.	5	Nov., 1909	102	103
Third Avenue		5,000,000	J. & J.	5	Jan., 1937	110	115
23d St		250,000	M. & N.	7	May, 1893	108	110

MONTREAL STOCKS AND BONDS.—Corrected by GORDON STRATHY & Co., Members Montreal Stock Exchange, 9 St. Sacrament Street, Feb. 18.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Montreal St. Ry. (p'd up sh.)	50	$600,000	M. & N.	4	May, '91.	184	190

BONDS.	Date of Issue	Amount Outstanding.	Interest Period.	%	Principal Due.	Bid.	Ask'd
Montreal St. Ry.	1885	£60,000	.....	5	1965	.....	.....

LOUISVILLE STOCKS AND BONDS.—Corrected by ALMSTEDT BROS. Stock and Bond Brokers, 510 West Main Street, Louisville, Ky., Feb. 18.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Louisville St. Ry. Co., pref.	100	$1,000,000	A. & O.	5	Jan. 1891	78	80
Louisville St. Ry. Co., com.	100	5,000,000	.....	...	Jan. 1891	21	22

BONDS.	Date of Issue	Amount Outstanding.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Louisville St. Ry. Co., 1st mort	1890	6,000,000	J. & J.	5	1930	94	95
Louisville City Ry. Co. Cons.	1884	1,000,000	J. & J.	6	1909	112½	.....
Central Passenger Ry. Co.	1888	400,000	M. & N.	6	1908	112½	.....
New Albany St. Ry. 1st Mort.	1888	150,000	J. & J.	6	1913	95	100

CHICAGO STOCKS AND BONDS.—Corrected by WILLIAM B. WRENN, 82 Washington Street, Chicago, Ill., Feb. 18.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Chicago City	100	$7,000,000	Q.—J.	3	.....	320	325
Chicago Passenger	100	1,000,000	A. & O.	2½	.....	....	96
North Chicago City	100	500,000	Q.—J.	7½	.....	500	.....
North Chicago Street	100	5,000,000	J. & J.	4	.....	181¼	182
West Division City	100	1,250,000	Q.—J.	8¾	.....	635	.....
West Chicago Street	100	10,000,000	Q.—F.	1½	.....	134⅝	135⅜

BONDS.	Date of Issue	Amount Outstanding.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Chicago City	.....	4,619,500	J. & J.	4½	.....	99	99¼
Chicago Passenger	1883	400,000	F. & A.	6	1903	105	109
North Chicago City, 1st mort.	.....	500,000	M. & N.	6	1900	.....	112
" " "	.....	1,640,000	M. & N.	4½	1927	95	97
North Chicago Street 1st mort	.....	2,350,000	J. & J.	5	1906	100	101½
West Division Railway	.....	3,790,000	J. & J.	5	.....	102	102½
" " " Ext.	.....	250,000	J. & D.	6	.....	101	101½
West Chicago Street	.....	4,160,000	M. & N.	5	.....	102	102½
West Chicago Street, Tunnel	.....	1,500,000	F. & A.	5	.....	.....	98

PITTSBURGH STOCKS AND BONDS.—Corrected by REA BROS. & Co., 115 Fourth Avenue, Pittsburgh, Pa., Members of New York, Philadelphia and Pittsburgh Stock Exchanges, Feb. 18.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Central Traction R. R. Co	50	1,500,000	.....	..	.....	28⅞	29
Citizens' Traction R. R. Co	50	3,000,000	J. & J.	3	.....	60¾	61
Pitts. & Birmingham R. R. Co	50	3,000,000	.....	...	.....	18⅜	18½
Pittsburgh Traction R. R. Co.	25	2,500,000	J. & J.	...	.....	53	54
Federal St. & Pleasant Valley	50	1,300,000	J. & J.	3	.....	23⅞	24⅛
Pittsburgh, Allegheny & Man	50	3,000,000	.....	...	.....	36	37
West End R. R. Co.	50	200,000	J. & J.	...	.....	70	.....
Second Avenue R. R. Co.	50	300,000	J. & J.	3	.....	49	50½
Penn Incline Plane Co.	50	250,000	.....	...	.....	.....	.....
Monongahela Incline Plane Co	50	140,000	F. & A.	...	.....	.....	.....
Fort Pitt Incline Plane Co	50	60,000	.....	...	.....	5	20
Mount Oliver Incline Plane Co	50	100,000	.....	...	.....	40	.....
Pittsburgh Incline Co.	100	150,000	.....	...	.....	115	.....

BONDS.	Date of Issue	Amount Outstanding.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Citizens' Traction R. R. Co.	1887	1,250,000	A. & O	5	1927	107	108
Pitts. & Birmingham Traction Co.	1889	1,500,000	M. & N.	5	1929	95	95¼
Pittsburgh Traction R. R. Co.	1887	750,000	A. & O.	5	1937	.. .	104
Pleasant Valley Ry.	1891	300,000	J. & J.	5	1919	.....	.....
P., A. & M. R. R. Co.	1891	1,500,000	J. & J.	5	1931	102	109½
Duquesne Traction Co.	1890	1,500,000	J. & J.	5	1930	.....	98
Second Ave. Electric R. R. Co	1889	1,500,000	J. & J.	5	1909	.....	.....
Central Traction Co.	1889	375,000	J. & J.	5	1919	.....	.....
Pleasant Valley R. R. Co.	1873	75,000	J. & J.	6	1903	.....	.....
Union R. R. Co.	1881	100,000	A. & O.	5	1901	.	.....
West End R. R. Co.	1887	75,000	J. & J.	5	1907	...	.....
Fort Pitt Incline Plane Co.	1881	30,000	.. ....	6	1901	...	.....
Mount Oliver Incline Plane Co	1871	44,500	M. & N.	6	1901	.....	.....
Penn Incline Plane Co. 1st Mort.	1883	125,000	.....	6	1903	.....	.....
Monongahela Incline Plane Co.	1887	50,000	A. & O.	5	1892	...	.....
Monongahela Incline Plane Co.	1887	50,000	A. & O.	5	1897	.. ..	.....
Pittsburgh Incline Co.	18 9	250,000	J. & J.	6	1919	.. ..	.....

SAN FRANCISCO STOCKS AND BONDS.—Corrected by PHILIP BARTH Broker, 440 California Street, San Francisco, Cal., Feb. 18.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
City R. R. Co	100	800,000	.....	...	.....	.....	100
California St. Cable Co.	100	1,000,000	Monthly	5	....	118½	118
Central R. R. Co.	100	1,000,000	.....	...	.....	.....	12
Geary St., Park & Ocean R. R. Co	100	1,000,000	.....	1	.....	90	100
North Beach & Mission Ry. Co	100	1,000,000	.....	...	.....	47½	53
Ferries & Cliff House R. R. Co.	100	2,500,000	.....	...	.....	.....	40
Omnibus Cable Co.	100	2,000,000	Monthly	4	.....	65	67
Presidio & Ferries R. R. Co.	100	1,000,000	.....	...	.....	22½	30

Bonds.	Date of Issue	Am't Outstanding.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Ferries & Cliff House	.....	650,000	M. & S.	6	1914	.....	107
Market Street R. R.	.....	3,000,000	J. & J.	6	913	121	125
Omnibus R. R.	.....	2,000,000	A. & O.	6	1918	115½	.....
Powell Street R. R.	.....	700,000	M. & S.	6	1912	.....	115
Park & Ocean R. R.	.....	250,000	J. & J.	6	1914	110	115
Park & Cliff House R. R.	.....	350,000	J. & J.	6	.....	92½	95
Cal. St. Cable R. R.	.....	.....	.....	...	.....	102¾	.....

ST. LOUIS STOCKS AND BONDS.—Corrected by JAMES CAMPBELL, Banker & Broker, 307 Pine st., St. Louis, Mo., Feb. 18.

Company.	Par.	Capital Issued.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Benton-Bellefontaine	100	$324,000	Q.—J.	3	1864	101	102½
Cass Ave. & Fair Grounds	50	300,000	.....	...	1876	44	50
Citizens'	100	1,500,000	A. & O.	1¼	1887	100	105
Jefferson Avenue	100	112,000	.....	..	1885	200	300
Lindell	100	2,500,000	Q.—J.	...	1890	56	60
Missouri	100	2,000,000	Q.—J.	2	1891	225	250
Mound City	100	1,000,000	.....	..	1890	190	200
Northern Central	100	200,000	.....	...	1884	100	105
People's	50	1,000,000	M. & S.	6	1889	40	45
St. Louis	100	1,000,000	J. & J.	6	1890	250	275
4th Street & Arsenal	50	150,000	Jan.	50	1872	15	25
Union	50	600,000	.....	...	1870	20	25
Union Depot	100	1,200,000	.....	...	1890	200	250
St. Louis & Suburban	100	1,000,000	... .	...	1891	11	16

BONDS.	Date of Issue	Amount Outstanding.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Benton-Bellefontaine	1880	$500,000	F. & A.	6	1900	102	102½
Cass Avenue	1886	200,000	F. & A.	6	1906	100	101
Citizens' Cable	1887	1,500,000	J. & J.	6	1907	107	108
Lindell	1890	1,500,000	J. & J.	5	1895–1910	99	100
Mound City	1890	525,000	A. & O.	6	1900–1910	105	106
Missouri Cable	1887	500,000	M. & S.	6	1907	102	105
People's 1st mort	1882	125,000	J. & D.	6	1902	102	105
" 2d mort	1886	75,000	M. & N.	7	1902	104	105
People's Cable	1889	800,000	J. & J.	6	1889–1914	97½	100
Northern Central	1884	200,000	J. & J.	6	1904	100	101
St. Louis Cable	1890	1,500,000	M. & N.	5	1900–1910	97½	98
Unlon	1885	150,000	M. & N.	6	1895–1915	102	103
Union Depot	1890	1,600,000	J. & O.	6	1900–1910	105	106

PHILADELPHIA STOCKS AND BONDS.—Corrected by ROBERT GLENDINNING & Co., 143 So. Fourth st. (Bullitt Building), Philadelphia, Feb. 18.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS							
Citizens'	50	$500,000	Q.—J.	4	1858	255	.....
Continental	50	1,000,000	J.—J.	6	1873	120	122
Frankford & Southwark	50	1,250,000	Q.—J.	6	1854	196	200
Germantown	50	1,500,000	Q.—J.	...	1858	97½	98
Green & Coates	50	500,000	Q.—J.	3	1858	118	120
Hestonville	50	2,050,000	.....	...	1859	30	32
Lombard & South	25	500,000	A.—O.	8	1861	59	61
People's Common	25	1,500,000	M.—S.	2½	1873	50	54
" Preferred	25	750,000	M.—S.	2½	.....	50	.....
Philadelphia City	50	1,000,000	J.—J.	7½	1859	148	150
Philadelphia & Gray's Ferry	50	617,500	J.—J.	3½	1858	66	70
Philadelphia Traction (50 pd.)	50	5,000,000	M.—N.	3	1883	75	.....
" " (40 pd.)						65	.....
Ridge Avenue	50	750,000	Q.—J.	5	1872	200	205
Second & Third	50	1,060,500	Q.—J.	4½	1853	150	160
Thirteenth & Fifteenth	50	1,000,000	J.—J.	9	1858	191	192
Union	50	1,250,000	J.—J.	9½	1864	170	175
West Philadelphia	50	750,000	J.—J.	10	1857	175	180
Metropolitan (N.Y.) Traction	100	20,000,000	Q.—F.	1	.....	97	100
Baltimore Traction	25	5,000,000	.....	...	1889	20	20½
Buffalo (N. Y.) Railway	100	6,000,000	.....	...	.....	25	30
Newark (N. J.) Passenger	100	6,000,000	.....	...	.....	15	20

BONDS.	Date of Issue	Amount Outstanding	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Baltimore Traction 1st Mort.	1889	1,500,000	M.—N.	5	1929	109	110
" " Imp.	1892	1,250,000	M.—S.	6	1901	102½	.....
Germantown, 1st mort	.....	67,000	J.—D.	5	1904	103	.....
" 2d mort	.....	160,000	A.—O.	5	1899	103	.....
Hestonville, 1st mort	.....	300,000	M.—N.	6	1895	104	.....
" " "	.....	124,500	J.—J.	6	1901	105	.....
" 2d mort	.....	75,000	M.—S.	6	1902	105	.....
People's, 1st mort	.....	219,000	J.—J.	7	1905	115	.....
" " "	.....	285,000	J.—J.	5	1911	100	.....
" Cons. mort	.....	247,000	M.—S.	5	1912	95	.....
West Philadelphia, 1st mort.	.....	246,000	A.—O.	6	1906	117	.....

OMAHA STOCKS AND BONDS.—Corrected by RICHARD C. PATTERSON, Banker and Broker, 907 N. Y. Life Building, Omaha, Neb., Feb. 18.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Omaha St. Ry. Co	100	5,000,000	M. & N.	....	Jan. 1, '89	60	....

BONDS.	Date of Issue	Am't Outstanding.	Inter'st Paid.	%	Principal Due.	Bid.	Ask'd
Omaha St. Ry. Co	1889	2,250,000	M. & N.	5	M'y 1, 1914	95	98

CINCINNATI STOCKS AND BONDS.—Corrected by GEO. EUSTIS & CO. Bankers and Brokers, 26 West Third Street, Cincinnati, Feb. 18.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Cincinnati	50	$6,000,000	Q.—J.	5	.....	109⅛	109⅞
Mt. Adams & Eden Park	50	1,400,000	Q.—J.	5	.....	109½	109¾
S. Covington & Cincinnati	50	275,000	J. & D.	6	.. ..	120	123½
Mt. Auburn Cable	100	300,000	.....	...	.....	.....	.....
Cin. Inclined Plane Ry	100	500,000	.....	...	.....	62	65
" " " Pref.	100	100,000	.....	6	....	98	101

BONDS.	Date of Issue	Amount Outstanding.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Cincinnati Street	.....	50,000	J. & J.	7	July, 1892	100½	102½
" "	.....	50,000	J. & J.	7	July, 1893	102	.....
" "	.....	50,000	J. & J.	7	July, 1894	104	.....
" "	.....	50,000	J. & J.	7	July, 1895	.....	110
" "	.....	50,000	J. & J.	7	July, 1896	108	112
" " extended	.....	100,000	J. & J.	4	July, 1896	.....	101
	.....	50,000	J. & J.	5	July, '96	103½	.....
Mt. Adams & Eden Park	.....	50,000	A. & O.	6	July, 1895	.....	.....
" " "	.....	50,000	A. & O.	6	July, 1900	104½	.....
" " "	.....	100,000	A. & O.	6	July, 1905	.....	.....
" " 10-20's	.....	200,000	J. & D	6	Je. '94-1924	105½	.....
" " Cable.	.....	250,000	M. & S.	5	Mar. 1906	104	105
Cin. Inclined Plane Ry	.....	125,000	J. & J.	7	July, 1899	110	.....
" " " "	.....	300,000	J. & J.	6	Jan. 1914	107	107½
Mt. Auburn Cable	.....	200,000	J. & D.	5	June, 1907	90	92½
" " 5-20's 2d.	.....	100,000	A. & O.	7	Ap. '93-1908	100	103
S. Covington & Cincinnati	.....	250,000	M. & S.	6	Mar. 1912	110	114

BALTIMORE STOCKS AND BONDS.—Corrected by HAMBLETON & CO., Bankers, 9 South Street, Baltimore, Md., Feb. 19.

Company.	Par.	Capital.	Period	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Balto. City Pass Ry. Co	25	1,000,000	Quart.	3	.....	60	70
Union Pass. Ry. Co	50	750,000	.....	...	.....	....	.....
Highlandtown & Point Breeze Ry. Co	50	189 000	.....	...	.....	.....	.....
Balto. Traction Co. (Cable)	25	5,000,000	Quart.	1	.....	20¼	21½
North Balto. Pass. Ry	25	.....	.....	...	.....	.....	.....

BONDS.	Date of Issue	Amount Outstanding.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Central Pass. Ry	1882	250,000	J. & J.	6	1912	110	112
Union Ry. Co. 1st mort	.....	50,000	M. & N.	6	.....	105	110
" " cons. mort	.....	1,500,000	.....	5	.....	93	100
Balto. Traction Co. (Cable)	1899	1,500,000	M. & N.	5	1929	110	111
City Pass. R. R. Co	1891	2,000,000	"	5	1911	110½	111

WASHINGTON STOCKS AND BONDS.—Corrected by CRANE, PARRIS & CO., Bankers, 1344 F Street, N.W., Washington, D. C., Feb. 18.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Wash'ton & Georgetown R.R.	50	500,000	Q. F.	...	1863	235	250
Metropolitan R. R.	50	750,000	Q. J.	...	1864	100	110
Columbia R. R.	50	400,000	Q. M.	...	1870	64	67
Capitol & North O St. R. R.	50	500,000	Q. J.	...	1875	42	43
Eckington & Soldiers' Home.	50	352,600	.....	...	.....	32	.....
Georgetown & Tenallytown	50	200,000	.....	...	.....	42	.....
Rock Creek R. R.	100	401,700	.....	...	.....	100	.....
Glen Echo R. R.	50	100,000	.....	...	.....	....	.....

BONDS.	Date of Issue	Amount Outstanding.	Interest Paid.	%	Principal Due.	Bid.	Ask'd
Washington & Georgetown	1883	500,000	J. & J.	6	1893-1923	101	.....
do. do. convert.	'83-'91	2,000,000	J. & J.	6	1899-1929	150	.....
Eckington & Soldiers' Home.	.....	100,000	J. & D.	6	1896-1911	97	100
Capitol & North O St. R. R.	1891	250,000	J. & J.	5	1921	10	11
Metropolitan R. R. convert.	1891	200,000	J. & J	6	1901	120	130

CLEVELAND STOCKS.—Corrected by W. J. HAYES & SONS, Bankers, Cleveland, O., Feb. 18.

Company.	Par.	Capital.	Period.	% last div.	Date of Issue.	Bid.	Ask'd
STOCKS.							
Broadway & Newburgh R. R.	100	1,000,000	.....	....	.....	106	110
Brooklyn St. R. R.	100	310,000	.....	2	.....	170	175
Cleveland City Cable, common	100	4,000,000	.....	....	.....	22½	25
" " pref'd	100		.....	....	.....	95	105
East Cleveland R. R.	50	2,000,000	Quart.	1¼	.....	75	78
Woodlawn Ave. & West Side	100	1,100,000	Quart.	1½	.....	145	150

The Street Railway Stock Market.

The financial situation in relation to street railway securities may be summed up in the word, favorable. The season is most propitious for the placing of street railway stocks and bonds under as favorable circumstances as have prevailed for several years. Then it must be said that the present time shows a greater need for favorable conditions than any we have ever had before, when the great movement in street railway construction is remembered. We are obliged, as usual, to describe the general situation in order to reach the tendencies of street railway securities, because, as before described in this column, the two are so related that one cannot be separated from the other.

The coal combination with its attendant excitement on the Stock Exchange, is significant in many ways to the street railway interests, besides the mere rise in the securities most concerned; while the consolidation of coal railway interests have more or less taken the attitude of a trust, or a pool, which is outlawed in this state, and under the laws of the United States, the principle involved of combination for mutual protection, is so widespread that laws antagonizing it are necessarily limited to technicalities which are secondary to the issue itself. So far all the law has been able to do in order to prevent the formation of trusts is to compel the trust to organize under the corporation laws; but such an act in no important sense alters the principles underlying the trust idea. A corporation must publish not less frequently than once a year an annual report of the company's standing, but beyond that particular the advantages of a corporation over a trust so far as the public is concerned, are not apparent. This being a reasonable conclusion, and a corporation of any size being perfectly lawful, it is not readily apparent why the existing prejudice against trusts should prevail to the extent it does. While we are not defending trusts, we are disposed to expose inaccuracies of opinions in a field that, in all probability, will grow into large proportions at an early date. The present instance of the coal combination will probably renew all the agitation against trusts which were in force several years ago; and in view of this possibility it is worth noting that the gentlemen who have enlisted themselves in the movement are among the most prominent in New York. Consequently it is to be presumed that they have taken their attitude after proper reflection regarding the consequences.

The significance of this movement to the street railway interests, is the road it points out for a union of forces in cases where any undue competition exists. While the field of such operations among street railways is necessarily more limited, the fact that a method of that kind is always open for adoption, relieves one of the severe strains of threatening competition, should such competition threaten to destroy all profits. Consequently the coal movement will be watched with keen interest to learn how the matter will turn out.

The money market is abnormally easy; interest rates are lower than they have been for a long time. This state of affairs is favorable to a rise in the value of street railway securities in several ways. First, in the readiness with which brokers can get loans to carry stocks, thereby increasing the demand for securities of all kinds; and next, in the fact that whenever interest is low, dividend paying securities rise in value, because such dividend paying securities earn more money than loaning money at interest; which means, idle capital will invest in such securities in preference. Then there are few or no signs

of any important change in the money market for some time to come; in all probability the present figures will hold well into the summer, which probability gives all new street railway enterprises a good opportunity to obtain capital under favorable conditions.

Steam railway earnings for January were about three per cent. in excess of the same month a year ago, and February promises to considerably exceed that figure. The first half of February shows an increase in such earnings of about eight per cent. in excess of the same period in 1891, and the probabilities are for the whole month that the increase will be even better, all of which tends toward a higher market for all kinds of securities. The railways west of Chicago have not yet entirely recovered from the glut in cereal freights, the grain of the Northwest has not all been marketed by any means, and there are districts in Dakota where the wheat has not yet even been all threshed. The railways east of Chicago now prevent any gluts in freight by notifying Western roads that whenever they have more grain than they can handle to advantage, they will take no more. This action prevents those blockades which occured frequently in the earlier part of the season, to the great detriment of railway profits. This particular was one of the causes why the railway earnings for January fell below the average increase for the past six months.

The volume of the Stock Exchange transactions during the last month has been abnormally large, one or two days showing the largest sales on record, and some of the brokers, in consequence, had the greatest difficulty in making their deliveries. In view of this trouble, and at the incitement of the banks, and probably because of the repeated urgings of the comptroller of the currency, a movement is now afoot for the Stock Exchange to adopt a system of clearings for the delivery of securities, which, when adopted, will remove most of the risk which the banks now labor under in their over certification of checks, which over certification now ranges from $20,000,000 to $50,000,000 daily.

Electrical stocks received a great deal of attention on the floor of both the New York and Boston boards, on account of the proposed consolidation of the Edison General Electric and Thomson-Houston Electric companies, and the quotations on both stocks advanced considerably. The basis for the proposed consolidation is given in another column. J. M. B.

Financial.

THE West Side Rapid Transit Co., of Chicago, have filed a certificate of increase of capital stock from $2,000,000 to $6,000,000.

$ $ $

A MOVEMENT is on foot to consolidate the Cincinnati Street Railway with the Mt. Adams & Eden Park Street Railway of Cincinnati.

$ $ $

H. S. CHAMBERLAIN has been appointed receiver of the Chattanooga (Tenn.) Union Railway by Judge Ray, upon application of W. S. Davis.

$ $ $

THE Plymouth (Mass.) & Kingston Street Railroad Co. have petitioned the State Railroad Commissioners for right to extend their tracks and increase their capital stock from $35,000 to $40,000.

$ $ $

THE directors of the Springfield (Mass.) Street Railway Co. have voted to increase their capital stock $50,000, making $700,000 in all. This was the limit allowed by the railroad commissioners last fall.

$ $ $

THE Schuylkill Electric Railway Co. of Pottsville (Pa.) have declared a cash dividend of three per cent. on full paid shares of stock. This is out of the net earnings of the company during the six months preceding.

$ $ $

THE capital stock of the Traction Co. of Philadelphia will soon be full paid. A call was issued last month for $10 per share upon the old stock, upon which only $40 had been paid. The call will give the company $1,000,000 fresh capital.

$ $ $

A CONTROLLING interest in the stock of the North Baltimore Passenger Railway Co. was purchased last month by the Baltimore Traction Co. for $45 per share. The par value is $25, and the stock has been selling at about 31 to 33.

$ $ $

THE absorption of the Watervliet Railway & Turnpike Co. by the Albany Railway Co. took place at the end of January, 1892, the latter company guaranteeing interest upon the first and second mortgage bonds of the Watervliet Railway company.

$ $ $

THE earnings of the St. Paul (Minn.) City Railway Co. in January were $57,695, against $52,892 last year. The January earnings of the Minneapolis Street Railway Co. were $82,281, against $70,873 last year, a total for the Twin City company of $139,976 against $123,765 last year.

$ $ $

THE annual report of the Newport (R. I.) Street Railway Co. presented last month shows that the number of passengers carried during the year was 808,150, an increase of 27,092, over the preceding year, and that dividends of seven per cent. on the preferred and five per cent. on the common stock have been paid.

$ $ $

THE following gives the receipts for the last eleven months of 1891 of the Concord (N. H.) Street Railway Co.: February, $1,331.28; March, $1,492.28; April, $1,632.87; May, 2,024.89; June, $2,369.29; July, $2,967.78; August, $3,264.26; September, $2,915.27; October, 2,849.25; November, $2,722.80; December, $2,609.17.

$ $ $

THE report of the Glens Falls (N. Y.) Sandy Hill & Fort Edward Street Railway Co. for the quarter ending December 31, shows gross earnings, $8,080.92; operating expenses, $5,506.03; net earnings, $2,574.89; other income, $426.53; gross income, $3,001.42; taxes, $1,698; net income, $1,303.42, as against a net loss of $693.02 for the corresponding quarter of 1890.

$ $ $

AT a special meeting of the stockholders of the Lynn & Boston Street Railroad Co. held last month the directors were authorized to issue coupon notes to an amount not exceeding $300,000 at five per cent. interest, having twenty years to run; the proceeds to be used in paying the floating debt and for additions to construction, real estate, equipment and other personal property.

$ $ $

A MORTGAGE in the sum of $800,000 given by the Toledo Electric Street Railway Co. to the New York Security & Trust Co., of New York City, was filed at the recorder's office last month. By the terms of the instrument, the street railway company takes up $600,000 worth of corporate bonds issued last March to secure a mortgage given to the same party, and issues $800,000 more to secure the present loan.

$ $ $

THE following amounts were paid last month to the municipality of Chicago, for quarterly licenses to January 1892: North Chicago Street Railway Co., $2,451.25; West Chicago Street Railway Co., $4,507.18; Chicago City Railway Co., $4,330. For the corresponding quarter last year the amounts were: North Chicago Street Railway Co., $2,163.75; West Chicago Street Railway Co., $4,602.83; Chicago City Railway Co., $4,398.

$ $ $

THE Metropolitan Street Railway Co. of Kansas City, in their annual report show for 1891: gross earnings $675,501; net earnings, $r90,-693; net, with miscellaneous income, $196,480; interest, $100,720; dividends, $69,835; surplus, $25.925. The expenses per horse car mile run in 1891, 11.200 cents; in 1890, 10.900 cents, and in 1889, 9.700 cents. The expenses per electric car mile were in 1891, 10,900 cents; in 1890, 11.500 cents; 1889, 11.800 cents.

$ $ $

CHARLES E. BENTON has been appointed receiver of the Utica (N. Y.) Belt Line Street Railway Co. The company's property is nominally worth $248,800 and actually $155,400. The property is covered by a first mortgage to secure $5,000,000 in bonds and a second mortgage to secure $2,000,000 in bonds, of which $69,500 have been issued. There is a floating indebtedness of about $75.000. The receiver is authorized to issue certificates for $7,500 due for rent and to operate the road.

$ $ $

THE Massachusetts State Railroad Commissioners have received petitions from the Cottage City Street Railroad Co. for leave to increase their capital stock $10,000 and to issue $25,000 of bonds, and from the Essex Electric Railway Co. of Salem for leave to issue $200,000 of bonds. They granted the petition of the Globe Street Railway Co. of Fall River to increase their capital stock from $400,000 to $700,000, and to issue mortgage bonds to the amount of $700.000 instead of $800,-000, as prayed for.

$ $ $

AT the annual meeting of the Central Traction Co., of Pittsburgh, Pa, held February 9, the report showed as follows: Receipts from passengers and rents were $186,320.51; expenses, including interest, $129,647.70; leaving $56,672.81 as the net earnings. The election for directors resulted: George I. Whitney, president; Calvin Wells, Thomas B. Atterbury, T. A. Gillespie, E. M. Byers, C. H. McKee and J. R. McGinley, with John J. Miller, secretary. The passengers carried numbered 3,000,000.

$ $ $

A BILL was filed last month in the United States Circuit Court by the Fidelity Trust & Safety Co. of Louisville, Ky., trustee for the first mortgage bondholders of the Mobile (Ala.) Street Railway Co., asking for a foreclosure of the mortgage of $500,000, on account of a default in interest due July, 1891, and January, 1892, amounting to $30,000. The bonds of the company are mostly held in Mobile, New Orleans, New York and Chicago. Mr. T. G. Outlaw was appointed receiver, and has filed his bond of $150,000.

The directors of the Worcester, Mass., Consolidated Street Railway Co. voted last month to act on the decree of the railroad commissioners and issue $350,000 of new stock, share for share to the holders of old stock. The first payment for those desiring to take the new stock will be due on March 15, and others on the 15th of each succeeding month until June. It is expected that the value of the company's stock after the new issue will be about 167½, and several sales of rights have been made at $67.50 per share.

$ $ $

The operations on the Third Avenue (New York) Railroad Co. for the last quarter of last year resulted in gross earnings of $414,982, and net income of $61,052. The gross earnings of the corresponding quarter in 1890 were $409,355, and net earnings $79,302. The great difference in the two reports lies in the fixed charges, which were $63,459 in 1890, and $86,432 in 1891. The company evidently values the cable improvement at $1,987,300, for that sum is given under the assets opposite "Third Avenue Cable Road." The funded debt is $5.000,000; mortgages against the company, $46,000, and profit and loss, surplus, $34,159.

$ $ $

By virtue of a decree of the Circuit Court in the case of Thomas Sparks, trustee, *vs.* the Ohio Falls Street Railway Co., the street railway with all the rights and franchises will be offered for sale at the Court House, at Jeffersonville, Ind., on Saturday, March 19, 1892, to satisfy a judgment of $12,000.00. The indebtedness was incurred in making extensions and failure to renew paper or to float bonds cause of the suit. The franchise is unconditional and is granted for a period of fifty years from January 14, 1889. The city has a population, including suburbs, of 15,000. The length of the line is five miles. The cost of plant was $35,000.00.

$ $ $

Harry C. Reiner, receiver for the Keokuk (Ia.) Electric Street Railway Co., has filed a statement in the Superior Court showing the receipts between December 8, when he was appointed, and January 24, to have been $1,981.85, while the operating expenses were $2,205.50. He affirmed that, owing to the condition of the track, equipment and rolling stock with the present inclement weather, it is impossible to make operating expenses. Accordingly, to meet the $1,116.61 indebtedness incurred, he asked the authority to issue $1,000 in receiver's certificates of $200 each, bearing seven per cent. interest. It is proposed to make these certificates a lien on the property, prior to all other claims.

$ $ $

At the annual meeting of the Standard Underground Cable Co. at Pittsburgh, January 28, 1892, Mr. Joseph W. Marsh was re-elected vice-president and general manager, Mr. Frank A. Rinehart, secretary and treasurer and Mr. O. R. Ebel, auditor. The business of the company for the year 1891 was very gratifying, having amounted to $518,677.27. The net earnings over all expenses for the year were $65,858.37, and the total surplus earnings or undivided profits of the company up to December 31, 1891, now amount to $369,213.50. During the year 1891 the company reduced their accommodation paper from $52,200 to $10,500, and in addition to this paid up all bills in full to December 1, besides having discounted a portion of the December bills.

A Purchase Announced.

The Dayton Manufacturing Co., announce that on February 18, they purchased the entire railroad supply business, including railroad supplies, patterns, tools, patents and goodwill of Post & Co., of Cincinnati, O. The Dayton Manufacturing Co. will complete all unfilled orders on the books of Post & Co., and state that with the increased facilities afforded them by this addition to their own large stock of manufactured and raw material as well as patterns, tools, etc., they are better able than ever to supply customers with everything in their line.

The National Capital.

The City of Washington is an object of perennial interest to all patriotic Americans. Not alone because it is the great throbbing heart of the mightest and grandest Republic the earth has ever known, but also on account of its material magnificence. All Americans take pride in its beautiful avenues, majestic architecture, stately homes, and well stored galleries and museums as things of grandeur and beauty in themselves, apart from the historic interest with which they are invested. It is a hope and aspiration of all "Young America," at least, to some time or other visit the Capital of his country.

The Baltimore & Ohio R. R. offers unequalled facilities in aid of this desire. All its through trains between New York, Philadelphia and Baltimore on the east, and Pittsburgh, Cincinnati, St. Louis and Chicago on the west, pass through Washington. Its fast express trains are vestibuled from end to end and heated with steam. Pullman's latest and best productions in the way of sumptuous Drawing Room Sleeping Cars are attached to all its through trains. The present management of the B. & O. have made vast improvements in the last two years, and the road is to-day one of the foremost passenger carrying lines in the country. Through tickets via B. & O. R. R. can be procured at all the principal ticket offices throughout the United States.

New York and Boston by the Big Four Route.

"The Southwestern Limited" via the Big Four Route, from St. Louis, Indianapolis and Cincinnati to New York and Boston, equipped with Wagner palace sleeping cars, combination library, smoking and cafe cars, luxurious coaches, and elegant dining cars, vestibuled from end to end, and running through solid via the great four-track New York Central & Hudson River Railroad, is conceded by competent judges to be "America's finest train," and with its terminal facilities in Grand Central Station, New York City, avoiding all ferries and transfers, offers advantages possessed by no other line. Tickets via the popular Big Four Route are on sale at all coupon ticket offices throughout the country. Take the Big Four Route on your next trip East. D. B. Martin, General Passenger and Ticket Agent, Cincinnati, Ohio.

A Luxurious Car.

Speaking of the private compartment cars, we quote from the *San Francisco Daily Report* of January 20, 1892, the car described being identical with those in daily service on the New York & Chicago, limited, over the Lake Shore route.

"Isn't this too lovely for anything!" exclaimed a very pretty Oakland girl yesterday afternoon as she entered the Wagner compartment car attached to the Wagner vestibule train of sleepers, which brought out the Eastern press delegates last week.

A D. R. reporter, standing near, at once became interested, for whatever receives so favorable a comment from an æsthetic damsel residing in the Athens of the Pacific must needs be lovely. The girl was right. Standing in one of those luxurious compartments, with everything so bright, attractive and comfortable, an irresistible desire to travel in a Wagner compartment car seized the reporter. "All the comforts of home" and everything that the heart of the traveler could desire were there. Hot and cold water within two feet of him as he reclined indolently on which in the day time was the most comfortable of lounges and at night is miraculously changed into the softest and most sleep inducing kind of bed. Cut off from the curious stare of his fellow travelers, the tourist can gaze his fill at the passing scenery and, when wearied of that, he can turn his gaze inward and amuse himself by wondering how the ingenuity of the Wagner people must have been taxed to devise so many comfortable things, and put them in so small a space.

Even the most æsthetic tastes could not find subject matter for offense in a Wagner compartment car. All the colors blend nicely, the dark, handsomely stained wood of the car harmonizing with the elegant frieze covering of the seats.

The compartment car is in the same style as those run on the famous limited train between New York and Chicago. It has ten connecting staterooms, furnished in different styles of wood, upholstered with silk damask to correspond with the wood. The seats are covered with the finest kind of frieze plush.

The car is steam heated, and each compartment is lighted by gas and contains a lavatory, hot and cold water, closet, etc.

Oh, yes, the reporter forgot about that pretty Oakland girl. He was just in time to catch her last sentence as she stepped off the train, and this was it, honor bright: "I vow I'll never travel in a Pullman sleeper again."

Bids Solicited for Street Railway Franchise At PLAINFIELD, N. J.

The subscriber, the City Clerk of Plainfield, N. J., solicits bids pursuant to resolution of the Common Council of said City, as follows:

"Whereas, it is, in the sense of the Common Council, that the best interests of the City of Plainfield require that a street railway in this city should be constructed and put into actual operation at the earliest date practicable,

"Resolved, that the City Clerk be and he hereby is instructed to advertise in the Engineering News and Street Railway Journal for sealed proposals, to be submitted to him on or before Monday, March 7, 1892, to be opened at the regular meeting of the Common Council, to be held on that date at the Council Chamber in said city at eight o'clock P. M., which proposals shall set forth that the proponents offer to organize under the Act of the Legislature of the State of New Jersey, entitled 'An Act to Provide for the Incorporation of Street Railway Companies and to Regulate the Same,' approved April 6, 1886, and the acts amendatory thereof, and supplemental thereto, and shall specify in detail the route or routes proposed, the character and description of motive power, rails, street cars and other equipment, and the terms and advantages offered." Frank W. Runyon,

Dated, Plainfield, N. J., February 3rd, 1892. *City Clerk.*

SPECIAL NOTICES.

FOR SALE.

FOR SALE.—38 lb. girder steel rails (side bearing) for relaying. S. P. S. Ellis, Penn Building, Pittsburgh, Pa.

FOR SALE.—30 twelve-foot cars, one-end type, with one fare box; in fair order. Gauge 4 ft. 8½ in. For all particulars apply to METROPOLITAN RAILROAD Co., Washington, D. C.

FOR SALE—STREET CARS.—On account of increase of business calling for larger cars, we have for sale 9 twelve-foot double-end, box cars, with fare box in each end. Gauge 4 feet 8½ inches. Apply to UNION STREET RAILWAY Co., New Bedford, Mass.

POSITIONS WANTED.

WANTED.—A good, practical foreman, capable of handling a great force of men in city railway work. Must come well recommended. Address "CONTRACTOR," care of STREET RAILWAY JOURNAL. 1t

WANTED.—S. P. S. Ellis, Penn Building, Pittsburgh, Pa., representing Johnson Company of Johnstown, Pa., invites correspondence with manufacturers desiring to be represented in Pittsburgh and vicinity.

WANTED.—A man with over 10 years' experience, desires a position to take charge of the inspection and detective department of a street railway company in any part of the country. Can furnish the best of references regarding ability, etc. Address "W. F. G.," care of STREET RAILWAY JOURNAL. 4t

WANTED.—A position as foreman or manager of railroad or stable, in the city, country, or States. Fully understands everything pertaining to railroads, and thoroughly understands the care of horses. Was with the Third Avenue Railroad Co. for twenty years. Can give good reference. Address "MANAGER," care of STREET RAILWAY JOURNAL. 1t

WANTED.—By a thoroughly practical mechanical and electrical engineer a position as superintendent or manager of an electric road. To any company about changing from horse to electric power, I will guarantee a great saving. Am competent to purchase and install both steam or electric plants of the best for the least money. Can furnish 15 years' references, which will include my record as an occasional manager and a reliable man whose whole time is given to the interests of any company by whom I am employed. Address "ECONOMICAL MANAGER," care of STREET RAILWAY JOURNAL. 3

FOR SALE.

125 tons second-hand 38 lb steel tram rails, in excellent condition.
100 tons second-hand 25 lb steel T rails, but little used.

D. E. GARRISON & CO., - - 219 N. 4th St. Louis, Mo.

FOR SALE.

Two 150 H. P. Engines, made by the N. Y. Safety Steam Power Co. Size, 15½ in. × 16 in. Two Band Wheels, 72 in. × 15 in. Foundation Stone for Engines.

Three Hill Friction Clutch Pulleys, 72 in. diameter × 21 in. face.

Three Hill Friction Clutch Pulleys, 72 in. diameter × 12½ in. face.

150 ft. of $3\frac{13}{16}$ Shafting, with Couplings and Adjustable Floor Stands.

Three Boilers, 44 in. diameter × 26 ft. long, with four flues each; all complete with steam and mud drums, fire front, breeching, steam pipe and fittings, two large heaters and purifiers.

This is a Complete Plant for Electric Purposes,

All in First Class Order, ready to put up. For Sale Cheap.

GRAINGER & CO.,

Foundry & Machine Works, Louisville, Ky.

FOR SALE.

A FIRST-CLASS Horse Railway Plant,

IN A LIVE, GROWING CITY,

CAN BE BOUGHT CHEAP,

In fact, for ONE-HALF actual present value.

Franchise EXCLUSIVE and for ELECTRIC Road.

With electricity it will prove not only a SAFE and SURE investment, but will pay, WITHOUT QUESTION, from start, at least 20 per cent. net.

Will take bonds of the road in payment for present road, if electricity is used.

Address,

"*ELECTRIC*," care STREET RAILWAY JOURNAL,
WORLD BUILDING, NEW YORK.

FOR SALE.

350 Tons 48 lb. Chicago Pattern Slot Rail,
2 Walker U Frames with 12 ft. Staggered Arm Sheaves,
4 Walker U Frames with 10 ft. Staggered Arm Sheaves,
1 Set Double Cable Driving Machinery with Four Ring Walker Differential Drums,
1 Hazelton Tripod Boiler, 150 H. P.,
1 " " 300 "

All the above but little used and in excellent condition.

CONSOLIDATED STREET RAILWAY CO.,
GRAND RAPIDS, MICH.

FOR SALE.

Electric Cars,

BOTH OPEN AND CLOSED.

QUICK DELIVERY AND AT LOWEST PRICES AND ON LONG TIME. THEY ARE REAL BARGAINS.

For Particulars write to

NEW YORK EQUIPMENT CO.,
15 Wall Street, NEW YORK.

STEEL RAILS.

Complete Outfit for

LOGGING, MINING, PLANTATION

—AND—

Street Rail and Tram Roads.

LIGHT SECTIONS RAILS and SPIKES IN STOCK.

Locomotives, Motors, Cars, etc.

New and Second Hand.

Humphreys & Sayce,
No. 10 WALL ST., NEW YORK.

ELECTRIC RAILWAYS.

C. E. LOSS & CO.,

RAILWAY CONTRACTORS,

Waukegan, Ill.

Contract for Road-bed Construction and all Materials, also for Entire Equipment.

Correspondence Solicited. —— References Furnished.

CORLISS ENGINES OF THE HIGHEST TYPE AND IN ALL SIZES, ARE MADE BY THE Lane & Bodley CO., CINCINNATI, OHIO.