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Of this issue of the Street Railway Journal 8000 copies are printed. Total circulation for 1905 to date, 293,750 copies, an average of 8160 copies per week.

Taking Out Trucks

One evidence of the growing unpopularity of work conducted on motors and trucks in difficult positions under cars as against work in the open was indicated in the reply of J. L. Sullivan, of the United Railways of St. Louis, to a recent Question Box question on the comparative merits of pitwork and work in the open. Mr. Sullivan favors taking trucks out from under a car when work is to be done on them without regard to whether the motors are adapted to be handled over a pit or not. That is, he considers it so much of an advantage to have the truck out from under the car that it is worth while, simply on account of better light and accessibility, even if the motors are of a type to be handled from below and the work is done in the pit. The time required to get a truck out from under a car may be more than compensated for by the better work that can be done on it after it is out.

The Exhibits at the Coming Philadelphia Convention

All those who have inspected the South Pavilion of the Philadelphia Museum, where the exhibit will be held in connection with the coming convention, unite in the opinion that it could not be better for the purposes for which it will be used next September. Not only are the shipping facilities excellent, as the railroad cars can be run directly into the building, but the building was constructed especially for exhibition purposes, with a substantial floor, high windows admitting plenty of light and air, and ample space. Moreover, the exhibit hall is close to the meeting hall, in fact is on the floor directly below, and the entrance to the hall for meetings is through that which is to be devoted to exhibits. Rarely, if ever, has there been such a combination of conditions favorable to a good exhibit. It is satisfactory to learn through the Manufacturers' Association that the requests for space have been unusually large this year and that the success of this feature of the convention is assured. We understand that some space is still available, and that if any manufacturer is still considering whether to exhibit or not, it is advisable for him to make his application without delay.

The Cost and Value of Sprinkling

Some companies are obliged by ordinance to sprinkle their tracks, others sprinkle them by contract with the city, and still others sprinkle them entirely on account of the advantages gained by the company in so doing. The advantages, as far as comfort to passengers are concerned, are quite evident, especially on high speed suburban roads, but it is perhaps not often considered that there is a direct saving in operating expenses which may easily equal or exceed the cost of sprinkling and sweeping the tracks. Difference in weather conditions from day to day, leaving out of account snow storms, may easily make as much as 10 per cent difference in the amount of power required per car mile. This is largely due to the varying condition of the rail surface from day to day. A rail covered with dry dust and dirt offers considerable more resistance to traction and some more electrical resistance at the point of wheel contact with the rail than a clean or wet rail. If we assume that 300 cars per day are operated over a given mile of single track and the cost of power per car mile be 2.5 cents, a saving of 10 per cent of this, or .25 cent would amount to 75 cents per day per mile of track. In the course of a year, this would figure up many times more than the cost of cleaning and sprinkling, excluding, of course, the cleaning of snow which must be taken care of in any event. We have not at hand much data on the cost of this cleaning. H. B. Fleming, in a recent answer in our Question Box, gave the cost of cleaning on the Chicago City Railway's extensive system as $43.70 per mile of single track per season. It would certainly look as if sprinkling was a good investment on a road which has heavy traffic. Of course, as the number of cars passing over a given piece of track per

day diminishes, the gain by cleaning and sprinkling diminishes also and finally becomes a negative quantity.

The "Near Crossing" Ordinance in Milwaukee

A number of years ago at different times ordinances were passed in various cities of the United States requiring street railway companies to stop at the near crossing for passengers instead of stopping after they had crossed the street. Almost without exception these ordinances have been repealed after a more or less extensive trial. The New York city authorities were the latest to make the trial until recently, when the City Council of Milwaukee passed such an ordinance, making the near crossing the legal stopping place for passengers. After about two weeks' trial the new rule was abandoned. There are many things to be said both for and against the near crossing plan. Its advantages are most apparent at streets where other street railway lines are crossed. Under the usual far crossing rule, it is frequently necessary to stop at both the far and the near side of a street to take on passengers. Under the near crossing rule, it is only necessary to stop at the near side. In this way time is saved at transfer points. This seems to be the chief, decided advantage of the plan, as its other advantages are offset by certain disadvantages. For example, it is urged in favor of the near crossing rule that it makes the cars run at a slow speed when crossing a street and hence reduces the danger, but, on the other hand, it must be remembered that since cars do not stop at all streets for passengers, the new rule does not insure slow speed in crossing all streets and that a certain element of danger and uncertainty is introduced because of the fact that teamsters may take some chances on a car stopping at a street corner and be more reckless about crossing in front of cars than they would be if they knew that cars did not stop. What has killed the plan where it has been tried has been the unwillingness of passengers to board and leave the car at the rear end when the front end is at the crossing. This causes congestion at the front end at a point where the conductor cannot look after the passengers, and if the streets are in bad condition it is not pleasant for the passengers to get off at the rear end in the mud and snow.

Mile Posts on Interurban Roads

The use of mile posts has long been regarded with favor by steam railroads operating between large centers of population located several hours' run from each other, but as far as we are aware, the practice has as yet received little or no attention from electric interurban roads. On long steam lines the mile post is always a welcome sign of progress to observing travelers, but it serves in the day time a more important purpose on account of the assistance it gives to the locomotive engineer in making schedule time. Of course, a good engine driver soon learns the tracks upon his division as well as a man knows the inside of his home, and every object along the line for 200 miles or 300 miles becomes so familiar that at first sight there seems to be little real need of the mile post to emphasize the relation of each particular landscape to the schedule. On well-operated roads the abutting residents often set their watches by the regularity of some famous flier in passing certain points.

When a train is late, however, the mile post is often a real help to the engineer through the mental suggestion it silently conveys as the locomotive passes. It saves thought at a time when every faculty employed in running safely at high speed is obtained toward the point of nervous collapse, unconscious though the engineman may be of its momentary influence. Trainmen's time-tables generally indicate the hour and minute of passing stations, junction points, sidings, etc., but when a train is delayed, the question of recovering lost time is largely a matter of being able to traverse a certain mileage as quickly as possible, and there is little opportunity for time-table reading and calculations. Then, too, the mile post furnishes a most convenient reference point in case of accidents, inspections and construction work.

All these points apply to a certain extent to the higher class of interurban work, although the distances are almost always much shorter and the maximum speeds lower. Even though a mile post is rarely useful at night unless the full glare of an arc light falls upon it, the numbering sometimes placed upon poles is of still less value in the maintenance of schedules, important though the latter may be for other reasons. Certainly as interurban lines become linked together through agreements or consolidations, it may be in some cases desirable to install mile or half-mile posts referring to large terminal cities for the convenience of through passengers and trainmen. The refinements of electric railway service are constantly increasing, and matters which a few years ago were quite overlooked are now frequently considered standard practice by progressive managers.

Automatic Couplers

Inventors have not been nearly as active in the electric railway car coupler field as they were with steam railroad couplers. In the railway field they seem to have directed their energies more to fenders and sand boxes. This has been so much the case that a few years ago the announcement to the superintendent of a road that a fender or sand box inventor was waiting in the ante-room would be sufficient to cause such an official to leave precipitately by the back door. The need for automatic couplers not having been as great in the electric railway business as in the steam railroad business, there have been but few practical automatic couplers suggested, and still fewer put in operation. In fact, it may be truthfully said that the use of automatic devices of this kind on electric roads in the United States has been so far practically confined to one type of coupler. Recently, however, there seems to have been a wave of increased interest in automatic couplers for electric service, and other types have come forward. It is far from being as easy to produce a good coupler for electric roads as for steam roads. Steam railroad curvatures are such that whatever swiveling is necessary on curves can be accomplished between the jaws of the two couplers, so that each draw-bar can be rigid on its car. On electric roads, the short radius curves and the long overhang of cars which is frequently found, makes it absolutely necessary to have a draw-bar which swivels. Here is where the trouble begins. When two swivel draw-bars are coupled together loosely at the point of coupling, they behave very well on the pull, but on the push they will bend and buckle in proportion to the looseness of the coupling. The ideal coupling would be one absolutely rigid from the swivel of one draw-bar to the swivel of the other. As such absolute rigidity is impossible in an automatic coupler, all that inventors can do is to reduce the lost motion which permits side play to as small an amount as possible. An interesting fact brought out in the recent article by W. T. Van Dorn in these columns is that couplers on multiple-unit trains must be stronger than on trains pulled with a locomotive or motor car at the head of the train. This is due to the fact that frequently much of the strain on the draw-bars in a multiple-unit train is a pushing strain, which tends to push them out of line and bend them, the danger of bending depending on the amount of side play allowed at the point of coupling.

Municipal Amenities

The recent conclave of Mayors seems to have lacked the fervent harmony upon municipal ownership which perhaps was to have been looked for. There are certain features about municipal conduct of large enterprises which appeal strongly to the sentiments of the average machine-made Mayor, quite apart from any possible considerations of political economy. You are not safe in setting down as an ardent Socialist every politician who professes belief in the municipal operation of public utilities. The more places to be filled, the more loaves and fishes for distribution to the hungry multitude who vote and are yet unsatisfied because there are not offices enough to go around. Suggest putting municipal employees under civil service regulations and you can quickly separate the Socialist from the other fellow. Perhaps it would be more accurate to divide them into two classes, theoretical Socialists and practical Socialists. The former believe in the employment of city property for the common good, the latter practice its redistribution upon whatever scale opportunity permits. Now both of these classes were represented among the assembled Mayors, and their partisans fell out, as might have been anticipated. In fact, in the heat of discussion, one Mayor threw a bombshell into the camp by plainly intimating that the only man who could have carried out municipal ownership honestly was unfortunately dead. At which bland verity there was an uproar, as might have been expected.

And while the sound of the wailing has not yet died away, there comes a sad-eyed publicist from the Antipodes to tell the ghastly truth about the workings of applied Socialism in Australia. In that blest land, it seems, they hit upon the happy expedient of federation, in the hope of getting enough offices to go around, and by help of municipal and State enterprise on a large scale they have pretty nearly succeeded. Who would be an agricultural laborer under a grinding private employer who really wants to raise crops, when he can become third acting assistant shovel carrier to the gentleman who digs gravel on a government railway? And in the absence of labor, capital is reduced to twiddling its thumbs and vaguely wondering whether it would not do better to emigrate. By good fortune, too, they have coupled public enterprise in Australia with an iron-clad civil service, just to show us the virtues of the horn of the dilemma, which is here somewhat unpopular. The result seems to be most joyful for the public employee, who thereby has a permanent, instead of merely a temporary, license to take it easy. Just how politics is there affected by the permanence of the jobs does not appear, but we hope that ere long, for the benefit of Mayor Dunne and his followers, this all-important detail will be made clear. We have no doubt that American ingenuity will find a way for keeping the votes in line even under civil service. The Australians certainly have experimented in government to the edification of the world, and they have done some very excellent things in the way of the ballot and legalizing titles to real estate, but they seem to have met their Waterloo in exploiting public ownership.

Meanwhile time goes on apace, and we do not see the enthusiasm for municipal works bearing any fruit to speak of. Most of the cities which have gone in for municipal lighting plants have been accumulating experience rather than profits, and some of them have become pretty sick of the job. It is an easy one to talk about, but when it comes to taking over an existing plant which has capitalized its blunders for twenty years, and running it with political appointees on an eight-hour day, it is hard to make both ends meet. After all, there is a solid substratum of common sense in the American people that in the last resort protects them from the occasional assaults of rampant foolishness. The municipal ownership craze will before long go the way of the greenback craze and other economic delusions. Before municipal ownership can possibly succeed on any considerable scale, municipal graft must be abolished, and if ever it finally departs it will take with it the only substantial objections to private ownership. Private ownership has no terrors for the community that can maintain an incorruptible city government. It takes more than an honest Mayor to inaugurate honest municipal ownership—it takes a public opinion that is inflexibly against every form of graft. And when public opinion is thus reformed it will respect and co-operate with private initiative upon terms of mutual good will. Socialism and similar doctrines offer no remedy for existing evils, save as they quicken the conscience of the individual. Society has tried these and kindred plans for wholesale reformation for the last 2000 years, but it has not yet found any efficient substitute for personal righteousness, which fact we submit for the consideration of those who deal in economic nostrums.

Some Operating Details

The mechanical department of a road when properly conducted makes sure that everything pertaining to motors, trucks and electrical equipment is in good order before a car leaves the house. It has been our observation that the same attention to details is not usually given to those parts of a car which come more directly under the eye of the passenger. It should be the duty of certain men in each car house or of the conductor of each car of the smaller roads to see that everything pertaining to the comfort of the passenger is as it should be on a car. This refers particularly to the condition of windows on semi-convertible types of car. It is not uncommon to see semi-convertible cars run out of a car house on very hot days with part of the windows closed. Many semi-convertible cars have windows with top sashes which are intended to be raised or lowered in summer, but as a matter of fact these top sashes on some roads are rarely touched, consequently the full benefit of the semi-convertible feature is not secured. Of course, in stormy weather it should be seen to by the proper employees that the car leaves the house with its windows or curtains in a condition corresponding to the weather. A complaint not often heard at this time of the year, but coming more frequently in winter weather, is on the poor ventilation of cars. The fact that a car has ventilators is too often forgotten by men in the transportation department. No matter how well a car may be designed in this respect, the thought expended in design is wasted unless those who actually operate the cars make use of the ventilators provided. Another thing which is responsible for some of the complaints of poorly ventilated cars is the lack of ventilation while the cars are standing in the car house between midnight and morning. If a car is allowed to stand with doors closed in a car house where there is little ventilation of air, all the foul odors it has collected during the day remain and it does not take long for cushions and woodwork to get sufficiently permeated with these stale odors to make the car seem unventilated at all times. Good ventilation in the car house and the opening of all doors before a car is taken into a car house will do much to improve this condition. On many roads these details are well looked after at present.

THE BERLIN-ZOSSEN HIGH-SPEED TESTS OF 1901

Although the Berlin-Zossen high-speed tests of 1901, 1902 and 1903 have passed into history, and although there is little likelihood of railroading along the same lines being attempted at present in Germany or elsewhere, the results determined there will necessarily have an important influence on all high-speed electric railroading in the future. This is particularly true in regard to the information secured on train resistance at high speeds and on braking at high speeds. Upon these two points especially the reports of the Zossen tests give information which is not found elsewhere.

As is well known, the tests were conducted three successive years, viz., in 1901, 1902 and 1903, and the principal technical results secured during these series of tests are published in three volumes of pamphlets which were issued by the Studien Gesellschaft at the close of each series of tests. The records of the 1903 tests are the most interesting of all, as during that year the highest speeds were made. This is the only pamphlet which is available in an English translation. The 1901 and 1902 tests, however, give a great deal of valuable information on both train resistance and braking; and in view of the future importance of high-speed railroading, and as these results have not been published in an extended way, it has been thought of interest to present an abstract of them in this paper.

The tests in 1901 were largely preliminary to determining the capacities of the car and track to withstand the proposed high speeds of 200 km (or 125 miles) per hour. During this year speeds up to 90 m.p.h. were secured, but as the track proved insufficient to withstand even this speed, the tests were discontinued. In 1902 the trials were conducted principally to determine the train resistance at different speeds up to 75 m.p.h.

The 1901 report sketches briefly the alterations that were found necessary in the original roadbed of the military railroad, which was built for a maximum speed of only 80 km per hour, the principal changes being made in the replacing of some of the rails and ties and in the use of heavier ballast over the middle portion of the line. The shop tests of the electrical equipments of the cars are described, after which a list of the rules to be observed during the tests is given. The report then takes up the proposed plan of conducting the individual runs by presenting a definite programme of the manner in which the higher speeds are to be approached. A log of the different runs made is given in detail, special attention being called to the data collected dealing with the accelerating and braking periods, the condition of the track and weather, the air pressure used in the pipes and brake cylinders, the operation of the short-circuit and hand brakes, the temperatures of the resistances, the frequencies and potentials used, etc., after which the more important results obtained from the 1901 tests are given, of which the following extracts are of special interest.

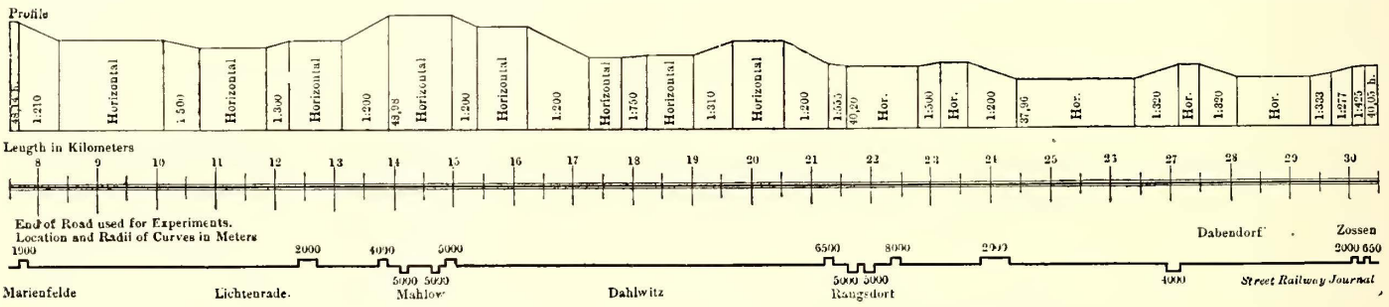
The article on braking is possibly the most valuable, as it suggests some of the difficulties encountered at speeds above those ordinarily used. Attention is called to the need of some automatic device for decreasing the brake pressure in proportion to the speed. Throughout all of the brake tests made upon this road, the lack of such a device was felt, and the curves of retardation obtained in the last year of these tests show plainly that at such high speeds the braking distance could have been materially decreased if such a device had been used. Another interesting point in this connection is the suggestion of using electrical means for braking at high speeds. No intimation is given as to how this would be best performed, but if some reliable method was devised whereby the excessive air pressures and tensions on the braking apparatus necessary at high speeds might be reduced, the safety of the service would be proportionally increased.

That some alteration in the present signal systems in use would have to be made in a service contemplating such high speeds is touched upon in the article on "Safety Devices," the suggestion given in this report being tried in the last year's tests with most satisfactory results.

Previous articles on these tests have appeared in the STREET RAILWAY JOURNAL for June 7, 1902, page 726; Aug. 2, 1902, page 142; May 20, 1905, page 915, and June 3, 1905, page 988. In a later issue some of the more important portions and diagrams of the 1902 report will be published.

REPORT ON ACCELERATION AND BRAKING

The time and distance required to attain a definite speed is limited both by the capacity of the motors on the car and the machines in the power house. The acceleration depends upon



PROFILE OF THE MARIENFELDE-ZOSSEN HIGH-SPEED EXPERIMENTAL LINE

The ability of the source of energy and the motors at starting to withstand high and fluctuating loads.

To attain a speed of 100 km per hour on the Zossen test track, the distance varied from 2000 m to 3200 m, and the time from 138 to 220 seconds. These figures correspond to an average acceleration of .13 m to .20 m per second per second, although they might have been considerably increased, as the motors could have supplied 3000 hp for short periods, while for these accelerations only 700 hp to 1000 hp were required.

Accelerations of over .20 m per second per second were not attempted during the test runs on account of the generators in the power house not being able to withstand the great variations in power which would result from higher accelerations.

In the practical installation of high-speed service quick acceleration is important only when the distance to be traveled is short and the stations are close together. If the trains run long distances without stopping it makes little difference if the time taken in starting is increased one or two minutes. The advantage gained by using lighter loads on the machines in the central station and the motors on the car, and thereby making it possible to choose motors of smaller capacity, is greater than that to be gained by shortening the starting period.

More important than the question of starting is that of braking, as the safety of the service to a greater degree depends upon the latter.

Both cars used in the Zossen high-speed tests of 1901 were arranged to be stopped by the Westinghouse quick-acting air brake, the ordinary hand brake and by the use of short-circuit

current. Besides these devices, car A was supplied with an electric brake which was operated by exciting the alternating-current motors with a battery located in the car.

These various braking systems were arranged independently upon each truck. In this manner it was possible to operate the air and the electric brakes from either platform upon both trucks at the same time, while the hand brake located on each platform could be used to operate the braking system of only one truck. With a pressure of six atmospheres in the brake cylinders, two of which are arranged upon each truck, a pressure of approximately 6000 kg is exerted on each of the twenty-four brake-shoes arranged on either side of the wheels, the shoes being acted upon thereby by a total pressure of 144,000 kg, equal to 156 per cent ot the weight of the car. The ratio between the pressure on the brake piston and that upon the three brake-shoes operated by this piston was approximately 1 to 6, thus a movement of 100 mm of the piston produced a brake-shoe movement of

$$\frac{100}{6} = 16.6 \text{ mm.}$$

By exerting a power of 40 kg on each wheel of the hand brake, a pressure of approximately 3640 kg was produced on each of the brake-shoes, which corresponds to a total pressure of 87,360 kg, equal to 95 per cent of the weight of the car. The ratio in this case is 1 to 1092.

In order to utilize the full value of the quick-acting air brake, a pressure regulator was placed before the train pipe, which allowed the air pressure in the brake cylinder to be properly regulated for different speeds through tightening or releasing a spring, and thus making it possible to obtain any desired brake pressure, within a definite limit, in the pipes during the operation of the brakes. For the tests, two of these pressure regulators were arranged on each platform and set for different pressures. By the use of a two-way cock either one or the other of the pressure regulators could be connected in the train pipe, and thus with the brakes, thereby allowing two different pressures to be used during the same brake test without it being necessary previously to adjust the tension on the springs.

Besides this, a pressure-reducing valve was connected with the brake cylinders on each truck, which performed the function of reducing the pressure in the brake cylinders as the speed decreased, and thereby prevented the skidding of the wheels due to the increased friction between the brake-shoes and wheels caused by the coefficient of friction increasing as the speed decreased.

During the progress of the test runs a great many brake tests were made with the air brakes, a summary of which is given in the accompanying table.

During these tests the principal points for accurate observation were the speed and the height of the air pressure in the pipes and brake cylinders. The time and the distance during which the brakes were in operation were also noted. The speed was determined by a recording distance key, besides which a Morse apparatus with two writing levers was arranged in car S, which made impressions every two seconds on a paper ribbon, and at the same time noted each revolution of the middle axle of one of the trucks.

The duration of the braking periods were determined very accurately by several observers using reliable stop-watches, and the braking distances were noted accurately within a few meters from the kilometer stones along the road. The recording distance key and the Morse apparatus served, at the same time, as an accurate check for the measured time and distance. The last-named apparatus also served as a suitable medium in determining accurately the braking curve and in fixing the speeds for each moment of the braking period.

The air pressure in the pipes was easily observed from the platforms, while the pressure in the brake cylinders was read from gages placed in the car.

The first brake tests showed less satisfactory results than had been expected, as the braking distances—even during emergency stops—were much greater than former experience

SUMMARY OF BRAKE TESTS, BERLIN-ZOSSEN, 1901

No. of Run.	Day.	Car.	Brakes Applied.	Speed km. per hour.	Braking Distance in Meters.	Braking Time in Seconds.	Air Pressure in Atmospheres. Pipes.	Air Pressure in Atmospheres. Cylinder.	Average Retardation met. p. s. p. s. $p=\frac{v^2}{2s}$	Retarding Force in Percentage of Car Wt. $\frac{100p}{g}$	Condition of Track.	Remarks.
1	Oct. 23	S.	Before Rangedorf, *	88	650	45	6.5	4.8	0.458	4.6	dry	†Brakes applied on only one truck.
2	Oct. 24	S.	Before Rangedorf, **	125	2,300†	147	6.5	4.8	0.262	2.7	dry.	Brake rods not properly adjusted.
3	Oct. 24	S.	At 29.10 km. mark, **	95	750	758	6.9	4.8	0.465	4.7	dry.	Stroke of the brake piston unnecessarily great. Triple valve standard construction of the Prussian Railways. A short ½-inch gas pipe was screwed in the exhaust of the pressure-reducing valve.
4	Oct. 24	S.	At 10.0 km. mark, *	113	1,250	69	5.5	4.8	0.38	3.9	dry.	
5	Oct. 24	S.	At 20.0 km. mark, **	123	1,300	70	6.0	4.8	0.45	4.5	dry.	
6	Oct. 26	S.	Before Marienfelde, *	128	1,770	92	braking during operation	4.4	0.36	3.6	dry.	
7	Nov. 1	S.	Before Rangedorf, **	143	1,700	80	6.0	5.0—4.8	0.46	4.65	dry.	
8	Nov. 2	S.	At 19.2 km. mark, **	138	1,600	78	8.0	5.3—4.8	0.46	4.65	damp.	Instead of the ½-inch gas pipe a choking disc with 3½mm hole was placed in the exhaust of the pressure reducing valve. Otherwise as above.
9	Nov. 2	S.	At 16.6 km. mark, *	142	1,560	75	8.0	5.5—4.8	0.50	5.1	damp.	
10	Nov. 4	S.	At 10.0 km. mark, *	141	1,400	65	8.0	5.5—4.8	0.55	5.55	damp.	Hole in the emergency valve piston increased from 3mm to 5mm. Valve otherwise as above.
11	Nov. 4	S.	At 16.45 km. mark, *	154	1,650	69	8.0	5.5—4.8	0.555	5.65	damp.	
12	Nov. 5	S.	At 16.3 km. mark, *	157	1,600	67	8.0	5.5—4.8	0.60	6.05	dry.	The ring was removed from the emergency-valve piston and the spring from the check valve. Otherwise as above.
13	Nov. 5	S.	At 16.6 km. mark, *	158	1,600	67	8.5	5.8—4.8	0.605	6.1	dry.	
14	Nov. 5	S.	At 10.0 km. mark, *	146	1,340	63	8.5	5.8—4.8	0.615	6.2	dry.	
15	Nov. 25	A.	Before Zossen, **	95	450	28	7.5	5.3—4.8	0.775	7.85	damp.	Triple valve the same as the earlier Prussian standard without spring in check valve with larger passage in slide valve. Choking disc with 1-6 mm hole. Otherwise as above.
16	Nov. 25	A.	At 9.0 km. mark, *	103	430	27	9.0	6.0—4.5	0.954	9.7	damp.	
17	Nov. 25	A.	At 9.0 km. mark, *	115	700	38	7.5	5.4—4.5	0.73	7.4	damp.	
18	Nov. 26	A.	At 12.7 km. mark, **	120	910	47	7.0	5.0—4.5	0.61	6.3	damp.	Choking disc with 2.5 mm hole Otherwise as before.
19	Nov. 26	A.	At 25.0 km. mark, **	120	850	45	8.5	6.5—4.5	0.658	6.7	damp.	
20	Nov. 26	S.	At 28.0 km. mark, **	106	500	32	7.5	5.4—4.5	0.92	9.4	damp.	Large new water-cooled brake shoes. Otherwise as above.
21	Nov. 26	S.	At 8.5 km. mark, *	120	800	39	8.2	6.0—4.5	0.74	7.6	damp.	
22	Nov. 28	A.	At 28. km. mark, **	127	800	45	8.5	6.0—4.5	0.78	7.9	dry.	
23	Nov. 28	A.	At 9.0 km. mark, *	85	320	27	5.5	4.5	0.87	8.85	dry.	
24	Nov. 29	A.	At 25.0 km. mark, **	120	750	40	8.5	6.0—4.5	0.74	7.6	dry.	Choking disc with 3 mm hole. Small brake shoes without water-cooling. Otherwise as above.
25	Nov. 29	A.	At 25.0 km. mark, **	120	720	39	6.0	4.5	0.77	7.9	dry.	
26	Nov. 29	A.	At 9.0 km. mark, *	122	800	40	5.5	4.5	0.72	7.3	dry.	
27	Nov. 30	A.	At 28.5 km. mark, **	118	550	36	8.5	6.0—4.5	0.98	10.0	wet.	
28	Nov. 30	A.	At 9.0 km. mark, *	115	620	34	8.5	6.0—4.5	0.825	8.4	wet.	
29	Nov. 30	S.	At 28.5 km. mark, **	125	850	46	8.5	6.0—4.5	0.71	7.2	wet.	2.5 mm choking disc, large brake shoes with water-cooling. Otherwise as above.
30	Nov. 30	S.	At 10.0 km. mark, *	110	550	32	7.6	5.4—4.5	0.85	8.65	wet.	

* Returning. ** Going.

with the air brake would indicate. The matter was taken up with the Westinghouse Air Brake Company, and through its representative, Mr. Führ, a number of alterations upon the braking apparatus was decided upon and carried out.

These alterations are noted briefly in the order in which they were made, under "Remarks" in the attached table. In the first place the principal point was to carefully adjust the brake-rods so that all of the brake-shoes exerted equal pressure against the wheels; the piston stroke was also shortened. Various means were tried to obtain rapid increases of air pressures in the brake cylinders at the beginning of the braking periods. For this purpose the triple valve used for quick-acting brakes on trains, which was installed in the cars, was replaced by the ordinary triple valve of the earlier Prussian railways. Again, the pressure-reducing valve used did not meet the requirements, as it reduced the pressure in proportion to the time and not to the reduction of speed.

Through these alterations a decided shortening of the braking distance was obtained, which may be seen from the brake diagrams in Figs. 1 to 3, and they also showed the possibility of obtaining still better results through further modifications. Particularly, it was made evident that the initial air pressure must reach its highest value in the brake cylinder immediately upon applying the brakes.

From the recorded diagrams in Fig. 5 is shown that with a pressure of 9, 8.5 and 8.4 atmospheres in the pipes the greatest pressure in the brake cylinders is only 7, 6.2 and 6.1 atmospheres. The triple valve should therefore be altered so that this great difference in pressure between the pipes and brake cylinders does not exist. Further, the pressure-reducing valve must be so arranged that the reduction of the air pressure in the brake cylinder during the braking period is made dependent upon the decreasing speed, so that the friction between the brake-shoes and the wheels remains as great as possible, but not so great that skidding of the wheels will result.

Since an automatic valve which fills these conditions is not to be obtained, the engineer's valve will be altered so that the motorman may return the brake pressure as desired during the braking period.

Finally, the tests also showed that the brake-shoes and the wheel rims became excessively hot through the continued application of the brakes. In the earlier runs the rims became blue, so great was the heating, and for test purposes car S was equipped with considerably larger shoes having pockets which were filled with water. The heating of both shoes and wheel rims was materially decreased by this arrangement, although they still became quite hot, and will become still hotter as the speed is further increased, so that there is danger that the tires will become loose upon the wheels. It will therefore be advisable to find a construction such that the braking power need not be applied entirely to the wheel tire, but partly to other brake discs attached to the axles or to the wheels.

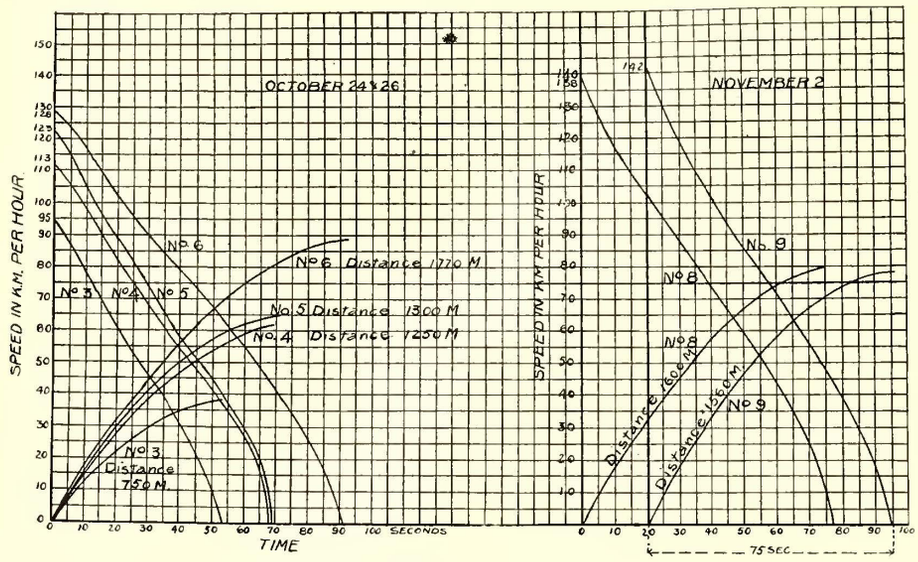


FIG. 1.—CURVES DERIVED FROM BRAKE TESTS

The friction between the wheels and the brake-shoes depends upon the value of the coefficient of friction, which was confirmed by the elaborate tests of Galton and Westinghouse in the years 1878 and 1879, and by Wichert in the years 1887 and 1888. The value of the coefficients of friction for speeds up to 96 km per hour, as determined in these tests, is given in the curves of Fig. 5A.

It is interesting to calculate the corresponding braking coefficients from the curves which were obtained in the different brake tests.

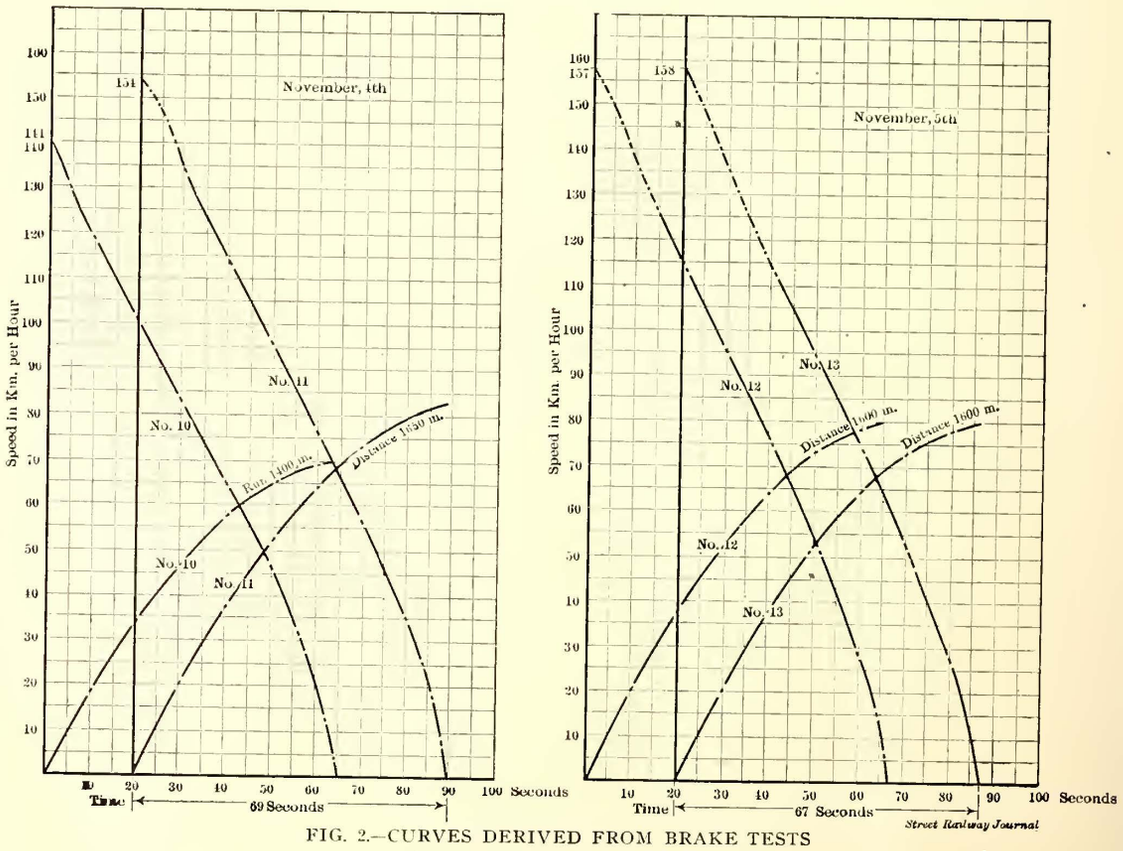


FIG. 2.—CURVES DERIVED FROM BRAKE TESTS

Let the *

Coefficient of friction	f.
Total pressure on the brake-shoes	D.
Mass of the car $\left(\frac{Wt}{g}\right)$	M.
Rotating mass referred to wheel circumference	R.
Air and train resistance	W.
Up and down grade of road	± a.
Retardation	p.

* These dimensions are all metric.

Then

$$fD + W \pm gM.a = p\ (M + R)$$

We have, for instance, from test No. 30

$$a = 0$$

$$M = \text{approx.}\ \frac{93000}{10} = 9300$$

Also by calculation

$$R = 790$$

At a speed of 20 km per hour, the curve shows

$$p = 1.7$$

The total pressure on the brake-shoes, after making allowance for the reduction of air pressure in the brake cylinder and the resistance of the brake rods, may be taken at 100,000 kg. The final value of the resistance W for the speed in question, no matter how it is calculated, will be so small compared to the braking resistance that it will have little or no effect upon the value of f.

Using, for instance, the formula

$$W = \left(2.5 + \frac{v^2}{1300}\right)\frac{Mg}{1000}$$

we obtain for the above case

$$W = 260$$

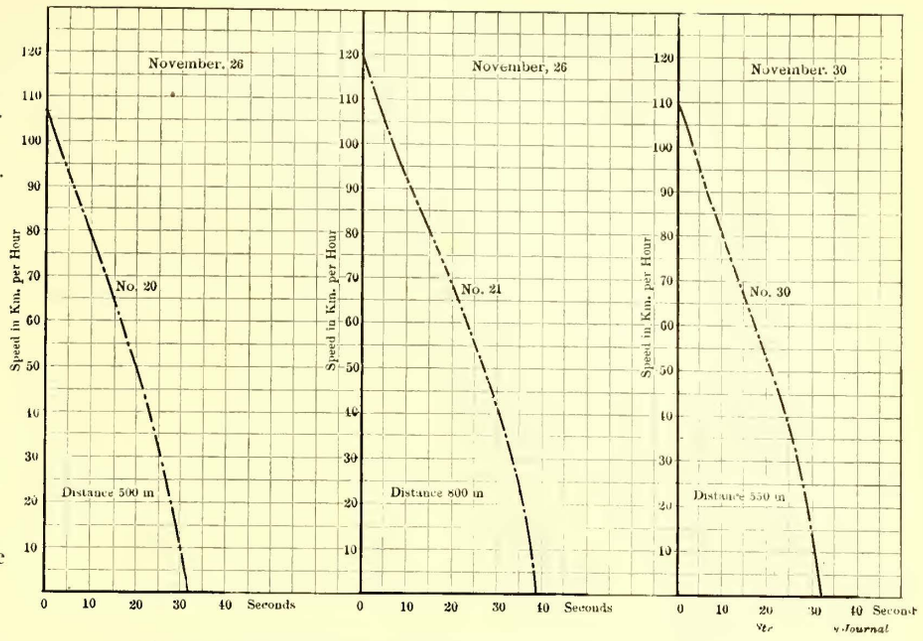


FIG. 3.—CURVES DERIVED FROM BRAKE TESTS, NOV. 26 AND 30, 1901

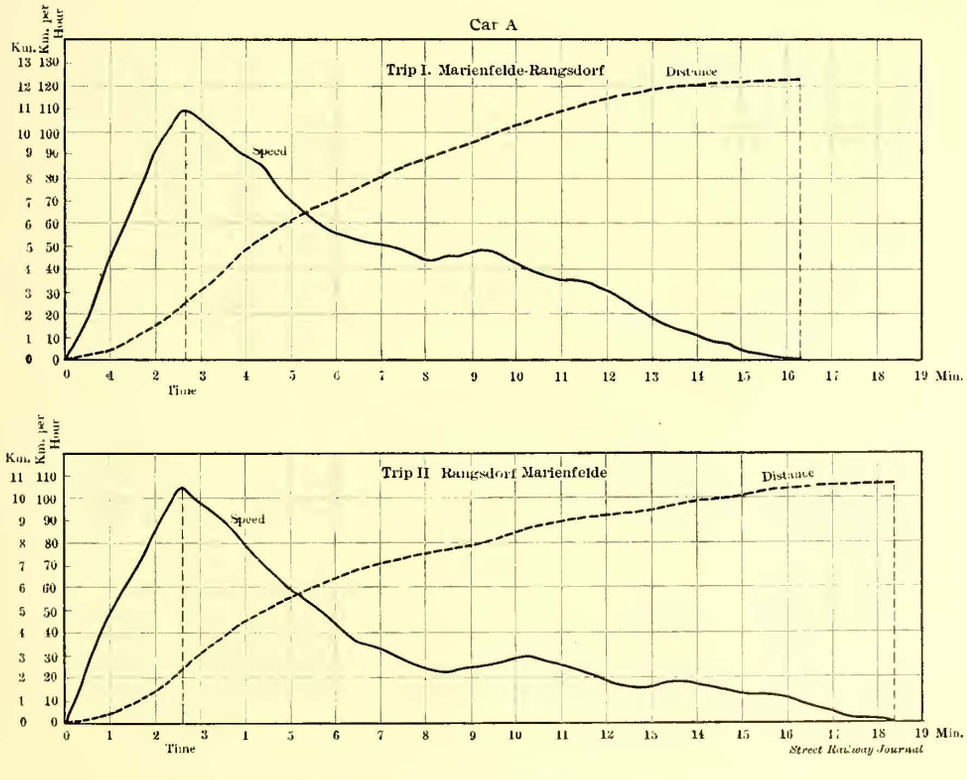


FIG. 4.—CURVES SHOWING COASTING TEST OF NOV. 28, 1901

By using these values in the original formula, we obtain

$$f = \frac{1.7\ (9300 + 790) - 260}{100{,}000}$$

$$= 1.7$$

At a speed of 60 km from the same test

$$p = 0.75$$

The pressure on the brake-shoes is approximately 110,000 kg.

From these values we obtain

$$f = 0.064$$

From test No. 29, at a speed of 100 km

$$p = 0.6$$

Assuming the pressure on the brake-shoes to be 120,000 kg, we obtain

$$f = 0.042$$

As shown by these results, the coefficients of friction—even at the greatest speeds—are less than those found by Westinghouse, which may be accounted for by the difficulty experienced in adjusting the brake rods, as the arrangement used did not insure all the brake-shoes being pressed equally against the wheels; also, because the friction is influenced by the material of the wheel tires and in that of the brake-shoes.

The selection of the Westinghouse quick-acting brake for the high-speed cars, due to its well-tested construction, was found to be correct for the present case; the particular brake arrangement used, however, is not satisfactory for single-operated cars. As suggested above, the condition met with here requires a braking system that operates quickly and insures an equal pressure upon all wheels which may be readily adjusted to suit the given speed. For this purpose a simple form of air brake in which the pressure can be easily regulated is sufficent. It would be still more desirable if, instead of the air brake, the momentum of the car could be utilized to stop it.

Tests were also made with the hand brakes, and were so conducted that at a given signal the shoes on both trucks were set at the same time. The results obtained showed that reliability could be placed upon this form of brake after taking into consideration the lower pressures between brake-shoes

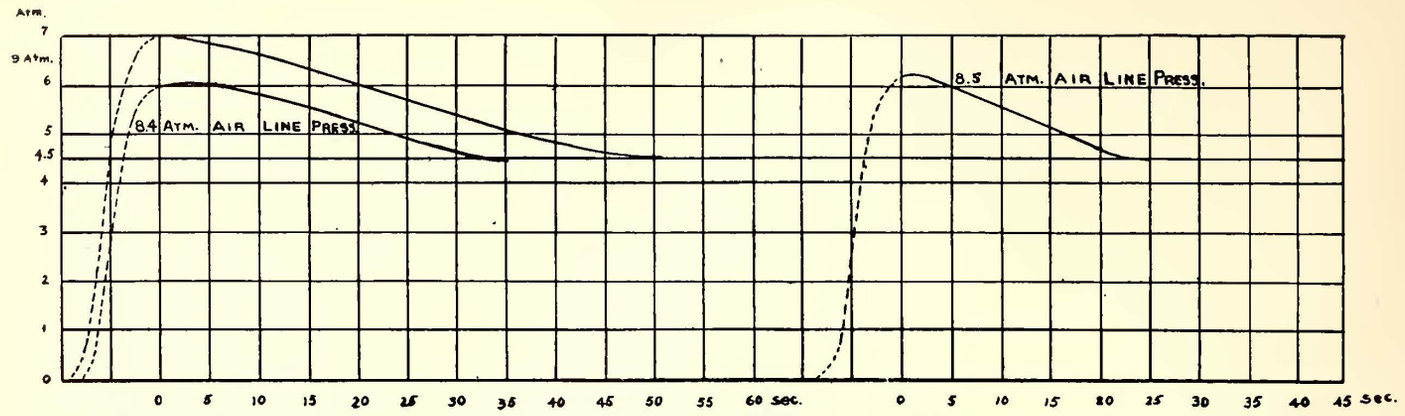


FIG. 5. DECREASE OF PRESSURE IN AIR CYLINDER WITH 2½-MM AND WITH 3-MM CHOKING DISC IN THE EXHAUST PORT OF THE PRESSURE-REDUCING VALVE

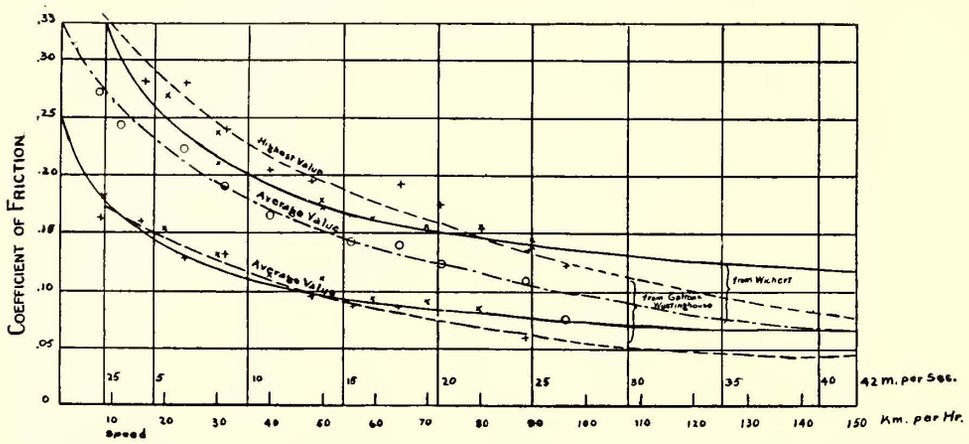


FIG. 5A.—VALUE OF THE COEFFICIENT OF FRICTION BETWEEN THE BRAKE-SHOES AND THE WHEELS, ACCORDING TO THE TESTS OF GALTON AND WESTINGHOUSE IN 1878 AND 1879, AND ALSO OF WICHERT IN 1887 AND 1888

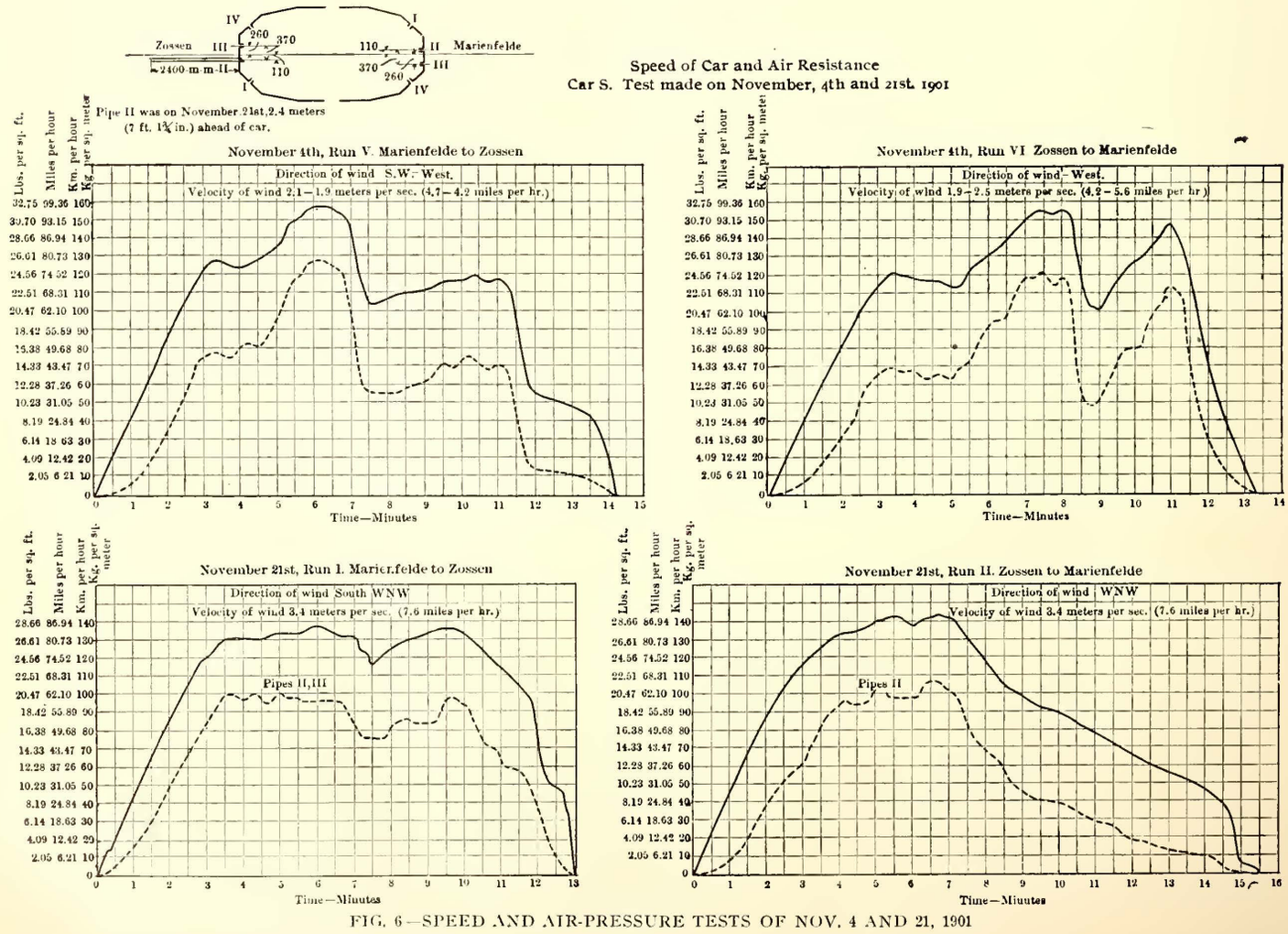


FIG. 6—SPEED AND AIR-PRESSURE TESTS OF NOV. 4 AND 21, 1901

and wheel rims. At an initial speed of 100 km per hour a braking distance of approximately 720 m in forty-two seconds was obtained, which corresponds to an average retardation of 0.66 m per second per second.

Many brake tests were attempted in car A with short-circuited current, but no decided results obtained. It is probable that much shorter braking distances could be obtained by using the short-circuit brake at the higher speeds. In general, braking by short-circuit current should only be attempted in case of emergency, as by the use of this method a great strain is thrown upon the motors, which might result in their injury. The braking system in car A, operated by exciting the motors with direct current, was not tested, as favorable results through the use of this scheme at high speeds have never been obtained.

A few words regarding the two coasting tests made on Nov. 28 with car A and shown in the curves of Fig. 4.

The speeds at the time of cutting off current were respectively 109 km and 106 km. The tests were made once in one direction and once in the opposite direction over practically the same part of the road. The distance the car ran without current in one case was 9600 m, and in the other, 8300 m, the corresponding times being 817 and 952 seconds. The curves and grades in either direction on the coasting stretch about equalized themselves. At the time of the tests the observations of the Potsdam Meteorological Observatory showed a wind direction of WNW and a speed of 11.4 m per second. The wind offered less resistance to the car when running in the direction Marienfelde-Zossen than in the opposite direction.

The differences in the coasting distances may be accounted for by the fact that the initial speeds were not the same. Taking the mean value from the recorded results of speed and time:

$$v = 107 \text{ km.}$$
$$t = 885 \text{ secs.}$$

Assuming that the speed decreases constantly, the retardation will also be constant and

$$p = \frac{v}{t} = 0.034 \text{ metres p. sec.}$$

The resistance of the car, which is assumed to be constant, will be

$$W = p\,(M + R) = 0.033 \times 9830$$
$$= 334 \text{ kg.}$$

From this the resistance per ton of train weight is

$$w = 3.7 \text{ kg.}$$

This average value for the resistance of the car looks small when compared with the average values obtained by the commonly used resistance formulæ.

From the formula already cited,

$$W = \left(2.5 + \frac{v^2}{1300}\right)\frac{Mg}{1000}$$

we obtain for a constantly decreasing speed starting at 100 km per hour an average value for the resistance per ton of train weight

$$w = 5.4 \text{ kg.}$$

In this formula the first term 2.5 depends only upon the sliding and rolling friction, and is applicable to an entire train as well as to the motor car in question. The difference in the final results therefore can only lie in the second term

$$\frac{v^2}{1300}$$

and the disagreement between the results of the test and those obtained by the formula is readily explained when we take into consideration the exceptionally great weight of the motor car, it playing no part in this term

$$\frac{v^2}{1300}$$

which relates chiefly to the air resistance.

In a train composed of many cars the formula gives more accurate results since the weight of the train as well as the air resistance increases with its length. Moreover, it is well known that this formula gives too high values for the higher speeds.

AIR RESISTANCE

To determine by test the relation between the speed and the pressure upon a rigid body, for the higher speeds, through opposite straight line movement, it was formerly necessary to use the ordinary measuring instruments, and it was consequently never practically possible to prove the accuracy of the results obtained in this manner.

The Zossen high-speed tests offered a favorable opportunity to correct this defect, as it was possible during the runs to make these measurements in a most accurate manner through the use of hydraulic pressure pipes. For this purpose holes were bored at different points through the front wall as well as in the rounded and beveled sides of the car, and short pipes were placed in them. Rubber tubes which connected with these pipes were led to water stand pipes arranged alongside of each other in the inside of the car. These latter consisted of simple communicating pipes of about 5 mm diameter, upon which a millimeter scale was attached. This scale could be adjusted vertically for a short distance so that its zero point could be set accurately at the level of the water in the pipes at the beginning of the observations.

Four such devices were arranged at each end of the car, two with openings in the front of the car and two on the rounded or beveled sides of the car ends. Several pipes were also arranged along the sides of the car, and at different periods during the observations were connected with the water pressure pipes. The placing of two openings at the front of the car was for the purpose of facilitating the use of different lengths of pipes, so that one opening always remained free and could be used for noting the pressure which was checked by the other.

The first thing of importance to determine was whether the length and the form of the mouth of the pipes at the front wall had any effect upon the pressure. To determine this a pipe with a funnel attached was placed in one of the openings at the front wall and a thin pipe without a funnel in the other. Further, the mouth of the funnel and then that of the pipe were reversed.

From these tests it was shown that the length and the form of the mouth of the pressure pipes placed at the front wall had no effect whatever upon the value of the air pressure. This method made it possible to reach all points at the front of the car with pressure pipes of different lengths and located in different positions, and accurately to determine the pressure at these points.

The determination of the manner and extent that the air pressure distributes itself upon the sides of the car was made independent from the influence of possible changes in speed by comparisons of the average openings, as well as the fixed openings, with the values obtained at the different points.

Further, a pressure pipe having different lengths was placed in the front wall opening and extended out in front of the car for lengths up to 3.4 m. Through this means it was shown that the pressure at the end of the pipe was about the same as that noted directly in front of the car and registered always the same as long as the opening of the pipe was kept toward the front. But as soon as the end of the pipe was bent toward the rear a decrease in pressure was at once noted, from which may be concluded that the compressed air cone driven before the car has its apex near this point.

Still other results were obtained by the measurement of the air pressure on the rounded and beveled sides of the front end of the car.

Upon these surfaces the air pressure is considerably less than on the straight surfaces at right angles to the direction

of motion, and a decided suction effect was sometimes noted at these places, depending greatly upon the direction of the wind. The pressure pipes along the sides of the car, whose mouths were placed even with the outside of the walls, indicated no decided variation due to the different speeds. Any difference of air pressure noted at these points was due more to the direction and the strength of the wind than from the speed. It was expected that a decided suction effect would be noted at the rear end of the car, but in reality only a slight effect was recorded, which did not increase very much as the speed increased.

On account of the time being limited for the tests, further observations were not possible along this line, as greater importance was attached to the determination of the air pressure at the front end of the car.

The results of these tests are given in the speed diagrams, a few of which are reproduced in Figs. 6-8. All of the pressure curves follow the general direction of the speed curves. Where this is not the case it can generally be accounted for by some local condition which caused the variation of the height of the water level at the moment the observation was being made. This could occur through a gust of wind of unequal pressure, also, as was often the case, the pressure would be suddenly altered when running by a building or similar object placed near the railroad.

The opening to which the pressure refers is noted upon each curve. In a few of the curves it may be seen what pressure was obtained at the end of the extended pipe. In Fig. 9 the observations for each day are plotted with air pressure as ordinates and speed as abscissæ. The different shaped points (that is, dots and crosses) refer to the different directions in running, and indicate that the pressure in the one direction has a different value than that in the opposite direction, although a general agreement between these values is clearly seen. The difference can only depend upon the strength and the direction of the wind which prevailed upon the particular day, the greater pressure applying to the direction of motion opposing that of the wind. The direction and speed of the wind is also noted as given by the Meteorological Observatory at Potsdam each day of the tests.

In Fig. 10 the final results of all of the tests are given, with the direction of motion separated. From this chart it is clearly noted that the air pressure increases in proportion to the speed through a curve somewhat similar to a parabola.

According to these measurements, up to a speed of 150 km per hour, the air pressure seems to follow closely the equation

$$p = 0.07v^2$$

in which v is the speed in meters per second and p is the pressure in kilogram on 1 sq. m of surface placed at right angles to the direction of motion.

Unfortunately, as above mentioned, it was not possible to conduct the measurements of the air pressure to such an extent that a final conclusion could be arrived at just what shape the car should have in order to lessen the air pressure as much as possible.

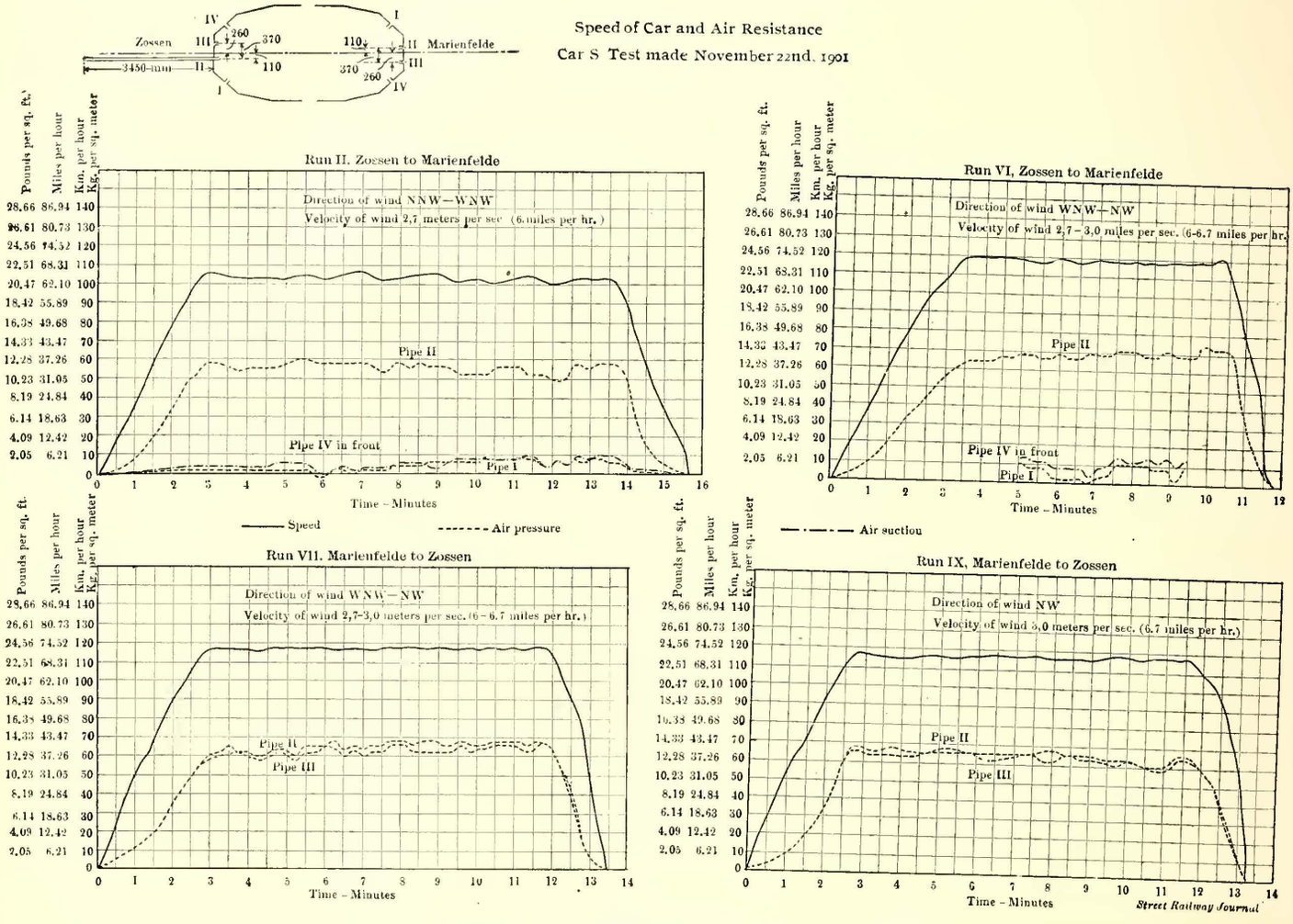


FIG. 7.—SPEED AND AIR-PRESSURE TESTS OF NOV. 22, 1901

ENERGY CONSUMPTION

For the determination of the energy consumption, observations were made in the car, as well as in the power station, and were taken during the latter series of the tests from the switchboard in the power station at intervals of ten seconds each. Records were made at the power station of the voltage, current strength and current consumption, and the frequency was determined through the number of revolutions of the generator. In the car the principal data taken were the voltage

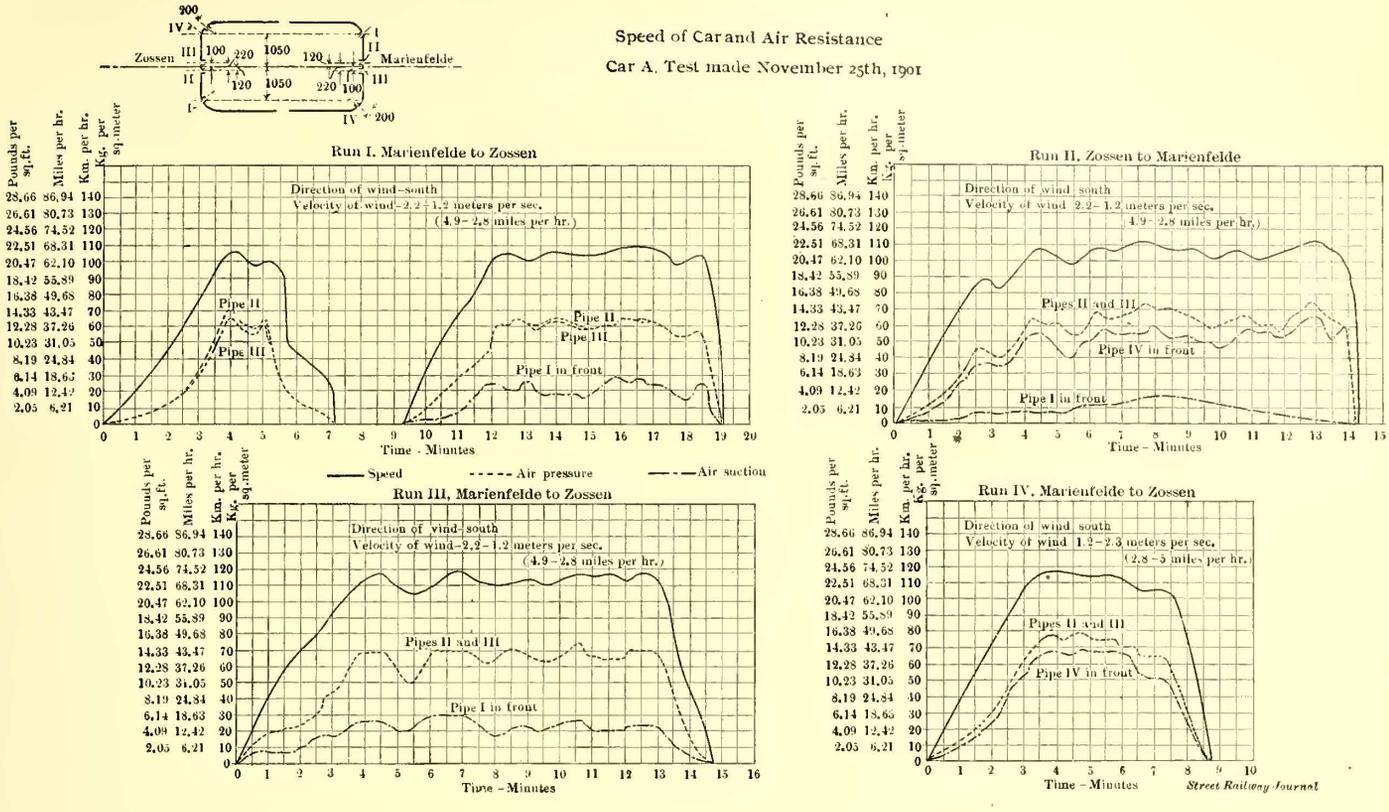


FIG. 8.—SPEED AND AIR-PRESSURE TESTS OF NOV. 25, 1901

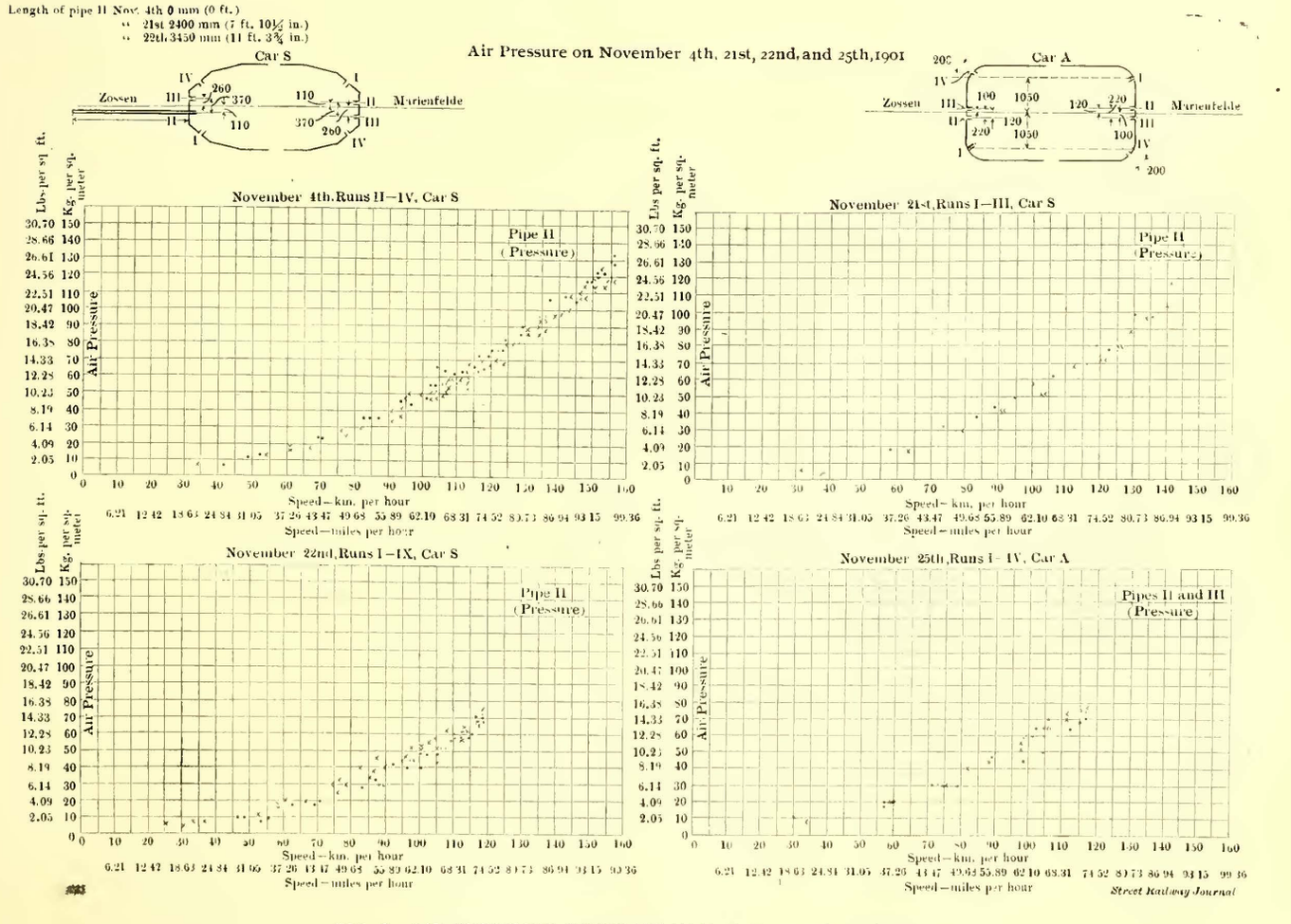


FIG. 9.—AIR-PRESSURE TESTS OF NOV. 4, 21, 22 AND 25, 1901

and current at intervals of 15 seconds or 30 seconds. Only during the latter runs could the current consumption in the car A be accurately observed, as previous to this no reliable instruments were available.

The frequency was determined quite accurately in car S by noting the revolutions of the motor for the air pump when running without load. The most reliable measurements were made at the power house, as it was possible to use very delicate instruments there, which could not be employed in the car during the trips, on account of the vibration. The results recorded by the instruments depend upon the frequency which was determined for each run by the speed desired, and was held constant in a very satisfactory manner by altering the weights attached to the governors on the steam engine. As the measuring instruments were calibrated for only one frequency, it was necessary at the end of the test to calibrate them again for the different frequency contemplated.

The current delivered from the primary machine had a potential of only 6000 volts, which was raised to 12,000 volts by transformers placed in the power house for this purpose.

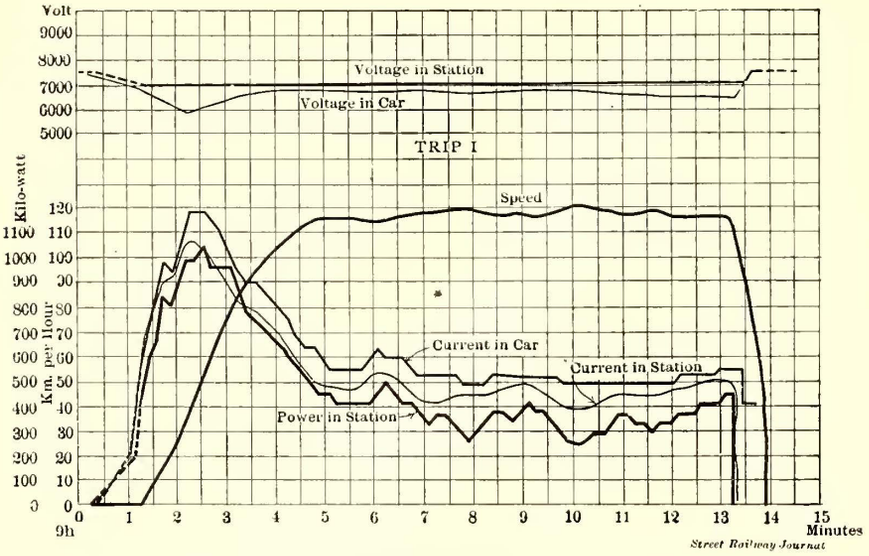
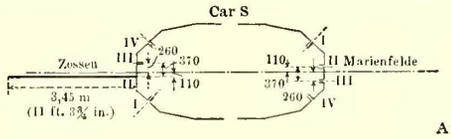


FIG. 11.—VOLTAGE, CURRENT, POWER AND SPEED CURVES FOR TRIP 1.

In Figs. 11-14 the results noted at the power house and in the car are plotted in the form of curves, which include also the speed curves. The full lines show the consecutive results as actually recorded by the instruments, while the dotted lines (in Fig. 12) represent data not recorded for short periods. In these dotted lines, however, each separate point is accurately determined, and the remaining part of the line is drawn in accordance to the other measurements, so that great errors at these places are impossible.

The curves were originally plotted in two scales, and the average values given in the following table were determined from these charts through the use of a planimeter. The table on the opposite page gives the actual figures obtained.

The results are separated for starting and continuous running, and in each case the average values for the measurements of the energy consumption and the power factor are separately calculated. The losses in the transmission line and the transformers in the power house were determined through calculation, and the energy consumption at the trolleys in the car is given by the recorded results.



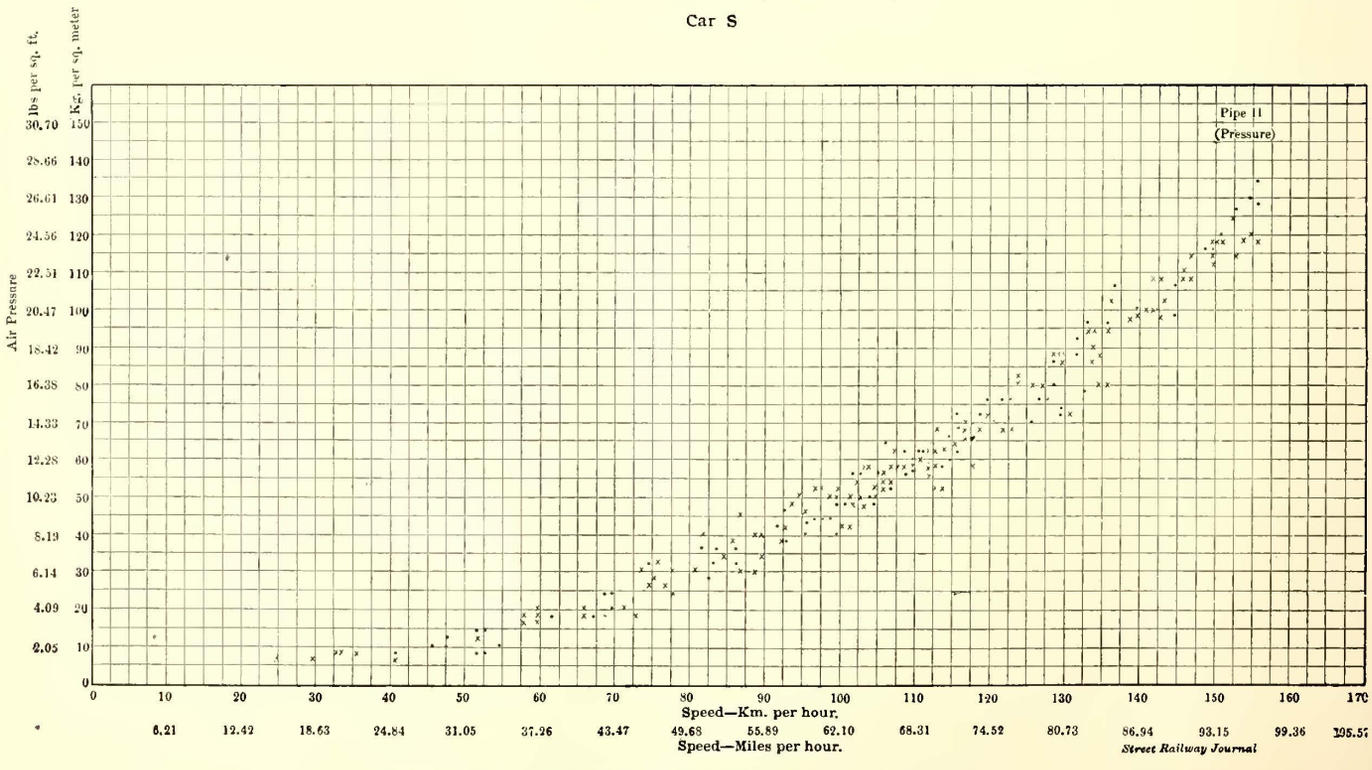


FIG. 10.—AIR-PRESSURE TESTS OF NOV. 4, 21 AND 22, 1901

It is a well-known fact that the difficulties of making measurements of three-phase installations are many, and the necessary data are not easily obtainable with absolute accuracy;

CAR A

Date—Nov. 1901.	Run No.	Frequency.	Starting Place.	Accel. Time from Turning on Current, Seconds.	Maximum Speed Km. Per Hour.	Power House Reduced to Secondary of Transformer. Measured Mean Values. Amp.	Volt.	Kw.	Calculated. P. F.	Kw. Hr.	Car at Trolleys, Measured Mean Values. Amp.	Volt.	Kw.	Accel. Time from Starting of Car, Seconds	Mean Accel. Meters, p. s. p. s.	Accel. Distance, Meters.	Difference in Level Meters.	Losses in Line and Transformers. Trolley Line Kw.	Transmission Line, Kw.	Transformer, Copper, Kw.	Iron Kw.	Total Kw.	Energy Consumption at Trolleys on Cars. Kw.	H.P.
26	*Ia*	27½	Mf.	231	118	87	7,300	740	0.675	47.5	(80)	....	....	225	0.146	4,400	—4.00	(3.5)	(83)	9.0	12¾	106	634	860
26	*Ib*	27½	km 13.65	240	(125)	84	7,400	675	0.63	45.0	....	....	....	....	....	....	....	....	....	....	13¼	....	....	....
26	*Ic*	27½	km 25	198	(99)	84	7,400	710	0.66	39.0	....	....	....	....	....	....	....	....	....	....	13¼	....	....	....
26	II	27½	Zo.	240	85	69	7,400	520	0.59	34.6	(65)	....	....	225	0.105	2,630	—0.75	(47)	(55)	5.9	13¼	(120)	400	544
27	I	27½	Mf.	255	118	86	7,600	695	0.616	49.2	(80)	7,000	....	240	0.136	5,100	—3.16	(4)	(83)	8.9	13¼	(110)	585	795
28	III	30	Mf.	231	135	92	8,000	870	0.685	56.0	(82)	7,500	....	203	0.185	4,800	—2.45	(4.5)	(87)	9.7	14½	(116)	754	1,025
29	I	27½	Mf.	285	115	....	....	....	....	....	64.5	6,500	(645)	235	0.136	4,200	—4.36	2.2	54	5.8	(12)	74	....	(876)
29	II	27½	Zo.	270	115	....	....	....	....	....	85.5	5,600	(745)	230	0.139	4,250	—2 09	80.	94	10.0	(12)	196	....	(1,012)
29	III	27½	Mf.	210	119	....	....	....	....	....	77.	6,500	(740)	180	0.184	3,650	—3.65	3.	77	8.2	(12)	100	....	(1,008)
29	IV	27½	Zo.	255	115	....	....	....	....	....	83.5	5,800	(750)	225	0.142	4,380	—2.09	77.	90	9.5	(12)	188	....	(1,020)
30	I	27½	Mf.	270	113	74½	7,000	623	0.69	46.6	68.	6,600	....	210	0.150	3,770	—4.36	2.5	60	6.6	12	81	542	737
30	*IIa*	27½	Zo.	255	110	92	7,000	765	0.69	54.0	81.	5,600	....	225	0.136	4,030	—2.00	72.	85	9.6	12	179	586	796

CAR S

21	I	30	Mf.	216	130	102	8,700	900	0.587	54 2	99.	7,600	....	210	0.172	4,320	—4.30	5.	126	13.2	16.5	161	739	1,000
21	II	30	Zo.	255	133	95	8,500	895	0.64	63.3	91.	6,800	....	240	0.154	5,350	—2.09	90.0	107	11.25	15.9	224	671	912
21	III	30	Mf.	216	102	86	8,100	722	0.60	43.4	85.	7,100	....	210	0.135	3,625	—4.36	4.	93	9.55	14.7	121	601	817
21	IV*a*	30	Zo.	222	115	96	8,000	845	0.63	52.0	96.	6,400	....	210	0.152	4,000	—2.00	102.	119	12.07	14.5	248	597	811
21	IV*b*	30	Mf.	192	120	99	7,850	875	0.655	46.7	93.	6,950	....	180	0.186	3,300	—5.20	22.7	112	11.92	14.	161	714	970
22	I*a*	25	Mf.	174	105	96½	6,900	760	0.66	36.7	91.	5,800	....	167	0.175	2,400	—3.15	2.2	107	11.4	12½	133	627	850
22	I*b*	25	km 30	72	(35-40)	83	6,950	550	0.55	11.0	(80)	....	....	....	....	....	....	(72)	(83)	(8.6)	12¾	(176)	374	509
22	II	25	Zo.	192	104	102	6,950	750	0.61	40.0	97.	5,300	....	186	0.155	2,850	0.	104.	121	12.8	12¾	250	500	680
22	III	25	Mf.	180	110	107	6,950	734	0.57	36.7	93.½	6,000	....	....	....	....	....	4.6	113	12.8	12¾	143	591	803
22	IV	25	Zo.	246	113	100	7,000	757	0.625	51.6	84.	5,300	....	(220)	(0.140)	3,580	0.6	78.	91	10.7	13.	193	564	767
22	V	25	Mf.	189	118	103	6,950	730	0.59	38.4	95.½	6,000	....	185	0.177	3,590	—3.69	5.	118	12.7	12¾	148	582	792
22	VI*a*	25	Zo.	213	118	107	7,000	790	0.61	46.6	96.	5,000	....	208	0.158	3,820	—1.30	101.5	119	13.2	13.	247	543	740
22	VI*b*	25	km 11.6	159	82	87	6,950	680	0.65	30.0	83.	5,900	....	145	0.158	1,940	+1.21	9.	89	9.4	12¾	120	560	762
22	VII	25	Mf.	186	118	106	6,900	750	0.595	38.6	94.	5,700	....	177	0.185	3,350	—3.69	4.5	114	12.8	12½	144	606	823
22	VIII	25	Zo.	228	118	105	6,900	790	0.63	50.0	98.	4,900	....	220	0.143	3,930	—1.70	106.	124	13.3	12½	256	534	725
22	IX	25	Mf.	174	118	109	6,850	772	0.60	37.4	95.	5,800	....	165	0.199	3,080	—3.69	4.5	116	13.3	12¾	146	626	850
22	X*a*	25	Zo.	222	116	108	6,850	810	0.633	50.0	100.	5,000	....	214	0.151	3,700	—0.94	110.	129	14.	12½	265	545	740
22	X*b*	25	km 22.5	78	(35)	88	6,900	615	0.585	13.3	(85)	....	....	....	....	....	....	(53)	(93)	(9.7)	12½	(168)	(447)	(608)
22	X*b*	25	Rdf.	216	(118)	113	6,700	817	0.625	49.0	(105)	....	....	....	....	....	....	(72)	(142)	(15.3)	11¾	(241)	(576)	(783)
22	X*c*	25	Licht.	159	(80)	113	6,800	830	0.625	36.7	(105)	....	....	....	....	....	....	(14)	(142)	(15.3)	12	183	(647)	(880)
26	III	27½	Mf.	213	100	90	7,350	705	0.62	41.7	(85)	....	....	213	0.142	3,360	—4.36	(38)	(93)	10.0	13	(120)	585	795
26	IV	27½	Zo.	249	117	88	7,400	730	0.65	50.5	(83)	....	....	243	0.134	4,560	—2.09	(76)	(89)	9.5	13¼	(188)	542	738
30	III*a*	27½	Mf.	210	123	102	7,000	815	0.66	47.5	(103)	6,600	....	200	0.171	3,730	—4.36	(5)	(130)	13.4	12	(160)	655	890
30	III*b*	27½	Dw.	156	124	104	7,000	865	0.69	37.5	(112)	6,200	....	156	0.166	3,420	—2.21	(55)	(130)	13.6	12	(210)	655	890
30	IV	27½	Zo.	246	121	100	7,000	805	0.666	55.0	98.	6,100	....	240	0.140	4,580	—2.09	106.	124	12.8	12	255	550	748

CAR A

Date—Nov. 1901.	Run No.	Frequency.	Run From Kw.	Run To Kw.	Average Speed Km. per Hour.	Power House Reduced to Secondary of Transformer. Measured Mean Values. Amp.	Volt.	Kw.	Calculated. P. F.	Kw. Hr.	Car at Trolleys, Measured near Values. Amp.	Volt.	Kw.	Time in Seconds.	Distance in Km.	Difference in Level Meters.	Losses in Line and Transformers. Trolley Line Kw.	Transmission Line, Kw.	Transformer, Copper, Kw.	Iron Kw.	Total Kw.	Energy Consumption at Trolleys on Cars. Kw.	H.P.
26	II	27½	27.82	11.22	88.	52	7,400	237	0.356	45.0	(47)	....	....	684	16,600	+4.48	12.	28½	3.2	13¼	57	180	245
27	I	27½	12.65	27.37	114.	57	7,600	332	0.444	43.0	(51)	7,000	....	465	14,720	—4.72	16.	33½	3.8	13¾	67	265	360
27	I	27½	20.15	27.37	124.	53	7,600	357	0.513	20.8	(48)	7,000	....	210	7,220	—4 23	18½	30	3.2	13¼	65	292	397
28	III	30	12.50	27.00	126.	58	8,000	405	0.504	46.7	(51)	7,500	....	414	14,500	—5.23	15½	33½	3.8	14¼	67	338	460
29	I	27½	11.75	24.80	116.	....	....	....	....	....	46	6,700	(370)	405	13,050	—5.82	11.	27.3	3.2	(12)	53	....	(500)
29	II	27½	26.20	13.63	116.	....	....	....	....	....	54	6,600	(480)	390	12,570	+10.0	17.5	37.6	4.2	(12)	71	....	(650)
29	III	27½	11.40	24.40	120.	....	....	....	....	....	44	6,850	(370)	390	13,000	—5.8	9.6	25.0	2.6	(12)	49	....	(500)
29	IV	27½	26.07	13.30	118.	....	....	....	....	....	53	6,700	(515)	390	12,780	+8.35	16.6	36.3	4.0	(12)	69	....	(700)
30	I	27½	11.32	27.80	117.	51	7,000	353	0.57	50.0	46½	6,650	....	510	16,500	—4.48	12.5	28.0	3.0	12	55	298	405
30	II*a*	27½	26.42	16.00	114.	78	7,000	580	0.615	53.4	62	6,450	....	330	10,450	19.0	25.7	49.6	6.2	12	93	487	662

CAR S

21	I	30	11.87	19.57	132.	86	8,950	630	0.472	36.7	76	8,000	....	210	7,700	+0.5	22.0	74.5	8.4	17.5	122	508	690
21	I	30	11.87	26.50	130.	79½	8,900	567	0.463	63.8	69	7,800	....	405	14,600	—5.60	26.8	61.5	7.1	17.3	113	454	618
21	II	30	25.10	18.10	140.	81	8,700	650	0.524	32.5	73	7,400	....	180	7,000	+4.3	36.7	69.	7.6	16.4	130	520	707
21	III	30	11.37	27.52	114	71	8,200	441	0.44	62.5	66½	7,500	....	510	16.150	—3 55	25.6	57.	6.1	14.6	103	338	460
21	IV*a*	30	26.45	17.53	119.	70½	8,200	490	0.49	36.7	64½	7,250	....	270	8,920	+3.9	29.6	53.7	5.9	14.6	104	386	525
22	I*a*	25	9.95	27.71	100.	60	7,000	272	0.373	48.3	54½	6,200	....	639	17,760	—5.4	16.2	38.3	4.3	12.7	71	201	273
22	II	25	27.60	8.90	102.	65½	7,000	310	0.39	57.0	58	6,100	....	660	18,700	+5.0	17.2	43.5	4.9	12.7	78	232	315
22	III	25	10.90	28.50	111.	59	7,000	274	0.384	43.3	52	6,300	....	570	17,600	—5 45	16.0	35.	4.0	12 7	68	206	280
22	IV	25	26.87	10.07	111.	68	7,000	423	0.515	64.3	56	6,200	....	546	16,800	+5.5	16.5	40.5	4.9	12.7	75	348	473
22	V	25	11.25	28.35	118.	64½	7,030	381	0.487	55.3	58½	6,250	....	522	17,100	—5.45	20.2	44.	4.8	12.8	82	299	406
22	VI*a*	25	26.63	13.00	118.	65	7,100	394	0.493	45.6	59½	6,150	....	416	13,640	+6.25	21.0	45.7	5.0	13.	85	309	420
22	VII	25	11.10	28.60	118.	63½	7,100	378	0.485	56.0	56	6,300	....	534	17,500	—5.45	18.7	40.5	4.6	13.	77	301	410
22	VIII	25	26.52	9.80	118	69	7,100	424	0.50	60.0	61	6,300	....	510	16,720	+6.6	19.0	48.	5.5	13.	85	339	461
22	IX	25	10.83	28.33	118.	63	7,000	382	0.50	56.7	56	6,200	....	534	17,500	—5 45	18.3	40.5	4.5	12.7	76	306	416
22	X*a*	25	26.75	24.12	117.	70	7,000	445	0.525	10.0	59	6,300	....	81	2,630	±0.	31.2	45.	5.3	12.7	94	351	477
22	X*b*	25	.....	.....	118.	74	7,000	452	0.505	20.4	....	....	....	162	(4,500)	....	....	....	2.8	12.7	....	....	....
26	III	27½	10.91	28.16	105.6	63½	7,400	337	0.415	55.0	(56)	....	....	588	17,250	—5.45	18.	40.5	4.6	13.3	76	261	355
26	IV	27½	25.89	8.99	114.	70½	7,400	420	0.465	62.0	(60)	....	....	534	16,900	+7.03	17.	46.5	5.5	13.3	82	338	460
30	III*a*	27½	11.28	16.53	123½	66	7,000	470	0.59	20.0	65	6,800	....	153	5,250	+1.45	12.0	54.5	6.6	12.	84	386	525
30	III*b*	27½	21.72	27.60	124.	64	7,000	456	0.59	21.7	60	6,600	....	171	5,880	—0.6	13.6	46.5	5.0	12.	94	362	492
30	IV	27½	25.87	11.21	123.	71	7,000	520	0.605	62.0	60	6,600	....	429	14,660	+5.82	19.0	46.5	5.5	12.	83	437	593

Note: Parentheses ( ) signify approximate values. HP. is metric HP.

however, the accompanying curves and tables usually show such close agreement in their corresponding values that the recorded results can be used as a reliable foundation for further discussion and calculations. A few results given in the table, which could not be positively checked throughout, are placed in brackets.

By observing the values given in the diagrams, we note the great fall in potential, which was due to the fact that the 13-km long-transmission line from the power house to the railway was composed of three single copper wires of only 50 sq. mm area each. It is also evident from the diagrams that the losses in the transmission line were greater than the loss in the trolley wires, even when the current was taken from the end of the trolley wires at Zossen.

Much better results would be obtained in a practical high-speed installation if the power house should be located at a more advantageous position.

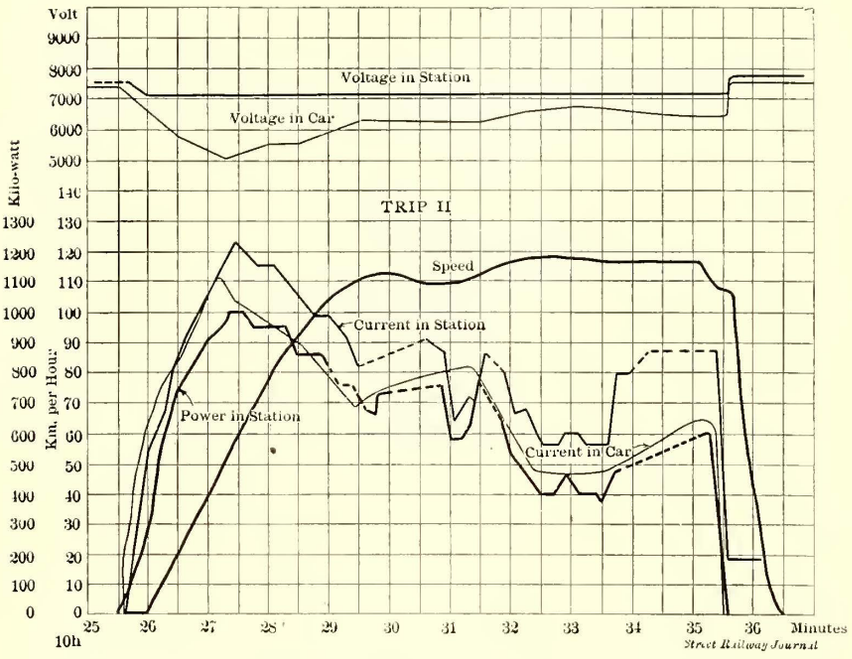


FIG. 12.—VOLTAGE, CURRENT, POWER AND SPEED CURVES FOR TRIP II.

The power factor at the power house appears unusually low, especially during continuous running, which on the whole was far under that for the accepted full load of the motors.

Generally, it must be remembered that in the design of this experimental installation, many unfavorable conditions had to be accepted which would not exist in the execution of a new installation. For such a case a suitable power house would be erected at the most advantageous location along the proposed line, and proper machines would be selected for the service conditions of the road, so that the supply of the necessary current could be accomplished without installing special transformers at the power house.

The recorded observations and measurements of the different tests for a constant speed gives the energy consumption at the trolley

for car A = 455 hp at 118 km per hour,
for car S = 405 hp at 115 km per hour;

the energy consumption at the sub-station

for car A = 478 hp at 118 km per hour,
for car S = 431 hp at 115 km per hour;

the energy consumption at the driving wheels

for car A = 397 hp at 118 km per hour,
for car S = 341 hp at 115 km per hour;

from which we obtain an efficiency

for the electrical equipment of car A = 87 per cent,
for the electrical equipment of car S = 79 per cent.

The average efficiency of the electrical equipment of the cars and trolley lines

for car A = 83 per cent,
for car S = 79 per cent.

The energy consumption at the engine shaft, under the supposition that the sub-station at the feeding point is included, but the transformers in the power house are not considered, and assuming an efficiency of the generators of 95 per cent for the given speeds, was

for car A = 504 hp,
for car S = 454 hp.

The efficiency of the electrical installation, including the generators, the trolley wires and the electrical car equipments, was

for car A = 79 per cent,
for car S = 75 per cent.

For the starting period, which is only a small part of the whole running time, we obtain an efficiency

for car A = 43 per cent,
for car S = 48 per cent.

According to the tests made by the Berlin Electric Works at the power house, the steam consumption of the steam engine was 4.6 kg per hp-hour, referred to the engine shaft.

Each developed horse-power on the driving wheels of the car at the above-named constant speeds of 118 km and 115 km per hour will require a steam consumption

for car A = 5.84 kg per hour,
for car S = 6.12 kg per hour.

The coal consumption by sevenfold evaporation for the above figures is, respectively, 0.835 kg and 0.875 per hp-hour.

These values would appear much better if the motors were heavier loaded, which will be the case at higher speeds; then the power factor, which in the above instances varies between 0.5 and 0.6, will be greater. This will cause the ohmic losses in the entire electric installation to be proportionately reduced. Also the higher potentials of 10,000-12,000 volts will help to increase the efficiency at the higher speeds by decreasing the losses. Higher voltages could not be used during the tests on account of the speed which required a low frequency, and also the disturbing influence upon the railway signal apparatus.

An accurate calculation of the total costs of the electrical service is not possible at this time, as the highest speed for which the electrical equipment of the power house and the motors in the car was designed could not be attained, and also the number of tests made was considered insufficient for such a determination.

For all future tests the measuring instruments employed should be of the best make and be calibrated beforehand for the different frequencies to be used. They should also be connected in circuit, and read at the same instant, whether in the power house or at the feeding station, as well as in each of the cars.

Previously, the measuring apparatus were connected in shunt circuits, but it would be better to connect them as far as possible directly in the high potential lines so as to insure as accurate results as possible from which reliable conclusions could be drawn.

SAFETY PRECAUTIONS AND DEVICES USED IN THE TESTS

Primarily, for the safety of the service of the railroad and the tests, it was considered absolutely necessary that the runs should take place by daylight and at a time when that portion of the road over which the tests were to be conducted was en-

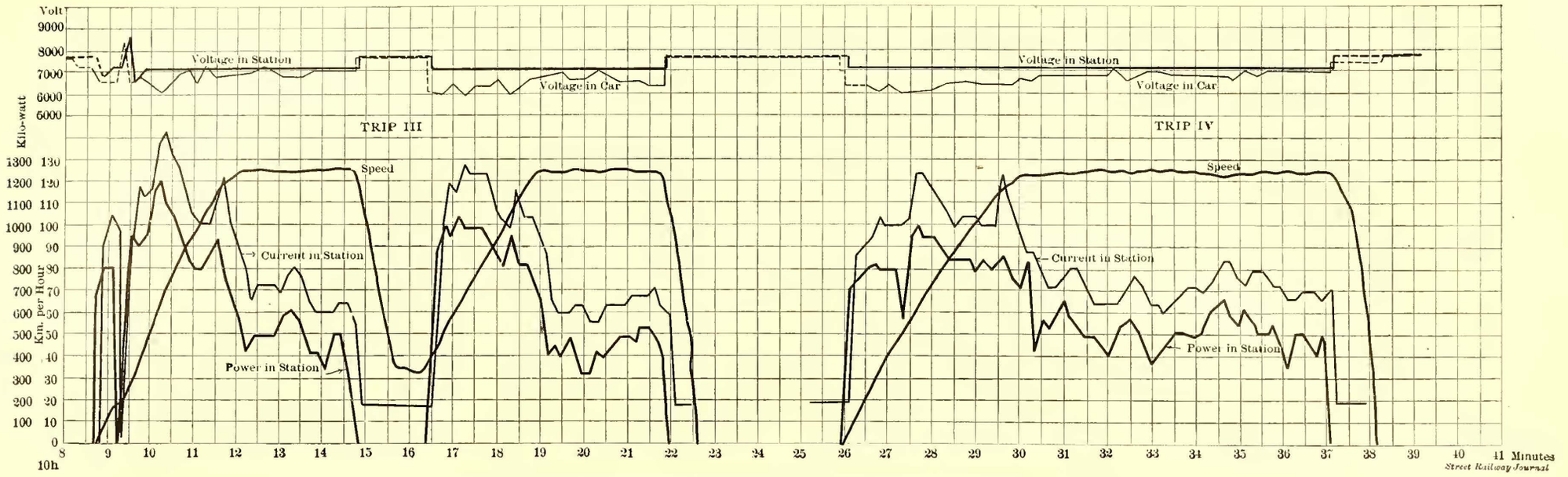


FIG. 13.—VOLTAGE, CURRENT, POWER AND SPEED CURVES FOR TRIPS III. AND IV.

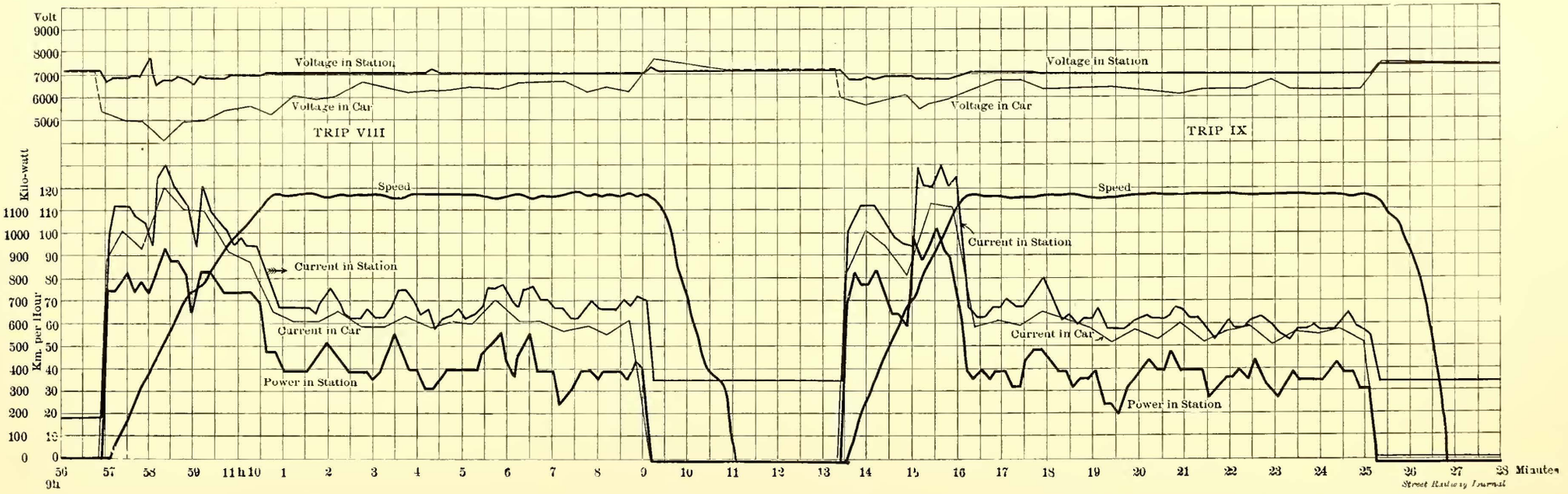


FIG. 14.—VOLTAGE, CURRENT, POWER AND SPEED CURVES FOR TRIPS VIII. AND IX.

tirely free. On account of these considerations, the time from 8 to 11:30 a. m., as proposed in the programme of the tests, was decided upon.

In order to make it impossible for any of the switches between Mahlow and Rangsdorf stations to be misplaced during this time, a special form of lock was used, which insured the proper placing of the switches. Besides this, an iron block with a movable wing-rail was fastened in each of these switches. To insure the allowance of sufficient time to stop the car at the end of the test stretch, four signal plates were used. These signal plates were furnished with white backgrounds and were fastened to pointed iron pipes, two being painted with the letter A (cut-out current) and two with the letter B (brake car). Two of these signals (one with A and the other with B) were erected alongside of the track near the end station, the distance from this station being so taken that the car could be easily stopped, even during the most unfavorable weather and when the motorman could only recognize the plate B by being close to it.

The regular guard of the road was increased so that when speeds of over 100 km per hour were made all roads crossing the test line were guarded by regular railroad employees, who were instructed to keep the gates at these crossings closed from the time the car left the starting station until it had passed. No further precautions for the safety of the service were attempted, and attention was turned to the working of the safety devices already installed as the higher speeds were approached.

The military road on which the tests were conducted is provided with the usual visual signals at the stations, and the less open parts of the road are furnished with signals which are operated from the stations through wire cables in conjunction with the main signals. Block signals are not employed on the road. For the ordinary service of the road, on which speeds of over 80 km per hour are not run, and on which trains are operated at comparatively great distances apart, the signal system installed is quite sufficient.

For the test runs, however, in which speeds of over 120 km per hour were made, it was found that these signals could not be recognized in time to stop the car before reaching them by using the braking apparatus at hand. This was the case even in clear weather, and on dark and foggy days the conditions were still worse, suggesting that it might be necessary in an organized high-speed service to slow up before reaching such signals, which would thereby lessen greatly the advantages gained through the use of the increased speed.

The worst conditions encountered proved to be during rainy weather, when the drops of rain adhering to the window panes of the motorman's cab obstructed the view. At such times it was possible to see only a portion of the track for a distance of 200 m to 300 m between or through the drops, and it was found necessary in these cases to reduce the speed in passing the stations.

On account of these considerations the signal system for a high-speed service must be so arranged that under all conditions the signals may be recognized absolutely and quickly.

If these objects are to be gained through signals arranged along the track, the first one must be placed at a distance from the station equal to the greatest braking distance required under the most unfavorable conditions. From the results of the brake tests already obtained, the first signal, for speeds up to 160 km, must be placed at least 1.5 km to 2 km before the station. Besides this, the form of the signal must be easily seen so that it may be unmistakably interpreted from the motorman's cab even at short distances, and during any prevailing fog, rain or snow. It would be better to employ a system in which a visual signal would automatically appear at a selected place in the cab itself and in plain view of the motorman, the system being connected with a separate acoustic signal (electric bell) which would sound whenever the visual signal stood at stop. The signal system in the car should be operated in conjunction with the one used along the track, and be so interconnected that if any defect in the latter should occur it would be automatically indicated by the former in the car.

During the tests that part of the road over which the runs were made was kept free from all other trains, so that special protection for guarding the necessary headway of the trains was not required. However, if the trains should be operated on short headway, special devices would have to be arranged for their protection, such as the automatic cutting out of the current on the different sections of the track.

THE MEGAPHONE AS AN AID TO RAPID TRANSIT IN BROOKLYN

In the vicinity of the Borough Hall, Brooklyn, the busiest point in the city, there is a perfect maze of street car lines. Just above the hall, at the junction of Adams and Fulton Streets, the Crosstown, Greenpoint, Bergen, Douglas, Fifth and Seventh Avenue lines all cross Fulton Street, nearly at right angles. Below the hall there pass the Fulton, Gates, Putnam, DeKalb and other lines destined to Fulton Ferry, New York and into Court Street. In addition to this, the Myrtle and Myrtle and Ralph Avenue lines turn into Washington Street from Myrtle Avenue at the junction of Fulton Street, Myrtle Avenue and Washington Street, destined to New York. Here transfers are issued in wholesale, which is not true of the other crossing, and confusion would be endless were it not for the scheme adopted by the Brooklyn Rapid Transit Company of stationing a man with a megaphone at this point, whose duty it is to announce cars and otherwise direct passengers. He announces the departure of the local cars in Brooklyn which encircle the City Hall, and directs passengers where to find seats. It is a plan worthy of emulation by companies in other cities that are hampered in moving cars by similar traffic conditions.

ELECTRIC RAILWAY PROGRESS IN WESTERN PENNSYLVANIA

The Titusville Electric Traction Company, of Titusville, Pa., is about ready to start an extension of its line from Trionville to Townsville, a distance of about 6 miles. It is planned to have the line ready for opening early in the spring of 1906. This extension is another link in the chain of electric roads which will ultimately connect the shores of Lake Erie with Pittsburg. Within another year this company will extend its line on the north from Townsville to Meadville, Pa. Surveys have been made to the south of this company's line, from Pleasantville to Oil City, and a road will ultimately be built to connect Titusville with Oil City. The Titusville road is one of the best paying properties in the western part of Pennsylvania. In the winter time its receipts are good and adequate to meet all its obligations. The summer traffic is enormous. As an example of what a small road can do with limited equipment and facilities, W. J. Smith, general manager, showed a representative of the Street Railway Journal the receipts for July 4, one of the best days during the summer. With eight cars more than 14,000 passengers were carried between 6 o'clock in the morning and midnight, the average being 72.48 passenger per car-mile. Considering these facts, together with the possibilities for the early realization of the extensions south to Oil City and north to Meadville, the company's future prospects are most promising.

The interchangeable mileage books in use on the electric railways of Ohio have been adopted by the Indiana Union Traction Company of Indiana. This is the first traction road in Indiana to adopt the mileage books.

CHANGING GAGE OF TRACKS IN EAST ST. LOUIS

BY W. A. BENNETT
Engineer Maintenance of Way, East St. Louis & Suburban Railway Company

In March, 1905, the management of the East St. Louis & Suburban Railway Company called for an estimate of cost of bringing to the standard 4-ft. 8½-in. gage all the tracks that were then 4-ft. 10-in. gage. The first impulse was to follow the example of the steam roads and make the change in one day. This would have not only suspended service for one day, and possibly longer, but would have necessitated the tearing up at one time every paved street in which tracks were laid, and the borrowing of all the men and tools that the neighboring steam and electric roads could furnish. It was therefore decided to do the work by divisions, keep up the service and tear up only a portion of the city at one time. The following estimate was made:

Changing 60 miles of T-rail track on ties, at $100	$6,000
Changing 17 miles of girder-rail track on ties, at $1,300	22,100
Changing 6 miles of girder-rail track in concrete, at $2,600	15,600
Changing 2 miles of miscellaneous track, at $1,300	2,600
Changing 65 railroad crossings, at $25	1,625
Changing special work	6,140
Changing equipment, 107 cars	3,000
	$57,065
New frogs, tie-rods, bolts, spikes, tie plugs, tools and incidentals	$11,413
	$68,478

This estimate was approved and work authorized March 31, 1905.

The work of organization and preparation was then begun. The plans for changing the complicated special work were made by the Pennsylvania Steel Company. An entire new plan of each job was prepared as for new work, but in addition the old location of the rails was shown. This formed a composite

AN ESPECIALLY DIFFICULT SITUATION FOR A CHANGE IN GAGE

plant, giving the number of each piece, its length, etc. All the old parts that could be used were put back and new frogs put in where old ones would not line or gage. Where rails were too long or too short, the length of the cut or "dutchman" was given. As these plans were made and approved, the new frogs were started in the shops. The frogs from Steelton, Pa., arrived in our yard in July. While waiting for the frogs, all the small outlying lines (where no special work was required) and all the suburban lines were changed. These, for the most part, are double track, and were changed one track at a time. The cars were changed in the shops and taken out over the 4-ft. 10-in. tracks at night.

The work of preparing the suburban lines was given to the regular section foremen. Each foreman was given a plan of his section, showing which rail was to be moved. At switches the rails opposite the frog were moved; on long curves the inside rail was moved and the joints opened; on short guarded curves the outside rail was moved in and the surplus rail cut off.

The work of renewing ties was then rushed, and no new ties were spiked on the side to be changed, except where necessary

PLACING THE CHANGED GAGE CARS IN SERVICE

to hold the track safe. All inside spikes were then pulled, excepting at every third tie, after which the spike holes were plugged and ties adzed smooth. The spikes that had been pulled were reset 1½ ins. from the rail by spiking to an iron shim 1½ ins. x 4 ins. x ½ in. Bolt holes were drilled in switch rods on the side to be moved so that stands did not have to be disturbed. At road crossings the planks were taken up, spikes reset and inside planks put down 1½ ins. further from the rail. Guard rails were not disturbed until the day of change. A

ST. CLAIR AVENUE, LOOKING WEST

gang of saw and drill men was organized to do all cutting and drilling in special work and railroad crossings. This cutting was done mostly at night. A rail saw driven by motor was tried, but it was found that the work could be done more quickly and cheaper by hand. The power saw cut faster than the hack saw, but it took so much time to put it on and take it off and adjust the machine that there was no time gained in the end. A hack saw was put to work on each rail at the same time, and when one was done all were done. The cuts were made to the base of the rail and were finished the day the gage was changed. A pair of blank angle-bars was put on the cut rails and bored to fit the old holes. In the special work the plates were removed, cuts made to the base of the rail, plates

replaced, bolted with two bolts and paving replaced until the day of change.

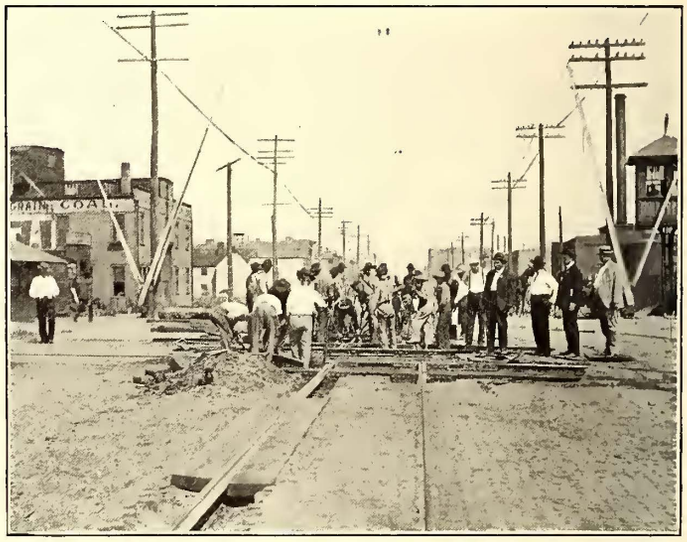
The contract for taking up and replacing paving was let to a local firm of contractors. On double track the two inside rails were moved. The entire pavement between tracks was taken up, as was a strip 18 ins. wide along the opposite side of the rails.

An extra gang of seventy men was organized to change the concrete tracks. This gang was divided as follows:

	Men
First division—pick and shovel labor	35
Second division—wrench men	6
Third division—jack and bar men	8
Fourth division—wrench men	4
Fifth division—grout men and sweepers	6
Sixth division—concrete mixers	7
Sub-foremen	3
Blacksmith	1
	70

The first division dug out the concrete around the rail. The second ran back the inside tie-rod nuts. The third moved the rail with powerful jacks. The fourth brought the track to gage by means of the tie-rods 6 ft. apart. The fifth cleared and grouted. The sixth replaced the concrete. Sub-foremen were with divisions 1, 3 and 6. The blacksmith, with portable shop, repaired and sharpened tools. A pneumatic drill was tried for removing concrete, but it was found to be more expensive, slower and not so good as sharp picks. A high-grade, short, heavy steel pick tempered blue was used.

CHANGING THE GAGE AT MISSSOURI AND COLLINSVILLE AVENUES



THE LOUISVILLE & NASHVILLE AND BALTIMORE & OHIO CROSSINGS AT ST. CLAIR AVENUE

By the time the new special work was ready, all the outlying lines in East St. Louis, and all the suburban lines, including all local lines in the city of Belleville, were changed. In Belleville, the cars were changed on the street while the work on the track was in progress. These lines being all single track, service was suspended for one day. After the suburban lines were thoroughly prepared they were changed one division at a time. The lines were divided into short sections and each gang given a certain amount to change. The gangs were organized as follows:

	Men
First division—three claw bars and one maul	4
Second division—three pinch bars and one maul	4
Third division—five mauls	5
Fourth division—one water carrier and push-car man	2
Total	15

Division 1 pulled remaining inside spikes and drove down broken spikes, took off guard rails at frogs and took up outside crossing planks. Division 2 moved the rail over to spikes previously driven and set an outside spike in every third tie. Division 3 drove the spikes and tested the gage. Each gang carried the following tools, viz.: One push car, nine mauls, four claw bars, three pinch bars, one adz, two wrenches, one monkey wrench, one gage, three chisels, one hack saw, one spike puller, one water keg, one water bucket, three extra maul handles, one pick, two shovels and 50 lbs. of ice.

The push cars were distributed by the work cars the day before changing. The men and tools were taken to their stations by the work cars early on the day of change. At quitting time the tools were collected and taken to the next day's work. The men were sent home in special cars. After the first suburban line was changed one work car was changed, and by using two cars of different gages, the men and tools could be taken to any point of the work.

At the signal to start changing, each gang tried to see which could be the first one ready for cars. Actual working time was kept for each gang on each day. At switches the bolts in the rods were removed and the switch point moved over 1½ ins. to holes previously drilled. The bolts were then replaced and stock rail moved up to point and spiked. At railroad crossings a piece of rail and rail-tongs were on hand to drive the crossings. The saw and drill gang was divided and stationed where cuts were to be finished and holes drilled. They finished cutting the crossings; the track men drove the frogs over, lined, gaged and spiked them, and the drill men replaced and bolted the angle bars. After the gage was changed and track safe for cars, each gang reported by telephone and then started back, pulling remaining outside spikes and spiking in full. A gasoline inspection car with wide wheels, capable of running on either 4-ft. 8½-in. or 4-ft. 10-in. track, was used for superintending the work. The best time was made by one gang on the Caseyville division, ½-mile section, in forty minutes. On the Belleville subdivision, 1-mile section, the best time on the westbound track in the morning was one hour and ten minutes; in the afternoon on eastbound track, one hour and fifteen minutes. On the Edwardsville division, from Collinsville to Edwardsville, 1-mile section, the best time was one hour and fifteen minutes, and on the same division, from Collinsville to East St. Louis, 1-mile section, one hour and five minutes.

The changing of the main lines in East St. Louis was carried on by divisions, beginning at the outlying districts and working toward the center. This work was done in nearly the same way as on the suburban, except that each gang was given a shorter section and a large gang placed at each job of special

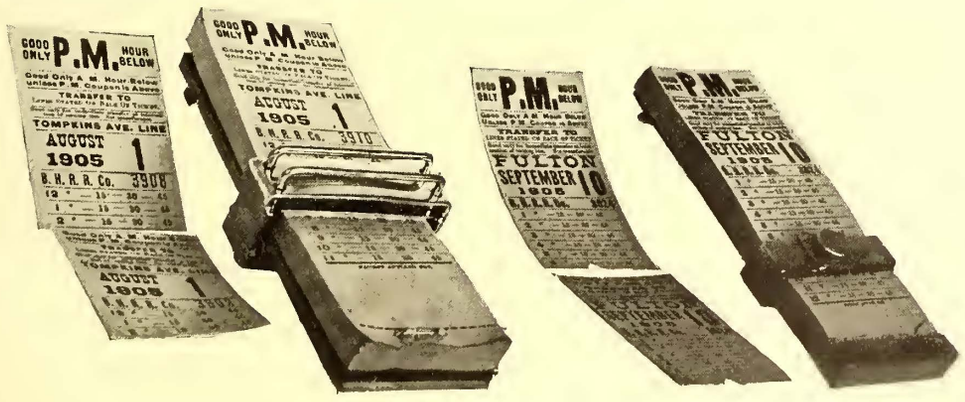
work. No work of changing was started until the line was thoroughly prepared. The girder rail tracks on ties had tie-rods every 10 ft., and only one tie was left spiked between tie-rods. All the inside tie-rod nuts were run back 1½ ins. and the inside spikes set 1½ ins. from rail, as in the suburban tracks. Temporary street crossings were made of planks after the spikes were pulled and all ties adzed smooth. Where brace tie-plates were used, the plates were moved with the rail, but claw tie-plates were not moved. In the special work all bolts were removed except two in each joint, and as many spikes pulled as safety would permit. Not so many claw bar men and spike pullers were needed in the city work as on the suburban, and these extra men worked on the tie-rods. In changing the special work, the plans were followed as closely as in putting in new work, and after the cuts were finished each piece was brought to its proper place, according to the plan. The frogs that were shown to be replaced were taken out and the new ones put in. The whole was lined and gaged before joints were tightened or spikes driven down. "Dutchmen" were then cut to fill openings, joints bored and bolted and all rails spiked down. The saw and drill gang did the cutting of "dutchmen," boring of holes and bolting in full. With few exceptions, the tracks and special work are in as good line and gage as before, and in some cases better. The paving contractors followed the track work as rapidly as possible, so that at no time was there a great amount of pavement taken up. The last change, and the only work that was done at night, was the Eads Bridge and the special work at the east approach. This was done on the night of Friday, July 28.

The entire work of changing the gage was done by our own men. No line was out of service more than a couple of hours except Belleville local lines. All of our reconstruction work was carried on at the same time, and at no time did we need more men than we had employed. Our total track force varied from 200 to 250 men.

The actual cost of the work has not yet been exactly determined, but will be within the original estimate.

A NEW DESIGN OF NON-PUNCH TRANSFER TICKET

A novel form of transfer ticket which is applicable to close restrictions as to time limits, and entirely without the use of a punch, has recently been perfected and is now in use by the Brooklyn Rapid Transit Company. The ticket and its holder were invented and placed into practical use by George R. Folds, who was formerly assistant to the general manager, and whose resignation to become general manager of the South Chicago City Railway Company was recently announced in these columns. In this new ticket the punch method of indicating time limits of the transfer is replaced by a novel method of tearing in the limit, the point at which the ticket is torn off the stub indicating the time at which transfer expires. The way in which this is accomplished is indicated in the illustration, in which bunches of transfers in the special spring holders are shown, together with sample transfer checks detached for different hours in both A. M. and P. M.



BOTH TYPES OF SPRING PAD HOLDERS AND SOME LOOSE TRANSFERS

The transfer ticket is ruled off with horizontal lines, one for each of the twelve hours of the half day. At the top is the hour of 12 for noon or midnight, and underneath are the later hours in order. In practical operation the spring holder is merely adjusted so that in detaching the check its straight edge will serve as the rule to cut the paper at the time limit desired; thus for 6 o'clock the check will merely be torn off beneath the figure 6, etc., the time limit thus always appearing at the bottom. The A. M. and P. M. designations are obtained by the coupon at the top of the check containing P. M. in heavy black letters. When this is torn off, the check is good only for A. M. use, as is clearly stated below the coupon, while if left on, it is only valid in the afternoon.

Two forms of spring pad holders are shown, one arranged for subdividing the hours and the other for tearing off the check plain without limiting the transfer for intervals less than one hour. It is probable that the Brooklyn Rapid Transit Company will eventually make use of the latter plan, as the experience there shows little advantage in the closer time limits. For this purpose a spring holder or clamp of a simple design in brass is used to grip the pad of transfer tickets, so that when properly set any number of transfers may be torn off across the straight edge without readjusting it. For adjusting the pad for later hours the clamp is merely released and the pad moved upward in the holder. The style of holder in which fifteen-minute intervals are recorded consists of a brass back with a spring slide covering the pad very similar to that already described, but carrying an adjustable thumb perforator. The slide is adjusted up and down the pad, as in the case of the other holder, but for subdivisions of hours the thumb perforator is moved crosswise to indent the lower edge of the check at the quarter-hour desired in tearing off. This quarter-hour designation results in a neat V-shaped indentation which is easily distinguished.

In the illustration the holders are shown with sample pads in place. The plain holder, carrying the Tompkins Avenue transfers, is shown put to a special duty of holding two pads, back to back, as upon this line two different classes of transfers are issued at different points. The holder works equally well on either side, so that, in effect, the conductor handles only one pad. At the sides of the holders are shown sample checks for P. M. and A. M., those for Tompkins Avenue torn off at even 2 o'clock limit, and those for Fulton Street at 6:15 a. m. and p. m. It will be noted that as the checks are torn off later in the day, their lengths become longer, so that expired time-limit transfers will be easily detected by the conductor. Furthermore, with this scheme the passenger cannot cut off the transfer to extend its time of expiration.

The most important advantage of the new form of transfer is, however, found to lie in the accounting department. In accordance with the policy in Brooklyn of collecting transfers from the conductors as quickly as possible, conductors are required to turn in their transfer receipts every half trip, so that the accounting department receives packages of transfers turned in at stated times. In checking these over it is found a most simple matter to examine time limits of all of them, even in very large quantities, as they must all necessarily be approximately of the same length. They are, in fact, sorted as to lengths before counting, and any checks received after the time limit had expired may readily be detected from their shorter length.

THE PLANS FOR REORGANIZATION OF THE AMERICAN STREET RAILWAY ASSOCIATION

President Ely, of the American Street Railway Association, has recently transmitted a circular letter to the members of the association, explanatory of the reorganization of the association and of the proposed constitution and by-laws, which were published in the last issue of this paper. This letter outlines the steps taken by the joint reorganization committee of the several associations, and describes some of the advantages which it is thought will result from the adoption of the new form of organization. As this letter is of interest to all engaged in the street railway industry, it is reproduced below:

The American Street Railway Association
OFFICE OF THE PRESIDENT
Buffalo, N. Y., Aug. 28, 1905.

To the Members of the American Street Railway Association:

Gentlemen:—It will be remembered that the last annual convention at St. Louis devoted considerable time to the consideration of questions relating to a more complete and perfect organization of this association and the various associations affiliated with it in street and interurban railway work, and that all matters and things concerned in bringing about said objects were committed to your executive committee with power to act.

Pursuant to such action your executive committee entered upon the work so delegated to it, and, as you have been heretofore advised, held a meeting at the Holland House in New York City upon the third and fourth days of February, 1905. At such meeting there were present representatives of all affiliated organizations, and a committee to prepare a plan of reorganization was appointed, consisting of the undersigned, as chairman, and the following members: For the American Street Railway Association, E. C. Foster, New Orleans; Richard McCulloch, St. Louis; C. G. Goodrich, St. Paul; W. E. Harrington, Camden, N. J. For the Accountants' Association, W. G. Ross, Montreal, and Frank R. Henry, St. Louis, alternate. For the Mechanical Association, H. H. Adams, Baltimore, and E. W. Olds, Milwaukee, alternate. For the Claim Agents' Association, W. A. Dibbs, New York, and W. H. Renaud, New Orleans, alternate. For the Manufacturers' Association, W. H. Heulings, Jr., Philadelphia, and William Wharton, Jr., Philadelphia, alternate.

The committee determined to have a thorough examination and study made of the scope, plans and methods of work of the more prominent organizations of similar character throughout the country.

Professor Henry H. Norris, of the department of electrical engineering at Cornell University, was selected for that part of the work and he at once entered upon it. He made a most complete and thorough investigation and a comprehensive and admirable report. Professor Norris' report was based upon a careful study of practically all of the similar organizations in the United States and Canada, and embraced an extensive digest of the constitutions and methods of work of the following: (1) American Street Railway Association, (2) American Railway Mechanical and Electrical Association, (3) American Association of Street Railway Claim Agents, (4) Street Railway Accountants' Association of America, (5) New York State Street Railway Association, (6) American Railway Association, (7) American Railway Engineering and Maintenance of Way Association, (8) Master Car Builders' Association, (9) American Railway Master Mechanics' Association, (10) International Tramways and Light Railways Association, (11) American Association for the Advancement of Science, (12) National Electric Light Association, (13) American Bankers' Association, (14) New York State Bankers' Association.

In analyzing the methods of procedure of the various associations, their work was divided into the following sections: (*a*) Object, (*b*) means of attaining same, (*c*) members, (*d*) privileges of same, (*e*) officers, (*f*) meetings, (*g*) lines of work undertaken, (*h*) dues.

Professor Norris' report was voluminous, embracing nearly 150 printed and typewritten pages. A very complete digest of the same was made and printed. The report was considered at a joint meeting of representatives of the affiliated associations held at the Hotel Bellevue-Stratford, Philadelphia, Pa., on the 12th and 13th of June, 1905, at which meeting there were present the following members of the joint committee: For the American Street Railway Association: President Ely, John J. Stanley (in place of E. C. Foster), John I. Beggs (in place of Richard McCulloch), C. G. Goodrich, and W. E. Harrington. For the Accountants' Association: W. G. Ross. For the Mechanical Association: H. H. Adams. For the Claim Agents' Association: W. H. Renaud. For the Manufacturers' Association: Wm. Wharton, Jr. There were also present the following named gentlemen: John B. Parsons, John Grant, C. C. Pierce, James H. McGraw, E. H. Baker, D. M. Brady, H. W. Blake, Samuel Curwen, H. J. Kenfield, E. M. Williams, George Keegan, Newcomb Carlton, and Professor H. H. Norris, of Cornell University.

The report and the draft of form of proposed constitution and by-laws accompanying the same were carefully gone into and discussed at great length, and finally read section by section, and freely amended.

The constitution and by-laws were adopted as amended and recommitted to a sub-committee for revision, and have been by it carefully revised, submitted to counsel, and finally approved and printed, and are herewith submitted to each member of the association. They have been issued to the technical press to insure the widest publication to all interested in street and interurban railway work, and through the membership committee, of which H. H. Vreeland is chairman, a copy will be sent to every non-member company, together with a letter setting forth the increased advantages of membership which will be afforded by the reorganized association and its affiliated organizations.

They will be brought up for final action at the coming convention to be held at Philadelphia on the 27th and 28th of September, 1905.

They are now transmitted to all members by direction of the executive committee, with the earnest request that they be carefully examined by every member.

In presenting for your consideration the condensed result of the labors of many persons throughout a period of nearly two years, we have only to say that the work has been undertaken and proceeded with throughout as one of paramount importance to the street and interurban railway profession.

Many busy men of large affairs have contributed of their time and effort not a little.

Some of them consider the results attained as embodying the only method of saving the American Street Railway Association and its affiliated organizations from utter confusion and uselessness.

Concerning the writer's views it may not be inappropriate at the present time to quote from the president's annual address delivered at the last convention. He said in part: "A careful inspection of the proceedings of the conventions of the last few years reveals the fact that most of the time of each convention has been occupied with the reading and discussion of papers embracing subjects which, for the most part, relate to the small technicalities of the business, and nearly all of which might have been profitably committed to proper auxiliary and subsidiary organizations. Broad fields of co-operative effort in the most important lines of our work have remained almost untouched. It becomes immediately apparent upon investigation and discussion of the situation that we might profitably enter upon the discussion of the greater questions affecting our welfare. The confusion of laws throughout the country affecting our corporations is a matter to which we might well devote attention. There are also such great questions as taxation; municipal ownership of street railways; franchise rights and obligations; statutory laws affecting our class of companies; municipal laws and ordinances, and other questions of importance to which your minds will readily refer. The collection and preservation of data tending to throw light upon the problems of great importance that confront us is also a matter deserving of attention, and in this regard it would seem that through the medium of the secretary's office and of appropriate standing committees an invaluable collection of data could be made and permanently preserved in such form as to be conveniently accessible to any member of the association upon merely making request of the secretary. If the work of the secretary's office should be made continuous, there would thus grow up in time a vast repository of valuable statistical and historical information, readily available as a matter of right to every member. This branch of the work alone, if properly prosecuted, would render membership in this association so valuable that it is difficult to understand how any street railway corporation would feel justified in remaining outside of this association."

Some of the more important advantages to accrue from the proposed reorganizations, as stated by Professor Norris, are:

(1) *The Information Bureau.* The function of this bureau will be to supply such information as follows:

(*a*) Statistics regarding electric railway construction, maintenance, and operation.

(*b*) General information regarding various electric railway properties.

(*c*) Information regarding statutes affecting electric railway construction and operation in various localities.

(*d*) Advice as to the practicability of new appliances, looking toward the establishment of a testing bureau, if such be found desirable.

(*e*) Scientific information along lines allied to electric railway work.

(2) *The investigation of general problems* affecting the relations of electric railways and the public, *e. g.,* municipal ownership at home and abroad, franchises, taxes, etc.

(3) *The investigation of technical problems,* such as the utility of new fuels, new prime movers, new motors, new systems of transmissions, new signal systems, etc.

(4) *The distribution of important information* among the members by means of regular and special bulletins.

(5) *The arrangement, binding, and distributing* of the volumes of *proceedings* of the association, including the indexing and general supervision of printing, proof-reading, etc.

(6) *The arrangement of the details of conventions.* This will relieve the president and executive committee of much detail work, and will enable the association to do a large amount of investigation by means of special and standing committees.

With this brief explanation your committee submits herewith the draft of proposed constitution and by-laws, and the accompanying form of charter to be granted by the American Street and Interurban Railway Association to its affiliated associations, each of which will be left to draft its own constitution and by-laws, which will be subject to the approval of the parent organization.

We invite your careful attention and investigation, and urge upon every member the desirability of a full representation at the coming convention, where final action upon this important matter will be taken.

Respectfully submitted,
The Executive Committee of the
AMERICAN STREET RAILWAY ASSOCIATION,
W. Caryl Ely, President.

CORRESPONDENCE

STARTING OF TURBINES

GENERAL ELECTRIC COMPANY

Schenectady, N. Y., Aug. 31, 1905.

Editors Street Railway Journal:

I have read the editorial on the "Practieal Operation of Steam Turbines" in your issue of Aug. 26, which expresses doubt concerning the praeticability of starting large steam turbines suddenly without a previous warming proeess. While many turbines now in operation require such treatment, it is not required in turbines recently produeed by the General Eleetric Company if they are properly set up and adjusted.

With these turbines, the matter of clearanee between revolving and stationary parts, within such limits as are ever desirable, does not affect the steam eeonomy to an appreeiable extent. Clearanees from ⅛ in. to 3-16 in. are used on large turbines, and if, under any extraordinary conditions, these should prove insuffieient, a considerable increase can easily be provided without appreeiable effect upon the steam eeonomy. It is also possible to inerease the clearanees of existing maehines where trouble is experienced, and in a few eases such changes have been made.

The following paragraph from a paper by A. S. Mann, published in your issue of June 10, shows the eonditions under whieh 1500-kw turbines are started in the General Eleetric Company's power plant:

> We have taken the time in a number of instances when all the auxiliaries have been in motion and it only remained to start the turbine and phase it in on the line; the only valves to open in such cases are the throttle and one small oil valve. The quickest two starts have been made in 45 seconds and 70 seconds, respectively, including phasing-in. Others range between 1 minute 10 seconds and 1½ minutes. These quickest two starts were made on a turbine which had stood for 24 hours with the throttle valve shut tight, though there was a slight leakage past the seat. After the throttle valve is off its seat, it is not more than 30 seconds before the turbine is up to speed. A cross-compound reciprocating engine of the four-valve type, 2250-hp capacity, can be brought up to speed from a standstill in 5 minutes if it is hot all over. This 5 minutes is to be compared with the 70 seconds required for the similar turbine operation.

These machines were among the first Curtis turbines produced, and similar conditions are obtainable in any other maehines of this type, and should be characteristie of all future produetion, except in eases of inaccurate machining or improper adjustment.

W. L. R. Emmett,
Engineer, Lighting Department.

INQUIRY REGARDING TESTS ON AXLES

Edgewater, N. J., Aug. 30, 1905.

Editors Street Railway Journal:

We are looking into the matter of adopting a regular system of drop test for all car axles, and in that way we propose to eheek weak axles due to flaws or erystallization. The writer would like information, first, as to the methods in force on other roads for inspecting axles, and, second, as to the maximum and average life of ear axles on interurban lines.

In regard to the first question, what is the method pursued by interurban, or even city, eompanies in inspeeting their car axles under daily operating ears, and how often is this inspection made? Is it covered in the regular daily car inspeetion, or are special axle inspections made at stated intervals? Further, when the wheels upon a pair of axles are being changed, are these axles put through any form of tests, or are they given just the regular external inspeetion? If they are regularly tested, what method of testing is pursued on 4-in., 4½-in. and 5-in. axles?

In regard to the seeond question as to the maximum life of axles, do the companies make it a practice of disearding all axles after a certain life or mileage, and if so, what is this life? Or at the end of a certain life, is it the praetice to put the axles through a test for tensile strength and take this as a governing faetor as to whether the axles shall be discarded or continued in serviee? F. W. Bacon, General Manager,
New Jersey & Hudson River Railway & Ferry Company.

THE FILIPINO AND THE ELECTRIC RAILWAY

A eopy of the "Manila Sun" to hand contains a series of electric railway notes from which the following are extraeted:

A eochero got out of his carretela and held his horse's head the other day when he saw a trolley ear in the distance. The ear passed, the horse never moved—but the eochero elimbed a telephone post.

A motorman lost control of the brake the first day of the opening of the car lines and dashed madly down the Eseolta end of the Bridge of Spain. The watehing crowd surged wildly backward, ladies sereamed, and Marker of the Klosko Habanero elutched his eash register. As the car took the eurve the motorman reversed his current, and the car swung protestingly around, grunted a couple of times and stopped. Everybody breathed again, and Marker began to figure on how much he could have sued the eompany for if the car had left the track and dashed into his place of business.

An old mujer stopped the ear the other day and tried to climb in. She had a pig, a bundle of zacate and some three pecks of vegetables with her, and wanted to take the whole lot aboard; but the ear sailed merrily away and left her angrily expostulating.

When an American sees one of the street cars for the first time he grins a bit and then looks around to see if any one is watching him. A Filipino stares at it as though he believes the devil was somewhere inside. A Chinaman doesn't look at the car at all—he stares at the wire above and wonders what makes the ear go.

A trolley ear isn't so very different from an automobile. I saw one standing in the middle of the Eseolta the other day, while three men lay on their baeks under it and softly swore as they tried to see why it wouldn't run.

NEW COUPLERS ON THE NORTHWESTERN ELEVATED, CHICAGO

All the cars of the Northwestern Elevated Railroad Company in Chicago are now being equipped with a new type of vertical plane automatic coupler which is the invention of R. B. Stearns, superintendent of the road, and F. D. Ward, formerly master mechanic of that road, but now with the Underground Electric Railways Company, of London, England.

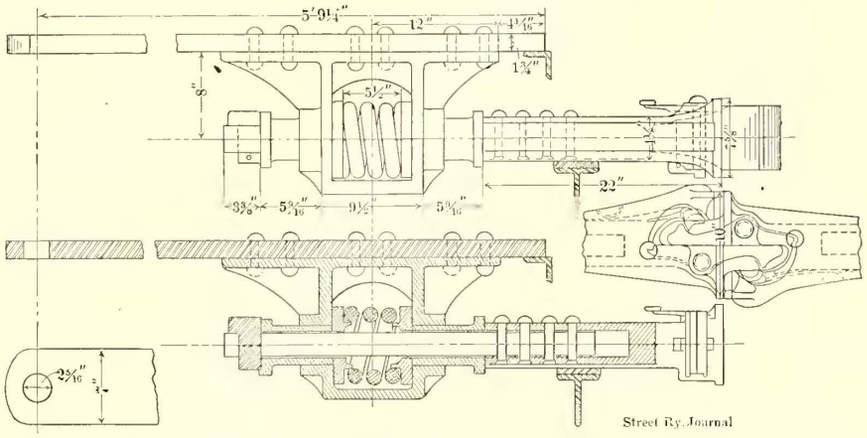


FIG. 1.—DETAILS OF VERTICAL-PLANE TYPE COUPLING FOR MOTOR CARS AND TRAILERS

The company has equipped its 254 cars with this type of coupler, and all cars of the Underground Electric Railways Company, of London, England, are being furnished with it. A number of these couplers were put on the Northwestern Elevated during the winter of 1902-3 and have run until the present summer.

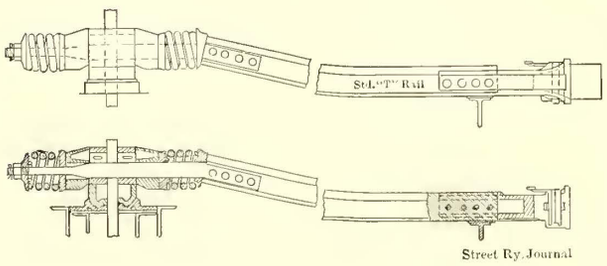


FIG. 2.—SIDE VIEW AND SECTION

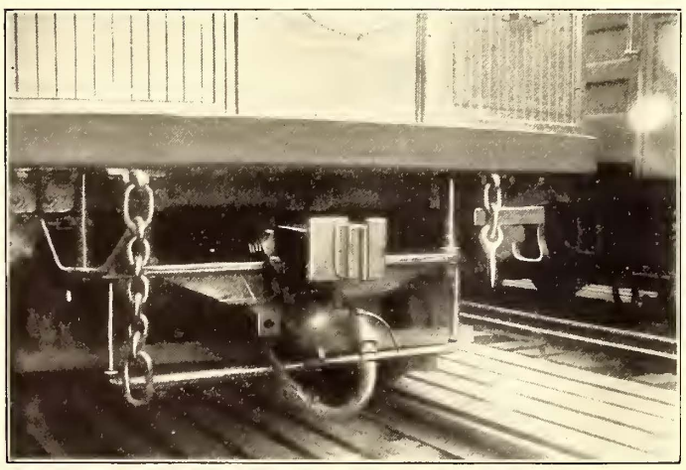


FIG. 3.—VIEW OF COUPLER IN POSITION

In addition to adopting this new automatic coupler, the company has arranged all its cars so that the air-brake hose and train cables for heat and light and multiple-unit control are attached to the draw-bars and swivel with them. The S. & W. automatic coupler is shown in the accompanying drawings, Figs. 1 and 2, and illustrations, Figs. 3, 4 and 5. It is a vertical plane coupler which requires no separate link, although the projecting parts, shown in the illustrations, are fastened in by pins and can be removed just as a link can should they wear out or break. It will be seen from the drawing that each coupler has a projecting part, which slides into a recess in the opposite coupler and is engaged by a notched pin, one segment of which has been removed. As the projecting part strikes this pin in entering, it revolves the pin a fraction of a revolution so that it can pass and catch. The pin revolves back to its original position by virtue of the pressure of leaf springs, which bear against a cam on the pin, and which tend to hold it in a position to lock the coupler. As there is a lock of this kind on each coupler, there is a double lock every time a coupling is made, although the coupler will hold if only one side locks. To uncouple, the pin or lock is revolved a fraction of a revolution by means of the handle on top of the coupler. The lock on each coupler must be unfastened in this way and then the couplers can be pulled apart. In the act of uncoupling, the locks are automatically thrown back into a coupling position so that no further attention to them is required. The cam on the lock against which the spring presses is of such a shape that, when the locks are pulled clear around to uncoupling position, they will remain there until the locks are partially revolved in the act of uncoupling. When this occurs they strike back to a coupling position.

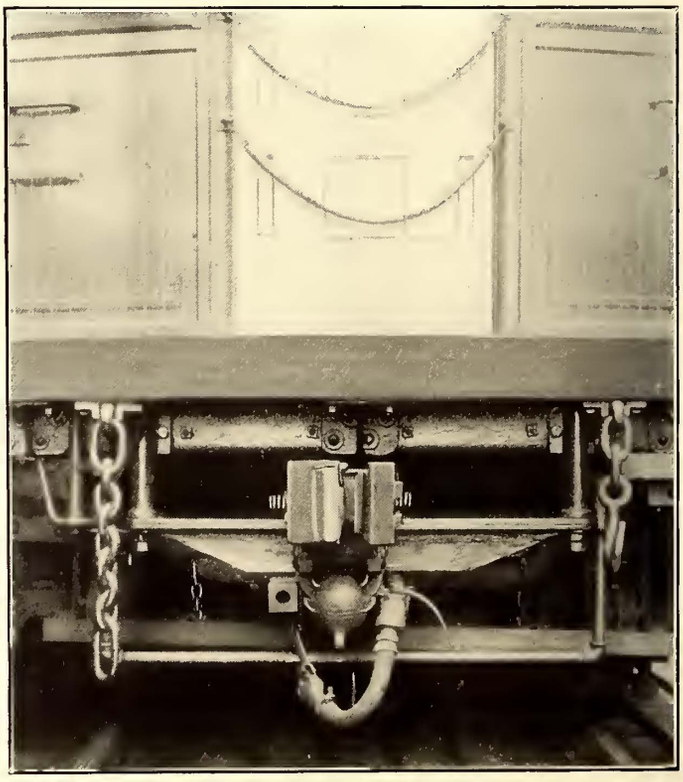


FIG. 4.—FRONT VIEW OF COUPLER AND TRAIN LINE CONNECTIONS

Two types of draft rigging are shown. One of these is for use where there is plenty of room for the swiveling of the draw-bar without interference with platform timbers or apparatus, such as motors, etc. On this, standard T-rails are employed, running back to the king pin of the truck. On the other, a long, flat steel plate under the car body has the buffer attached to it. The latter type employs a sin-

gle buffing spring, which serves both for compression and draft. The couplers are made of cast steel, and are only machine-fitted in part, as they do not depend on the tightness of the lock to prevent them from buckling or bending out of line when pushing. They are kept in alignment by the

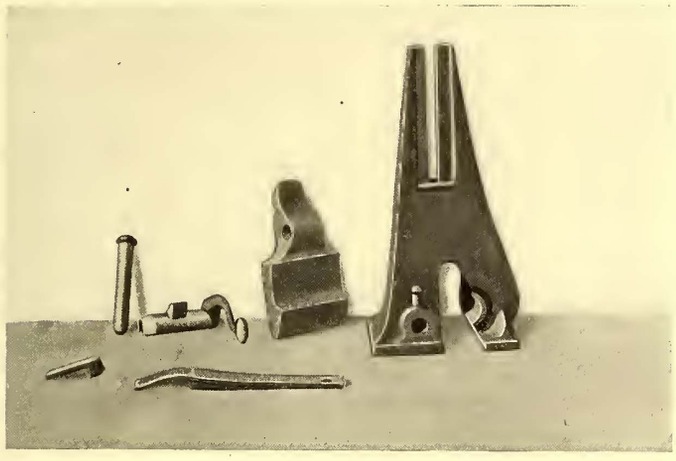


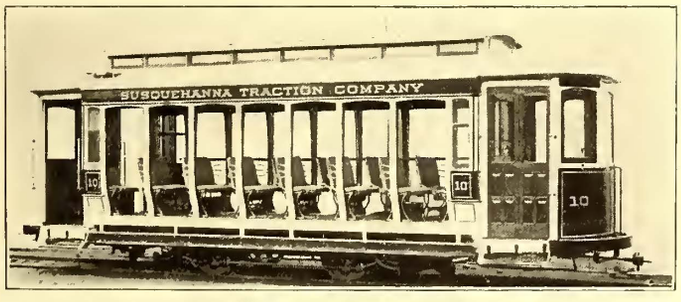
FIG. 5.—DETAILS OF COUPLER

long, flat backs of the links or projecting parts, which are back to back when the coupling is made. As there are no sudden changes of grade on the elevated road and the overhang is not large, couplers are made so that they may move up and down freely, just as do M. C. B. couplers on steam railroads.

The air-brake piping, the train cable for the multiple-unit system, and the light and heat-circuit cable are attached to the draw-bar and swivel with it. The connection with the air-brake hose swivels on a metallic joint in the piping located some distance back under the car body. The electric cables are protected by a spiral wire guard to prevent mechanical wear on the insulation.

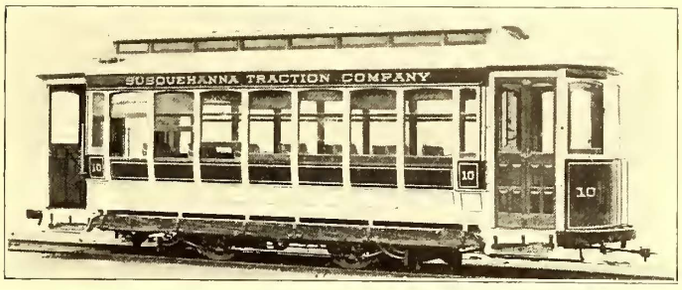
CONVERTIBLE TYPE CAR FOR CENTRAL PENNSYLVANIA

The Susquehanna Traction Company, Lock Haven, Pa., recently received from the J. G. Brill Company the convertible type of car shown. The railway company operates a line in the central part of Pennsylvania, connecting Lock Haven, Flemington and Mill Hall. As will be seen from the illustrations, the type, when opened or closed, has the appearance of the standard types. By simply pushing the sashes and panels into pockets in the side roofs, conversion may be effected quickly and easily, the car always being prepared for any change of



SUSQUEHANNA TRACTION COMPANY'S CAR, OPEN

weather. The builder's "grooveless post" arrangement is included, which, besides making it unnecessary to cut into the posts, reduces friction, increases strength and enables the panel to be readily removed for inspection and repairs. With the "grooveless post" system each pair of sashes is joined together with brass tongue-and-groove sliding connections and conducted into a pocket in the side roof by means of small metal roller brackets moving on bow-shaped steel guides which extend from top plate to lower ventilator rail and are within the pocket. The panels slide into the pockets by means of metal guides on the posts, which are straddled by the projecting edges of the two sheets of thin steel which compose the panels. These metal sheets are held 5/8 in. apart by horizontal wooden slats, and have spaces between which successfully air-jacket the car against cold. The car illustrated is mounted on the No. 21-E single truck, which carries the car body 2 ins. lower than any other single truck. Brackets connect the back of the seats with the posts, thus forming convenient handles, which encourage passengers to face in the right direction when leav-



SUSQUEHANNA TRACTION COMPANY'S CAR, CLOSED

ing the car. Twenty-eight passengers may be comfortably seated, the seats being of spring cane. Ash in natural color and decorated birch ceilings constitute the interior finish. The vestibule sashes are composed of single lights and are arranged to drop into pockets.

The general dimensions are as follows: Length over the end panels. 20 ft. 7 ins., and over the crown pieces and vestibules, 30 ft.; panel over the crown piece and the vestibule, 4 ft. 8½ ins.; width over the sills and the panels, 7 ft. 2¼ ins.; width over the posts at the belt, 8 ft.; sweep of the posts, 5 ins. The side sills are 5¼ ins. x 7 ins., reinforced with 3¼-in. x 5-in. x ⅜-in. Z-bars, and the end sills are 4¼ ins. x 6 ins. The thickness of the corner posts is 3⅝ ins., and of the side posts, 3⅜ ins. The No. 21-E trucks have a wheel base of 7 ft. and 33-in. wheels.

DURKIN CONTROLLER HANDLE

In the description of this device which was published in the issue of this paper for August 25 an engraving appeared in the article showing various unassembled parts which did not belong to the Durkin controller handle. This engraving has given rise to some misconception, so that the explanation should be made that the engraving did not relate to the handle, and was published through an error of the printer.

SPECIAL TRAIN FROM CHICAGO FOR THE CONVENTION

The Pennsylvania short lines have arranged to run a special train from Chicaga to Philadelphia on account of the convention of the American Street Railway Association and its affiliated associations. The train will leave Chicago on Monday, Sept. 25, at 7:30 p. m., and will arrive at Pittsburg the next morning, where cars from the following points were attached to the train; from Cleveland, carrying the Northern Ohio and Michigan delegations; from St. Louis, carrying the delegates from the Southwest, and from Cincinnati, carrying the Southern delegates. The run from Pittsburg will be by daylight, and the train will reach Philadelphia in time for dinner. This will afford a delightful ride over the Alleghenies.

For rates, sleeping car space, and further particulars, address G. C. Beltzhoover, district passenger agent, or C. L. Kimball, assistant general passenger agent, 2 Sherman Street, Chicago.

FINANCIAL INTELLIGENCE

Wall Street, Sept. 6, 1905.

The Money Market

The money market this week reflected to a greater extent the heavy losses in cash sustained by the local banks as a result of the outflow of money to the West and South for crop-moving purposes. The tone of the market was firm, and rates for all classes of accommodations were about ¼ per cent higher than those prevailing at the close of last week. The advance in rates, however, failed to stimulate any decided increase in the demand for funds, but at the same time there was no disposition on the part of lenders to press their funds except at the full asking rates. Call money, which a week ago ruled at about 2 per cent, averaged about 2½ per cent this week. In the time loan department sixty day money loaned at 3½ per cent, as against 3¼ per cent recently quoted. Ninety day money, which carries the borrowing up to the middle of December, was offered at 3¾ per cent by some of the large trust companies, while four months' funds were obtainable at 4 per cent. Six months and longer maturities were quoted at 4¼ per cent, but the demand at that figure was extremely light. Commercial paper was decidedly more active, dealers reporting a better assortment of names, and a good absorption both by local trust companies and by out-of-town institutions. Rates moved up in sympathy with the advance in time loan quotations, prime endorsements being quoted at 4¼ per cent, choice single names at 4¼ to 4½ per cent and other good names at 5 to 5½ per cent. Foreign exchange ruled weak at about 4.8590, due to liberal offerings of cotton and finance bills. The European markets were practically unchanged, except at London, where discounts displayed a hardening tendency, owing to the withdrawal of gold by the continent. The bank statement, published a week ago, showed a further loss in cash of $7,103,500, and a further reduction in the surplus reserve of $3,479,300 to $5,498,875, which, with the exception of 1902, is the lowest point for this period since 1893. The regular monthly statement of the Treasury Department of the amount of money in circulation in the United States (exclusive of Treasury holdings) on September 1, showed a total of $2,621,659,054, as against $2,604,902,301 on August 1, 1905, and $2,558,279,984 on September 1, 1904. The estimated population of the United States on September 1, 1905, was $83,493,000. The circulation per capita on that date was $31.40, the highest per capita circulation ever reached in the United States, and compared with $31.29 on August 1, $31.16 on September 1, 1904, and $29.60 on September 1, 1903. At the close there was nothing in the situation to cause any concern regarding the money market in the immediate future. The belief prevails in banking circles that owing to the enormous crops which now seem assured, the local institutions will be called upon to furnish more money for their movement than in former years, but there is no doubt that the banks will be able to furnish all necessary funds without causing a stringency in money.

The Stock Market

The stock market has been lower and at times under considerable selling pressure from the bear party, and speculative opinion has been influenced to some extent by the frequent sensational utterance of the leader of the Boston bear pool. Consideration of the possibilities of the money market for the next sixty days has, however, been the dominant influence, and is responsible for the more pessimistic feeling which prevails. Money is moving to the interior in large volume, and this movement will continue for some weeks, and it is doubtful if any return movement will set in before November. Money rates have ruled somewhat firmer, and if there should be any active demand for funds for speculative purposes, it will probably result in the establishment of higher rates for both call and time money. The peace agreement was signed on Tuesday, and there has been much discussion of a forthcoming Russian loan, the amount of which is uncertain, although it is intimated that it will be larger than many expect. The large foreign banks had made preparation for such a loan before the termination of the war on the belief that Japan would compel the payment of an indemnity by Russia, and there should therefore be no difficulty in financing the proposed new loan on the other side. The demand, however, will tie up a large amount of foreign capital which might otherwise be available for this market. General conditions continue highly satisfactory, and the activity in all lines of trade, coincident with large crops, has created a legitimate demand for money somewhat in excess of early expectation, but according to the best banking authority there is no reason to anticipate any stringency, and consequently no bear campaign in the stock market based upon dear money. The point of speculative attack has been the metal stocks, and this has been influenced by the weaker tone of the copper metal market and anticipated decrease in the foreign demand for the metal. The selling extended to the other active stocks, with considerable pressure on the higher priced issues, although at the end of the week there was a rather sensational advance in Canadian Pacific, Reading and American Smelting. This was followed by a renewal of the selling movement, and prices ran off to the lowest point reached in several months. The banking interests have not rendered any pronounced support, and their attitude appears to be to discourage any active bull speculation in stocks until the money market is in better shape and the supply of funds is larger. The cotton market has been adversely influenced by the bearish government report, showing a higher average condition than expected, and indicating a yield considerably in excess of 10,000,000 bales, which, with the amount carried over from the last crop, will be ample to meet all requirements. There has been nothing of especial importance in the grain markets, which are inclined to sag under the weight of the indicated yields of wheat and corn.

The local traction stocks held fairly well until toward the end of the week, when they weakened in sympathy with the general market. Some selling of Brooklyn Rapid Transit was undoubtedly influenced by the delay in the publication of the annual report.

Philadelphia

Little interest was manifest in the market for traction stocks this week. Dealings were upon a much smaller scale, and although prices displayed irregularity, the net changes were insignificant. A noteworthy feature of the trading was the continued firmness in Philadelphia Traction, over 500 shares of which changed hands at 101. Philadelphia Rapid Transit was extremely quiet, about 1000 shares being dealt in at prices ranging from 28¼ to 28¾. Philadelphia Company common after selling at 46½ at the opening ran off a point and closed at 45⅜. About 1200 shares were dealt in. Consolidated Traction of New Jersey sold at 83½ to 83¾ for 282 shares. Union Traction changed hands at 62 to 61½, to the extent of about 500 shares. United Traction of Pittsburg preferred sold at 50, and an odd lot of United Railway Investment preferred brought 88⅞. American Railways opened at 54¼, and later sold at 53½ ex the dividend. Railways General sold at 4 for 100 shares. The directors of the Railways Company General have called a special meeting of the stockholders to be held on September 18, to consider a proposition to reduce the capital stock from $1,200,000 to $900,000, by retiring the stock owned by the company.

Baltimore

The feature of the Baltimore market was the strength displayed by the United Railway issues, all of which scored decided gains. The buying was especially heavy in the stock and in the income bonds and was accompanied by reports of a deal whereby the property will eventually pass to the control of the interest that now dominate the local gas industry. The free stock sold to the extent of more than 1000 shares at prices ranging from 15¼ to 16, while upwards of 3000 shares of the deposited stock changed hands at from 15¼ to 16½. The income bonds opened at 66 and declined to 64⅛, but later recovered to the opening figure. The certificates for income bonds deposited rose from 63⅛ to 65 and closed within a small fraction of the highest. About $79,000 of the free bonds, and upwards of $20,000 of the certificates were dealt in. The 4 per cent bonds were quiet but strong, about $18,000 changing hands at around 95. Other transactions included Macon Railway & Light 5s at 99½ to 99⅝, Norfolk Railway & Light 5s at 111, City & Suburban 5s at 114 and Washington City & Suburban 5s at 105.

Other Traction Securities

There was a decided improvement in the Chicago market. More issues were dealt in than for many weeks past and prices generally showed improvement. Chicago City Railway sold at 190 for 100 shares, and a like amount of West Chicago brought 45. South Side Elevated continued the upward movement, upwards of 600

shares changing hands at from 97 to 99. Kanass City Railway & Light common was active, about 1000 shares selling at from 56¾ to 54½, with a subsequent rally to 55¾. The preferred stock sold at 88½. Metropolitan Elevated common sold at 26 and 25¾, while the preferred was dealt in to the extent of 700 shares at from 69¼ to 68. It is said that the company's earnings are large, and that a resumption of dividends on the preferred stock is almost certain this year or early in 1906. An odd lot of Chicago & Oak Park preferred sold at 18. The Boston market was dull and irregular. Massachusetts Electric preferred broke from 62 to 60, but later recovered to 61. Boston Elevated sold at from 155 to 154. Other sales included 168 West End common at from 99¾ to 99, 9 preferred at 113, $2,000 4 per cent bonds of 1915 at 102½, 50 Boston & Worcester common at 25, 50 Boston & Suburban at 21, and 5 shares of the preferred at 68. In the New York curb market Interborough Rapid Transit displayed decided strength, upwards of 24,000 shares selling at prices ranging from 215 to 220, the final transactions taking place at 219. Washington Railway common sold at from 42⅞ to 44, but later eased off a fraction. The preferred brought 92½ for 300 shares, and $30,000 of the 4 per cent bonds brought 91. American Light & Traction preferred sold at 105 for 5 shares.

It is interesting to note that in spite of the existence of the fever in New Orleans the prices recorded in some securities at the New Orleans Stock Exchange on August 30 exceeded the high water mark, New Orleans Railway & Light common closing at 36½, which was within two points of the highest price ever recorded for the stock. On that date the sales amounted to 2120 shares, and the market closed firm at 36⅞. The preferred stock opened and closed at 78¾, which is within 4⅛ points of high water mark. The present condition of the Stock Exchange reflects public sentiment in New Orleans, and a renewal of confidence is plainly evident.

There are indications that the United Gas Improvement Company (Widener-Elkins syndicate) is again seeking to lease the Cincinnati, Newport & Covington Company, to operate it in connection with its Cincinnati traction and lighting interests. This doubtless accounts for the activity in the securities of this company during the past few weeks. About 1600 shares of the common changed hands last week, advancing to 38⅛; a few weeks back it sold at 33, the preferred sold at 95½ to 56¼. Cincinnati Street Railway sold at 146¾, Detroit United at 94⅜, and Toledo Railway & Light at 34⅝.

Aurora, Elgin & Chicago continues the active feature in Cleveland. About a thousand shares of the common sold with a range of 24⅜ to 24⅞. Cleveland Electric was active, and advanced to 80¼. Cleveland & Southwestern Traction strengthened slightly to 10 for the common, while the preferred showed a slight decline to 49⅜. Elgin, Aurora & Southern sold at 37, a slight advance. Lake Shore electric common advanced to 13⅜, and the preferred to 56. Northern Ohio Traction was weaker at 22⅞, while Northern Texas advanced to 70. Western Ohio sold at 15. The 5 per cent bonds of this company have been particularly active, $57,000 worth advancing the price from 83 to 84½. Aurora, Elgin & Chicago 5s sold at 95⅜. All of the Cleveland tractions are showing fine increases in earnings the past two months.

Security Quotations

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

	Aug. 30	Sept. 6
American Railways	53	53½
Boston Elevated	154	154
Brooklyn Rapid Transit	71⅜	69¼
Chicago City	190	190
Chicago Union Traction (common)	8	8⅜
Chicago Union Traction (preferred)	—	—
Cleveland Electric	—	80
Consolidated Traction of New Jersey	—	—
Consolidated Traction of New Jersey 5s	—	109½
Detroit United	94⅜	93⅜
Interborough Rapid Transit	215¾	219
International Traction (common)	—	34
International Traction (preferred) 4s	—	73½
Manhattan Railway	166	164
Massachusetts Electric Cos. (common)	17½	17
Massachusetts Electric Cos. (preferred)	60½	60
Metropolitan Elevated, Chicago (common)	25	24½
Metropolitan Elevated, Chicago (preferred)	68½	67
Metropolitan Street	131⅜	129⅛
Metropolitan Securities	83½	82¾
New Orleans Railways (common), W. I.	36	36½
New Orleans Railways (preferred), W. I.	78	78⅝
New Orleans Railways, 4½s	90½	90½
North American	99	98¾
North Jersey Street Railway	—	—
Philadelphia Company (common)	46¼	45¾
Philadelphia Rapid Transit	28⅜	28¼
Philadelphia Traction	101	101
Public Service Corporation 5 per cent notes	96¾	96¾
Public Service Corporation certificates	69¼	69¼
South Side Elevated (Chicago)	96	a98
Third Avenue	128½	127
Twin City, Minneapolis (common)	116¾	115½
Union Traction (Philadelphia)	61⅝	61¼
West End (common)	99	99
West End (preferred)	113	113

a Asked. W. I., when issued.

Iron and Steel

The "Iron Age" says the feature of the market during the last week has been the heavy buying of steel rails for 1906, notably on the part of the Western lines. It is estimated that the total sales foot up to fully 250,000 tons. Further heavy equipment orders have been placed, the Pennsylvania leading with over 16,000 steel cars. The activity in nearly all lines of finished material is evidenced by the fact that the orders booked by the United States Steel Corporation for August make that a record month. The pressure which caused the advance in structural material from 1.60 to 1.70 cents base Pittsburg is expected to lead to a like advance in the price of plates at an early date. In the pipe trade the principal item has been the placing of an order for 60 miles of 18-in. pipe by the Ohio Fuel Supply Company. A smaller order placed is for 15 miles of 10-in. pipe. In the pig iron trade a feature has been some contracting for foreign iron.

MANILA SYSTEM NOT FOR SALE

Reports circulated early in the week to the effect that negotiations are pending for the sale of the street railway lines and lighting system in Manila prove to be erroneous. J. G. White & Company, of New York and London, who, in association with other important interests financed the work, built the system and control and operate it, state emphatically that the shareholders are satisfied with results and that the stock is not for sale.

A CHICAGO ROAD CHANGES HANDS

W. S. Reed, First National Bank Building, Chicago, formerly of the firm of Townsend, Reed & Company, has secured control of the Chicago Electric Traction Company and will use it to secure an entrance to Chicago for the Chicago & Southern Traction Company, which he is promoting between Chicago and Kankakee. The Chicago Electric Traction Company has a line running from Sixty-Fourth Street and South Park Avenue, Chicago, to Blue Island and Harvey. It connects with the South Side Elevated Railroad at Sixty-Fourth Street. It has been in the hands of a receiver for several years, and has a number of times been considered in connection with interurban railway enterprises projected into Chicago from the south.

WESTCHESTER COMPANY GETS MT. VERNON FRANCHISE

The aldermen of the city of Mt. Vernon have voted unanimously in favor of granting the application of the New York, Westchester & Boston Railroad for a perpetual franchise to cross over or under the streets of the city, and the franchise has been signed by the mayor. This action was taken at a public meeting and followed a favorable report of the railway committee of the Board of Aldermen, which has been considering the company's application for several weeks. The Westchester Company has given a bond to begin work in the city within sixty days. The company's plan is to build a four-track, third-rail railway from New York to Port Chester, N. Y., a distance of 27 miles. Construction work of that part of the line in Bronx Borough, New York, is rapidly approaching Mt. Vernon.

REPORT OF THE ALLIS-CHALMERS COMPANY

The fiscal year of the Allis-Chalmers Company has been changed to end on June 30, instead of April 30. The net profits of the company for the fiscal period ended June 30, 1905, after deducting all expense of manufacturing and selling, and after making provision for the depreciation of business and machinery, and for possible bad debts, amounted to $58,982. For the fiscal year ended April 30, 1904, the net profits were $952,624, out of which dividends of $853,125 were paid on the preferred stock, leaving a surplus for the year of $99,499. President Warren in his annual report says, "The contraction in general business referred to in the last annual report, as then justifying the postponement of dividends, continued during the first half of the last fiscal period, with particular manifestation in the steam engine department of this company. This was due largely to the introduction of steam turbines, especially those of large capacity, for which certain manufacturers had been preparing for several years. Our engineers have been engaged during the last year in improving our established standard lines of apparatus and machinery, and in reducing its cost. Particular attention and effort have been devoted to developing and perfecting a line of steam turbines, gas engines, centrifugal pumps, hylraulic turbines, steam turbo-generators, hydraulic turbo-generators, induction motors, street railway motors and controlling devices therefor, transformers, steam and hydraulic dredges and steam shovels. Soon after the beginning of this calendar year an improvement was manifested in the general business of the company, the orders increasing in April to the normal volume, and since then exceeding in extent the previous record of the organization; but the results of these orders will be realized only upon their execution and the delivery of the work. This increase pertained more particularly to the older branches of the business of the company."

PLANS FOR SAN FRANCISCO'S MUNICIPAL LINE

Plans and specifications are now being prepared for the conversion of the present Geary Street Cable Railroad, in San Francisco, into an underground conduit road, from Market Street, along Geary Street, to Point Lobos Avenue, and along Point Lobos Avenue to Fifth Avenue, a distance of 3.33 miles; also for the construction of a new electric underground conduit road from Fifth Avenue along Point Lobos Avenue to Tenth Avenue, and along Tenth Avenue to Fulton Street at Golden Gate Park, an additional distance of .81 mile. The cost has been estimated at $304,705, which has been appropriated and is now available. An appropriation will be made next year for the necessary cars, tool and appliances. Bids will be received for the present work in about three months. The stockholders of the cable railroad, whose franchise has expired, have given notice that they claim the rails and roadbed, and will probably contest the city's taking possession of them for its municipal road. Thomas P. Woodward, city engineer of San Francisco, is in charge of construction details.

ACCIDENT FAKIR RUN DOWN IN PHILADELPHIA

In a signed confession obtained Saturday, Sept. 2, by the Philadelphia Rapid Transit Company, Edward L. Pape, of New York, aged 24, tells how he mulcted companies in New York, Chicago, Cleveland and Buffalo. He had turned State's evidence on the men who were connected with him. Two of these, John Burns and John Wilmott, were arrested, while the police are after a New York lawyer, who, Pape says, did the gang's legal business. Pape was held under $2,000 bail for court, while his two confederates, who are confined in a workhouse in Cleveland, will be taken to New York where they will face a number of serious charges.

Pape, who was the leader of the gang, has a peculiar physical asset that was most valuable to him in these schemes. Time after time, after he had apparently been hurled from a moving street car, he has been taken to hospitals of various cities in an unconscious condition. Doctors at these institutions, after making an X-ray examination, would declare that he had either a fracture of the skull or an injury to the vertebra. With his confederates for witnesses to the accident and the endorsement of the physicians, Pape would have a case for damages that could not be attacked. He did have an injury to the fifth vertebra, but this was received as a result of diving from a height of 40 ft. into a vat containing 6 ft. of water. A miscalculation caused Pape to strike his head against the side of the vat. When he recovered from the effects of this accident, which broke a vertebra, there was a lump on the back of his neck, and the muscles of the front of the neck had taken a peculiar formation. By simulating the actions of a man who had his spine injured, he could, by the aid of these physical evidences, fool the doctors.

CHICAGO RAILWAY INTERESTS IN LARGE AMUSEMENT ENTERPRISE

Plans are about completed for the organization of a company to construct and operate an immense amusement park at Ravena, Ill., a suburb of Chicago. The principal owner will be the Chicago & Milwaukee Electric Railroad, which has at present a track operating through Ravena to Chicago, and which has been placed in operation through Zion City. A. L. Drum, general manager of the company, visited Coney Island, New York, last week, and as a result the announcement is made that Frank C. Bostock, who now runs a Hippodrome at Blackpool, England, the Paris Hippodrome and another in Cleveland, and has large interests at Coney Island, will be manager of the company.

A large tract of land will be devoted to the new amusement park. In the center will be an immense artificial lake, fed by a lagoon from Lake Michigan. At one end of the lake the summit of a mountain will project, and resting on the top of it will be as exact a reproduction of Noah's Ark as human ingenuity can make it. A long runway will lead to the ark from the shore, and on this runway Bostock's animals will pass to and fro in representation of the old Biblical legend, "The animals passed in two by two." The main deck of the ark will be an immense arena in which Bostock will put on the best features of his many animal acts.

At the other end of the lake and on solid foundation, will be an immense spherical shaped structure, to be known as "The Moon." In it will be the most up-to-date theater that has yet been planned, and designs for which are now in the hands of McElatrick & Sons, of New York. The immense globe will represent the planet after which it is named. Mr. Arthur will be the manager of this theater, and will conduct high-class summer shows in it. The first production he will make will be "Moonshine," the comedy with music by Royal-Hobart-Klein, in which Miss Marie Cahill will star this season.

"A Trip to the Moon" in miniature will be afforded patrons of the park, it is hoped, by having airships, modelled on the types that have already made successful flight and supported on glide line, flying about this imitation moon. The surface of the sphere will be modelled to represent the outer crust of the moon, along the lines of recent astronomical researches.

AN IMPORTANT PENNSYLVANIA PROJECT TAKING SHAPE

Frank G. Patterson, president of the Southern Traction Company, says that within a month the contract will be awarded for the construction of an electric railway touching Altoona, Hollidaysburg, Roaring Springs and Bedford on the south, and Johnstown, Ebbensburg, Gallitzin and intervening points on the north and west. It is stated that a complete right of way for the line has been obtained. The preliminary and final surveys were made by Fitzgerald & Hamilton, of Pittsburg. Complete estimates for the building of the road, cost of cars and machinery and buildings have been prepared by the firm. It will cost, according to the final estimate of the engineers, not less than $450,000 to put the road in operation. The line will pass through a community containing a population of over 135,000. No opposition to the construction of this line is to be offered by the Pennsylvania Railroad interests, it is now stated. Through an arrangement just perfected with the Real Estate Title & Trust Company, of Altoona, that company will act as trustee for the mortgage that will be given by the Southern Traction Company. The announcement is made that the new company will operate its line entirely independent of any other interests in this section of the State, and that through traffic arrangements will be made with all lines now in operation and those in prospect.

Power houses, general offices, car houses and car shops will be built, it is stated, at Duncanville. It is proposed to have much of the grading and track laying completed before the ground freezes too hard, and by May 30 next, it is to be arranged to operate the first cars. The company contemplates operating a park in the mountain country next year. At Gallitzin the company will have a connection with the Wilmore & Gallitzin line proposed by other Pittsburg interests. This line will be about 15 miles long, and with the Southern lines a total of 33 miles of electric railway will be started this fall.

LONG ISLAND EXTENDS ELECTRIC SERVICE

The institution of the third-rail system upon Atlantic Avenue, Brooklyn, and the partial abolishing of steam as motive power during the last week, was another step in the extension of the electric service of the Long Island Railroad. Aug. 29 the company ran the first train through the completed improvement, using all of

the subways and viaducts for the first time, and bringing the train to a standstill at the subway station in the Flatbush Avenue depot. Everything about the improvement is now completed, with the exception of the subway station at Flatbush Avenue, and the work on that portion is being rushed. Two subway platforms are in the station, and the steps leading to the street are completed. The company is now running about thirty trains a day over the improvement. These trains are what are known as the rapid-transit service to Jamaica. The through trains are run by steam. The railroad is now making up the fall schedule of trains, which will go into effect on Sept. 20 or thereabouts. Every train on the avenue will then be run by electricity. Passengers going further east than Jamaica from Brooklyn will be forced to change cars at Jamaica for the eastern points. It is intended by the company to run trains through to Manhattan as soon as the river tubes and the Fulton Street (Brooklyn) subway are completed. The next line which will be run by electricity is the North Shore division running from Long Island City to Bayside, L. I., and Port Washington, L. I. Work has already commenced on the line, and surveyors are busy mapping. Part of the electricity which is to be generated in the two big power houses will also be used on the Bay Ridge line and the Manhattan Beach line. The line is to be four-tracked from Bay Ridge to Long Island City and to Manhattan Beach from Long Island City. Cut-ins and cross-overs are to be maintained at all intersecting lines.

STREET RAILWAY PATENTS

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

UNITED STATES PATENTS ISSUED AUG. 22, 1905

797,582. Switch Operating Device; Cyrus C. Johnson, Mount Vernon, Ill. App. filed Oct. 18, 1904. The car has a pair of depending hooks which engage one or another end of a centrally pivoted lever arranged to throw the switchpoint in either direction.

797,591. Electrical Railway Signaling System; Leonidas N. Lyon, Jr., Flatonia, Tex. App. filed Nov. 29, 1904. The patentee provides a pair of conductors adjacent to the usual track rails which constitute "a main circuit." When it is desired to telegraph from one train to another, the main circuit is shunted through the trains by electro-magnetic devices so as to form an auxiliary telephone or telegraph circuit.

797,647. Composite Brake Shoe; Daniel O. Ward, Oak Park Ill. App. filed Feb. 26, 1904. The brake shoe is made in the form of a skeleton frame or box having ribs with a plurality of hard cast-iron plates inset therein.

797,678. Electric Railway Signal; Jake Friedlander, Fargo, N. D. App. filed Dec. 27, 1904. Contacts are provided beneath the usual track rails, which are completed by the depression of the rail under the weight of a train. By stopping the train over one of these contact points, a telephone circuit is completed by which communication is had with the train despatcher.

797,772. Switch; Charles M. Hibbets, Washburn, Tex. App. filed Feb. 21, 1905. In order to prevent spreading of the rails at a switch, known as "splitting a switch," the patentee provides a form of guard rail which will automatically throw the train back on the main line, even though the rails at the switch point are spread.

797,783. Railway Signal; Vibe K. Spicer, Kenilworth, Ill. App. filed Sept. 12, 1902. The semaphore arm is mechanically raised by projection on an endless belt, which is driven by an electric motor. When the arm is raised the circuit is automatically broken and a brake applied.

797,839. Switching Device; Carl J. Carlson, Spokane, Wash. App. filed Dec. 9, 1904. A diamond-shaped block is pivoted in a slot in the path of the car in such a way as to be shifted to its alternate position when engaged by a depressible roller on the car. The block is connected to the switchpoint.

797,861. Car Platform; Augustine Melgarejo, Harrison, N. Y. App. filed May 16, 1905. A pivoted shelf or step is hung adjacent to the car door, and may be depressed by a lever so as to constitute a bridge to a stationary platform.

797,863. Syntonic Signaling System; Maurice Milch, Schenectady, N. Y. App. filed March 30, 1904. A signal circuit arranged in resonance with the alternating high frequency power circuit when only a single car is on a block. If two cars enter the same block, the resonance is destroyed and warning signal given.

797,870. Switch or Point for Railways, Tramways, and the Like; Albert J. Smith, Cardiff, England. App. filed Jan. 9, 1905. A spring-pressed switchpoint is normally held against movement by a detent which is depressed by a roller on the car manipulated by the motorman. A cam in the track is afterward depressed by the car wheel so as to restore the switchpoint to normal position.

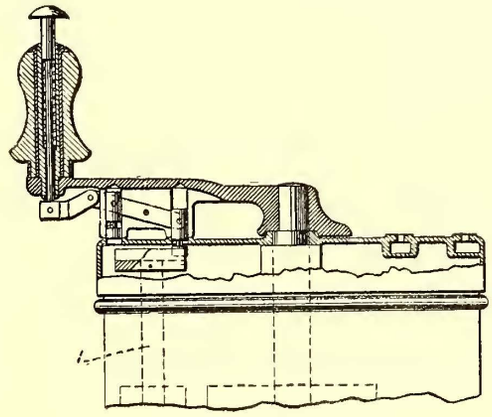
797,896. Street Car Brake; Mathias Klein, Pittsburg, Pa. App. filed April 29, 1905. Comprises a serrated shoe which is pivotally mounted beneath the bed of a car, and which can be manipulated by the motorman to engage the roadbed over which the car is traveling.

797,905. Cable Grip; Horatio S. Moore, Monongahela, Pa. App. filed Jan. 5, 1905. One of the cable-gripping shoes has a wedge surface on the back thereof, against which a co-operating wedge is applied by a toggle-joint.

798,050. Sanding Device; Charles Thompson, Philadelphia, Pa. App. filed Jan. 21, 1905. A sand box for street cars in which the mouth of the hopper is closed by a plunger having wings or blades thereon, which are reciprocated by an air cylinder so as positively to feed out the sand. The wings have a slight revoluble movement.

UNITED STATES PATENTS ISSUED AUG. 29, 1905

798,069. Car Fender; William W. McClung, Butlet, Pa. App. filed April 29, 1905. A U-shaped bar having sides of unequal length, and means for connecting the longer of said sides to the lower member of the truck-frame of a car with the looped end depending nearly to the rails and in advance of the flanged wheels and the spaced sides disposed at opposite sides of the wheel.

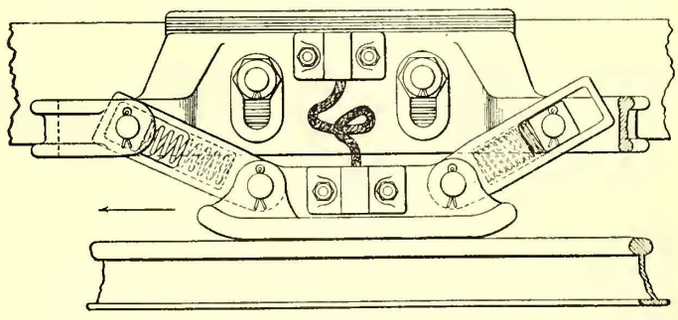


PATENT NO. 798,190

798,097. Trolley Stand; Boniface A. Grasberger, Richmond, Va. App. filed Dec. 12, 1904. Pneumatic means for controlling the trolley pole.

798,099. Point and Crossing for Railways; Robert A. Hadfield, Sheffield, England. App. filed Jan. 27, 1903. Details of a removable wear plate.

798,173. Gear Casing for Electric Railway Motors; Henry R. Edgecomb, Edgewood Park, Pa. App, filed Aug. 17, 1904. An electric motor having a field-magnet frame comprising two parts, ringed together for independent movement, and a gear-case formed in two parts, which may be removed independently of each other.



PATENT NO. 798,368

798,190. Controller for Electric Motors; George Laird and John P. Todd, Manchester, England. App. filed July 22, 1904. Comprises in combination a main drum and a reversing switch-drum, a single operating lever having means for so adjusting its connection with the reversing switch-drum that a one-way movement of the lever may effect rotation of said drum in either direction.

798,227. Electric Railway Motor; Norman W. Storer, Pittsburg, Pa. App. filed Aug. 6, 1904. An electric motor comprising a field-magnet frame having upper and lower halves, which are hinged together at one side, and axle-caps secured to both halves at the opposite side.

798,263. Brake Shoe; Cyrus L. Bundy, Dover, N. J. App. filed April 3, 1905. A brake shoe comprising a bearing member and a backing of sheet steel, or similar material anchored thereto along

the back thereof, and having an eye member with its side walls integral and continuous with and drawn in from the edges of the main portion.

798,283. Track Sanding Device; John E. Holcomb, Winsted, Conn. App. filed Dec. 22, 1904. Adjacent to the valve at the end of the sand pipe is an air cylinder and piston. When air pressure is admitted to the cylinder the piston is forced downward, carrying with it the valve stem of the sand pipe, with which it is suitably connected, and also operating a device for cleaning the end of the sand tube.

798,368. Third-Rail Contact Shoe; Samuel B. Steward, Jr., Schenectady, N. Y. App. filed May 5, 1904. The shoe is spring-pressed against the conductor.

798,394. Trolley; Frederic C. Cottrell, Taunton, Mass. App. filed April 26, 1905. A pair of vertical rollers mounted in the trolley harp and spring-pressed toward each other, and adapted to be separated when a hanger is encountered.

798,410. Controller; George H. Hill, Schenectady, N. Y. App. filed May 2, 1904. In order to provide a cheaper construction of controller for small motors, the blow-out magnet is carried directly by the controller arm.

798,427. Controller Attachment for Supplementary Circuits; William Lintern, Westpark, Ohio. App. filed Nov. 7, 1904. A supplemental switch upon the controller arm makes a contact for ringing a gong or other purpose at the axis of the arm in whatever position such arm occupies.

798,439. Trolley Wire Finder; Peter McDonald, Harrison, N. J. App. filed Oct. 8, 1903. A pair of spirally grooved rollers mounted one on each side of the trolley wheel, which guide the wire onto the wheel.

798,556. Railway Switch; Victor Angerer, Ridley Park, Pa. App. filed June 8, 1905. Sufficient resistance is placed upon the switchtongue to prevent accidental throwing of the switch, while it can be readily moved in the ordinary manner by a bar.

798,557. Railway Switch; Victor Angerer, Ridley Park, Pa. App. filed June 8, 1905. See above patent.

798,574. Pedestal for Car Seats; Robert Dunning, Winton Place, Ohio. App. filed Oct. 17, 1904. The pedestal is hollow and adapted to contain an electric heater.

PERSONAL MENTION

MR. GEORGE WESTINGHOUSE returned Sept. 5 on the "Kaiser Wilhelm II.," after an extended trip abroad.

MR. F. P. FOSGATE, train despatcher at Concord, N. H., for the Boston & Maine Railroad, has been appointed assistant superintendent of the Portsmouth Electric Railroad.

MR. B. H. WARREN, who retired from the presidency of the Allis-Chalmer Company on Sept. 1, will, it is said, become the head of the new engineering and contracting company, which is to be established in New York, and which will have several powerful interests associated with it.

MR. G. M. BASFORD, formerly editor of the "American Engineer and Railroad Journal," has been appointed to the position of manager of the bureau of publicity of the American Locomotive Company, a department of the company just established. Mr. Basford will assume his new duties Oct. 1.

MR. JOHN T. MANSON, president of the Yale National Bank of New Haven, Conn., has just been elected president of the Recording Fare Register Company of that city. Mr. Manson has for several years been identified with the operation of street railways, being president of the Milford & Uxbridge Street Railway, of Milford, Mass.

MR. FRANK J. DUFFY, who some time ago had under consideration the question of resigning as secretary and treasurer of the Beaumont Traction Company, of Beaumont, Tex., to become general manager of the Vicksburg Railway & Light Company, of Vicksburg, Miss., is now acting as secretary, treasurer and manager of the Beaumont Traction Company, some changes having been made in the personnel of that company. The Vicksburg and Beaumont properties are controlled by the same management.

CAPT. HENRY GROVER, retiring superintendent of the Chelsea division of the Boston & Northern Street Railway, was last week given a purse of gold and his wife a purse of silver by the employees of the division. The presentation was made by Mr. John J. Sullivan, foreman of the Broadway barns of the division. Capt. Grover resigned after working for the company and its constituents nearly twenty-five years. He entered the service as a driver. A year later he was made stable foreman, in 1892 purchasing agent for the road, and seven years ago superintendent of the Chelsea division. One of Capt. Grover's early associates in the company was Mr. E. C. Foster, now president and general manager of the New Orleans Company. Capt. Grover's successor is Mr. George H. Gray, who was superintendent of the Woburn division of the company and formerly was foreman of the Broadway car house of the company.

MR. P. J. MITTEN, who has been superintendent of overhead lines for the Milwaukee Electric Railway & Light Company for the past nine and one-half years, became superintendent of motive power of the Indiana Union Traction Company, with offices at Anderson, Ind., on Sept. 1. Previous to his experience at Milwaukee, Mr. Mitten was with the Denver Tramway Company for four years. Just before leaving Milwaukee he completed a line car with independent gasoline motor, which had a number of novel features. The evening of Aug. 29 he was presented with a fine gold watch by the employees of his department.

MR. GUTHRIE GRAY, of the National Battery Company, of Buffalo, died at Muskoka Lake, on Aug. 26, at the age of thirty-one years. Mr. Gray was graduated from the Lawrence Scientific School of Harvard University in the class of 1896. After his graduation, he was for a number of years employed in the engineering department of the Buffalo General Electric Company, whose employ he left to accept a position under Mr. Henry Rustin, the superintending engineer in charge of the extensive lighting systems of the Pan American and the St. Louis expositions. For the past two years Mr. Gray has been employed in the engineering department of the National Battery Company, of Buffalo, N. Y.

MR. WILLIAM RANDOLPH STRICKLAND has resigned from the New York Central Railroad and is now associated with J. G. White & Company, of New York, as assistant to the secretary. Mr. Strickland is a graduate of the Massachusetts Institute of Technology, and during the Spanish War served at the Mare Island Navy Yard as assistant engineer. After the war Mr. Strickland was employed by the Blake Pump Company and Buckeye Engine Company as draftsman, and also in designing special electric cranes and controllers for the Case Manufacturing Company in the capacity of assistant and also as chief engineer. Mr. Strickland made the hydraulic calculations for the North Fork power house scheme at Denver, Col., in 1900. After he had completed this work he joined the staff of the Colorado Fuel & Iron Company as engineer of location on a standard gage line over M'Clure Pass. He also located several electric and narrow gage steam lines in Colorado. In 1902 Mr. Strickland was appointed designing engineer for the Lannius Machine Company, and in that capacity laid out its combined amalgamator, concentrator and arrestor. In 1903 he was appointed location engineer on the New York Central Railroad and supervised the extension from Cherry Tree to Possum Glory, as well as several of the double tracking and grade revision schemes. For the past year Mr. Strickland has been assistant engineer in the maintenance of way department, handling correspondence from all divisions in regard to the repair and construction of bridges and buildings.

MR. ARTHUR N. DUTTON has been promoted from assistant superintendent of elevated lines of the Brooklyn Rapid Transit Company to the position of assistant to the general manager, succeeding Mr. Geo. R. Folds, who recently went to the South Chicago City Railway as general manager. Mr. Dutton's duties in the new capacity will not for the present, however, embrace the wide scope of those of Mr. Folds, but will be confined more to that of personal representative of General Manager Calderwood. Mr. Dutton is 32 years of age, a native of Milwaukee, Wis., and has had an extensive railroad experience, a liking for which he inherited from his father, Mr. C. F. Dutton, a man well and favorably known in steam railroad circles, principally as general manager of the Milwaukee & Northern Railroad. Mr. Dutton's first business experience was obtained in the First National Bank of Milwaukee, following which, in 1896, he began active railroad work by entering the office of Mr. A. G. Wells, general superintendent of the A., T. & S. F. at Albuquerque, N. M. A year later he was placed in charge of the timber-treating plant of the company at Flag Staff, subsequent to which he was promoted to the position of chief clerk to the superintendent of the Arizona division, at Winslow. Later, in the desire for a more practical experience, he gave up the more remunerative position to become yardmaster at Seligman, following which he was promoted to assistant train despatcher at The Needles. He was in the employ of the Santa Fe during the reconstruction period of the old Atlantic & Pacific Railroad, westward from Albuquerque, during which time he gained valuable experience. In March, 1903, Mr. Dutton was secured by the Brooklyn Rapid Transit Company as general inspector of elevated lines, but three months later was appointed assistant superintendent, for which position he was eminently well fitted, and in which he has been highly commended by his superiors for his efficiency. Mr. Dutton is succeeded as assistant superintendent of elevated lines by Mr. L. V. Smith, who has formerly been general inspector for the company.