THE WEISS SYSTEM OF STREET CAR MOTORS.

(Continued from first page.)

each possessing a capacity of 125 ampere hours and two volts electromotive force. The plates are contained in hard rubber cells. The cells are at present arranged in series, so that twenty-two, thirty, or forty, according to requirements, can be thrown into action at the same time. This leaves an excess of 20 cells, which may be regarded as a provision for emergencies. With this arrangement, it will be seen that the first twenty-two cells have the most constant work to do, and become most quickly exhausted. It is proposed now to adopt a different style of connection and switchboard, so as to use the batteries in series or in parallel, and thus by varying the electromotive force to vary the power applied to the car.

The switchboards for regulating the battery in any case are carried upon the dashboards of the cars. The driver can turn on more or less current and can shut it off entirely by manipulating the switch handle.

The current drives a five horse power shunt-wound Griscom motor, which is placed under the floor of the car. It has four sets of brushes. By handles worked from the platforms, these can be thrown on and off the commutator drum in pairs, so as to give at will either direction of rotation to the motor shaft. To reverse the motion, the driver has to go to the other platform, as from one platform only one direction of motion can be given.

On the shaft of the motor, which in ordinary running, at eight miles an hour, makes 1,250 rotations per minute, is a pinion. This gears with a larger cog wheel. The latter is mounted on a shaft which extends across the car. The height of this shaft corresponds, as nearly as possible, with that of the axles of the wheels.

As seen in the illustration, an extra pair of wheels is used. These come between the regular ones, and are flangeless. They and one adjacent pair constitute the driving wheels. The shaft turned by the motor carries at each end a friction wheel. A circular friction surface, a few inches less in diameter than the wheels, is provided on the inner side of both driving wheels. The friction wheels, when driving the car, bear against these surfaces. The shaft carrying the friction wheels is fixed in position, and constantly rotates when the motor is in action. To cause it to drive the car, the two pairs of driving wheels are drawn together. To do this, powerful levers are arranged at both ends of the cars, to be operated by the driver. When these are drawn back, the two pairs of wheels are made to pinch the friction roller between their friction surfaces, and consequently rotate with it, thus moving the car. To allow the wheels to be drawn together, a small amount of play between the pedestals is allowed for. When the lever is released, the wheels spring apart and away from the friction wheel. The amount of this motion is very slight. It need not exceed an eighth of an inch for each pair.

One feature in the history of electric cars has been the trouble incurred in reducing the high speed of the dynamo, whether by belts, plain gear wheels, or worm and pinion. In the present construction it will be noticed that the gearing is not on a wheel axle, and that it is not connected therewith except by the frictional surfaces. This feature, it is claimed, will obviate the wearing strains upon the teeth of the wheels, and avoid the trouble hitherto experienced. Mr. Reckenzaun's recent paper on the subject of gearing for electric street cars very fully portrayed the engineering difficulties of the problem, and gave the different ways in which its solution had been attempted. In the Weiss system a new method of solving the problem is attempted.

The general factors of the car motor and other parts may be thus summarized: The motor is of nominal five horse power, and can absorb from one to 125 amperes at seventy volts electromotive force. Each cell of the storage battery is good for 125 ampere hours in ten hours, at a potential of two volts. Thus twenty-two cells at the normal rate will give 550 watts. But on this car they are used more rapidly, so as to develop from one to three electrical horse power. With thirty cells from two to five electrical horse power, and with forty cells from four to eight electrical horse power are obtained. On average tracks 2,000 watts or 2·68 electrical horse power will drive the car at ten miles an hour. It can turn any curve, the absence of flanges from the center pair of wheels facilitating this operation. It has gone around a curve of 30 feet radius at the rate of twelve miles an hour. It has ascended with a load a grade of between six and seven feet per hundred.

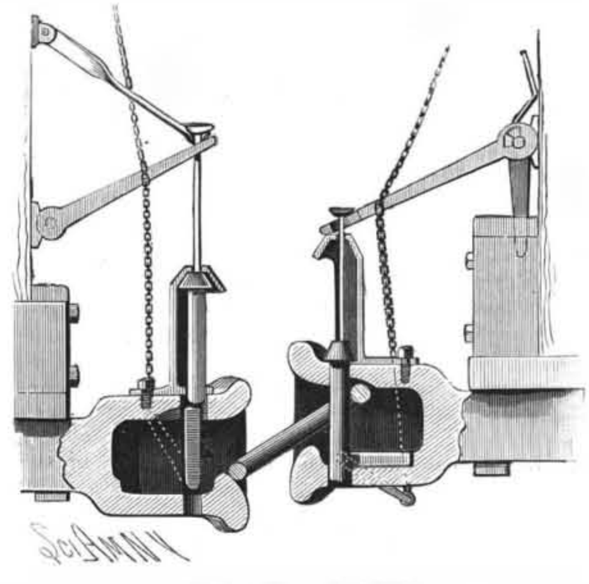
On average running at eight miles an hour it can be used for ten hours without charging the battery. This is based on $5\frac{4}{10}$ hours actual running time at an average of $2\frac{1}{2}$ horse power.

The car with two pairs of wheels weighs 5,200 lb. The additional weight incident to the electrical part is thus divided: The extra pair of wheels with their axle weigh 500 lb., the motor 400 lb., the framing, levers, connecting rods, and other minors parts 250 lb., and the battery 2,100 lb. This gives a total for the extra parts of 3,250 lb.

The bell for stopping and starting the car, the alarm bell for giving warning of the car's approach, and the lamps for lighting the car are worked by the current also. The installation is very complete in these respects. It will be seen that the storage battery is no necessary part of the system, as it is equally well adapted for receiving its supply from overhead or underground leads.

AN IMPROVED CAR COUPLING.

A car coupler which provides a means for retaining the link in suspension outside the drawbar when the cars are in an uncoupled position is shown herewith, and has been patented by Mr. John B. Butts, of Kansas City, Mo. In the bottom of the link opening of the drawhead is pivoted a dog, adapted to rest horizontally when a coupling is made, and to maintain a vertical position beneath the suspended pin when the car is uncoupled, the dog being operated from either the top or the sides of the car by a rod journaled transversely on the car end, and having crank arms at its extremities and a chain connection with the roof, the transverse rod carrying a lever which is in communication with the dog through a chain and arm, as shown in dotted lines. A casing with cone-shaped cap is on the upper side of the drawhead, in vertical alignment with its pin aperture, a vertical rod attached to the pin passing upward through the casing and through a slot in the lever extending from the transverse rod on the end of the car. When the pin is in position in the



BUTT'S CAR COUPLING.

drawhead, as shown to the right, the lever rests substantially on the cap of the casing, and the head of the pin rod on the upper side of the free end of the lever. Above the transverse rod on the end of the car, a twisted arm is pivoted in a bracket, such arm having a recess in one edge and a downward cam-like projection opposite the recess on the other edge. When it is desired to uncouple, and leave the car so that it will not couple with an opposing drawhead, the pin rod, as the pin is raised, comes into engagement with the recess of the twisted arm, the head of the rod resting upon the upper face of the arm, and holding the pin up as shown to the left in the illustration, when the lever by which it was raised may be dropped, carrying the dog in the bottom of the link opening to a horizontal position, and the car will not be coupled by the contact of an opposing drawhead. As the lever is again raised, it comes in contact with the cam-like projection of the twisted arm, and thereby frees the pin rod, allowing the pin to drop into its aperture simultaneously with the drop of the lever.

Running Railway Trains in England.

Among the thousands who travel by rail, there are probably very few who are cognizant of the precautions taken to prevent accidents; nor are the majority of railway travelers aware that under the present system of "running a train," it is almost impossible for a collision to occur except through the negligence of some of the company's servants. In an interesting article on signalmen lately published in a contemporary, the writer explained how the signals were worked; but, according to a railway employe's statement in *Chambers's Journal*, he gives one a very inadequate idea of the care exercised by railway companies to prevent accidents and loss of life to travelers. For instance, we will take an ordinary train at its start in the morning. In the first place, at the commencement of the journey, the engine driver and the fireman belonging to the train, after having "signed on duty"—that is, signed the train book in the shed foreman's office—and being passed by the foreman as fit for work, are required to be with the engine about an hour before the time of starting the train, in order that the driver may satisfy himself that the engine is in proper working order.

His first care is to see that the engine has been thoroughly cleaned, that all working parts are free from grit, and that his previous night's statement as regards repairs, etc., to the engine, has been acted upon; and gets coal and water. He then oils all working parts himself, and proceeds to the station to "pick up" the carriages forming the train. Each carriage has been overhauled by the carriage examiner, whose duty it is to see that the train is all right and fit to proceed on the journey; and where any defect is noticed, the carriage is taken off and sent to the "shops" to be repaired. The train is now within the jurisdiction of the station master, who, having previously seen that the signals and signalmen in his district are in proper condition, at once proceeds to satisfy himself that the carriage examiner has done his duty properly, and notices that the carriages are properly "coupled."

It will be at once easily understood that to prevent oscillation and to secure the easy and smooth running of the train, it is necessary that all the vehicles composing the train should be so tightly coupled as to insure the buffers being brought so firmly together as not to be separated by any change of gradient or by the starting of the train. It is the station master's duty to observe the state of all couplings—including continuous brake couplings and cord communications—and cause any that require it to be adjusted. These couplings are also examined by the guard, who, while in the station, is under the orders of the station master. After the guard has seen that the doors of the carriages are properly closed, the train is ready to start.

The signal to the engine driver to proceed must be given by the guard upon receiving intimation from the station master that all is right. When there are two or more guards with a train, the signal to the driver must only be given by the guard nearest the engine, and then not until he has exchanged signals with the guard or guards in the rear. On the guard rests the chief responsibility for the safe running of the train. How onerous are his duties may be seen from the following. In the first place, he must regulate the working of the train in accordance with the time tables of the line over which he has to run. He must also see that the train does not travel on the line after sunset or in foggy weather without a red tail lamp and two side lamps, which he must keep properly burning throughout the journey.

Every guard when traveling must keep a good lookout, and, should he apprehend danger, he must at once attract the attention of the engine driver. This he does by using the "communication," and also by applying his hand brake, if he has one, sharply and releasing it suddenly. This operation—from the check it occasions—if repeated several times, is almost certain to attract the notice of the driver, to whom the necessary caution or danger signal must be exhibited; and should the train be fitted with a continuous brake with which the guard has a connection, he must apply it until he is certain the driver is alive to the danger. Should danger be first apprehended by the driver, he immediately gives three or more short, sharp whistles, which is a signal for the guard to apply the brake.

If, from any cause, it is found that the train cannot proceed at a greater speed than four miles an hour, the guard must immediately go back one thousand yards, or to the nearest signal box, if there be one within that distance; in which case the signalman must be advised of the circumstance. Otherwise, the guard who goes back must follow the train at that distance and use the proper danger signals, so as to stop any following train until assistance arrives or the obstruction is removed.

When the train is stopped by accident or from any other cause, the guard must go back as before mentioned, and place detonators on the rails at fixed distances, and must not return to the train until recalled by the engine driver sounding the whistle. Should the absence of a signal at a place where a signal is ordinarily shown, or a signal imperfectly lighted, be noticed by the guard, he must treat it as a danger signal, and report the circumstance to the next signalman or station master. These rules, properly carried out, and signalmen and others doing their duty, it will be plainly evident that, although accidents will sometimes occur, the railway companies do their best to secure the safe working of the line.

Substitute for Gum Arabic.

A substitute for gum arabic, which has been patented in Germany, and is likely to be largely used for technical purposes now that good gum arabic is so scarce, is made as follows, according to the *American Druggist:* Twenty parts of powdered sugar are boiled with 7 parts of fresh milk, and this is then mixed with 50 parts of a 36 per cent solution of silicate of sodium, the mixture being then cooled to 122° F. and poured into tin boxes, where granular masses will gradually separate out, which look very much like pieces of gum arabic. This artificial gum copiously and instantly reduces Fehling's solution, so that if mixed with powered gum arabic as an adulterant, its presence could be easily detected. The presence of silicate of sodium in the ash would also confirm the presence of adulteration.

The Sunken Treasure Ship at New York.

Over a hundred years ago, the British war ship Hussar, having on board nearly five millions of dollars in gold coin, was sunk in the waters of the East River, in what is now the northeasterly part of New York City. Up to the present time, the raising of the vessel and the recovery of the treasure has baffled the efforts of capable men, though aided by the best appliances of modern science and mechanics. It still remains a task for the genius of the inventor to devise a practical method of solving the problem.

In his opinion in the case of Joseph C. Hartshorne against George W. Thomas, lately filed by Vice-Chancellor Bird, of New Jersey, he tells this interesting story:

The British frigate Hussar, sunk near the city of New York on Nov. 25, 1780, was a 32 gun ship, 206 feet in length, 52 feet 2 inches beam; one of England's proudest ships. She had on board £580,000 in treasure for the purpose of paying the army and navy, they having been without pay for nearly three years. The Mercury also sailed for the same destination with £380,000 of British treasure on board. Its destination was also New York. The Hussar lay at anchor off the Battery two days after her arrival, and during this time the treasure on board the Mercury was transferred to the Hussar, the city then being besieged by an army of "American rebels" and in great danger of capture.

The Hussar was then ordered to sail forthwith to Newport, R. I., and on her way up the East River to the Sound she struck upon Pot Rock, nearly opposite the upper extremity of Randall's Island. An effort was made to land her at Port Morris. When she got within less than 100 yards of the shore, she sank suddenly with all on board, numbering about 150, leaving only the topmasts in view. There were many American prisoners on board, who, being chained below, went down with the ship, and the loss of whose lives created deep feeling of indignation among revolutionary patriots throughout the country. The shore where the vessel went down and where she now lies has nearly perpendicular walls, and at medium tide the water is about 70 feet deep. The whole amount of money on board is estimated at $4,800,000.

In 1794 the British government employed two brigs and labored two summers endeavoring to raise the ship by means of grapples, but without success. It is said they were ordered off by the American government. In 1819 the work was again undertaken by a British company, endeavoring to operate upon the ship by means of a diving bell, the most effective submarine appliance known at that time, but owing to the great volume of tide it was compelled to abandon the enterprise. After this the British government offered a large salvage to induce parties in the States to undertake the raising of the ship. Two or three companies were organized for that purpose in and about Philadelphia and Baltimore, and made the attempt, but without success, owing to the great strength of the tide at all times.

In 1848 Capt. Taylor invented what was called submarine armor, and he was so confident that his invention could successfully operate upon the Hussar that he was induced to obtain personal knowledge at the Admiralty department in England in regard to the amount of treasure. He labored in the undertaking until his death. He willed his invention to his friend, Charles B. Pratt, of Worcester, Mass., with his entire outfit, which he had been three years or more collecting, upon condition that Mr. Pratt should prosecute the work until the treasure was finally obtained, and that he should give one-sixth thereof to his wife and daughter. Mr. Pratt accepted the terms, and was joined in the enterprise by others.

The ship's decks were entirely removed; 26 cannon, large and small, were taken up and sold for $1,500; 4,000 cannon balls, large quantities of rotten cordage, many bushels of gun flints, several leather buckles with the name Hussar on them, which may be seen at the historical rooms in the city of Worcester; many human bones and skulls, manacles, and chains, glass, earthen and pewter ware, the ship's bell, and hundreds of articles usually on board of a war vessel, most of which are still in the custody of the company.

Mr. Pratt and his friends continued the work until 1866, when individual interests had been divided, subdivided, and resubdivided and the fractions scattered far and near. With a great deal of trouble the several interests were collected and a company incorporated under the laws of New York, with a nominal capital corresponding with the amount of treasure the Hussar was supposed to contain, and divided into 48,000 shares of $100 each, and known as the Frigate Hussar Company. This company worked with more or less success after that time.

An effort was made to get the submarine company which operated on the steamer Golden Gate, lost on the Pacific coast, with $1,000,000 in gold on board, to operate on the frigate Hussar, but it does not appear that that effort was successful. It is in evidence that from 1857 to 1880 there were continuous efforts made by different interests to reach and raise the Hussar or to lift the buried treasure from her hulk. Although he had commenced searching for the prize in 1879, in 1880 George W. Thomas, the defendant, being influenced by a stronger desire to exhume this treasure and by a strong conviction that it could be accomplished, secured permission from the government to proceed, and solicited aid from his friends for the purpose of carrying on the enterprise. Money was advanced to him by them. On the receipt of money he acknowledged it, and gave them a stipulation agreeing that he would, as soon as he recovered the treasure, "pay to said —— the sum of $——, with no delay more than will be necessary to convert the same into lawful money of the United States." The complainant advanced to the defendant $5,000 in the first instance, which was acknowledged by the signing of such a receipt. This was upon February 16, 1882. On March 2, 1883, he advanced $5,000 more on like terms. In May of the same year he advanced $3,000 additional, which last sum the complainant insists was upon the same representations and for a like purpose, but which the defendant insists was loaned to him upon his own personal security, together with a chattel mortgage on the scow in use at the work, and without any reference to the enterprise of raising the buried treasure.

The enterprise thus begun by Thomas was carried on until January, 1884, when his supporters became discouraged, sought to call him to account, and failing that, they formed a company for the purpose of carrying on the work themselves. They succeeded in having the government annul all obligations between it and Thomas. His property was attached, and when the proceedings were settled, the chattel mortgage alluded to was enforced and all his appliances were sold. No part of the money advanced by the plaintiff has ever been repaid, except what was realized from the sale under the chattel mortgage.

The bill in this case asks that the contract made by the defendant with the plaintiff and others be specifically performed; that a receiver may be appointed to take charge Thomas' property, and that the defendant account for all the moneys received by him to raise the sunken treasure. The vice-chancellor refuses every part of the application except that calling upon the defendant to account.

"It is just to say," says the vice-chancellor, "that I can discover nothing which tends to the conclusion that the defendant, Thomas, attempted in any sense to mislead. That the accomplishment of the undertaking was certain in his mind is very plain. He undoubtedly believed that he would be successful, and he made every reasonable effort to convey this conviction to the minds of those from whom he sought pecuniary aid. It would not perhaps be departing from the truth to say that his expressions were over-confident, and that cautious men—men not given to speculation or fond of pursuing chimeras—would not have entertained his propositions. Most probably such men would have spurned them, and would have found his convictions utterly baseless in the immense reward that was offered for the loan; that is, $37,500 for the advance of only $5,000. But it is not the first time that a shining hook has been grasped to be followed by mortification and loss."

The International Hygienic Congress.

The session of the International Hygienic Congress at Vienna was closed on October 2, when it was finally decided that the next session should be held in London, in 1891. The meetings were remarkably successful, and did much to enlighten the public as to the nature of the questions which are now being discussed by students of hygienic laws. On Wednesday, September 28, interest was centered chiefly in the third section, where the circumstances under which cholera is disseminated were considered. Prof. Max Gruber, of the Vienna University, who gave an account of the incidents of cholera in Austria during the years 1885-86, stated that he could find no evidence of water having played any part in disseminating the disease during that period. He believed that cholera was disseminated by human intercourse, and this experience, he said, coincided with that of English observers. On the other hand, Dr. Spattuzzi, of Naples, attributed the absolute immunity from cholera enjoyed by Naples during 1885-86, and the comparatively small extent of the disease during the present year, to the excellent water supply provided in 1884. Prof. Pettenkofer made some interesting statements on the influences which, in his opinion, locality and season have on the spread of cholera. In support of his views he referred to experiences in India, where each province has its own time of year when the disease is more prevalent, but he also freely admitted the effects of pilgrimages and fairs in spreading the disease. In the course of the debate Prof. Pettenkofer again took occasion to pay a high tribute to England for the measures adopted for the prevention of cholera, and M. Proust, of Paris, expressed himself in the same sense. Thursday was devoted to excursions and the visiting of public institutions in Vienna. On Friday, Sir Douglas Galton, who presided over the first section, offered some valuable remarks on the treatment of infectious fevers. He showed that in London much had been done by the system of isolating small-pox and scarlet fever patients quickly, by taking them to a ship hospital or to hospitals remote from dwelling houses. "But it is most undesirable," he added, "that in these isolated hospitals too many patients should be concentrated in one ward. The principle should be smaller wards, of four to six patients at most, and great simplicity of construction with ample aeration." Sir Douglas expressed the opinion that the bodies of patients who die of infectious fevers should be burned, and in this view he was supported by Sir Spencer Wells, who said that the good done by giving the people pure air and water, wholesome food, and proper dwellings must to a large extent be counteracted by the continual presence of thousands of putrefying bodies in and around centers of population. Much interest was excited by the proceedings of the third section, when the question of preventive inoculation against rabies was discussed. At the final meeting, the usual votes of thanks were passed, and Prof. Ludwig, the president, said that all the objects of the congress had been attained. Dr. Roth, of London, expressed a hope that the "protectorate" of the next congress would be undertaken by the Prince of Wales.—*Nature.*

Remarkable Efficiency of Improved Brakes.

It will be remembered that it was suggested last May that a proper supplement to the Burlington brake tests would be the running of a train a long distance, with varying conditions of grade, track, and weather. Something of that kind the Westinghouse company has now undertaken with its peripatetic school of braking. The journeys of its 50 car train, fitted with its latest improvements, seem to be something in the nature of a triumphal progress, or, at least, will pass as one until some competitor can make a more brilliant showing. The aim in these last illustrations of the efficiency of the air brake seems to have been to use it under actual working conditions as to leverage and pressure, rather than to make the quickest possible stops. At the tests at Como (near St. Paul) emergency stops down a grade of about 31 ft. were made in 172 ft. at 19 miles an hour, in 200 ft. at 20¼ miles, 490 ft. at 36 miles, and 583 ft. at 37 miles. At Chicago, on level track, the stops were 164 ft. at 20 miles, 184 at 22 miles, 469 at 40, and 487 at 37 miles an hour. These were with a 50 car train empty. With a 20 car train, the stops at Como were 109 ft. at 20 miles and 327 at 37 miles. At Chicago they were 120 ft. at 20 miles and 272 at 33 miles. The reports received show that there were no injurious shocks, and with the 50 car train no skidding. With the 20 car train, greater leverage was used, and the wheels were skidded more or less. The time required for complete application of the brakes on the 50 car train is stated as before as two seconds, and the time of release at the thirty-fifth car 25 seconds. These results are of the greatest importance, as showing that trains can make such stops without shock and without the aid of electricity, but they only confirm the knowledge gained in the recent private trials at Burlington. They have been seen, however, by a great number of people, and will carry conviction. One most remarkable episode of the journey to St. Louis was a stop not in any programme. The train was flagged while going 52 miles an hour on a 63 ft. grade, and was stopped in less than half its length—that is, in less than 950 ft. The train comes east by Cincinnati, Cleveland, and Buffalo, and later will go south. It will be surprising if at the end of its wanderings the sum of human knowledge about air brakes is not a good deal increased.—*Railroad Gazette.*

The Northwestern Gold Fields.

Dr. Dawson, Assistant Director of the Geological Survey, who headed the party sent by the Dominion government to explore the country adjacent to the Alaska boundary, has returned to Victoria. Two of his party, Messrs. Ogilvie and McConnell, will winter in the district, making astronomical observations, which will give data for the establishment of the international boundary. The exploration so far has secured a great deal of geological, geographical, and general information of the country, and indicates that it is far from being the Arctic region it is sometimes represented to be. The point from which the Doctor turned back was at the junction of the Lewis and Pelly Rivers. It is 1,000 miles north of Victoria. There the flora was found to differ but little from that on the banks of the Fraser. A great deal of open, grassy country exists along the streams tributary to the Yukon. No areas of tundra or frozen swamps, such as are to be met with in the interior of Alaska, were discovered by the expedition. The Doctor's conclusion is that the whole country from Cassian to the vicinity of Forty Mile Creek, on the Yukon River (which must be near the eastern boundary of Alaska), yields more or less gold in placer deposits. This would constitute a gold-bearing region fully 500 miles in length by an indefinite width, and which, so far, in comparison to the area, has been very little prospected.