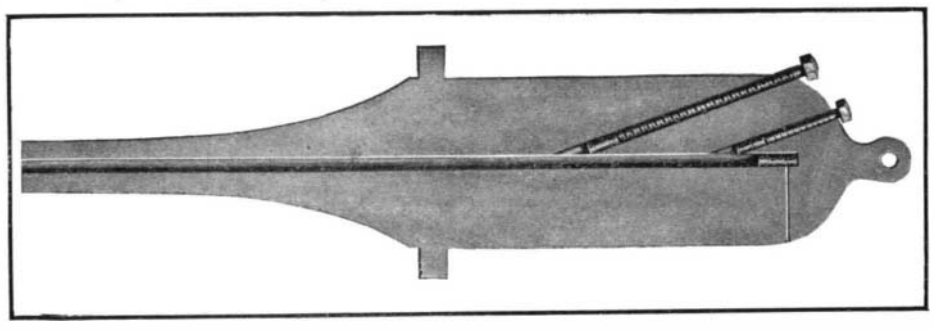
ignition is of the make-and-break type, the igniters being operated from a horizontal camshaft running across the top of the motor, and driven by bevel gears from a vertical shaft extending into the crankcase. A magneto, driven off the flywheel, supplies current. The switch is visible in the photograph at the lower front edge of the motor. The chains which drive the propellers pass through tubular guides on their way from the sprockets on the motor crankshaft to the sprockets on the propeller shafts. One of the latter of these is visible at the left-hand upper edge of Fig. 1. The crossed tubes carrying the chain of the other propeller are also distinctly visible in this illustration. The method of reversing the direction of rotation of the propeller by crossing the chain does not seem to be an extra good one, despite the statement of Mr. Orville Wright that he has never had any trouble with this arrangement. Whether this had anything to do with the breaking of the propeller, or not, will probably never be known. The propellers which were used on the day of the accident were new ones about 9 feet in diameter and of a somewhat less pitch. The propellers which were used previously, and which were about 8½ feet in diameter and of the same pitch, are those illustrated in our photographs. They ran at a speed of about 400 revolutions a minute. Mr. Wright had hoped to increase the speed of the aeroplane by the use of new propellers, as their flatter pitch should enable the motor to obtain a higher speed and develop somewhat more power. Ordinarily, the motor developed about 25 horse-power, which was sufficient to drive the machine over 40 miles an hour. The specifications put out by the government required a speed of 40 miles an hour with two men on board, and Mr. Wright hoped to surpass that considerably. As far as endurance was concerned, he had already, on September 12, made a flight of 1 hour, 14 minutes, 24 seconds, which was practically a quarter of an hour longer than was required by the specifications. These required that he should carry a passenger, however, and it was in a second effort to see what he could do in this direction that he took Lieut. Selfridge with him on the 17th instant.

In one of our illustrations, Fig. 8, the aeroplane is seen upon an army wagon. This photograph shows it as it is being transported from the shed where it was put together to the tent where it was housed during the first few days of its stay at the Fort Myer parade ground. In this picture the vertical rudder is shown folded up against the rear of the plane, and the runners are also folded back against the front edge. When it is desired to take the machine apart, the outer quarters of the main planes can be folded back upon the central halves, and the whole machine can be quickly disassembled. Great ingenuity was displayed by the Wright brothers in constructing their aeroplane so that it would fulfill the condition of being readily dismounted and packed upon an army wagon, but the great simplicity of the entire machine is the most striking point about it, and the one which most strongly evidences a real stroke of genius. The result of the accident will be a greater striving of inventors to produce a machine having automatic stability, and which will only require sufficient attention on the part of the aviator to steer it sidewise and up and down, and to keep the motor running. It would also seem that a new impetus should be given to Langley's idea of experimenting over water where, if a machine took a sudden plunge, the aviator would at least have a chance of escaping. The accident to the Langley machine some years ago, when it plunged into the Potomac while Mr. C. M. Manly acted as aviator, illustrates this point; for, although the machine was injured, and Mr. Manly had a very narrow escape, nevertheless he is alive to-day and is one of our most enthusiastic aviators.

In the Electrical World C. E. Lord describes a method of ventilating a high-speed machine so that the noise is reduced to a minimum. The air which cools the rotor does not pass directly to the stator, but follows a restricted path through the stationary member. The ventilating passageways in the stator are arranged concentrically about the axis of the rotor, and means are provided for cutting off direct communication between the ventilating passageways and the air gap of the machine.

AN EARLY ARMOR-PIERCING GUN.

The following sketch and description of an early and decidedly novel design for an armor-piercing gun have been furnished us by Mr. W. B. Williamson, of Ames, Okla., who was on special service in Washington from 1862 to 1865, and was in a favorable position to observe the construction and test of the gun. The drawing, it should be understood, is only approximately correct, the sketch on which it is based having been made from memory after a lapse of forty years. The gun was cast at the Washington navy yard and placed in the experimental water battery (then used for drill and practice). Its length was about 11 feet, and its bore only 2⅛ inches. Its weight was about equal to that of a 32-pounder iron Dahlgren. From the trunnions to the muzzle the taper was abrupt; from the trunnions to the neck ring the piece had all the ear-marks of a 68-pounder smoothbore. The projectiles, which were forged from tool steel and turned down to caliber, were about 12 inches long. The gun was rifled, and soft metal rims were swaged on the projectile to enable it to take the rifling. The first powder charge and the projectile were loaded from the muzzle. On the right side of the breech were two holes bored at acute angles to the longitudinal axis of the gun, the first entering the bore a little ahead of the projectile, the second farther ahead, nearer the trunnions, in the position shown in the engraving. Each hole was fitted with a long, coarse-threaded breech-pin. A charge of powder, somewhat smaller than the main charge, was inserted in each chamber, and the breech-pin screwed home. Each of these auxiliary chambers was of about 2 inches bore. The gun easily pierced a 9-inch iron plate at 500 yards, and it required a 12-inch plate to stop the projectile.



Length, 11 feet. Bore, 2⅛ inches. Penetrated a 9-inch iron plate. The gun had three powder chambers in which the charges were ignited successively as the projectile passed down the bore.

AN EARLY BREECHLOADING GUN.

It will be seen that, in a certain sense, the designer of this gun anticipated the theories of our modern smokeless powder; for the charge was burned progressively, part of it at the breech, and two other portions at succeeding intervals during the travel of the projectile down the bore.

President Lincoln, visiting the yard one day in 1862, requested to have the gun loaded, sighted the piece, and fired, making a center. Thereupon the piece was dubbed "Abe Lincoln's pocket piece."

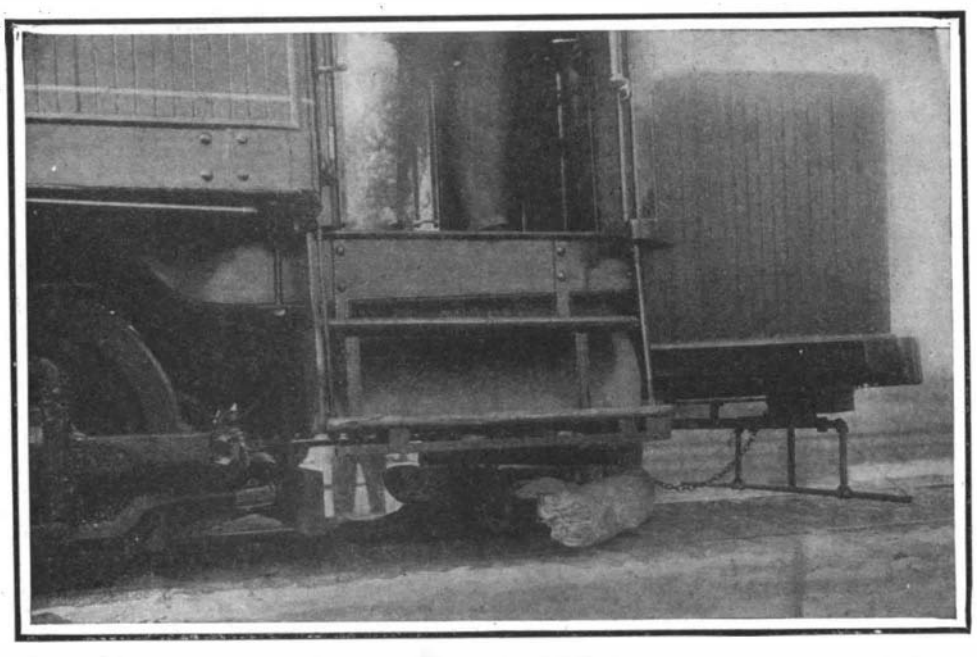
According to a contemporary, there is manufactured in Holland a substance called liconite. It is similar to rubber in appearance and in many of its qualities. It is a compound of bitumen and various oils, has neither rubber nor gutta-percha in its composition, is elastic and tough, and is said to be non-hygroscopic, unaffected by water, dilute acids, or alkalis, and capable of withstanding all ordinary temperatures without flowing or cracking.

CAR FENDER TESTS BY THE PUBLIC SERVICE COMMISSION

The Public Service Commission of the city of New York never inaugurated a more commendable movement that when it arranged for a series of public competitive trials of street-car fenders, with a view to selecting the most efficient type for use on the street railways in this city. It has been moved to take this step as the result of the statistics of street-railway accidents which have been gathered under its administration. These were of such an appalling character, both in number of fatalities and the shocking character of the injuries, that the Commission at once took steps to institute the present inquiry and select a really effective car fender. The tests are to be carried out partly at Schenectady and partly at Pittsburg; the first on tracks provided by the General Electric Company, and the later series on tracks near the works of the Westinghouse Company. Neither of these concerns has the least financial interest in the competition; they merely place the excellent facilities of their respective plants at the service of the Commission. The tests, of which we present several illustrations, were held upon a stretch of track running along the banks of the Erie Canal in the presence of the Commissioners and their engineering staff, eminent traction engineers from various parts of the country, and several members of the General Electric Company's own engineering force.

The first series of tests took place on Wednesday, September 16, and evidence that the competition will be of the most widespread character was shown by the fact that up to noon of the previous day, 112 men had registered for competition at the office of the Commission. The character of the tests and the conditions of the competition were given in full detail in our issue of September 19. The first fender tried was of the projecting automatic type, and was manufactured by John O'Leary, 25 Congress Street, Cohoes, N. Y. It consists of a square section of metallic latticework which, when in use, extends in front of the car close to the track, and, when not in use, can be raised and tied up to the dash board. One of these fenders was attached to a trolley car weighing 25 tons, provided by the General Electric Company. Dummies representing boys weighing 50 to 60 pounds and others representing women weighing 120 pounds were placed upon the track in various attitudes, and run into by this car with the fender in position. The tests were made with the car going 15 miles an hour and also at a speed of 6 miles an hour. There were two series of tests, one on cobblestone pavement and the other on asphalt pavement, this being done to reproduce as nearly as possible street conditions in New York city.

The dummies were placed on the track standing up, lying on their side, or stretched along the rail, and the effect of the contact with the fender in all such positions was noted. In most instances the fender made a clean pick-up of the dummy and carried it, as if in a basket, until the car was brought to a standstill by the brakes. In some instances the dummy was scarcely injured by the impact; in others it was deprived of one or two legs; and in cases where the fender failed to pick it up, it was rolled along over the roadbed and badly mangled. The credit marks used in each test to keep the official record were as follows: A counted 4 points for a complete pick-up or removal from the track; B counted 3 points for a partial pick-up or removal from the track, with any part of dummy remaining under fender; C counted 2 points for a partial pick-up or removal from the track, but with the dummy for the most part under the fender; D counted 1 point where no pick-up is made and when the dummy is entirely under the fender, but dragged sufficiently to prevent its going under the car. In the first series of runs made on cobblestones at 15 miles an hour, the O'Leary fender received four A's, one C, and one D. In the same series on cobblestones at 6 miles an hour it received three A's, one B, and two D's.



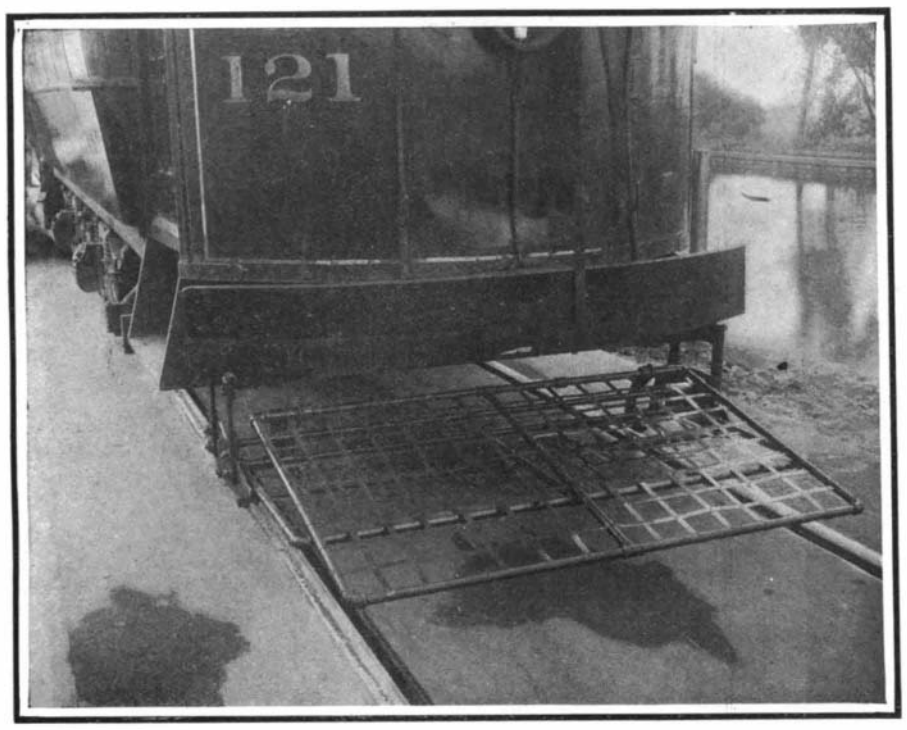
Shows Manner in Which Defective Fender Allowed Body to Pass and Be Mangled.

CAR FENDER TESTS BY THE PUBLIC SERVICE COMMISSION.

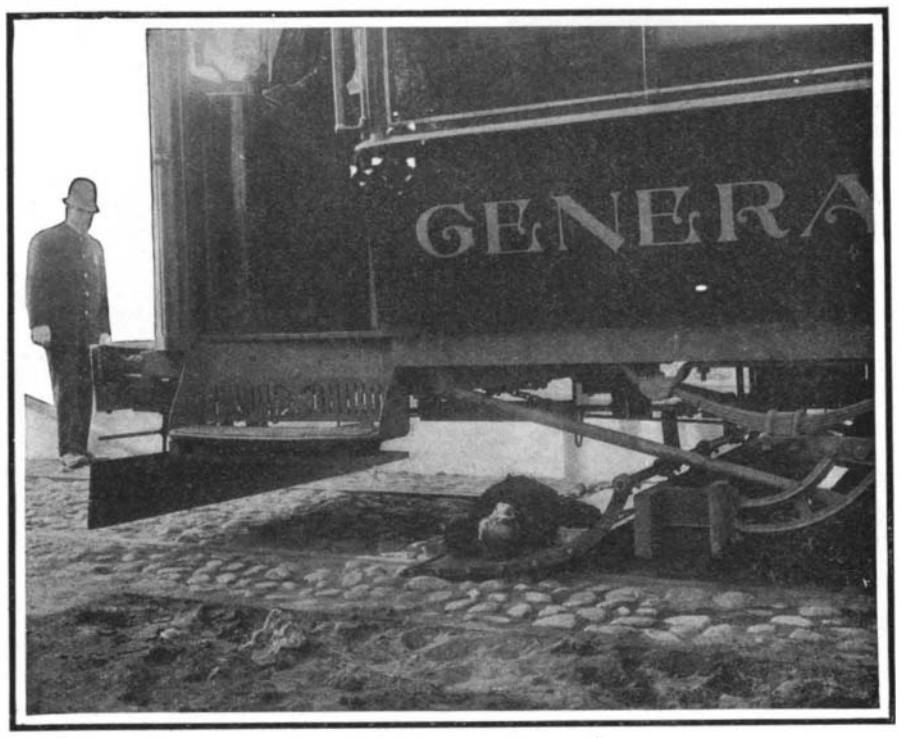
The dummies, as will be seen from our photographs, were constructed so as to closely approximate the forms of living persons; and the distributing of the weight, center of gravity (most important point), etc., were carefully considered. It will be noticed

that the greater number of clean pick-ups was made at the quarter speed, which was to be expected.

Another fender tested on the first day is known as the drop fender, which was entered by the Charles N. Wood Company, of Boston. This fender is of that type which depends upon the motorman to drop it when approaching an object on the track. On the second day the Hoefling double fender, entered by John Caulfield, of Grand Rapids, Mich., and the Sterling wheel guard, entered by the Sterling-Meaker Company, of Newark, N. J., were tested. The former consists of two fenders, one above the other. The upper one serves as a trip to automatically drop the lower fender, when it strikes a body. The Sterling wheel guard consists of a basket-like screen, which is suspended in front of the wheels under the body of the car. It is connected with a board, which is suspended from the overhang of the car. When this board strikes a body it automatically drops the screen in front of the wheels, and the latter picks up the body.



The Regan Fender, Under Test at Schenectady.



The Clark Wright Wheel Guard, Showing Manner in Which Body Is Picked Up.

Ionic Medication.

The introduction of medicaments into the human body in the form of "ions," first applied by Leduc of Nantes in 1903, has rapidly gained ground in medical practice, and many applications of the principle are now in use. It is well known that when a current of electricity is passed through a solution of a chemical salt, the latter becomes decomposed or electrolized, the base, as a rule, going to the negative pole and the radical to the positive pole. This is accounted for by the theory that the molecules exist as ions, or electrified particles of matter, those of the base and radical carrying respectively their negative and positive charge of electricity. These ions are dissociated by the electric current, which appropriates them to the corresponding complementary poles of the circuit.

Advantage is taken of this principle to force medicinal substances in the ionic state into the tissues of the body. If a solution of, say, quinine sulphate be used to soak a pad covering the positive pole of a battery, this pole applied to the skin, and the negative pole so arranged that the current may pass through the tissues, the quinine ions will seek the opposite pole, and in so doing will pass through the tissues with the current. The ions thus forced into the body enter not only into the lymph spaces, but into the cells themselves, becoming a part of the protoplasm, and consequently their effects are much more pronounced. The principle may be shown experimentally by placing a piece of raw beef between the poles of a battery, the negative electrode being covered with blotting paper soaked in a solution of potassium iodide, and the positive electrode similarly treated with starch solution. On applying the current the iodine ions pass through the beef of the positive pole, the paper on which soon shows the blue color of starch iodide.

This process, described as cataphoresis or ionic medication, has been tried with considerable success in the case of such drugs as break up into ions. Relief of tabes dorsalis by cocaine ionization was described in the British Medical Journal in January, 1905, and since then a number of cases have been successfully treated by this method. Dr. Lewis Jones and Dr. Dawson Turner have both reported on cases of rodent ulcer cured by means of zinc ions. The process is extremely simple—a portable battery with wires has a disk or rod of zinc attached to the positive pole. The zinc is covered with a few layers of lint wetted with a 5 per cent solution of zinc sulphate and applied to the ulcer previously cleansed. The negative electrode is either held in the patient's hand or placed in a basin of salt water in which the hand is immersed. The current is gradually raised to 40 to 60 milliamperes, or as much as the patient can bear, and continued for thirty seconds. The surface of the ulcer is now white and dry, and another application may be made in a week or a fortnight, two or three applications usually being sufficient. A burning sensation like that of a mustard plaster is felt, which in sensitive patients may be counteracted by means of cocaine.

Other applications of the ionic treatment are suggested. Copper ions have been found efficacious in destroying the parasite of ringworm, and magnesium ions have cured multiple warts on the hands. The chlorine ions have proved useful in fibrous ankylosis and sclerosis, and a case of Dupuytren's contraction, which had lasted fifteen years, was recently cured in the same way. The salicylic ion has been found to relieve tic douloureux which had proved refractory to other remedies. Giovine records cases of gonorrhœal arteritis and tabetic arthropathy of the knee, in which the iodine ions from potassium iodide gave good results, also a case of sclerodactylia, which was cured by application of chlorine ions. The difficulty in the way of treating lupus has so far lain in the fact that the bacillus contains a large proportion of fat, which is a complete non-conductor of electricity.

In applying the ionic treatment it should be borne in mind that basic ions move from the positive to the negative pole, consequently the medicament must be introduced at the opposite pole. Acids move in the opposite direction. The limitations of the method are that the ions can be introduced only very slowly, and a prolonged application, possibly under chloroform, would be necessary to reach parts at great depth.—The Prescriber.

This Dummy Picked Up While Facing Car, Which Was Moving at 15 Miles an Hour.

150-Pound Dummy on Track, Sideways to Approaching Car.

This Shows Mutilation of Person Struck in Trying to Pass in Front of Car.

CAR FENDER TESTS BY THE PUBLIC SERVICE COMMISSION.