Correspondence.

The Black Wolf—The Horse with Tube.

To the Editor of the Scientific American:

In your issue of Sept. 17 is an article on the American black wolf. Last winter a farmer of this place found what he supposed a large black dog in his flock of sheep, but on killing it old hunters, or some one else, called it a black wolf. It was wild, is a sure fact.

Your article from the New York *Times* on "A Horse with a Tube in his Neck," leads me to think that it may be interesting to you to know of a trotting horse that has been treated in the same way, and successfully. A Mr. Olmsted, of Coudersport, Potter County, Pa., has the horse, and I have seen him on the track, and, to all appearances, he trotted as well as if he breathed in the natural way.

C. E. H.

The Trolley System in Boston.

To the Editor of the Scientific American:

In your issue of October 1 appeared an article entitled "Electric Cars in Boston," signed "J. V. M." Some of the statements made in this article concerning the danger of the overhead system are so entirely at variance with the facts that, appreciating the fairness and impartiality of your journal, I have thought it advisable to write you concerning the same, believing that you will give my letter the same publicity that you did that of "J. V. M."

The fire which "J. V. M." refers to is, doubtless, that which started on Thanksgiving Day, 1889. I have written to the fire marshal in Boston concerning this fire, and beg to quote you his exact reply:

"BOSTON, October 6, 1892.

"GENTLEMEN: Yours of the 3d inst., inclosing a letter from the General Electric Co., in relation to fires caused by trolley wires, together with your request for a report on the same, is at hand.

"I have noted the statement in the clipping which you inclosed from the SCIENTIFIC AMERICAN, to the effect that 'horses and men have been killed and injured by falling trolley wires, and one of the worst fires in Boston, where three or four million dollars' worth of property and several lives were lost, was set by an electric wire which was supposed to have come in contact with the trolley system.'

"As to the injuries inflicted upon men and horses by falling trolley wires, I am, of course, unable to give you any information, but the statement that one of the city's worst fires, presumably the Thanksgiving Day fire of 1889, is supposed to have been caused by trolley wires is entirely erroneous. On the contrary, the result of a most thorough investigation made at that time convinced me beyond doubt that no possible blame could be attached to trolley wires.

"Reference to pages 17 and 18 of the special report made at the time of that fire will show more fully why I exempted the trolley wire as a possible cause.

"As to the cause of the Thanksgiving Day fire, I would respectfully refer you to pages 21 and 22 of the special report before referred to, from which you will see that I attributed the cause of the fire to the overcharging of the fifth circuit wire of the Electric Time Company, by reason of its being in contact with a highly charged wire, or by contact with a foreign wire, which, in turn, was in contact with such highly charged wire. With the exception of the contact referred to on pages 17 and 18, no wires were found to be in contact with trolley wires in other parts of the city, while electric light wires, messenger wires, telephone wires, and time companies' wires were found in several places burned off and lying across one another. I have no doubt but from one of these contacts the fire was started.

"So far as I have been able to determine, we have never had a fire loss caused by trolley wires since the introduction of the system in this city.

"While there is very much less danger from the trolley system than from electric light wires, their voltage being only about one-fourth or one-fifth as great, I still suppose it would be possible for a fire to be caused by trolley wires under certain conditions.

"I can only say that, under the system of inspection that the railway company has adopted, their wires have so far done no damage.

"On pages 59 of the fourth annual report, 70 of the fifth annual report, and 65 of the sixth annual report, which I send herewith, will be found instances where trolley wires have shown a tendency to start fire, and these were the result of accidental injury to the insulations. Very truly yours,

"CHAS. W. WHITCOM, *Fire Marshal.*

"*To the Board of Fire Commissioners, Boston.*"

From this you will see that the fire marshal not only denies positively that the fire in question was started by a trolley wire but he states that, so far as his knowledge goes, *no* fire in Boston has ever been started by a trolley wire.

Should you desire to see the special report of the fire marshal on the Thanksgiving Day fire, I shall be very glad to send you a copy of the same.

As to danger to life and limb from the trolley system, statistics in Boston (which has the most extensive trolley system in the world) show that the accidents which have occurred depend largely upon the individual characteristics of the man in charge of the car, for, as a matter of fact, a man has much more complete control of an electric car than of a horse car. The record shows that during the last year 14 people were killed by street railway cars in Boston—10 by horse cars, and 4 by electric cars; not *one* of the latter, however, was killed by the trolley wire or by the current itself. Contrast this record with the record of fatal injuries in New York City, taken for one week, and which was published in the New York *Recorder* of September 16, 1892, showing 4 deaths in this city by horse cars.

Consider, also, that travel on Washington and Tremont Streets, Boston, the principal business streets of the city, is so congested that there is at all times of the day a continuous line of cars moving in both directions and the comparison is still more striking, showing conclusively that the average horse car is far more deadly than "the trolley." Very truly yours,

WM. J. CLARK,
General Agent, Railway Department,
General Electric Company.

New York, October 8, 1892.

The Liverpool Overhead Railway.

BY JAMES HENRY GREATHEAD.

The railway is composed almost entirely of wrought iron. The line, now approaching completion, traverses the whole length of the famous Liverpool docks, a distance of about six miles. The extensions north and south, authorized last session, extend beyond the docks and away from the river, in order to give better access between the residential neighborhood reached by them, the docks, and the heart of the city. With the exception of a short length where the line passes under the Lancashire and Yorkshire Railway coal sidings, the railway is, as its name indicates, overhead, and for the most part just over the lines of the original Dock Railway, which is upon the surface. The latter railway serves for the distribution of goods by horse traction, and has been used also by passenger omnibuses, with specially constructed wheels to enable them to leave the track when necessary. These vehicles will leave the rails altogether upon the completion of the Overhead Railway, which will afford a means of transit at least three times as rapid, when the Dock Railway will be available exclusively for goods.

The Overhead Railway consists generally of plate iron girders supported upon channel iron columns, and carrying an iron flooring, upon which the permanent way is laid direct, without the usual intervening ballast. The normal spans are 50 feet, but there are some of 100 feet, with bowstring girders, and others of special construction for opening and affording a passage to the docks for exceptionally bulky goods, such as marine boilers, etc.; thus there is a tilting bridge near the Sandown Dock, and a swing bridge of novel construction, and worked hydraulically, crossing the entrance to the Stanley Dock. This is the only dock entrance crossed by the railway, the other docks being on the river side of it. The columns are grouted into cast-iron sockets, bedded in and bolted to masses of concrete, forming the foundation. With the exception of some half-dozen spans, the line has been constructed without the use of scaffolding, and with very little interference with the traffic either of the docks or of the streets. This important end was attained by adopting a construction which admitted of each span and its flooring being put together at one end, and transported as a whole over the already completed portion of the railway.

A depot was established at the north end of the railway, where the flooring was constructed and riveted together and to the main girders. The whole span was then raised by jacks; a steam bogy with wheels running upon the two rails nearest the main girders (and thus having a gauge of 16 feet) was run under the span, which, being lowered upon the trolley, was carried by it at such a level as to clear the main girders to the southern end of the structure. Arrived at this point, the span was slung upon a movable gantry, and by it deposited upon the columns prepared to receive it. In this manner span after span was added, as many as ten being placed in a week, representing a length of 500 feet of railway.

The decking is of arched plates, finishing to 2 feet 6 inches wide and 15 inches deep, made water-tight by asphalt placed in the V-channel between the arches. This form of flooring (known as Hobson's arch plate system), first used on this railway, is being extensively nsed elsewhere. It is, for its weight, of great strength and stiffness, and is readily made water-tight. The flooring is made of ordinary iron plates and tees. The plates are 46 inches wide by $\frac{6}{16}$ inch thick, and vary in length from 22 feet to 27 feet. The tees are 4½ inches × 3½ inches × $\frac{7}{16}$ inch section, and are of lengths corresponding to the plates.

In order to ascertain the exact strength of the floor, some actual sections were tested to destruction, and the deflections at each increase of load were carefully tabulated with the following results:

Test.—(*a*) Three sections of floor measuring 7 feet 6 inches in width.

(*b*) Span 22 feet, ends resting upon supports.

(*c*) Load distributed over four points corresponding with the positions of the rails.

Test Load. Tons.	Deflection at Center. Inches.
30	nil
35	¼
40	$\frac{7}{16}$
50	$\frac{9}{16}$
60	¾
70	$\frac{15}{16}$
80	1⅛
90	1¼
100	1$\frac{9}{16}$
110	2 (limit).

The floor plates ultimately collapsed by the total rupture of the T-irons at 163 tons, and with a deflection of 10 in. It is hoped that members may be able to see the actual construction of the decking at the north end. A short description may, therefore, be of interest. The flat plates are delivered sheared to exact length and width. Six of them at a time are heated in a long oven (to a cherry-red heat), whence they are separately hauled out endways into a hydraulic press, which bends them to the required shape. After cooling upon a grid or frame where they are tightly held to prevent change of form, they are taken to a multiple drilling machine, which drills the requisite rivet holes (about two hundred) in two operations and in fifteen minutes. After the end angle irons, for attachment to the main girders, are added, the decking is completed by riveting mechanically the covered plates to the T-irons forming the lower member. These combined operations are performed at the rate of forty to forty-five plates per day.

There are to be fifteen stations. They are built upon iron girders and columns, the platforms being about 115 feet in length by 12 feet wide, and 3 feet above rail level. Access to the platforms is gained from the street level by four staircases at the more important stations, and on each platform a waiting shed is provided with pay offices and turnstiles. An extensive carriage shed is erected near the Hornby Docks, with five lines of way running through at the same rail level as the main structure of the railway, and underneath, on the ground floor, is the repairing shop, to be equipped with the necessary tools. The railway is to be worked by electricity, generated at a station, for which twelve of the arches, forming the viaduct which carries the coal sidings of the Lancashire and Yorkshire Railway, have been appropriated, near the Bramley Moore Dock, and about the middle of the line. At this station are three engines, each capable of working up to 400 I.H.P., and each driving a separate Elwell-Parker dynamo. The electricity will be carried north and south along the railway by a steel conductor, placed on porcelain insulators, supported upon cross timbers between the rails of each line. Hinged collectors of cast iron, sliding upon this conductor, will make the connection between the motors upon the train and the dynamos at the generating station. The motors are not placed (as on the City and South London Railway) upon a separate locomotive, but are carried by the passenger carriages themselves.

A train will consist of two carriages, each to seat fifty-six passengers, and provided with a motor at one end. The carriages will be so coupled as to give a motor at each end of the train, and the motors will be so connected together as to be controlled from either end by the driver, who will always travel at the front end, changing ends upon arrival at a terminus, and carrying with him a key, without which the motors cannot be operated. All the carriages will be exactly alike, and will contain compartments for two classes of passengers, with through communication from end to end of the train under the control of the guard. A train loaded with passengers will weigh about forty tons. The trains will be lighted by electricity, and are fitted with the Westinghouse brake, deriving compressed air from a reservoir on the train, the reservoir being charged after each journey. This system of working the brakes has been found to answer well on the City and South London Railway. The generating station will contain at first six boilers of the Lancashire type, each 30 ft. long by 8 ft. diameter, with a working pressure of 120 lb. and stoked mechanically. The engines are horizontal compound condensing, by Messrs. John Musgrave & Sons, Bolton. It is intended to commence running with a five minutes' service of trains, but the generating plant is designed to be capable of working a three minutes' service, and the journey from end to end of the railway (inclusive of stoppages) is to be performed in half an hour. There are thirteen stations upon the dock portion of the line, and a novel feature on the railway will be a system (Timmis') of automatic signals at all the intermediate stations, in place of the ordinary signaling arrangements. These signals will be electrically worked by the trains themselves, and considerable saving in the working expenses will result. The permanent way, it will also be noticed, is of a novel construction. Longitudinal sleepers, resting directly upon and keyed to the arched decking, support the rails and the electric conductor. As already stated, there is no ballast between the permanent way and the structure, and the working charges in connection with the maintenance and repair of the permanent way should be exceptionally light. The total cost of the railway, including equipment, will be about £85,000 per mile.

Mr. J. W. Willans is the contractor for the works, and the Electric Construction Corporation, Limited (Wolverhampton), are providing the electrical equipment and the carriages. The engineers, Sir Douglas Fox and the author, have been represented on the work by Mr. Francis Fox and Mr. S. B. Cottrell, and Mr. F. Hudleston has had charge of the work (for Mr. Willans), and to him is due the credit for the design of the tilting and swing bridges referred to. It is intended to open the line for traffic very shortly.

ALUMINUM ELECTRO-PLATING IN ARCHITECTURE.

The tower that surmounts the magnificent pile of buildings that compose the new City Hall of Philadelphia will be 547 feet 3½ inches high when completed. A part of this height is stone and the remainder will be cast iron with wrought iron bracing.

The late Mr. MacArthur, the architect of the public buildings, fully appreciated the difficulty and expense involved in keeping the iron work painted and free from rust. It was estimated that it would cost $10,000 per annum. He proposed to make the outer skin of aluminum. But the high cost of that metal prevented its use, and the clock story, which is the beginning of the iron work, was cast in iron, and to preserve it from rusting it was intended to dip the different pieces in boiling linseed oil. When, on the death of Mr. MacArthur, Mr. John Ord succeeded him as architect, he (Mr. Ord) suggested the iron work should be electroplated with aluminum to keep it from rusting, and after fully considering the matter it was determined to first plate the iron with a thick coat of copper, which, by experience, was known would protect iron, and then put a finishing coat of aluminum over the copper so as to make it harmonize with the rest of the tower, and prevent the copper from turning green and becoming unsightly.

In the fall of 1891 at the works of the Tacony Iron and Metal Company, Tacony, Pa., who have the contract for the iron work of the tower, the construction of a building 120 feet long by 60 feet wide was begun under the supervision of Mr. Francis Schumann, the president of the company, and was finished early in 1892. Mr. J. D. Darling, of New York, had been appointed manager of the new plating works, and it was determined to use his process for plating with aluminum. By April the huge tanks had been put in place, the electrical installation completed and the different solutions to be used in plating made and run into the tanks, and the largest electro-plating plant in the world was ready to begin on the largest work ever undertaken.

The size of the largest castings determined the size of the tanks. These were the columns and pilasters that surround the clock story. They are 26 feet long by 3 in diameter at the lower end. Therefore, the tanks were made 28 feet long by 4 feet wide, by 5 feet deep, and hold about 3,800 gallons when filled to the proper height. (The tank that holds the aluminum solution was made 8 feet deep for special work and holds 7,000 gallons.) They rest in cement pits in two parallel rows of three each, as shown in the illustration, and when the solutions were run in, water was admitted into the pits at the same time. The object of this was twofold—the water on the outside of the tank keeps it from leaking and also balances the hydrostatic pressure of the liquid within and prevents bulging. Over the center of each row of tanks are I beams properly supported from the girders, and continuing for 30 feet outside of the building, on which run trolleys with differential hoisting blocks attached. To the two ends of the column or pilaster, spiders with a central projecting trunnion are fitted, by means of set screws, and wrought iron slings with a bearing on one end are hooked to the tackle and the end containing the brass bearing is passed over the trunnion. The column when hoisted is thus free to turn on its axis. The operation of plating a column is as follows: The column is placed on a truck resting on a narrow gauge track, of which there are two running into the plating shop. It is then run under the projecting I beam, and, the slings being adjusted, it is hoisted clear of the truck. By means of a windlass fastened to the side of the building and ropes running over guide pulleys, it is then pulled along the I beam over the first tank, which is of iron and contains a strong solution of caustic soda heated by a steam coil; it is lowered in and boiled for several hours until all the grease and oil is dissolved off. It is then raised and, after thorough washing with water from a hose, is pulled over and lowered into the second tank and pickled with dilute sulphuric acid until all the rust and scale are dissolved and loosened.

It is then taken to the extreme end of the building and thoroughly cleaned by the vigorous use of steel brushes and plenty of water. It then receives its first coat of copper in the third tank, which contains a cyanide plating solution. When the metal is coated with copper it is removed from the bath, and any holes are soldered, the copper giving a good ground for the solder to adhere to. From there it is transferred to the second row of tanks and, after having been coated with paraffine wax inside, is lowered into the fourth tank, which contains an ordinary acid copper plating solution. There it receives a heavy coat of copper (about 16 ounces to the square foot of surface), then, after having the paraffine boiled off, it enters the fifth or aluminum tank, and, after receiving a heavy deposit of aluminum, 2 to 3 ounces to the square foot, is washed with pure water in the sixth tank and run out of the building and placed on a truck on the other track ready for removal. There are also two smaller tanks shown to the left in the illustration for plating small work. The total amount of surface to be plated will be about 100,000 square feet. The plating current is furnished by four dynamos, the largest of their kind ever built in the country for purely electro-plating purposes, through copper conductors 6 inches wide by ½ inch thick, which run underground and alongside the different tanks. These are insulated there with resin run in while melted. The dynamo shown to the left feeds the alkaline copper tank and develops 1,000 amperes at a pressure of 6 volts. The middle one develops 2,000 amperes at 8 volts and furnishes current for the aluminum tanks. The two to the right are coupled together and develop 4,000 amperes at 2½ volts, which feeds the acid copper tanks.

The columns and other pieces are brought into the electric circuit by wires passed around them like slings, and attached at the ends to a conducting brass bar over the tanks.

In the cyanide tank a current density of 3 amperes to the square foot is employed; in the acid tank 10 amperes, and in the aluminum tank 8 amperes.

As it is often asserted that aluminum cannot be deposited from an aqueous solution, the following information furnished by Mr. Darling may prove of interest: Although aluminum is generally credited with indestructible qualities, and high resistance to corrosion, it has but few qualities that would make it advantageous as an electro-deposit upon other metals; for while, in a massive state, it resists atmospheric action and retains a certain brightness for a long time, when it is deposited electrically from an aqueous solution, which deposit is of necessity of a more or less porous nature, it soon tarnishes and assumes a dull bluish white color when exposed to the direct action of the elements. But for a protective coat, say for copper, for which purpose it is used on the tower, it answers very well, as the slight superficial oxidation that takes place protects the metal underneath from further attack, and the neutral color that it assumes harmonizes well with the stone work of the tower.

For interior decorative work which is not exposed to the weather and can be protected by a coat of lacquer, some very beautiful and lasting effects can be produced by its use, as it can be finished with a fine "mat" or "satin finish" which is as white as that of silver. This finish may be produced directly in the bath. It is also easily polished.

Aluminum is, no doubt, more difficult to deposit than any other of the common metals. This is because of the high voltage necessary to decompose aqueous aluminum solutions, and its tendency to redissolve after being deposited. We have not got the thermal data required to calculate the potential difference or electro-motive force necessary to decompose the different aqueous solutions of aluminum, but reasoning by analogy, it must be several volts in each case, and as water requires only a minimum electro-motive force of 1·5 volts to decompose it, it would seem at first glance that a compound which requires over two volts for its decomposition in aqueous solution would involve the decomposition of the water, and, therefore, would be impossible. But in reality this is not so, as may be seen in the case of caustic soda, which requires over two volts. Yet sodium may be obtained by its electrolysis if mercury be present to absorb it and protect it from the water.

The fact is that when two substances are present requiring different E. M. F. to decompose them, if the E. M. F. is high enough to decompose the higher compound, the current is divided between them in some ratio decomposing them both, and I find that by using a solution of aluminum that has but a slight dissolving effect on aluminum, with a density of current of 8 amperes to the square foot, with sufficiently high voltage (6½ to 7), aluminum can be deposited on the cathode at the rate of one gramme per hour per square foot, in a reguline state, and with higher currents it can be deposited much quicker, but will be in a pulverulent state, which does not adhere.

MR. SAMUEL W. FAIRCHILD, of New York City, has been appointed one of the commissioners to represent the State of New York at the World's Columbian Exposition. Mr. Fairchild is well known as the president of the New York College of Pharmacy.

The Bot Fly of Human Beings.

Apropos of our editorial review of Prof. Blanchard's summary of the Oestridæ which burrow beneath the skin of man, we may mention an interesting communication which we have just received from Mr. David Logan, now connected with the Gypsy Moth Commission, of Massachusetts. Mr. Logan writes us that he has been familiar with the species having this disagreeable habit, first in Honduras on the Rio Tinto, but more abundantly on the Rio Magdalena, near Mompos and upon the River Sinu, thirty leagues south of Carthagena, in the United States of Colombia. In his nineteen years' experience in tropical forests he estimates that he has had at least a hundred of these parasites in different parts of his body, and at one time had eighteen of the maggots squeezed out of his back. He had been for weeks in the woods hunting mahogany, and there were neither cattle nor people anywhere around. It was, in fact, in a perfect wilderness. He is in doubt as to whether the eggs are laid on the skin or upon the bushes and come off upon the clothing of people passing. Naked Indians, he states, had not one-tenth as many as whites who wore shirts.

Mr. Logan further states that the natives believe that the grubs are produced by a species of yellow mosquito, and have named the larva *gusano de mosquito*. The back and shoulders of human beings appear to be specially subject to attack, although the *gusano* sometimes shows itself in other places, and Mr. Logan was once attacked in the upper lip. The first evidence of the presence of the grubs in the skin is the appearance of a little swelling resembling a small boil, not painful, but giving to the victim a feeling of uneasiness. On close observation a minute orifice may be seen in the center of this swelling. When first detected the larva is usually of about the size of a pinhead. It works chiefly at night and not continuously, but intermittently. Mr. Logan had never kept specimens in his person for study or experiment, but at one time had one for about six weeks in his shoulder. It was at this stage at least one inch long when contracted, and when elongated about an inch and a quarter in length. There were rings around the body apparently covered with minute hairs or spinules, the body being narrowed at the ends and much thicker than the head. The common remedy adopted was to place a piece of leaf tobacco over the perforation in the skin, and soon after the maggot could be squeezed out.

As to the deposition of the eggs we have information from other observers that the flies have been seen to oviposit on the skin, and it is easily conceived that the young grubs will more easily travel and get purchase to enter the skin where persons are clothed than otherwise. The absence of cattle or people from the locality on the Sinu is not necessarily an argument in favor of oviposition upon vegetation, since the insects may, and undoubtedly do, breed in wild animals. It is likely that the species concerned is *Dermatobia noxialis*, commonly known in the Spanish Americas as *Ver macaque*.—*Insect Life.*

Corean Paper.

In Corea the manufacture of paper is one of the most important industries. Touching this manufacture and the uses to which the finished product is put, the consul-general of the United States at Corea in a recent report says that in addition to its use for writing and for books, it is employed in a great diversity of ways. It serves as string, and in the manufacture of lanterns, fans, umbrellas, shoe soles, hats, boxes, and coats. It is also used for covering floors, walls, and ceilings, and stretched on frames supplies windows and doors. Corean paper is highly prized in China and Japan, and is especially sought for the manufacture of umbrellas. It is made from a bush of the mulberry order (*Broussonetia papyrifera*), which is indigenous, growing in many parts of the kingdom, but thriving best in the moist, warm climate of the south. It is chiefly grown from cuttings for this especial purpose, and the wild and cultivated plants are said to be of equal value. The bark, which alone is used, is generally gathered in the spring, and it is boiled for a long time in water in which a quantity of wood ashes has been mixed, until it becomes a pulp, the mass having been beaten during the whole time of the boiling. Fine bamboo screens are then placed in shallow wooden vats, and a ladleful of the pulp is evenly spread over the screen by a dexterous circular motion of the hand. This operation is repeated once or twice, or as often as may be necessary—the more frequent the operation, the finer the paper—and the screen is allowed to drain into the vats until a proper consistency is reached, the drippings being thus saved. They are placed on a hot floor to dry. After the drying has proceeded far enough the paper is again laid on a hot floor and ironed by hand. The long lines in the paper show strands of the bamboo screens, and their nearness, distinctness, or absence indicate the fineness or otherwise of the paper. They are almost imperceptible in some grades of paper, while in others they are distinct and far apart. The province of Chulla is the chief seat of manufacture.