IMPROVED VEHICLE AXLE.

We give an engraving of a novel vehicle axle recently patented by Mr. Edwin Firth, of Providence, R. I. The spindle, A, is provided at its outer end with a revolving pin, C. The end of the spindle has a recess to receive a sleeve in which the pin, C, is journaled, and is provided at its inner end with a flange to hold it in place. The sleeve is screwed in the end of the spindle, and retained permanently in the recess by a pin, D, driven transversely through a groove in the end of the spindle and the wall of the sleeve.

The pin, C, adjoining the end of the spindle is provided with a square enlargement or nut having its outer end rounded and screw threaded. The axle box is secured in the usual manner in the hub. The inner end of the spindle has a flanged collar to receive the inner end of the axle box, between which and said collar there is a washer of leather to prevent sand and grit from entering the bearing. The outer end of the axle box has a transverse pin, E, which, when the hub is adjusted upon the spindle, bears against one of the sides of the nut or enlargement upon the revolving pin, C. It will thus be seen that when the wheel revolves, the pin, C, is caused to revolve at the same rate of speed. The end of the axle box is threaded to receive the lubricating cap or nut, B, which is provided with a diaphragm, having an opening which is screw threaded to receive the end of the revolving pin, C, and provided with grooves, through which the lubricant may pass from the chambered nut or cap, B, to the bearing. This cap has a plug, which is removed when lubricating material is to be supplied to the cap.

The nut or cap which serves to secure the wheel upon the spindle revolves with the wheel, and at the same rate of speed, as though it formed an integral part thereof. By this means the necessity of making right and left hand threads, according to the direction of revolution, is avoided, thus simplifying the manufacture and lessening the expense of production. It is impossible for the nut or cap to come off by ordinary usage. When the nut is screwed into position, it makes a liquid-tight joint at the outer end between the axle-box and spindle, completely covering the end of the latter, and making it impossible for sand and grit to enter the bearing. The nut or enlargement upon the pin, C, as it revolves, creates a vacuum, by which the oil is drawn out of the chambered nut and supplied to the bearing rapidly or slowly, according to the speed of revolution. No oil can be lost or wasted, since it must of necessity pass direct to the bearing.

This improvement is of great service in taking up slack caused by wear upon the spindle. The cap or nut, B, when adjusted, engages threads upon the axle box, and also upon the revolving pin, which forms an integral permanent part of the spindle. The wheel or the axle-box is thus held in a certain position in relation to the spindle. If in this position it becomes loose or slack, it is only necessary to unscrew the nut from the end of the axle box, forcing the latter upon the spindle until tight, and again adjusting the nut, which must then, before it takes with the thread upon the end of the axle box, be screwed down upon the pin, C, a sufficient distance to compensate for the wear.

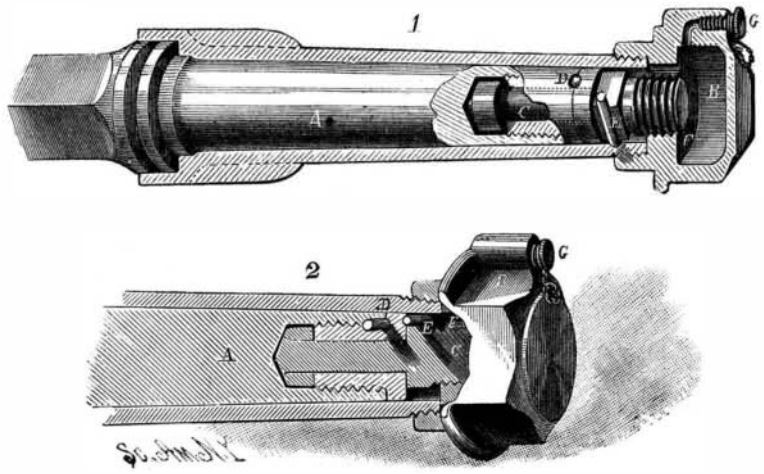
For further information address Mr. Edwin Firth, 118 Grove St., Providence, R. I.

A New Cattle Disease.

At a recent meeting of the Southern Counties Veterinary Medical Association, held at London, England, Mr. G. Fleming, Army Veterinary Inspector, read a paper on a new disease which he had discovered to prevail extensively, chiefly among cattle, in England, and the nature of which has until now been hidden in obscurity. It manifests itself by great enlargement and induration, as well as ulceration of the tongue. It also attacks the bones of the face and jaws, appears inside and outside the throat in the form of tumors, and is very destructive, especially among young stock. Mr. Fleming, by means of morbid specimens from the tongues and heads of calves, as well as by microscopical preparations, clearly demonstrated the affection to be due to the presence of a minute fungus, which probably obtains an entrance to the tissues either through the mucous follicles or an abrasion in the mouth. From the peculiar manner in which the fungus grows, and the radiating arrangement of its branches, it has received the name of *Actinomyces*, and it is consequently proposed to designate the disease *Actinomycosis*. It has hitherto only been noticed in Germany and Italy, and no fewer than sixteen cases are reported in the German medical journals as having been observed in man. Mr. Fleming produced some evidence to show that the fungus could be successfully implanted from a diseased to a healthy animal; and one of the German cases, in which a man was affected, would lead to the suspicion that it may be communicated from the lower animals to our own species. Instances were given in which the microphyte had also been found in pigs, goats, a horse, and a dog.

Drifts and Tunnels.

These two terms are in common use in mining reports, but are not always correctly used or rightly understood. A drift is a tunnel, but a tunnel is not always a drift. Of the two sorts of mining tunnels, the drift and the cross cut, the former always follows or is intended to follow the vein.

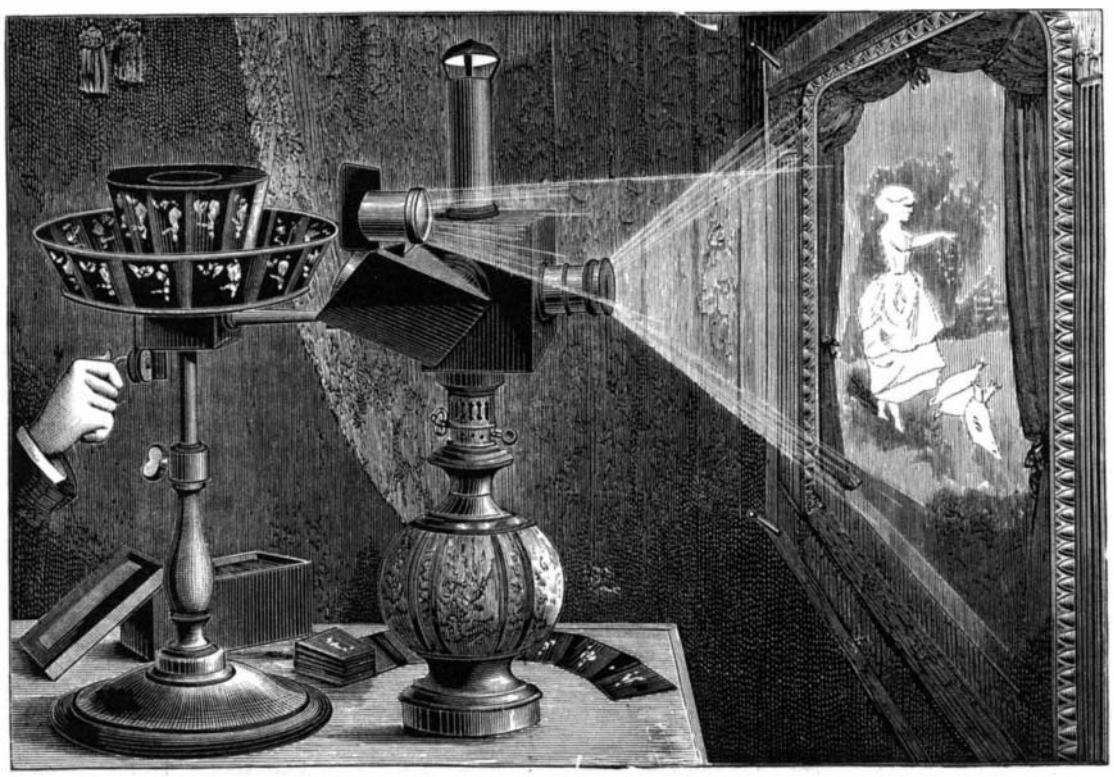


FIRTH'S VEHICLE AXLE.

When the vein is missed by following a wrong lead, a cross-cut may be necessary to find it again. This is legitimate, but not all cross cuts can be so described. Too frequently, as the *Mining Record* points out, the main object of the cross cut seems to be to eat the treasury stock and "down" mining companies. This operation, our contemporary says, has cost Hillsdale County (Colorado) about $5,000,000 in the past five years. "The cross cut in mining is frequently inevitable, but the mining company that undertakes to determine the value of a prospect by a cross cut tunnel costing from one to thirty thousand dollars is"—not wise.

THE PROJECTING PRAXINOSCOPE.

We have already made known to our readers an optical apparatus constructed by Mr. Reynaud, the "Praxinoscope," which produces with remarkable clearness, by reflection, an animated illusion in the center of a prism of plane mirrors of the successive poses of a person in motion. We have also shown how, in the "Theater Praxinoscope," such illusion is rendered completer by an ingenious arrangement which allows the animated object to appear on an appropriate ground or scene.



REYNAUD'S NEW PROJECTING PRAXINOSCOPE.

The recent remarkable experiments in instantaneous photography, which have permitted the different attitudes of man and animals being caught and fixed, seem to us to give a special interest to this sort of researches, and to consequently call attention to apparatus that allow of such attitudes being brought together after they have been fixed, so as to make a synthesis of them, so to speak, and to thus reproduce the action of life itself.

Such is the purpose of the new instrument that we herewith figure—the "Projecting Praxinoscope"—by means of which the images obtained are projected upon a screen so as to be visible to the entire audience.

By a modification of the lampascope Mr. Reynaud obtains, with the aid of an ordinary lamp, both a projection of the scene (through the objective seen at the side of the lantern) and a projection of the animated object through an objective seen in front and a little above the lantern. To effect this, the poses or phases that form an object are drawn and colored on glass, and united into a band by connecting pieces of cloth. One of these flexible bands is placed in the flaring crown of the instrument, which latter contains apertures that correspond with the poses of the object.

To understand the direction taken by the luminous rays, we must imagine a condensing lens, which, being near the flame of the lamp is not visible in the figure, and also a plane mirror inclined at an angle of 45°, which reflects the luminous fascicle and causes it to traverse the pictures behind the apertures in the crown. This luminous fascicle, which is again reflected by the facets of the prism of mirrors, finally enters the objective, and the latter transforms the central virtual image into a real and enlarged one on the screen.

By making the two parts of the apparatus converge slightly, the animated object is brought into the middle of the scene, where it then seems to undergo its motions as if endowed with life.

A moderate and regular motion is communicated to the instrument by means of a small winch affixed to the support. This apparatus furnishes with an ordinary moderator lamp pictures that are well lighted and that have a very curious effect. It will, then, allow of animated projections being obtained without the aid of a special luminous source, simply by the use of a common, every-day lamp.—*La Nature.*

An Asphalt Mortar.

The *Centralblatt der Bauverwaltung* describes a patented composition made at a factory in Stargard, Pomerania, which has for some years past been used with perfect success on the Berlin-Stettin railway for wall copings, water tables, and similar purposes requiring a waterproof coating. The material is composed of coal tar, to which are added clay. asphalt, resin, litharge, and sand. It is, in short, a kind of artificial asphalt, with the distinction that it is applied cold, like ordinary cement rendering. The tenacity of the material when properly laid, and its freedom from liability to damage by the weather, are proved by reference to an example in the coping of a retaining wall which has been exposed for four years to the drainage of a slope 33 feet high. This coping is still perfectly sound, and has not required any repair since it was laid down. Other works have proved equally satisfactory. In applying this mortar, as it is termed, the space to be covered is first thoroughly dried, and after being well cleaned is primed with hot roofing varnish, the basis of which is also tar. The mortar is then laid on cold to the thickness of about three-eighths of an inch, with either wood or steel trowels, and is properly smoothed over. If the area covered is large, another coating of varnish is applied, and rough sand strewn over the whole. The waterproof surface thus made is perfectly impregnable to rain or frost, and practically indestructible. The cost of the material laid is estimated at not more than 5d. per square foot; and it is stated that this price can be reduced by at least 1d. for large quantities put down by experienced workmen.

How Hogs Prevent the Renewal of Pine Forests.

A correspondent writing from Johnsonville, S. C., incidentally mentions a curious instance of the influence of animals in controlling or preventing forest growths. It appears that the fondness of hogs for the juicy roots of young pines leads them to seek them assiduously, so that where hogs are allowed to roam in that region one can hardly find a young long-leafed pine in a thousand acres of pine forest. There being no young trees to take the place of the old ones used up by the lumbermen and turpentine gatherers, that species of pine timber is rapidly being exterminated.

A FRENCH chemist claims to have discovered a method of overcoming the danger threatening vineyards from the ravages of the phylloxera. His process is to inoculate the vines with the phenol poison. The phylloxera do not attack plants thus treated, and are extirpated for want of food. The vines are in no way injured by the inoculation process.

The Distribution of Carp.

The United States Fish Commission have been distributing large numbers of young carp for stocking ponds in various parts of the country. Over 40,000 were sent out during the first ten days of November, and from 50,000 to 60,000 more were awaiting distribution. Among the earlier shipments were 1,000 to Pennsylvania, 2,000 to New York, 6,600 to New England States, 1,200 to Ohio, 12,400 to Kentucky, 1,600 to Virginia, and 16,000 to Iowa and Minnesota.

In reply to inquiries by a correspondent of the *Tribune*, Professor Baird said that from 12,000 to 15,000 carp ponds in all have been stocked since the commission began the work. About 10,000 applications were then on file from different parts of the Union, and new applications were constantly received at the rate of fifty to one hundred a day. As the value of the carp for food, the ease with which it is kept, and the rapidity with which the species multiples, as well as that of its growth, become known in a country or neighborhood, the demand for young fish to stock new ponds of course increases. The hardy constitution of the carp renders its transportation alive and in good condition from place to place an easy matter, and is another strong point in its favor. Small tin buckets partly filled with water are now extensively used for this purpose. Each of these buckets has a capacity of about one gallon, and is fitted with a cover, in which are two small holes for the admission of air. Twenty young fish can make a long journey by express in one of these buckets very comfortably without a change of water. A year or two ago, as an experiment, a common tin bucket containing a few live carp was sent by express to Commissioner Blackford, in New York, with a request that if the fish were alive when he received them he would reship them to Washington without changing the water. He did so, and when they reached Washington again, after a week's absence, the fish were found in good condition and did not appear to suffer after remaining another week in the same water, although the bucket stood in a warm room in the meantime. The small buckets mentioned are much used in sending carp to individual applicants not too remote from Washington. Where a number of applicants live in the same vicinity a dozen or two dozen buckets are packed in a strong wooden crate and sent by express. For larger shipments ten gallon tin cans are used, one of which will accommodate from 150 to 200 young fish.

It has been found by experience that the young fish taken from the water in the spring appear to be more tender and do not bear transportation so well as those taken in the autumn. It is found, too, that the growth of the carp in the South is about twice as rapid as in the North. There is a carp now at the Smithsonian Institution which, as a young fish an inch or two in length, was sent to Georgia and placed in a pond where it remained less than a year, when it was sent back to Washington weighing seven pounds. In the latitude of New York and New England, one of Professor Baird's assistants informed the correspondent the average yearly increase in weight the first year is about three to three and a half pounds. Carp weighing from three to six pounds are occasionally seen on the tables of fish dealers in the Washington markets, having been taken in the Potomac, into which it is supposed they escaped during a season of high water when the carp ponds were invaded by the river. These fish are esteemed a delicacy and sell at good prices.

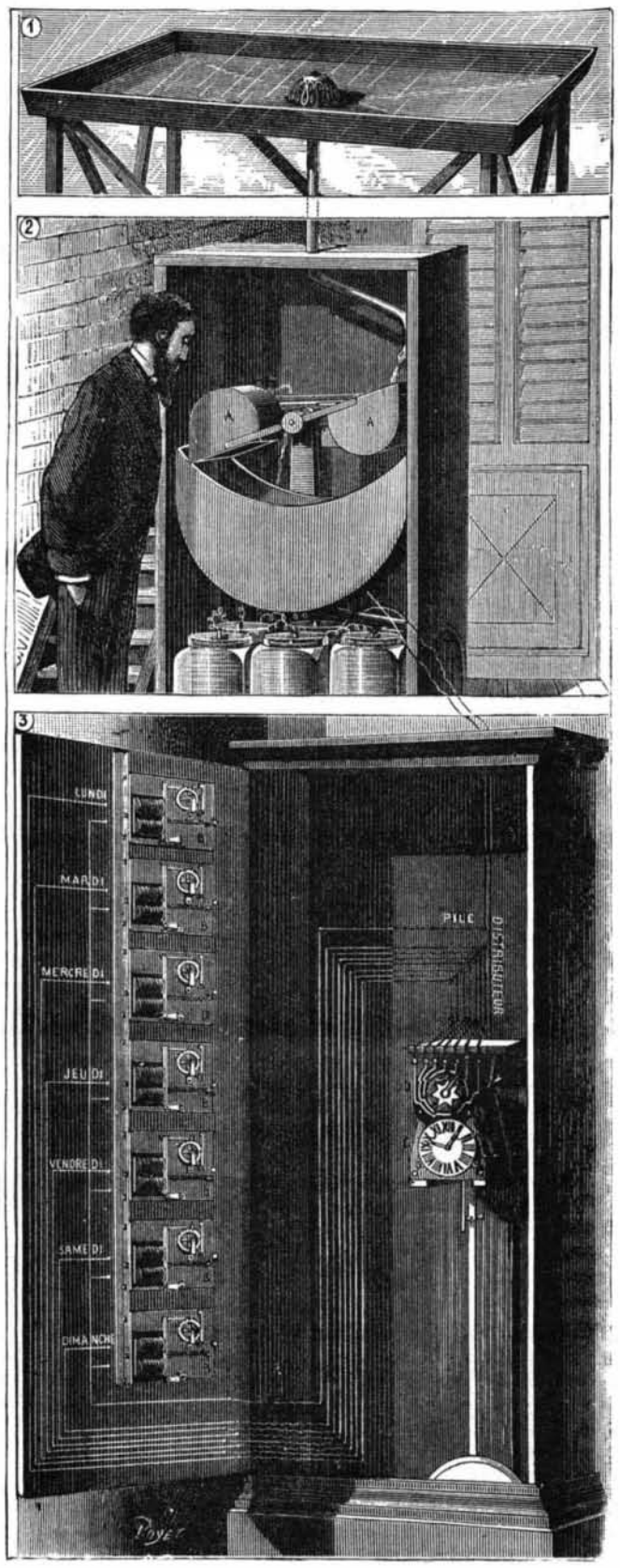
The Weehawken Tunnel.

The bore through the Palisades of the Hudson River, at Weehawken, N. J., opposite New York city, is now complete, though it will probably take six months more of work to finish the tunnel and its approaches. The eastern approach has been cut through solid rock a distance of 150 feet. Its width is 56 feet. The tunnel is 4,000 feet in length, 27 feet wide, and 21 feet high. The greater part of the cutting, 3,400 feet, has been done since January, 1882. The estimated cost of the tunnel was about $1,250,000; but it is thought that the actual cost will amount to much more. The tunnel has been cut in sections, the inner ones from five shafts from the upper surface of the bluff. These shafts, which have an average depth of about 150 feet, will be useful for ventilating the tunnel. Seventy compressed air drills have been constantly employed. A recently invented and very powerful steam shovel has done effective service in removing material and loading cars.

It is estimated that this year's output of the Wood River and Sawtooth mines in Idaho will be about $3,000,000, or double the yield of the entire Territory three years ago.

A Large Driving Belt.

P. Jewell & Sons, Hartford, Conn., have lately finished a four ply belt, 124 feet long, 38 inches wide, and 1 inch thick. It weighs 1,834 pounds. This belt is intended for a rolling mill in the Washburn & Moen Wire Works, Worcester, Mass., and is expected to transmit more than 1,600 horse power from a 24-foot pulley to a 10-foot pulley, with a belt speed of 5,200 feet per minute, almost one mile. The belt is made of the thickest and best selected hides, four of them making the thickness of the belt. These thicknesses are secured by rivets, and the joints by "scarf joints" cemented.



Figs. 1, 2, and 3.—PLUVIOMETER AT THE COMPTOIR D'ESCOMPTE, PARIS.

METEOROLOGICAL APPARATUS AT THE COMPTOIR D'ESCOMPTE, PARIS.

Among the clockwork and meteorological apparatus installed in the "Pas-Perdu" hall of the Comptoir d'Escompte, of Paris, there are a few that have appeared to us to be sufficiently interesting to be brought to the attention of our readers. Among these are a pluviometer and an electrical anemoscope, which, thanks to the kindness of M. Collin, the inventor and manufacturer of one of them, we have examined in detail. We give herewith a sufficiently complete description of them to allow their operation to be understood.

The arrangement of the building precluded the idea of causing the rain to directly actuate the registering mechanism, and the distance from the roof to the apparatus necessitated a series of conduits which, through their length, would have retained an appreciable quantity of liquid, and made the indications of the pluviometer inaccurate. For this reason M. Collin pursued his researches in another direction, and finally decided upon the electrical system, whose arrangement we shall now describe.

The apparatus consists of three parts: (1) a reservoir of given surface for receiving the rain; (2) a distributer; and (3) a registering receiver—the two latter being connected with a pile by an electric circuit.

The reservoir (Fig. 1), of a superficies of one meter, designed to collect the rain, is placed on the roof. Immediately beneath it, in the top story of the building, is installed the apparatus which we call a distributer, and into which flows the rain water that actuates it by its weight. This apparatus (Fig. 2) consists of an axle revolving upon two bearings, and carrying, fixed by the middle, an arm at each of whose extremities is adapted a small bucket, A. In a normal state the arm is almost horizontal, and there is always one bucket in a position to receive the rain water coming from the collector on the roof. Upon the same axle there is a piece with four cams, upon which there acts, to hold the axle, a lever carrying a regulating weight. This lever allows the axle to revolve under the influence of the weight of water contained in the bucket only under a pressure of a weight of 500 grammes, this corresponding to a layer of water of a half-millimeter in depth over a surface of one meter. Then every time a bucket turns over and empties, a half-millimeter has fallen on the roof.

Upon the same axle, again, there is a small ebonite cylinder carrying two strips of metal, two millimeters in width, set longitudinally into the whole length of the cylinder. Perpendicular to the axle there are two insulated strips of metal, carrying two terminals for the electrical circuit. The extremities of these strips rub over the cylinder without making a contact between them; but, when the axle in revolving presents one of the metallic parts to the friction of the strips, the latter became united metallically, and the rotary motion of the axle is shown by a closing of the circuit.

The receiver (Fig. 3), located in the grand hall on the ground floor, consists of a series of seven sets of wheelwork, B, B, B, etc., analogous to the counters employed in electrical clockwork. To each of these there is adapted a dial (seen externally in Fig. 6) which carries one of the following inscriptions: *Monday*, *Tuesday*, *Wednesday*, etc., up to *Sunday*. These dials are divided from 1 to 20 by figures, between which are a certain number of points, the figures representing millimeters and the points semi millimeters. The mean of the rain that falls per 24 hours in the latitude of Paris being 15 millimeters, this division is sufficient. It is upon these dials that are registered the electric currents sent by the distributer; but the rain that falls on Monday must be registered on the one carrying such an inscription, and so on for all the rest. To effect this, a clockwork regulator, I, whose mechanism actuates a circular commutator, D (Fig. 3), receives the electric currents coming from the distributer, and transmits them to the receiving dial that corresponds to the proper day. This commutator is arranged in the following way: Upon an ebonite disk there are fixed seven arcs of a circle, the unition of which constitutes a flat ring, each part of which is insulated and carries a terminal to which is attached a wire that runs to one of the seven receiving dials. In the center of the seven metallic parts there is an insulated axis to which is attached the copper wire coming from a pile whose zinc wire is connected with the distributer. This central axis is moved by a jumper that makes it revolve a seventh of a revolution every twenty-four hours, at midnight. It carries an index, or, better, a flexible strip whose extremity rubs against the arcs. The electric current sent by the distributer (Fig. 2) enters the regulator, C, then (Fig. 3) through the central axis, and escapes

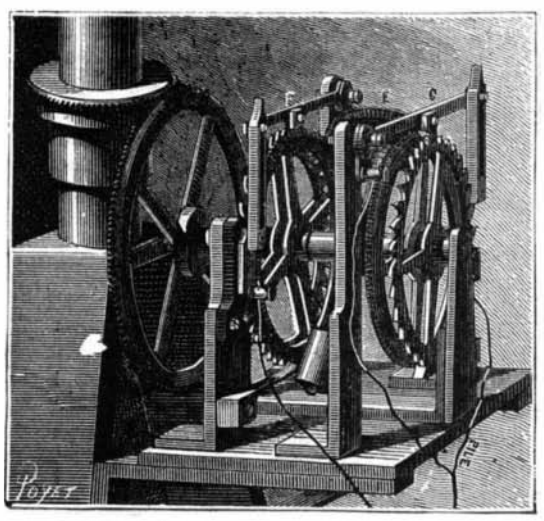


Fig. 4.—DISTRIBUTER OF THE ELECTRICAL ANEMOSCOPE.

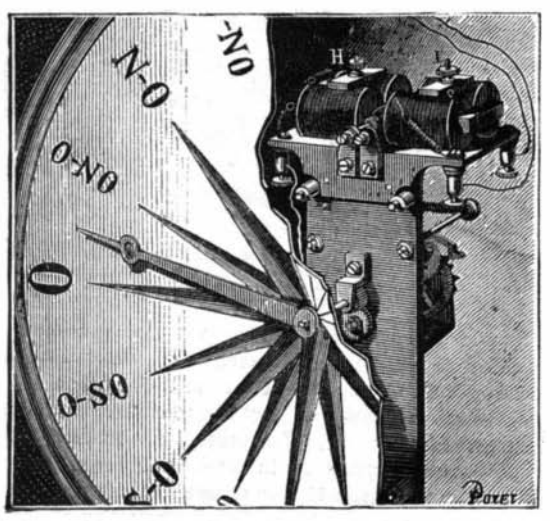


Fig. 5.—RECEIVER OF THE ELECTRICAL ANEMOSCOPE.