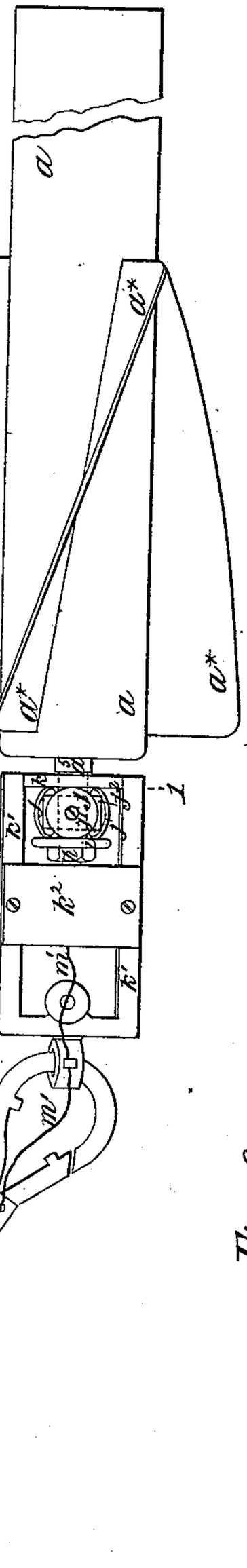
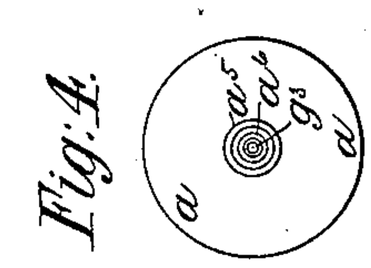
(No Model.)

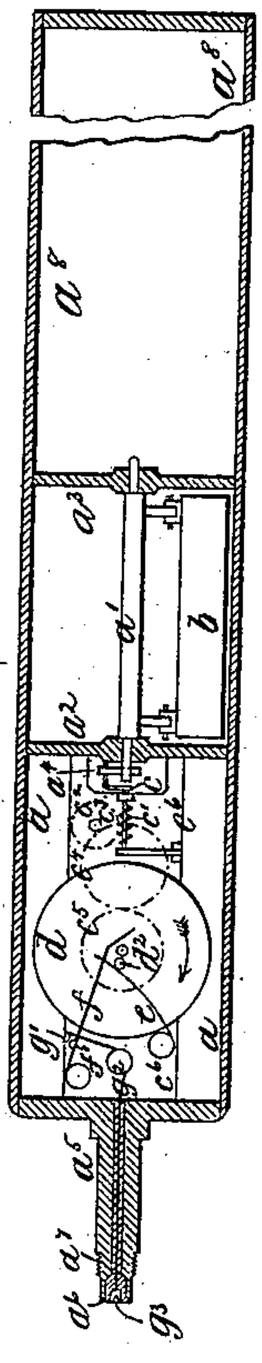
R. M. LOWNE.

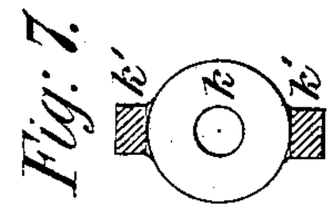
ELECTRIC LOG OR APPARATUS FOR ASCERTAINING THE SPEED OF SHIPS AND THE RATE OF CURRENTS.

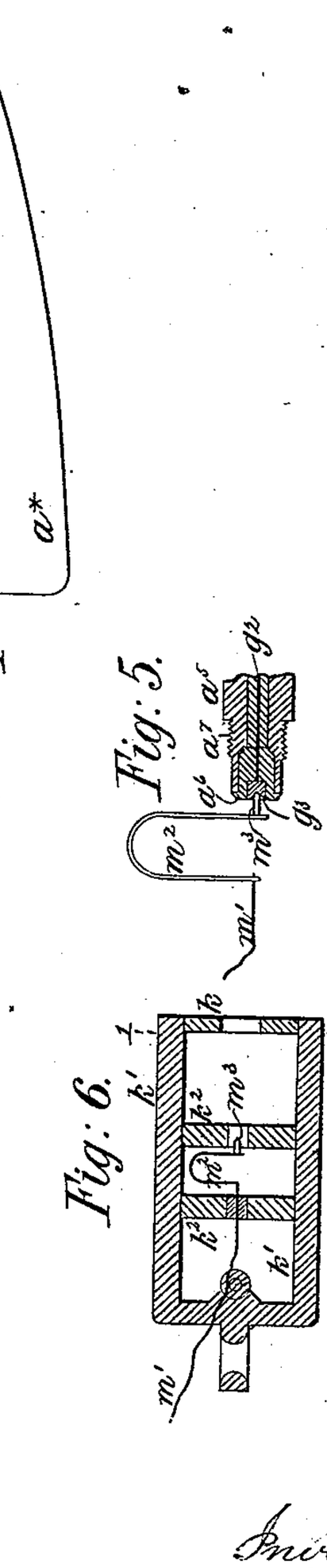
No. 272,724. Patented Feb. 20, 1883.











Attest

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ELECTRIC LOG OR APPARATUS FOR ASCERTAINING THE SPEED OF SHIPS AND THE RATE OF CURRENTS.

SPECIFICATION forming part of Letters Patent No. 272,724, dated February 20, 1883.

Application filed October 2, 1882. (No model.) Patented in England July 3, 1882, No. 3,128; in Belgium August 31, 1882, No. 48,749; in Italy October 23, 1882, and in France November 9, 1882, No. 150,574.

To all whom it may concern:

Be it known that I, ROBERT MANN LOWNE, a subject of the Queen of Great Britain, residing at East End Finchley, in the county of Middlesex, England, have invented certain new and useful Improvements in Electric Logs or Apparatus for Ascertaining the Speed of Ships and the Rate of Currents, an application for Letters Patent having been made in Great Britain, No. 3,128, dated July 3, 1882,) of which the following is a specification.

My invention consists of an improved method of insulating electrical conductors under salt-water, and of making and breaking an electrical circuit under salt-water or otherwise, and has for its object improvements in apparatus for recording by electricity the number of revolutions of a rotator which may be placed under fresh or salt water, and at any convenient distance from a recording apparatus.

In carrying my invention into effect I employ a rotator somewhat similar to that of the ordinary mechanical ship's log. The rotator is towed by means of a cable, one end of which is made fast to the ship, while the other end is attached to the rotator in such a manner that the rotator may revolve freely. The cable contains two insulated metallic conductors. The ends of these conductors are connected respectively to a recording apparatus on board ship and to the rotator under water. The purpose of the rotator is to make and break an electrical circuit at every given number of revolutions, which circuit, being made and broken, operates suitable mechanism in the recording apparatus on board ship, thereby recording the number of revolutions of the rotator.

Having thus briefly described the means I employ to enable me to carry out my invention, I will now proceed to describe the novelties and details thereof.

Figure 1 is a side elevation of an electric log or apparatus constructed according to my invention. Figs. 2 and 3 are longitudinal sections drawn at right angles to each other, and Fig. 4 is an end view of the rotator-case. Fig. 5 is a longitudinal section of parts drawn to an enlarged scale. Fig. 6 is a longitudinal section through the frame to which the towing-cable and the rotator are connected. Fig. 7 is a cross-section on the line 1 1 of Figs. 1 and 6. Fig. 8 is a plan of the friction-rollers, and Fig. 9 is a plan of the front disk or plate.

Like parts are marked with similar letters of reference in all the figures.

Now, according to my invention, the rotator is constructed of brass or any suitable metal, and is in the form of a hollow case, *a*, preferably cylindrical, with blades *a** fixed on the outside of the case, with their surfaces at an angle with the axis of rotation, as usual. The hollow case *a* of the rotator is hermetically sealed in any convenient way, in order to exclude water, and it contains all the apparatus for making and breaking contact. There is no fixed point outside the case to operate the mechanism inside, and I will now explain how this result is obtained.

Inside the rotator-case is suspended a weight, *b*, capable of revolving with its axis of revolution in a line with the axis of revolution of the rotator. This weight is attached to a spindle, a', the ends of which pass through holes in the plates a^2 a^3, fixed inside the rotator-case *a*. With this arrangement the rotator will revolve round the weight, the weight *b* and its spindle a' remaining stationary. The object of the weight *b* is to get a fixed point inside the rotator-case *a*.

Instead of the weight *b* being fixed to a spindle, it might be in the form of a ball or cylinder, supported so as to run round inside the rotator-case; but I prefer the weight and spindle.

Attached to one end of the spindle a' is a projection or carrier, a^4, which comes in contact with another projection or carrier, *c*, which is fixed to the worm c' or first wheel of a train of wheels, c' c^2 c^3 c^4 c^5, which operates a contact maker and breaker. The train of wheels c' c^2 c^3 c^4 c^5 and contact apparatus are fixed to a frame-work, c^6, which is fixed to the inside of of the rotator, and the frame-work c^6 revolves with the rotator. The first center of the train of wheels c' c^2 c^3 c^4 c^5 has its axis of rotation in a line with the axis of the rotator itself, and also in a line with the spindle a' of the weight *b*. When the rotator revolves the first center of the train of wheels (that of the worm c') is held stationary by means of the carrier a^3 and the sus-

pended weight *b*. The train of wheels c' c^2 c^3 c^4 c^5 gears into and runs round the stationary first center c', and so operates the contact maker and breaker.

The spindle a' of the suspended weight *b* might form the first center of the train of wheels itself; but I prefer to separate the weight *b* from the train of wheels.

The contact maker and breaker may be of any convenient and already known form; but the apparatus I prefer to employ for making and breaking contact, according to my invention, is as follows: I arrange a fly-wheel, *d*, free to move on its axis within or in a line with the axis of motion of the last of the train of wheels. This fly-wheel *d* is caused to revolve on its axis by a pin, c^7, which is fixed to and projects from the last, c^5, of the train of wheels, which pin c^7 comes in contact with a corresponding pin, d', fixed on the fly-wheel *d*. The fly-wheel *d* is attached from the last of the train of wheels, and gets its motion on its axis from the projecting pin. On the fly-wheel *d* is a second pin, d^2, which is arranged in such a manner as to operate a spring, *e*, for a certain distance of revolution of the fly-wheel *d*. After this distance is passed the spring *e* reacts on the pin d^2, causing the fly-wheel *d* to revolve independently. During this independent revolution of the fly-wheel *d* electrical contact is made and broken by means of any suitable arrangement of levers or otherwise.

The following is the arrangement I have found to answer: The pin d^2 of the fly-wheel *d* gives motion to the lever *f*, which causes the contact-point f' to come in contact with the contact g'. The points f' g' are kept in contact until the pin d^2 has passed the end of the lever *f*.

The object of the fly-wheel is to make a contact of longer duration than can be done during the releasing of a spring. The contact is made and broken during the time of the momentum of the fly-wheel, after the spring is released and ceases to react.

The electrical arrangement according to my invention is as follows: In my invention I make no attempt to insulate the wires and conductors which proceed from the zinc pole of the battery, this being non-oxidizing pole; but the wires and conductors which proceed from the copper or oxidizing pole I insulate in the manner which I will immediately explain.

All the oxidizable metallic conductors which proceed from the carbon or copper pole of the battery, but have to go under water, I cover with non-conducting material, and to connect such conductors with the contact apparatus within the rotator I employ a non-oxidizable metal, such as platinum. The platinum, although exposed to salt-water and in the electric circuit, technically speaking, "polarizes," and will not allow the current to pass if one cell of a battery is employed. A number of cells may be employed; but they must be coupled together for quantity and not intensity. If for intensity, water is decomposed, and the platinum no longer prevents the current of electricity from passing. Now, according to my invention, the object of employing platinum is to connect the two poles of a battery metallically with the contact maker and breaker without the entire intervention of non-conducting materials or stuffing-boxes and flexible diaphragms, as before used. The way I accomplish this is as follows: As before mentioned, the case *a* of the rotator is hermetically sealed and contains the contact apparatus. The contact is produced by bringing the two small metallic surfaces or points f' g' together, which when apart are insulated from one another. As is well understood, one of these points—that marked f'—is metallically connected through the frame c^6 with the case *a* of the rotator. The other, g', is insulated from the rotator by non-conducting material. The insulated point is connected to a platinum wire, g^2, which is brought through a tube, a^5, attached to the front end of the rotator-case *a*. This tube a^5 is in a line with the axis of rotation, and the wire g^2 is carried through its center. The space between the tube a^5 and the wire g^2 is nearly filled with gutta-percha or any material which is a good non-conductor, and at the same time impervious to water. At the end of the platinum wire before mentioned is attached a platinum center or contact-piece, g^3. This platinum center is let into a plug, a^6, of vulcanite, which plug a^6 is let into the tube a^5, and covers its end in such a manner that the platinum center g^3 forms the end of the tube a^5, and the extreme end of the rotator *a* is soldered up hermetically.

Outside the tube a^5, before mentioned, and near its end, is formed a screw, a^7, which carries a nut, *h*. This nut secures a first disk or plate, *i*, which, by the intervention of friction-rollers *j*, pulls the rotator *a* through the water. The friction-rollers *j*, according to my invention, are three wheels, attached through their centers by pins j' to a ring, j^2, which is fitted loosely over the tube a^5, before mentioned. These wheels or friction-rollers *j* revolve each on its own axis, and they are free to run round the tube or axis of the rotator. I arrange loosely over the tube a^5, and between the rotator-case *a* and the friction-rollers *j*, a second disk or plate, *k*. This disk or plate *k* has fixed to its edges a frame, k', which frame contains the end of the tube a^5, with its platinum center g^3, also the first disk, *i*, mentioned, and likewise the friction-rollers *j*.

The rotator *a* is pulled through the water in the following manner: The cable *l* is attached to the frame k', which imparts the pulling strain by means of the second mentioned disk, *k*, to the friction-rollers *j*. The friction-rollers *j* imparts the strain to the first mentioned disk, *i*, which is free to run on the friction-rollers. The first disk, *i*, and the rotator *a* revolve together. By this means all the pulling strain is borne by the circumferences of the friction-rollers *j*, the centers of the friction-rollers *j* merely serving to keep them in position.

I make metallic contact between the conductor *m* at the end of the cable *l*, which is connected with the copper pole of the battery, and the platinum center g^3 at the end of the rotator *a*, in the following manner: To the end of the conductor *m*, before mentioned, is soldered or fixed a piece of platinum or platinum wire, *m'*. The point is covered with non-conducting material, so that the platinum is the only conductor exposed to the water. This platinum end *m'* of the conductor *m* is connected by means of platinum or platinum wire in any convenient manner to a platinum spring, m^2, which is fixed within the frame *k'*, before mentioned, where it is protected by a cover, k^2. This platinum spring m^2 is arranged in such a manner as to press a platinum end or point, m^3, which forms part of or is fixed to the spring m^2, into the platinum center or contact-piece g^3, before mentioned. The platinum center g^3 revolves with the rotator *a*, while the platinum end or point m^3 is stationary with the frame *k'*. All the platinum parts are carefully insulated from every part of the apparatus, but may be entirely exposed to the water.

The conductor *n*, which is connected with the zinc pole of the battery, is metallically connected with any convenient kind of swivel *o*, suitable for dragging the rotator, so that the zinc pole of the battery is connected with the whole of the rotator.

In sea-water it is not necessary to metallically connect the conductor *n*, coming from the zinc pole of the battery, with the rotator, as the sea-water itself would be a sufficient conductor.

According to my invention, the hollow cylinder or case *a* of the rotator is prolonged to such a length as to form an air-chamber, a^8, of sufficient buoyancy to hold up the back end of the rotator, which is not supported by the cable *l*. The blades $a^\times$ and the weight of the mechanism of the rotator are placed as far forward as is convenient, so that the weight may be supported as much as possible by the cable *l*. The end which is not supported by the cable is held up by the air contained in the air-chamber a^8 at the back of the rotator. The object of this air-chamber is to keep the rotator in a horizontal position, or nearly so. I preferably make the air-chamber sufficiently large so that its buoyancy is sufficient to elevate the back of the rotator. The tendency of the rotator, when the back end is elevated, is to dive under water when it is towed. This obviates the necessity of using a weight to sink the rotator.

Instead of connecting the log or apparatus to a moving ship, it may be connected to a light-ship or to other fixed point to ascertain the speed of currents.

Having thus described the nature of my said invention and the mode in which I carry the same into effect, I would have it understood that what I claim, in an electric log for ascertaining the speed of ships and the rate of currents, is—

1. A hermetically-closed rotator, *a*, containing the apparatus for making and breaking contact, and provided with an air-chamber, a^8, substantially as herein shown and described, and for the purpose stated.

2. In combination with a hermetically-closed case or rotator, *a*, an inclosed suspended or rolling weight, *b*, which, in the revolution of the rotator, gives motion, by a projection or carrier, *c*, to a train of wheels, $c'\ c^2\ c^3\ c^4\ c^5$, operating the contact maker and breaker, substantially as herein shown and described.

3. The combination of fly-wheel *d* for making and breaking contact, spring *e*, operating said fly-wheel, train of wheels $c'\ c^2\ c^3\ c^4\ c^5$, suspended or rolling weight *b*, for setting the wheels in motion, and a hollow rotator inclosing the whole, as set forth.

4. The combination of rotator, battery having copper pole, platinum center or contact-piece g^3, carried by the rotator, for establishing electrical connection between the rotator and pole, platinum spring m^2, carrying platinum point m^3, and cable having conductor *m*, the spring m^2 being connected to the conductor, as set forth.

5. The combination of rotator-case *a*, cable having conductor *n*, swivel *o*, and battery having zinc pole, the swivel being in connection with the conductor, and forming, with the rotator-case and surrounding water, the means for effecting electrical connection between the rotator and the zinc pole, as set forth.

6. The combination of hermetically-closed rotator-case *a*, containing the contact making and breaking mechanism, the disk *i*, wheels *j*, plate *k*, and frame *k'*, substantially as herein shown and described, and for the purpose stated.

7. The combination of hermetically-closed rotator-case *a*, inclosed suspended or rolling weight *b*, train of wheels $c'\ c^2\ c^3\ c^4\ c^5$, fly-wheel *d*, contacts *g' f'*, platinum center or contact-piece g^3, platinum point m^3, and spring m^2, substantially as herein shown and described, and for the purpose stated.

R. M. LOWNE.

Witnesses:
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