(No Model.)

J. C. BOYLE.

MAGNETO ELECTRIC INDICATOR.

No. 332,480. Patented Dec. 15, 1885.

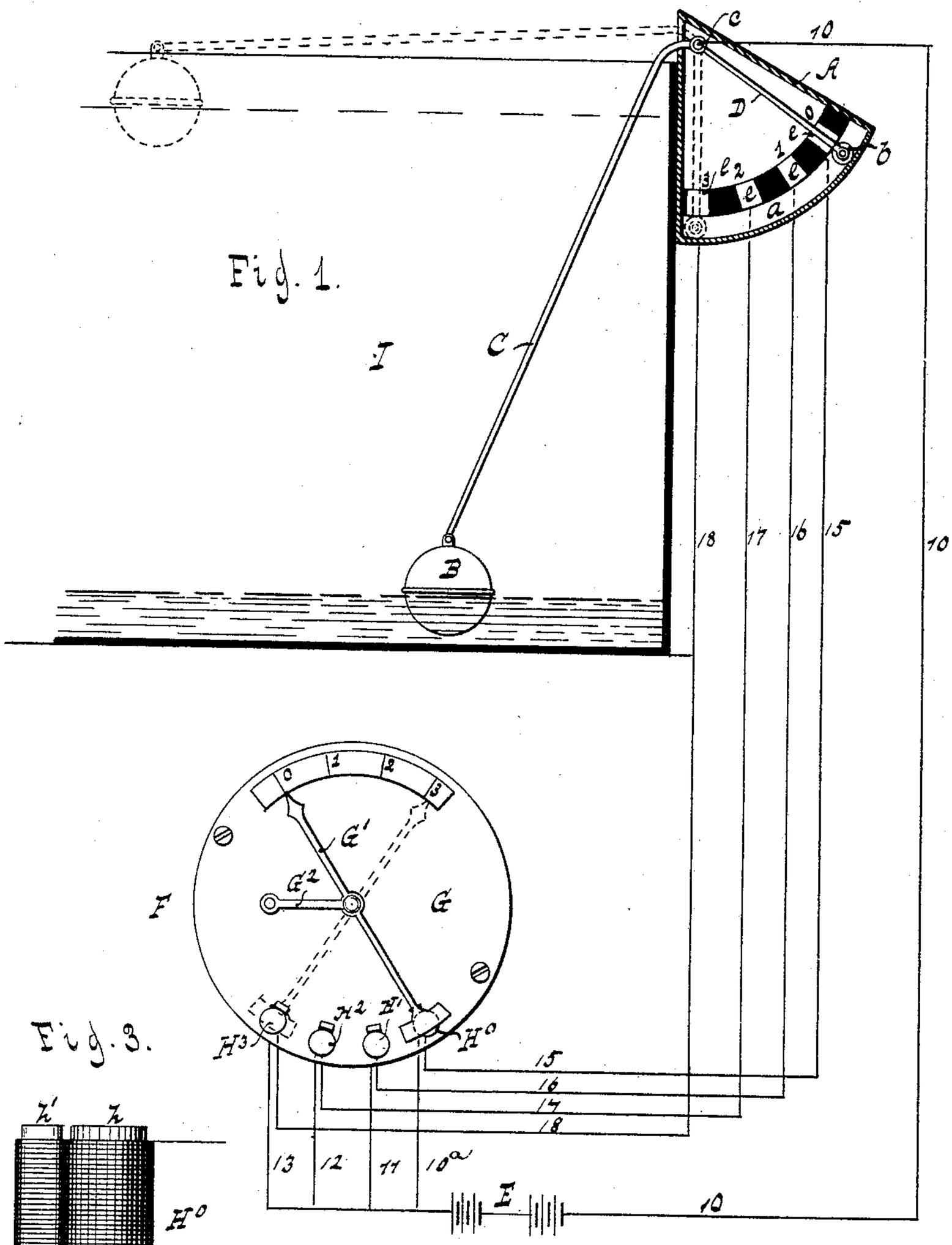


Fig. 1.

Fig. 3.

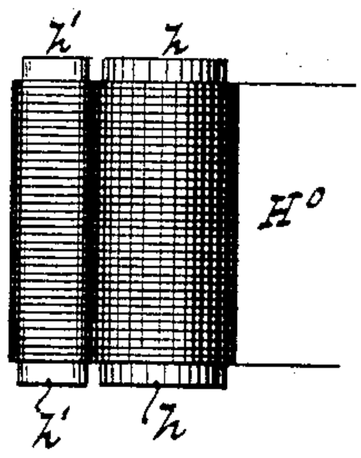
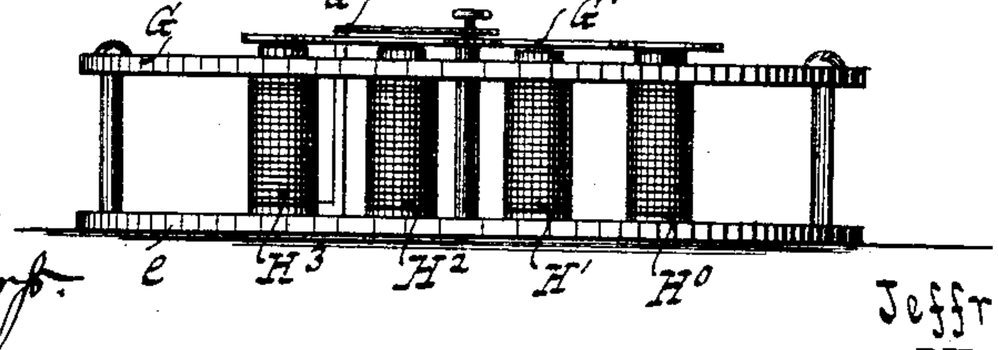


Fig. 2.



WITNESSES:

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UNITED STATES PATENT OFFICE.

JEFFREY CRON BOYLE, OF BROOKLYN, NEW YORK.

MAGNETO-ELECTRIC INDICATOR.

SPECIFICATION forming part of Letters Patent No. 332,480, dated December 15, 1885.

Application filed October 7, 1885. Serial No. 179,231. (No model.)

To all whom it may concern:

Be it known that I, JEFFREY CRON BOYLE, a subject of the Queen of Great Britain, residing at Brooklyn, in the county of Kings and State of New York, have invented new and useful Improvements in Magnetic Electric Indicators, of which the following is a specification.

This invention relates to magnetic electric indicators; and it consists in the combination of devices hereinafter described and claimed, reference being made to the accompanying drawings, in which—

Figure 1 is a sectional face view of my indicator applied as a liquid-gage. Fig. 2 is a side elevation of the indicator. Fig. 3 is an elevation of the magnets.

Similar letters indicate corresponding parts.

In the drawings, the letter A, Fig. 1, designates a case, which is made of hard rubber or other poor conductor of electricity.

B is a float, which may be made of any material and of any shape suitable for the purpose. The float is secured to an arm, C, which is mounted on a pivot, *c*, secured in the back of the case A, and which extends beyond said pivot *c*, so as to form the contact-arm D. This contact-arm is made of metal, and it may be made separate from the float-arm C and connected to the same in such a manner that its position is controlled by the position of the float. On the lower end of the contact-arm D is mounted a metallic roller, *b*, which extends into a slot, *a*, in the back of the case A. In this back are secured metallic contact-plates e^0 e' e^2 e^3, which extend flush or a little beyond the edge of the slot, so that as the roller is moved in the slot *a* it is brought successively in metallic contact with the said contact-plates. These contact-plates are separate from each other, and consequently insulated from each other; but insulating material can be placed between said plates, as shown in the drawings.

E is a galvanic battery, and F is the indicator, consisting of a dial, G, and index-hand G′, suspended so as to swing freely, and magnets H^0 H' H^2, &c., adapted to act individually upon the index-hand. The index-hand G′ is centrally suspended in relation to the dial from a hanger, G^2, secured to the bottom plate, *e*, of the indicator, and one of the ends of this index-hand points to a series of numbers or other characteristic marks on the dial, while its other end extends over and is subjected to the attraction of the magnets H^0 H' H^2, &c. Each of the magnets H^0 H' H^2, &c., consists of a soft-iron core, *h*, Fig. 3, suitably wound with insulated wire to form the electro-magnet, and of a permanent hard-steel magnet, *h′*, which can be secured to the electro-magnet by any suitable means; but in the example shown in the drawings the same is secured to said magnet by a winding or two of the wire with which the soft core is surrounded, so that the current passing through the coil tends to additionally magnetize the hard-iron magnet *h′*, which will prevent the same from gradually losing its magnetism. The object of this secondary magnet *h′* is to hold the index-hand in the position it has been drawn by its corresponding electro-magnet after the current has ceased to pass through the coils of the same. The pivot *c* of the contact-arm D connects by a wire, 10, with one pole of the battery E, and from the other pole of the battery extend wires 10^a 11 12 13 to the coils of the electro-magnets H^0 H′, &c., while the second wires, 15 16 17 18, from the coils connect with the contact-plates e^0 e' e^2 e^3, whereby a separate independent circuit is formed for each electro-magnet.

In the example shown in the drawings the indicator is applied to indicate the height of liquid in a tank, I, and the case A is secured to said tank. When the level of the liquid in the tank is low, the float B assumes the position shown in full lines, and when the level of the liquid is high the float is brought into the position shown by dotted lines. When the level of the liquid is low, the roller *b* is in contact with contact-plate marked e^0, and a circuit is closed through magnet H^0, and the index-hand is attracted by said magnet and held in the position shown by full lines in Fig. 1. As the float rises with the level of the water in the tank, the contact-roller *b* is moved in the slot, and the circuit is broken, but the index-hand still points to zero on the dial, under the action of the permanent magnet *h′*. When the roller *b* arrives at the contact-plate marked *e′*, the circuit is closed through magnet H′, and the index-hand is attracted by said magnet, and the hand is drawn about so as to point to e^2 on the dial. This is repeated to the limit of the level

of the water, or to high-water mark. By these means the depth of the liquid in the tank can be indicated if the dial is so graduated that the number 0 indicates low water, the number 1 one foot of water, and so on to high-water level.

The indicator herein described can be used for various other purposes where it is necessary that the indications should be known to persons at a distance.

This device may also be attached to an electrical thermometer for indicating temperatures at a distance, the numbers on the dial being made to show the degrees of heat or cold.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination, with a circuit-closer and the index-hands, of the pairs of magnets H^0 H′, each pair consisting of an electro-magnet and a permanent magnet placed together, the permanent magnet retaining the index-hand after the electro-magnet has become demagnetized, a battery, and connections between the battery, the magnets, and the circuit-closer, substantially as described.

2. The combination, with a circuit-closer, of the index-hand G′, the magnets H^0 H′, &c., each composed of an electro-magnet, *h*, and a permanent magnet, *h*′, said magnets H^0 H′ being arranged beneath the hand, and in a position to act upon the same, a battery, and connections between the battery, the magnets, and the circuit-closer, substantially as shown and described.

In testimony whereof I have hereunto set my hand and seal in the presence of two subscribing witnesses.

JEFFREY CRON BOYLE. [L. S.]

Witnesses:

W. HAUFF,

E. F. KASTENHUBER.