(No Model.)

J. J. GHEGAN.

MAGNETIC WATER LEVEL INDICATOR.

No. 355,815. Patented Jan. 11, 1887.

Fig. 1.

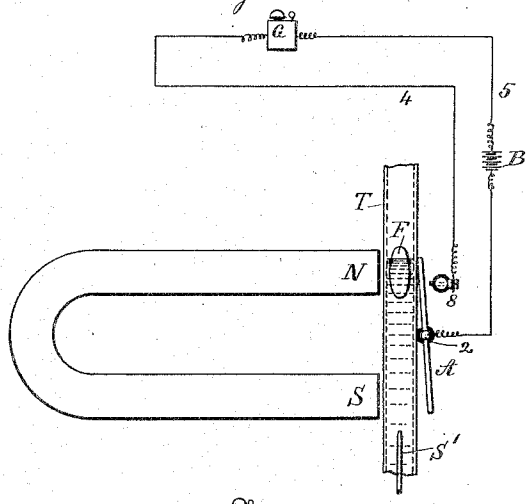

Fig. 2.

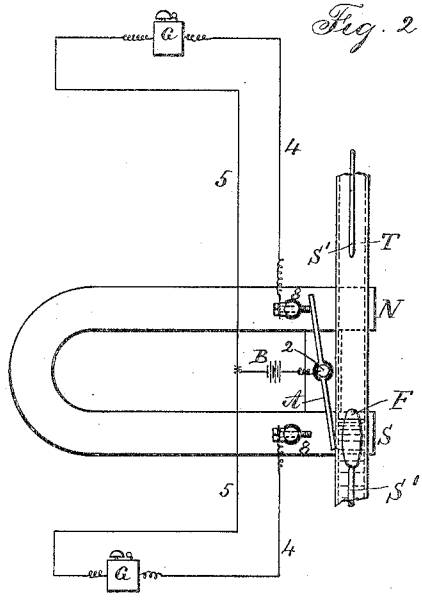

Fig. 3.

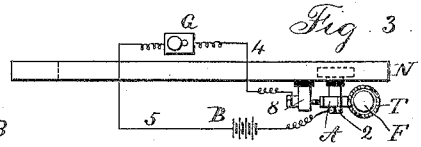

Fig. 4.

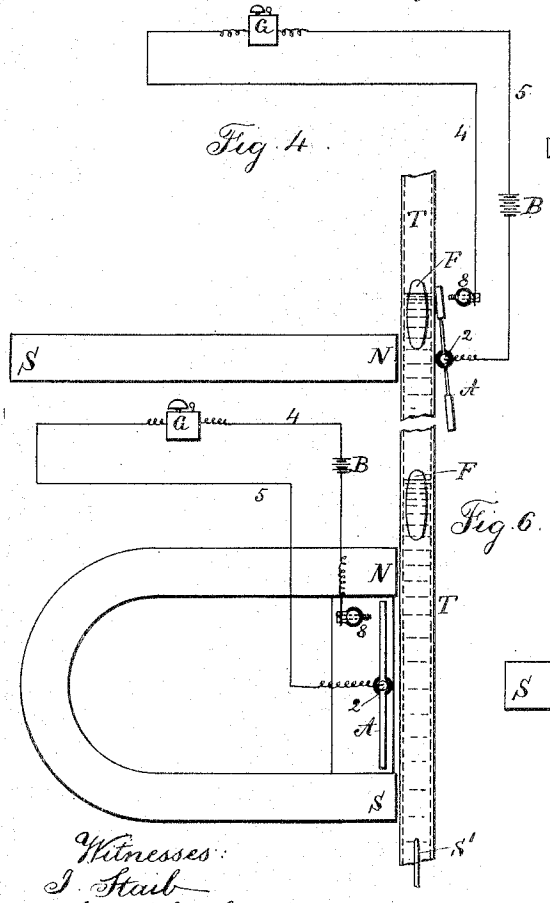

Fig. 5.

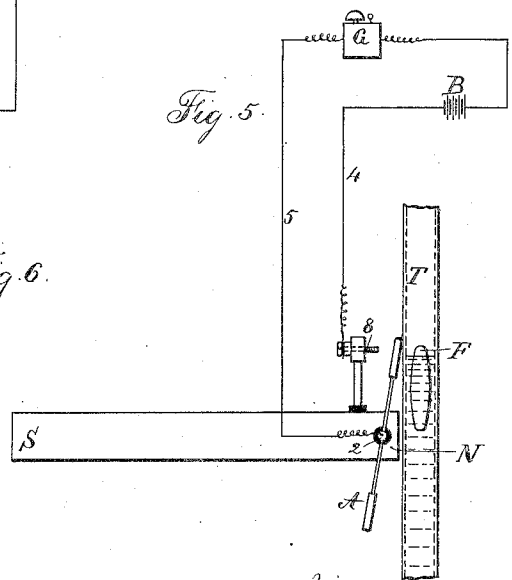

Fig. 6.

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UNITED STATES PATENT OFFICE.

JOHN J. GHEGAN, OF NEWARK, NEW JERSEY.

MAGNETIC WATER-LEVEL INDICATOR.

SPECIFICATION forming part of Letters Patent No. 355,815, dated January 11, 1887.

Application filed July 6, 1886. Serial No. 207,256. (No model.)

To all whom it may concern:

Be it known that I, JOHN J. GHEGAN, of Newark, in the county of Essex and State of New Jersey, have invented an Improvement in Magnetic Indicators, of which the following is a specification.

This invention is especially adapted as a liquid-level indicator for steam and other boilers, whereby an indication or an alarm can be given when the liquid is either too high or too low.

In my application No. 195,310, filed March 15, 1886, patented August 17, 1886, No. 347,589, I have shown a float formed of or containing magnetic material, and acting in connection with a magnet and an electric-circuit controller. My present invention is a division or selection from said application of a separable feature and a modification of and improvement upon the devices of the aforesaid application. I make use of a pivoted armature, which is influenced by changes in the magnetic field due to the movement of floating magnetic material, and such armature becomes an indication of the liquid level, or it acts as a circuit closer or breaker to give an indication or alarm at a greater or less distance from the apparatus. When the armature is pivoted and exposed to equal and opposite magnetic attractions to bring it back to a normal position, it can be balanced and held by the magnetic action alone, and on vessels and in places where the apparatus is subject to motion there will not be any false movement of the armature.

In the drawings, Figure 1 represents my improvement with a horseshoe-magnet, with the tube containing the liquid at the ends of the poles. Fig. 2 is a similar view with the tube at the side of the poles. Fig. 3 is a plan view of the device shown in Fig. 2. Figs. 4 and 5 represent modifications of the apparatus with straight-bar magnets, and Fig. 6 shows a modification of the horseshoe-magnet with the armature swinging in the line of and between the poles.

The magnet N S is either a permanent magnet or an electro-magnet, and it is shown in the form of a horseshoe in Figs. 1, 2, 3, and 6, and as a straight bar in Figs. 4 and 5. It may be of any desired shape.

The armature A is pivoted at 2, and it is preferably placed in such a relation to the magnet N S that the magnetism will hold it in a definite position, and if swung from this position by the hand or otherwise the magnetism will return it to the normal position.

This armature may be of soft iron or other material capable of being magnetized by induction from the magnet N S, or it may be permanently magnetized, similar to a compass-needle. In Figs. 1, 2, 3, and 6 the armature is represented as composed entirely of magnetic material. In the form shown in Figs. 4 and 5 the end portions of the armature may be of magnetic material, and the middle portions of brass or other non-magnetic material.

T represents a tube or vessel of glass or other suitable material, within which the water or other liquid may rise or fall. When this is used in connection with a steam or other boiler, the top and bottom end of such tube are to be connected to the said boiler as usual. Within this tube T is a float, F, of suitable form, and preferably of thin sheet-iron or other magnetic material, or it may be of other material and contain magnetic material, and this float is preferably elliptical at the ends, and in the tube T there are preferably one or more stops, S', of wire or other non-magnetic material, to prevent the float F descending entirely below the magnetic field in case of sudden withdrawal of the liquid, or ascending too high by the addition of water.

It will now be understood that the proximity of the float F to one or the other of the magnet-poles will disturb the magnetic field, so as to deflect the armature A in one direction or the other, and I make use of this deflection to give a visual or other signal or alarm, according to the circumstances under which the same may be used. It is generally preferable to make use of the armature A as a circuit closer or breaker, and to introduce into that circuit an alarm—such, for instance, as a repeating-bell, (indicated at G;) but any suitable electric device may be employed. I have represented a battery at B and the circuit-wires 4 and 5 as leading to the alarm, and terminating, respectively, at the pivot 2 and contact 8.

Upon reference to Fig. 1 it will be understood that the induced magnetism in the float F from the pole N will attract the armature

and separate the same from the contact 8. If now the level of the water is lowered so that the float B is opposite to the pole S, the lower end of the armature A will be attracted and the circuit closed through 8 to give an alarm. The same effects will be produced when the parts are arranged in the manner shown in Figs. 2 and 3, and this form is preferable, because the parts are all connected with the magnet, and the magnet can be placed directly against the side of the tube T.

The arrangements of devices shown in Figs. 4 and 5 correspond generally with those shown in Figs. 1 and 2; but with the bar-magnet the pivot 2 should be opposite to the end of one pole, or directly upon that pole, as in Fig. 5, and the magnetic material should be only at the ends of the armature; and it is preferable to make the float F sufficiently long for one end to be opposite the pole of the magnet and the other end opposite the magnetic material at one end of the armature, so that this float attracts the armature end to which it is adjacent, in consequence of the induced magnetism set up in the magnetic field, and thereby the circuit is opened or closed, according to the position of the float.

I have found that when the pivot of the armature is behind the face of the magnet pole or poles, as seen in Figs. 2 and 6, the magnetism alone will bring the armature back to a normal position parallel to the poles when the magnetism is not disturbed; hence this form is especially adapted to water-indicators for marine boilers, because the armature will only respond to force that disturbs the magnetic field.

The armature may be placed between the poles of the horseshoe-magnet with the same effect as last named. This is shown in Fig. 6.

When there are two circuit-closing devices and two alarms, as shown in Fig. 2, the improvement is adapted to give a high-water alarm or a low-water alarm. When the float is equidistant between the two circuit-closing devices, neither end will be acted upon by the magnetism. The distance between the magnet-poles should be greater than the length of the float.

I claim as my invention—

1. The combination, in a liquid-level indicator, of a float containing magnetic material, a horseshoe-magnet with its poles adjacent to the path in which the float descends, and an armature acted upon by the magnetism when the float is near either pole of the magnet, substantially as set forth.

2. The combination, with the tube and a float therein containing magnetic material, of a magnet adjacent to the tube, an armature upon the same side of the tube as the magnet, and a circuit closed by the armature, and an indicating device, substantially as specified.

3. The combination, with a float having magnetic material and a magnet, of a pivoted polarized armature and an electric circuit and circuit-controlling device, substantially as set forth.

4. The combination, with the liquid-holding tube and a float therein having magnetic material, of a magnet outside said tube and adjacent thereto and an armature pivoted behind the face of the pole of said magnet, and an electric circuit and circuit-controlling devices, substantially as set forth.

5. The combination, with the tube and a float therein containing magnetic material, of a magnet with the sides of the poles adjacent to the tube, an armature pivoted to a support on the magnet, and a circuit that is closed by the movement of the armature, and an indicating or alarm apparatus, substantially as specified.

6. The combination, in a liquid-level-indicating apparatus, of a float containing magnetic material, a magnet adjacent thereto, and an armature upon a support connected with the magnet, and an electric circuit and circuit-controller, substantially as set forth.

7. The combination, in a liquid level indicator, of a float containing magnetic material, a magnet adjacent thereto, a two-ended armature, and two circuit-closing devices, whereby an alarm or indication is given when the float is in either one of two positions, as set forth.

8. The combination, in a liquid-level indicator, of a magnet, a float containing magnetic material, and one or more stops to limit the movement of the float, substantially as set forth.

9. The combination, in a liquid-level indicator, of a float containing magnetic material, a horseshoe-magnet adjacent to such float, an armature within the field of the magnet, an indicating device, an electric circuit to the same, and a circuit-controlling device, substantially as set forth.

Signed by me this 2d day of July, A. D. 1886.

JOHN J. GHEGAN.

Witnesses:
GEO. T. PINCKNEY,
WILLIAM G. MOTT.