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MEANS FOR LOCALIZING FOREIGN SUBSTANCES WHICH HAVE BECOME EMBEDDED IN THE HUMAN BODY.

APPLICATION FILED AUG. 16, 1915.

1,307,654. Patented June 24, 1919.

Fig. 1.

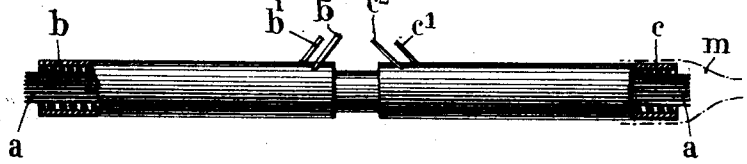


Fig. 2.

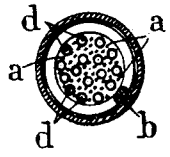


Fig. 5.

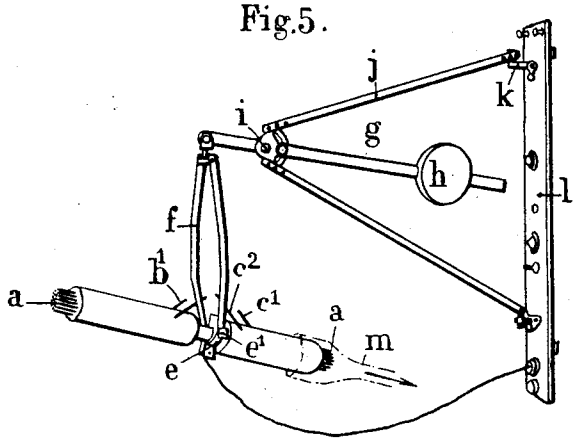


Fig. 3

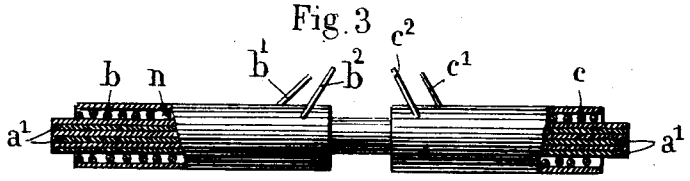
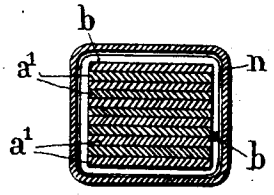


Fig. 4.



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MEANS FOR LOCALIZING FOREIGN SUBSTANCES WHICH HAVE BECOME EMBEDDED IN THE HUMAN BODY.

1,307,654. Specification of Letters Patent. Patented June 24, 1919.

Application filed August 16, 1915. Serial No. 45,735.

To all whom it may concern:

Be it known that I, JEAN BERGONIÉ, a citizen of the French Republic, and resident of 6 bis rue du Temple, Bordeaux, France, have invented certain new and useful Means for Localizing Foreign Substances Which Have Become Embedded in the Human Body, of which the following is a specification.

This invention relates to electromagnetic devices for localizing metallic objects which have become embedded in the tissues of the body.

It has already been proposed to employ the attractive power of electromagnets to draw said objects to the surface of the body and thus extract them, but this method of extraction may in some cases prove highly dangerous owing to the fact that the object, while being suddenly withdrawn, may come in contact with an artery or other vital organ.

This invention consists in providing an electromagnet of special construction supplied either with alternating current, or with direct current rendered intermittent by a suitable circuit-breaking device, and adapted to exert a succession of weak attractions and not a powerful continuous attraction as heretofore, which weak attractions have for effect to impart a vibratory movement to the object which enables the operator to perceive and determine by touch the spot at which the movement is set up and thus locate the object.

The core of the electromagnet is constituted by an assemblage of separate elements formed of iron or other magnetizable metal, such as a bundle of iron wires or of thin and mutually isolated iron plates, which assemblage, in order to prevent any detrimental heating which may be caused by the high intensity of the current passing through the windings or by Foucault currents, is traversed by a cooling fluid.

Figure 1 of the accompanying drawings is an elevation, partly in section, of an electromagnet according to the present invention, having a core constituted by a bundle of iron wires.

Fig. 2 is a transverse section of a modified construction drawn to a larger scale.

Figs. 3 and 4 show an electromagnet according to the present invention, having a core constituted by a pile of thin iron sheets; Fig. 3 being an elevation, partly in section, and Fig. 4 being a transverse section drawn to a larger scale.

Fig. 5 shows the electromagnet carried on its support.

In the form of the invention illustrated in Fig. 1, the electromagnet comprises a core constituted by a bundle of iron wires a and two windings b, c, terminating respectively in connection-wires b^1, b^2, c^1, c^2, whereby said windings may be connected together either in series or in parallel according to the voltage of the current employed and the results to be obtained. The core of the electromagnet may, however, be constituted, as shown in Figs. 3 and 4, by a pile of thin iron sheets a^1 isolated from one another by any convenient means, for instance by sheets of paper, a coating of varnish, or they may even be oxidized on their surface for the same purpose. On the pile are wound, as above described, the two conductive wires b, c which are inclosed in a casing of any suitable material. The electromagnet is energized either with alternating current of 110 or 220 volts, or with direct current rendered intermittent by any suitable kind of circuit-breaking device.

The electromagnet may be cooled by the circulation of air or other fluid through the interstices between the iron wires forming the core, and if necessary through small tubes d arranged within the bundle as shown in Fig. 2, or by other kind of cooling process. The circulation of air may be produced by means of a pump, an injector, or any other means, as for example as shown in Fig. 5 by connecting a pipe m, leading either to a suction pump or to an injector, to the end of the electromagnet opposite to the end which is applied to the patient.

The electromagnet is carried by a bracket which permits it to be moved readily in all directions and arranged for instance in the following manner: The electromagnet is carried at its central portion, Fig. 5, by a collar e furnished with trunnions e^1 engaging in the two limbs of a fork f hung from the end of a lever g furnished with a counterweight h and movable around a pivot pin i carried by a bracket j adapted to rotate on pivot pins k carried on a back-plate l.

By this method of mounting, the electromagnet may be moved very easily in all directions and be readily brought above the

part to be explored. When the electromagnet is above the point at which the foreign body is located, it produces on said body, by the action of the alternating current or of the intermittent current by which it is energized, a series of successive attractions which have for effect to impart such a vibratory movement to said body as will be readily detected by touch. The operator may thus ascertain with great accuracy the location of the foreign body when he feels the latter vibrate.

What is claimed is:—

1. That improvement in the art of localizing foreign conducting substances embedded in the human body which comprises bringing an electromagnet near the body in the supposed vicinity of the foreign substance, energizing said electromagnet by a variable electric current so as to cause the substance to vibrate by reason of the inductive action and then noting by touch the region of the flesh affected by such vibration.

2. That improvement in the art of localizing foreign conducting substances embedded in the human body which comprises bringing an electromagnet near the body in the supposed vicinity of the foreign substance, energizing said electromagnet by a variable electric current of low average magnetizing force so as to cause the substance to vibrate by reason of the inductive action, but not to be forcibly acted upon, and then noting by touch the region of the flesh affected by such vibration.

JEAN BERGONIÉ.

In presence of—
CHAS. P. PRESSLY,
FRANÇOIS WEBER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."