No. 803,410. PATENTED OCT. 31, 1905.

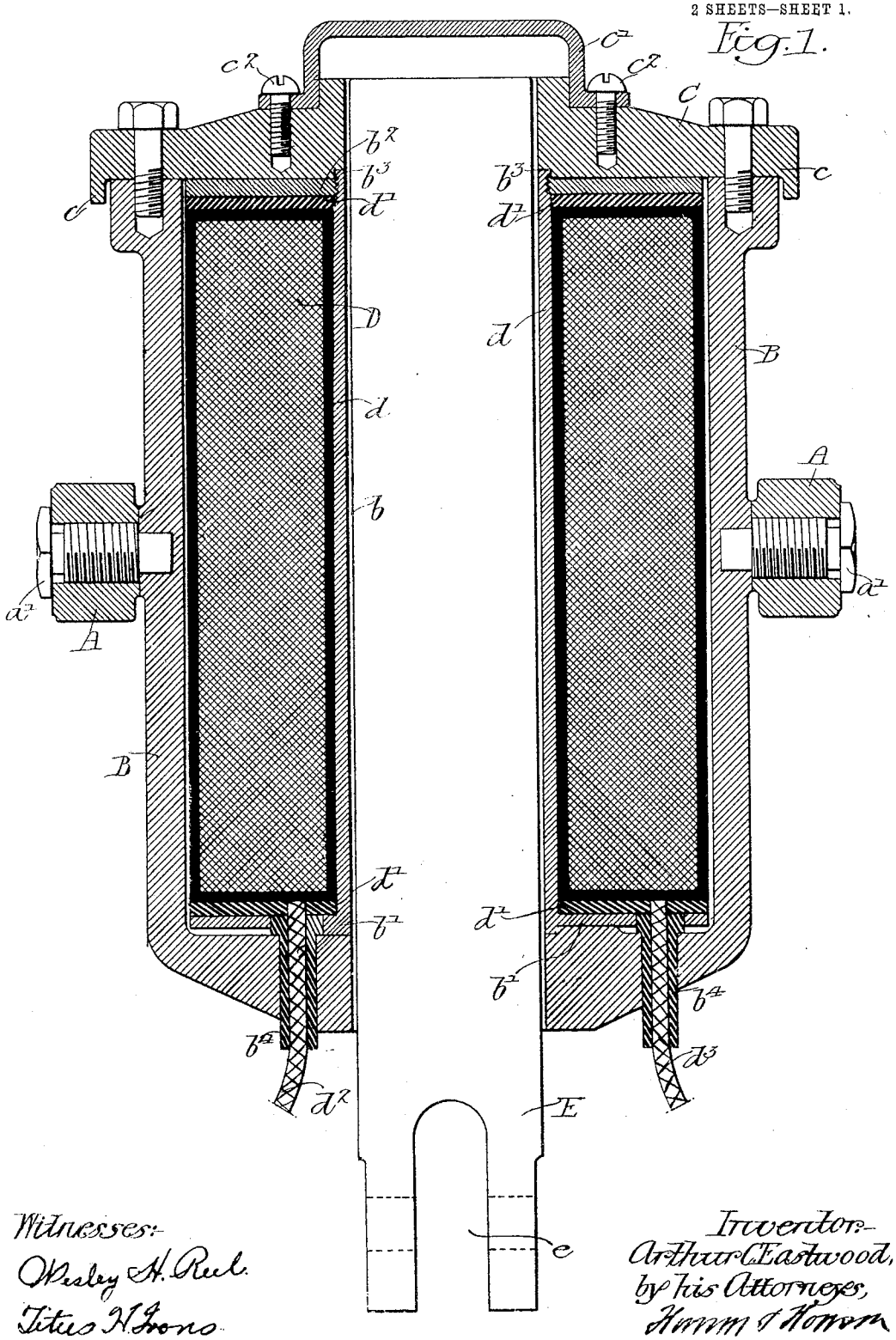
A. C. EASTWOOD.

ELECTROMAGNET.

APPLICATION FILED APR. 1, 1904.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
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Titus H. Irons

Inventor:
Arthur C. Eastwood,
by his Attorneys,
Munn & Howson

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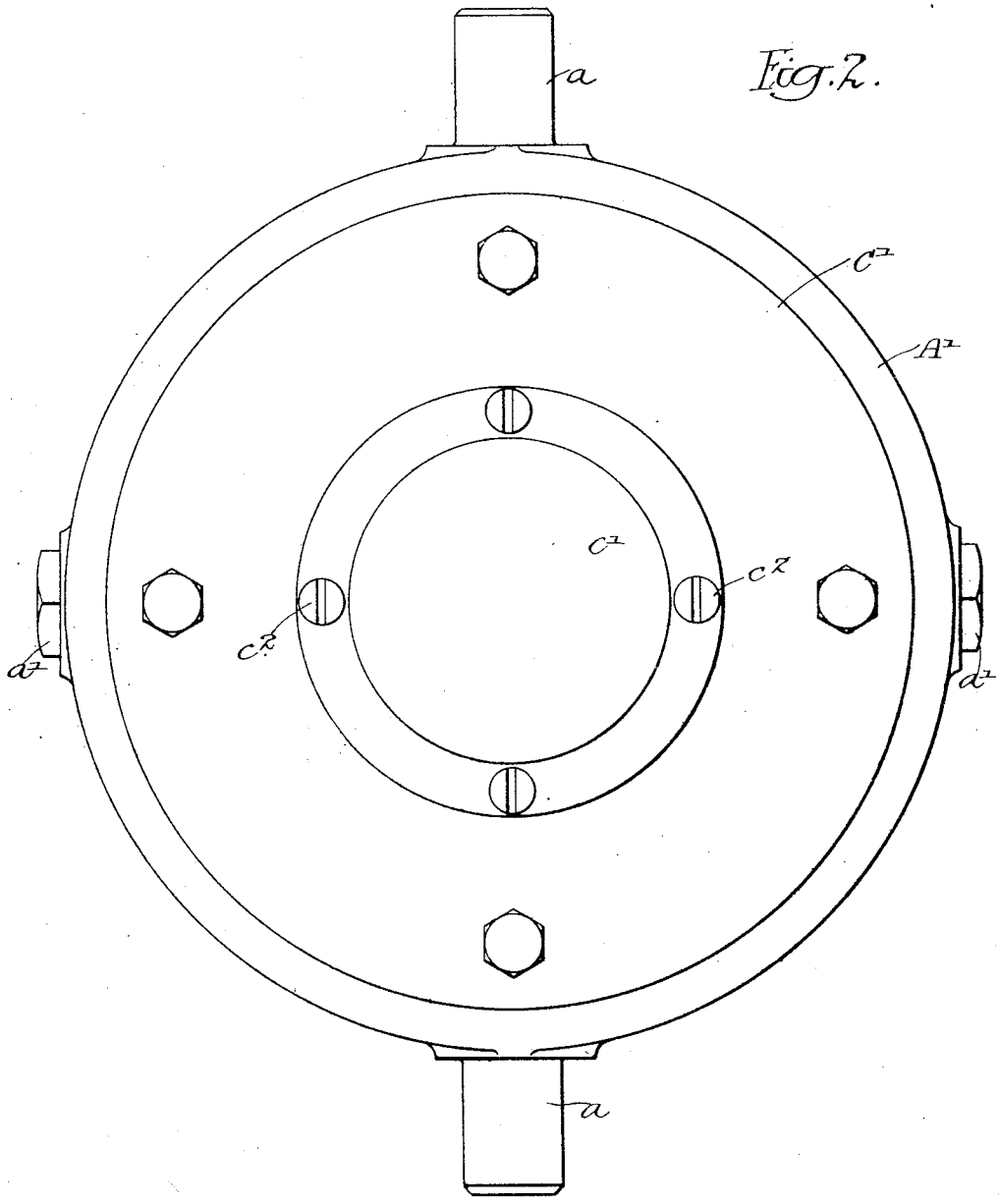
A. C. EASTWOOD.

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APPLICATION FILED APR. 1, 1904.

2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

ARTHUR C. EASTWOOD, OF CLEVELAND, OHIO.

ELECTROMAGNET.

No. 803,410. Specification of Letters Patent. Patented Oct. 31, 1905.

Application filed April 1, 1904. Serial No. 201,120.

To all whom it may concern:

Be it known that I, ARTHUR C. EASTWOOD, a citizen of the United States, residing in Cleveland, Ohio, have invented certain Improvements in Electromagnets, of which the following is a specification.

My invention consists more particularly in an improved form of electromagnet especially designed for releasing brakes on electrical machines and also for operating clutches or similar devices.

The object of the invention is to provide a construction of magnet such that the movable plunger with its attached parts will be brought to rest absolutely without shock and without the use of auxiliary mechanism, such as dash-pots, &c.

I further desire to provide a construction which while being simple and substantial shall be relatively inexpensive and at the same time relatively powerful for a given size and weight of the parts required.

I also desire to so construct my improved magnet that it may automatically adjust itself to variations in the alinement of the parts attached to the movable plunger, at the same time so arranging its parts that it is adapted for service in exposed positions without danger of injury.

These objects I attain as hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1 is a sectional elevation of my improved magnet, showing the detail construction of the same; and Fig. 2 is a plan view of the magnet shown in Fig. 1.

In the past electromagnets designed for the class of work above indicated have been almost universally of the horseshoe type, having two magnetizing-coils, a yoke with two projecting pole-pieces extending for some distance into the upper ends of the coils, and a pair of plungers attached to a second yoke adapted to be drawn into the coils when the latter were energized by a suitable electric current.

Since the force of attraction upon the fixed poles and the movable plungers of this type of magnet greatly increases as said plungers approach the poles, there is a very rapid acceleration of the motion of the plungers and the parts attached thereto, and as the motion of these parts is usually arrested either by allowing the plungers to strike the fixed poles or by permitting the yoke to strike a fixed stop a blow involving a considerable amount of energy is delivered each time the plungers are attracted into the coils. Such action naturally produces wear and tear on the electromagnet and its attached mechanism, being frequently a source of great danger because of its tendency to loosen bolts and other fastenings by the repeated jarring.

In the past it has been attempted to overcome this objectionable action by the use of dash-pots or equivalent devices placed to check the motion of the plungers; but not only is the first cost of such devices relatively high, but by reason of lack of attention and proper adjustment they have frequently failed to accomplish their purpose.

In some instances solenoids including a coil of wire and a plunger without a return-circuit of magnetic material have been used for the purpose of overcoming the objectionable features noted; but such construction in addition to requiring a relatively large coil is comparatively inefficient, besides being altogether impracticable where a considerable load is to be moved.

In the above drawings, A is a supporting-ring having trunnions a, adapted to be carried in any suitable form of bearing and provided at points on a diameter ninety degrees from the diameter upon which the trunnions a are set with two bearing-screws a', whose ends are formed to serve as bearings for the support of a cylindrical casing B of magnetic material. Said casing has bolted to it a cap C, also of magnetic material, provided with overhanging edges c and having an opening through its center over which a cap c' of non-magnetic material is held by means of screws c^2.

It will be seen that the lower end of the casing B is formed in the present instance integral with the sides thereof and also has an opening through it in line with the opening in the cap C. A tube b, of brass, whose interior diameter is the same as that of the openings in the two ends of the casing B, is provided with a flange b' at its lower end and has screwed upon its upper end a second flange b^2, which end preferably extends into a recessed portion of the cap C, as indicated at b^3. Upon the spool formed by the tube b and the flanges b' and b^2 is wound a coil D of insulated wire provided with a covering d of insulated material and also having insulating-washers d' between its ends and the flanges b' and b^2. There are relatively small openings through the end of the casing B, in which are placed

insulated bushings b^4, extending also through openings in the flange b' and serving for the passage of the wires d^2 and d^3, by which current is supplied to the winding D.

Within the brass tube b and the openings in the ends of the casing B is a freely-movable plunger E, having its end forked, as indicated at e, for the reception of a brake-rod or other structure to be operated by the motion of said plunger.

Under normal conditions with the winding D deënergized the upper end of the plunger e will be at a given distance below the top of the casing B. When, however, current is supplied to this winding, the plunger will be drawn up until it occupies a position of magnetic equilibrium. It is obvious that when the upper end of the plunger has passed through the head C of the casing its further motion will not tend to reduce the reluctance of the magnetic circuit in which it is included, so that it will be in magnetic equilibrium when its end is at or near the upper face of the said cap or cover. It will be noted that the metal of the ends is thicker near the openings for the plunger than toward the edges, so as to provide sufficient metal for the magnetic circuit of the device at points otherwise of too small cross-section.

By the arrangement of supporting devices used—viz., the trunnions a, ring A, and the screws a'—it will be seen that the magnet is free to accommodate itself to variations in the alinement of the plunger E, with the result that the various links or slotted bars hitherto found necessary in connection with stationary electromagnets can be dispensed with.

It will be observed that the casing, including the parts B and C with the cap c', entirely surrounds and protects the winding D, so that there is no possibility of any body coming in contact with and injuring the coil nor of moisture entering the structure.

The conductors d^2 and d^3 are of flexible material, so that they in no way interfere with the free motion of the magnet upon its supports.

It will be appreciated by those skilled in the art that by my improved construction there are no stationary poles required, so that I am enabled to dispense with the machining hitherto found necessary in the construction of electromagnets of this type and also reduce the labor necessary in assembling the various parts.

I have found experimentally that within the ranges commonly met with in practice—viz., a movement of from one to two and a half inches—the armature of my improved form of electromagnet will lift fully as much as those of the common forms of "stopped" or "plugged" electromagnets.

I claim as my invention—

1. The combination in an electromagnet, of a substantially cylindrical shell of magnetic material having end portions also of magnetic material, one of said end portions being removable and being flanged to fit over said cylindrical shell, there being openings through said end portions, a winding within the shell, and a plunger of magnetic material movable through the winding and the openings in the end portions, substantially as described.

2. The combination of a winding, a casing of magnetic material surrounding the same having end portions provided with openings, an armature axially movable through the winding and through said openings, one of said end portions having a cap over its opening, with a non-magnetic tube forming a guide for the armature and extending through the winding, the ends of said tube extending respectively into annular depressions in the end portions of the casing, substantially as described.

3. The combination of a casing of magnetic material having through it a tube of non-magnetic material, with a cover to the casing having downwardly-turned edges and being provided with a recessed portion for the reception of one end of the tube, there being openings through the cover and through the end of the casing opposite thereto, a cap covering the opening through the cover and a plunger operative through the tube and said openings, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ARTHUR C. EASTWOOD.

Witnesses:
C. W. COMSTOCK,
D. P. BALLARD.