A. C. EASTWOOD.

LIFTING MAGNET.

APPLICATION FILED AUG. 10, 1908.

928,510.

Patented July 20, 1909.

2 SHEETS—SHEET 1.

Fig. 4.

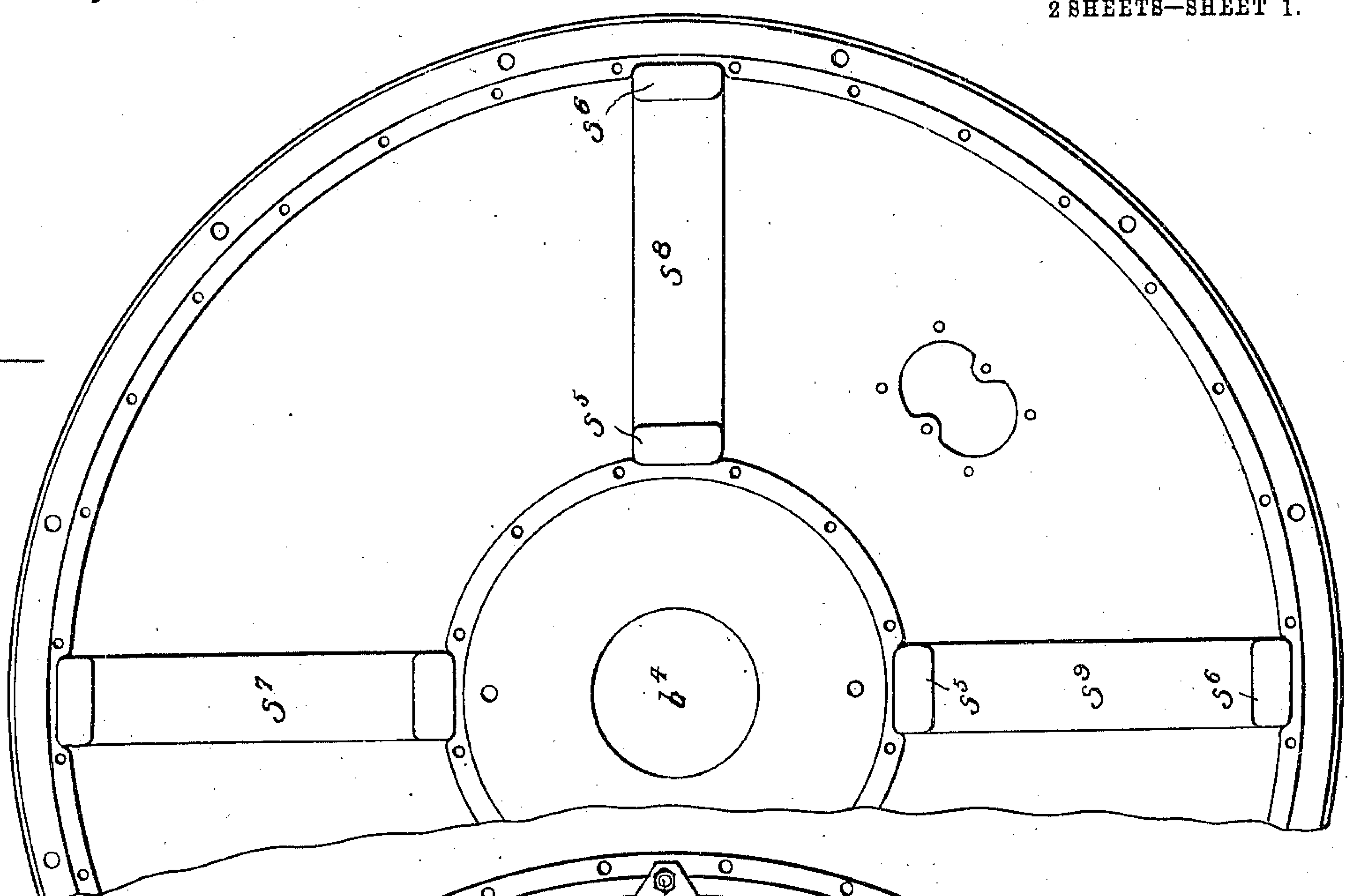
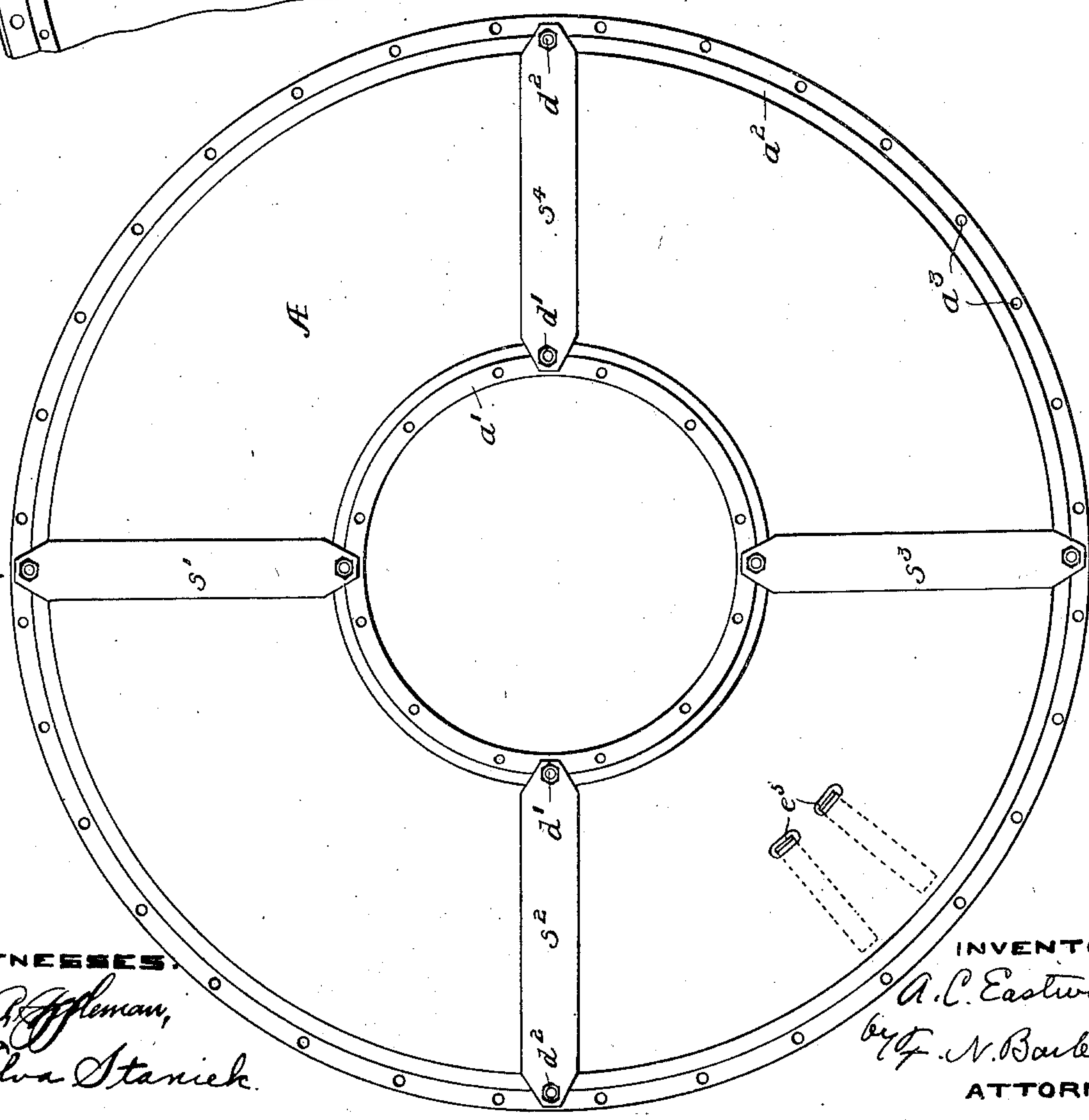


Fig. 1.



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2 SHEETS—SHEET 2.

FIG-3.

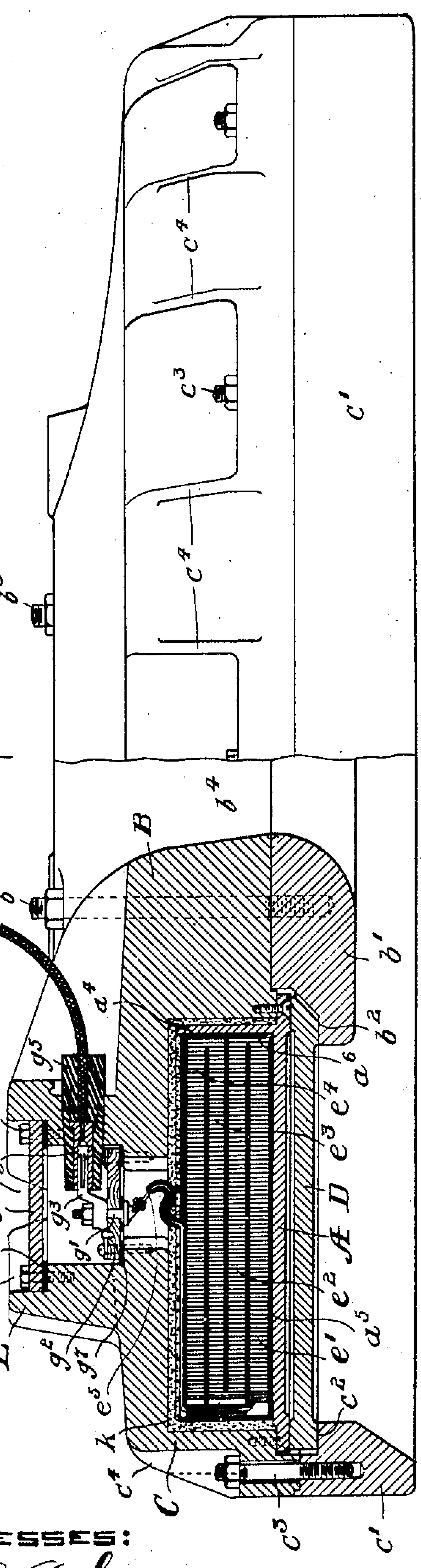
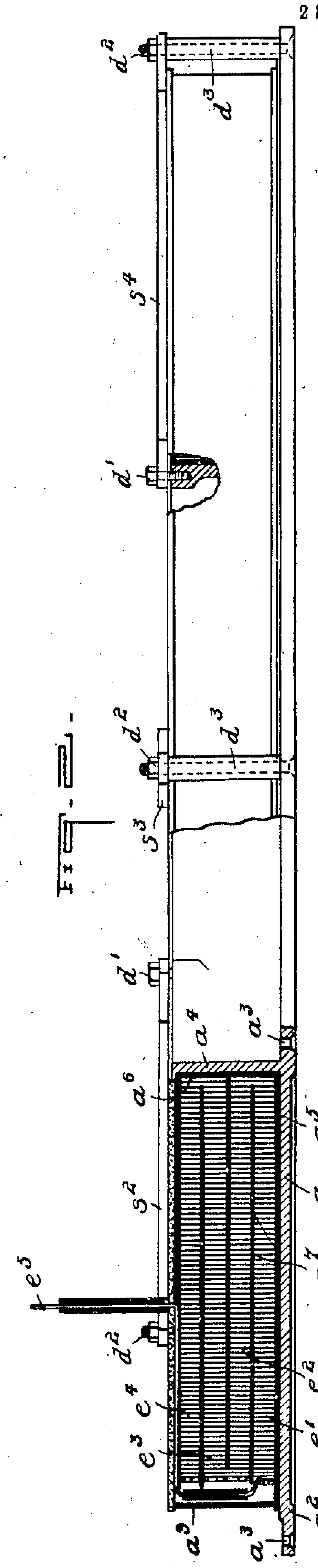


FIG-2.



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LIFTING-MAGNET.

No. 928,510. Specification of Letters Patent. Patented July 20, 1909.

Application filed August 10, 1908. Serial No. 447,682.

To all whom it may concern:

Be it known that I, ARTHUR C. EASTWOOD, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented or discovered new and useful Improvements in Lifting-Magnets, of which the following is a specification.

My invention relates to new and useful improvements in lifting magnets.

The objects of my invention are to provide means whereby the magnetizing winding of the magnet may be more expeditiously and cheaply wound; whereby the assembled winding may be more readily and safely handled; and whereby, when in place in the magnet case, the winding will be supported and protected in such a manner as to guard against the effects of the rough handling and exposure, to which the magnet will be subjected in service.

My invention applies particularly to lifting magnets in which the winding is of the so-called strap or ribbon form, that is, the conducting member of the winding is rectangular in cross section having a width considerably greater than its thickness. Certain features of my invention are, however, equally applicable to magnets in which the winding is made up of the ordinary forms of insulated wire. In a strap or ribbon winding it is desirable to form the winding of a number of coils, one above the other rather than of a single coil of greater depth. This is true because insulating material, such as asbestos, in the form of a ribbon must be in the neighborhood of 10/1000 of an inch in thickness to be commercially practicable. In order that the insulating ribbon may form a minimum proportion of the total winding space, it is necessary that the conducting ribbon be as thick as possible compared with the thickness of the insulating ribbon. With a conductor of given cross section, if the thickness is made large, the width must be made correspondingly smaller. Naturally a coil of large diameter wound up of narrow ribbons of copper and asbestos is very delicate and difficult to handle, since it is very likely to "dish" out of shape by the slipping of one turn over another, which is very likely to ruin the coil, because the insulating ribbon may become torn or displaced so as to permit neighboring conducting turns to come into electrical contact thus establishing short circuits.

My invention provides means whereby the several shallow coils which make up the winding are well supported during the process of winding and the subsequent handling of the coil prior to securing it within the frame of the lifting magnet.

My invention provides simple and reliable means for clamping the winding firmly in place so as to prevent it from either moving vertically or turning about its axis.

Referring to the accompanying drawings, Figure 1 is a top plan view; Fig. 2, a side elevation partly in section of the winding of my improved magnet and the means for supporting the winding; Fig. 3, a side elevation partly in section of a complete magnet; and Fig. 4, a bottom plan view of a portion of the magnet case with the winding and bottom-plates removed.

In these figures, A is an annular bottom plate preferably of brass, having its inner and outer peripheries provided with finished flanges a' and a^2, which are provided with screw holes a^3 spaced closely together so that the bottom plate may form a water tight joint with finished shoulders on the lower face of the central core B and the outer pole C of the magnet case. The plate A is also provided with an upwardly projecting flange a^4 which serves as a mandrel upon which the coils are wound.

I have shown four separate coils e', e^2, e^3 and e^4. In winding the coils the form or mandrel comprised by the bottom plate A with its flange a^4 is first thoroughly insulated by means of the insulating plate a^5 and the insulating sleeve a^6 which slips over, or may be wound upon, the flange a^4. The form may then be mounted upon a rotatable head stock, preferably so arranged that the plate A will be horizontal thereby better supporting the insulation and the coils in the process of winding. The first coil is then wound, being made up of alternate strips or ribbons of copper and insulation, such as asbestos. When the first coil is completely wound, its periphery is held by suitable clamps or binding wires (not shown). The insulating plate a^7 is placed above the coil e' and the second coil e^2 is similarly wound. The remaining coils e^3 and e^4 are also wound in a similar manner. Suitable connections, of course, being made between the end of one coil and the beginning of the next so as to cause current to flow through the several coils in series in a uniform direction. When the last coil e^4 is wound a heavy insulating plate is laid upon it, this plate being provided with slots through which pass the terminal connections e^5. Radial clamping straps s', s^2, s^3, and s^4 are then placed over this top plate of insulation and are drawn down by means of bolts or screws d^2 and d' respectively, the screws d' engaging with bosses at the upper end of the central flange a^4 and the bolts d^2 passing through suitable holes near the outer edge of the bottom plate A. The bodies of the bolts d^2 are covered with sleeves of insulating material d^3 to prevent the possible contact with the periphery of the winding. By means of these clamps the entire winding is clamped firmly against the bottom plate A before being handled, and the entire winding, therefore, becomes a unit held firmly together and may be moved about and assembled in the magnet case without danger of injury to the coils. After the winding is completed, an insulating layer a^9 is bound around the exterior of the winding. The winding is then preferably impregnated with a compound which will thoroughly waterproof it. It is then assembled in the magnet case, the inner and outer flanges of the plate A being firmly screwed in place to the lower faces of the inner and outer poles, as previously described.

As will be seen in Fig. 4, the inner and outer walls of the magnet case are provided with slots or notches s^5, and s^6 respectively to accommodate the ends of the straps s', s^2, s^3, and s^4 and the clamping screws and bolts d' and d^2 which engage the ends of these straps. The upper surface of the winding space is likewise provided with grooves or slots s^7, s^8, etc., for accommodating the bodies of the straps s', s^2, s^3 and s^4, these grooves having at their ends pockets of greater depth for accommodating the heads of the bolts d' and d^2. This construction is adopted to secure minimum weight of the completed magnet and also to add to the efficiency of dissipating the heat developed within the magnetizing winding.

If the winding space were made large enough all around to accommodate the projecting ends of the clamping straps s', s^2, s^3, and s^4 and deep enough to receive the depth of the straps in addition to the depth of the winding, the magnet would necessarily be considerably larger and heavier than a magnet in which my preferred construction is used; or, if the winding space be made of the same general dimensions, the portion of the winding space actually filled by the winding would be smaller, and less magnetizing force could be developed in the magnet. Further, the spaces between the surfaces of the winding and the magnet case would be increased thus interfering with the conduction of heat to the magnet case, from which the heat is finally dissipated. The outer or wearing plate D, which I preferably make of manganese steel is then put in place, and the pole shoe c' is bolted to the lower face of the outer pole C. This pole shoe has a shoulder or step c^2 which engages with the periphery of the wearing plate D so as to support and assist in clamping the plate D in place. The pole shoe c' is held in place by a series of bolts or studs c^3 which have their nuts and threaded ends disposed between the ribs c^4 whereby they are protected from abrasion. The center pole shoe b' is then bolted in place on the face of the central pole B. This pole shoe is provided with a shoulder or step b^2 which engages and supports the central edge of the wearing plate D. The pole shoe b' is held in place by studs or bolts b^3 which pass through the core B, which is provided with a central opening b^4 serving as a ventilating flue or duct through the magnet. The terminals e^5 are then connected to the lower ends of studs g' carried by an insulating plate g^2. These studs terminate in L-shaped plugs g^3 adapted to engage with removable female members g^4, which in turn are surrounded with insulating sleeves g^5, each having a central passage through which passes a flexible connecting wire g^6, connecting the windings of the magnet with a source of current. After the terminals e^5 are connected to the studs g' and before the insulating plate g^2 is screwed in place, the casing of the magnet is poured full of a sealing compound k composed of an insulating material which softens under the influence of heat. The spaces between the surface of the winding and the frame of the magnet are completely filled with insulating material in this way. The insulating plate g^2 is then screwed in place, a gasket g^7 being placed beneath it so as to form a water-tight joint. The top of the cavity in which the terminals are located is then closed by a steel plate g^8 under which is placed packing g^9 to effect a water-tight joint.

The walls L of the terminal spaces are preferably made very heavy and are cast integral with the frame of the magnet so that the terminals may be protected from the hard usage to which the completed magnet will necessarily be subjected when dangling from the end of a hoisting chain on a crane. The walls of the terminal cavity are also preferably brought up to a sufficient height to cover and protect the heads of the studs or screws g^{10}, which clamp the cover plate g^8 in place. These upwardly extending walls l are provided with apertures g^{11} to prevent water accumulating in the top of the terminal cavity above the plate g^8.

It is noted that I have shown the pole shoe c' of such dimensions that its active face will be lower than the active face of the central pole shoe b'. This is done so that the poles of the magnet may come into better engagement with the uneven surface of bulk material, such as pig iron. The depth of the pole ring c' is also of advantage mechanically since the ring will be very strong in a vertical direction and therefore capable of withstanding the heavy blows which it receives when the completed magnet, which may readily weigh 5000 pounds, is dropped upon piles of iron and steel.

I claim—

1. A lifting magnet frame having an annular space, a winding, a cylindrical internal support for the winding, a cap plate for the internal support, and means for securing the said support in the said annular space.

2. A lifting magnet having a winding, a winding support comprising a bottom plate, having a concentric shoulder extending therefrom and serving as a support for said winding, and means for clamping said winding firmly against said bottom plate.

3. A lifting magnet having a top plate, a central core depending therefrom, an outer pole concentric with and spaced from said central core, a winding in the space between said central core and said outer pole, a bottom plate arranged to support the winding and having a central flange secured to the lower face of said central pole, an outer flange secured to the lower face of said outer pole, and an upwardly projecting flange serving as a central support for said winding.

4. A lifting magnet having an annular winding space, a winding therein, a winding support comprising an annular bottom plate having annular inner and outer flanges engaging with the lower faces of the inner and outer walls of said winding space, and an upwardly projecting flange serving as a central support for said winding.

5. A lifting magnet having an annular winding space, a winding therein, means for supporting and clamping said winding in place, said means including a bottom plate having inner and outer flanges engaging with the faces of the inner and outer walls of said winding space, an upwardly projecting flange serving as a central support for the winding, clamping means above the winding, screws or bolts for drawing said clamping means toward said bottom plate and clamping the winding between the clamping means and the bottom plate, there being pockets in the walls of said winding space for accommodating said straps and said bolts or screws.

6. A lifting magnet having an annular winding space, a winding therein, means for supporting and clamping said winding in place, said means including a bottom plate having inner and outer flanges engaging with the faces of the inner and outer walls of said winding space, an upwardly projecting flange serving as a central support for the winding, clamping means above the winding, and screws or bolts for drawing said clamping means toward said bottom plate and clamping the winding between the clamping means and the bottom plate.

7. A lifting magnet having an annular winding space, a winding therein, a bottom plate having inner and outer flanges clamped to the lower faces of the inner and outer walls of said winding space, and means independent of the walls of the winding space for clamping said winding against the upper side of said bottom plate.

8. A lifting magnet frame having an annular winding space, and an insertible unit for said winding space consisting of a bottom plate, a central support, a winding composed of a plurality of coils wound one above the other around the central support and rigidly clamped to the bottom plate extending radially outward from said central support, said bottom plate having shoulders adapted to engage with the inner and outer walls of said winding space.

9. A lifting magnet having an annular coil space, a magnetizing coil in said coil space, a spool upon which the coil is wound, the lower head of said spool engaging with the walls of the magnet near the open end of the annular winding space and being adapted to make a water tight joint therewith.

10. A lifting magnet having an annular winding space and a unit for said winding space, said unit comprising a bottom plate for closing said winding space and a winding clamped to the upper side of said bottom plate.

11. A lifting magnet having an annular winding space, a bottom plate, the inner and outer edges of which are screwed to the lower faces of the inner and outer walls of said winding space, a magnetizing winding in said winding space, means for clamping said winding against the upper side of said bottom plate, a cover plate of non-magnetic material covering said bottom plate, and pole shoes clamped to the lower faces of the inner and outer walls of said winding space, said pole shoes being adapted to clamp said cover plate in place.

12. A lifting magnet having a winding space, a magnetizing winding in said space, a non-magnetic bottom plate for closing said winding space, means independent of the walls of said winding space for clamping said winding to said bottom plate, there being recesses in the walls of said winding space for accommodating said clamping means.

13. A lifting magnet having a winding space, a winding in said space, a support for

said winding, and means independent of the walls of said winding space for clamping said winding to said support, there being recesses in the walls of said winding space for accommodating said clamping means.

14. A lifting magnet having a central pole, an outer pole concentric with and surrounding said central pole and removable pole shoes on the bottom faces of both of said poles, the pole shoe on the outer pole being deeper than the pole shoe on the central pole, such that its under face is lower than the under face of the pole shoe on the central pole.

Signed at Cleveland, Ohio, this 1st day of Aug. 1908.

ARTHUR C. EASTWOOD.

Witnesses:

C. PIRTLE,

H. M. DIEMER.