A. C. EASTWOOD.

LIFTING MAGNET.

APPLICATION FILED FEB. 15, 1906.

950,718. Patented Mar. 1, 1910.

FIG. 1.

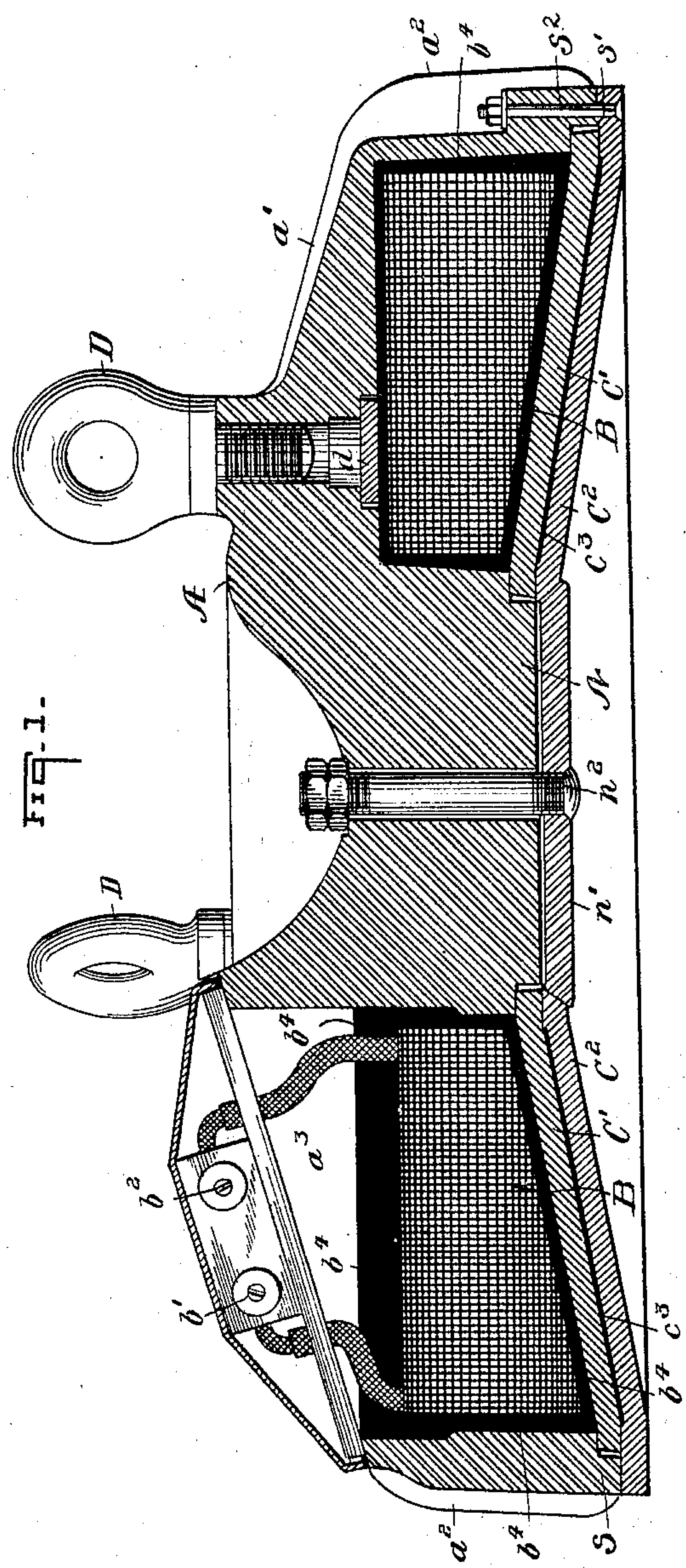
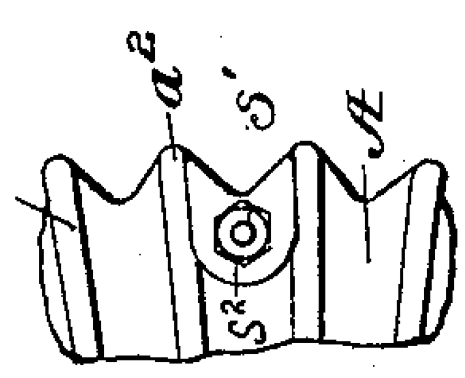


FIG. 2.



WITNESSES:

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ARTHUR C. EASTWOOD, OF CLEVELAND, OHIO.

LIFTING-MAGNET.

950,718. Specification of Letters Patent. Patented Mar. 1, 1910.
Application filed February 15, 1906. Serial No. 301,293.

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.

The object of my invention is to increase the durability of lifting magnets through the better protection of the magnetizing coil, to decrease the cost of repairs, and to facilitate the making of repairs.

My invention applies particularly to that type of lifting magnet described in U. S. Patent No. 794,086 issued to me, July 4, 1905, though it is applicable, with beneficial results, to other forms of lifting magnets.

The magnet described in United States Patent, No. 794,086, is a very powerful one and when it is used for handling pig iron for instance, the pigs of iron will jump through a vertical distance of several inches to attach themselves to the lower face of the magnet. This results in a series of blows of considerable force as each pig of iron may weigh 100 pounds. This of course produces wear of the brass plate which protects the lower side of the coil and eventually the plate may be worn to such an extent as to allow it to spring inward thus damaging the coil. The brass plate is customarily held in place by screws passing through it into the inner and outer pole pieces of the magnet. These screws also become battered by the repeated blows delivered by the material attracted by the magnet so that their removal becomes very difficult. The repair of the magnet including the renewal of the coil and the brass plate is therefore a tedious and expensive matter. My present invention provides means for overcoming these difficulties and embraces also means for deadening the vibration which otherwise might be transmitted to the coil with injurious results, together with means for compensating for the expansion of the winding without injury to the insulation and certain other details of construction which will be hereinafter described.

The drawing shows in Figure 1, a vertical cross section of a magnet embodying my improvements, and in Fig. 2, a plan of the right portion of Fig. 1.

In the drawing A is the frame of the magnet, made of magnetic material, preferably annealed steel. The frame A is provided on its upper surface with radial ribs a^1; and around its periphery, with vertical ribs a^2. These ribs are provided for increasing the surface available for dissipating the heat generated in the magnetizing coil. They are also so disposed as to mechanically stiffen and strengthen the frame of the magnet; at the same time, they are so arranged, with reference to the direction of magnetic flux, that their full section is available for conducting the magnetic flux. By this construction, increased radiating surface, increased strength, and maximum section of magnetic circuit are obtained with minimum weight of material.

The frame A is provided with a downwardly projecting core N, the lower face of which forms one pole of the magnet. The outer annular projection S of the frame A forms a second pole-piece.

B is the magnetizing coil which surrounds the core N and approximately fills the space between the core N and the annular pole S. It is to be noted that the annular face of the pole S is considerably lower than the face of the pole N and that the magnetizing coil B is thicker at its outer than at its inner diameter. This construction is used for the reasons given in United States Patent No. 794,086, issued to me, July 4, 1905. The lower face of the coil B is held in place and protected by a non-magnetic plate C^1 (made, for instance, of brass), which plate engages at its inner and outer edges with finished shoulders in the poles N and S. The plate C^1 is held in place and is shielded by an annular non-magnetic plate C^2, which is held in position at its inner edge or central opening by the tapered pole shoe n^1, which in turn is held by a bolt n^2 extending through the core N. This bolt is threaded and provided with a nut at its upper end screwed down on the core N. The plate C^2 is clamped at its periphery by a series of bolts s^1 which pass through lugs s^2 on the outer surface of the pole piece S and have their heads in the lower face of the piece. The lugs s^2 are located between the ribs a^2 in such a manner that the nuts which hold the bolts s^1 in place are protected and are not liable to become bruised and battered in service. A sheet of elastic material c^3, such as rubber packing, is placed between the plates C^1 and C^2 and has the effect of deadening any blows which may be delivered on the lower face of the magnet. The plate c^2 is a wearing plate and may be worn through in places before its renewal becomes necessary since the second plate C^1 sufficiently protects the coil. The renewal of the plate C^2 can be conveniently and cheaply effected.

The coil B is entirely inclosed within an annular chamber in the frame A. The ends of the coil pass upward through a large rectangular opening a^3 in top of the frame A and are received in connecting blocks b^1, b^2, which are arranged for receiving plug connections to connect the coil to the source of current supply.

When the magnet is assembled the coil is of such size that a space is left between each of its faces and the corresponding walls of the annular coil space in the frame of the magnet. This space is then poured full of a plastic insulating compound b^4 which softens with heat, the compound being poured in through the terminal opening a^3, which is filled to a sufficient depth only to seal the coil in place. When the coil becomes heated by the passage of current through it, it, of course, expands; the insulating compound becomes plastic under the influence of heat and a portion of it is forced upward into the space a^3 to compensate for the expansion, thus preventing excessive strain on the coil and preventing injury to the insulation. The said space having been poured full of the plastic material prevents the access of air with its burden of moisture into contact with the winding. If there is an air space, such as obtains in the ordinary practice, about the winding, a part of the moisture which the air in this space contains, will condense when the magnet becomes cold. When the magnet is heated again by the electric current in the winding, expansion of the air in the space about the winding takes place which will raise the air above normal atmospheric pressure and a portion of the air will escape. When the magnet cools a second time, this rarefied air will contract, producing a partial vacuum and causing fresh air to work in, carrying its burden of moisture. In practice, this action, called breathing, is almost impossible to prevent as air will creep in through and around the insulation on the leads which enter the magnet frame. The gradual accumulation of the moisture which occurs through this breathing action gradually disintegrates the insulation and finally the winding will become grounded through the high potential discharge which takes place when the circuit of the winding is opened. To prevent the access of moisture to the winding, I make the space about the winding full of the insulating material as already stated. This excludes air space about the winding and so avoids the breathing action and no opportunity for an accumulation of condensed moisture within the magnet frame exists. Furthermore when the usual air space about the winding is full of insulation, the heat from the winding is conducted away and dissipated more rapidly than when the insulation partially fills the space so as to imperfectly contact with the winding and the frame. When the said space is not filled, that part of the space not occupied by the insulation is filled with air which is an extremely poor conductor of heat.

Eyebolts D are screwed into the upper face of the frame A and are used for attaching the magnet by means of chains to the hook of a crane or other hoisting mechanism. The holes which receive the eyebolts D pass entirely through the metal of the frame A and are counterbored at the bottom to receive the washers or followers *d*. When it is desired to remove the coil B, the bottom plates C^1 and C^2 are removed as are also the eyebolts D. Longer screws or other tools are then inserted in place of the eyebolts and are screwed or forced down onto the washers *d*, thus forcing out the coil B, the washers protecting the coil from the action of the forcing tool. To facilitate the removal of the coil B the vertical faces of the winding space are given an outward draft so that the coil is readily freed from the case.

The magnets may have rectangular, elliptically or other horizontal cross-sections, but they are mere equivalents or forms of my invention.

I claim—

1. In a lifting magnet, a magnetizing coil, a non-magnetic plate for protecting the coil, and a second non-magnetic plate covering the first plate to receive directly the impact of articles attracted thereagainst and to prevent injury to the coil by said impact.

2. In a lifting magnet, the combination of a magnetizing coil, a non-magnetic plate for covering the coil on the active side of the magnet, a second non-magnetic plate for preventing wear of the first plate, and elastic packing between said plates.

3. In a lifting magnet, a frame having a central pole and an annular outer pole, a magnetizing coil between said poles, a non-magnetic plate for retaining said coil, and a wear plate, said wear plate being held by a pole shoe detachably clamped to said central pole.

4. In a lifting magnet, a frame, a magnetizing coil therein, a wear plate to protect the lower face of the magnet, bolts extending up through both the frame and the plate, means for causing the bolts to draw the frame and plate toward each other, said drawing means being located so as to be protected from abrasion of the articles attracted to the magnet.

5. A magnet, having its upper and lateral portions provided with ribs, the length of the ribs being coincident with the directions of the magnetic flux in the magnetic circuit.

6. A magnet having its upper and lateral portions provided with ribs so arranged that the cross-section of each of said ribs adds to the cross-section of the circuit of the magnetic flux.

7. A magnet having the top portions of its frame provided with ribs, the length of the ribs being substantially coincident with the directions of the magnetic flux in said portions of the frame.

8. In a lifting magnet, a frame provided with ribs, a magnetizing coil in the frame, a wear plate on the bottom of said frame, bolts to secure the frame and plate together, and securing means for said bolts seated between said ribs.

9. In a magnet, a chamber, a magnetizing coil therein, and plastic material surrounding the coil, said chamber having an aperture, through which the leads from said coil pass and a portion of said plastic material may be displaced to compensate for the expansion of the coil.

10. In a magnet, a chamber, a magnetizing coil therein, and plastic material surrounding the coil, said chamber having a cavity into which a portion of said plastic material may be forced when the coil expands.

11. In a magnet, a chamber, a magnetizing winding therein, and a material to seal the winding in the chamber, said material becoming plastic when heated, there being a passage in a wall of the chamber, into which a portion of the plastic material may be displaced by the expansion of said winding.

12. In a magnet, a frame, a magnetizing coil therein, said frame being provided with holes extending therethrough into the space occupied by the coil, and followers between the coil and the frame and in line with said holes and means insertible in said holes and engageable with said followers to force the coil from the frame.

Signed at Cleveland this 10″ day of February, 1906.

ARTHUR C. EASTWOOD.

Witnesses:
C. W. Comstock,
J. H. Hall.