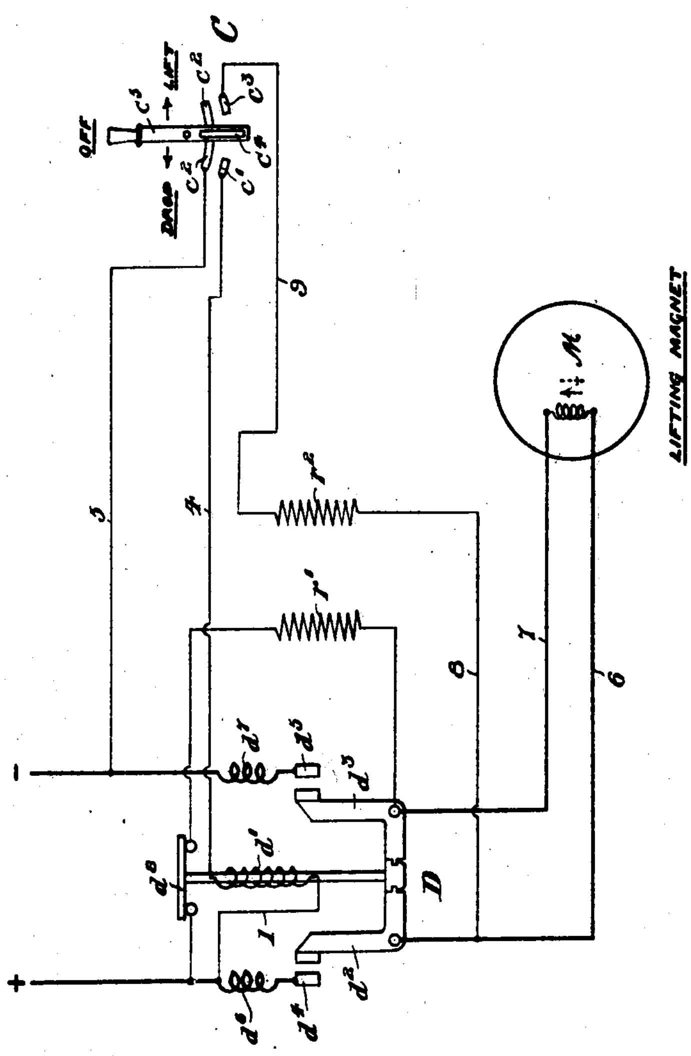
A. C. EASTWOOD.
LIFTING MAGNET CONTROLLER.
APPLICATION FILED JAN. 28, 1909.

961,342. Patented June 14, 1910.



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ARTHUR C. EASTWOOD, OF CLEVELAND, OHIO.

LIFTING-MAGNET CONTROLLER.

961,342. Specification of Letters Patent. Patented June 14, 1910.

Application filed January 28, 1909. Serial No. 474,731.

To all whom it may concern:

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

My invention relates to a controller for controlling the action of a lifting magnet.

The chief object of my invention is to secure a more rapid release of the load lifted by the magnet thus increasing the handling capacity of a given crane and magnet and also reducing the percentage of material spilled or misplaced in the process of handling.

My invention also provides means for opening the circuit of a lifting magnet, which naturally is of a highly inductive nature, reliably, quietly and without excessive insulation stresses.

The use of lifting magnets for handling pig iron, scrap and similar miscellaneous matter necessitates a magnet winding of a large number of ampere turns and also a magnet frame of heavy cross section. Consequently, the circuit including the magnetizing winding becomes highly inductive in nature with the result that when the circuit of the magnet is opened by any of the ordinary switches or circuit controlling devices, a persistent arc of a very flaring or expansive nature is set up, the energy stored in the magnet being discharged through the arc. This arc on account of the inductive character of the circuit emits a large volume of light and usually also a considerable sound both of which are likely to prove disconcerting to the operator. Further the persisting character of the arc prevents rapid deënergization of the magnet so that all or a portion of the load lifted thereby has a tendency to hang on for several seconds after the controller has been operated to release the load. This last point is very objectionable in cases where material such as pig iron and scrap is being handled from railway cars or a stock pile into charging boxes for open hearth furnaces by means of a crane equipped with a lifting magnet. Such charging boxes are usually from three to eight feet long and from eighteen to twenty-four inches in width, consequently material must be quite accurately deposited by the magnet to avoid excessive spilling. When material is handled by means of a crane and lifting magnet the magnet is usually suspended from hoisting cables or chains of from thirty to fifty feet in length. If the motion of the crane is suddenly checked the magnet with its load has a tendency to swing like a pendulum and if uncertainty exists in the release of the load when the magnet controller is operated to deënergize the magnet, the magnet is likely to swing past the point where it is desired to deposit the load thus causing spilling and scattering of the material. Either this will occur or the operator must wait until the load has substantially come to rest before operating his controller to release the load, which, of course, necessitates a loss of time and a reduction in the capacity of the plant. This objectionable condition becomes further aggravated where the material to be handled will retain a considerable percentage of the induced magnetism and the material is of such form as to completely bridge the poles of the magnet—this causing the material to more tenaciously cling to the poles of the magnet after the circuit of the magnetizing winding has been opened. My invention possesses particular advantage when applied to magnets handling material of such a character.

In controlling devices at present commonly used with lifting magnets, when it is desired to release the load, the circuit of the magnet winding is opened at the contacts of a magnetically operated switch under the influence of a powerful magnetic blow-out, and, at the instant of disconnecting the magnet winding from the line the winding is connected in a local or discharge circuit.

In a test I found that a lifting magnet of annular type, capable of lifting eighteen hundred pounds of pig iron per lift, when equipped with this commonly used control device would hold a load consisting of a plate ¾ of an inch in thickness for nine seconds after the switch was operated to deënergize the magnet. With my improved control system identically the same magnet with the same excitation released the same load in 1 76/100 seconds after the switch was operated to deënergize the magnet. The saving in time and the increased speed of handling which may be secured by the use of my system is evident.

In carrying out my invention, I provide a magnetically operated switch or switches for connecting the winding of the magnet to the supply circuit, and a master switch for energizing the operating solenoid or solenoids of these switches. I also provide the master controller with contacts by means of which, when it is desired to deënergize the magnet and promptly release the load, the magnetizing winding may be connected through a resistance to the line, the ends of the winding being transposed such that a limited current will flow through the magnet winding in the reverse direction.

I find that in the case of a lifting magnet requiring 45 amperes at 220 volts for full excitation, a reverse current of two amperes is sufficient to cause the desired promptness in releasing the load and at the same time this small current is not sufficient to cause the load to cling to the magnet. It is natural to suppose that this more sudden deënergization of the magnet would cause more severe arcing and higher insulation strains than the ordinary forms of magnet controllers which permit the magnet to release its load more slowly. I have discovered, however, that this is not the case. By means of my invention the circuit of the magnet is opened with the occurrence of a smaller and quieter arc and no appreciable disturbance of line voltage occurs.

To describe more fully the operation of my invention reference will be had to the accompanying drawing, which is a diagram of the electrical connections of my invention.

In this drawing the magnet is represented by M, the magnetic switch by D, and the controller by C. The magnetic switch D has an operating solenoid d' which simultaneously operates the two contact arms d^2 and d^3 to make contact with the fixed contacts d^4 and d^5.

d^6 and d^7 represent blow-out coils provided to extinguish the arc formed when the said contacts open.

d^8 is an auxiliary contact which opens when the solenoid operates to close the main contacts d^2 and d^3. In the controller C, the controller arm c^5 carries the brush c^4 which makes contact with the fixed contacts c', c^2, and c^3 when moved to the several operating positions.

When it is intended to energize the magnet for lifting a load, the controller arm c^5 is moved to the position marked "Lift," at which time the brush c^4 makes connection with the contacts c' and c^2. A circuit is now established from the positive through the wire 1, the operating solenoid d', the wire 4, the contact c', the brush c^4, the contact c^2, and the wire 5 to the negative. This energizes the solenoid d' of the magnetic switch D, closing the main contacts d^2, d^4 and d^3, d^5 and opening the auxiliary contact d^8. Current then flows from the positive through the fixed contact d^4, the movable contact d^2, the wire 6, the lifting magnet winding m in the direction of the solid arrow, the wire 7, the movable contact d^3, and the fixed contact d^5 to the negative. This fully energizes the magnet. If it is now desired to drop the load quickly, the controller arm c^5 is moved to the position marked "Drop" so that the brush c^4 connects the contacts c^2 and c^3. As soon as the brush c^4 leaves the contact c', the solenoid d' of the magnetic switch is deënergized and the circuit to the magnet M is interrupted. As soon as the brush c^4 connects the contacts c^2 and c^3 a circuit is established from the positive through the auxiliary contact d^8, the resistance r', the wire 7, the magnet winding m in the direction of the dotted arrow, the wire 8, the resistance r^2, the wire 9, the contact c^3, the brush c^4, the contact c^2, and the wire 5 to the negative. This connection allows current to flow through the magnet winding m in the opposite direction to that while lifting, the current being limited to a small value by the resistances r' and r^2. After the load carried by the magnet has dropped, the controller arm C^5 may be placed in the off-position to prevent a waste of current which would flow through the magnet if the controller arm were left in the "drop" position. When it is again necessary to pick up the load, the arm c^5 is again moved to the position "lift."

I claim—

1. In a controller for lifting magnets, the combination of a magnetically closed switch for connecting the winding of the magnet to the supply mains, a master switch, said master switch having contacts for energizing the winding of said magnetically closed switch, and contacts for closing the circuit of the winding of said magnet to give a reverse direction of current flow through said winding.

2. In a controller for lifting magnets, the combination of a magnetically closed switch for connecting the winding of the magnet to the supply mains, a master switch, said master switch having contacts for energizing the winding of said magnetically closed switch, contacts for closing the circuit of the winding of said magnet to give a reverse direction of current flow through said winding, and means for limiting the current when flowing in the said reverse direction.

3. In a controller for lifting magnets, the combination of a magnetically closed switch for connecting the winding of the magnet to the supply mains, a master switch, said master switch having contacts for energizing the winding of said magnetically closed switch, and contacts for closing the circuit of the winding of said magnet to give a reverse direction of current flow through

said winding, there being a space or "off-position" between said first and second mentioned contacts of the master controller.

4. In a controller for lifting magnets, the combination of a magnetically closed switch for connecting the winding of the magnet to the supply mains, a master switch, said master switch having contacts for energizing the winding of said magnetically closed switch, contacts for closing the circuit of the winding of said magnet to give a reverse direction of current flow through said winding, there being a space or "off-position" between said first and second mentioned contacts of the master controller, and means for limiting the flow of current when flowing in the said reverse direction.

5. In a controller for lifting magnets, a magnetically closed switch having main contacts for connecting the winding of the magnet to the supply mains when it is desired to energize the magnet, an auxiliary switch actuated by said magnetically closed switch said auxiliary switch being open when said magnetically closed switch is closed and closed when said magnetically closed switch is open, said auxiliary switch when closed being adapted to connect one end of the winding of the magnet to the supply main opposite to that to which the same end of the winding was connected by the magnetically closed switch, a resistance, and a master controller having in one position contacts for energizing the winding of said magnetically closed switch and in another direction contacts which, when closed, complete a circuit through said resistance, the winding of the magnet and said auxiliary switch with the current flowing through the magnet in a direction opposite to that in which the current flows when the magnetically closed switch is closed.

Signed at Cleveland, Ohio, this 25th day of Jan., A. D. 1909.

ARTHUR C. EASTWOOD.

Witnesses:

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J. H. HALL.