F. E. TOWN.

MOBILE CIRCUIT CLOSER.

APPLICATION FILED DEC. 5, 1906.

968,208. Patented Aug. 23, 1910.

Fig. 1

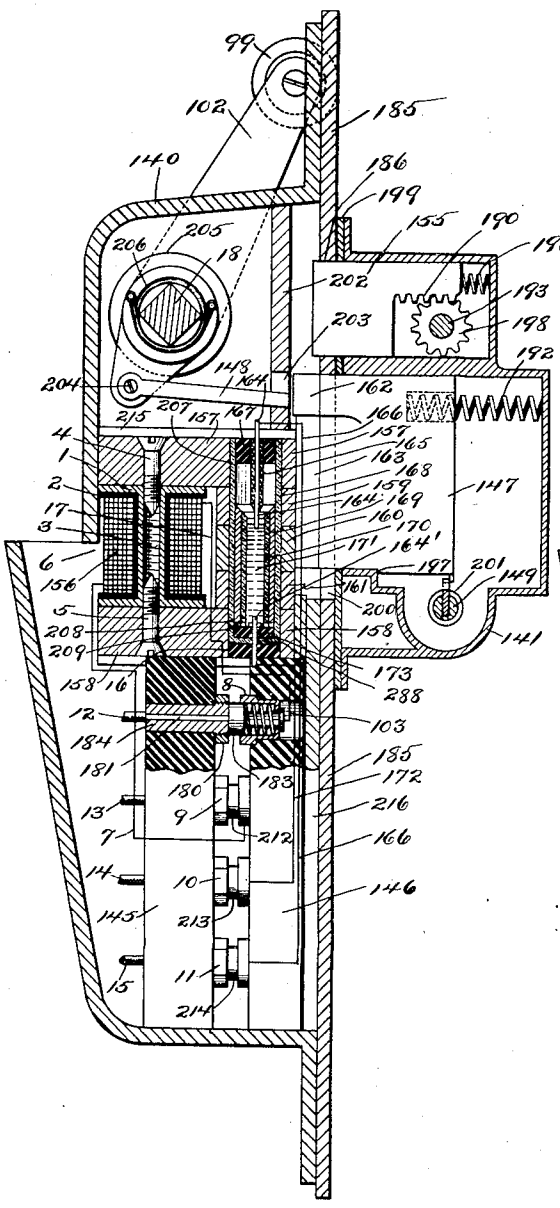
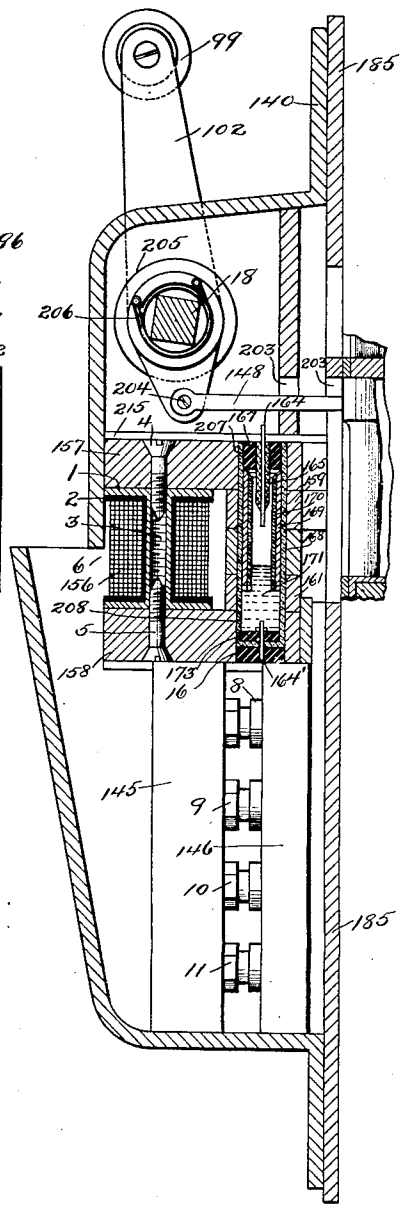


Fig. 2



Witnesses

Walter C. Strang

James G. Bethell

Inventor

Frederic E. Town

By Attorney

C. M. Nissen

UNITED STATES PATENT OFFICE.

FREDERIC E. TOWN, OF NEW YORK, N. Y., ASSIGNOR TO OTIS ELEVATOR COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

MOBILE CIRCUIT-CLOSER.

968,208. Specification of Letters Patent. Patented Aug. 23, 1910.

Application filed December 5, 1906. Serial No. 346,372.

To all whom it may concern:

Be it known that I, FREDERIC E. TOWN, a citizen of the United States, residing at New York city, in the county of New York and State of New York, have invented a new and useful Improvement in Mobile Circuit-Closers, of which the following is a specification.

My invention relates to circuit controllers and although it is herein shown as applied to an elevator door lock and in my co-pending application, Serial No. 319,483, filed May 31, 1906, for an improvement in elevator door locks, as applied to an automatic electric elevator system, it may have a general application. The door lock mechanism including my improved circuit closer is covered in said co-pending application.

One of the objects of my invention is the provision of a circuit controller having its circuit breaking terminals entirely inclosed, in combination with a magnet and a movable armature external to said controller to effect the operation of the latter.

A further object of the present invention is to provide a mobile circuit-closer associated with a magnet which has a movable armature for effecting the operation of said circuit-closer.

Another object of my invention is to provide a combined terminal carrier and electromagnetic circuit controller which can easily be removed and replaced by another of like structure, said terminal carrier co-acting when in position with substantially stationary contacts electrically connected to the terminals of said electro-magnetic circuit controller.

Other objects of the invention will appear hereinafter, the novel combinations of elements being pointed out in the claims.

In the accompanying drawings, Figure 1 represents a vertical sectional view of an elevator door lock with my invention applied thereto, the circuit controller being shown in closed position; Fig. 2 is a similar view but showing the circuit-closer in open position.

Referring to the drawings, it will be seen that a terminal block 145 of insulating material carries a plurality of fixed contacts 180, 9, 10 and 11. This terminal block is fixed within the lower central portion of the casing 140 which in this instance is the keeper casing of an elevator door lock. This casing has secured to it a face plate 185 provided with openings 186 and 200 for the passage of the latch 155 and locking bolt 147, respectively. Mounted in the upper portion of the casing 140 in suitable bearings is the shaft 18 which carries the lever arm 102 having a roller 99 at its upper outer end and having a link 148 pivoted at 204 at its lower end. This link is adapted to pass through an opening 203 in the partition 202 fixed in the casing 140, and strike against the projection 162 of the locking bolt 147.

The lock casing 141 is provided with a face plate 199 and contains the latch 155 and bolt 147 together with the means for operating the same. The door knob spindle 193 carries a pinion 198 which is adapted to engage the rack 190 of the latch 155 and move the same against the action of the spring 196. A spring 192 forces the locking bolt through the lower opening in the face plate 199, but outward movement of the locking bolt is limited by the shoulder 197.

201 designates a keyhole for the insertion of a key 149 so that the door may be opened manually if desired.

In a well known manner a cam connected to an elevator car is adapted to engage the roller 99 to force the lever 102 to the position shown in Fig. 2, thus effecting the unlocking of the door in an obvious manner. It is also evident that the lever 102 may be operated manually so that it is deemed unnecessary to make any further illustration in this application to illustrate the mode of applying my invention.

The combined magnetic circuit-closer and terminal carrier fits snugly between the partition 215, the upper portion of the fixed terminal block 145 and the face plate 185 of the keeper casing. When the latter is removed the circuit-closer and the terminal carrier 146 may be easily removed.

The electro-magnetic mechanism for effecting the operation of the mobile circuit-closer comprises a solenoid 156, mounted on the iron spool 1 with an intermediate spool 2 of insulating material. The spool 1 is internally screw-threaded at 3 for the reception of the screws 4 and 5 at its ends for securing the pole pieces 157 and 158 to said solenoid and spools, constituting an electromagnet 6. Each of these poles as viewed in Fig. 1 extends to the right and each is provided in this instance with a vertical

cylindrical opening 207 and 208, respectively. Through these openings passes a tube 168, of insulating material, preferably glass. If desired the openings in the pole 158 may not extend entirely therethrough but merely form a cylindrical recess for the reception of the glass tube 168. This tube may be entirely open at the bottom and closed by means of a plug of cork 173, or said tube may be closed by the material of which it is composed, as shown at 288 in Fig. 1. The electro-magnet including the poles 157 and 158 may be of any desired design and construction and may in some instances be replaced by a permanent magnet.

Within the tube 168 is adapted to move vertically or on an incline, a cylindrical piece of magnetic material 169, preferably soft iron. The tube contains a certain quantity of mercury 171, or other conducting fluid, and on this mercury floats the iron tube 169. In order to give this tube 169 greater displacement when drawn down without increasing its weight too much, the interior of the tube may be coated with some insulating material or an additional glass tube 170 placed within the same. The lower ends of the iron tube 169 and the glass tube 170 are notched at 209 so as to prevent sticking of the tube 169 to the bottom when said tube is forced downwardly in a manner hereinafter described, thus insuring its quick upward movement when the downward force acting thereon is released. These details, however, may be varied by those skilled in the art without departing from the principles of my invention.

The upper end of the glass tube 169 is closed with insulating material 167, as by means of an ordinary cork which is provided with a central opening for the insertion of the insulating rod or tube 165. This insulating rod carries the contact terminal 164 which extends downwardly a suitable distance and is adapted to come in contact with the mercury 171 as shown in Fig. 1. Preferably the rod 165 is composed of glass which has been molded over the platinum wire 164. Through the bottom of the tube 168 extends another contact terminal 164′ which always makes electrical connection with the mercury 171. Preferably the terminal 164′ is a platinum wire as well as the terminal 164. The terminal 164′ may pass upwardly through the insulating bottom 173 or also through the glass bottom 288 of the tube 7 and the insulating block 16. If the terminal 164′ passes through the glass bottom it is preferably secured in position when said tube is made. The parts as thus associated constitute a mobile circuit-closer.

Held in place by separating blocks 159 and 161 of non-magnetic material secured respectively to the poles 157 and 158, is an intermediate piece 160 of magnetic material. The parts 159 and 161 are made of non-magnetic material, as for example, brass, while the part 160 is composed of magnetic material similar to the poles 157 and 158 and preferably soft iron. It will therefore be seen that when the poles 157 and 158 with the intermediate blocks 159, 160 and 161 are secured in position, an opening extends entirely through the same, and in this opening is placed the tube 168.

Normally the iron tube 169 within the glass tube 168 floats on the conducting fluid 171 as indicated in Fig. 2, when the terminals 164 and 164′ are electrically disconnected. At this time the lines of force extending from the pole pieces to form a magnetic field are symmetrically distributed between the poles 157 and 158. The reluctance to the lines of force between the two poles of the electro-magnet is greatest through the parts 159 and 161 which are composed of non-magnetic material. Since the permeability of these parts is substantially the same as that of air, the reluctance is the same as if these were air gaps, but in order to make the circuit-closing device mechanically stronger it is preferable to insert the material instead of leaving air gaps. Furthermore, the intermediate block 160 is supported in proper position by the pieces of non-magnetic material although the latter could be omitted if desired, and the part of magnetic material 160 could be secured to and carried by the tube 168, or in any other desired manner.

Now when the locking bolt 147 which is composed of soft iron is allowed to be moved to locking position as indicated in Fig. 1, its V-shaped, rounded or semi-cylindrical face 163 will engage with the corresponding recesses in the faces of the pole piece 157, block 159, and block 160. The locking bolt will then provide a path of very low reluctance for the lines of force between the upper pole of the magnet and the intermediate block 160. The gap between the pole 157 and the intermediate magnetic part 160 will be substantially eliminated by this operation and therefore the effective magnetic field will be shifted downwardly between the magnetic part 160 and the pole 158. In other words the ends of the poles of the electro-magnet are now the part 160 and the pole 158. When the locking bolt 147 is in the position indicated in Fig. 2 the air gap between the same and the poles of the electro-magnet is too great to have any appreciable effect on the iron tube 169. At this time the electro-magnet when energized, tends to draw the iron tube 169 toward its upper pole 157, as mercury enough is used to float this tube slightly above middle position. The iron tube 169 will therefore take a position at a point slightly above the midway position between

the poles 157 and 158 of the electro-magnet. The magnet may be constructed so as to hold the locking member 147 firmly in position magnetically, but it is preferably so designed that such member may be manually withdrawn from the position in Fig. 1 to the position in Fig. 2 without too great effort.

When the locking bolt 147 is moved into the position shown in Fig. 1 so that the pole 157 is magnetically connected to the intermediate part 160, the iron tube 169 will be attracted downwardly between the pole 158 and the magnetic block 160, which now is in effect the other pole of the electro-magnet. The iron tube 169 will always tend to place itself in such a position as to close any magnetic gaps so as to lessen the reluctance to the lines of force in the well known manner. When the iron tube 169 is thus attracted downwardly the mercury 171 will be displaced and its depth therefore increased until it engages the inner end of the terminal 164, so as to electrically connect the latter with the terminal 164'. The terminals 164 and 164' may be connected in any circuit that is desired to be controlled by means of the leads 166 and 172 which are connected respectively to the contacts 214, 11, and 213, 10. The fixed contacts 10 and 11 are connected respectively to the terminals 14 and 15 which lead directly to the apparatus to be controlled. The terminals 213 and 214 like those designated 183 and 212, are spring-pressed and mounted in cup-shaped receptacles 8 which are fixed to the removable terminal block 146. The outward movement of the spring-pressed terminals is limited by the heads 103. The terminal block 146 is in this instance rigidly connected to the pole piece 158 of the electro-magnet, and the terminals carried by said block are so arranged that when the magnet is placed in position the spring-pressed terminals will engage the fixed terminals. These fixed terminals comprise cylindrical metal blocks 184 each having a hole longitudinally through its center for receiving the bare wire 181. The right-hand end of the block 184 is slotted crosswise so that when the nut 180 is secured in position on the screw threaded outer end of said block, the wire 181 will be clamped in position with its end exposed. The advantage of this construction is that the wire 181 may be secured in position with its end projecting a slight distance to the right of the block 184 as viewed in Fig. 1. The outer end of the block 184 together with the end of the wire 181 may then be filed so that the surfaces of each will be flush with the other. The spring-pressed terminals may then come in direct contact with the ends of the wires as well as their carrying blocks, and therefore, more efficient electrical connection can be made.

The terminals of the electro-magnet are here shown connected by the wires 17 and 7 to the spring-pressed contacts 183 and 212 respectively, the latter being adapted to engage the fixed terminals connected to the wires 12 and 13 leading to a source of energy. As an additional protection to the contacts carried by the block 146 of the electro-magnetic device, a plate 216 is secured to said block so as to be engaged by the face plate 185 when the parts are in their proper positions as in Fig. 1. The plate 216 also serves as a means for more rigidly connecting the block 146 and its terminals to the electro-magnet and circuit-closer.

It should be noted that the circuit-closing device herein disclosed may take the place of a simple switch which cannot be used near explosive or very inflammable substances. This is for the reason that whenever the circuit-closer is opened any sparking or arcing that could be produced will occur within the glass tube and such arcing will therefore not be exposed to the atmosphere, nor could arcing produce any melting of the parts. In such case the magnetic member 147 could be mounted in the same manner as an ordinary switch blade or operated in any other desired manner. In other words, my improved circuit-closing device may be used as a simple switch, the magnetic member for effecting the opening and the closing of the switch being mounted in any convenient manner.

Obviously those skilled in the art may make various changes in the details and arrangement of parts without departing from the spirit and scope of my invention, and I desire therefore not to be limited to the precise construction herein disclosed.

Having thus described my invention, what I claim and desire to have protected by Letters Patent of the United States is:—

1. The combination with a movable magnetic member, of an electro-magnet having one of its poles extended into the path of said movable member, a mobile circuit-closer associated with the poles of said electro-magnet, a section of magnetic material between said poles but magnetically separated therefrom, and means for moving said first-named magnetic member into engagement with said first-named pole and said intermediate section of magnetic material.

2. The combination with a magnet, of a mercury circuit-closer associated with the poles of said magnet, a section of magnetic material mounted between said poles but out of magnetic contact therewith, and a movable member adapted to magnetically connect one of the poles of said magnet and said intermediate section to effect the operation of said mobile circuit-closer.

3. The combination with a magnet, of a receptacle between the poles of said magnet,

said receptacle being adapted to contain electric conducting liquid, a plurality of contacts, and magnetic means comprising an external movable element for displacing said liquid to electrically connect said contacts.

4. The combination with an inclosed mobile circuit-closer, of a magnet, a block of magnetic material intermediate the poles of the magnet, and a movable piece of magnetic material to connect a magnet pole to said intermediate block to direct the magnetic flux in a predetermined path and effect the closure of the circuit-closer.

5. The combination with an electro-magnet, of an insulating tube located externally of the electro-magnet between the poles thereof and containing mercury, circuit terminals, an iron tube floating on said mercury, and means for moving the iron tube to displace the mercury to electrically connect said terminals.

6. The combination with a magnet having extended poles, of an insulating tube connected between said poles, a movable member of magnetic material floating on mercury in said tube, insulated terminals projecting into said tube, a section or block of magnetic material between said poles, and a magnetic member to connect one of said poles and said block to distort the magnetic field adjacent the magnet poles and effect a downward movement of the interior movable member, and the displacement of the mercury to electrically connect said terminals.

7. The combination with a magnet with laterally extending poles, of an insulating tube closed at its ends and fitting within openings in said poles, insulated circuit terminals projecting into said tube, an iron tube having an interior wall of insulating material and floating on mercury in said tube, two sections of non-magnetic material and an intermediate section of magnetic material between the poles and associated with said tube, and a movable magnetic device for connecting the upper pole with the said intermediate section to effect the descent of the iron tube and the consequent displacement of the mercury to electrically connect said terminals.

8. The combination with a mobile circuit-closer comprising a plurality of circuit terminals conducting liquid and a freely movable device for displacing the same, of an electro-magnet associated with said circuit-closer, and an insulating terminal block for said circuit-closer and electro-magnet and rigidly connected thereto.

9. The combination with a mobile circuit-closer, of an electro-magnet associated therewith, a terminal block rigidly connected to said magnet and circuit-closer, a corresponding fixed terminal block, means for receiving and supporting the circuit-closer, magnet and first-named terminal block as a single device, and a movable magnetic member for effecting the operation of the circuit-closer.

10. As an article of manufacture, the combination with a mobile circuit-closer comprising circuit terminals and a member floating on mercury, of an electro-magnet associated therewith, and an insulating terminal block carrying switch terminals for said magnet and circuit-closer, the aforesaid parts being connected together in a single portable device.

11. As an article of manufacture, the combination with an electro-magnet, of an inclosed mercury circuit-closer rigidly connected to the poles of said electro-magnet and comprising a freely movable element in contact with the mercury, an insulating block rigidly connected to said magnet, and contacts carried by said block and electrically connected to the terminals of said electro-magnet and said circuit-closer.

12. The combination with an electro-magnet having laterally extending poles, of a plurality of sections of non-magnetic material with an intermediate section of magnetic material between said poles, an insulating receptacle containing liquid conducting material and extending between said poles and through said sections, electric terminals extending into said receptacle, a plurality of insulated contacts connected respectively to the winding of the electro-magnet and said terminals, and a frame for carrying and supporting the aforesaid parts as a unitary structure.

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

FREDERIC E. TOWN.

Witnesses:
CHAS. M. NISSEN,
W. H. BRADY.