No. 884,345. PATENTED APR. 7, 1908.

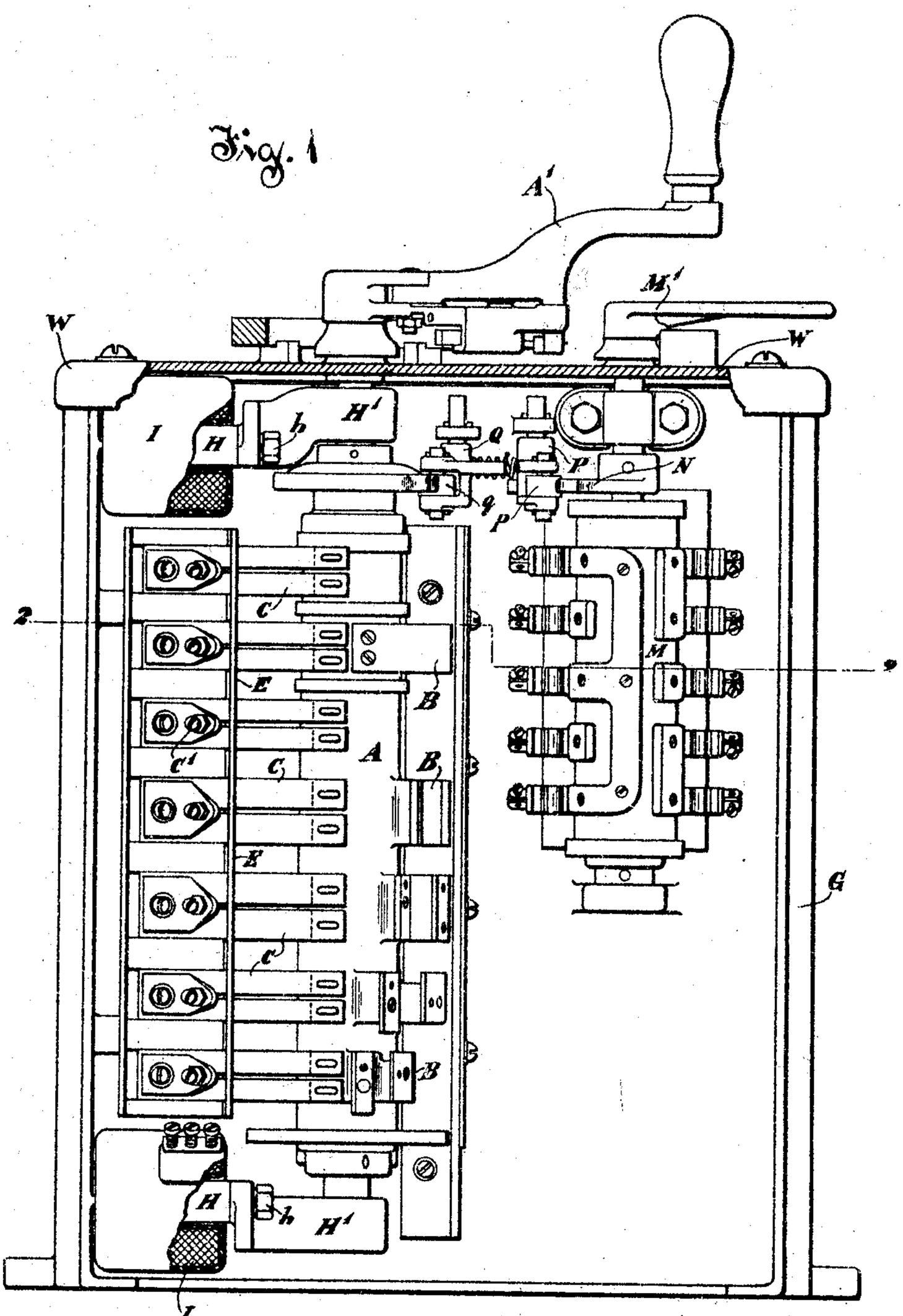
E. W. STULL.

CONTROLLER.

APPLICATION FILED OCT. 26, 1907.

2 SHEETS—SHEET 1.

Fig. 1



Witnesses

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2 SHEETS—SHEET 2.

Fig. 3

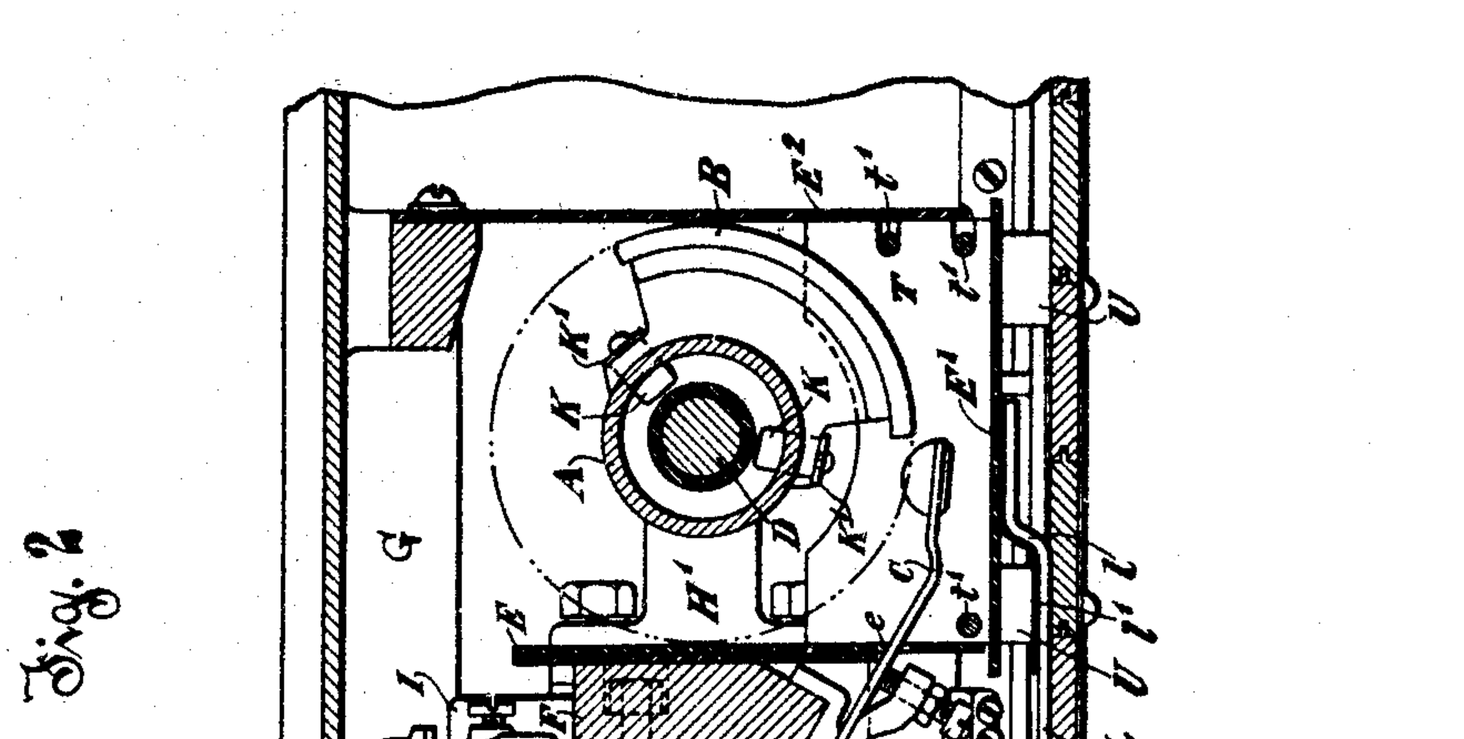

Fig. 2

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UNITED STATES PATENT OFFICE.

EMMETT W. STULL, OF NORWOOD, OHIO, ASSIGNOR TO ALLIS-CHALMERS COMPANY, A CORPORATION OF NEW JERSEY, AND THE BULLOCK ELECTRIC MANUFACTURING COMPANY, A CORPORATION OF OHIO.

CONTROLLER.

No. 884,345. Specification of Letters Patent. Patented April 7, 1908.

Original application filed March 31, 1906, Serial No. 309,027. Divided and this application filed October 26, 1907. Serial No. 399,346.

To all whom it may concern:

Be it known that I, EMMETT W. STULL, a citizen of the United States, residing at Norwood, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Controllers, of which the following is a full, clear, and exact specification.

My invention relates to controllers for electric motors and particularly to motor controllers for electric railway work.

This application is a division of my copending application Serial No. 309,027, filed March 31, 1906.

The object of the present invention is to better the arrangement of blow-out magnets so that a more efficient action thereof is obtained. In carrying out this object the controller is provided with a plurality of blow-out magnets magnetically in parallel and supplying a common magnetic circuit, the ends of the blow-out magnet cores or extensions therefrom forming bearings for the shaft of the controller drum. This shaft is of magnetic material. The blow-out magnetic circuit thus extends by way of the controller shaft to one side of the place where arcing is liable to occur. It preferably returns from the other side of such arcing place by way of extensions of magnetic material from the other pole or poles of the blow-out magnet or magnets. Plugs of magnetic material may be inserted in the controller drum for properly directing and concentrating the lines of force at the desired circuit-breaking points of the controller and for diminishing the reluctance of the blow-out magnetic circuit.

The various novel features of my invention will appear from the description and drawings and will be particularly pointed out in the claims.

Figure 1 is an elevation of my improved invention with the front half of the controller casing removed and with some of the parts in section; Fig. 2 is a partial horizontal section on the line 2—2 of Fig. 1 and shows the general arrangement of the blow-out circuit; and Fig. 3 is an elevation of part of the front half of the controller casing looking from the inside, the arc deflector plates being removed.

In the drawings A is the controller drum, movable by the usual handle A′ and provided with contacts B with which the spring contact fingers C co-act to vary the connections between the supply circuit and the controlled devices, which may be electric motors. The drum A is mounted on but insulated from a shaft D of iron or other magnetic material. Surrounding the drum is a box or casing E, E′, E² of insulating and refractory material, such as prepared asbestos which may be covered with mica. The parts E and E² of this box or casing are fastened in place on the main controller, the part E forming a screen or shield between the circuit-breaking points of the controller and the supports for the contact fingers. The part E′ is mounted on the front part G′ of the main controller casing. The spring contact fingers C are mounted on a support F on the outside of the shield E, the fingers being adjustable by the screws C′. The fingers C extend through holes or openings *e* in the shield E into proximity to the controller drum so that proper engagement between the fingers C and the contacts B may be made when the drum is rotated. Should any arc form between adjacent fingers and attempt to run back along the fingers towards their supports, the shield or screen E through which the fingers extend and which is in the path of the arc will act to cool and thereby break said arc. Thus destructive and dangerous arcing between the fingers is avoided. If desired, instead of having the fingers C extend through openings in the shield E, they may extend around the edge of said shield, though with such an arrangement the absolute prevention of the drawing back of the arcs would not be secured.

The main controller casing is formed in two parts, a back part G of iron or other magnetic material, and a front part G′ of wood or other insulating material, and has a cover W of brass or other non-magnetic material. As shown in Fig. 2, the front part G′, which is nearest the operator, is made of tongue and groove boards fastened together and strengthened by metallic bands *g* at the top and bottom, both inside and outside. Extending from the iron part G of the controller casing are two cores H H′ on which are placed coils I I to form blow-out magnets. These coils may be connected in any desired manner. Core extensions H′ H′ are fastened to the cores H H in any desired manner, as by screws *h*, and serve not only as paths for the magnetic flux but also as bearings for the iron shaft D of the controller drum. This

controller shaft also forms part of the magnetic circuit for the two blow-out magnets, which are so wound as to make the extensions H′ H′ of the same polarity. Plugs K of iron or other magnetic material are embedded in the controller drum A and extend inward nearly to the insulation around the iron shaft D of said drum and outward toward the contacts B, but are not mounted on and do not touch the shaft itself. These plugs are located so as to be just beneath the circuit-breaking points of the controller or the points where the contact fingers C leave the contacts B, and are riveted to small plates K′ also of magnetic material, these plates serving to spread out the magnetic field across the whole width of the contact finger. The plates and attached plugs are removably fastened to the contact segments B, as by screws *k*. These plugs therefore are common pole pieces of the two blow-out magnets and serve individually to concontrate and direct the lines of force at those points respectively where arcing is liable to occur and collectively to diminish the reluctance of the magnetic circuit.

For still better directing and concentrating the lines of force at the proper points and further diminishing the reluctance of the magnetic circuit, strips of iron may be mounted inside of the front half G′ of the controller casing, which when this casing is in place bear against the back half G of the casing and are practically magnetically continuous therewith. For better insulation the ends of the strips L are protected by insulation *l′*. These strips extend from the iron part of the casing, which is part of the blow-out magnetic circuit, around the inside of the wooden part of the casing until they are over the ends of fingers C. At *l* they are bent inwardly to bring them nearer the ends of fingers C. These strips are the other common pole-pieces of the blow-out magnets, of opposite polarity to the plugs K. Thus as shown in Fig. 2 the breaking of the circuit between fingers C and contacts B occurs in a strong magnetic field between the ends of strips L and the plugs K. This field is excited by the two coils I I magnetically in parallel, and the path of the flux is from the cores H H to the casing G, strips L, across the air gaps to plugs K, shaft D, extensions H′ H′ to cores H H. The only gaps of any length in this divided paramagnetic path are those between the strips L and plugs K, in which gaps the circuit-breaking takes place. There is one strip L for each finger C and there may be plugs K at each end of each contact B as shown in Fig. 2, so that the proper blow-out action may be obtained at the circuit-breaking points in whichever direction the controller drum is rotated. The various contacts B are arranged in any desired manner around the shaft D, the connections and arrangements of these contacts forming no part of my present invention.

Extending from the part E′ of the insulating box around the controlling drum are plates T of insulating and refractory material, such as asbestos covered with mica. These plates are spaced apart by insulating tubes and are held together in a unitary structure by bolts *t′*, shown as three in number, passing through the tubes and the plates. When in place these plates extend inwardly between each contact finger and the adjacent ones, thus serving to prevent the arc of one contact finger from striking over to another contact finger. One of these contact plates is shown in Fig. 2 below the contact finger C. The unitary structure formed by these plates is placed against the in-turned ends of the strips L on the inside of the front half G′ of the controller casing as shown in Fig. 2, and is fastened to the plate E′, being spaced from the casing by bushings U and the strips L. This set of plates may be held in place by any desired means, as by bolts.

At the right hand side of the controller casing is the reversing switch M of any desired type, movable by a handle M′. Between this reversing switch and the main controller drum is provided interlocking mechanism, which, however, forms no part of the present invention and requires no description herein.

Many modifications in the precise arrangement here shown and described may be made without departing from the spirit and scope of my invention, and in the following claims I aim to cover all such modifications.

What I claim as new is:—

1. In a controller for electric motors, the combination of a controller drum, a shaft therefor, and two blow-out magnets, pole pieces of said magnets forming bearings for the controller shaft.

2. In a controller, the combination of a casing of magnetic material, extensions from said casing, blow-out coils on said extensions, and a controller drum the shaft of which is journaled in said extensions.

3. In a controller, the combination of a casing of magnetic material, extensions from said casing, blow-out coils on said extensions, and a controller drum the shaft of which is journaled in said extensions beyond said coils.

4. In a controller, the combination of a controller drum, a shaft of magnetic material therefor, and a plurality of blow-out magnets the like poles of which form journals for said shaft.

5. In a controller, the combination of a controller drum, a shaft of magnetic material therefor, a plurality of blow-out magnets the like poles of which form journals for said shaft, contact fingers coöperating with said drum, and extensions of magnetic material

from the other poles of said magnets to the rear of said contact fingers.

6. In a controller, the combination of contact fingers, a rotatable drum, a shaft of magnetic material therefor, a casing of magnetic material, blow-out coils, extensions from said casing which furnish cores for said coils, projections from said cores which furnish bearings for said shaft, and strips of magnetic material which extend from said casing to the rear of said contact fingers.

7. In a controller, a plurality of blow-out magnets, cores for said magnets, and a controller drum the shaft of which is journaled in said cores.

8. In a controller, a plurality of blow-out magnets, cores for said magnets, and a controller drum the shaft of which is journaled in the corresponding ends of said cores.

In testimony whereof I affix my signature, in the presence of two witnesses.

EMMETT W. STULL.

Witnesses:
GEO. B. SCHLEY,
FRED J. KINSEY.