No. 789,419. PATENTED MAY 9, 1905.

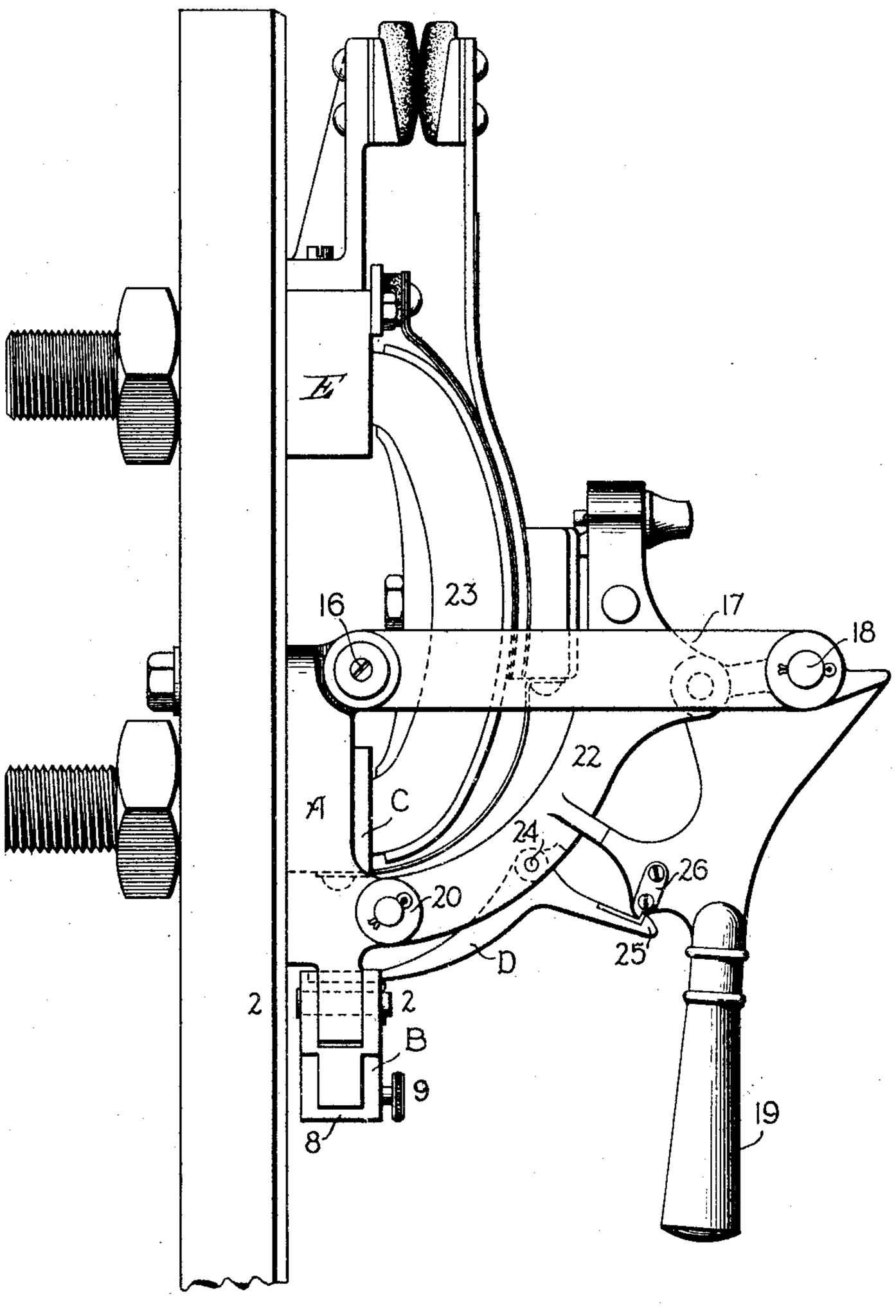
C. E. EVELETH & O. O. RIDER.

MAGNETIC CONTROLLING DEVICE.

APPLICATION FILED JUNE 3, 1903.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses.

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2 SHEETS—SHEET 2.

Fig. 2.

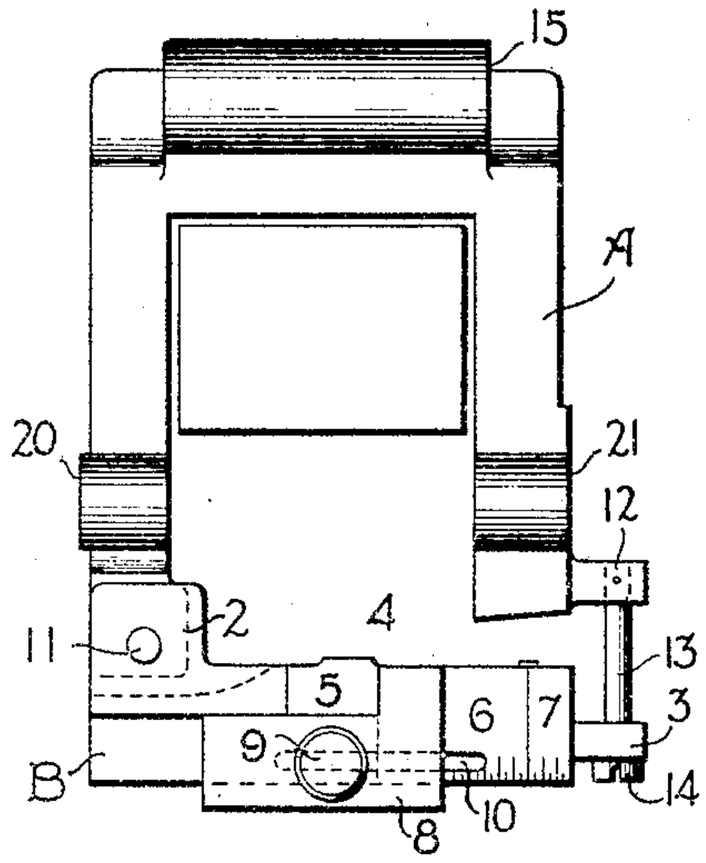
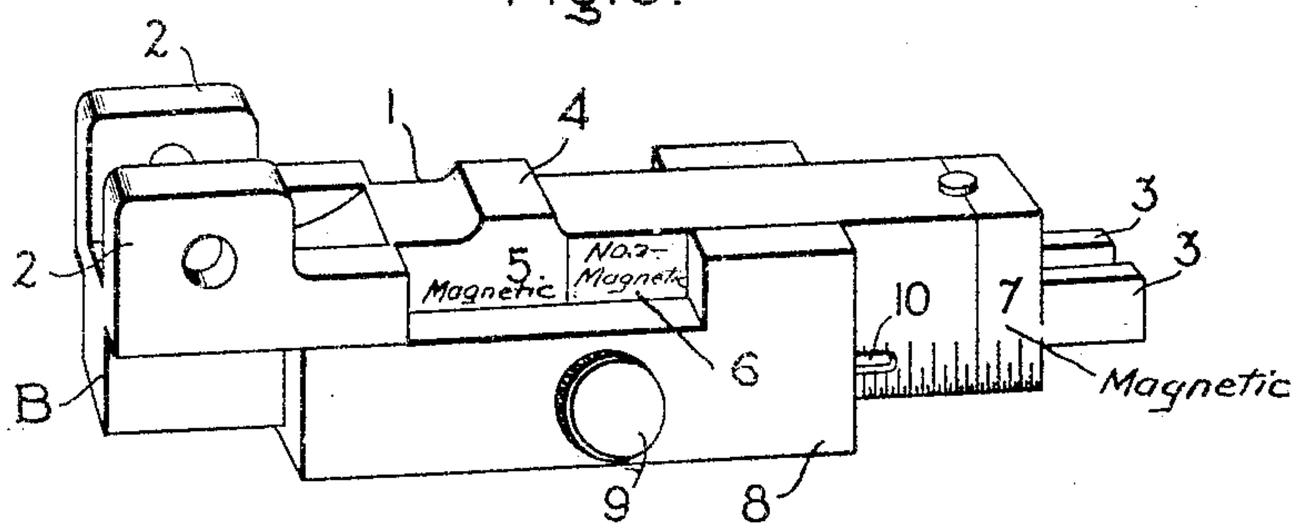


Fig. 3.



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UNITED STATES PATENT OFFICE.

CHARLES E. EVELETH AND ORAN O. RIDER, OF SCHENECTADY, NEW YORK, ASSIGNORS TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

MAGNETIC CONTROLLING DEVICE.

SPECIFICATION forming part of Letters Patent No. 789,419, dated May 9, 1905.

Application filed June 3, 1903. Serial No. 159,845.

To all whom it may concern:

Be it known that we, CHARLES E. EVELETH and ORAN O. RIDER, citizens of the United States, residing at Schenectady, in the county of Schenectady and State of New York, have invented certain new and useful Improvements in Magnetic Controlling Devices, of which the following is a specification.

The present invention relates to magnetically-controlled apparatus, and more particularly to devices of this class having means for adjustment whereby they are adapted for use under various loads and conditions of service.

As magnetic controlling devices have been constructed heretofore the method of adjustment has consisted either in varying the length of the air-gap between the magnet members or in varying the amount of force exerted to hold the magnet members in open position. The former method is open to the objection that a wide calibration with a scale of equal steps cannot be had, for the reason that the magnetic effect is inversely proportioned to the square of the length of air-gap, and the latter method is also objectionable, for the reason that the means for exerting the force to hold the parts in open position, usually an adjustable weight or spring, are difficult to manipulate and occupy much valuable space.

The object of our invention is to provide a convenient magnetic controlling device having a wide range of calibration with equal distances between the steps of calibration.

In carrying out our invention we provide one of the magnet members with a section of non-magnetic material to increase the reluctance to the lines of force and connect adjustably therewith a member of magnetic material adapted to shunt the lines of force around a greater or less part of the section of non-magnetic material, and thereby vary the reluctance of the magnetic circuit.

The invention will be readily understood by reference to the following description, taken in connection with the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a side elevation of a circuit-breaker for use in connection with currents of large volume provided with a magnetic controlling device embodying one form of our invention. Fig. 2 shows in plan a stationary contact of the circuit-breaker and the members of the magnetic controlling device in operative relation therewith, and Fig. 3 is a perspective view of the calibrated member of the device with the adjustable slide in position thereon.

It is well known that if a bar of iron or other magnetic material be brought into proximity to a current of electricity the magnetic lines of force accompanying the electric current will pass into and through the bar, or, in other words, the bar will become magnetized. This principle is made use of in the present application of our invention as follows: A U-shaped bar A of soft iron or steel is provided, having a movable member B pivoted thereto at one end, and the rectangular magnetic conductor thus formed is placed about some current-carrying part of the apparatus to be controlled, such as a stationary contact C, with the movable member B normally held in open position by its own weight. As the current flowing through the conductor increases the magnetic flux in the magnetic conductor members A and B increases correspondingly until the magnetic force between the parts A and B becomes sufficient to pick up the member B. The apparatus controlled has some part, such as a trip-lever D, held in the path of the movable member B, normally operating to hold the parts of the apparatus in operative position, but when engaged by the movable member B operates to release these parts and break the circuit.

In order that the magnetic members A and B may be adjusted to act under different conditions or volumes of current, the reluctance or opposition of these parts to the passage of magnetic lines of force is rendered adjustable by providing a section of their length with a non-magnetic material, such as brass, and mounting an iron slide thereon, which will

conductively bridge the whole or a part of the section.

As shown in Figs. 2 and 3, the movable core member B is made in the shape of a prismatic bar 1, with hinge-lugs 2 2 projecting from its opposite sides at one end, and extending upwardly above its upper edge, at its opposite end, are two spaced stop projections 3 3, and at about the middle of its upper edge is provided a short contact elevation 4. The bar is made up of three sections 5, 6, and 7, brazed or welded together. The left-hand section 5 embraces nearly half its length and is of iron or steel. The intermediate section 6 embraces nearly all the remaining half of the bar and is of brass or other non-magnetic material, and section 7 at the free end of the bar is relatively short and of iron or steel. An adjustable slide 8, of magnetic material, embraces three sides of bar 1 for somewhat more than half its length and is provided with a thumb-screw 9, extending through one side and engaging a channel 10, formed in the side of the bar 1. When the slide is in its extreme right position, the section 6, of non-magnetic material, is entirely bridged thereby, and as a consequence the magnetic lines of force traversing the bar will be shunted through the slide 8 around the section 6, and by adjusting the slide 8 into positions to the left the shunting effect will be correspondingly reduced in proportion to the length of non-magnetic material between the end of the slide 8 and section 7. Bar 1 is accordingly calibrated to act at different loads—that is to say, from five hundred to five thousand amperes or from two thousand five hundred to thirty thousand amperes, as the case may be. In either case the scale has approximately equal spaces between the respective steps, and ample room is provided in which the figures of calibration may be stamped.

The U-shaped conductor member A has its left-hand arm reduced at its end to enter between the lugs 2 2 of the movable conductor member B, to which it is connected by a pin 11, and its right-hand end is provided with a right-angled projection 12, to which a rod 13 is secured. The rod 13 has a head 14, upon which the stop projections 3 3 of the movable member normally rest, with the upper surface of the bar 1 slightly below the right end of member A.

In the application of the device shown in Fig. 1 the upper side of the member A is provided with an elongated bearing 15 for the reception of a pivot-pin 16, to the ends of which a pair of links 17 are connected, which links carry at their outer ends the fulcrum-pin 18 of the operating-lever 19. Near the lower ends of the member A bearings 20 and 21 are provided, to which are pivoted the arms 22 of the movable contact member 23. The trip-lever D is pivoted at 24 upon the arms 22 and extends at its lower end into proximity to the contact-surface 4 of the movable conductor member B, and at its upper end it is provided with a shoulder 25, adapted to engage a catch 26, carried by the operating-lever 19.

When the current passing through the circuit-breaker by way of contacts E, 23, and C exceeds a predetermined amount, the movable member B will be drawn up from the position indicated in Fig. 2 into closed position, with the right-hand ends of the members A and B in contact. This movement of member B raises the lower end of the trip-lever D, causing it to release the lever 19 and permitting the circuit-breaker to spring open in the usual manner.

We do not wish to restrict ourselves to the form of the parts or the application thereof shown in the drawings, since it is apparent that they may be changed and modified and used in connection with other forms of apparatus without departing from our invention.

What we claim as new, and desire to secure by Letters Patent of the United States, is—

1. The combination with a magnetic conductor having a section of non-magnetic metal, of means to shunt lines of force about said section.

2. The combination with a magnetic conductor having a section of non-magnetic metal, of adjustable means to shunt lines of force about said section.

3. The combination with a magnetic conductor comprising sections of magnetic and non-magnetic material integrally united, of means to shunt lines of force about more or less of the section of non-magnetic material.

4. The combination with a magnetic conductor comprising two relatively movable parts, one of which is provided with a section of non-magnetic metal, of means for shunting lines of force about said section.

5. The combination with a magnetic conductor comprising stationary and movable members, one of which is provided with a section of non-magnetic material, of an adjustable part of magnetic material adapted to shunt lines of force about a greater or less portion of said section of non-magnetic material.

6. The combination with a magnetic conductor comprising stationary and movable members, one of which is provided with a section of non-magnetic material, of an adjustable part of magnetic material adapted to make contact with said section of non-magnetic material and the magnetic material of the member provided with said section, and means for holding said part in adjusted position.

7. The combination with a magnetic conductor comprising stationary and movable members, one of which is provided with a

section of non-magnetic material, of means for normally holding said members in open-circuit relation, and adjustable means to shunt lines of force about a greater or less portion of said section of non-magnetic material.

8. A magnetic controlling device for circuit-breakers comprising stationary and movable magnetic conductor members one of which is provided with a section of non-magnetic metal, and means carried thereby to shunt lines of force about a greater or less portion of said section.

In witness whereof we have hereunto set our hands this 1st day of June, 1903.

CHARLES E. EVELETH.
ORAN O. RIDER.

Witnesses:
BENJAMIN B. HULL,
HELEN ORFORD.