No. 685,431. Patented Oct. 29, 1901.

J. PEARSON.

MAGNETIC DEVICE FOR USE IN ALTERNATING CURRENT CIRCUITS.

(Application filed Feb. 19, 1901.)

(No Model.)

Fig. 1.

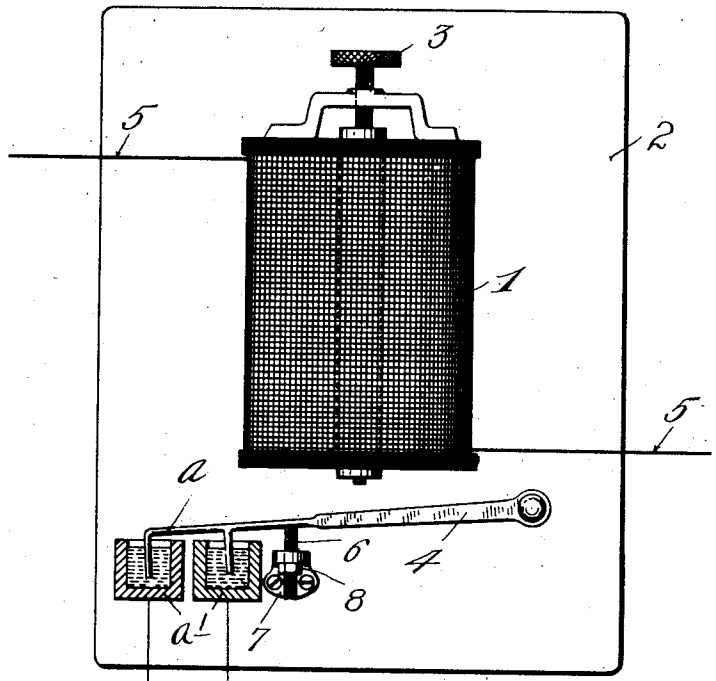


Fig. 3.

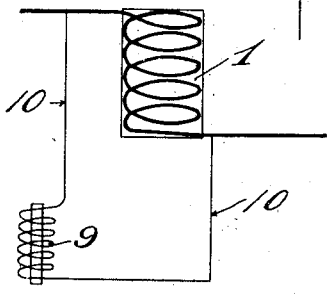


Fig. 2.

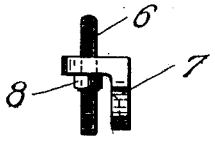
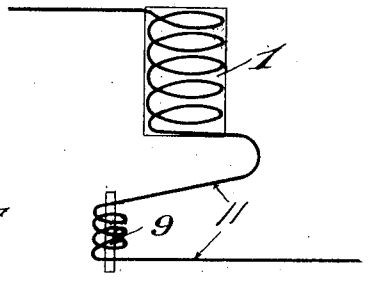


Fig. 4.



Witnesses.
Harry Kilgore
C. F. Turner.

Inventor.
John Pearson,
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Williamson & Merchant

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOHN PEARSON, OF ST. PAUL, MINNESOTA, ASSIGNOR OF ONE-HALF TO JAS. F. WILLIAMSON, OF MINNEAPOLIS, MINNESOTA.

MAGNETIC DEVICE FOR USE IN ALTERNATING-CURRENT CIRCUITS.

SPECIFICATION forming part of Letters Patent No. 685,431, dated October 29, 1901.

Application filed February 19, 1901. Serial No. 47,984. (No model.)

To all whom it may concern:

Be it known that I, JOHN PEARSON, a citizen of the United States, residing at St. Paul, in the county of Ramsey and State of Minnesota, have invented certain new and useful Improvements in Magnetic Devices for Use in Alternating-Current Circuits; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to magnetic devices. It is especially designed for use in alternating-current circuits, but may also be employed in direct-current circuits.

The invention consists of the novel devices and combinations of devices hereinafter described, and defined in the claims.

The invention is illustrated in the accompanying drawings, wherein like notations refer to like parts throughout the several views.

In said drawings, Figure 1 is a view chiefly in elevation, but with some parts shown in section, illustrating one form of my device as applied for controlling an auxiliary circuit. Fig. 2 is a detail showing the minor magnet of the form illustrated in Fig. 1 detached. Fig. 3 is a view in diagram illustrating a modification wherein the minor magnet is in the form of an electromagnet and is shunt-connected into the same circuit as the main magnet. Fig. 4 is a view similar to Fig. 3, but showing the minor magnet direct-connected in series with the main magnet.

Referring to Fig. 1, the main magnet 1 is shown as mounted on a suitable support 2 and as provided with an adjustable core adapted to be variably set by a set-screw 3 in any desired adjustment relative to the pivoted armature-lever 4. The conductors for the main magnet 1 are marked with the common numeral 5 within the magnetic field of the main magnet 1, and on the opposite side of the armature-lever 4 is suitably mounted a minor magnet in position to act in opposition to the main magnet on said armature-lever 4 coincidently with the action thereon of the main magnet.

As shown in Fig. 1, the minor magnet is in the form of a piece of soft iron 6, adjustably secured to its support 7. For that purpose the minor magnet may be conveniently in the form of a soft-iron screw tapped through the support and provided with a lock-nut 8. This little piece 6 of soft iron being located within the field of the main magnet 1, as noted, will become magnetized by induction from the main magnet and the magnetic forces in the two magnets will be in step with each other. Hence the minor magnet will act on the armature-lever 4 in opposition to the main magnet coincidently with the action of the main magnet and will hold said armature-lever in its retracted position until the main magnet has been energized up to a point where its lifting effect exceeds the mere holding effect of the minor magnet on the armature.

If the device be applied in an alternating-current circuit, the said minor magnet will serve a function which for some purposes I have found in practice to be highly important, to wit: It will prevent the trembling of the armature 4 from the short alternations in the alternating current. Whether employed in an alternating-current circuit or a direct-current circuit the minor magnet will also serve to hold the armature-lever 4 in its open position until the main magnet 1 has been energized up to some desired predetermined voltage, thereby preventing too early a lift of the armature-lever 4 from the main magnet 1 and insuring a quick lift when the main magnet is energized up to the desired voltage. As shown, the armature-lever 4 is provided with a bail-contact a for coöperation with a pair of mercury-cup contacts a', located in an auxiliary circuit, one of the conductors of which is shown as sectioned and connected to said contacts a', the said conductor being marked a^2. I have found such a device highly serviceable in alternating-current circuits where it is desirable to control some auxiliary circuit, like a trip-circuit, only upon coincidence of phase and frequency in the source of current supplying the alternating-current circuit. Whether in a direct-current circuit or an alternating-current circuit it is of general

service in many ways wherever the corresponding functions are desired. For example, it is of value for use in automatic switches, circuit-breakers, and other forms of circuit-controllers where some carefully-timed action is required and a quick movement of the armature-lever is desired.

Instead of the soft-iron induction-magnet 6, as shown in Fig. 1, the minor magnet may be a coil or electromagnet 9, as shown in Figs. 3 and 4, and be either shunt-connected in respect to the main magnet 1, as shown by the conductor 10 in Fig. 3, or be direct-connected in series with the main magnet, as shown by the conductor 11 in Fig. 4. When thus properly connected, the electromagnet 9, if properly proportioned in respect to the main magnet 1, will serve the same purposes as said soft-iron or induction magnet 6. Otherwise stated, the electromagnet may be employed as the minor magnet, if properly wound and connected in respect to the main magnet 1. Said winding and connection must be such that the magnetic forces in the two magnets will be in step with each other. I prefer the soft-iron magnet 6 because of its extreme simplicity and cheapness and have found the same perfectly reliable in practice.

What I claim, and desire to secure by Letters Patent of the United States, is as follows:

1. The combination with a main magnet and its armature-lever, of a minor magnet acting on said armature in opposition to the main magnet, and coincidently with the action thereon of the main magnet, whereby the armature is held in engagement with the minor magnet until the main magnet attains a predetermined strength, substantially as described.

2. The combination with the main magnet, and its armature-lever, of a minor magnet acting on said armature-lever in opposition to the main magnet, coincidently therewith, with the two magnets so arranged that the magnetic forces therein will be in step with each other, and the minor magnet will hold the armature in engagement until the main magnet attains a predetermined strength, substantially as and for the purposes set forth.

3. The combination with a main magnet and its armature-lever, of a piece of soft iron located within the field of said magnet and energized thereby, in position to act on said armature-lever, in opposition to said main magnet coincidently therewith, substantially as and for the purposes set forth.

4. The combination with an alternating-current circuit, of a main magnet therein, an armature-lever for the same, a minor magnet acting on said armature-lever in opposition to said main magnet coincidently therewith, with the two magnets so arranged that they are magnetized from the same current, and the armature is held in engagement with said minor magnet until the main magnet attains a predetermined strength, substantially as and for the purposes set forth.

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

JOHN PEARSON.

Witnesses:
MABEL M. MCGRORY,
F. D. MERCHANT.