

2 Sheets—Sheet 1

Patented Jan. 16, 1894.



Inventor
Herbert P. White
by his Attorneys

by his Attorneys
Housen & Housen

(No Model.)

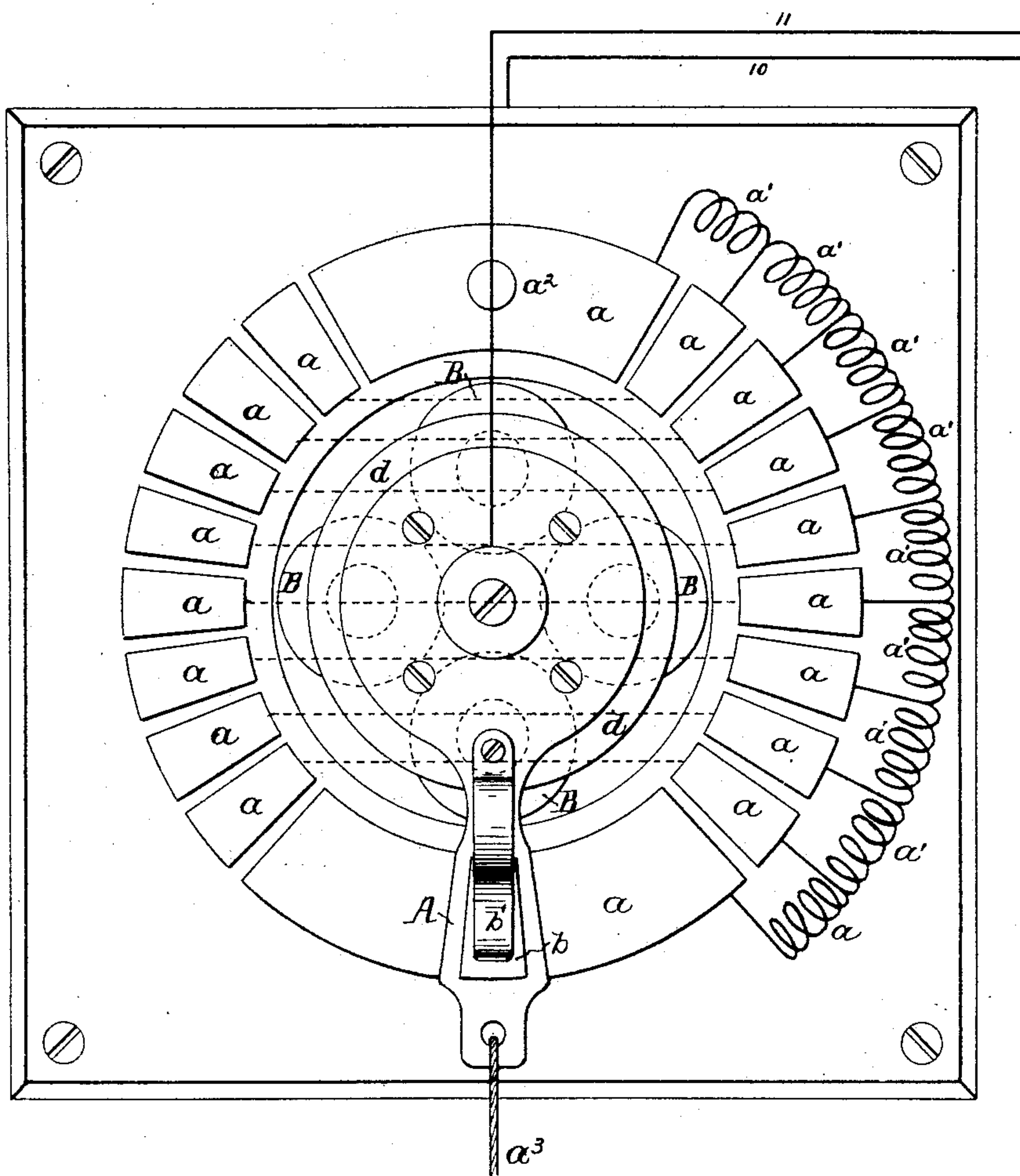
2 Sheets—Sheet 2.

H. P. WHITE.
AUTOMATIC ELECTRO MAGNETIC SWITCH.

No. 513,065.

Patented Jan. 16, 1894.

FIG. 2.



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UNITED STATES PATENT OFFICE.

HERBERT P. WHITE, OF PHILADELPHIA, PENNSYLVANIA.

AUTOMATIC ELECTRO-MAGNETIC SWITCH.

SPECIFICATION forming part of Letters Patent No. 513,065, dated January 16, 1894.

Application filed September 25, 1893. Serial No. 486,380. (No model.)

To all whom it may concern

Be it known that I, HERBERT P. WHITE, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain
5 Improvements in Automatic Electro-Magnetic Switches, of which the following is a specification.

The object of my invention is to construct a simple and effective form of automatic
10 switch for use in the starting of electric motors, the purpose of such switch being to turn the current into the armature coils of the motor gradually, that is to say, with a weak initial current which gradually increases in
15 strength as the armature increases in speed until by the time the armature has reached its maximum speed it will receive the maximum strength of current. This object I attain in the manner hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1, represents a longitudinal section of an automatic switch constructed in accordance with my invention, with diagrammatic
25 representation of motor, cut-out switch, reversing switch, and connections; and Fig. 2, is a face view of the automatic switch, with diagrammatic representation of resistances.

So far as regards the switch plate, switch
30 arm and resistances, they are the same as those of any ordinary automatic switch, with the exception that I have shown the improved switch in duplex form, that is to say, with resistance terminals on each side of the center,
35 so as to provide for the swinging of the switch lever in either direction from the point of rest. The switch plate is divided into a number of insulated sections a coupled to the resistance coils a' so that when the switch arm
40 A is in the position of rest, as shown in Figs. 1 and 2, the current will pass through the entire series of resistances, but when said arm is swung around the switch plate either to the right or left, the resistances will be success-
45 ively cut out as the contact block of the arm passes successive sections of the switch plate until by the time the switch arm comes into contact with the stop pin a^2 at the top of the switch plate, all of the resistances will be cut
50 out and the entire strength of current will pass to the motor.

The essential feature of my invention con-

sists in the provision of a rotating magnetic clutch interposed in a suitable shunt of the line circuit and serving to attract an arma- 55 ture mounted upon the switch arm and to rotate the same until it is stopped by contact with the pin a^2 , the switch arm being restored to its position of rest by means of a suitable spring or weight as soon as the current 60 through the rotating magnet is broken; in Fig. 1, for instance, I have shown a cord a^3 for connecting a weight to the arm A.

In Fig. 1 the switch arm A is represented as provided with a contact block b mounted 65 in the outer end of the arm so as to move to and fro therein and acted upon by a spring b' tending to press it into contact with the face of the switch plate. Upon the arm is also mounted an armature ring d located adjacent 70 to the poles of a series of electro magnets B which are carried by a disk B' secured to or forming part of a worm wheel D which is slowly rotated by engagement with a worm on any available rotating shaft driven either by 75 the motor itself or by an independent motor. I have shown in the present instance a series of four magnets, although less than this, or even a single magnet may be used, if desired. In the present instance the switch is con- 80 structed so that the worm wheel may be driven from the motor itself, the provision of the two sets of switch plates permitting of the operation of the switch by either a right or left hand swing of the switch arm, depending 85 upon the direction of rotation of the motor. It will be evident, however, that when the worm wheel is driven by an independent shaft rotating continuously in the same direction, but one set of switch plates will be needed as 90 the switch arm will, in that case, always travel in the same direction. The worm wheel D turns upon a hollow stud F secured to the fixed frame F' of the switch, the shaft G of the arm passing through said hollow stud and 95 being confined longitudinally by means of a suitable nut and washer at the rear end. The magnet coils are connected to the two sets of contacts f mounted upon the ring H and each having a contact brush f' so as to provide for 100 the proper conveyance of current to the magnets when the reversing switch is used, as hereinafter set forth.

The operation of the device is as follows:—

When the current is first turned on, the switch arm occupies the position shown in Figs. 1 and 2 and the current consequently passes through all of the resistances, but as the motor begins to rotate, movement is transmitted to the magnets B, and the armature ring *d* of the switch arm, being attracted by said magnets, is caused to rotate with the same so as to gradually cut out the resistances and increase the strength of current to the motor, the movement of the switch arm continuing until it strikes the stop pin *a*² where it remains until the current is broken, the tendency of the rotating magnets being to hold the switch arm continuously in this position against the action of the restoring spring or weight until the current is broken, whereupon said spring or weight will immediately return the switch arm to the position of rest preparatory to a repetition of the operation.

The motor circuits are as follows:—1 represents the positive wire of the main line and 2 the negative wire of the same, these wires being continued through the field magnet of the machine so as to direct current through the same as soon as the switch 3 is closed. The reversing switch arm has three sets of plates, 4, 5 and 6, and the switch terminals have corresponding plates 4^a, 5^a and 6^a and 4^b, 5^b and 6^b. The central plate 5 of the switch arm is connected by a wire 8 to the wire 2 of the line and the plate 4 of said switch arm is connected by a wire 9 to the wire 1. The plate 4^a is connected to the switch plate by a wire 10 and the switch arm A is connected by a wire 11 to one of the commutator brushes of the armature of the motor, the other brush of the same being connected by a wire 12 to the plate 5^a, and by a wire 13 to the plate 4^b. The plate 5^b is connected by a wire 14 to the wire 10. These constitute the armature circuits and when the reversing switch is moved to the left the current passes from the line 1 through 9, 4, 4^a and 10 to the switch plate, thence through the resistances and from the switch arm through the wire 11 to one of the commutator brushes of the armature of the motor, returning through the other brush, through 12, 5^a, 5 and 8 to the line wire 2. When the switch arm is moved to the right the connections are reversed, the line wire 2 being now connected with the wire 10 through 8, 5, 5^b and 14 and

the wire 12 being connected to the line wire 1 through 13, 4^b, 4 and 9. The outer plates 6, 6^a and 6^b of the switch arm and terminals serve to form the shunt circuit for the switch magnet, the switch plate 6 of the switch arm being connected by the wire 16 to the wire 9 and thence to the line wire 1, the plate 6^a and 6^b being connected by the wire 15 and said wire being connected by the wire 17 to one of the brushes *f*' of the switch magnet contact plate, the other of said brushes *f*' being connected by a wire 18 to the line wire 2. There is consequently always a shunt circuit from one main line to the other to and through the magnets in either position of adjustment of the reversing switch.

Having thus described my invention, I claim and desire to secure by Letters Patent—

1. An automatic switch for electric motors comprising the switch plate and its resistances, a swinging switch arm, a rotating magnet, or series of magnets, acting upon an armature carried by said switch arm, and means for restoring the switch arm to a position of rest when the current through said magnet is interrupted, substantially as specified.
2. The combination in an automatic switch for electric motors, of the switch plate and its resistances, a swinging switch arm having an armature, a magnet, or series of magnets mounted so as to rotate in proximity to said armature, and worm gearing for rotating said magnet, substantially as specified.
3. The combination in an automatic switch for electric motors, of a switch plate having right and left sections each connected to the resistances, a switch arm free to swing either to right or left, and carrying an armature, a magnet or magnets, mounted so as to rotate in proximity to said armature, and means under control of the motor for rotating said magnet whereby the switch is operated upon rotating the motor in either direction, substantially as specified.

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

HERBERT P. WHITE.

Witnesses:

FRANK E. BECHTOLD,
JOSEPH H. KLEIN.