No. 822,269. PATENTED JUNE 5, 1906.

H. GEISENHÖNER.

MOTOR STARTING RHEOSTAT.

APPLICATION FILED JUNE 10, 1905.

2 SHEETS—SHEET 1.

Fig. 1.

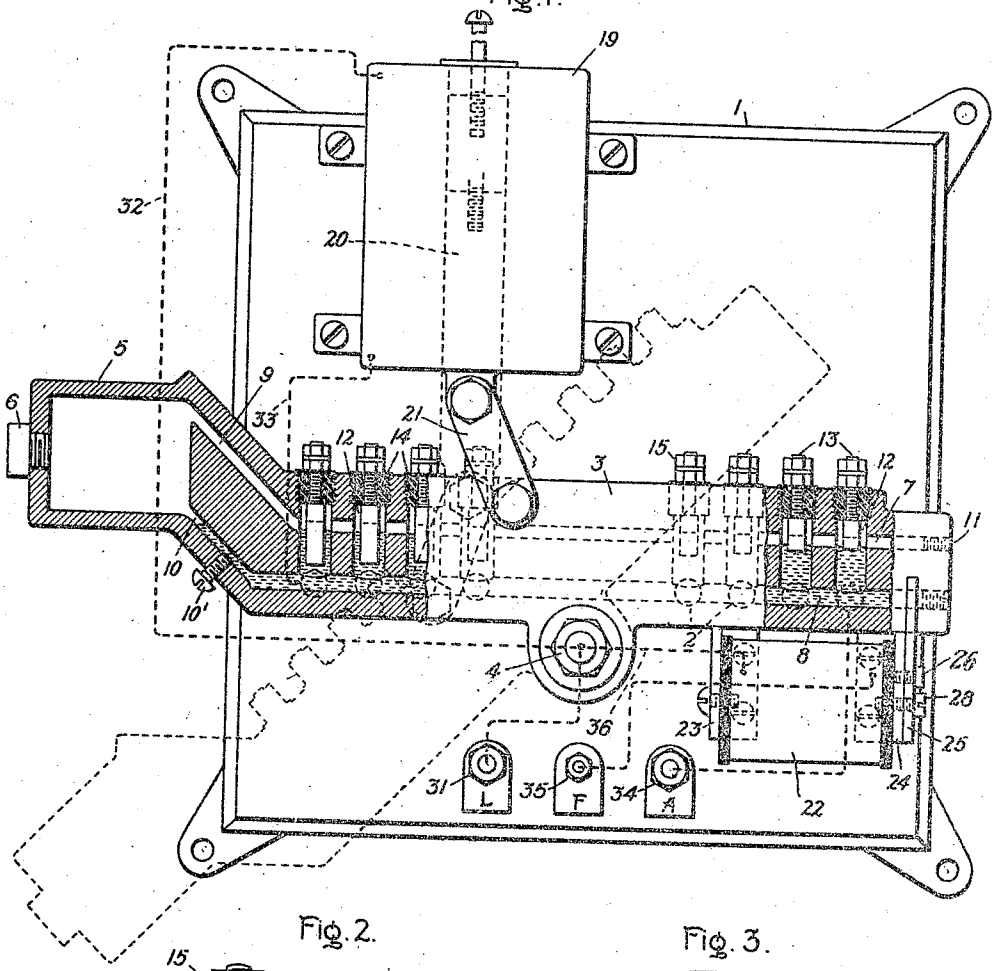


Fig. 2.

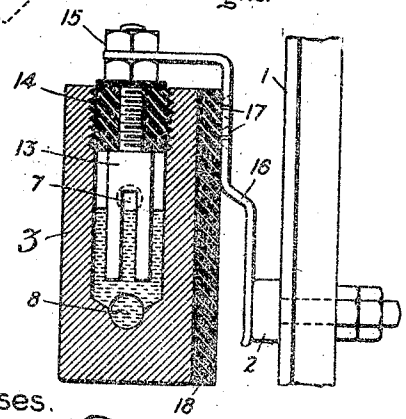
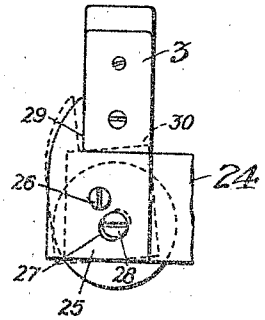


Fig. 3.



Witnesses.

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2 SHEETS—SHEET 2

Fig. 4.

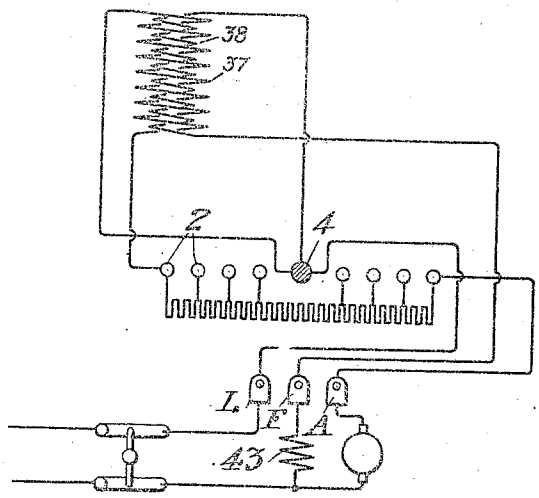
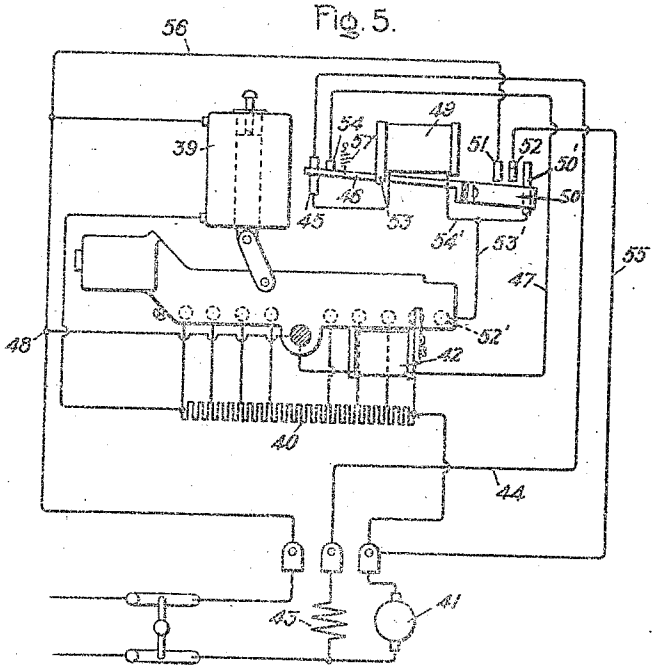


Fig. 5.



Witnesses.

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UNITED STATES PATENT OFFICE.

HENRY GEISENHÖNER, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

MOTOR-STARTING RHEOSTAT.

No. 822,269. Specification of Letters Patent. Patented June 5, 1906.

Application filed June 10, 1905. Serial No. 264,612.

To all whom it may concern:

Be it known that I, HENRY GEISENHÖNER, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Motor-Starting Rheostats, of which the following is a specification.

This invention relates to switches for controlling electric circuits, and has for its object the provision of a device of this character which is inexpensive to manufacture, has few working parts, requires no skill in its manipulation, and is at the same time perfectly reliable, safe, and efficient.

More specifically my invention relates to automatic motor-starting switches in which the controlling element is a quantity of mercury so arranged as to automatically cut out resistance upon simply closing a switch. In carrying out my invention I provide a pivoted controlling-arm having a bias to a position at an angle with the horizontal, provided with contacts corresponding in position and number with the studs of the rheostat. The arm contains mercury, and the passages therein are so arranged that when the arm approaches a horizontal position the mercury flows through the same and successively engages the contacts to cut out the resistance and effects a timing or successive cutting out of resistance steps, which is necessary to successful motor-starting. One of the principal features of this construction is that the circuit is not broken at the surface of the mercury, which is an advantage in that there will be no deterioration of the mercury due to the sparking.

My invention further consists in the details of construction and in the arrangement and combination of elements hereinafter set forth, and particularly pointed out in the claims annexed to and forming a part of this application.

In the drawings, Figure 1 is a plan view of a motor-starting rheostat embodying my improvements. Fig. 2 is a cross-section of the controlling-arm. Fig. 3 is a detail showing an end view of the controlling-arm and the clamp on the retaining-magnet. Fig. 4 is a diagrammatic view showing a slight modification, and Fig. 5 is a diagrammatic view showing another modification.

Referring to the drawings, 1 is the insulating-base of an ordinary rheostat provided with the contact-studs 2. The controlling-arm 3 is pivoted at about its middle point 4 and is so arranged as to have a bias from the horizontal position, as shown in dotted lines. This bias may be accomplished by having an excess of weight of the arm to the left of the pivotal point. Other well-known equivalents may of course be substituted for the force of gravity to bring about this result. The arm 3 is provided with an offset portion 5, which is chambered out, as shown, to contain a quantity of mercury. The end of the arm is perforated and a screw 6 inserted therein, and through this perforation the mercury is poured into the arm. The main body of the arm is provided with two holes 7 and 8, which are connected with the chambered portion by means of the passages 9 and 10. A screw 10′ is screwed into the arm and arranged so as to contract the passage 10 more or less, as desired, by the adjustment of the screw. The holes 7 and 8 are preferably drilled and the ends afterward plugged up, as shown at 11. The arm 3 is provided with a series of contacts corresponding in number with the rheostat-studs 2 and so arranged as to engage said studs when the arm is moved to a horizontal position. A series of holes or pockets 12 are formed in the arm, one for each contact, and are positioned so as to intersect the longitudinal holes 7 and 8. The contact comprises an external terminal and one within the arm. The inner terminal 13 is fork-shaped and is fitted to an insulating-bushing 14, screwed into the hole in the arm. The shank of the terminal 13 projects through the bushing and has secured to it by means of the nuts 15 the outer terminal 16. This is preferably made of spring conducting metal and is further secured to the arm 3 by means of the screws 17, an insulating-plate 18 being interposed between the terminal and the arm. A solenoid 19, having an armature 20, is provided for raising the arm to a horizontal position. The armature is conected to the arm 3 by means of the link 21.

As a means of retaining the arm in a horizontal position the following construction is employed: A retaining-magnet 22 is mounted upon the base 1 near the extremity of the arm 3 and is provided with pole-pieces 23 and 24, secured to and insulated from the

magnet. A retaining-clamp 25 is pivoted at 26 to the pole-piece 24 and is provided with an elongated hole 27, into which fits the central retaining-screw 28 of the magnet. The clamping member 25 is provided with a shoulder 29 for engaging the arm 3 to hold it in position. As the arm 3 comes into engagement with the pole-pieces it encounters the edge 30 of the clamp, rotating the same and moving the shoulder 29 so as to engage the arm, and as the magnet is energized the clamp is held in this position, securely clamping the arm against the pole-pieces.

The arrangement of circuits is as follows: Current passes from the line-terminal 31 to the pivot 4 and thence through conductor 32, solenoid 19, and conductor 33 to the first stud of the rheostat, thence through the resistance, and back to the armature-terminal 34. The field-current passes from pivot 4 through the magnet-coil 22, thence by conductor 36 to the terminal 35, thence through the field to the other side of the line. It will thus be seen that when the motor-circuit is completed by the closing of the line-switch (shown in Figs. 4 and 5) and the solenoid 19 is energized the arm 3 is drawn toward a horizontal position, closing the armature-circuit through the studs 2 and contact 16 and short-circuiting the solenoid 19 as the mercury makes contact with the first and longest stud 13. The mercury then passing through the passage 8 rises successively in the holes 12, making contact with the terminals 13, which, it will be observed, become shorter toward the end of the arm. The hole 7 acts as an air-passage, permitting the mercury to rise without obstruction. Upon failure of voltage the arm upon being released drops back and breaks the circuit at the studs, the mercury quickly returning through opening 9. By thus making and breaking the circuit outside of the mercury instead of within it the life of the mercury is greatly prolonged and there is no fusing of the terminals 13, which are not readily accessible. I introduce hereby a time element which is much more easily varied and is more definite and constant than a dash-pot such as is usually employed.

In Fig. 4 I have shown diagrammatically a slight modification of my device, the arrangement of the controlling-arm being the same as that shown in Figs. 1, 2, and 3. In this form the operating-solenoid is provided with two windings 37 and 38, the former in series with the armature the same as the winding of solenoid 19 in Fig. 1, and the latter winding 38 is in series with the field the same as the winding of magnet 22 in Fig. 1. In this form the windings of the two magnets 19 and 22 of Fig. 1 have simply been combined into one magnet, so that upon failure of voltage the arm will drop back to its normal position.

In Fig. 5 I have shown a modification whereby as soon as the full current is passing through the motor the retaining-magnet and the controlling-arm are short-circuited, allowing the latter to drop back into its inclined position, so as to be in readiness in case the current should go off and on again suddenly. Referring to this figure, the solenoid 39 is in series with the starting resistance 40 and the armature 41, the retaining-magnet 42 being in series with the field 43 through conductor 44, terminal 45, switch-arm 46, terminal 54, and conductor 47, connecting with the line at 48.

A magnet 49, to which is pivoted the switch-arm 46, has a winding in parallel with magnet 42, the switch-arm 46 acting as an armature for said magnet and being provided with a bridging contact 50, insulated from 46 for engaging sliding contact 50′ and for bridging contacts 51 and 52. When now the motor-circuit is closed, the solenoid 39 draws the starting-arm to a horizontal position to cut out resistance, the retaining-magnet holding it in this position. When, however, all of the starting resistance is cut out and running conditions established, coil 49 is energized, through conductor 53′, by the mercury in the starting-arm reaching the stud 52′, and the armature portion of the switch-arm 46, pivoted to the magnet at 53, is attracted, bridging the contacts 50′, 51, and 52 and at the same time breaking the circuit between the contacts 45 and 54. By the bridging of the contacts 51 and 52 the solenoid 39, controlling-arm, and contact-studs are shunted through conductors 55, contacts 51 and 52, and conductor 56, and at the same time by breaking the connection between contacts 45 and 54 the circuit of the retaining-magnet 42 is broken, allowing the arm to drop to its inclined position. This of course by breaking the contact at 52′ would deënergize magnet 49; but by the bridging of contacts 50′ and 51 the energy of magnet 49 is maintained through conductor 56, contacts 51 and 50′, conductor 54′ magnet 49, contact 45, and conductor 44 to field 43. The short circuit of the starting parts is thus maintained until upon failure of voltage the arm 46 will be drawn up by the spring 57 and starting conditions restored.

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

1. A time-switch comprising a reservoir containing a conducting fluid, a plurality of contacts, means for delivering said fluid from said reservoir and causing it to successively engage said contacts, means for returning said fluid to said reservoir, and means for causing said circuit to be broken outside of said fluid simultaneously with the return of the said fluid to said reservoir.

2. A time-switch comprising a reservoir containing a conducting fluid, a plurality of contacts, means for delivering said fluid from

said reservoir and causing it to successively engage said contacts, pockets for retarding the passage to the contacts, means for returning said fluid to said reservoir, and means for causing said circuit to be broken outside of said fluid simultaneously with the return of the said fluid to said reservoir.

3. A time-switch comprising a series of contact-studs, a movable arm containing mercury and provided with a series of contacts adapted to engage said studs, and means whereby the mercury is caused to close an electric circuit between said contacts.

4. In a starting-rheostat, the combination with a series of resistances and contact-studs therefor, of means for cutting out said resistances comprising a pivoted mercury-containing arm biased from the horizontal and provided with contacts adapted to engage said studs, and means whereby said mercury is caused to successively engage said contacts when the arm is moved to a substantially horizontal position.

5. In a motor-starting rheostat, the combination with a series of contact-studs, of a pivoted mercury-containing arm biased from the horizontal and having a series of contacts mounted thereon for engagement with said studs, said contacts having terminals within said arm, and means whereby the mercury is caused to engage said terminals to cut out resistance when the arm is moved to a substantially horizontal position.

6. In a motor-starting rheostat, the combination with a series of contact-studs, of a pivoted arm biased from the horizontal, having a chambered portion containing mercury, and a passage therethrough communicating with said chamber, said arm being provided with contacts having an external portion for engaging said studs and an internal portion for engaging the mercury in said passage when the arm is moved to a substantially horizontal position.

7. An automatic starting-rheostat provided with contact-studs and comprising a pivoted controlling-arm containing mercury and having a bias from the horizontal, contacts on said arm for electrically connecting said studs and said mercury when the arm is moved to a substantially horizontal position, and electromagnetic means for moving said arm.

8. An automatic starting-rheostat provided with contact-studs comprising a pivoted controlling-arm having contacts mounted thereon for engaging said studs but biased from engagement therewith, means in connection with said arm for successively short-circuiting said contacts to cut out resistance after they have been moved into engagement with said studs, electromagnetic means for moving said arm into said engagement, means for retaining it in that position, and electromagnetic means responsive to the full running-current for short-circuiting said retaining means and allowing said arm to assume its normal position.

9. A time-switch comprising a reservoir containing a conducting fluid, a plurality of contacts, means for delivering said fluid from said reservoir and causing it to successively engage said contact, means for returning said fluid to said reservoir, and means for causing the said circuit to be broken outside of said fluid.

In witness whereof I have hereunto set my hand this 8th day of June, 1905.

HENRY GEISENHÖNER.

Witnesses:
BENJAMIN B. HULL,
HELEN ORFORD.