J. HÖFLE.

AUTOMATIC REVERSING STARTER.

APPLICATION FILED OCT. 24, 1910.

989,847.

Patented Apr. 18, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

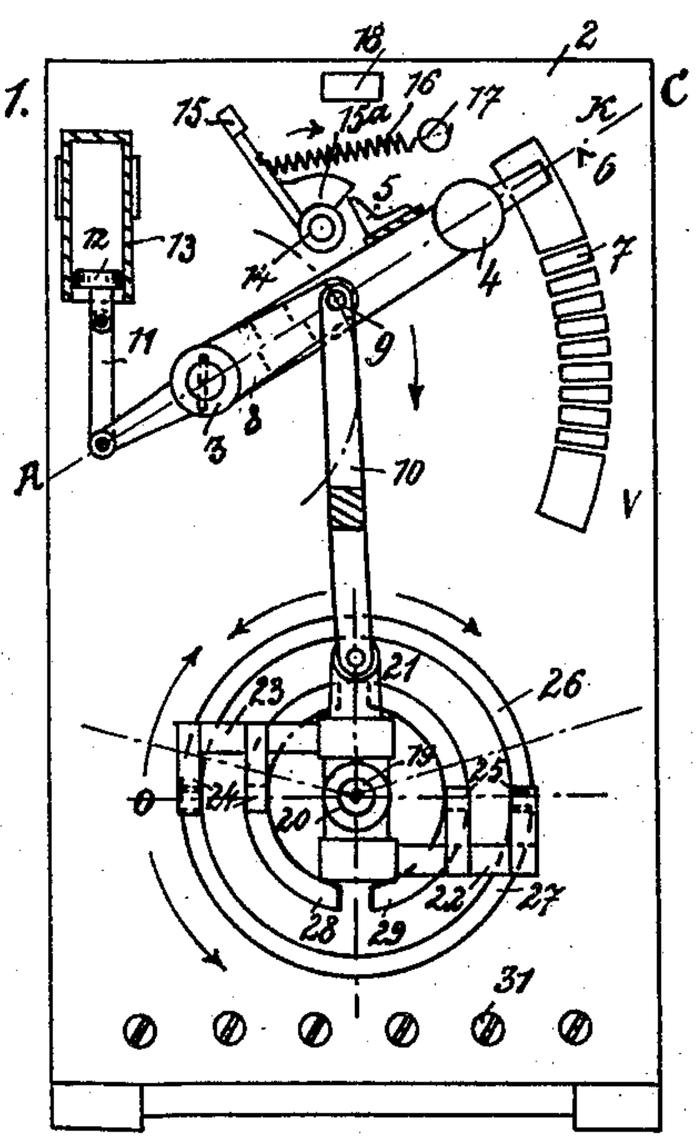
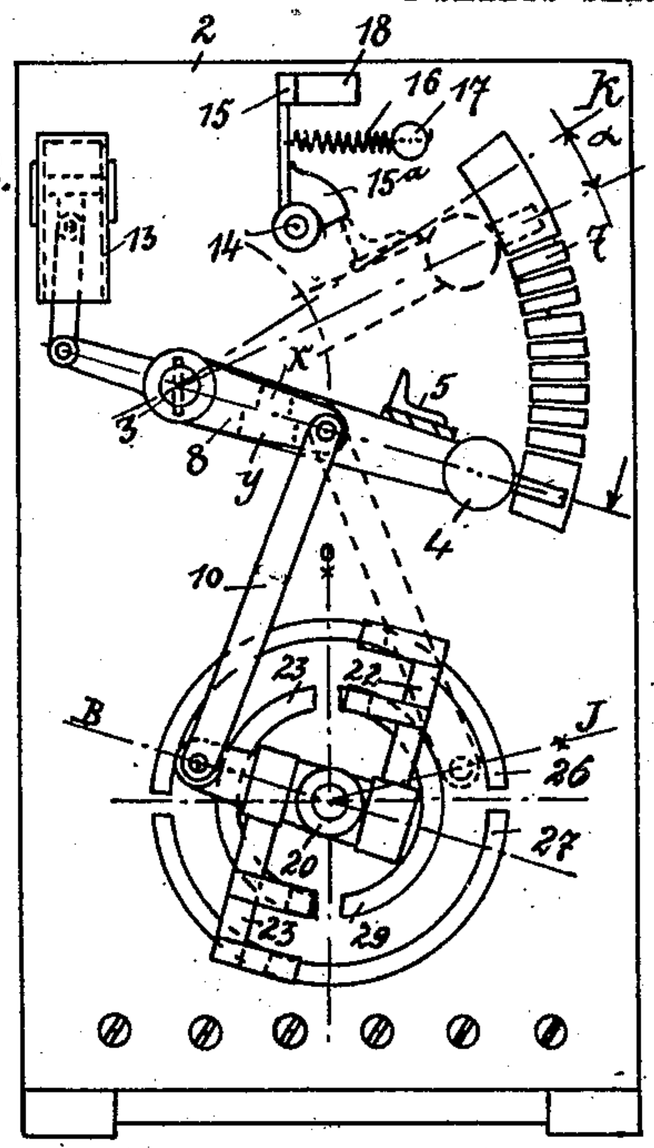


Fig. 2.



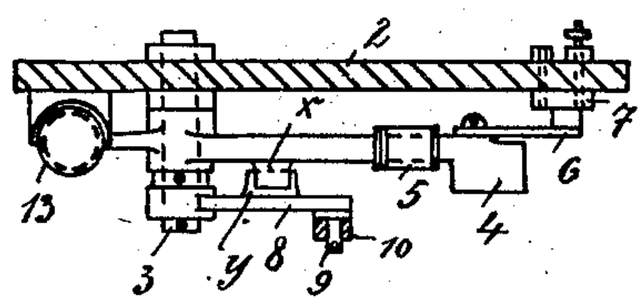
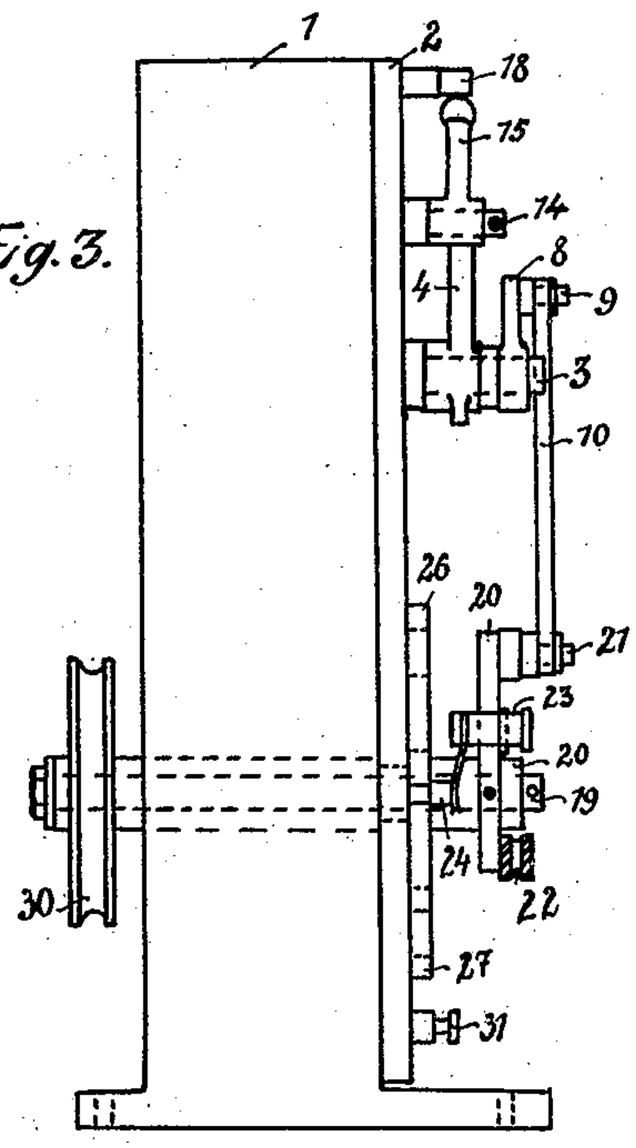


Fig. 4.

Fig. 3.



Witnesses

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2 SHEETS—SHEET 2.

Fig. 5.

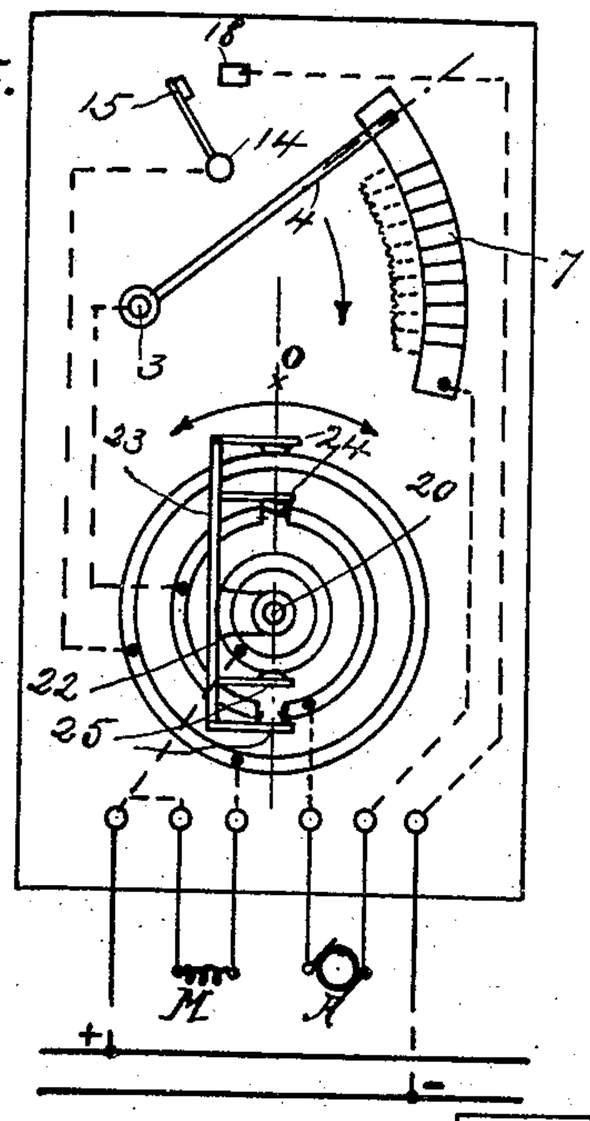


Fig. 6.

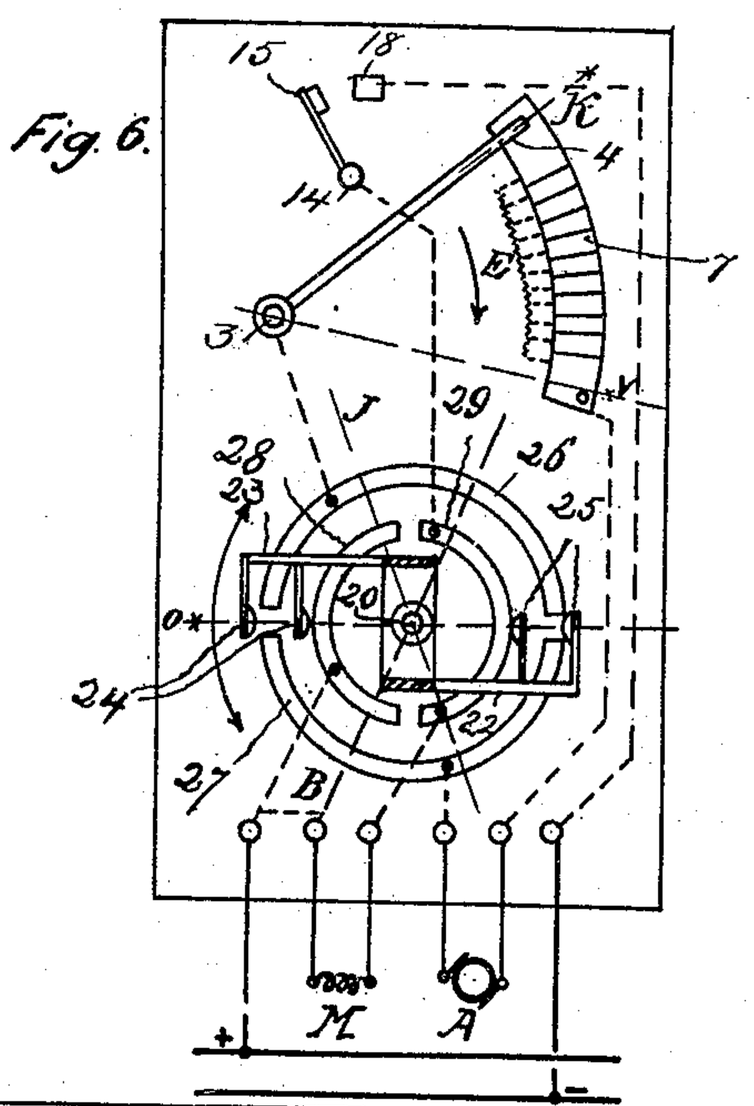
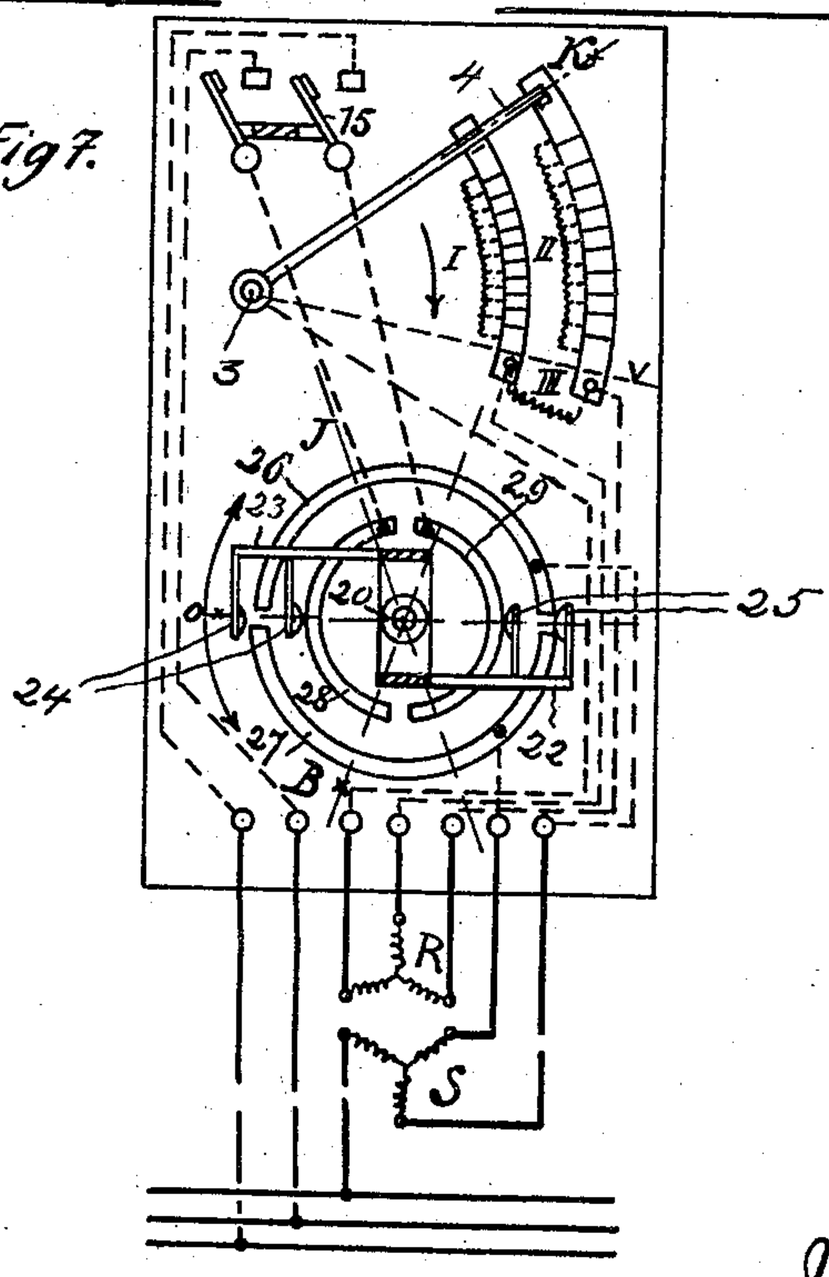


Fig 7.



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AUTOMATIC REVERSING STARTER.

989,847. Specification of Letters Patent. Patented Apr. 18, 1911.

Application filed October 24, 1910. Serial No. 588,755.

To all whom it may concern:

Be it known that I, JULIUS HÖFLE, a subject of the King of Hungary, residing at the city of Budapest, in the Empire of Austria-Hungary, have invented certain new and useful Improvements in Automatic Reversing Starters; 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, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

My invention relates to automatic reversing starters comprising four principal parts, namely the change-over switch for determining the direction of rotation of the motor controlled thereby, the resistance-switch for interposing and cutting out starting resistances, the series circuit breaker and, lastly, the dash-pot for the switch lever of the resistance-switch. According to my invention these four parts are mechanically so connected together that, firstly, the motor can only be started with the entire series resistances in circuit, and, secondly, the circuit is broken neither at the change-over switch nor at the resistance-switch, but only at the series circuit-breaker. Consequently, the attendant has to observe only this one place, as no sparks occur at the others.

The means for reversing the current are new and comprise two concentric sets of segmental contacts, whose ends are so close together that in the off position of the change-over switch the ends of one concentric set are electrically connected one with another by contact brushes thereon. Further, it is new to connect the change-over switch by means of a rod with the switch lever which cuts out starting resistances when starting the motor, and also it is new to arrange on the resistance-switch lever a projection or lug which opens the series circuit-breaker or allows it to close.

One illustrative embodiment of my invention and two modifications thereof are represented by way of example in the accompanying drawings, wherein:—

Figure 1 is a front elevation of the starter in the off position, Fig. 2 a like view of the same in the on position, Fig. 3 is a side elevation of the starter in the position according to Fig. 1, the dash-pot not being shown, and Fig. 4 a top plan view corresponding to Fig. 1, while Figs. 5, 6 and 7 are diagrams of connections, Fig. 6 showing the connection for shunt motors, Fig. 5 the same connection except that a modified change-over switch is shown here, and Fig. 7 shows a modified main switch and resistance-switch and the diagram of connections for the three-phase reversing starter.

Referring to the drawings, an insulating slab 2 carrying the pivot 3, on which the switch lever 4 carrying a projection or lug 5 and the contact brush 6 is free to rotate, is mounted on the resistance box 1. The driving lever arm 8 which is pivotally connected by the pin 9 with one end of the connecting-rod 10 but insulated from the other end thereof, is fast on the pivot 3.

The series switch-lever 15 is fulcrumed on the pivot 14 mounted on the slab 2 and the spring 13 constantly tends to pull this lever toward the contact 18 and close the circuit. This lever 15 has a shoulder 15^a which moves in the track of the lug 5.

The segmental contacts 26, 27, 28, 29 are mounted on the lower part of the slab 2. The two-armed lever 20 having one arm pivotally connected by the pin 21 with the connecting-rod 10 is fast on the shaft 19 journaled in the box 1. This lever 20 carries the brush-holders 22, 23, of which the holder 23 carries the contact brushes 24 and the holder 22 the contact brushes 25. These brushes 24 and 25 electrically connect the adjacent segmental contacts; the ends of the latter are so near together that in the off position of the switch the same are connected by these brushes, so that should the brushes slide over the ends the circuit cannot be broken.

The lever 4 loose on the pivot 3 has not only a contact brush 6 movable over contacts 7 connected with the starting resistances, but also a lug x normally resting against the lug y of the lever 8 (see Fig. 4) and descends as soon as the lever 8 moves downward, while it is raised again when the lever 8 is rocked upward. In order that the lever 4 may fall slowly and gradually a dash-pot is provided comprising a perforated cylinder 13 and the piston 12 pivotally connected by the rod 11 with the lever 4, movable therein.

My improved automatic starter operates as follows:—When the shaft 19 is rotated by the pulley 30 fast on it, the lever 20 is

driven, and rocks the lever 8 by means of the rod 10 downward, while the brushes 24 and 25 simultaneously slide over the contacts 27, 28 and 26, 29, respectively. If the lever 20 is rocked in the other direction the brushes 24 and 25 slide over the segments 26, 28 and 27, 29, respectively. The former position, as shown in Fig. 2, is for causing the motor to run counter-clockwise and the latter for causing the motor to run in the reverse direction. When the lever 8 moves downward the lug x of the lever 4 is no longer supported, as the lug y descends with the lever 8, and, consequently, as the piston 12 is forced into the cylinder 13, the lever 4 descends slowly and moves gradually over the contacts 7. The projection 5 on the lever 4 is simultaneously removed from the shoulder 5^a of the switch lever 15 and the spring 16 pulls this lever against the contact 18, whereby the main circuit is closed.

If the circuit is followed with reference to Fig. 6 it will be seen that the current goes from the — feeder to the main switch 18, 15, then by way of the pivot 14 to the change-over switch, passing by way of the contact brush 25 to the contacts 29, 26, thence by way of the pivot 3 and switch lever 4, contact brush 6 and by way of the starting resistance E to the armature A and onto the contact 27, through the brush 24 to the contact 28 and to the + feeder. The field magnet winding M has one pole connected directly with the + feeder and the other with the right-hand inner contact 29 and by way of this with the — feeder.

The only difference between Fig. 5 and Fig. 6 is that in the modification shown in the former figure the change-over switch comprises two concentric circular contacts and two concentric segments, as clearly shown.

In Fig. 7 R designates the rotor or secondary winding and S the stator or primary winding of the motor. Two feeders are connected with the double-pole main switch 15′ connected with the two inner contacts 28, 29, while the third feeder is connected directly to one phase of the stator, the other two phases being connected to the change-over switch. Three sets of starting resistances I, II, III are provided for the rotor, one for each phase; the primary winding is electrically insulated from the secondary.

I claim:—

1. In an automatic starter for electric motors, the combination with a change over switch revoluble in opposite directions; of a pivoted resistance switch, pivoted means between the resistance switch and change over switch to operate the former, and a series switch mechanically controlled by the resistance switch.

2. In an automatic starter for electric motors, the combination with a change over switch; of a freely falling pivoted resistance switch, a pivoted lever to support the resistance switch, a link pivotally connected to the supporting lever and change over switch.

3. In an automatic starter for electric motors, the combination with a change over switch; of a freely falling pivoted resistance switch, means to retard the fall of said resistance switch, a pivoted lever to support the resistance switch, a link pivotally connected to the supporting lever and change over switch.

4. In an automatic starter for electric motors, the combination with a change over switch; of a freely falling pivoted resistance switch, a dash-pot to control the fall of said resistance switch and a link pivotally connected to the supporting lever and change over switch.

5. In an automatic starter for electric motors, the combination with a change over switch; of a freely falling resistance switch, a pivoted lever to support the latter switch, a link pivotally connecting the supporting lever and change over switch, a pivoted spring-urged series switch controlled by the resistance switch and a dash-pot to retard the resistance switch and thereby the series switch.

In testimony that I claim the foregoing as my invention, I have signed my name in presence of two subscribing witnesses.

JULIUS HÖFLE.

Witnesses:
FRANZ KÉMÉUTZY,
HUGH KEMÉUY.