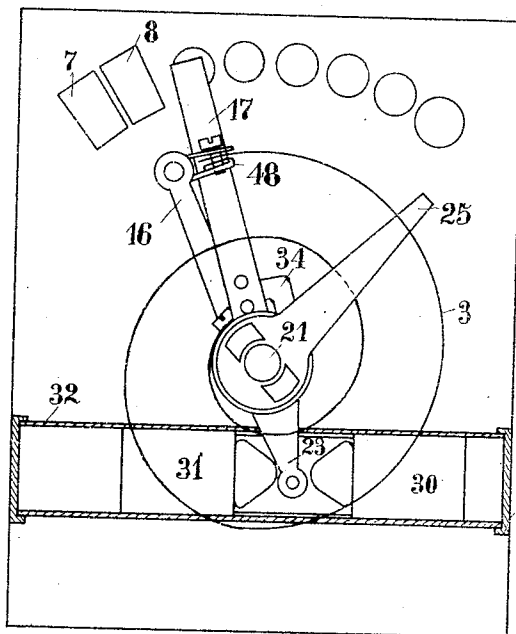
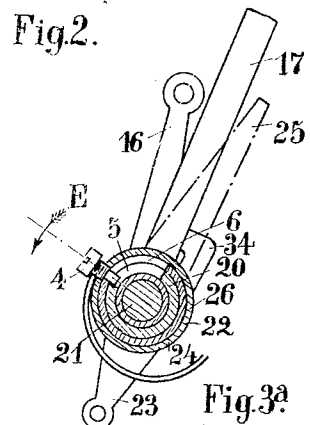
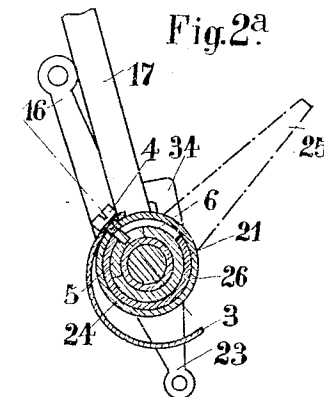
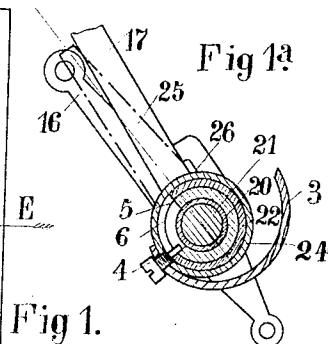
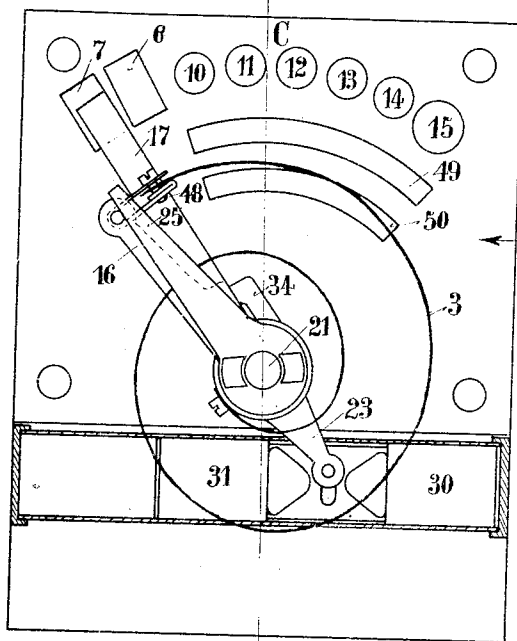


954,724.

K. VON DREGER.
STARTER FOR ELECTRIC MOTORS.
APPLICATION FILED JULY 11, 1908.

Patented Apr. 12, 1910.

3 SHEETS—SHEET 1.



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3 SHEETS—SHEET 2.

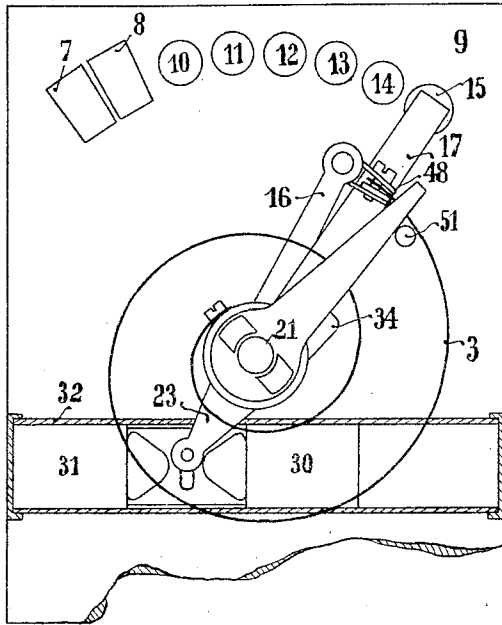


Fig. 4.

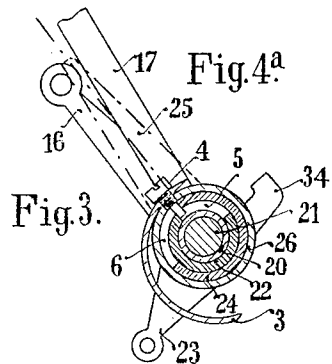
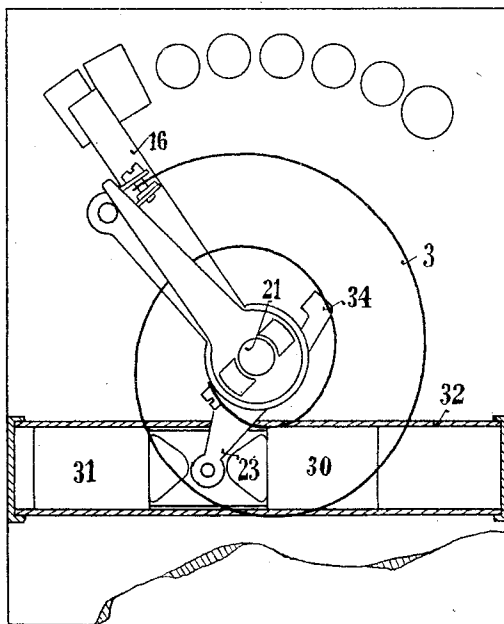


Fig. 3.

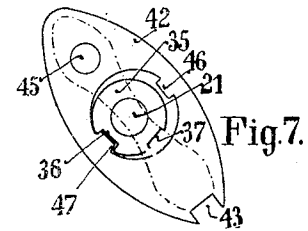


Fig. 7.

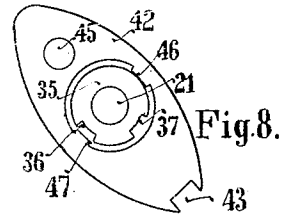


Fig. 8.

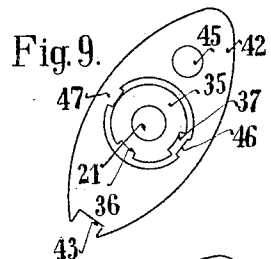


Fig. 9.

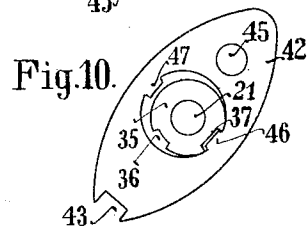


Fig. 10.

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3 SHEETS—SHEET 3.

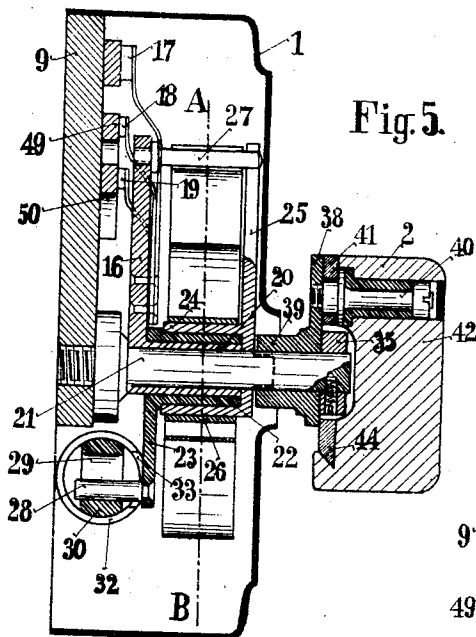


Fig. 5.

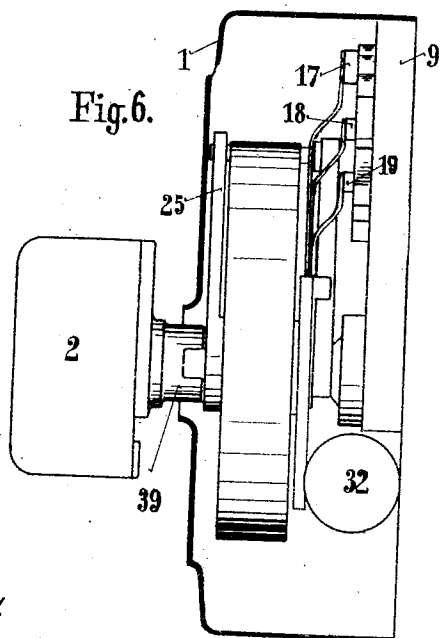


Fig. 6.

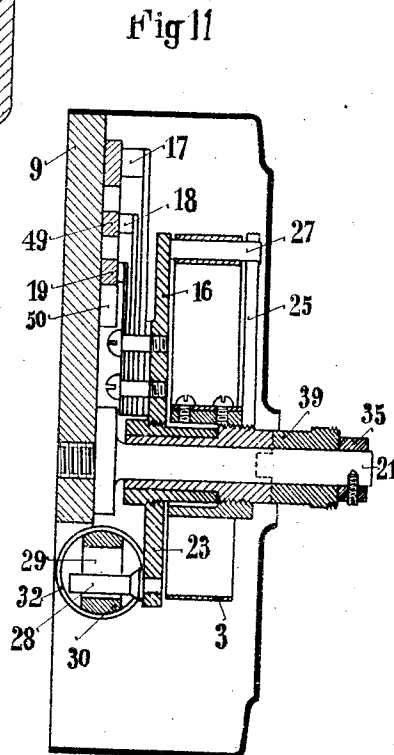


Fig. 11

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UNITED STATES PATENT OFFICE.

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STARTER FOR ELECTRIC MOTORS.

954,724.

Specification of Letters Patent.

Patented Apr. 12, 1910.

Application filed July 11, 1908. Serial No. 443,137.

To all whom it may concern:

Be it known that I, KARL VON DREGER, electrician, residing at Bellealliancestrasse No. 92, Berlin, Germany, a subject of the Emperor of Austria-Hungary, have invented certain new and useful Improved Starters for Electric Motors, of which the following is a full, clear, and exact description.

In known types of starters for motors the switching-in movement of which is retarded by any convenient known means, while their switching-off movement takes place rapidly and unimpeded by any braking action, the braking means selected is frequently an air or a liquid braking means acting in one direction only. As the valves provided for obtaining this action in one direction frequently give rise to inefficient operation of the piston as a result of fouling, thickening of the liquid, oil or the like; it is advisable to use brake pistons not forming a tight joint and in accordance with the present invention this is effected by coupling the piston with the switch lever only during the switching-in movement and disconnecting it therefrom during the switching-off movement so that the switch lever is replaced unimpeded by the braking action, the brake piston being then returned to its initial position separately by coupling springs arranged in the known manner between the starting and switch levers and which are put under tension owing to the switching-off movement. A switch of this kind is illustrated by way of example in the accompanying drawing, in which:

Figure 1 shows the switch in front elevation, the cap 1 protecting it from dust and the like, the outer switch handle 2 having been removed. Fig. 2 shows the switch at the moment at which the rapid movement of the outer handle 2 to the right hand for switching-in has taken place. The spring connecting the outer switch lever with the inner switch lever is in tension and has already somewhat displaced the inner switch lever. Fig. 3 shows the switch when complete switching-in has taken place. Fig. 4 shows it entirely switched off. Figs. 1 and 4 differ in that in the former the double brake piston is situated at the beginning of the forward movement and in the latter at the beginning of the backward movement. In Fig. 4 the spring connecting the outer switch handle with the inner switch handle

has been put under tension by the switching-off movement of the former. It should be noted that the tension of the main coupling spring in the switching-off movement is produced in the opposite manner to the switching-in movement. Figs. 1^a to 4^a show the inner switch lever in section on the line A—B of Fig. 5. The screw 4 and the slots 5 and 6 in which its inner end slides, which are shown in Figs. 1^a to 4^a and which serve for locking the main coupling spring 3, are not visible in Fig. 5 because the corresponding side of the switch is broken away. The screw and the slots are located in the section line A—B. Fig. 5 is a central cross-section on the line C—D in Fig. 1. Fig. 6 is a side elevation of the switch viewed in the direction indicated by the arrow E in Fig. 1. The outer casing of the switch is broken away here likewise. Figs. 7 to 10 respectively show the outer switch handle in the switched-off position, at the beginning of the switching-in movement, at the end of the switching-off movement and finally in the switched-off position and locked. Fig. 11 is a sectional elevation of a modification of my invention.

Referring to the drawings, 7 and 8 designate fixed insulating parts which are mounted on the wall 9 of the interrupter which ordinarily consists of slate.

10 to 15 are the switch contacts connected with the series resistances in the known manner.

16 is the inner switch lever upon which the three known switch springs 17, 18 and 19, the free ends of which are provided with slide pieces, are mounted. By means of a long hub 20 the switch lever 16 is mounted so as to be freely rotatable. On the stud 21 is fixed the plate 9. On the hub 20 the lever 23 is mounted freely by means of a long hub 22. The hub 24 is fitted freely upon the hub 22 and is provided with a lever 25, and finally a ring 26 is loosely mounted on the hub 24; to this ring the coupling spring 3 is fixed by the screw 4, as shown in Figs. 1^a to 4^a. The two hubs 22 and 24 are provided with slots 5 and 6 in which the extension pin on the screw 4 engages as shown in Figs. 1^a to 4^a. A strong horizontal stud 27 is fixed to the lever 16 and against it the lever 25 bears during the switching-off movement of the outer switch handle 2, so that the inner switch lever 16 and its contact springs are moved back, that is to say

toward the fixed insulating pieces 7 and 8. The lever 23 is likewise provided with a strong stud 28 which engages in a slot 29 in the double brake piston 30—31. This
 5 piston moves in the cylinder 32, which is provided at the middle of its front side with the slot 33, shown in Fig. 5 which is of corresponding length and width for the purpose of permitting of the entry and free
 10 displacement of the stud 28. In the example illustrated, the cylinder 32 is completely closed at both ends.

It is assumed that the two pistons 30, 31 do not form perfect joints. An arm 34 on
 15 the lever 23 serves for temporarily coupling the two levers 34 and 16.

A ring 35 is mounted on the outer end of the fixed stud 21 in such a manner that it is unable to be rotated or displaced. This ring
 20 is provided with two recesses 36 and 37 as clearly shown in Figs. 7 and 8. Between the ring 35 and the lever 25 is freely mounted a lever 38 which is connected with the lever 25 by means of a claw clutch 39. A strong
 25 stud 40 is screwed into the lever 38 in order to permit of rotating the handle 2, consisting of the metal part 41 and the non-conducting part 42, within given limits.

In order to prevent rotation of the handle
 30 part 42 relatively to the flange-like metal part 41, as shown in Figs. 7 to 10 the latter is recessed at one end at 43 and the nose 44 on the part 42 engages in this recess. In
 35 Figs. 7 to 10, 45 designates the bore enabling the metal part 41 to turn about the stud 40. The metal plate 41 (see Figs. 7 to 10) comprises a large recess embracing the ring 35 externally. This recess comprises inwardly
 40 directed noses 46 and 47.

When the motor is switched off, the contact spring 17 bears against one of the insulating parts 7 (Fig. 1). The lever 25 rests
 45 against the stud 27. The outer switch handle 2 (which is shown, together with the other parts, in mid position in Fig. 5, for the sake of clearness) occupies the position
 50 shown in Fig. 7, that is to say the nose 47 engages in the recess 36 in the fixed ring 35.

Now, if the handle 42 (indicated in
 55 broken lines only in Fig. 7 and omitted altogether in Figs. 8-10, for simplicity) be seized for the purpose of switching in the motor and then pressed toward the right, at first it will not impart an angular movement
 60 to the lever 38, because this is prevented by the engagement of the nose 47 in the recess 36; on the other hand, the nose 47 will leave the said recess, and it is only when this has taken place and the handle 42 assumes
 65 the position shown in Fig. 8 that the lever 38 is able to follow the rotary movement given to the handle 2. Now if this movement toward the right takes place rapidly, as shown in Fig. 8 the nose 46 slides on the
 70 cylindrical periphery of the ring 35 until

it reaches the position shown in Fig. 9 when it snaps into the recess 37 as shown in Fig. 10. Owing to this rotation of the
 75 switch handle 2, which is imparted to the ring 26 through the hub 24 and screw 4, the spring 3 is extended because it tends to displace the lever 16 by means of the eye 48, which latter is, however, prevented from a
 80 speedy displacement by bearing against the upper arm 34 of the lever 23. The lever 23 is itself prevented from speedy displacement owing to the fact that the piston 30 compresses the air in front of it in the cylinder 32 and simultaneously the piston 31
 85 produces a rarefaction behind it. During the rapid switching-in movement of the handle 2, the lever 16 is only able to follow the pull of the extended spring to such an extent that it reaches the first contact
 90 10, as shown in Fig. 2. Fig. 2 likewise shows that the lever 25 outstrips the lever 16 during the switching-in movement and therefore effects the same angular displacement as the handle 2. As, owing to the
 95 engagement of the nose 46 in the recess 37 the handle is prevented from automatic retractive rotation, the spring 3 remains extended until all the parts have reached the position shown in Fig. 3 in which the contact
 100 springs 17 have reached the contact 15 and the other two contact springs have reached the right hand end of the fixed contact pieces 49 and 50. A stop 51 secured to the slate plate 9 prevents the switch
 105 lever 16 from passing beyond the position shown in Fig. 3. Here the stud 27 does not come against the lever 25 because the movement of the switch handle is purposely made greater than the angular displacement of the switch lever. The object
 110 of this is that the spring 3 may be certain to present such force at the end of the switching movement that it is able to draw the contact springs as far as the last contact 15. As the two pistons 30 and 31 do not form
 115 perfect joints, they allow the air to pass slowly, and to the same extent that the two pistons are able to move, the spring 3 is able to move the inner switch lever forward.

If the switch handle 2 is rotated to the
 120 left hand side for the purpose of switching-off the motor, in the first place the nose 46 leaves the groove 37 and it is only after this has taken place that there is an actual angular displacement causing the lever 25
 125 to strike against the stud 27, and thereupon a rapid return of the lever into the position shown in Fig. 1 by means of this stud. During this movement of the lever 16, the levers 23 and 34 remain behind, as they are
 130 prevented from speedy displacement by the two pistons 30 and 31. Accordingly, by the movement of its outer end, the spring 3 is extended in the opposite direction to its former extension and in correspondence
 135

with the passage of the air between the outer face of the piston and the wall of the cylinder, returns both pistons into the original position shown in Fig. 1. As at the end of the contra-clockwise rotation of the switch handle the nose 47 snaps into the recess 36, the spring remains extended until it has returned the piston to its initial position.

During the switching-in movement of the handle 2 the hub 24 has carried with it the sleeve 26 and the inner end of the spring 3 by means of the screw 4 as shown in Fig. 1^a. The extension of the screw 4 runs freely in the slot 6 in the hub 22 in the lever 23, 24. During the switching-off movement the reverse takes place. The slot slides over the screw 4 to a certain extent, while, as the screw 4 bears against the end of the bush 22 (Fig. 4) the spring 3 is prevented from rotating as speedily as the switch handle. The inner end of the spring therefore by means of the screw 4 forces the bush 22 and the lever 23 connected with it in the direction indicated by the arrow E in Fig. 3^a.

Fig. 1^a corresponds to Fig. 1; the extension of the screw 4 bears against the lower ends of the two slots 5 and 6 in Fig. 1^a. Fig. 2^a corresponds to Fig. 2. In accordance with the tension of the spring; the extension of the screw bears against the left hand end of the slot 5 in Fig. 2^a, while it is not in contact with the ends of the slot 6. Fig. 3^a corresponds to Fig. 3. The two left hand ends of the slots bear against the extension of the screw 4. Finally, Fig. 4^a corresponds to Fig. 4; the slot 5 is free to pass by the extension of the screw 4 while the latter still bears against the left hand extremity of the slot 6.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

1. In a starter for electric motors, the combination of a fixed shaft, a series of contact pieces insulated one from another, a contact lever rotatable on said shaft, an actuating lever freely rotatable on said shaft, a sleeve on the hub of said actuating lever, a spring between said sleeve and contact lever, a brake controlling lever rotatably mounted on said shaft, a brake coupled with said brake controlling lever, means between said contact lever and brake controlling lever to actuate the latter when the former is moved forward, a pin carried by the sleeve on the hub of the actuating lever and acting respectively on the hubs of the actuating lever and brake controlling lever whereby said sleeve is rotated and the spring placed under tension when said levers are rotated, means between the actuating lever and the contact lever to move the latter positively when the former is moved back, a lever on the outer end of said shaft coupled

with the actuating lever, a handle rotatably connected with said last mentioned lever eccentrically to the shaft, and a ring secured to said shaft said ring and handle being provided with complementary recesses and projections adapted to engage when the handle occupies either extreme position.

2. In a starter for electric motors, the combination of a fixed shaft, a series of contact pieces insulated one from another, a contact lever rotatable on said shaft, an actuating lever freely rotatable on said shaft, a sleeve on the hub of said actuating lever, a spring between said sleeve and contact lever, a brake controlling lever rotatably mounted on said shaft, a brake cylinder having a piston operatively connected with the brake controlling lever, a pin carried by the sleeve on the hub of the actuating lever and acting respectively on the hubs of the actuating lever and brake controlling lever whereby said sleeve is rotated and the spring placed under tension when said levers are rotated, means between the actuating lever and the contact lever to move the latter positively when the former is moved back, a lever on the outer end of said shaft coupled with the actuating lever, a handle rotatably connected with said last mentioned lever eccentrically to the shaft, and a ring secured to said shaft said ring and handle being provided with complementary recesses and projections adapted to engage when the handle occupies either extreme position.

3. In a starter for electric motors, the combination of a fixed shaft, a series of contact pieces insulated one from another, a contact lever rotatable on said shaft, an actuating lever freely rotatable on said shaft, a sleeve on the hub of said actuating lever, a spring between said sleeve and contact lever, a brake controlling lever rotatably mounted on said shaft, a brake cylinder constructed without valves, a piston loosely fitting the cylinder, connections between the piston and controlling lever, a pin carried by the sleeve on the hub of the actuating lever and acting respectively on the hubs of the actuating lever and brake controlling lever whereby said sleeve is rotated and the spring placed under tension when said levers are rotated, means between the actuating lever and the contact lever to move the latter positively when the former is moved back, a lever on the outer end of said shaft coupled with the actuating lever, a handle rotatably connected with said last mentioned lever eccentrically to the shaft, and a ring secured to said shaft said ring and handle being provided with complementary recesses and projections adapted to engage when the handle occupies either extreme position.

4. In a starter for electric motors, the combination of a fixed shaft, a series of

contact pieces insulated from one another, a contact lever rotatable on said shaft, an actuating lever freely rotatable on said shaft, a sleeve on the hub of said actuating lever, a spring between said sleeve and contact lever, a brake, a two armed brake controlling lever rotatably mounted on said shaft, having one arm connected with the brake, and the other arranged to be acted on by the contact lever when it is moved forward into switching position, a pin carried by the sleeve on the hub of the actuating lever and acting respectively on the hubs of the actuating lever and brake controlling levers, whereby said sleeve is rotated and the spring put under tension when said levers are rotated, means between the actuating lever and the contact lever to move the latter positively when the former is moved back, a lever on the outer end of said shaft coupled with the actuating lever, a handle rotatably connected with said last mentioned lever eccentrically to the shaft, and a ring secured to said shaft said ring and handle being provided with complementary recesses and projections adapted to engage when the handle occupies either extreme position.

KARL VON DREGER.

Witnesses:

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WOLDEMAR HAUPT.