C. E. AVERY.

ELECTRIC MOTOR.

APPLICATION FILED APR. 8, 1909

958,354.

Patented May 17, 1910.

Fig. 1.

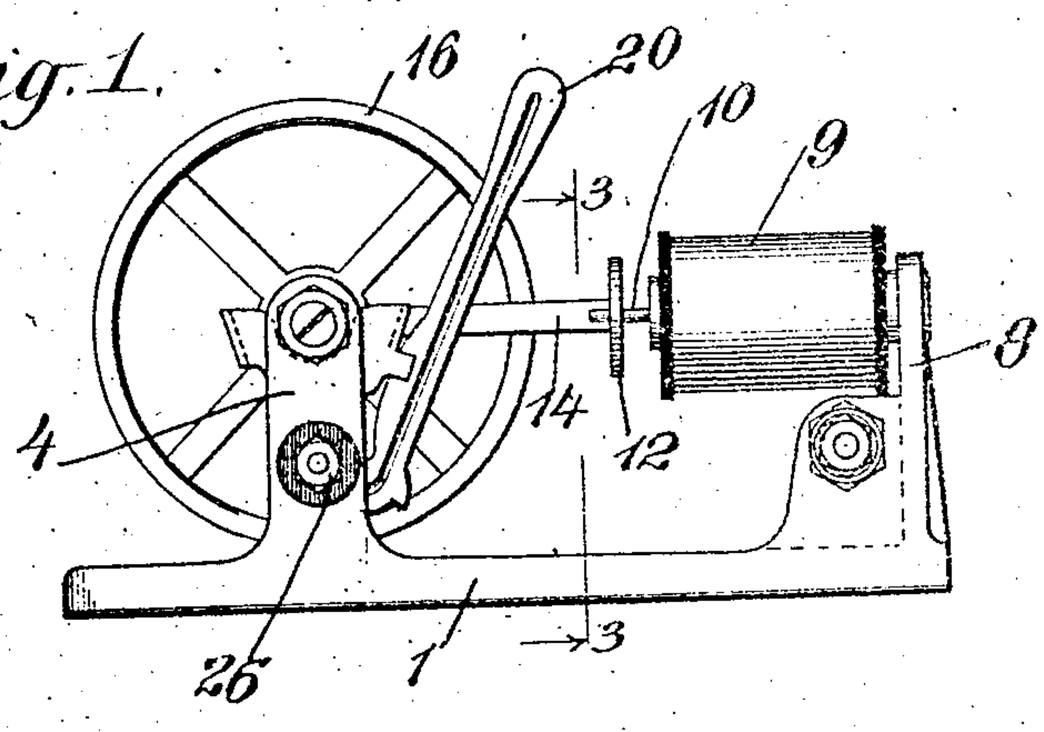


Fig. 2.

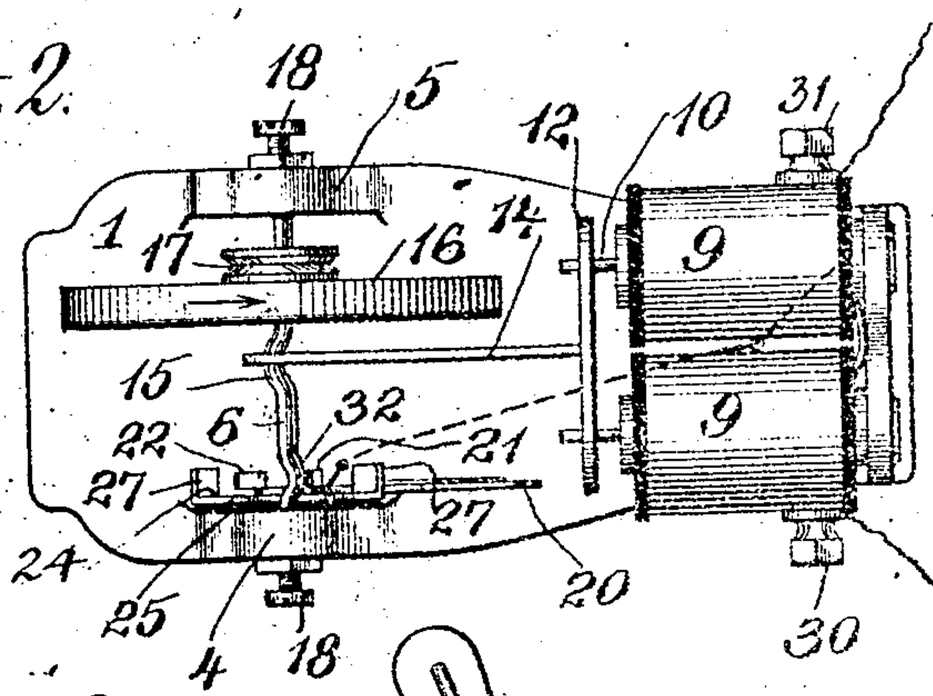


Fig. 5.

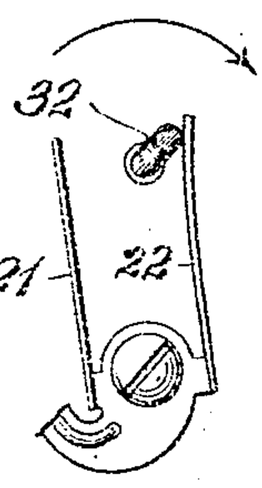


Fig. 3.

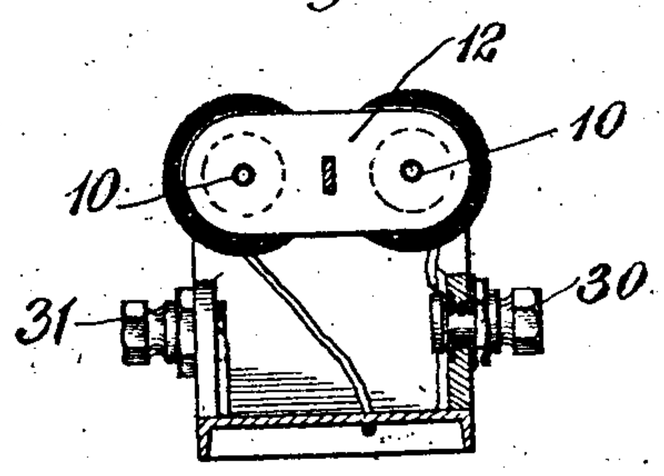
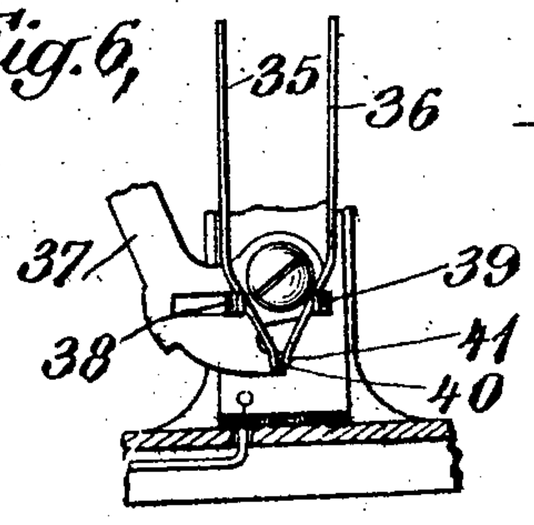


Fig. 4

Fig. 6.



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ELECTRIC MOTOR.

958,354. Specification of Letters Patent. Patented May 17, 1910.

Application filed April 8, 1909. Serial No. 488,683.

To all whom it may concern:

Be it known that I, CHARLES E. AVERY, a citizen of the United States, and a resident of the city of Jersey City, Hudson county, New Jersey, have invented certain new and useful Improvements in Electric Motors, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to electric motors, and the object thereof is the construction of a toy motor, adapted to be operated on a battery circuit, and to provide therefor a simple arrangement of the parts in order to reduce the cost of manufacture and secure durability of the device and reliability of operation.

A further object thereof is the provision of a switch, whereby the motor may be started in either direction and reversed at will.

In the drawings, Figure 1 is a side elevation of the motor; Fig. 2 a plan; Fig. 3 a transverse section on the line 3—3, (Fig. 1); Fig. 4 a detail of the starting and reversing switch; Fig. 5 is a detail showing the switch arms reversed; and Fig. 6 is a detail view showing a modified construction of the switch.

Similar reference characters are employed to designate like parts in all the views.

In the preferred form shown in the drawing, the motor comprises a bed plate 1, provided with standards 4 and 5 in which a crank shaft 6 is journaled and on one of which the switch is mounted. At one end, the bed plate 1, is provided with a standard 8, to which an electro magnet 9 is secured, and by which it is supported. The bed plate and the supports or standards for the crank shaft and the magnet are preferably formed integrally of iron or other conducting metal. Studs 10 are rigidly supported by the magnet 9, and project longitudinally therefrom. An armature 12, is mounted to reciprocate on the studs 10, the apertures in the armature, through which the studs pass, being large enough to permit the armature to move freely on the studs, notwithstanding the slight rocking movement imparted to the armature by the connecting rod 14, when, as in the particular construction illustrated, it is at one end rigidly secured to the armature. By rigidly connecting the armature to the connecting rod, I obviate all lost motion at that point, thus securing a more positive and sensitive operation of the motor, while lessening the expense of construction and assembling. The other end of the connecting rod is journaled on a crank 15, formed on the shaft 6, on which a fly-wheel 16, and a driving pulley 17, are fixed. Screws 18, forming adjustable bearings for the crank shaft, are threaded in the standards 4 and 5.

A starting and reversing switch, comprising a lever 20, and resilient conducting springs 21 and 22, is pivotally mounted upon a plate 24, which is secured to the standard 4, from which it is insulated by a sheet of suitable non-conducting material 25. The switch, the plate and the insulating sheet are preferably secured to the standard by a single screw 26, which passes through them serving as a pivot for the switch and clamping the lever against the plate with sufficient pressure to hold it in any position to which it may be adjusted on its pivot by the arm 20″. The plate 24, is provided with wings 27, which form guards to protect the switch arms from injury, and one of which may act as a stop to limit the movement of the lever 20 in one direction; its movement in the opposite direction may be limited by a stop 29, projecting from the plate 24.

The electrical connection of the motor is clearly shown in Figs. 2, 3 and 4. One terminal of the circuit is connected to an insulated binding post 30, to which one terminal of the magnet coils is connected. The opposite terminal of the coils is connected with the insulated plate 24, with which the switch arms 21, 22 are in electrical contact. The other terminal of the circuit is connected with a binding post 31, which is in electrical connection with the crank shaft 6, (which is made of conducting material), through the frame of the motor; but it will, of course, be understood that these connections may be differently arranged.

The crank shaft 6, is formed with a cam-like offset 32, which projects from the shaft at an angle of about 90 degrees to the crank. This offset is preferably formed by bending the shaft.

The conducting spring arms 21 and 22 are arranged one on each side of the shaft 6, so that the offset 32 will contact with one or the other of the conducting arms at each revolution of the shaft so as to close the circuit through the arm which may have been

thrown into the path of the offset 32, as clearly shown in Fig. 4, in which the switch arm 21 is shown in contact with the offset 32, the opposite arm 22 being out of the path of movement of the offset, so that the circuit will not be closed through that arm. The result of this arrangement is that with the switch in the position shown in Fig. 4, the cam or offset 32 will contact with the spring arm 21 at each revolution of the shaft while the crank is in the upper half of its revolution, thereby closing the circuit through the magnet, and the fly-wheel will rotate in the direction shown by the arrow in Fig. 2. But if the switch be reversed to the position shown in Fig. 5, then at each revolution of the shaft, the cam 32 will contact with the spring arm 22, while the crank is in the lower half of its revolution and close the magnet circuit, attracting the armature to turn the fly-wheel in the opposite direction. All that is necessary to do therefore to start the motor, is to turn the wheel slightly until the cam 32 contacts with the switch arm that has been thrown into position, when the circuit will be established to actuate the motor in the direction for which the switch has been set. To reverse the motor while running, the switch is simply moved into the opposite position and the motor will at once assume the opposite direction of rotation. The speed of the motor may be varied by moving the lever 20 to adjust the position of the arms 21 and 22 for a longer or shorter contact with the shaft or offset.

In Fig. 6 is illustrated a modified construction of the switch, in which the switch arms are designated by the numerals 35 and 36 and the switch lever by the numeral 37. In this construction, the switch arms consist of a single strip of spring conducting metal and are removably held in position on the switch arm by their own resiliency, thus permitting the removal and replacement of the arms in case of injury or deterioration due to sparking which may occur when a relatively heavy current is employed, without requiring the removal of any other parts. In this construction, the switch lever is provided with projecting lugs 38, 39 and 40. The strip for the switch arms is formed with a loop 41, which closely embraces the lug 40. From this point, the arms 35 and 36 diverge and then extend upwardly on opposite sides of the crank shaft. Their divergent portions bear against the lugs 38 and 39, and the arms may be instantly put in place by simply placing the loop 41 over lug 40 and pressing the arms together to permit the diverging portions to enter between the lugs 38 and 39, against which they will bear with sufficient pressure to hold them securely in place, the lugs being slightly bent or curved to form recesses for the spring.

What I claim is:

1. In an electric motor, the combination with a bed plate provided with standards for a crank shaft and magnet, of an electro-magnet supported by its standard, studs on the magnet, an armature mounted to reciprocate on said studs, a crank shaft carrying a fly-wheel, and a connecting rod between the armature and the crank shaft, substantially as set forth.

2. In an electric motor, the combination with an operating magnet, an armature, supports on which the armature is mounted to reciprocate, a fly-wheel, a crank-shaft on which the fly-wheel is mounted and a connecting rod journaled at one end on the crank and at its opposite end fixed rigidly to the armature, substantially as set forth.

3. In an electric motor, the combination with the crank shaft, of an offset thereon forming a circuit-closing contact, a switch lever, conducting arms extending on opposite sides of the crank shaft and means engaging said arms for removably holding them in place on the switch lever.

4. In an electric motor, the combination with the crank shaft, of an offset thereon forming a circuit-closing contact, a switch lever, resilient conducting arms extending on opposite sides of the crank shaft and means engaging said arms, whereby the same are removably held in place on the switch lever by their own resiliency.

5. In an electric motor, the combination with a bed plate provided with standards for the crank shaft and magnet, of an electro-magnet supported by its standard, studs projecting from the magnet cores, an armature mounted to reciprocate on said studs, a crank shaft carrying a fly-wheel, and a connecting rod, one end of which is rigidly fixed to the armature, and the opposite end of which is journaled on the crank shaft, substantially as set forth.

6. In an electric motor, the combination with a crank shaft journaled in standards on the bed plate, a plate supported on one of said standards, a reversing switch pivotally mounted on said plate, having arms arranged on opposite sides of the shaft and guards for said arms carried by said plate, substantially as set forth.

7. In an electric motor, the combination with a crank shaft carrying a circuit closing contact, of a reversing switch comprising a switch lever and conducting arms formed of a continuous metallic conducting strip held removably on the switch lever by lugs formed thereon, and extending on opposite sides of the crank shaft.

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