

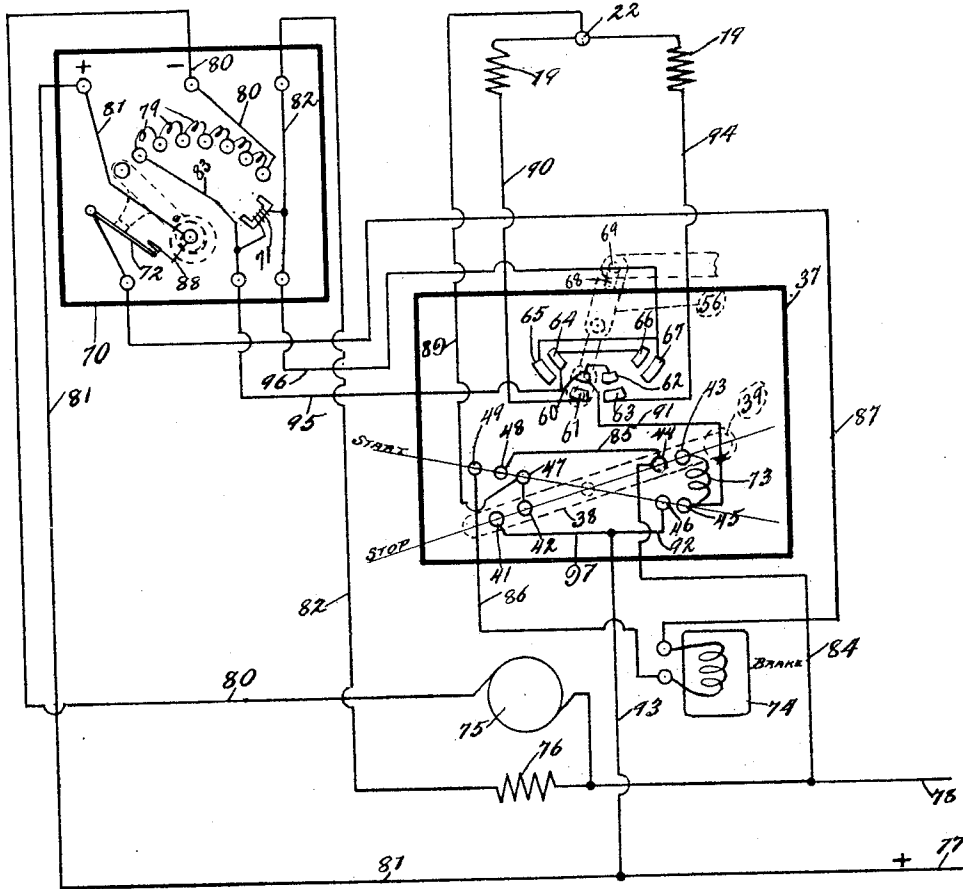
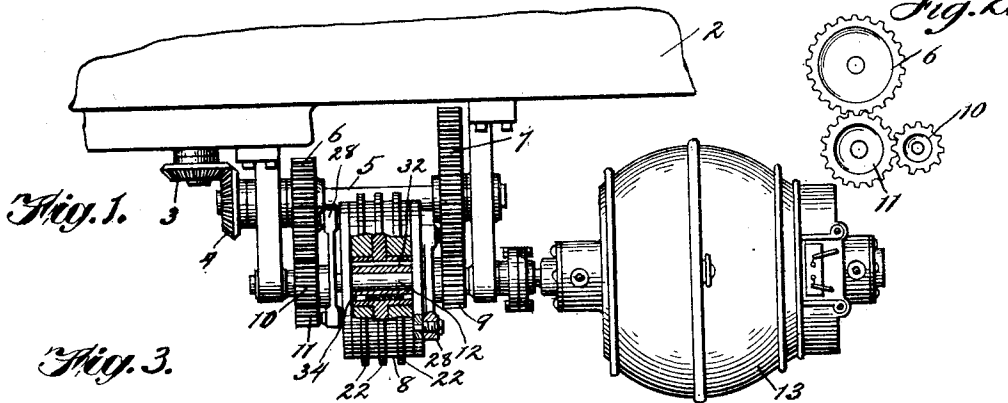
No. 799,720.

PATENTED SEPT. 19, 1905.

H. H. CUTLER.  
ELECTROMAGNETIC CLUTCH.

APPLICATION FILED SEPT. 22, 1902.

3 SHEETS—SHEET 1.



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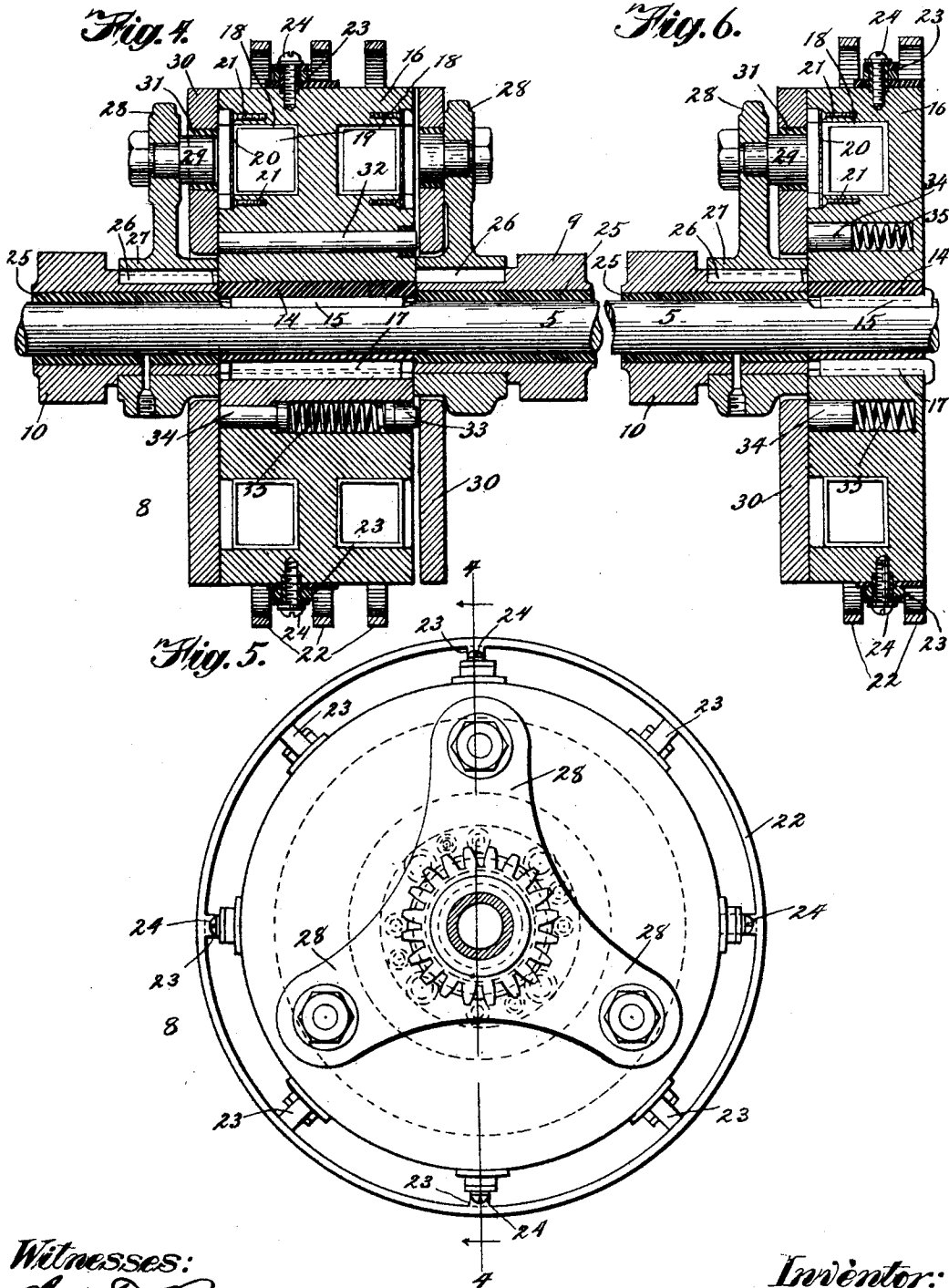
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3 SHEETS—SHEET 2.



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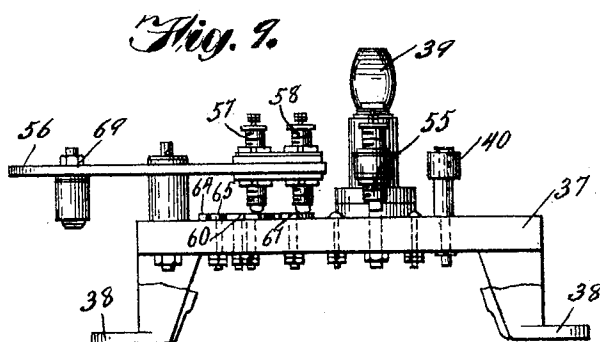
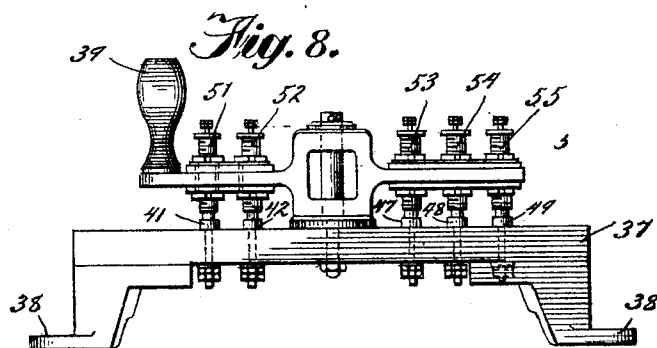
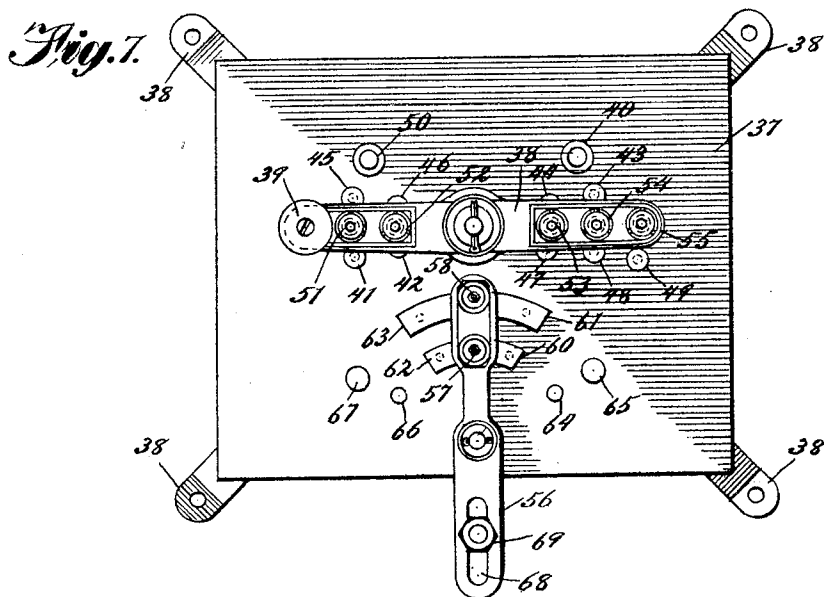
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Witnesses:

*Chas. D. Perry*

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Inventor:

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# UNITED STATES PATENT OFFICE.

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## ELECTROMAGNETIC CLUTCH.

No. 799,720.

Specification of Letters Patent.

Patented Sept. 19, 1905.

Application filed September 22, 1902. Serial No. 124,354.

*To all whom it may concern:*

Be it known that I, HENRY H. CUTLER, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented a certain new and useful Improvement in Electromagnetic Clutches, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to improvements in clutch apparatus.

One object of my invention is to provide means whereby a magnetic clutch may be caused to readily release its armature whenever it is desired to disconnect the same from the machinery operated thereby or to stop the machinery, and thus avoid the trouble caused by a failure of the clutch, owing to the residual magnetism thereof, to fail to release the attracted parts. In order to accomplish this result, I provide means for exerting a yielding pressure between the clutch members, tending to move them out of contact, whereby when the clutch-windings are deenergized the members of the clutch are separated. I further provide means for reversing the current through the energizing coil or coils of the clutch at the time it is desired to stop the machinery or to release the clutch, whereby the coil or coils are more quickly deenergized and the residual magnetism is neutralized.

My invention further contemplates including a resistance in the path of this reversed current, whereby the magnetism of the clutch-windings does not reverse and build up suddenly, thus giving more time for the members of the clutch to separate under the influence of the yielding pressure aforesaid.

Another object of the invention is the provision of means whereby a positive protection is afforded in case the travel of the machinery exceeds the normal or desired amount. For this purpose my invention contemplates short-circuiting the retaining-magnet of the rheostat, whereby at such abnormal movement of the mechanism the rheostat-arm is returned to normal position and all parts are stopped.

Further objects and the means by which they are accomplished will appear from the detailed description and claims.

My invention is illustrated in the accompa-

nying drawings, in which the same reference characters designate like parts throughout the several views, and in which—

Figure 1 shows a motor connected with a planer for the operation thereof. Fig. 2 shows the arrangement of the gear-wheels at one end of the counter-shaft. Fig. 3 is a diagram of the circuits and apparatus involved in my invention. Fig. 4 is a longitudinal sectional view of the clutch employed in my invention. Fig. 5 is an end view of the same. Fig. 6 is a sectional view of a modified form of clutch. Fig. 7 is a face view of the starting and reversing switches. Fig. 8 is an edge view thereof, and Fig. 9 is a view of the same at right angles to Fig. 8.

In Fig. 1 the numeral 2 represents a planer-bed or analogous part, the gear-wheel 3 being connected with a shaft to operate the planer-bed in a suitable manner. A bevel-gear meshes with the gear-wheel 3 and is mounted upon a shaft 5, to which is secured a small gear-wheel 6 near one end and a larger gear-wheel 7 at the other.

8 represents a magnetic clutch of special form, which will be described hereinafter and which operates a pinion 9, meshing with the gear-wheel 7 upon the counter-shaft 5, and a similar pinion 10 is operated by the clutch at its opposite end, said pinion, as shown more clearly in Fig. 2, engaging with an intermediate gear 11, which intermeshes with the gear-wheel 6 on the shaft 5. The clutch-shaft 12 forms a continuation of the shaft of the motor 13, whereby when the latter is operated the magnetic clutch 8 may be operated to drive the planer-bed in one direction at one speed and in the opposite direction at a different speed.

The clutch 8 is shown in detail in Figs. 4 and 5, in which the shaft 5 is provided with a non-magnetic sleeve 14, suitably secured thereto by a key 15 and upon which the clutch member or driving member 16 of the clutch is carried, said member being secured by the key 17 to the sleeve 14. The said member is provided in each of its opposite faces with an annular channel 18, in which a magnet-coil 19 is wound, suitable strips 20 being placed at intervals outside of the coil 19 across the channel 18 and secured to the member 16 by screws 21 21 to hold the coil in place. Upon the outside of the member the contact-rings 22 22 22

are located, said rings being each provided with laterally-extending lugs at suitable intervals, beneath which and over which suitable insulating strips or washers are provided, a screw 24 being passed through the said strips and lugs into the member 16 to secure the rings in place, an insulating-bushing surrounding the screw 24. The outer terminals of the magnet-coils 19 are connected with the outer rings 22, and the inner terminals are connected to the inner rings. Suitable stationary brushes are provided to connect with these rings to convey the current thereto, and a reversing-switch, as hereinafter described, is employed in the circuit to properly direct the current through said coils.

The pinion 10, at the left-hand side of the clutch, rotates upon a non-magnetic sleeve 25, carried by the shaft 5, and is secured, by means of key 26, to the hub 27, having the radiating arms 28, as shown more clearly in Fig. 5. Bolts are passed through suitable apertures in the ends of these arms and have cylindrical heads 29, projecting from their inner faces. The armature-disk 30 for the left-hand magnet-coil is carried upon these circular heads, suitable non-magnetic bushings 31 being provided in the apertures in the disk, whereby when the magnet is energized the disk slides forward upon the projections 29 and frictionally engages the face of the clutch member 16, thus causing the pinion 10 to rotate with the clutch and motor. At the opposite end of the clutch a like arrangement exists, the pinion 9 being carried upon a similar non-magnetic sleeve 25, secured by key 26 to the hub of the arms 28. A similar armature-disk 30 is provided for the right-hand coil 19 of the clutch.

Pins 32 extend through member 16 and project slightly beyond the face of the same, whereby when one of the disks is attracted it strikes the ends of the pins 32 and releases by the impact the opposite armature in case the latter has just been attracted. This arrangement thus insures the releasing of one armature before the other is engaged with the member 16, whereby strain and injury to the mechanism due to the sticking of an armature by the residual magnetism are avoided.

In order to push the armature-disk out of contact with the faces of the clutch member 16 when it is desired to stop the mechanism, spring-pins 33 and 34 are provided near the hub of the member 16, a coiled spring 35 serving to press these pins outwardly, whereby when the magnet-coils are deprived of operating-current the pins push the armature-disks away from the face of the magnet.

As stated above and as shown in Fig. 3, a suitable reversing-switch 37 is necessary, which switch is preferably actuated by the planer. This switch is shown in Figs. 7, 8, and 9, in which 37 indicates the insulating-base upon which the operating parts are

mounted, 38 being the securing lugs or feet, by means of which the same may be secured to the wall, floor, or other support.

39 is the starting and stopping switch, which is adapted when moved by the handle 39 to one limit of its movement until checked by the stop 40 to engage the stationary contacts 41, 42, 43, and 44 and at the opposite limit of its movement to engage contacts 45, 46, 47, 48, and 49, a suitable stop 50 serving to prevent the lever moving beyond operating position in this direction. Suitable brushes, preferably of the carbon type, are carried by the switch 39, said brushes being indicated at 51, 52, 53, 54, and 55, these brushes being vertically adjustable, as shown in Fig. 8. The reversing-switch 56 is mounted near one edge of the insulating-base 37 and is provided with a pair of brushes 57 and 58, which engage in the normal movement of the lever 56 the stationary contacts 60 and 61 and at the opposite limits of its normal movements like contacts 62 and 63. Other contacts 64 and 65 and 66 and 67 may be engaged by the lever if swung to an abnormal distance to either side. At the opposite end of the lever a slot 68 is provided in which a reciprocating bar operated from the planer-bed is secured by means of the bolt 69, the slot permitting a certain amount of adjustment.

In the diagram in Fig. 3 the starting-rheostat is shown at 70, 71 being the usual retaining-magnet for the arm of the rheostat, 72 being a switch which is normally opened by a projection upon the rheostat-arm. The two coils of the clutch 8 are shown at 19, and the reversing-switch is shown at the upper side of the insulating-base 37. 73 indicates a resistance adapted to be placed in series with the magnet-coils 19 when it is desired to stop the mechanism. A solenoid-brake 74 is adapted to be applied to the motor when its solenoid is deenergized, the motor-armature being indicated at 75 and its shunt-field at 76 and the leads of the power-circuit at 77 and 78.

In the operation of the apparatus the switch 38 is moved to starting position and the arm of the rheostat 70 is moved toward the right. As soon as the arm of the rheostat reaches the first contact of the rheostat resistance 79 a circuit is completed from the negative side of the power-circuit through the armature 75 of the motor, thence over conductor 80 and through the resistance 79, the arm of the rheostat, and thence over conductor 81 to the opposite side 77 of the power-circuit. Similarly the circuit is closed from the negative side through shunt-field of the motor, over conductor 82 through the winding of retaining-magnet 71, thence over conductor 83 to the first contact of the rheostat 79, and thence through the arm of the rheostat and over conductor 81 to the opposite side of the circuit. The motor-armature and its field are thus energized and the motor is started. The resist-

ance in the armature-circuit is gradually cut out as the arm of the rheostat is moved to the right, and the resistance 79 is cut into the shunt-field to reduce its strength as the arm proceeds in its travel. The starting-lever 38 having been placed in starting position, a path for current through the brake is provided from the negative side of the power-circuit over conductors 84 and 85 to contact 48, thence through the switch 38 to contact 49, over conductor 86 to the solenoid of the brake. It then passes by way of conductor 87 to the switch 72 upon the base of the rheostat 70 and through conductor 88 to conductor 81 and the other side of the power-circuit, the switch 72 having been closed as soon as the arm of the rheostat is moved from normal position. The brake-solenoid is thus energized and the brake prevented from stopping the mechanism. A path for current through one of the coils of the clutch is also provided, said path being traced from the negative side of the power-circuit through conductors 84 and 85, thence through the switch 38 to contact 47, and thence over conductor 89 to point 22, which corresponds to the central contact-ring upon the clutch, and thence through the left-hand winding 19 of the clutch-magnet, over conductor 90, to the contact 61 of the reversing-switch. The reversing-switch 56 being assumed to be in the position shown, at this time circuit is completed there-through to the contact 60, which is connected by conductor 91 with the contact 45 of the starting-switch. The circuit is then completed through switch 38 to the contact 46 and thence over conductors 92 and 93 to the opposite side of the power-circuit. The left-hand magnet-coil 19 is thus energized and the corresponding armature-disk is attracted, which operates the planer in the corresponding direction. As the planer-bed reaches the limit of its desired movement the reversing-switch is brought into contact with the contacts 62 and 63, whereby current is cut off from the left-hand coil 19 and is directed through the corresponding right-hand coil, which is connected, by means of conductor 94, with the contact 63, circuit then being completed through the reversing-lever to the contact 60, from whence the path is the same to the other side of the circuit as just traced. As long as the apparatus remains in this condition the planer will continue to be operated automatically by means of the reversing-switch 56, which is, as stated before, operated from the reciprocating mechanism of the planer, (indicated by the rod in dotted lines in Fig. 3.)

Should current upon the line fail for any length of time, the retaining-magnet 71 will be deenergized and the spring upon the rheostat will cause it to return to normal position, thus opening the circuits of the apparatus, as well as switch 72, and deenergizing the solenoid of the brake, thus stopping all parts. In case the reciprocating mechanism of the

switch 56 should fail to stop at the proper point in its movement the lever 56 will be moved into contact with either the contacts 64 and 65 upon one side or the like contacts 66 and 67 upon the other, in either of which cases the retaining-magnet 71 would be shunted by the conductors 95 and 96, leading from opposite sides of the retaining-magnet to the said contacts 64, 65, 66, and 67. When this occurs, therefore, all parts are to be restored to normal position and the machinery stopped, as above described.

When the operator desires to stop the mechanism, the starting-lever 38 is moved to the stopping position, with a result that the circuit is opened between the contact 49 and the switch 38, thus permitting the brake to be immediately applied. Moreover, the current is reversed through the coil of the clutch-magnet. This circuit may be traced from the negative side of the power-circuit through conductor 84 to contact 44, thence through the switch 38 to contact 43, then through the resistance-coil 73 to contact 45, thence over conductor 91, through contact 60, the reversing-lever 56 to contact 61, and thence over conductor 90 and through the coil 19 in the reverse direction from that above described, when the parts are in the same position, but with normal running, thence to point 22 and over conductor 89 to contact 42, thence through the switch 38 to contact 41 and over conductors 97 and 93 to the opposite side of the power-circuit. The current in this path therefore serves to deenergize the operating-magnet of the clutch. This part also includes the resistance 73, so that a large enough current does not flow therethrough to so quickly build up the magnetism of the clutch in the opposite direction that its armature will not be released by the spring-pins 33 or 34. The starting-lever may now be moved to an intermediate position, in which the circuits through the clutch-coils are opened.

In Fig. 6 I show a modification of the clutch in which only one armature-disk is employed, the spring-pins 34 serving to press the said armature away from the face of the driving member when the magnetism of the coil in the latter is reversed by the arrangement shown in the diagram and when the resistance 73 is included in series therewith.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A clutch having a magnet member and an armature member, of means for reversing the current through the coil or coils of said magnet member when it is desired to deenergize the same, means for resiliently pressing said armature member away from said magnet member, whereby the armature is freed from the magnet when the latter is deenergized, substantially as described.

2. A clutch having a magnet member and

an armature member, said armature having an outward yielding pressure exerted against the same, of means for reversing current through the former when it is desired to de-energize the same, and means for including a resistance in the path of said reversing-current, substantially as described.

3. A clutch having two members, of means for exerting a yielding pressure between said members to force them apart when deenergized, and means for reversing current through the winding or windings of said clutch when it is desired to deenergize the same, substantially as described.

4. A clutch having a magnet member and an armature member, means to release said armature member from the magnet member by impact, and means for yieldingly pressing said armature away from the magnet member, substantially as described.

5. A clutch having a magnet member, an armature member opposite each face of said magnet member, means for yieldingly pressing said armature members away from the magnet member, and means for releasing one of said armature members from the magnet member by the impact of a blow delivered thereto by the opposite member when attracted, substantially as described.

6. The combination with a motor adapted to drive machinery, of a clutch for connecting said member with the machinery to be operated, a reversing-switch for reversing the connections through said switch to cause the machinery to be driven in reverse directions, a starting-rheostat having a retaining-magnet to maintain the rheostat-arm in working po-

sition, and means for short-circuiting said retaining-magnet when the reversing-switch exceeds its normal travel, substantially as described.

7. The combination with a motor, of a clutch to connect the same with machinery to be driven, means for reversing the connection in said clutch to drive the machinery in different directions, and means to reverse current through the coils of said clutch when it is desired to stop the same, substantially as described.

8. The combination with a motor, of a clutch to connect the same with machinery to be driven, means for reversing the connection in said clutch to drive the machinery in different directions, means to reverse current through the operating-coil of said clutch and to cut in a resistance in series therewith when it is desired to stop the machinery, substantially as described.

9. The combination with a motor, of a magnet-clutch to connect the same with the machinery to be driven, said clutch having an armature yieldingly pressed away from the same, and means for reversing the current through the actuating-winding of said clutch and for including a resistance in series therewith when it is desired to stop the machinery, substantially as described.

In witness whereof I have hereunto subscribed my name in the presence of two witnesses.

HENRY H. CUTLER.

Witnesses:

A. W. BERRESFORD,  
F. L. PIERCE.