No. 791,536. PATENTED JUNE 6, 1905.

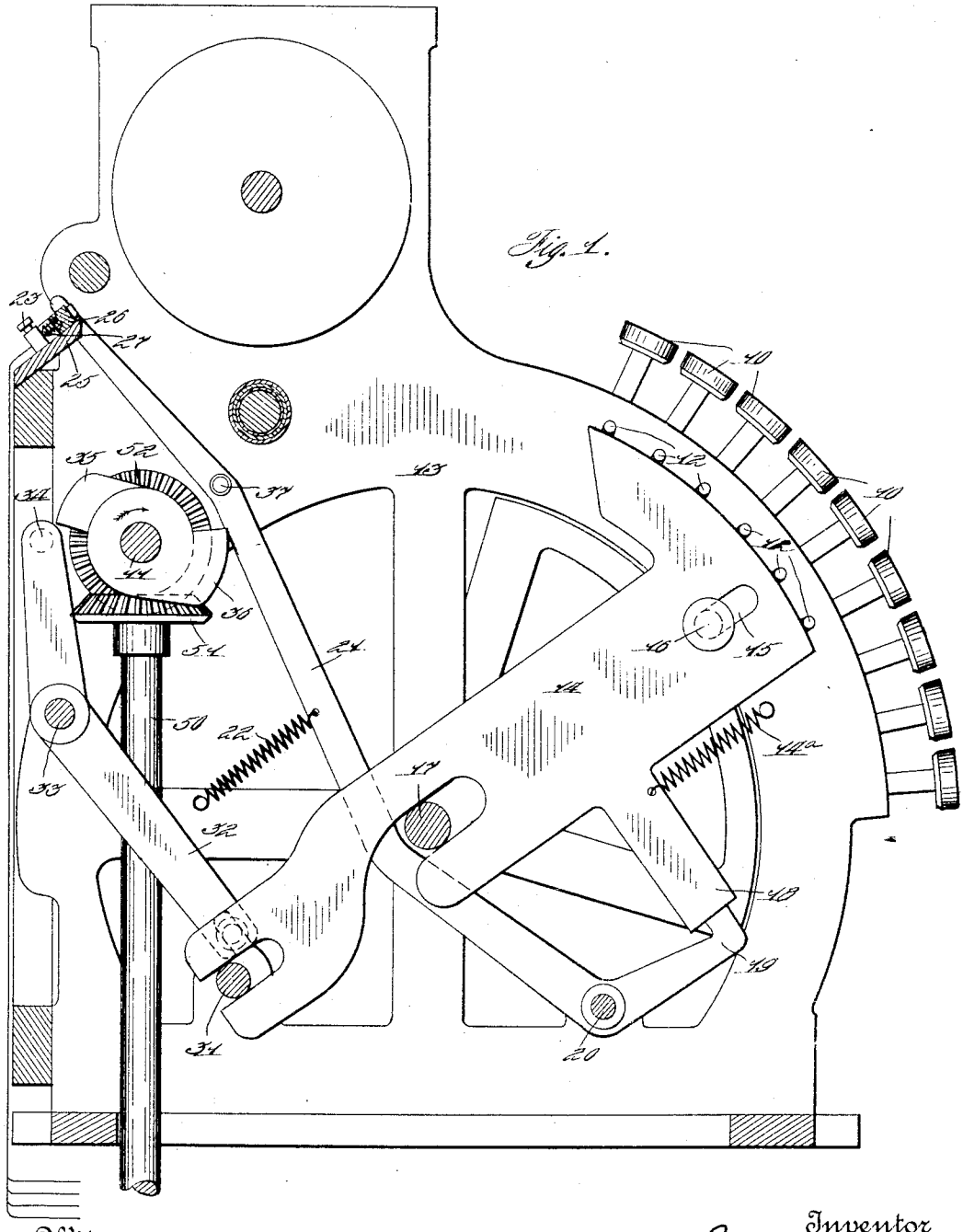
J. P. CLEAL.

DRIVING MECHANISM FOR CASH REGISTERS.

APPLICATION FILED OCT. 26, 1903.

3 SHEETS—SHEET 1.

Fig. 1.



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3 SHEETS—SHEET 2.

Fig. 2.

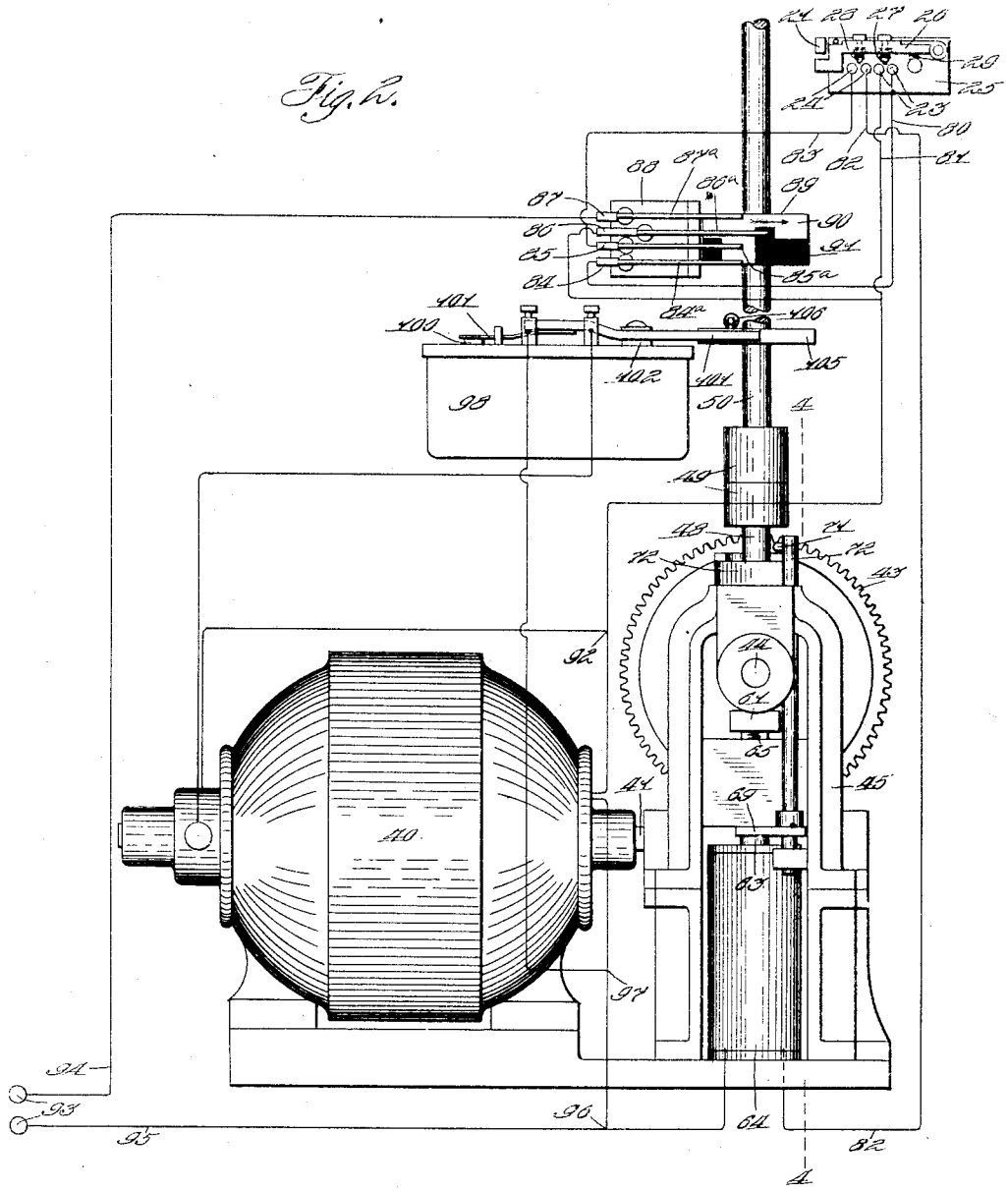
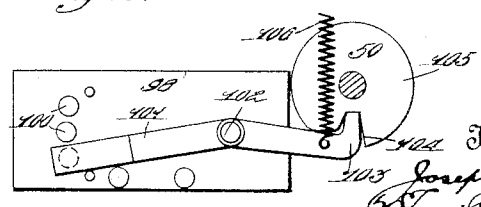


Fig. 2a.



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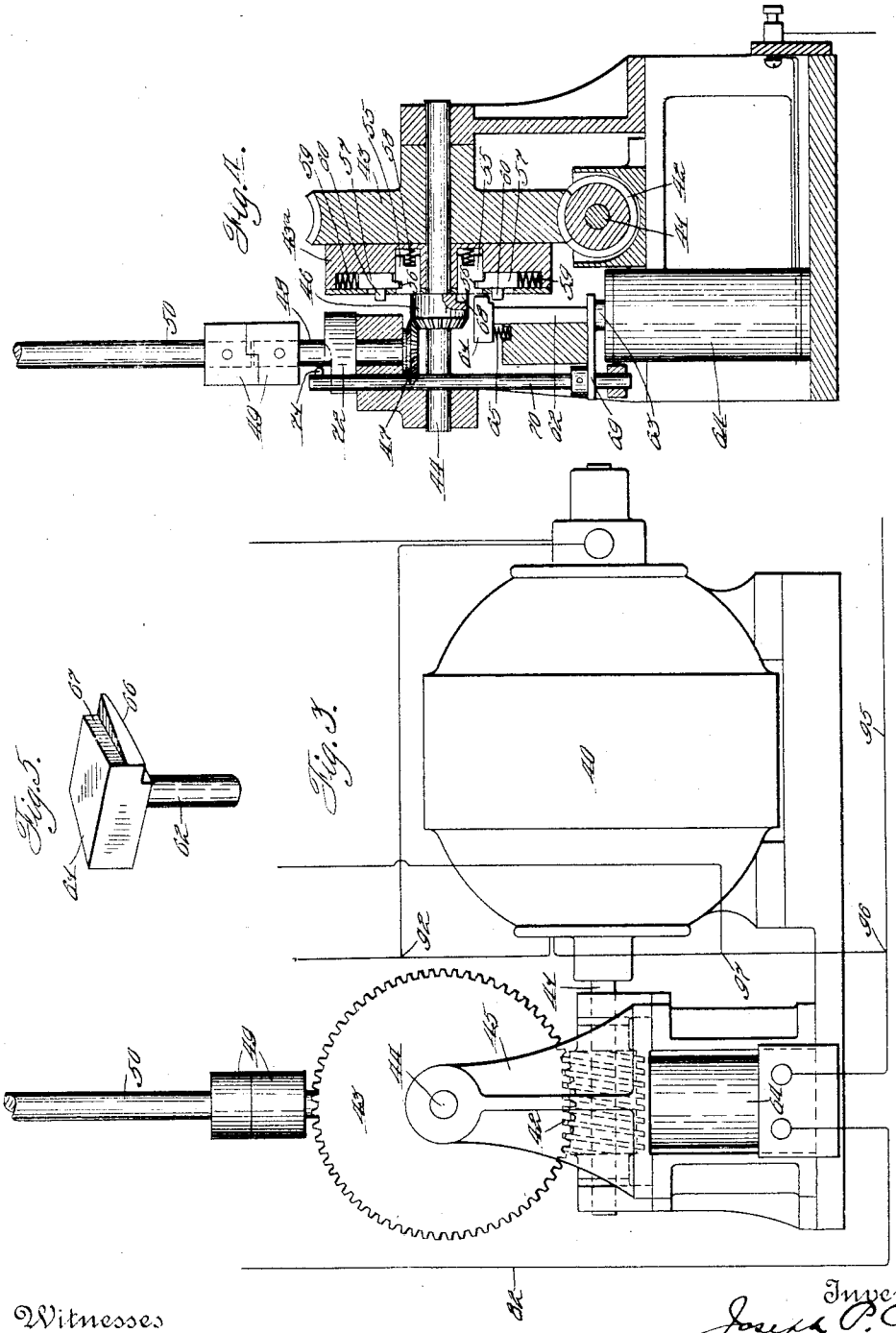
3 SHEETS—SHEET 3.



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No. 791,536. Patented June 6, 1905.

UNITED STATES PATENT OFFICE.

JOSEPH P. CLEAL, OF DAYTON, OHIO, ASSIGNOR TO NATIONAL CASH REGISTER COMPANY, OF JERSEY CITY, NEW JERSEY, AND DAYTON, OHIO, A CORPORATION OF NEW JERSEY.

DRIVING MECHANISM FOR CASH-REGISTERS.

SPECIFICATION forming part of Letters Patent No. 791,536, dated June 6, 1905.

Application filed October 26, 1903. Serial No. 178,637.

To all whom it may concern:

Be it known that I, JOSEPH P. CLEAL, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Driving Mechanism for Cash-Registers, of which I declare the following to be a full, clear, and exact description.

My invention relates to an improved form of driving mechanism for cash-registers and similar machines; and it consists in certain novel constructions, as more fully set forth hereinafter.

For convenience I have shown and described my invention as applied to the type of cash-registers set forth in Letters Patent to Cleal and Reinhard, No. 580,378, dated April 13, 1897, which is a form of cash-register at present well known in the art; but it is of course to be understood that my improvements are equally applicable to other various forms of cash-registers.

In the accompanying drawings, Figure 1 represents a vertical cross-section from front to rear of the cash-register to which I have applied my improvements, showing the circuit-closing mechanism controlled by the clerks' keys. Fig. 2 represents a rear elevation of the electric motor and operating-shaft driven thereby, together with the circuit connections. Fig. 2ª is a detail view of the rheostat used in connection with the motor. Fig. 3 is a front elevation of the driving-motor, showing the worm-gear for operating the driving-shaft. Fig. 4 is a detail vertical section on the line 4 4 of Fig. 2. Fig. 5 is a detail perspective view of part of the clutch-operating mechanism.

The driving mechanism which I have employed in my invention is an electric motor; but as far as certain features of my improvements are concerned it will of course be understood that other forms of driving mechanism may be used other than an electric motor.

In general terms the construction of the motor mechanism for driving the machine comprises an electric motor and a magnetically-operated clutch, together with circuit-making devices controlled by the bank of clerks' keys of the cash-register, with the electrical connections so arranged that upon the depression of any clerk's key the motor will start and the current will also be set up through the magnet, and thereby operate the clutch, so as to connect the motor to the main operating member or shaft of the cash-register, and then as soon as the motor is started and the clutch has been operated the current through the magnet will be automatically broken, but the current through the motor will continue until the main operating-shaft has been given almost one complete revolution.

Referring to the accompanying drawings, I have shown in Fig. 1 a single bank of keys 10 of the cash-register, which keys I have designated as "clerks' keys," and as will be understood from reference to the aforesaid patent there may be other banks of keys similar to these keys 10 to register the various amounts of purchase, this machine being of the well-known two-motion variety, in which the keys are first depressed and then by the revolution of the main operating-shaft 11 the registration, indication, and printing is effected. For a more detailed description of this part of my invention reference may be had to the aforesaid Letters Patent, this constituting no part of my present invention. Formed upon each of the keys 10 are laterally-projecting pins 12, which project through suitable slots formed in the main frame 13 of the machine. These pins are adapted to engage the upper end of a plate 14, which is formed at its upper end with a slot 15, engaging a stationary guide-pin 16, and at its middle portion straddles a transverse shaft 17. This plate 14 has a downwardly and forwardly extending arm 18, against which abuts the forward arm 19 of a bell-crank lever pivoted about the transverse shaft 20, said bell-crank lever having a long rearwardly-extending arm 21, which extends upward to the rear of the machine to control the circuit-making device, said arm 21 being normally drawn rearward by means of a spring 22. This circuit-making device com-

prises two pairs of electrodes 23 and 24, (see Fig. 2,) mounted upon a suitable insulating-plate 25, and pivoted upon this plate 25 is an arm 26, carrying two contact-points 27 and 28. A spring 29 normally presses the arm 26 forward in such manner as to keep the contact-points 27 and 28 out of engagement with their respective electrodes 23 and 24. The arm 26 is bent at its outer end and is engaged at this end by the aforesaid bell-crank-lever arm 21, so that the movement of this arm 21 rearward will carry the aforesaid contact-points into engagement with their respective electrodes.

Referring again to Fig. 1, it will be seen that the plate 14 is formed at its lower end with a bifurcated portion which straddles the transverse shaft 31, and fast to this lower end is a bell-crank lever 32, which is pivoted upon a suitable stub-shaft 33, which projects outward from the main frame of the machine, and the upper arm of which bell-crank lever carries a pin 34, which pin is in lateral alinement with a cam 35, fast upon the main operating-shaft 11. Fast on the same shaft and by the side of the cam 35 is a second cam 36, which is in lateral alinement with an antifriction-roller 37 on the aforesaid arm 21. Upon the pressing in of any clerk's key 10 the locking-pin 12 of that key will force the plate 14 downward and rearward against the tension of the spring 14ª, thereby carrying the arm 18 out of the path of the bell-crank-lever arm 19, so that said arm 19 can then move rearward, and thereby the spring 22 will draw the arm 21 rearward, and thus bring the contact-points 27 and 28 of the aforesaid circuit-making device into contact with their respective electrodes 23 and 24, and thereby close the magnet and the motor-circuits in a manner to be later described, and when the arm 18 is moved into such position, as described, the hooked forward end of the arm 19 latches over said arm 18 and holds said plate 14 in operated position until released in the manner to be later described. The downward movement of this plate 14 also operates the aforesaid bell-crank lever 32 and carries the pin 34 into the path of its coöperating cam 35, and upon the revolution of the main operating-shaft 11 in the direction of the arrow in Fig. 1 by means of the electric motor, as later described, the cam 36 contacts with its antifriction-roller 37 and forces the arm 21 forward, so as to break the circuit at the electrodes 23 and 24, and this forward movement of the arm 21 causes the hook of the aforesaid arm 19 to be withdrawn from engagement with the arm 18 on the plate 14, thereby leaving said plate free to be returned to normal position, which return is positively effected by means of the cam 35, which engages the pin 34, and by means of the bell-crank lever 32 forces said plate 14 back to normal position, in which position the arm 18 again abuts against the lower end of the arm 19, and thus holds the arm 21 out of operative position until a clerk's key has again been depressed.

I will now describe the electric motor and the clutch mechanism for connecting the same with the main operating-shaft of the register.

The register may be mounted on any suitable cabinet, (not shown,) and in the base thereof may be mounted an electric motor 40, (see Figs. 2 and 3,) the armature-shaft 41 of which motor has fast upon the outer end a worm-gear 42, (see Fig. 3,) which turns a gear-wheel 43, journaled upon the shaft 44, suitably supported in brackets 45. Said shaft 44 has fast upon its middle portion (see Fig. 4) a bevel-gear 46, which meshes with another bevel-gear, 47, formed upon the lower end of a vertical shaft 48, which by means of suitable coupling-collars 49 is connected to a shaft 50, which extends upward through the cabinet and has fast upon its upper end a bevel-gear 51, (see Fig. 1,) which meshes with a bevel-gear 52, fast upon the main rotation-shaft 11, so that a single revolution of the shaft 50 will cause a single revolution of the main operating-shaft 11 in a manner which has heretofore usually been accomplished by means of a hand-operated crank. Fast upon the side of the aforesaid gear-wheel 43 is a plate 43ª, which contains part of the clutch mechanism, to be later described, and by means of this clutch the aforesaid bevel-gear 46 is coupled to the gear-wheel 43 and automatically uncoupled therefrom in such manner as to rotate the shaft 50, and thus give the main operating-shaft 11 one complete revolution. The aforesaid clutch-plate 43ª, which is fast on the side of the gear-wheel 43, has mounted within recesses formed therein four clutch-pins 55, which are situated at a quadrant's distance from one another. Each of these pins is formed with a notch 56, which is engaged by the ends of a locking-pin 57. Each clutch-pin 55 is normally spring-pressed outward by means of a spring 58, and each locking-pin 57 is normally spring-pressed toward the clutch-pin by means of a spring 59. Each locking-pin 57 has formed upon it a retracting pin 60, which projects outwardly from the outer surface of the aforesaid plate 43ª and is adapted to be engaged by the clutch-operating block 61, which is mounted upon the upper end of a rod 62, which is fast to a core 63 of an electromagnet 64, said block being spring-pressed upward by means of a spring 65. This block is formed with two cam-surfaces 66 and 67, as shown better in detail in Fig. 5. The bevel-gear 46 has formed in it a notch 68, which is adapted to be engaged by one of the clutch-pins 55 when the same is released by the retracting of the locking-pin 57 in a manner to be described. Also fast upon the rod 62 is a laterally-extending arm 69, to which is attached a vertical rod 70, which has

formed upon its upper end a pin 71, lying in the path of the cam-disk 72, fast upon the vertical shaft 48. The operation of this clutch is as follows: When the current is sent through the electromagnet 64 in the manner to be presently described, the core 63 is pulled downward, and thereby the block 61 is also pulled downward against its spring tension. In the meantime the current has also been made through the electric motor, as will be hereinafter explained, and thereby the gear-wheel 43 and the plates 43^a attached thereto are made to revolve by means of the worm-gear 42. As soon as one of the retracting pins 60 comes in contact with the lower cam-surface 66 of the block 61 this cam-surface causes the pin 60 to be cammed downward, thereby retracting the pin 57 from engagement with the clutch-pin 55, and thus allowing this pin 55 to spring outward into engagement with the notch 68 in the bevel-gear, and thus coupling this bevel-gear to the rotating plate 43^a, whereby the shaft 50 and the main revolution-shaft 11 are made to revolve. Shortly after the current has been set up through the magnet this current is again broken, as later described, whereby to allow the clutch-operating block 61 to resume its normal position; but a positive return of said block is secured by means of the aforesaid cam-disk 72 on the shaft 48, which disk engages the pin 71, and thereby carries the shaft 70, and consequently the block 61, upward to normal position. As soon as the block 61 has thus been returned to normal position it now lies in the path of the projecting clutch-pin 55, so that when the said pin 55 has made one complete revolution the other cam-surface 67 of said block 61 engages the pin 55 and forces the same backward into normal position, where it is again latched by its locking-pin 57.

I will now describe the electric connections for starting the motor and for energizing the magnet for operating the aforedescribed clutch.

To the electrodes 23 (see Fig. 2) are attached lead-wires 80 and 81 of what may be called the "motor-circuit," and to the electrodes 24 are attached lead-wires 82 and 83, what may be called the "magnet-circuit." The wire 80 leads to a binding-post 84, which is mounted in a plate 88, constructed of insulating material and suitably attached to the main frame of the machine. This plate also has mounted in it three other binding-posts, 85, 86, and 87, all of which have projecting outwardly therefrom spring-pressed contact-arms 84^a, 85^a, 86^a, and 87^a, which are arranged to rest upon a make-and-break device which comprises a collar 89, fast upon the shaft 50, said collar being formed of fiber material, but having upon its periphery a brass contact-collar 90, the shape of which is shown in Fig. 2. In the normal position of the machine, as shown in Fig. 2, it will be seen that the arms 84^a, 85^a, and 87^a rest upon the brass collar portion 90, while the arm 86^a rests upon the fiber portion 91. The other lead-wire 81 of the motor-circuit is divided and one portion thereof is connected with the binding-post 86 and the other portion is led to the binding-post of the motor 40, having also a subdivided portion at 92, which goes to energize the field for the armature. The electric current may be derived from any suitable source of electric energy and transmitted to suitable binding-posts 93, from which extend the lead-wires 94 and 95. The wire 94 is connected with the aforesaid binding-post 87, and the wire 95 is divided at 96, from which point one portion of the circuit is carried through the magnet 64 and thence through the wire 82 to one of the electrodes 24, while the other portion of the circuit as divided at the point 96 is again divided at 97, from which point one wire leads through a rheostat 98 and thence to the other binding-post of the motor 40, and the other portion leads through the field for the armature-magnet, and thereby connects with the wire 92. The wire 83 of the other electrode 24 is connected with the binding-post 85. The rheostat 98 is constructed in the usual manner, with resistance-coils and with successive contact-points 100, (see Fig. 8^a,) over which rides a lever 101, pivoted at 102 and formed at its outer end with a nose 103. This nose projects into a notch 104, formed in a disk 105, fast upon the shaft 50, and the nose is held in engagement with said notch by means of a spring 106. As soon as the shaft 50 begins to revolve said nose 103 is forced out of its notch, and the arm 101 is thereby successively carried over the various contact-points 100, and thus the resistance in the circuit is varied in a well-known manner, so as not to throw the load too suddenly upon the motor.

The operation of these parts is as follows: As soon as the clerk's key 10 (see Fig. 1) has been depressed in the manner previously described, so as to carry the bell-crank-lever arm 21 rearward, and thereby operate the circuit-making device by forcing the contact-pins 27 and 28 into engagement with their respective electrodes 23 and 24, as will be seen by tracing out the lead-wires 80 and 81 of the motor-circuit and the lead-wires 82 and 83 of the magnet-circuit, so that the electric current will be set up through the electric motor 40 and also through the magnet 64, so that the motor will start revolving, and the magnet will operate the clutch in a manner heretofore described, so that the rotation of the motor may be imparted to the main revolution-shaft of the machine, it being observed that the three contact-arms 84^a, 85^a, and 87^a at the start rest upon the conducting-collar 90, and the fourth contact-arm 86^a rests upon the non-conducting or fiber portion 91. As soon, however, as the shaft 50 has begun to revolve (in

the direction shown by the arrow on the collar 89) it will be seen that the portion of the conducting-collar 90 which normally lies below the contact-arms 84ª and 85ª will be withdrawn therefrom, so that during the rest of the revolution said arms will rest upon the fiber portion, while the arm 86 will now rest upon the conducting-collar 90, together with the arm 87ª, which always rests upon the conducting-collar. In such position of the rotating collar 89 it will be apparent from tracing out the electrical connections that the electric current will flow only through the electric motor and will be cut out from the magnet, and, furthermore, it will be obvious that the current will flow through the motor independently of the aforesaid circuit-making device controlled by the special keys, so that the circuit may be broken at the electrodes 23 and 24, and still the current will run through the motor until the shaft 50 has completed one revolution, at which point the contact-arm 86ª again rests upon the fiber portion 91 in the position shown in Fig. 2, and thereby the current through the motor is broken. Therefore I derive this great advantage of being able to start the motor-circuit by means of a circuit-making device controlled by the clerk's key; but as soon as the motor is started I am enabled to break the circuit at said circuit-making device and still maintain the current through the motor by the independent circuit-controlling device, so that the clerk's key may be released and the circuit broken at the aforesaid circuit-making device before the time when the main motor-circuit is broken. This breaking of the circuit at the said circuit-making device has already been described, being produced by the actions of the cams 35 and 36 (see Fig. 1) upon the pins 34 and 37, respectively, and the keys being released in a well-known manner, as described in the aforesaid Letters Patent. Such a construction also prevents sparking at the circuit-making device controlled by the clerk's keys—that is, at the contact-points 27 and 28. After the motor-circuit has been broken at the end of one complete revolution of the machine in the manner just described the motor will of course run on for a short time, carried by its own momentum; but the main operating-shaft 11 of the machine may be brought to a positive stop at the end of one complete revolution by any suitable means.

The constructions herein shown and described are particularly well adapted to carry out the objects of my invention; but it is of course to be understood that various other forms of mechanism may be used for this purpose, and in the appended claims I do not wish to be limited by the particular construction shown and described.

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

1. In a machine of the character described, the combination with an operating member therefor, of a driving-motor therefor normally inactive and devoid of potential energy and normally disconnected from said member, a series of keys, and means controlled by any one of said keys for starting said motor and for connecting the same with the operating member.

2. In a machine of the class described, the combination with an operating member therefor, of a driving-motor therefor normally inactive and normally disconnected from said member, a series of keys, means controlled by any one of said keys for starting said motor and for connecting the same with said member, and motor-controlled means for automatically stopping said motor and disconnecting the same from said member.

3. In a machine of the class described, the combination with an operating member therefor, of an electric motor for driving the same normally inactive and normally disconnected from said operating member, a motor-circuit, a magnetically-operated clutch for connecting said motor and said member, a clutch-circuit, a series of keys, and means controlled by any one of said keys for closing the circuit in said motor and in said magnetically-operated clutch.

4. In a machine of the class described, the combination with an operating member therefor, of an electric motor for driving the same normally inactive and normally disconnected from said operating member, a motor-circuit, a clutch for connecting said motor and said member, a magnet for operating said clutch and situated in shunt-circuit with said motor, a series of keys, means controlled by said keys for making the circuit through said motor and said magnet, and means for automatically breaking said circuit.

5. In a machine of the class described, the combination with an operating-shaft therefor, of an electric motor for driving the same normally inactive and normally disconnected from said operating-shaft; a motor-circuit; a clutch for connecting said motor with said shaft; a magnet for operating said clutch; a magnet-circuit; a series of keys; a circuit-maker operated by said keys for closing the circuit through said motor and said magnet; and means controlled by said motor for breaking the circuit through said magnet after the motor has started and for continuing the current through said motor independently of the circuit-making device controlled by said keys, with provisions for automatically breaking the circuit through said motor at the end of the operation of said operating-shaft.

6. In a cash-register, the combination with an operating-shaft therefor, of an electric motor for driving the same normally inactive and normally disconnected from said shaft; a motor-circuit; a clutch for connecting said motor

with said shaft; a magnet for operating said clutch; a magnet-circuit; a series of keys; a circuit-maker operated by said keys for closing the circuit through said motor and said magnet; means controlled by said motor for breaking the circuit through said magnet after the motor has started and for continuing the current through said motor independently of the circuit-making device controlled by said keys, with provisions for automatically breaking the circuit through said motor at the end of the operation of said shaft; and means for disconnecting the circuit-making device controlled by said keys after said motor has started.

7. In a cash-register of the class described, the combination with an operating-shaft therefor, of an electric motor for driving the same normally inactive and normally disconnected from said operating-shaft; a motor-circuit; a clutch for connecting said motor with said shaft; a magnet provided with a core for operating said clutch; a magnet-circuit; a series of keys; a circuit-maker operated by said keys for closing the circuit through said motor and said magnet; means controlled by said motor for positively returning said magnet-core to normal position; and means controlled by said motor for breaking the circuit through said magnet after the motor has started and for continuing the current through said motor independently of the circuit-making device controlled by said keys, with provisions for automatically breaking the circuit through said motor at the end of the operation of said operating-shaft.

8. In an electrically-operated driving mechanism for cash-registers and like machines, the combination with an electric motor and a motor-circuit, of a key-operated circuit-making device for the motor-circuit, and means controlled by the movement of the motor for making the circuit through the motor independently of said key-operated circuit-making device.

9. In an electrically-operated driving mechanism for cash-registers and like machines, the combination with an electric motor and a motor-circuit, of a key-operated circuit-making device for the motor-circuit, and means controlled by the movement of the motor for automatically making and breaking the circuit through the motor independently of said key-operated circuit-making device.

10. In an electrically-operated driving mechanism for cash-registers and like machines, the combination with an electric motor and a motor-circuit, of a key-operated circuit-making device for the motor-circuit, means controlled by the movement of the motor for making the circuit through the motor independently of said key-operated circuit-making device, and means also controlled by the movement of the motor for breaking the circuit in the key-operated portion of the motor-circuit irrespective of the position of the key-operated device.

11. In an electrically-operated driving mechanism for cash-registers and like machines, the combination with an electric motor and a motor-circuit; of a key-operated circuit-making device for the motor-circuit; means controlled by the movement of the motor for making the circuit through the motor independently of said key-operated circuit-making device; means controlled by the movement of the motor for automatically making and breaking the circuit through the motor independently of said key-operated circuit-making device; means also controlled by the movement of the motor for breaking the circuit in the key-operated portion of the motor-circuit irrespective of the position of the key-operated device; and means also controlled by the motor for breaking the motor-circuit at the key-operated circuit-making device prior to the aforesaid independent breaking of the motor-circuit by the movement of the motor.

12. In an electrically-operated driving mechanism for cash-registers and like machines, the combination with an electric motor; of a motor-circuit having one portion thereof divided into two circuits each containing a separate make-and-break point; key-operated means for making the circuit at one of such points to start the motor; and motor-operated means to make the circuit at the other of said points.

13. In an electrically-operated driving mechanism for cash-registers and like machines, the combination with an electric motor; of a motor-circuit having one portion thereof divided into two circuits each containing a separate make-and-break point; key-operated means for making the circuit at one of such points to start the motor; and means for automatically making and breaking the circuit at the other of said points by the movement of the motor.

14. In an electrically-operated driving mechanism for cash-registers and like machines, the combination with an electric motor; of a motor-circuit having one portion thereof divided into two circuits each containing a separate make-and-break point; key-operated means for making the circuit at one of such points to start the motor; means for automatically making and breaking the circuit at the other of said points by the movement of the motor; and means also operated by said motor and independent of said key-operated means, for breaking the circuit at another point in that divided portion of the circuit containing the key-operated circuit-making means.

15. In an electrically-operated driving mechanism for cash-registers and like machines, the combination with an electric motor; of a motor-circuit having one portion thereof divided into two circuits, one of said divided circuits containing a single make-and-break

point and the other circuit containing a key-controlled make-and-break point and an auxiliary make-and-break point; key-operated means for making the circuit at said key-controlled make-and-break point; motor-operated means for making and breaking the circuit at the make-and-break point of the first-mentioned divided circuit; and motor-controlled means for breaking the circuit at the auxiliary make-and-break point of the second-mentioned divided circuit.

16. In an electrically-operated driving mechanism for cash-registers and like machines, the combination with an electric motor; of a motor-circuit having one portion thereof divided into two circuits, one of said divided circuits containing a single make-and-break point and the other circuit containing a key-controlled make-and-break point and an auxiliary make-and-break point; key-operated means for making the circuit at said key-controlled make-and-break point; motor-operated means for making and breaking the circuit at the make-and-break point of the first-mentioned divided circuit; and motor-controlled means for breaking the circuit at the auxiliary make-and-break point of the second-mentioned divided circuit, and for subsequently releasing the key-operated means to break the circuit at that point, and for then making the circuit at the auxiliary make-and-break point of this second divided circuit when the motor-circuit is broken through the first divided circuit.

In testimony whereof I affix my signature in the presence of two witnesses.

JOSEPH P. CLEAL.

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