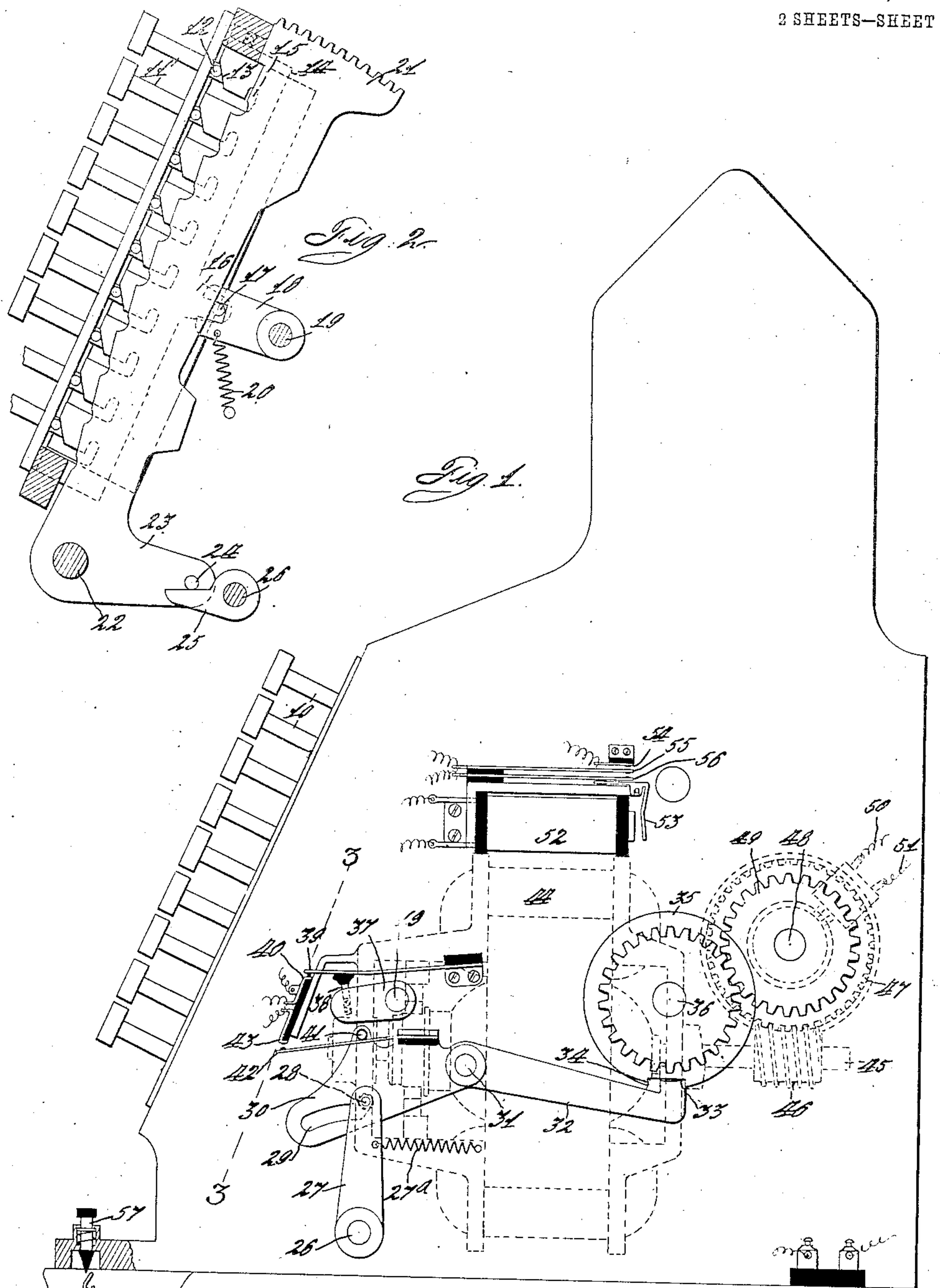


C. F. KETTERING.
DRIVING MECHANISM FOR CASH REGISTERS.
APPLICATION FILED JUNE 11, 1906.

924,616.

Patented June 8, 1909.

2 SHEETS—SHEET 1.



Witnesses
[Signature]
Earl Meust.

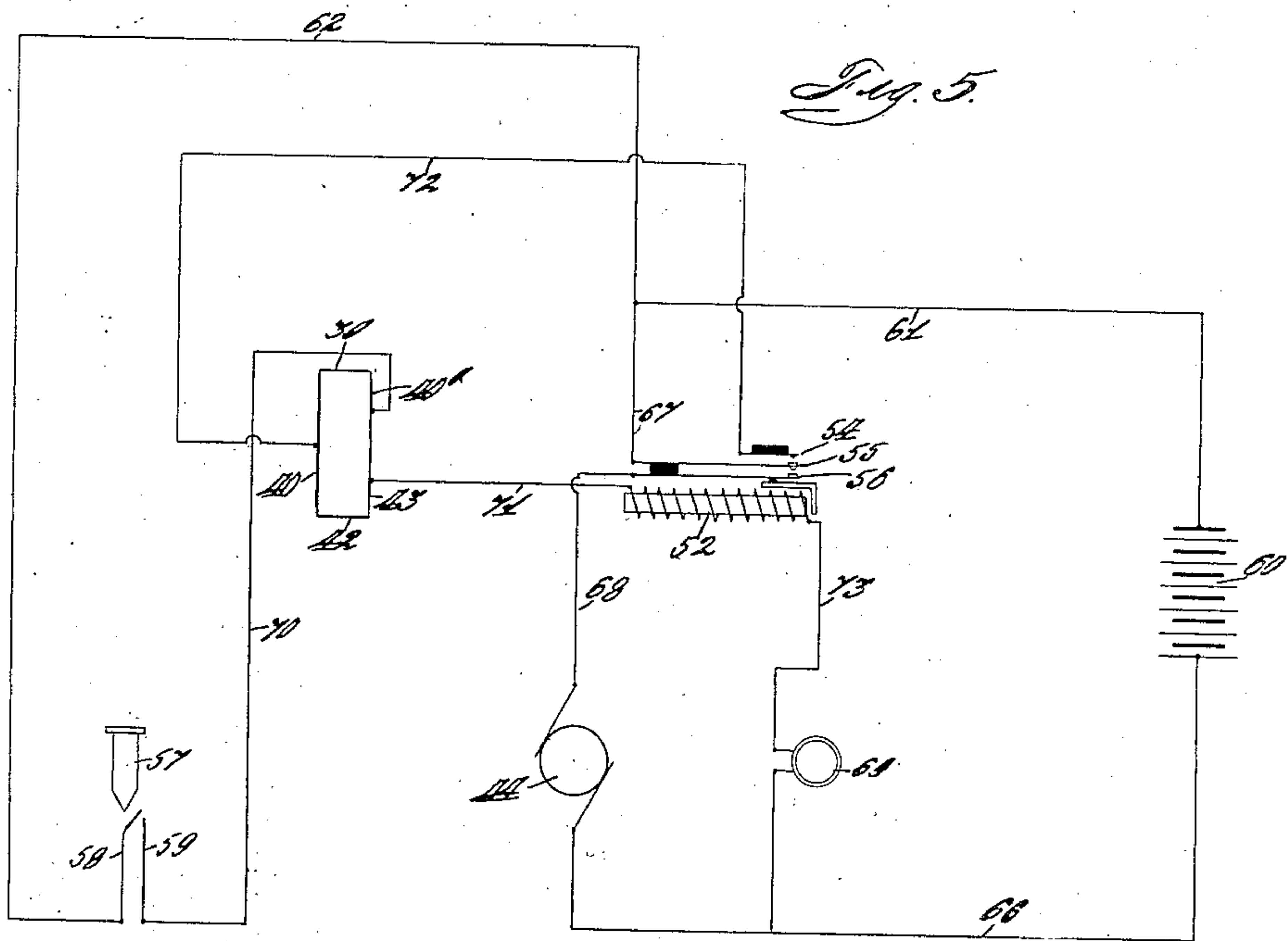
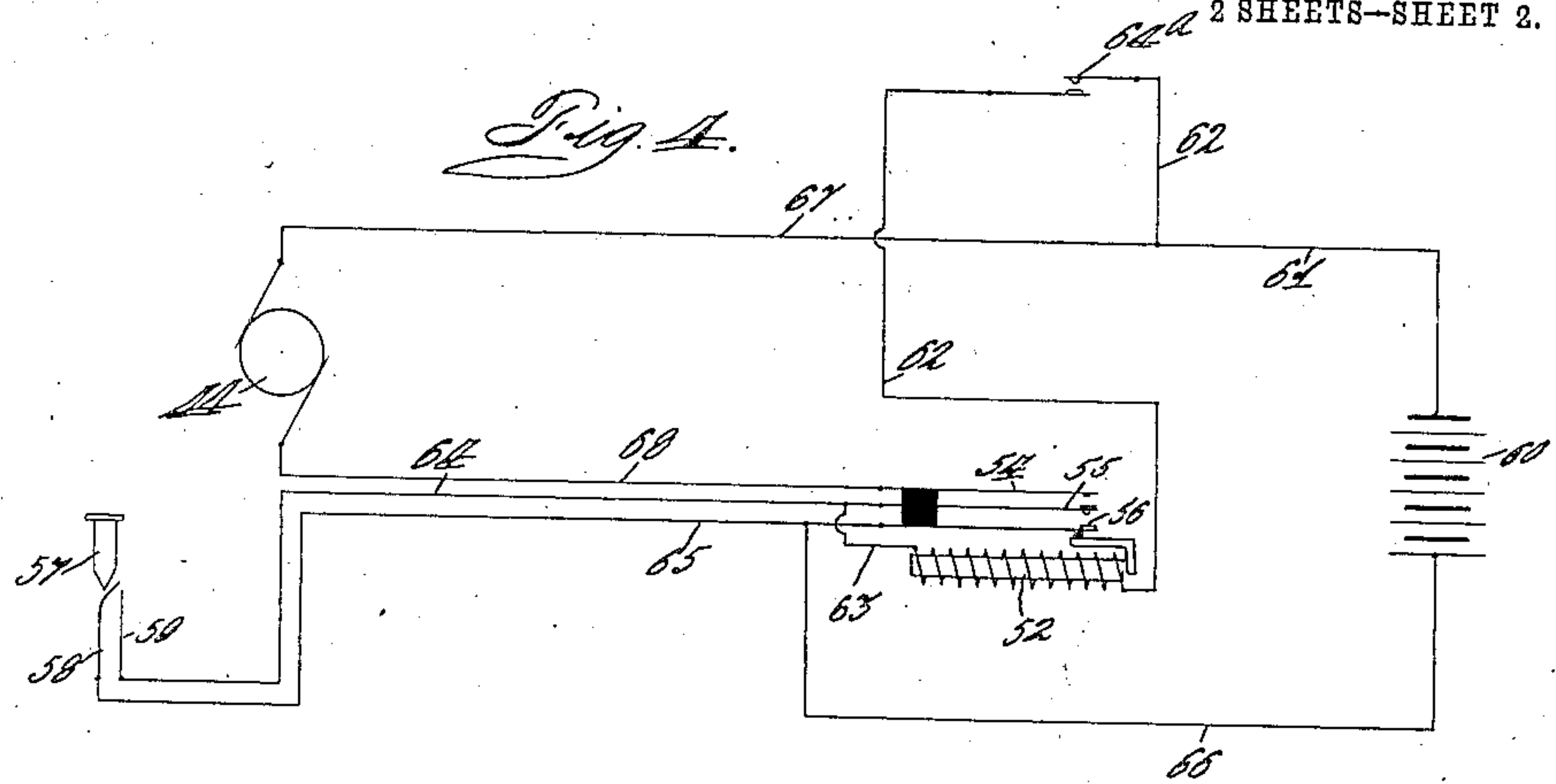
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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

CHARLES F. KETTERING, OF DAYTON, OHIO, ASSIGNOR TO NATIONAL CASH REGISTER COMPANY, OF DAYTON, OHIO, A CORPORATION OF NEW JERSEY.

DRIVING MECHANISM FOR CASH-REGISTERS.

No. 924,616.

Specification of Letters Patent.

Patented June 8, 1909.

Application filed June 11, 1906. Serial No. 321,243.

To all whom it may concern:

Be it known that I, CHARLES F. KETTERING, 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 Mechanisms for Cash-Registers, of which I declare the following to be a full, clear, and exact description.

This invention relates to motor-driving devices, and has for its object to provide an improved form of motor for use with intermittently operated machines.

I have shown my invention as applied to a cash register, but it is evident that it may be used with many other types of machine, and in fact may be used with any machines which require to be driven only intermittently.

In particular my invention comprises an electric motor and connections therefrom to a cash register, and means controlling the motor-circuit to allow the motor to run only long enough for a complete operation of the register, and then to allow the motor to stop. I have shown the motor-circuit as controlled by the keys of the cash register in combination with a special key, and the circuits are so arranged that the special key, when depressed, finally closes the circuit, but the continued closure of the circuit is not dependent on the key being held depressed, the circuit remaining active until the completion of the operation of the machine.

I have shown my invention as applied to a well-known cash register, the invention of Thomas Carroll, on which an application for patent has been filed, Serial No. 172,970, filed September 12, 1903. This machine comprises a plurality of banks of keys, which are adapted to be depressed in accordance with the amount to be registered, and power is furnished to the machine for the operation thereof by means of a crank-handle. I have substituted the motor-driving device shown in this application in place of the crank-handle.

With these and incidental objects in view, the invention consists in certain novel features of construction and combination of parts, the essential elements of which are set forth in appended claims and a preferred form of embodiment of which is hereinafter specifically described with reference to the

drawings which accompany and form part of this specification.

Of said drawings: Figure 1 is an elevation of the right-hand side of the machine, showing the motor. Fig. 2 is a vertical section through one of the banks of keys, showing the detent therefor. Fig. 3 is a detail of the contacts taken on line 3—3 of Fig. 1. Fig. 4 is a theoretical diagram of the circuits employed, and Fig. 5 is a diagram of the circuits as used in the machine.

In the use of this machine the value keys are depressed, and some one clerk's or department key segregates the transaction, and such depression of the transaction key is employed to close a contact in an auxiliary circuit. This auxiliary circuit includes the coil of a relay and a magnetic clutch, so that when the circuit is closed the relay is energized and the armature thereof closes contacts for the motor-circuit. The energizing of the clutch connects the motor rigidly to the registering mechanism, and it will be noted that in the arrangement of circuits described the clutch is energized and caused to contact the usual soft iron disk before the circuit is made through the motor. The same order of operation prevails at the close of the movement, so that when the motor circuit is broken, the clutch has already disconnected the motor from the machine, and the motor has practically no load thereon.

In general terms, the machine may be said to comprise a series of value keys shown in Fig. 1, and a series of special clerks' or transaction keys 11, best shown in Fig. 2. These keys carry on each of them a pin 12, which, when the keys are depressed, is adapted to ride over cam edges 13 on a detent 14 and raise the same. When the key reaches the extreme inward position the pin 12 allows the detent 14 to partially resume its normal position through slots 15 in the detent. This construction is well known in connection with cash registers. The detent 14 carries near the middle thereof a projection 16, bearing a pin 17, which pin is adapted to move a lever 18, pivoted on a shaft 19. This lever 18 is adapted to be rotated during the operation of the machine to release the keys from the detent, but it will also be seen that when the keys are depressed the detent 14, through its pin 17, will raise lever 18 against the ten-

sion of its spring 20. A rack segment 21 is pivoted on a rod 22, and is adapted to be also moved by the pin 12 on any key when the same is depressed. This segment is moved differentially, depending on the key depressed, such movement being due to the fact that the keys strike the segment at different distances from its center, and also to the fact, as shown in Fig. 2, that the pins 12 of the various keys are normally at different distances from the edge of the segment, so that there will in each case be a different amount of lost motion. The segment 21 has at the bottom thereof a part 23, carrying a pin 24, which is in position to engage and rock an arm 25 on a shaft 26.

Referring now to Fig. 1, it will be seen that this shaft 26 carries rigidly therewith an arm 27, having at the extreme end thereof an anti-friction roller 28, moving in a cam slot 29 in a lever 30, said lever being journaled on a pin 31. This cam slot 29 for most of its length is struck from the shaft 26 as a center, but at one end, as shown in Fig. 1, the slot is at an angle, and it follows from this structure that when shaft 26 is rocked against tension of spring 27^a, the pin 28 will ride down the angular portion of the slot 29 and rock the lever 30 around its pivot 31. Lever 30 carries at the rear thereof an arm 32, having a projection 33, normally engaging a notch 34 in a disk 35, mounted on a shaft 36. This shaft 36 is the main rotation shaft of the machine, and as will be seen from the previous description is normally locked by the projection 33 of lever 32. The pivot 19 which carries arm 18, adapted to be moved by the transaction keys, has also rigid therewith an arm 37, in which is mounted a spring-pressed plunger 38, having an insulated head. This insulated head is adapted to engage main-contact spring 39, shown in Figs. 1 and 3, and it will be seen from the previous description that this contact 39 is moved away from its co-acting contacts 40 and 40^a during the depression of the key. As was previously stated, the key when depressed first raises the arm 18 and then lowers it again. This movement will raise the insulated plunger and then lower it at the end of the key stroke, so that the contact is broken during the stroke of the key. The lever 30, previously referred to, carries at the top thereof an insulated roller 41, bearing on a contact spring 42, adapted to engage a coöperating contact 43, and also to engage contact 40, as best shown in Fig. 3.

It will be evident from the previous description that when the transaction key 11 is depressed the segment 21 will be rocked around its pivot 22, and will thereby rock lever 27, and the oblique cam slot 29 will then raise the lever 30 and its roller 41. This will allow the spring contact 42 to engage and connect contacts 40 and 43. The

electric motor for the machine is indicated in dotted lines in Fig. 1, and is designated by the numeral 44. The armature shaft 45 carries a worm 46, and this engages a gear 47 on a stub-shaft 48. Movable with the gear 47 is a second gear 49, the teeth of which mesh with the gear on shaft 36. Wires 50 and 51 indicate the circuit for the magnetic clutch, which comprises the usual coils and disk mounted on shaft 48. A relay 52 is carried by the motor-frame, and its armature 53 is adapted to close three contacts, 54, 55 and 56. A push-key 57 when operated closes contacts 58 and 59, and this finally closes the circuit for the machine.

Referring now to the diagrams, and first to Fig. 4, it will be seen that the current for the circuits is supplied by a battery or other generator 60. A wire 61 leads from one pole of the generator to the motor 44, but the motor circuit is normally broken at the relay contacts 54, 55 and 56. A shunt wire 62 includes the coil of relay 52, and the wire 63 connects the other end of the coil to the relay contact 55. This shunt circuit is normally broken at the point 64^a. The push key 57 is, as previously stated, adapted to close the contacts 58 and 59. In this theoretical diagram the contact 64^a occupies the place in the circuit of the contact 39, 40, 40^a, 42 and 43 in the machine. This contact would therefore be closed by the depression of any transaction key, but the circuit is still incomplete, and is only completed by the momentary depression of key 57. When this key is closed a circuit will be made from the battery through wire 61, shunt 62, including contact 64^a, relay-coil 52, wire 63, wire 64, contacts 59 and 58, wire 65, and wire 66 back to the battery 60. This circuit, it will be noted, does not include the motor, but does include the relay 52. The relay will thereupon be energized and attract its armature, closing the contacts 54, 55 and 56. The motor circuit is now completed through wire 61, wire 67, motor 44, wire 68, contacts 54 and 56 and wire 66 back to the battery. The motor thereupon begins its operation. It will be noted that when contacts 54, 55 and 56 are closed, that the shunt circuit now does not need to include contacts 58 and 59 closed by the push-key, inasmuch as the circuit will now be made through wire 62, contact 64^a, relay-coil 52, wire 63, contacts 55 and 56 and wire 66 back to the battery. This relay coil 52 will therefore keep its own circuit closed and the motor-circuit will remain closed until contact 64^a is broken at the end of the operation.

Referring now to Fig. 5, it will be seen that this figure shows the circuit used in the machine and in this figure contacts 39, 40, 40^a, 42, and 43 are separately indicated. When one of the transaction keys 11 is depressed, the elevation of its detent and the consequent

rocking of arm 37 will break the circuit at contact 39 during the depression of the key, but at the end of the key movement contact 39 will again be in engagement with contacts 40 and 40^a. At the end of the key stroke the shaft 26 will be rocked and the lever arm 27 on said shaft will consequently rock the plate 30 carrying pin 41 away from contact spring 42 which is thereby lifted to engage contacts 40 and 43. This rocking of plate 30 and lever 32 serves to release the locking projection 33 from disk 35. The key 57 is next momentarily depressed, closing contacts 58 and 59 and a complete circuit is then made, including battery 60, wire 61, shunt 62, contacts 58 and 59, wire 70, contacts 40^a, 39, 40, 42 and 43, wire 71, relay-coil 52, wire 73, clutch 69 and wire 66, back to the battery. This will energize both the relay-coils and the clutch coil thereby connecting the motor to the machine. When the armature of the relay is attracted, contacts 54, 55, and 56 are closed and the motor circuit is then complete including wire 61, wire 67, contacts 55 and 56, wire 68 and motor 44 back to the battery, the motor will immediately start and operate the register. The closing of contacts 54 and 55 energizes a branch of the main circuit which runs to contact 40 and from thence back to the battery through contacts 42 and 43, wire 71, relay-coil 52, wire 73, clutch 69 and wire 66, but this branch circuit does not include contact 39 or contacts 58 and 59 so that, even though push-key 57 is released, the circuit is still retained complete and the motor continues its operation. With the machine described the keys are released almost immediately after the operation begins and this is the reason for the provision of contact 39. The motor circuit, including the branch 72, does not include contact 39, so that this may be broken in the first part of the operation without stopping the motor. The divided circuit including shunt 72 includes the relay-coil as well as the armature contacts so that the relay remains locked and the motor circuit consequently closed until the spring arm 42 is depressed and the motor circuit thereby broken. It is true that the return of the segment 21 will permit the arm 27 to return to its normal position nearly, but the downward movement of the plate 30 to depress spring contact 42 will not be permitted until the disk 35 has made a complete rotation inasmuch as its periphery rides on the projection 33 and prevents upward movement thereof. When disk 35 completes its rotation and notch 34 therein is again over the projection 33, spring 27^a may rock the arm 27 causing the circuit to be broken at 42 and at the same instant locking the machine by projection 33. With the arrangement of circuits shown the clutch circuit is made and broken before the motor circuit so as to produce a sequence of opera-

tions where practically no load is on the motor when the motor circuit is broken, although the time interval between the making or breaking of the clutch and motor circuits is very small. With this construction the disk 35 may be locked, but no strain is thereby produced on the motor as the clutch has been previously deenergized and the motor may therefore run on until its energy is exhausted.

It will be evident that if an attempt is made to manipulate the machine by holding key 57 depressed, the attempt will fail, inasmuch as the circuit is broken at contact 42 by the operation of the machine.

While the form of mechanism here shown and described is admirably adapted to fulfil the objects primarily stated, it is to be understood that it is not intended to confine the invention to the one form of embodiment herein disclosed, for it is susceptible of embodiment in various forms all coming within the scope of the claims which follow.

What is claimed is as follows:

1. In a cash register the combination with an electric motor and a circuit for same including contacts, of a push key and connections for closing said motor circuit, and means for maintaining said motor circuit locked closed while said push key returns to normal position.
2. In a cash register, the combination with an electric motor and a circuit for same including contacts, of a circuit including a relay for closing said contacts, a key for closing the circuit through said relay, and a shunt circuit through said relay coil closed by the movement of the armature of said relay.
3. In a cash register, the combination with an electric motor, of a starting circuit therefor, contacts in said circuit, keys for controlling said contacts, means requiring a complete depression of a key to close said contacts, and a key for closing another contact in said starting circuit.
4. In a cash register, the combination with an electric motor and a circuit including same, of a circuit including a relay for closing said motor circuit, and also including primary and secondary break devices, keys for closing said break devices separately, and means for maintaining said relay circuit closed irrespective of the return of said primary break device to breaking position.
5. In a cash register, the combination with an electric motor and a circuit therefor, of a shunt circuit including a relay and primary and secondary make and break devices for closing the motor circuit, keys for closing said make and break devices separately, and a second shunt including said primary make and break device for maintaining said relay circuit closed irrespective of the release of said secondary make and break device.
6. In a cash register, the combination with

an electric driving device and a circuit for same, of a key for closing said circuit at will, means for breaking said circuit during the motion of the key, and means for maintain-
 5 ing said circuit closed after the key is released.

7. In a cash register, the combination with an electric motor and a circuit for same, of a shunt circuit including primary and second-
 10 ary make and break devices, keys for closing said make and break devices separately, means in said shunt circuit for closing said motor circuit, and a second shunt closed by the movement of said means, and maintain-
 15 ing said motor circuit closed.

8. In a cash register, the combination with an electric motor and a normally incomplete circuit for same, of a circuit including a re-
 20 lay and primary and secondary make and break devices for closing said motor circuit, manipulative devices for operating said primary make and break device, a tap push-key for operating said secondary make and break device, and a shunt to said secondary
 25 make and break devices for retaining the relay circuit closed.

9. In a cash register, the combination with an electric motor for the same, a motor circuit including contacts, a circuit including a
 30 relay for closing said motor circuit, a plurality of keys controlling said relay circuit, and means for breaking said relay circuit during the depression of a key.

10. In a cash register the combination
 35 with an operating mechanism and means normally locking same, of an electric motor for driving said mechanism, a circuit for said motor, a controlling circuit for said motor circuit, and a plurality of keys for closing
 40 said controlling circuit and unlocking said operating mechanism.

11. In a cash register, the combination with an electric motor and a circuit therefor, of a controlling circuit for said motor cir-
 45 cuit having a plurality of contacts in series therein, a plurality of keys for closing said contacts, and means for maintaining said motor circuit closed after said keys have been released.

12. In a cash register, the combination
 50 with a circuit including a relay, a contact in said circuit, keys for closing said contact, an additional contact in said circuit, means for opening said contact during the stroke of the
 55 key, a locking device for the machine and means controlled by said keys for operating said locking device.

13. In a cash register, the combination with a normally locked operating mechan-
 60 ism, and an electric motor for driving same, of a controlling circuit for said motor, a contact in said circuit and a series of keys for closing said contact and operating said locking device.

65 14. In a cash register, the combination

with an electric driving device for the machine and a circuit including same, of a controlling circuit for said motor circuit includ-
 ing contacts, a series of keys, a member com-
 70 mon thereto, a cam device operated by said member when any key is operated to control said contact, and means for returning said cam to normal position.

15. In a cash register, the combination with an electric driving device for the ma-
 75 chine and a circuit including same, of a circuit including a relay for controlling said motor circuit, a series of keys, a member operated thereby having a pin, and a lever having a cam slot with which said pin engages
 80 for closing said relay circuit.

16. In a cash register, the combination with an electric motor for driving same and a line circuit for said motor, of a shunt to the
 85 motor circuit having contacts, a relay in said shunt for controlling said motor circuit, a second shunt to the line, and keys for closing a plurality of breaks in said second shunt.

17. In a cash register, the combination with an operating mechanism and means nor-
 90 mally locking the same, of an electric motor for driving said mechanism, a circuit including said motor, a shunt including contacts and a relay for closing and locking the motor circuit, a key, and a member controlled by
 95 said key for closing said shunt contacts and operating said locking mechanism.

18. In a cash register, the combination with an operating mechanism, of a motor nor-
 100 mally disconnected from said operating mechanism, means for connecting said motor thereto, a circuit including contacts for controlling said means and including a starting device for the motor, and a second circuit for
 105 retaining said motor in operative relation after said contacts are operated.

19. In a cash register, the combination with an electric motor therefor, of a circuit
 110 including same, a starting circuit for said motor, means for closing said starting circuit, and means for holding said motor circuit closed after the starting circuit has been opened.

20. In a cash register, the combination with an electric motor, and a circuit for same
 115 with primary and secondary controlling contacts, of a series of keys for closing said primary contact, a single manipulative device for closing the secondary contact, and means
 120 controlled from the motor for breaking said secondary contact.

21. In a cash register, the combination with an operating mechanism and a device
 125 for driving same normally disconnected therefrom, means for connecting said device to the operating mechanism, means actuated with the connecting means for causing the driving device to start, and means for retain-
 130 ing the driving device and connecting means in operation.

22. In a cash register the combination with
an electric motor and a circuit for same in-
cluding contacts, of a circuit including a re-
lay for closing said contacts, said circuit in-
5 cluding primary and secondary break de-
vices, keys for closing said primary and sec-
ondary break devices separately, and a shunt
circuit around said secondary break device

closed by the movement of the armature of
said relay.

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

CHARLES F. KETTERING.

Witnesses:

ROY C. GLASS,
CARL W. BENST.