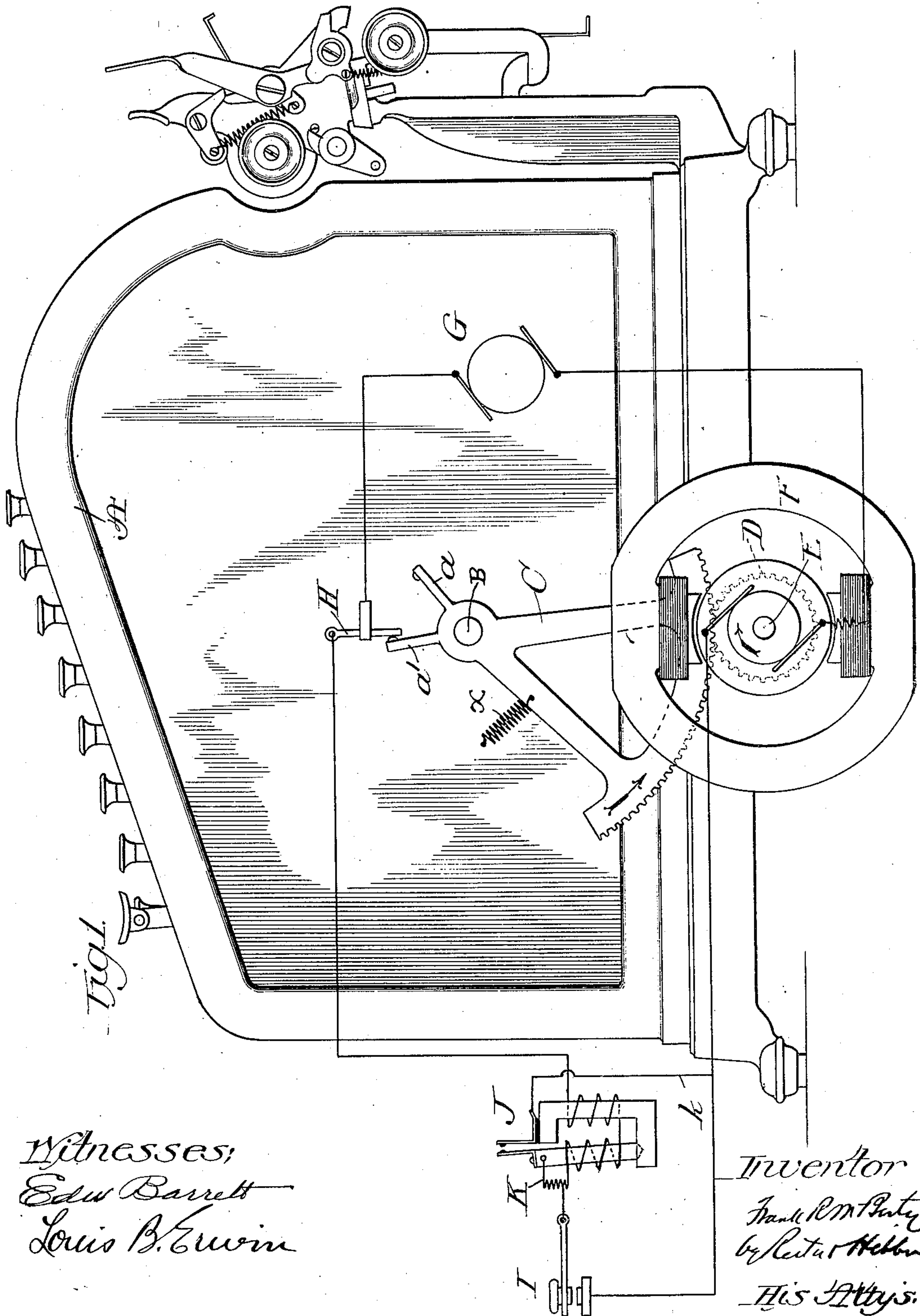


F. R. MObERTY.
 ADDING MACHINE.
 APPLICATION FILED FEB. 27, 1904.

938,501.

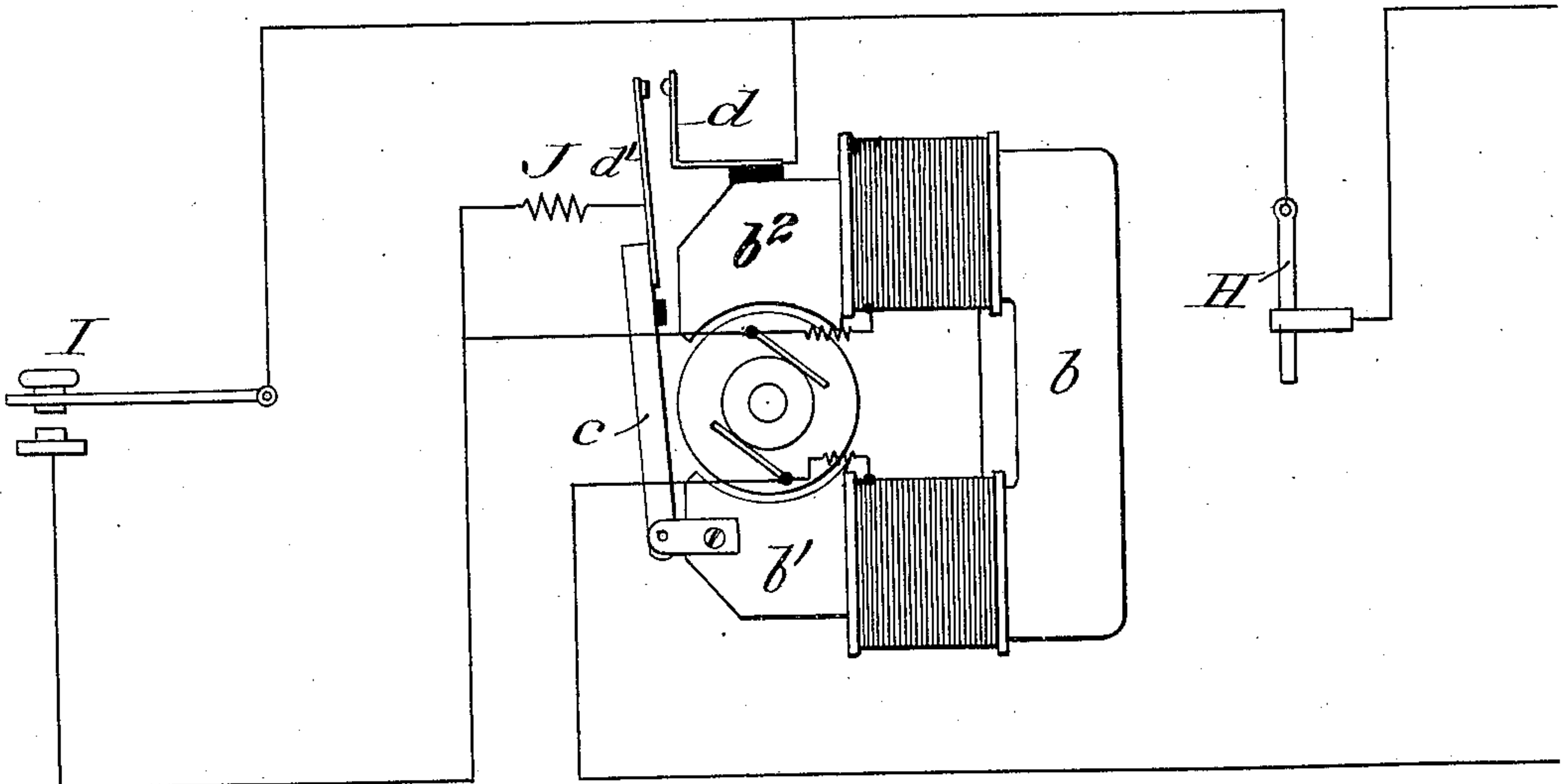
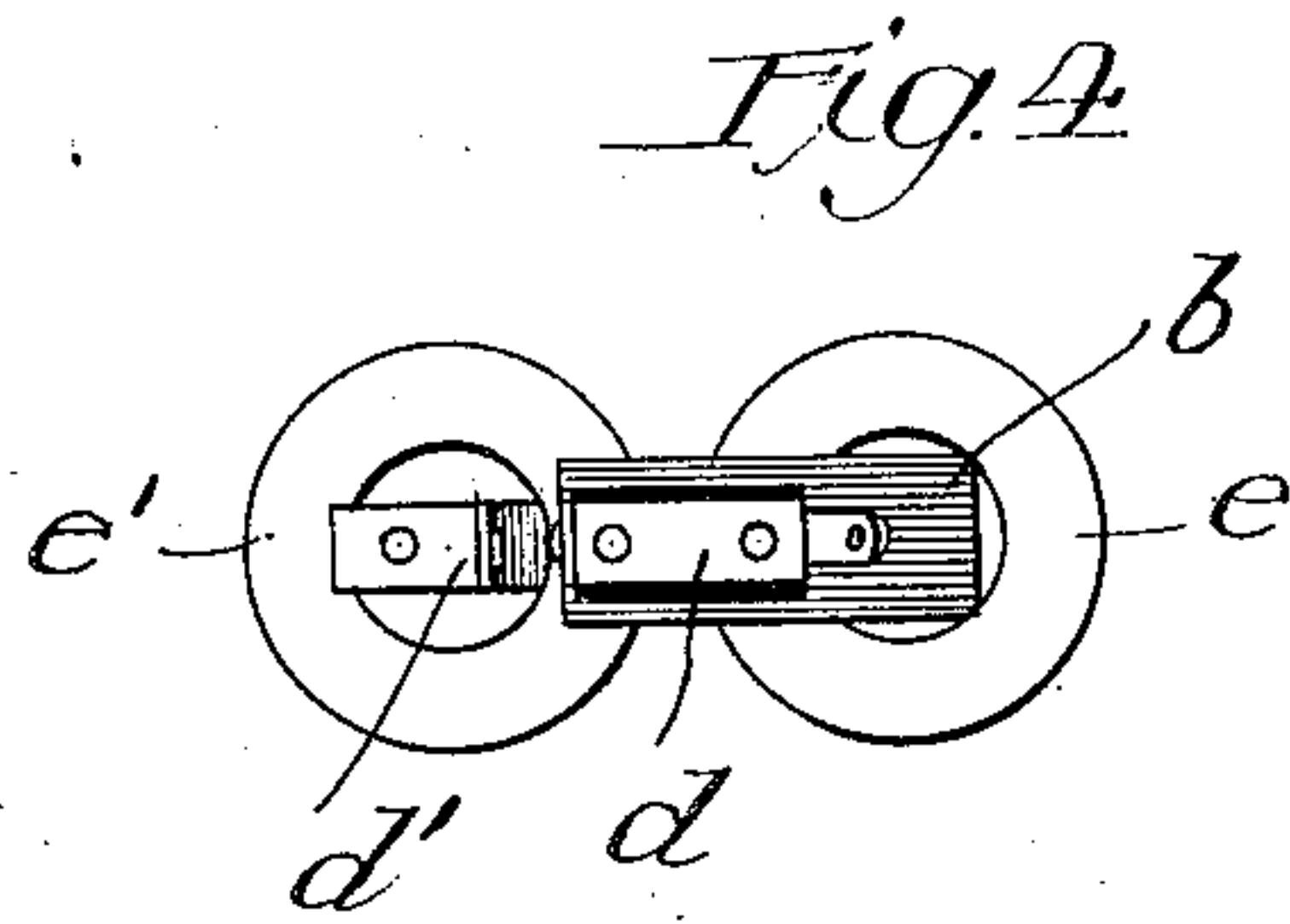
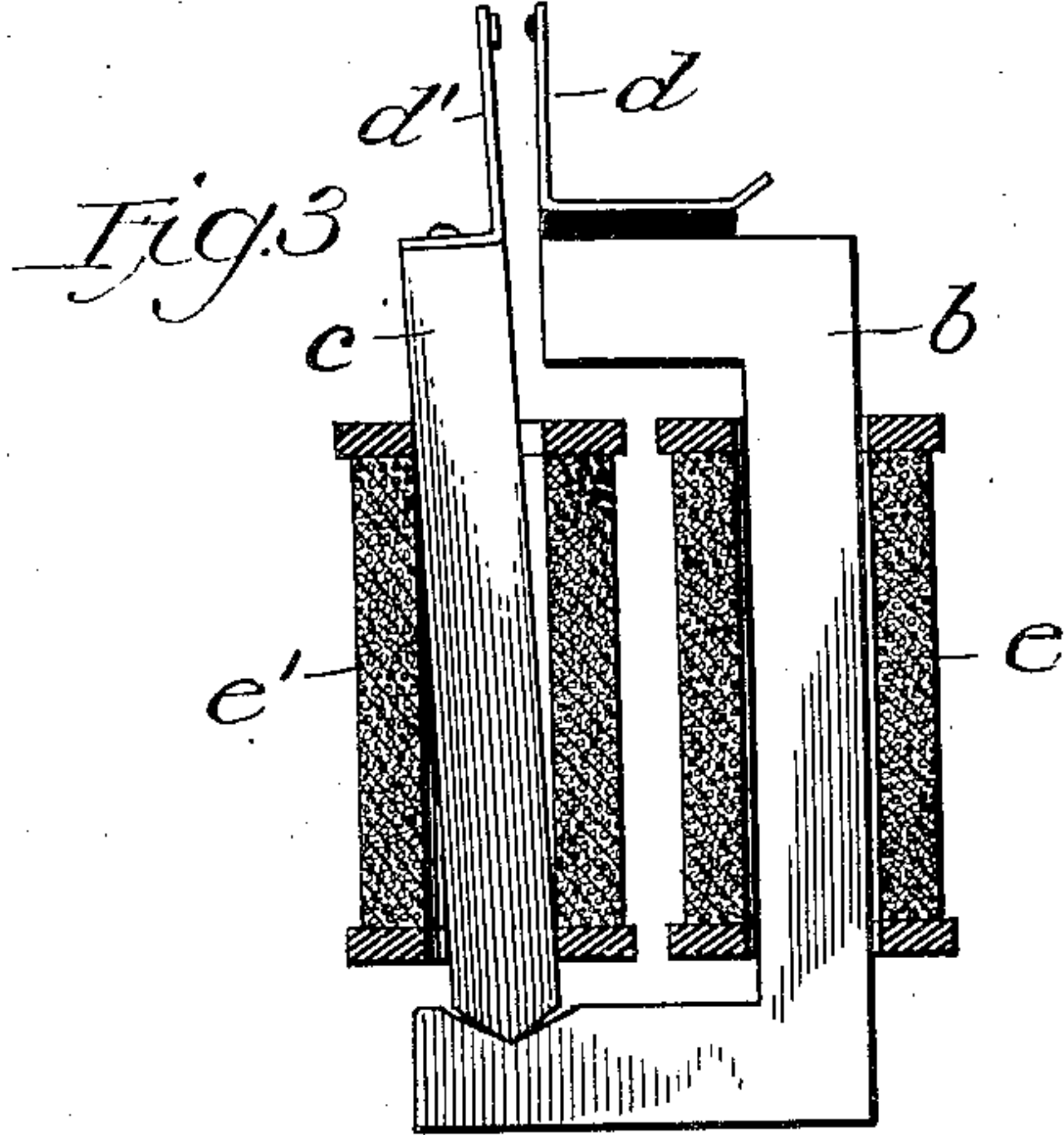
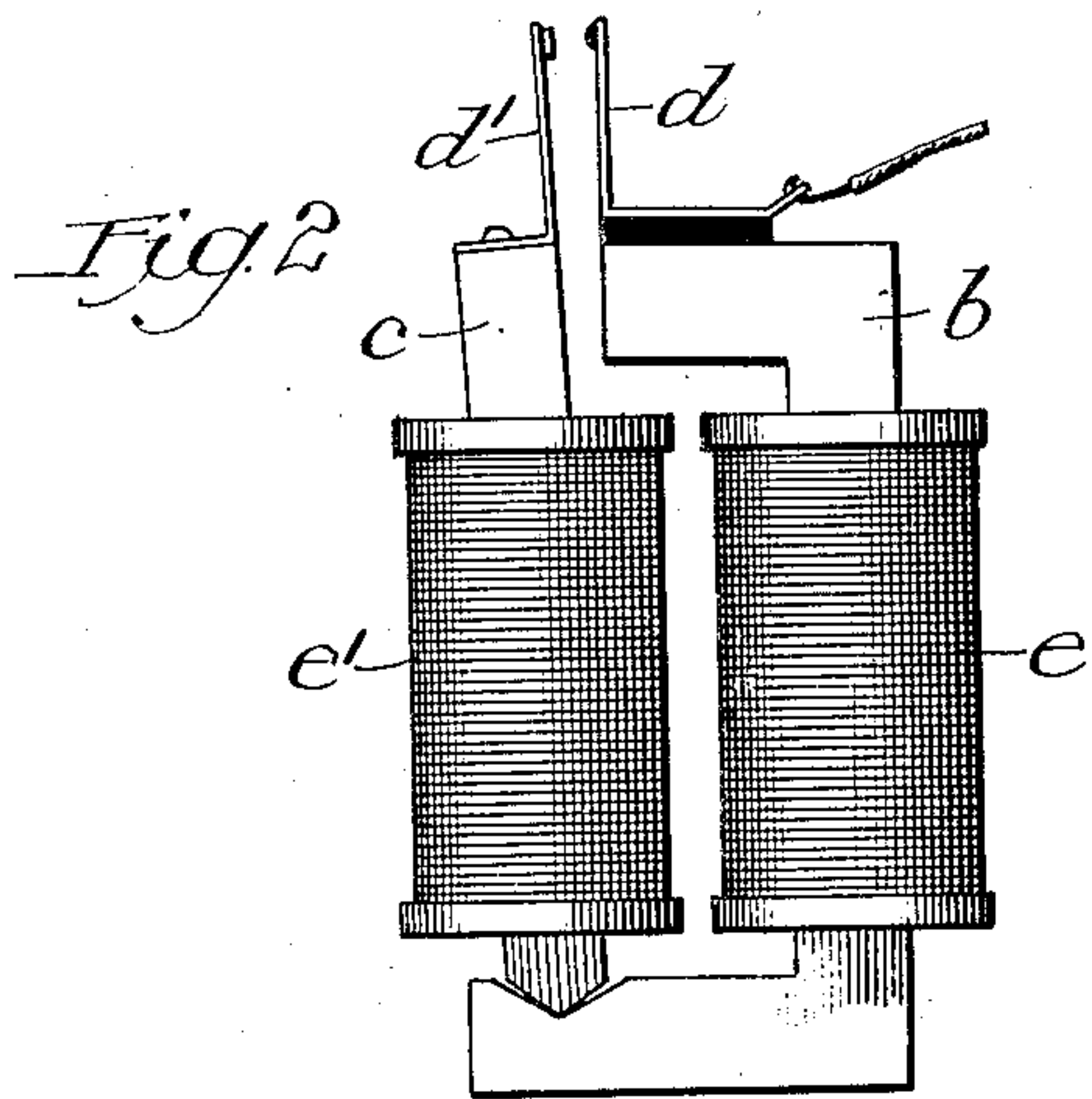
Patented Nov. 2, 1909.
 2 SHEETS—SHEET 1.



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 2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

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ADDING-MACHINE.

938,501.

Specification of Letters Patent.

Patented Nov. 2, 1909.

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To all whom it may concern:

Be it known that I, FRANK R. McBERTY, a citizen of the United States, residing at Evanston, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Adding-Machines, of which the following is a description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates more particularly to electric operating devices for such machines, intended to take the place of the handle by which such machines are ordinarily manually operated, and in the drawings I have illustrated my invention as applied to a familiar type of such machines commonly known as the Burroughs adding machine, the details of whose construction and mode of operation are illustrated and described in various Letters Patent of the United States, such as Nos. 504,963, 505,078 and 595,864.

In the accompanying drawings, Figure 1 shows an outline of such adding machine, in side elevation, with a diagrammatic illustration of one adaptation of my invention thereto; Figs. 2, 3 and 4 show details of the self-locking magnetic switch employed in the circuit shown in Fig. 1; and Fig. 5 shows a modified adaptation of the invention to the same machine.

The same letters of reference are employed to indicate corresponding parts in the several views.

In Fig. 1, A represents an adding machine of the type referred to, which is operated by a rock shaft B, to which is ordinarily secured an operating handle for the manual operation of the machine, the complete operation of the machine consisting in depressing the necessary keys to represent the amount to be added and printed, and then pulling the handle of the rock shaft forward to its limit of movement (about a quarter turn of the shaft) and releasing it, whereupon the handle and shaft and mechanism within the machine will be restored to normal position by suitable springs located within the machine for that purpose.

In the present instance I secure to the rock shaft B a depending gear-toothed sector C, which meshes with a pinion D fast upon the armature shaft E of an electric motor F located in a circuit from a generator G. This circuit is provided with two openings or

breaks, one controlled by a knife-blade switch H, and the other by a push-button I, while interposed in the circuit at J is a self-locking magnetic switch whose function and mode of operation will be hereinafter explained. The knife-blade switch H is arranged to be automatically operated by two contact arms *a a'* projecting upward from the sector C, between which arms the lower end of the switch H depends. Under this arrangement of parts the motor circuit is normally open at the push-button I. When said button is depressed and the circuit closed at that point, the motor armature will be rotated in the direction of the arrow, and will swing the sector C rearward until the arm *a* contacts with the lower end of the switch H and swings it forward to open the circuit at that point, whereupon the motor will be deprived of current and the restoring springs within the machine will turn the rock shaft B and sector C and motor shaft back to normal position, and as they reach such position the sector arm *a'* will contact with the forward side of the switch H and restore it to normal position and again close the circuit at that point. The springs within the machine, for restoring the parts to normal position, are not shown in the present drawings, but in Fig. 1 I have illustrated a substitute spring connected to the sector C, which will perform the functions of the springs within the machine so far as the return of the sector and connected parts to normal position is concerned.

The foregoing description has assumed, for the sake of simplicity, that the circuit has been maintained closed at the push-button I by continued pressure upon such button, but for the purpose of permitting the button to be released immediately after the initial closing of the circuit the self-locking magnetic switch J and branch circuit adapted to be closed by it are employed, and this switch is made of such novel construction in the present instance as to adapt it for operation by either a direct or an alternating current, so that either a direct or an alternating current motor may be employed for operating the machine. This switch, whose details are illustrated in Figs. 2, 3 and 4, comprises a horse-shoe magnet *b*, an armature *c* and a pair of contacts *d d'* secured respectively to the magnet and the armature.

These contacts are interposed in a branch circuit K, which leads from one side of the motor circuit to the contact piece d , and thence by the contact piece d' (when the two
 5 contacts are closed together), to the other side of the circuit. The branch K is normally open at the contacts $d d'$, but when the motor circuit is closed at the push-button I and the magnet thereby energized, the upper
 10 end of its armature c will be drawn toward it and the branch circuit will be closed at the contacts, whereupon the push-button contacts and wires leading to them will be shunted or short-circuited by the branch K,
 15 the current passing in such case from one side of the motor circuit by the branch K and contacts $d d'$ to the opposite side of the circuit and thence back to the generator. Inasmuch as the magnet will hold the switch J
 20 thus closed so long as current continues to flow through the motor circuit (*i. e.*, until the circuit is opened at the knife-blade switch H in the manner heretofore explained), it follows that the push-button I
 25 may be instantly released, after it has been depressed to initially close the circuit, and the circuit will thereafter be maintained closed through the switch J and branch K. This general mode of operation, including
 30 the employment of a self-locking magnetic switch J in the circuit, is adapted to either direct or alternating currents, but for use with alternating currents a special construction of the self-locking magnetic switch is
 35 necessary, one embodiment of which I have illustrated in the drawings and will now describe more in detail.

The armature c of the magnet is made comparatively heavy, so as to have considerable
 40 inertia, and it is arranged in approximately vertical position and pivots or swings upon its lower end, which is knife-blade shape and rests in a suitable seat provided for it in the lower pole-piece of the magnet.
 45 This arrangement of the armature in approximately vertical position (inclining slightly forward or away from the pole-piece of the magnet at its upper end), permits its inertia to be taken advantage of
 50 while still leaving the armature free to be moved toward the pole-piece of the magnet with a minimum force. Both the armature and the magnet core and pole-pieces are constructed of thin laminæ of iron insulated
 55 from each other for the prevention of eddy currents, in order that the magnet may be effectively magnetized by alternating currents of high frequency. Both the magnet and its armature are surrounded by coils
 60 (e and e') located in the motor circuit and reversely wound (Fig. 1), so that the upper end of the armature will be magnetized with a polarity the reverse of that of the upper pole-piece of the magnet and the attractive
 65 force between them be correspondingly in-

creased when their coils are energized. Instead of arranging the upper end of the armature to be drawn into direct contact with the upper pole-piece of the magnet, to close the switch, the contacts $d d'$ are employed, and one of them (d' in the present
 70 instance), is formed of a spring so light that it will readily yield to pressure when the upper end of the armature is drawn toward the upper pole-piece of the magnet, with the
 75 result that after the contact points are brought together by the initial movement of the armature, the latter may be drawn still farther toward the upper pole-piece of the magnet, the spring yielding to permit such
 80 further movement. Under this construction and arrangements of parts, when the coils of the magnet and armature are energized by an alternating current, the upper end of
 85 the armature will be drawn toward the upper pole-piece of the magnet, by successive impulses of current, and the switch be closed and maintained closed at the contacts $d d'$. The attraction exerted upon the upper end
 90 of the armature by an impulse of the current in one direction will draw the armature toward the magnet, and the inertia of the armature will be so great that it will not fall away from the magnet during the intermissions of the current; and the result
 95 will be that the armature will be drawn toward the pole-piece of the magnet by successive impulses of the current and the branch circuit be closed at the switch contacts, and it will be maintained closed at
 100 that point notwithstanding the alternations of the current, for the reason that although the armature of the magnet will be released from the attractive force at each reverse impulse or intermission of the current, and
 105 will tend to return to normal position and open the branch circuit, its inertia will prevent its moving far enough toward normal position to do so during any such reversal of the current, a considerable movement of
 110 it being accommodated by the spring contact d' without actually separating the contacts.

The coils $e e'$ are preferably both mounted in fixed position, the coil e' having an opening through it of sufficient size to permit the
 115 play of the armature of the magnet without moving the coil itself. The coils e and e' are approximately alike, this construction insuring that the core and the armature shall be magnetized with approximate equality
 120 and in co-incident phases.

As will be understood from the foregoing description, by the employment of a magnetic switch of the construction described,
 125 or of any other construction embodying the essential features described, either a direct or an alternating current may be used for operating the machine, such switch being adapted for use in connection with either a
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direct current motor, an alternating current motor, or a motor adapted for use with either current.

Fig. 5 illustrates a modified employment of the self-locking magnetic switch J adapted to alternating currents, in which one of the pole-pieces of the motor field is itself utilized as the magnet of the switch. Thus the armature *c* is pivoted at its lower end to the lower pole-piece *b'* of the field frame *b* of the motor, while its upper end stands in front of and in proximity to the upper pole-piece *b²* and carries a yielding spring contact *d'* adapted to cooperate with a contact *d* secured to said upper pole-piece. These contacts *d d'* are interposed in a branch line K, connecting the opposite sides of the motor circuit, as in Fig. 1. When the circuit is closed at the push-button I and the field-frame of the motor thereby magnetized, the upper pole-piece thereof will attract the upper end of the armature *c* and close the branch circuit at the switch contacts *d d'*, and will maintain the circuit closed through said branch until the circuit is opened at the knife-blade switch H in the manner described. In Fig. 5 this knife-blade switch is simply illustrated diagrammatically at the rear of the motor, but it will be understood that the actual arrangement of it will, or may, be the same as that shown in Fig. 1.

While I have shown the motor shaft geared directly to the sector carried by the operating rock shaft of the machine, I contemplate interposing a reducing gear between the motor shaft and sector, so that instead of causing the sector and operating shaft to be given their full movement by a single revolution or less of the motor shaft, greater movement of the motor shaft may be permitted, so that a smaller and less powerful motor may be employed with less expenditure of current.

Having thus fully described my invention, I claim:

1. In electric operating means for adding machines and the like, the combination with the driving member thereof, and means for returning said driving member to initial position in each operation of the machine; of a motor circuit, a motor in said circuit for operating said driving member, manually operated means for closing the circuit at one point, a magnetic switch having its magnet in said circuit, for closing the circuit and maintaining it closed independently of said manually operated means, and means operated by the driving member for automatically opening the circuit; substantially as described.

2. In electric operating means for adding machines and the like, the combination with the driving member thereof, and means for returning said driving member to initial position in each operation of the machine;

of a motor circuit, a motor in said circuit for operating said driving member, manually operated means for closing the circuit at one point, a magnetic switch having its magnet in said circuit, for closing the circuit and maintaining it closed independently of said manually operated means, means operated by the driving member for automatically opening the circuit, and spring-operated means for closing the circuit; substantially as described.

3. In electric operating means for adding machines and the like, the combination with the driving member thereof, and means for returning said driving member to initial position in each operation of the machine; of a motor circuit, a motor in said circuit for operating said driving member, manually operated means for closing the circuit at one point, a magnetic switch having its magnet in said circuit, for closing a branch of the motor circuit in shunt of the manually operated means, and means operated by the driving member for automatically opening the circuit; substantially as described.

4. In electric operating means for adding machines and the like, the combination with the driving member thereof, and means for returning said driving member to initial position in each operation of the machine; of a motor circuit, a motor in said circuit for operating said driving member, manually operated means for closing the circuit at one point, a magnetic switch having its magnet in said circuit, for closing a branch of the motor circuit in shunt of the manually operated means, means operated by the driving member for automatically opening the circuit, and spring-operated means for closing it; substantially as described.

5. In electric operating means for adding machines and the like, the combination with the driving member thereof, and means for returning said driving member to initial position in each operation of the machine; of a motor circuit, a motor in said circuit for operating said driving member, manually operated means for closing the circuit at one point, a magnetic switch having its magnet in said circuit, for closing a branch of the motor circuit in shunt of the manually operated means, means operated by the driving member for automatically opening the circuit, and spring-operated means for restoring the parts to normal position and closing the circuit; substantially as described.

6. In electric operating means for adding machines and the like, a motor circuit, a motor in said circuit for operating said machine, manually operated means for closing the circuit at one point, a branch circuit adapted to be closed in shunt of said manually operated means, a switch in said circuit operated by the magnetization of the

field of the motor, to close said branch circuit, and means operated by the motor for automatically opening the circuit; substantially as described.

5 7. In electric operating means for adding machines and the like, a motor circuit, a motor in said circuit for operating said machine, manually operated means for closing the circuit at one point, a branch circuit
10 adapted to be closed in shunt of said manually operated means, a switch in said circuit operated by the magnetization of the field of the motor, to close said branch circuit, means operated by the motor for auto-
15 matically opening the circuit, and spring-operated means for closing it; substantially as described.

8. In electric operating means for adding machines and the like, a motor circuit, a
20 motor in said circuit for operating said machine, manually operated means for closing the circuit at one point, a branch circuit adapted to be closed in shunt of said manually operated means, a switch in said circuit
25 operated by the magnetization of the field of the motor, to close said branch circuit, means operated by the motor for automatically opening the circuit, and spring-operated means for restoring the motor-
30 shaft and connected parts to normal position and closing the circuit; substantially as described.

9. In electric operating means for adding machines and the like, the combination with
35 the driving member thereof, and means for returning said driving member to initial position in each operation of the machine; of a motor circuit, a motor in said circuit for operating said driving member, a pair of
40 contacts in said circuit adapted to be closed by a push-button or the like, a self-locking magnetic switch interposed in said circuit for closing it in shunt of the push-button and its contacts, a switch for opening and
45 closing said circuit at another point, and means operated by the driving member for automatically opening said last mentioned switch; substantially as described.

10. In electric operating means for adding
50 machines and the like, the combination with the driving member thereof, and means for returning said driving member to initial position in each operation of the machine; of a motor circuit, a motor in said circuit for
55 operating said driving member, a pair of contacts in said circuit, adapted to be closed by a push-button or the like, a self-locking magnetic switch interposed in said circuit for closing it in shunt of the push-button,
60 and its contacts, a switch for opening and closing said circuit at another point, means operated by the driving member for automatically opening said last-mentioned switch, and spring-operated means for closing
65 it; substantially as described.

11. In electric operating means for adding machines and the like, a motor circuit, a motor in said circuit, a sector fast upon the operating shaft of the machine and geared to said motor, means for manually closing
70 said circuit, and a switch in said circuit arranged to be automatically opened by said sector; substantially as described.

12. In electric operating means for adding machines and the like, a motor circuit, a
75 motor in said circuit, a sector fast upon the operating shaft of the machine and geared to said motor, a restoring spring for said sector, means for manually closing said circuit, and a switch in said circuit arranged to
80 be automatically opened and closed by said sector; substantially as described.

13. In electric operating means for adding machines and the like, a sector C fast upon the operating rock shaft B of the machine, a
85 motor circuit, a motor F located in said circuit and geared to the sector C, a switch H in said circuit, and a contact arm *a* carried by the sector for opening said switch; substantially as described.
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14. In electric operating means for adding machines and the like, a sector C fast upon the operating rock shaft B of the machine, a motor circuit, a motor F located in said
95 circuit and geared to the sector C, a restoring spring for said sector, a switch H in said circuit, and a pair of contact arms *a a'* carried by said sector for opening and closing said switch; substantially as described.

15. In combination with a motor magnet,
100 and a source of alternating current for operating the same, a manually operated switch for closing the circuit, and a self-locking magnetic switch having its switch contacts connected in multiple with said manual
105 switch and its magnet located in said circuit, said magnetic switch having an armature of high inertia, and yielding contacts adapted to prolong closure of the circuit; whereby said magnet is caused to maintain its own
110 circuit when excited by alternating currents.

16. In combination with a motor magnet and a source of alternating current for operating the same, a manually operated
115 switch for closing said circuit, and a self-locking magnetic switch having its switch contacts connected in multiple with said manual switch and its magnet located in said circuit, said magnetic switch having an
120 armature of high inertia, the core of said magnet being laminated as described, and yielding contacts adapted to prolong closure of the circuit; substantially as described.

17. In a self-locking magnet for excitement by alternating currents, the combination with the laminated core, of a heavy armature therefor, and means for applying a
125 relatively light retractive force, yielding contacts controlled by said armature, adapted to permit fluttering of the armature with-
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out breaking the circuit and magnetizing coils approximately alike for said core and armature, whereby the core and armature are magnetized with approximate equality and in coincident phases; substantially as described.

18. In a self-locking magnetic switch, adapted for excitement by alternating currents, the combination of two magnetic members and equal magnetizing helices therefor, the armature member being heavy and being retracted by a relatively feeble force, and yielding switch contacts controlled by said armature to be closed when the armature is attracted; substantially as described.

19. In electric operating means for adding machines and the like, the combination with a reciprocatory driving member of such machine spring-drawn in one direction, of a motor circuit, a motor in said circuit for operating the said driving member in opposition to its spring, manually operated means for closing the circuit at one point, a magnetic switch having its magnet in said circuit, for closing the circuit and maintaining it closed independently of said manually operated means, and means for automatically opening the circuit by the reciprocatory driving member of the machine as it is brought by the motor to the limit of its movement in one direction; substantially as described.

20. In electric operating means for adding machines and the like, the combination with a reciprocatory driving member of such machine spring-drawn in one direction, of a motor circuit, a motor in said circuit for operating the said driving member in opposition to its spring, manually operated means for closing the circuit at one point, a magnetic switch having its magnet in said circuit, for closing the circuit and maintaining it closed independently of said manually

operated means, means for automatically opening the circuit by the reciprocatory driving member of the machine as it is brought by the motor to the limit of its movement in one direction, and means for closing the circuit by said member when returned by its spring to the limit of its movement in the opposite direction; substantially as described.

21. In electric operating means for adding machines and the like, the combination with a reciprocatory driving member of such machine spring-drawn in one direction, of a motor circuit, a motor in said circuit for operating the said driving member in opposition to its spring, manually operated means for closing a branch of the motor circuit in shunt of the manually operated means, and means for automatically opening the circuit by the reciprocatory driving member of the machine as it is brought by the motor to the limit of its movement in one direction.

22. In electric operating means for adding machines and the like, the combination with a reciprocatory driving member of such machine spring-drawn in one direction, of a motor circuit, a motor in said circuit for operating the said driving member in opposition to its spring, manually operated means for closing a branch of the motor circuit in shunt of the manually operated means, means for automatically opening the circuit by the reciprocatory driving member of the machine as it is brought by the motor to the limit of its movement in one direction, and means for closing the circuit by said member when returned by its spring to the limit of its movement in the opposite direction; substantially as described.

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