

No. 890,960.

R. L. BURD.

PATENTED JUNE 16, 1908.

# ELECTRICALLY OPERATED ADDING MACHINE.

APPLICATION FILED FEB. 7, 1907.

4 SHEETS—SHEET 1.

*Fig. 1.*

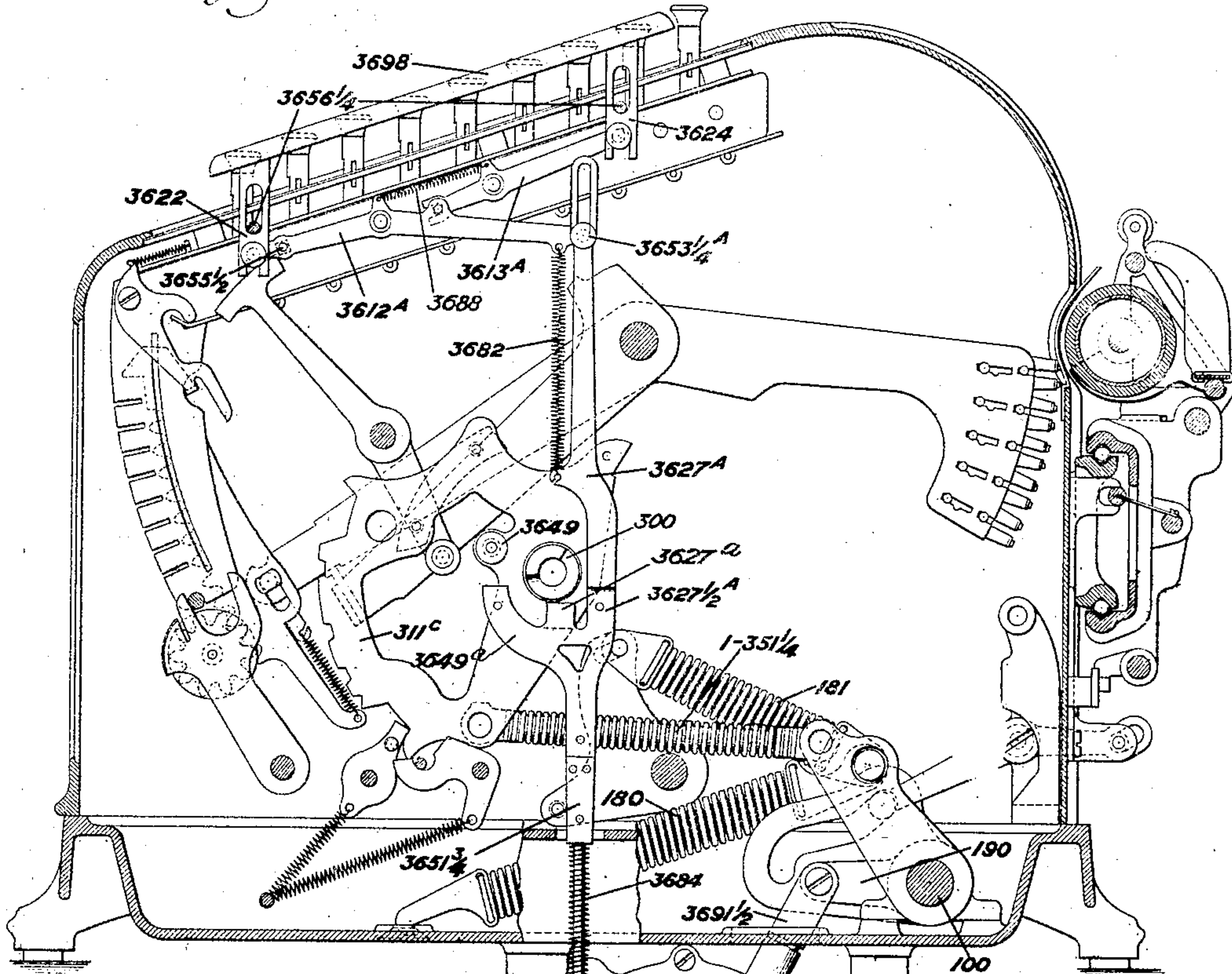


Fig. 2.

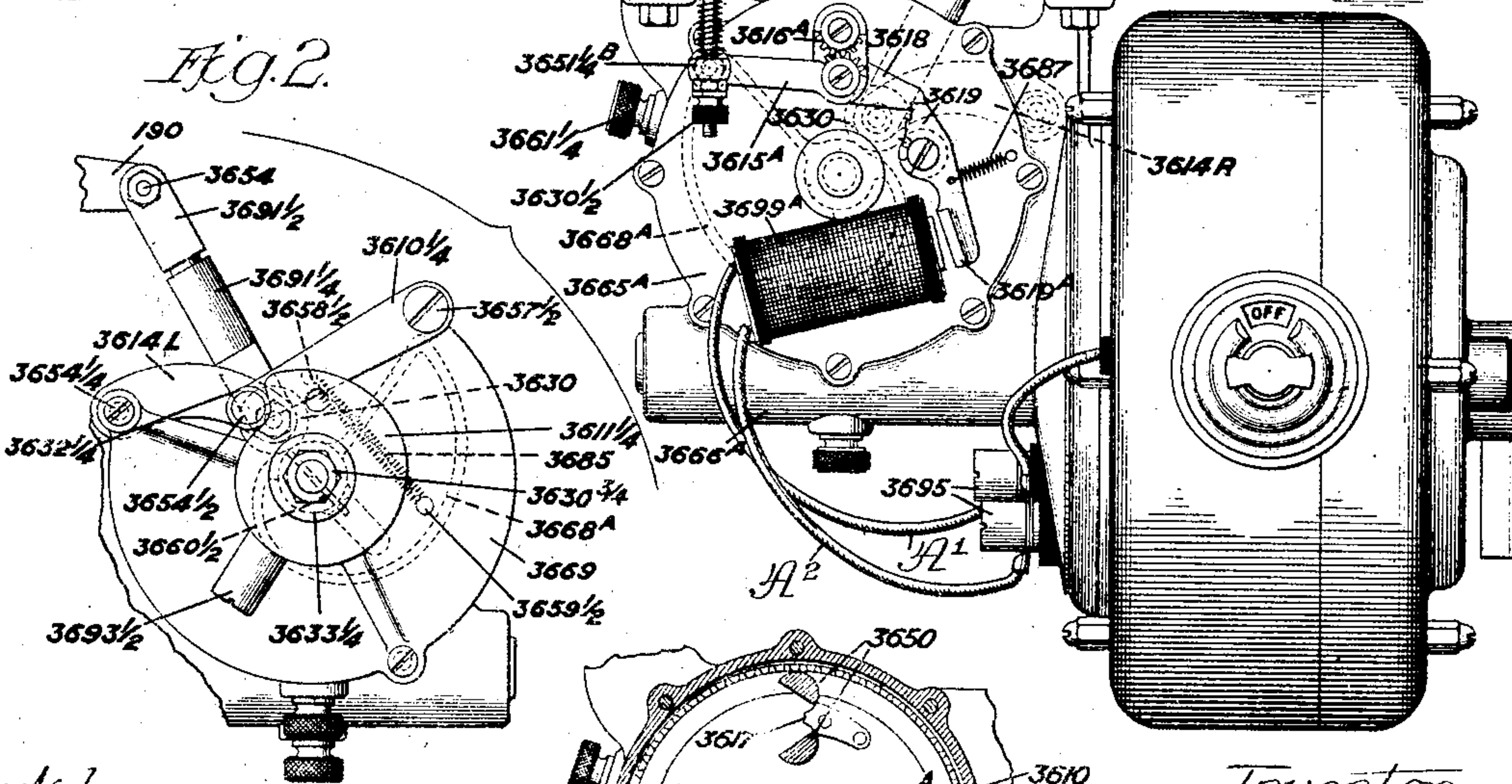
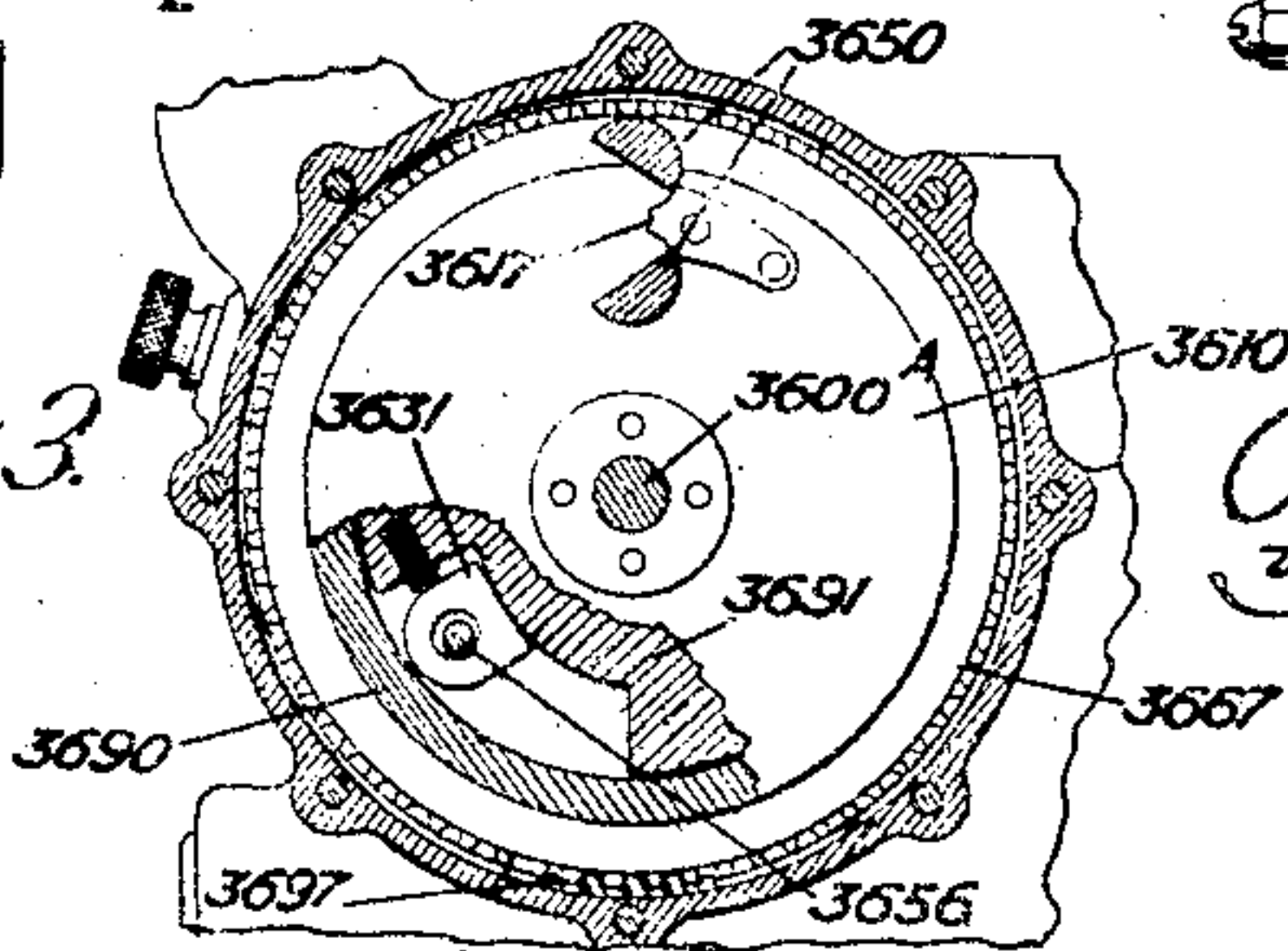


Fig. 3.



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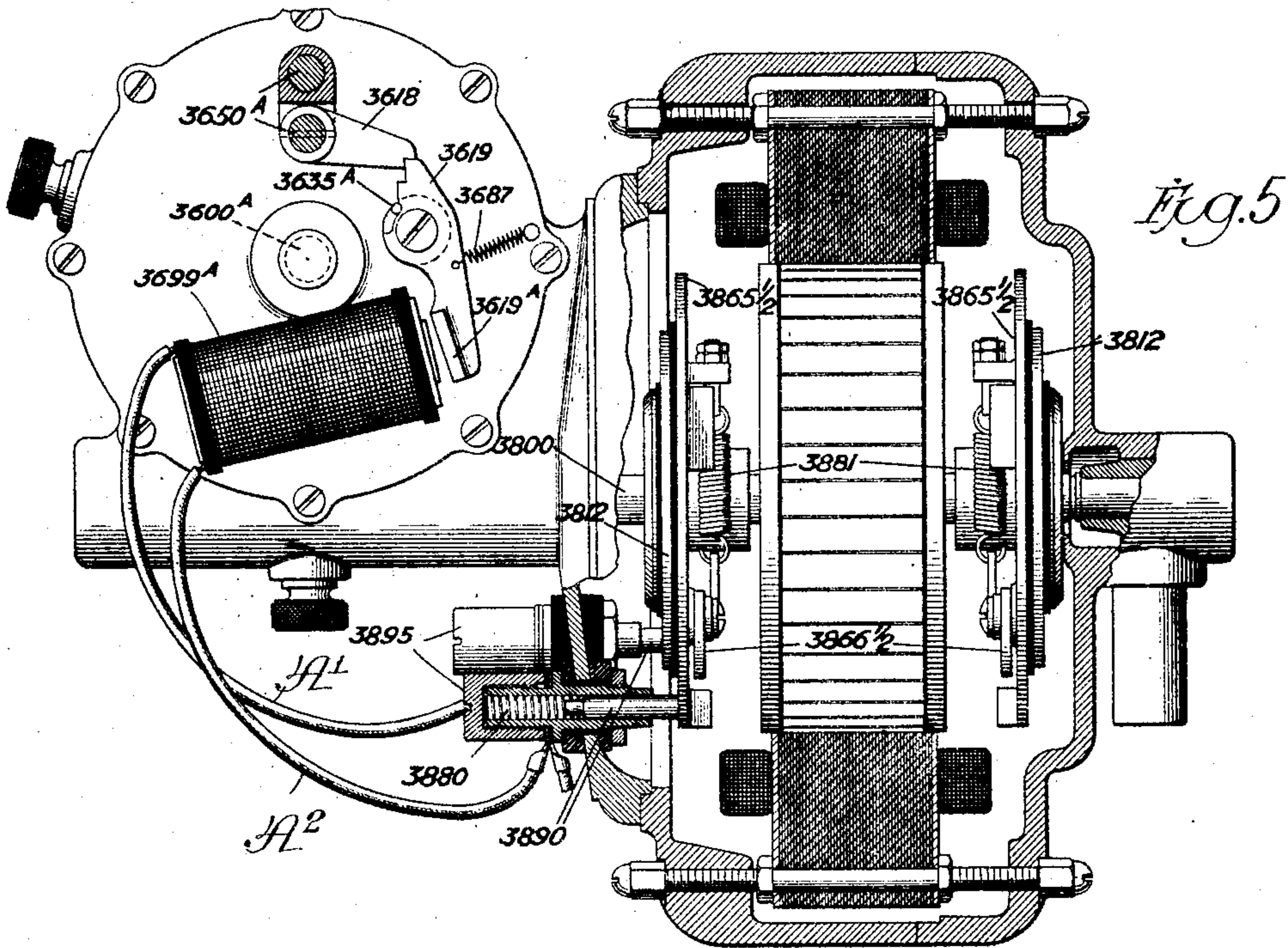


Fig. 5

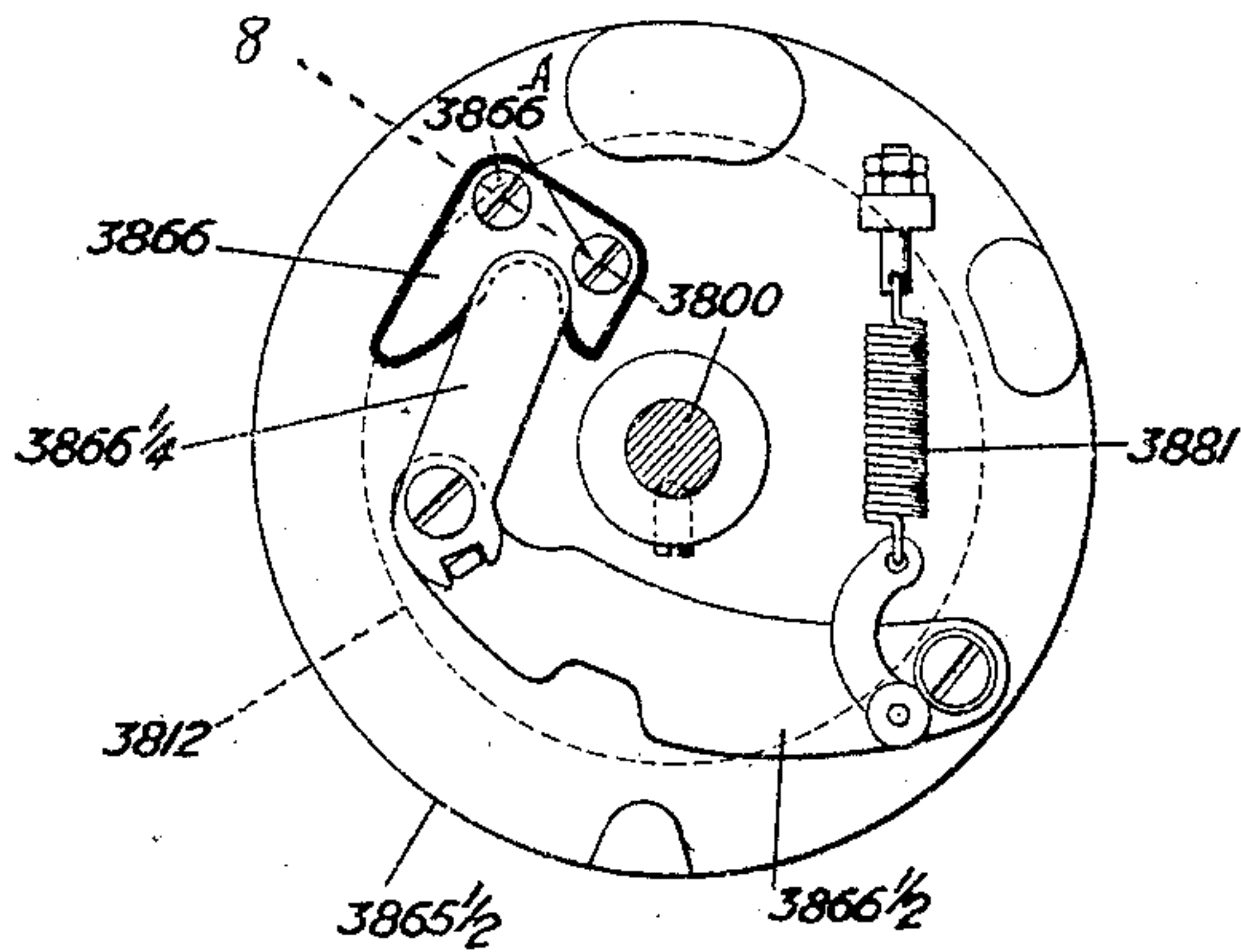
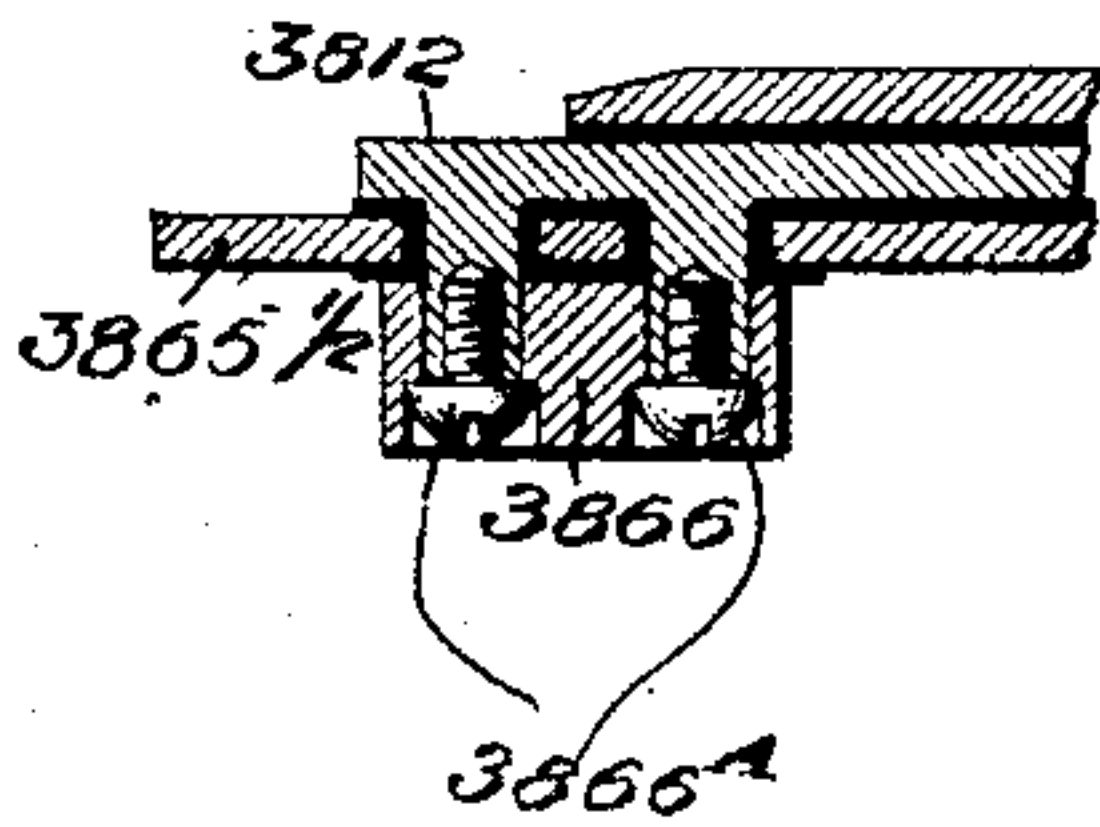


Fig. 6



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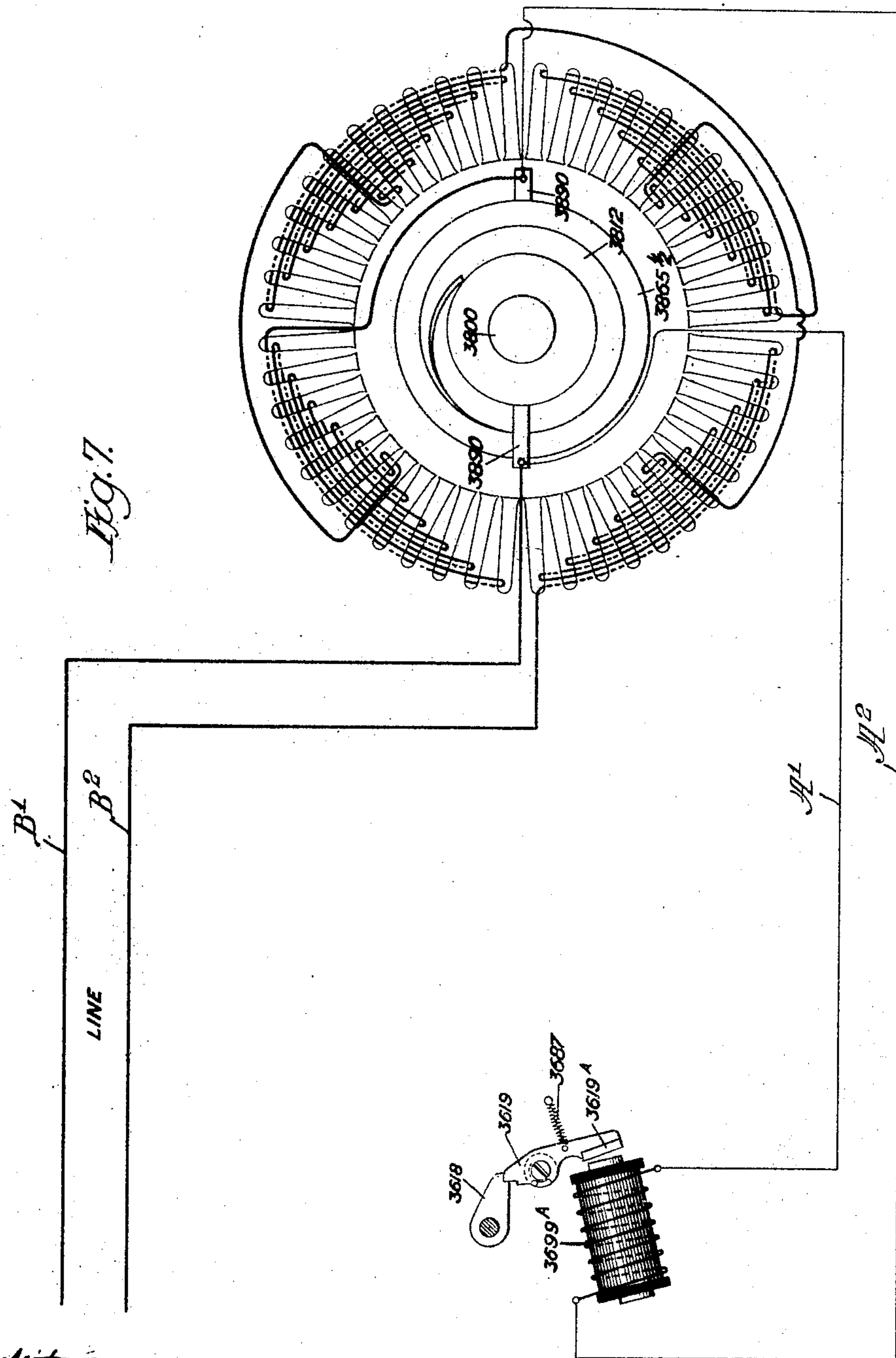
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4 SHEETS—SHEET 4.



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# UNITED STATES PATENT OFFICE.

ROY L. BURD, OF DETROIT, MICHIGAN, ASSIGNOR TO BURROUGHS ADDING MACHINE COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

## ELECTRICALLY-OPERATED ADDING-MACHINE.

No. 890,960.

Specification of Letters Patent.

Patented June 16, 1908.

Application filed February 7, 1907. Serial No. 356,226.

*To all whom it may concern:*

Be it known that I, ROY L. BURD, a citizen of the United States, residing at Detroit, Wayne county, Michigan, have invented certain new and useful Improvements in Electrically-Operated Adding-Machines, of which the following is a specification.

The object of the present invention is to provide for making the establishment of a driving connection between the motor and the adding machine dependent upon the speed attained by the motor after the current has been turned on so that with an alternating current motor no difficulty will be encountered on account of poor starting torque. Thus by preventing effective manipulation of the starting key until the motor has attained a predetermined speed the motor cannot be deleteriously affected by prematurely placing a load upon it. As the alternating current motor does not develop anything like full power short of attaining practically full speed it is preferable to prevent effective manipulation of the starting key until this point is reached.

In the present embodiment of the invention the armature shaft of the motor carries a centrifugal switch normally closed to afford a path of least resistance for the current which traverses the field magnets. As full speed is reached in rotation of the armature shaft centrifugal force operates to automatically open the switch. Thereupon the current is shunted through an electromagnet whose armature constitutes a lock for the starting mechanism.

In the accompanying drawings which illustrate the invention in a preferred form Figure 1 represents partly in right-side elevation and partly in section an adding machine of the well-known Burroughs type equipped for operation by an electric motor and having automatic controlling devices of the character above indicated; Fig. 2 represents in left-side elevation part of the connections between the motor and the adding machine; Fig. 3 represents in vertical section certain clutch and detent devices which control the driving connection between the motor and the adding machine; Fig. 4 represents a transverse section of the driving connections between the motor and the adding machine; Fig. 5 represents a transverse section of the motor together with a right-side elevation of the associated starter lock; Fig. 6 represents

an elevation of the centrifugal switch; Fig. 7 is a diagram of circuits together with an elevation of the starter lock, and Fig. 8 is a cross-section on line 8 of Fig. 6.

While the invention is preferably shown as applied to the well-known Burroughs adding and listing machine it is to be understood that it may be equally well applied to other types of such machines. For the details of the particular type here chosen for purposes of illustration reference may be had to the William S. Burroughs patents Nos. 504,963 and 505,078 of June 12, 1893. For the purposes of the present specification it will suffice to merely refer to a few of the familiar parts of this Burroughs machine.

The reference numeral 300 designates the usual stub drive shaft to which the detachable handle is applied when the machine is operated by hand, this shaft carrying a full stroke sector 311<sup>c</sup>. The latter is cranked through the medium of a distensible link 1351<sup>1</sup>/<sub>2</sub> to an oscillatory drive shaft 100. The electric motor is suspended beneath the adding machine and is adapted to turn said shaft 100 against the stress of springs 180 which restore said shaft to normal as soon as the motor has ceased to act. The motor drives a worm 3697 (Fig. 4) which in turn rotates a worm-wheel 3667 carrying an annular flange 3690. A shaft 3600<sup>A</sup> on which said worm-wheel is journaled carries a disk 3691 within said flange. This disk is peripherally recessed to accommodate struts 3631 for clutching the disk and flange together. The shaft 3600<sup>A</sup> carries a driving cam 3668<sup>A</sup> operating upon a roll 3630 (Fig. 1) at the lower end of a pitman 3691<sup>1</sup>/<sub>2</sub> jointed at its upper end to a crank arm 190 on the shaft 100. Radius links 3614<sup>R</sup> and 3614<sup>L</sup> serve to properly guide the pitman 3691<sup>1</sup>/<sub>2</sub> and it will be seen that as the cam rotates the shaft 100 will first be turned one way thereby and then permitted to be carried back to normal by the springs 180.

The clutch above described is arranged to be automatically opened at the end of each complete rotation of the cam, through devices presently to be described. The cam 3668<sup>A</sup> is preferably made with an abrupt or radial side and in order to prevent chattering of the clutch the following means are employed: A snail-back cam 3611<sup>1</sup>/<sub>2</sub> is secured to the shaft 3600<sup>A</sup> (Fig. 2) and an arm or bar 3610<sup>1</sup>/<sub>2</sub> is pivoted to the casing and equipped



with a roll 3632 $\frac{1}{2}$  pressed against the periphery of said snail-back cam by a spring 3685 which connects the arm or bar 3610 $\frac{1}{2}$  with the casing. The form and relative arrangement of these parts is such that as the abrupt face of the cam 3668<sup>A</sup> passes the roll 3630, the roll 3632 $\frac{1}{2}$  crowds past the nose of the snail-back cam and prevents any back lash which the springs of the clutch might otherwise cause. These clutch springs operate to thrust the struts 3631 into driving engagement with the disk 3691 and the flange 3690. A disk 3610 loose upon the shaft 3600<sup>A</sup> carries pins 3656 loosely engaging the open centers of the struts. Said disk 3610 carries a stop plate or strip 3617 and there are journaled in the casing two plugs 3650<sup>A</sup> formed with inwardly projecting end portions 3650 semi-circular in cross-section for co-action as detents with the stop plate or strip 3617 (see Fig. 3). It will be seen that so long as these detents stand in front of said stop plate there can be no driving engagement of the clutch parts. Thus the clutch is normally restrained against closing. The two plugs 3650<sup>A</sup> are geared together by intermeshing segments 3616<sup>A</sup> and 3615<sup>A</sup> (Fig. 1) and the displacement of the detents to permit closing of the clutch is effected by depression of a bar 3698 extending along the right-hand side of the key-board of the adding machine. This bar is provided with legs 3624 and 3622 slotted to engage guiding pins 3656 $\frac{1}{2}$  and bifurcated to straddle studs at the outer ends of levers 3612<sup>A</sup> and 3613<sup>A</sup>. A spiral spring 3688 connects these two levers so as to hold their outer ends normally elevated and the lever 3613<sup>A</sup> is bifurcated to engage a stud of the lever 3612<sup>A</sup> so as to secure an even depression of the bar 3698. The lever 3612<sup>A</sup> is extended rearwardly and equipped with a stud 3653 $\frac{1}{2}$ <sup>A</sup> engaging a slot in the upper end of a vertical bar 3627<sup>A</sup>. The latter is connected by a spiral spring 3682 with the rearwardly extending arm of said lever 3612<sup>A</sup> and it will be seen that depression of the bar 3698 will operate to elevate the bar 3627<sup>A</sup> unless the latter is blocked, in which case the spring 3682 will stretch. The vertical bar is made in sections and the middle section 3627 $\frac{1}{2}$ <sup>A</sup> has a forward extension 3649<sup>a</sup> and an intermediate upward projection 3627<sup>a</sup>, the latter to prevent the rise of the bar when the handle is in place or to prevent the insertion of the handle when the bar is elevated, and said forward extension 3649<sup>a</sup> adapted to coöperate with a stud 3649 on the sector 311<sup>c</sup> to effect full restoration of the vertical bar to depressed position shortly after the machine starts to operate. The lowermost section 3651 $\frac{1}{2}$  of the vertical bar takes the form of a round rod which extends loosely through an eye 3651 $\frac{1}{2}$ <sup>B</sup> secured to the arm of the segment 3615<sup>A</sup>.

It will be seen that through the connec-

tions last described the elevation of the vertical bar through depression of the finger bar 3698 will result in turning the detent plugs and releasing the clutch. A spring 3684 surrounds the rod-like portion of the section 3651 $\frac{1}{2}$  of the vertical bar and a thumb nut 3630 $\frac{1}{2}$  is applied to the lower end of said section of the bar so that the latter may be drawn downwardly at will should the machine happen to stick with the projection 3627<sup>a</sup> across the shaft 300 and necessity thus arise for applying the handle to said shaft.

None of the above-described devices constitute *per se* any part of the present invention though their arrangement and mode of operation come into consideration in connection with the present embodiment of the invention. Coming now to the features which characterize the latter the lower one of the two detent plugs 3650<sup>A</sup> has secured to it a rearwardly projecting arm 3618 which must necessarily be depressed as an accompaniment to elevation of the segment arm 3615<sup>A</sup> (Fig. 1). Any such movement is normally prevented by the engagement with said arm 3618 of the upper end of a lever 3619 pivoted intermediate its ends to the casing. The arm 3618 is preferably notched to receive the point or nose of the lever 3619 and the movements of the latter are limited by the abutment of suitable shoulders in its pivot portion with a pin 3635<sup>A</sup> projecting from the casing. A spiral spring 3687 normally presses the lever into engagement with the arm 3618 (Fig. 5). The lower arm of this lever carries an armature 3619<sup>A</sup> standing opposite the pole-piece of an electro-magnet 3999<sup>A</sup>. The energizing of this magnet of course attracts the armature and by overcoming the spring 3687 disengages the lever 3619 from the detent arm 3618. Thus effective manipulation of the starting bar 3698 depends upon the energizing of this magnet. The latter occurrence does not ensue until the motor has attained full speed after the current is turned on. The means for effecting this result will next be described.

The winding of the electromagnet is wired directly to binding posts 3895 of the motor (Fig. 5) through suitable conductors A' and A<sup>2</sup>, which binding posts likewise take the line wires B' and B<sup>2</sup> (Fig. 7). Within these binding posts are brushes in the form of copper tubes 3690 pressed by springs 3880 into contact with disks 3812 and 3865 $\frac{1}{2}$  respectively secured to the armature shaft 3800 and insulated from each other. One of the line wires must of course traverse the field magnets before reaching the binding post and its brush and in Fig. 7 the line wire B<sup>2</sup> is so represented. The motor circuit is normally completed through a switch which establishes electrical connection between the disks 3812 and 3865 $\frac{1}{2}$ . This switch is of centrifugal character being adapted to automatically



open when the motor attains full speed. Said switch is best illustrated in Fig. 6 and comprises a jointed lever 3866 $\frac{1}{2}$  pivoted at one end to the disk 3865 $\frac{1}{2}$  and drawn toward the armature shaft by a spring 3881. The outer member 3866 $\frac{1}{2}$  of this lever constitutes a contact piece normally seated in the flaring hollow of a block 3866 secured against the side of the disk 3865 $\frac{1}{2}$  but thoroughly insulated therefrom. The fastening screws 3866<sup>A</sup> of said block make electrical connection with the other disk 3812 being insulated from the disk 3865 $\frac{1}{2}$  where they extend through the same. The flaring of the hollow or socket of the block and the slight free play in the joint of the lever provide for an effective contact as will be obvious. So long as this contact is preserved no current will flow through the magnet 3699<sup>A</sup> because such contact supplies a path of less resistance for the current than that presented by the magnet winding and connections. However, so soon as the motor attains a speed sufficient to break the contact by outward swing of the jointed lever against the stress of the spring 3881 then the current must perforce traverse the magnet. This will result as before explained in unlocking the detent devices so that the operator can release the clutch.

While the construction above described will be seen to thoroughly fulfil the object primarily stated it is to be understood that such construction is susceptible of considerable modification without necessarily departing from the spirit and scope of the invention.

What is claimed is:

1. In a machine of the character described, the combination with an electric motor, driving connections including a normally-restrained clutch, and manipulative means for releasing the clutch; of a lock for said means controlled by the speed of the motor.

2. In a machine of the character described, the combination with an electric motor, driving connections including a normally-restrained clutch, and manipulative means for releasing the clutch; of a lock for said means centrifugally controlled by the speed of the motor.

3. In a machine of the character described, the combination with an electric motor, driving connections including a normally-restrained clutch, and manipulative means for releasing the clutch; of an electric lock for said means controlled by the speed of the motor.

4. In a machine of the character described, the combination with an electric motor, driving connections including a normally-restrained clutch, and manipulative means for releasing the clutch; of an electric lock for said means centrifugally controlled by the speed of the motor.

5. In a machine of the character described, the combination with an electric motor, driv-

ing connections including a normally-restrained clutch, and manipulative means for releasing the clutch; of a lock for said means, an electro-magnet controlling said lock and wired to the motor brushes, and a speed-controlled switch in the circuit of the motor beyond its brushes.

6. In a machine of the character described, the combination with an electric motor, driving connections including a normally-restrained clutch and manipulative means for releasing the clutch; of a lock for said means, an electro-magnet controlling said lock and wired to the motor brushes, and a centrifugal switch in the circuit of the motor beyond its brushes.

7. In a machine of the character described, the combination with an electric motor, driving connections including a normally-restrained clutch, and manipulative means for releasing the clutch; of a lock for said means, an electro-magnet controlling said lock and wired to the motor brushes and a centrifugal switch carried by the armature of the motor.

8. In a machine of the character described, the combination with an electric motor, driving connections including a normally-restrained clutch, and manipulative means for releasing the clutch comprising a rocking detent; of an electro-magnet wired to the motor brushes, an armature for said magnet spring-drawn into locking engagement with said detent, and a centrifugal switch in the main circuit of the motor and carried by the latter's armature.

9. In a machine of the character described, the combination of field coils, an armature shaft carrying insulated plates, a centrifugal switch connecting said plates, brushes running in contact with the latter respectively, line wires connected with said brushes respectively, the one directly and the other through the field coils, an electro-magnet wired directly to said brushes, an armature for said magnet, a spring-drawn lever carrying said armature, a detent normally engaged by said lever, a clutch restrained by said detent, and driving connections controlled by said clutch.

10. In a machine of the character described, the combination with an electric motor, driving connections including a clutch, and means for closing the clutch; of a lock for said means controlled by the speed of the motor.

11. In a machine of the character described, the combination with an electric motor, driving connections including a clutch, and means for closing the clutch; of a lock for said means centrifugally controlled by the speed of the motor.

12. In a machine of the character described, the combination with an electric motor, driving connections including a clutch, and means for closing the clutch; of an elec-



tric lock for said means controlled by the speed of the motor.

13. In a machine of the character described, the combination with an electric motor, driving connections including a clutch, and means for closing the clutch; of an electric lock for said means centrifugally controlled by the speed of the motor.

14. In a machine of the character described, the combination with an electric motor, driving connections including a clutch, and means for closing the clutch; of a lock for said means, an electro-magnet controlling said lock and wired to the motor brushes, and a speed-controlled switch in the circuit of the motor beyond its brushes.

15. In a machine of the character described, the combination with an electric mo-

tor, driving connections including a clutch and means for closing the clutch; of a lock for said means, an electro-magnet controlling said lock and wired to the motor brushes, and a centrifugal switch in the circuit of the motor beyond its brushes.

16. In a machine of the character described, the combination with an electric motor, driving connections including a clutch, and means for closing the clutch; of a lock for said means, an electro-magnet controlling said lock and wired to the motor brushes and a centrifugal switch carried by the armature of the motor.

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