

G. E. PALMER.
ELECTRIC SWITCH.
APPLICATION FILED MAY 3, 1910.

999,851.

Patented Aug. 8, 1911

3 SHEETS-SHEET 1.

Fig 1

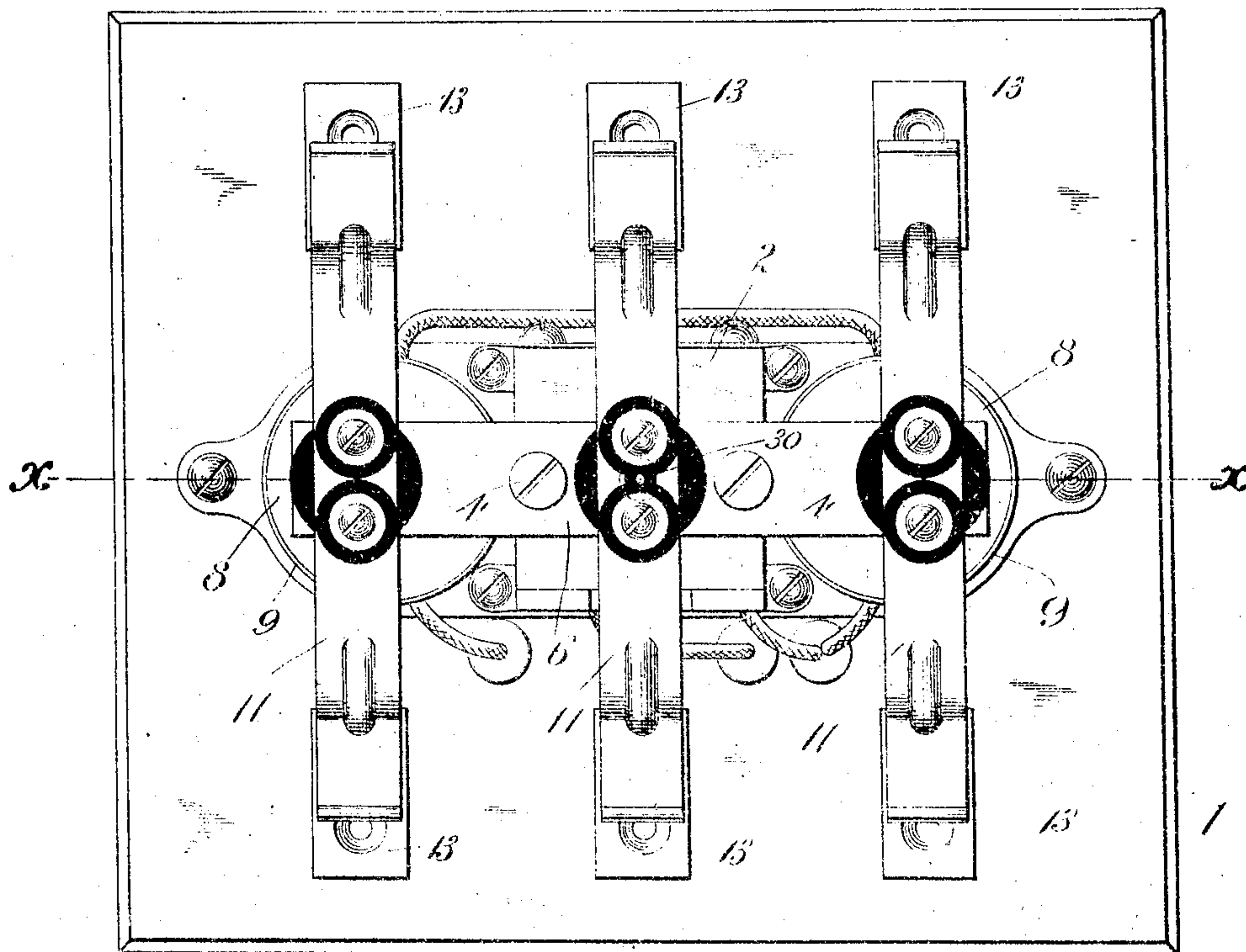
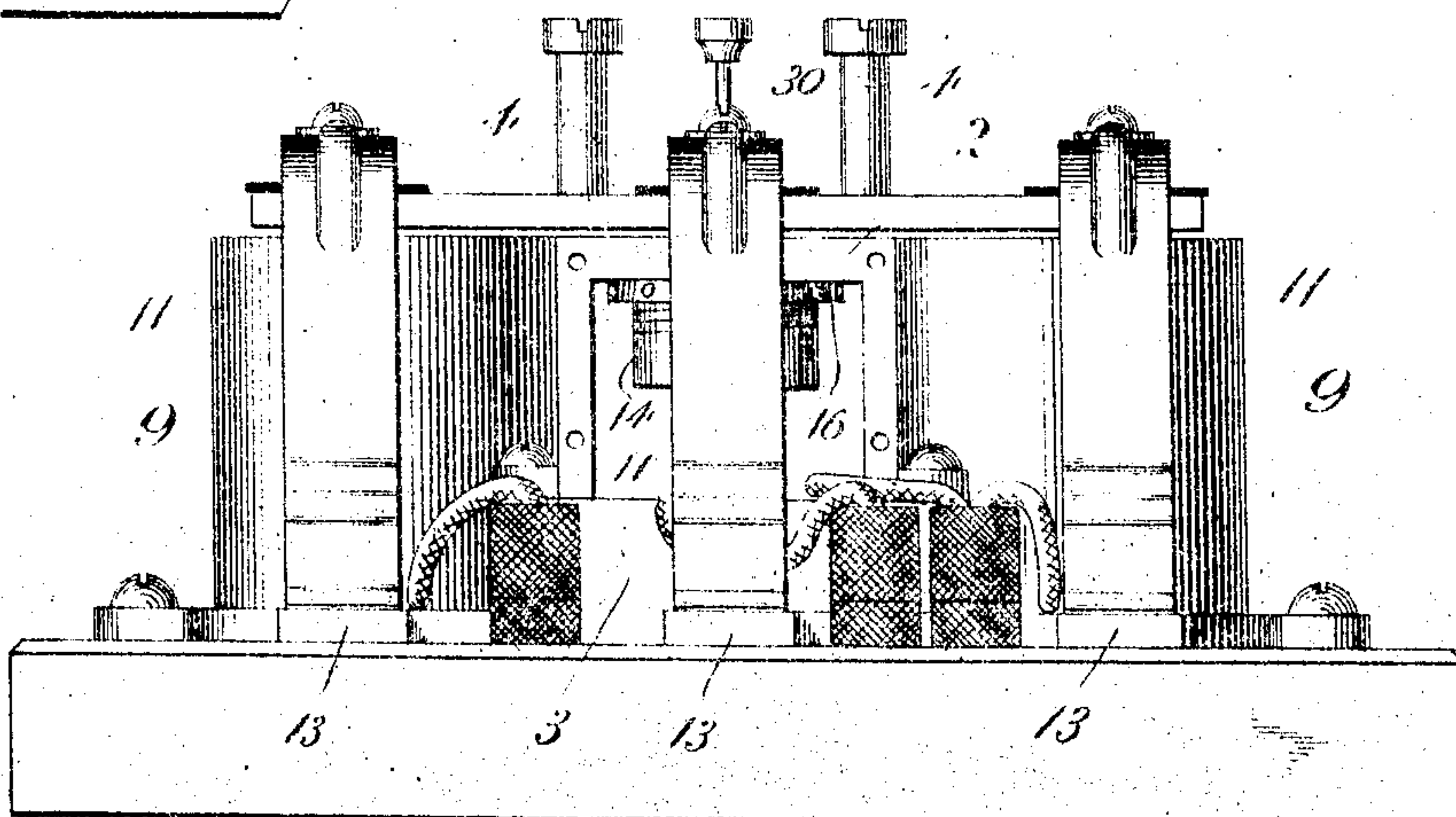


Fig 2



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3 SHEETS—SHEET 2.

Fig. 3

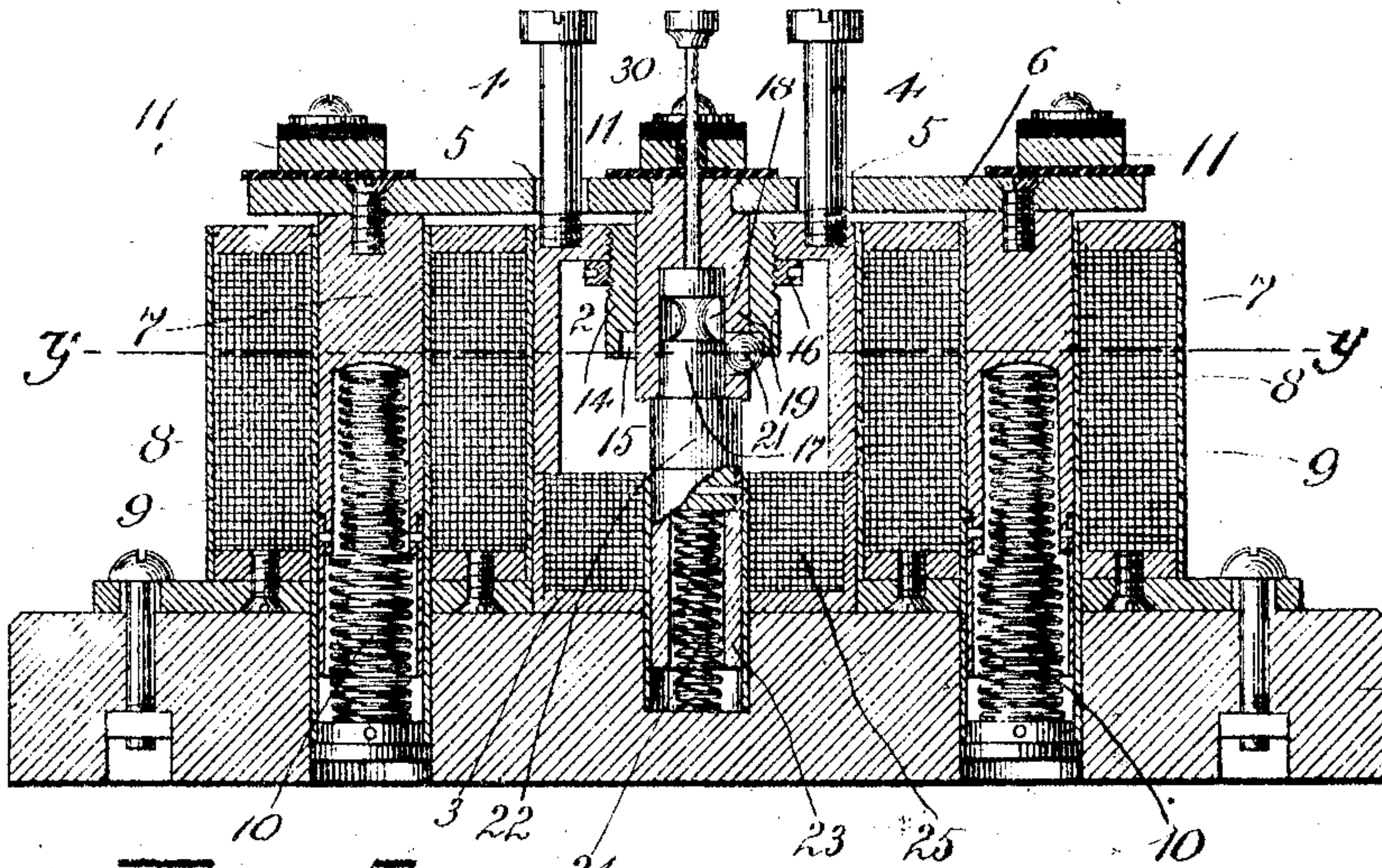


Fig. 5

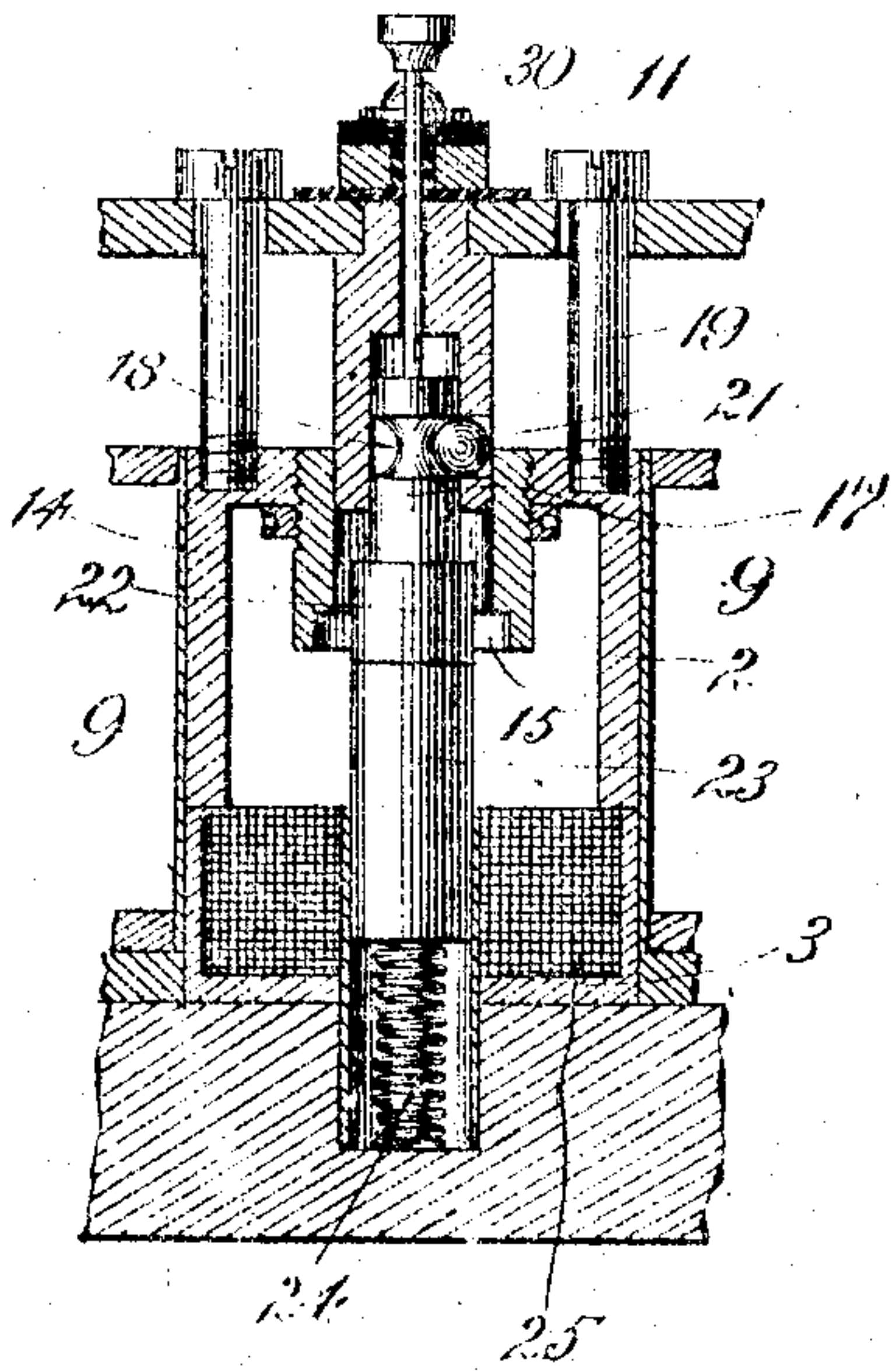


Fig. 6

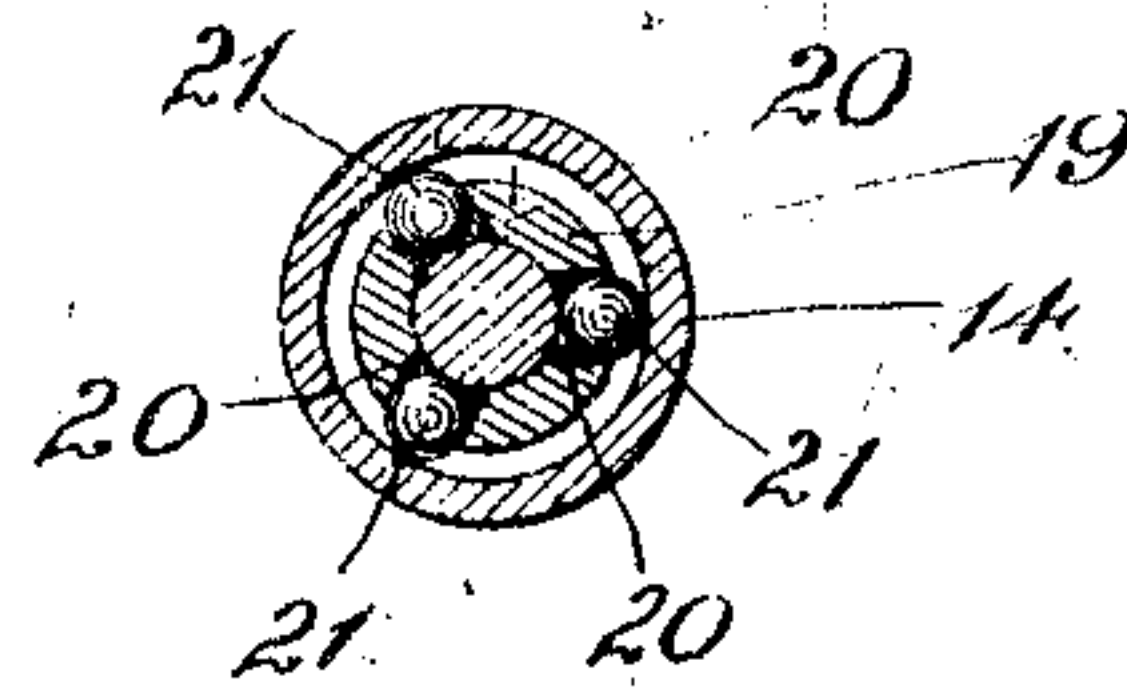
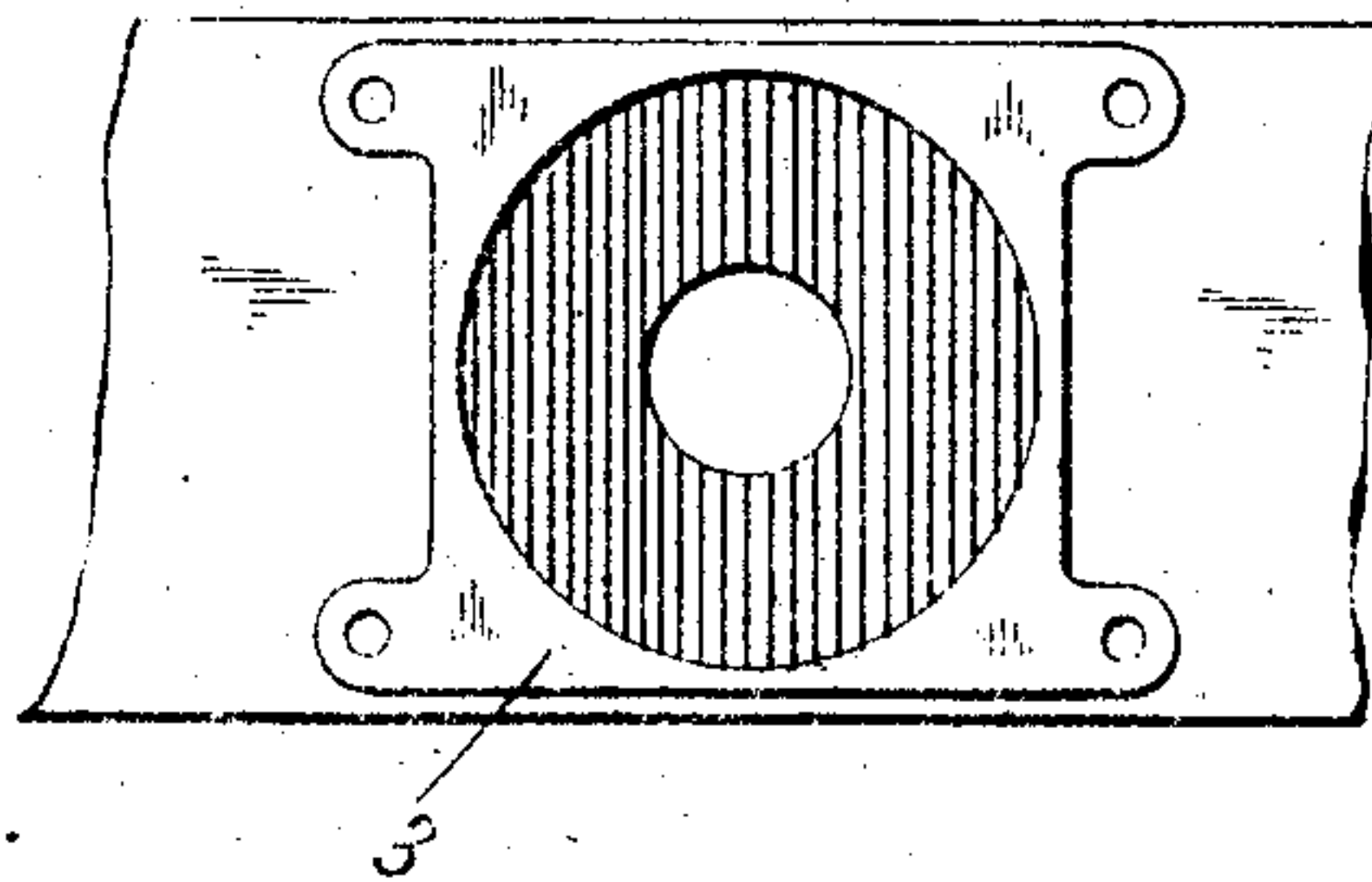


Fig. 7



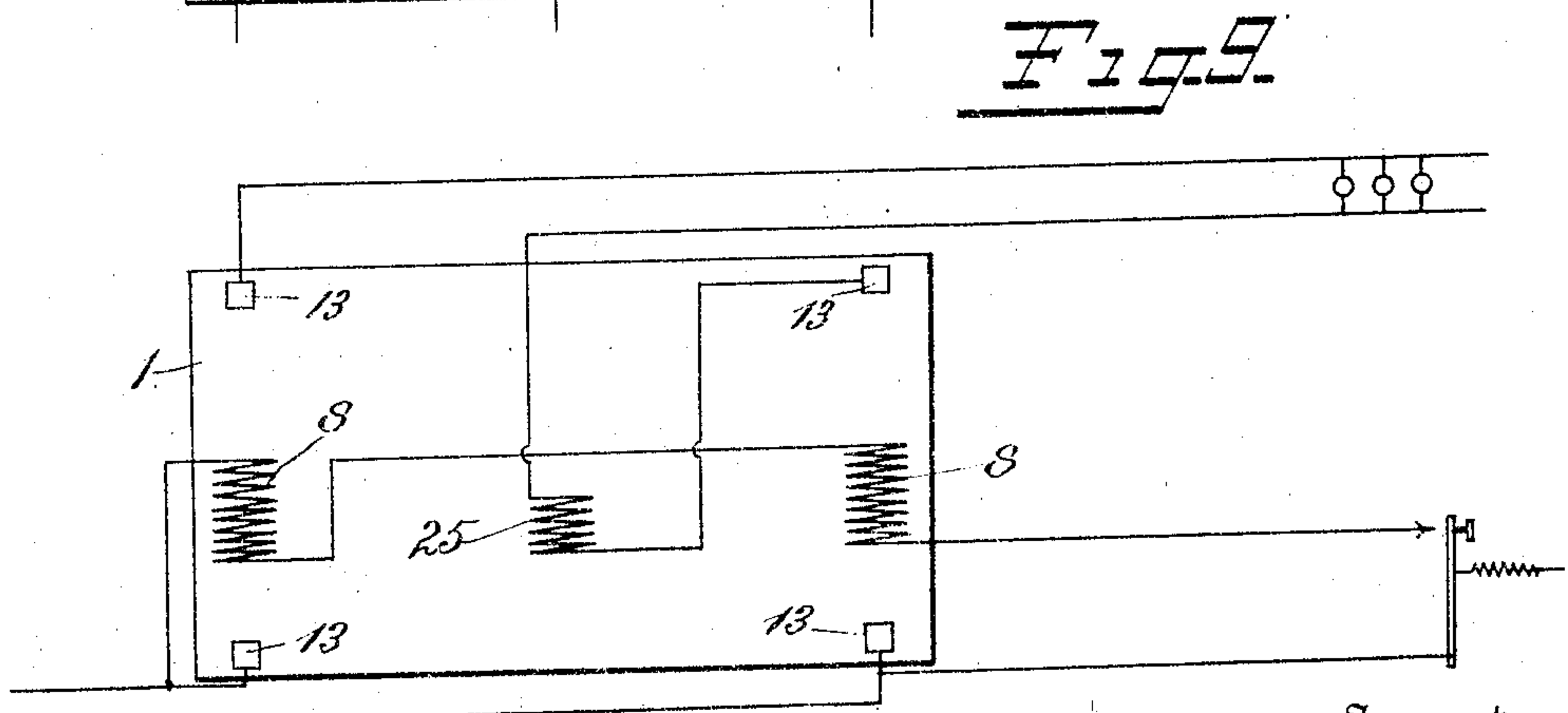
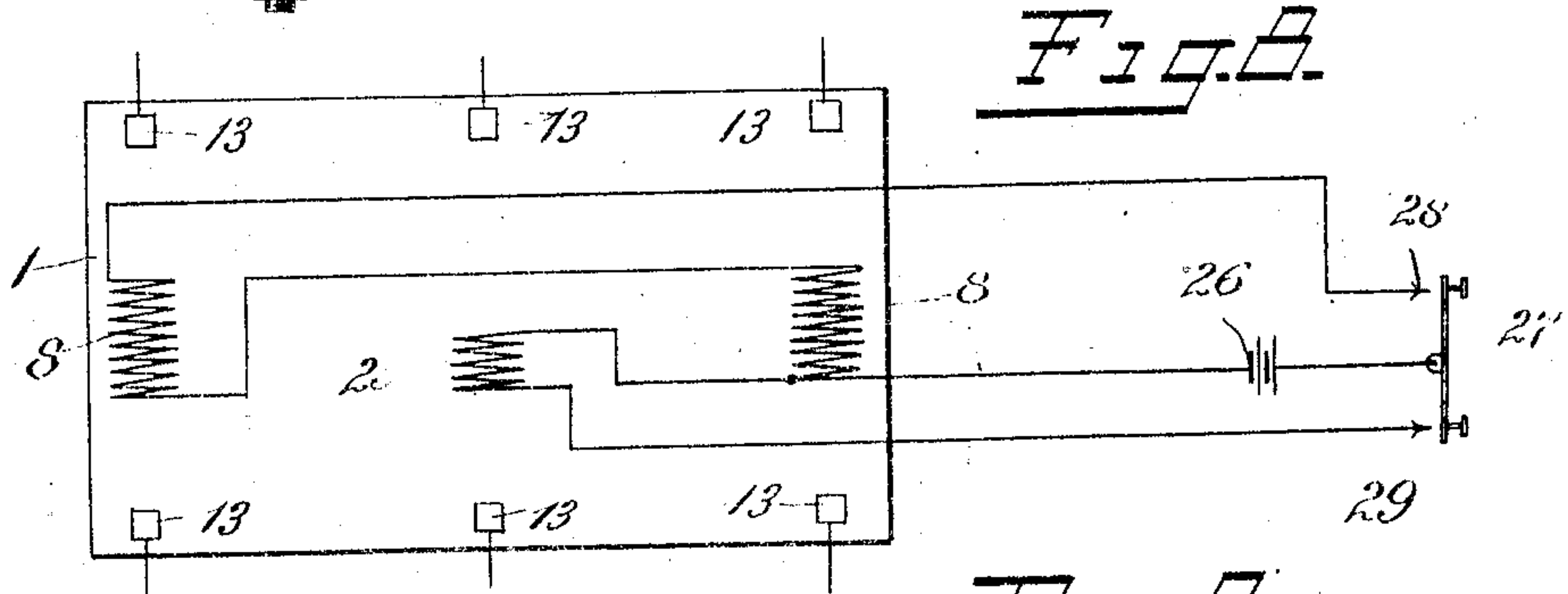
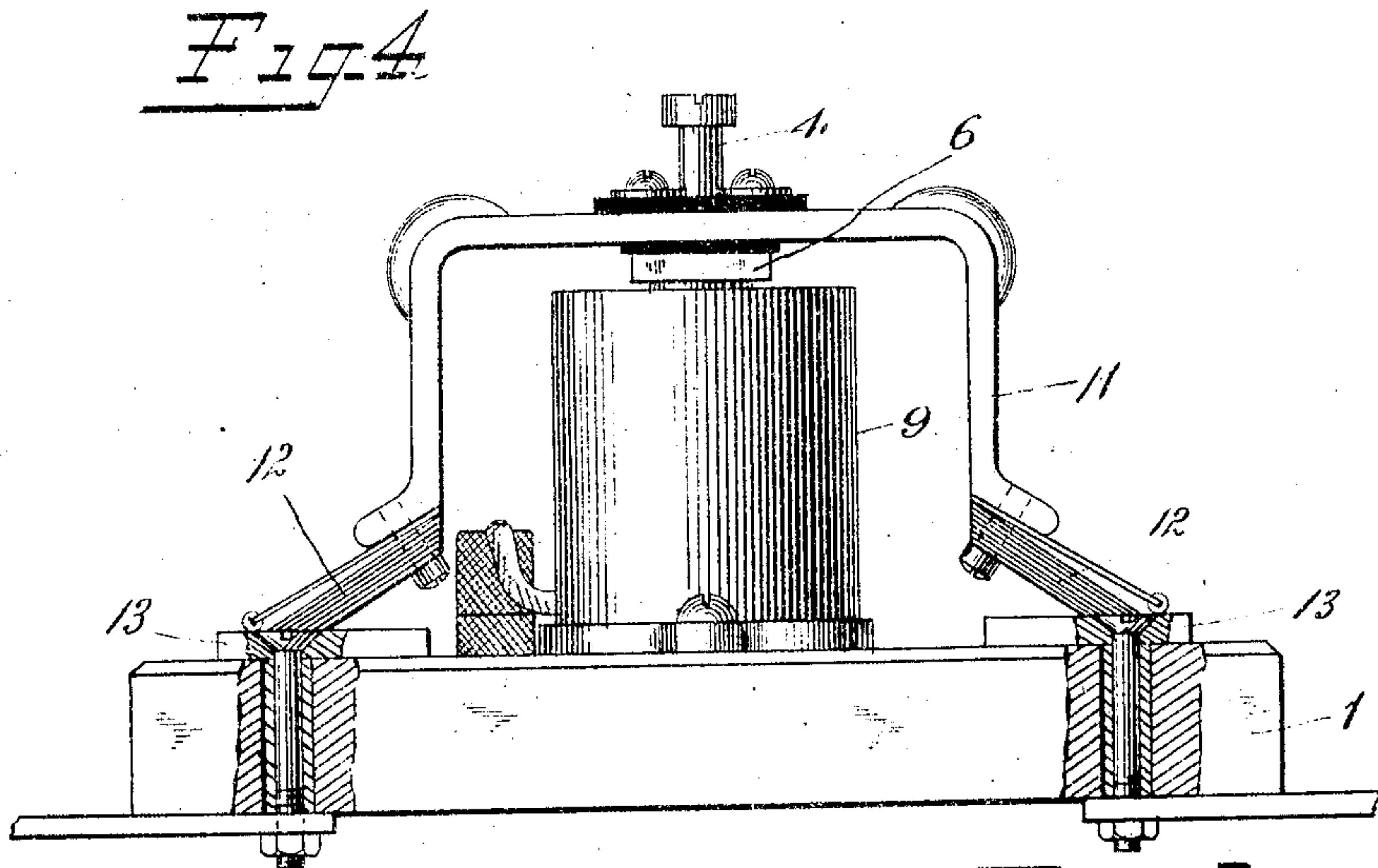
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

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ELECTRIC SWITCH.

999,851.

Specification of Letters Patent.

Patented Aug. 8, 1911.

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To all whom it may concern:

Be it known that I, GRANVILLE E. PALMER, a citizen of the United States, residing at Winchester, county of Middlesex, State of Massachusetts, have invented certain new and useful Improvements in Electric Switches, of which the following is a full, clear, and exact description.

My invention relates to electric switches and has for its object to produce a new and improved electromagnetically controlled switch for controlling electric circuits.

It further has for its object to produce an electromagnetically controlled switch, which can be closed by electromagnetic means.

It further has for its object to provide a switch with a substantially frictionless electromagnetically controlled releasing means.

It further has for its object to provide a simple and efficient means for adjusting the clutch.

The following is a description of an embodiment of my invention, reference being had to the accompanying drawings, in which—

Figure 1 is a plan view of the switch; Fig. 2 is a side elevation; Fig. 3 is a vertical longitudinal section of the switch on the line $x-x$ Fig. 1; Fig. 4 is an end elevation; Fig. 5 is a detail view showing the clutch in open position; Fig. 6 is a section of the clutch on the line $y-y$ Fig. 3; Fig. 7 is a detail of the casing for the releasing coil; Fig. 8 is a diagram of circuits for remote control operation; Fig. 9 is a diagram of circuits for the switch when used as an automatic overload circuit breaker.

Referring more particularly to the drawings, 1 is the switch base; 2 is a guide support preferably of non-magnetic metal carried by a recessed block or casing 3 secured to the base 1. The block 3 is preferably made of magnetic material for the purpose hereinafter stated. The guide support 2 carries pins 4—4 screwed therein which pass through openings 5—5 in a bar 6 to which are connected iron plungers 7—7 passing into coils 8—8, which coils are surrounded by iron sheaths 9—9 so as to be ironclad.

The plungers 7—7 are for part of their length hollow and contain springs 10—10 which normally tend to raise the plungers 7—7 and the bar 6 connected thereto. The bar 6 is provided with three switch bars 11—11—11. These switch bars are insu-

lated from the bar 6. They terminate respectively in leaf springs 12—12, which, when the bar 6 is depressed, engage corresponding circuit terminals 13—13. The springs 10—10 normally tend to separate the switch arms 11 from the circuit terminals 13, and thus open the circuit.

In order to hold the bar 6 depressed and yet permit of its being easily released, I attach to the guide support 2 an externally screw-threaded stationary abutment 14, having a recess 15 at its lower end. This abutment is preferably made in the form of a tube and on account of the screw thread connection may be adjusted relatively to the carrier 2 and when adjusted locked in position by the lock nut 16.

17 is a movable abutment opposed to the abutment 14 and provided with a circumferential recess 18. A spring 24 normally tends to move the abutment 17 so as to keep the recess 18 above the recess 15. The abutment 17 may be, however, moved down sufficiently so as to bring the two recesses opposite one another. Between the stationary abutment 14 and the movable abutment 17 is an intermediate member 19 having one or more recesses 20 and a ball detent 21 in each recess, each detent consisting preferably of a single ball. The length of each detent is greater than the thickness of the intermediate member 19 but is small enough so that the detent may be contained within either the combined recesses 15 and 20 or the combined recesses 18 and 20. The recesses 15 and 18 are each of a depth less than a radius of one of the balls of the detents. The abutment 17, or at least the lower part 22 thereof, is made of magnetic material. The extension 23 therefrom surrounding the spring 24 is made of non-magnetic material. Surrounding the lower end of the abutment 17 is a coil or solenoid 25 which when energized overcomes the spring 24 drawing down the abutment 17 when the switch is closed. The solenoid 25 being in the recess in the block 3 is iron-clad.

Fig. 8 shows the circuits for operating the device both on opening and closing from a distance. In this figure, 8—8 are the closing coils; 25 is the releasing coil; 26 is a source of current; 27 is a local circuit controller adapted to make engagement with contacts 28 and 29.

When a circuit is closed through the

contact 28, the coils 8—8 are energized to overcome the springs 10—10 and also the spring 24 and causing the bar 6 and the switch arms 7 to move downward until the blades 12 engage the contacts 13. When the parts reach this position, the recess 18 and the balls 21 have been brought into a line with the recess 15. The movable abutment 17 is then raised by its spring 24 causing the balls 21 to leave the recess 18 and partly enter the recess 15. The abutment 17 continues to rise, holding the balls 21 in their new position. The intermediate portion 19 is now locked to the stationary abutment 14 since it can not be raised on account of the engagement of the balls 21 with the cavity 15 of the stationary abutment 14, therefore the bar 6 and the switch arms 11 are held in depressed position. If, when the parts are in lowest position, the local circuit is closed through the contact 29, the coil 25 is energized. The spring 24 is a relatively weak spring and just strong enough to move the abutment 17. The solenoid 25 is correspondingly weak and when energized is simply strong enough to draw down the abutment 17 against the action of the spring 24 but not strong enough to resist the action of the springs 10—10. When the solenoid 25 is energized by closing the local circuit at the contact 29, the abutment 17 is pulled down until the lower shoulder of the recess 18 moves below the detent 19 so that the recess 18 comes opposite the balls 21. The intermediate member 19 then tends to rise on account of the action of the springs 10, and as it does so, the balls 21 are forced away from the shoulder at the upper edge of recess 15 and partially into the recess 18 so that the parts 17 and 14 are unlocked and the parts 17 and 19 are locked together. The springs 10 being sufficient to overcome the pull of the magnet 25 carry the intermediate member 19, together with the abutment 17, upward as far as the guide pins 4 will permit, thus separating the switch arms 11 from the terminals 13 and breaking the circuit.

Where it is desired to have the switch open automatically when the load reaches a certain point, the coil 25 is placed in series with the load as shown in Fig. 7. When the coil 25 is energized to the necessary extent, the movable abutment 17 is pulled down until the intermediate member 19 is released. The coils 8—8 may be placed in multiple with the translating devices or supplied with current from any suitable source of current.

A rod or projection 30 from the movable abutment 17 may be provided for moving the same manually and thus releasing the clutch, since when the clutch is closed, it will be released when the abutment is moved into releasing position by any means.

One advantage of this particular form of my invention is that I am able to make the terminals on the switch base coincide with the bus-bars on the switchboard, that is, the terminals 13 may be and preferably should be spaced according to the regulation spacing of the bus-bars. The switch is compact, the switch arms spanning the coils 8, which are located between the terminals 13—13. The parts are strong without being massive. The movement on closing and on releasing is without serious friction. The clutch on release responds quickly to a given current. The construction is simple and not liable to get out of order.

My invention permits of various modifications of form as will be apparent to those skilled in the art. The form shown, however, is in my opinion the preferable form.

What I claim is:

1. In a switch, the combination of a base, a terminal thereon, a switch arm adapted to engage said terminal and normally tending to withdraw from said terminal, a stationary abutment fixed relatively to said switch base, a movable abutment in proximity to said stationary abutment, and a movable intermediate member between said abutments carrying a detent, said abutments each having cavities facing the intermediate member and adapted to receive a part of the detent carried by said movable member and a solenoid adapted to act on said movable abutment.

2. In a switch, the combination of a base, a terminal thereon, a switch arm adapted to engage said terminal, means normally tending to withdraw said arm from said terminal, a stationary abutment fixed relatively to said switch base, a movable abutment in proximity to said stationary abutment, a movable intermediate member between said abutments carrying a detent, said abutments each having cavities facing the intermediate member and adapted to receive a part of the detent carried by said movable member, and a solenoid adapted to act on said movable abutment, and a spring acting upon said movable abutment in opposition to said solenoid.

3. In a switch, the combination of a base, a terminal thereon, a switch arm adapted to engage said terminal, means normally tending to withdraw said arm from said terminal, a stationary abutment fixed relatively to said switch base, a movable abutment in proximity to said stationary abutment, a movable intermediate member between said abutments carrying a detent, said abutments each having cavities facing the intermediate member and adapted to receive a part of the detent carried by said movable member, and a solenoid adapted to act on said movable abutment, a spring acting upon said movable abutment in opposition

to said solenoid, and a solenoid tending when energized to move said switch arm into engagement with said terminals.

4. In a switch, the combination of a base, a plurality of pairs of terminals thereon, a switch arm for each pair of terminals, a universal bar connecting said switch arms, a guide carrier having guides for said bar, a clutch having a stationary abutment carried by said guide carrier, a movable abutment, and an intermediate member, said intermediate member being carried by said bar and carrying a detent adapted to secure the intermediate member to said abutments alternately, and means tending to separate said switch arms from said contacts.

5. In a switch, the combination of a base, a plurality of pairs of terminals thereon, a switch arm for each pair of terminals, a universal bar connecting said switch arms, and normally tending to move away from said base, so as to separate said switch arms from said terminals, electromagnetic means for moving said switch arms into engagement with said terminals, and located between said universal bar and said base, and a detent for holding said switch arms in engagement with said terminals, said switch arms having a rectilineal movement.

6. In a switch, the combination of a base, a pair of terminals thereon, a U-shaped switch arm having on its two branches contact surfaces adapted to engage said terminals, respectively, a spring tending to withdraw said arm from said terminals, a solenoid located within the U-shaped switch arm and adapted to move said switch arm into engagement with said terminals, and a clutch adapted to hold said switch arm in engagement with said terminals.

7. In a switch, the combination of a base, a plurality of pairs of terminals thereon, a plurality of U-shaped switch arms each having on its two branches contact surfaces adapted to engage said terminals, respectively, a bar mechanically connecting said switch arms, springs tending to withdraw said switch arms from said terminals, a pair of solenoids between said bar and said base and located within the U-shaped switch arms, and adapted when energized to move said bar toward said base so as to cause said arms to engage said terminals, and a clutch adapted to hold said switch arms in engagement with said terminals.

8. In a switch, the combination of a base, terminals thereon, movable contacts adapted to engage said terminals, a pair of closing solenoids adapted when energized to cause said contacts to engage said terminals, springs tending to withdraw said contacts from said terminals, a releasing solenoid located between said closing solenoids, a clutch in line with said releasing solenoid consisting of a stationary abutment, a mov-

able abutment acted on by said closing solenoid, both abutments containing recesses, an intermediate member, and a detent carried thereby adapted to enter said recesses alternately.

9. In a switch, the combination of a base, a terminal thereon, a switch arm adapted to engage said terminal and normally tending to withdraw from said terminal two opposed abutment members, and an intermediate member, one of said abutment members being independently movable relatively to said switch arm and to said base, another of said three members being stationary relatively to said base, and the third being connected to said switch arm, so as to move therewith, a detent carried by said intermediate member, said abutment members having recesses for partially receiving said detent, said independently movable abutment member tending to move in one direction, and a solenoid acting when energized to move said independently movable member in the opposite direction, one of said movements of said independently movable abutment member being such as to bring its recess into line with said detent when said detent is partially within the recess in said other abutment member.

10. In a switch, the combination of a base, a terminal thereon, a switch arm adapted to engage said terminal and normally tending to withdraw from said terminal two opposed abutment members, and an intermediate member, one of said abutment members being independently movable relatively to said switch arm and to said base, another of said three members being stationary relatively to said base, and the third being connected to said switch arm, so as to move therewith, a detent carried by said intermediate member, said abutment members having recesses for partially receiving said detent, a spring acting on said independently movable abutment member and tending to move it so as to bring its recess out of alignment with said detent when said recess and detent are in line with the recess in the other abutment, and a solenoid acting when energized to move said independently movable abutment member in the opposite direction so as to bring its recess into alignment with said detent.

11. In a switch, the combination of a base, a terminal thereon, a switch arm adapted to engage said terminal and normally tending to withdraw from said terminal, two opposed abutment members and an intermediate member, one of said abutment members being independently movable relatively to said switch arm and to said base, another of said three members being stationary relatively to said base, and the third being connected to said switch arm so as to move therewith, a detent carried by said inter-

mediate member, said abutment members having shoulders for engaging parts of said detent, said independently movable abutment member tending to move in one direction, and a solenoid acting when energized to move said independently movable abutment member in the opposite direction, one of said movements of said independently movable abutment member being such as to move its shoulder away from said detent 10 when said detent is in engagement with the shoulder of said other abutment.

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