

L. A. LAPLANT.
AUTOMATIC CIRCUIT CLOSER.
APPLICATION FILED APR. 8, 1910.

994,170.

Patented June 6, 1911.

3 SHEETS—SHEET 1.

Fig. 1.

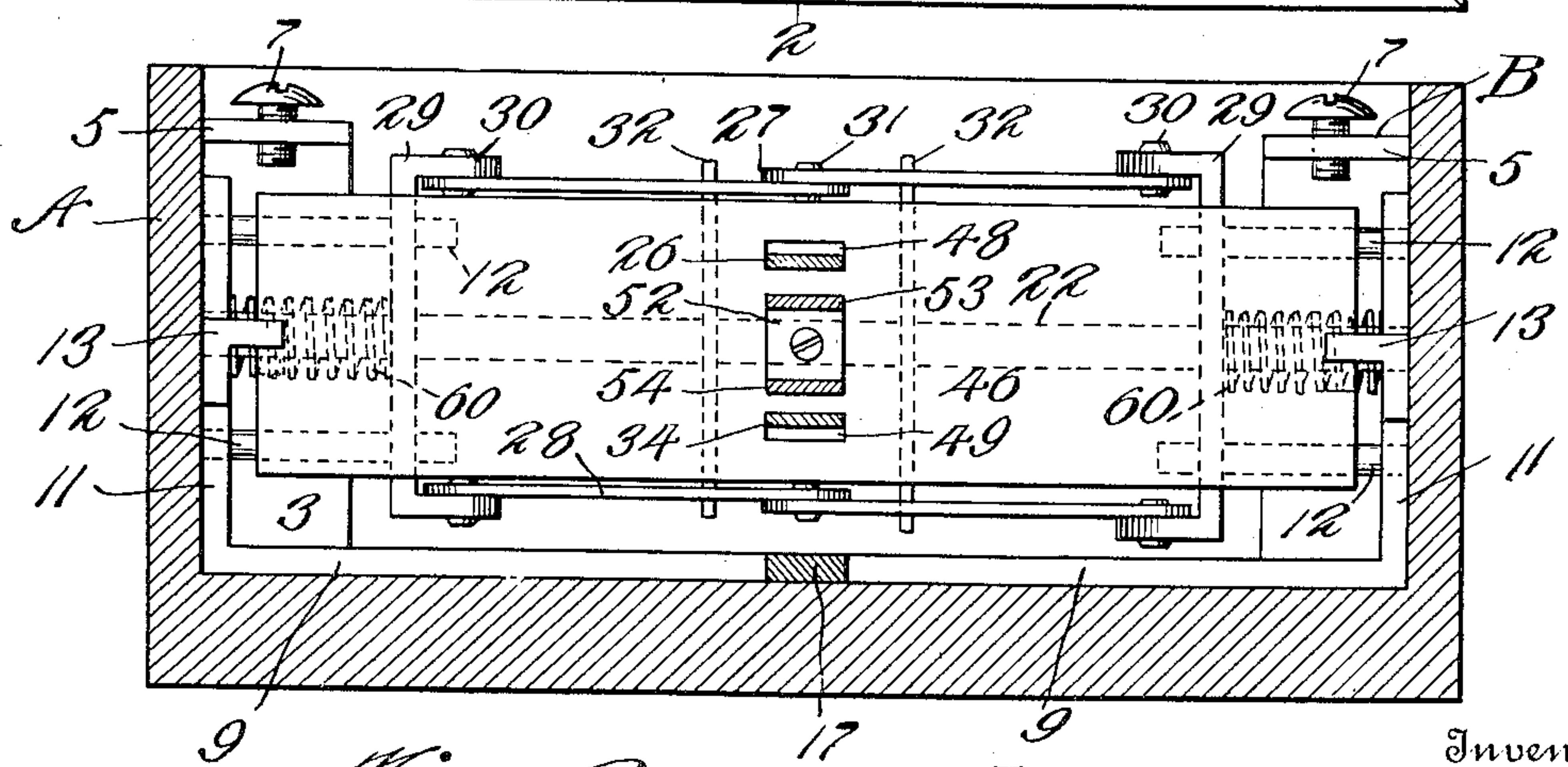
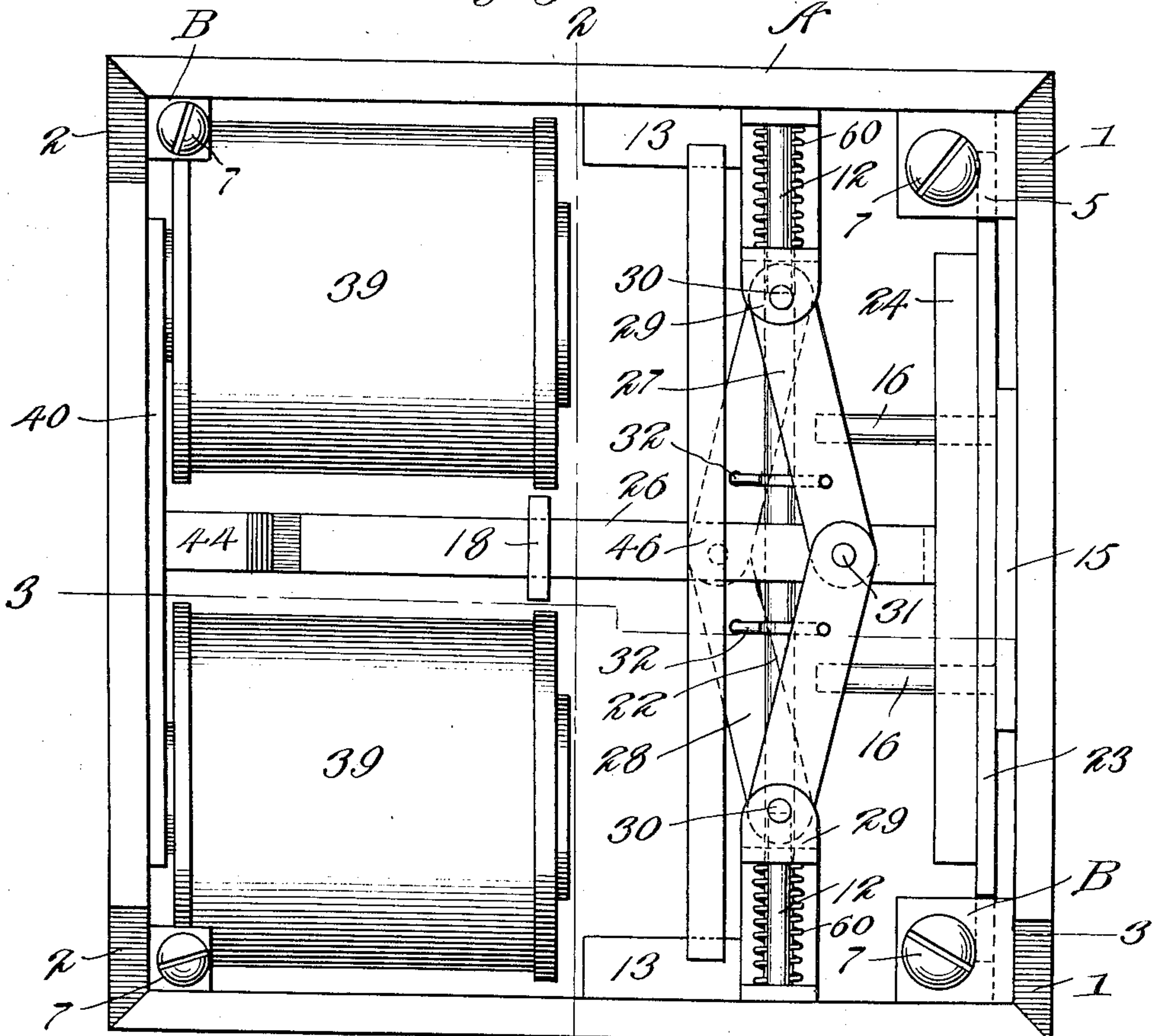


Fig. 2.

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Witnesses

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3 SHEETS—SHEET 2.

Fig. 3.

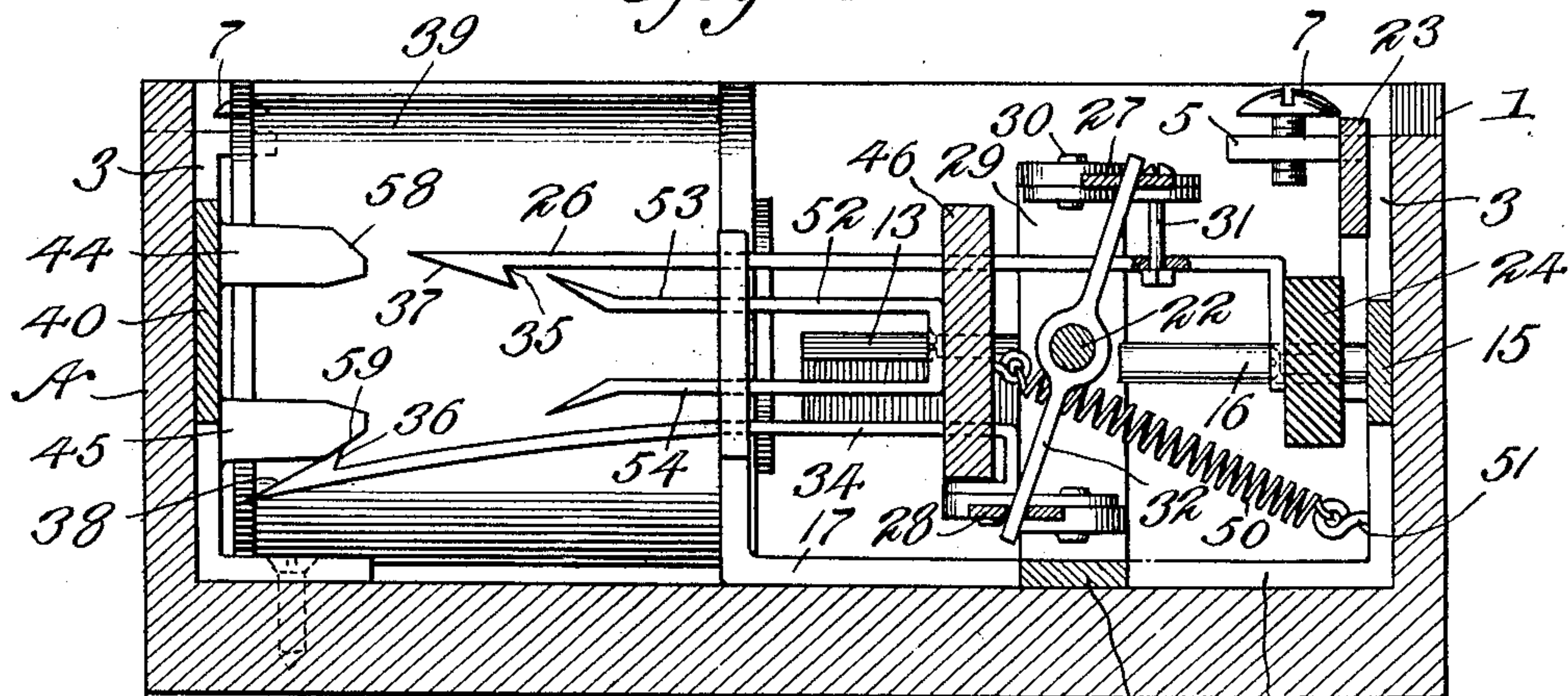


Fig. 4.

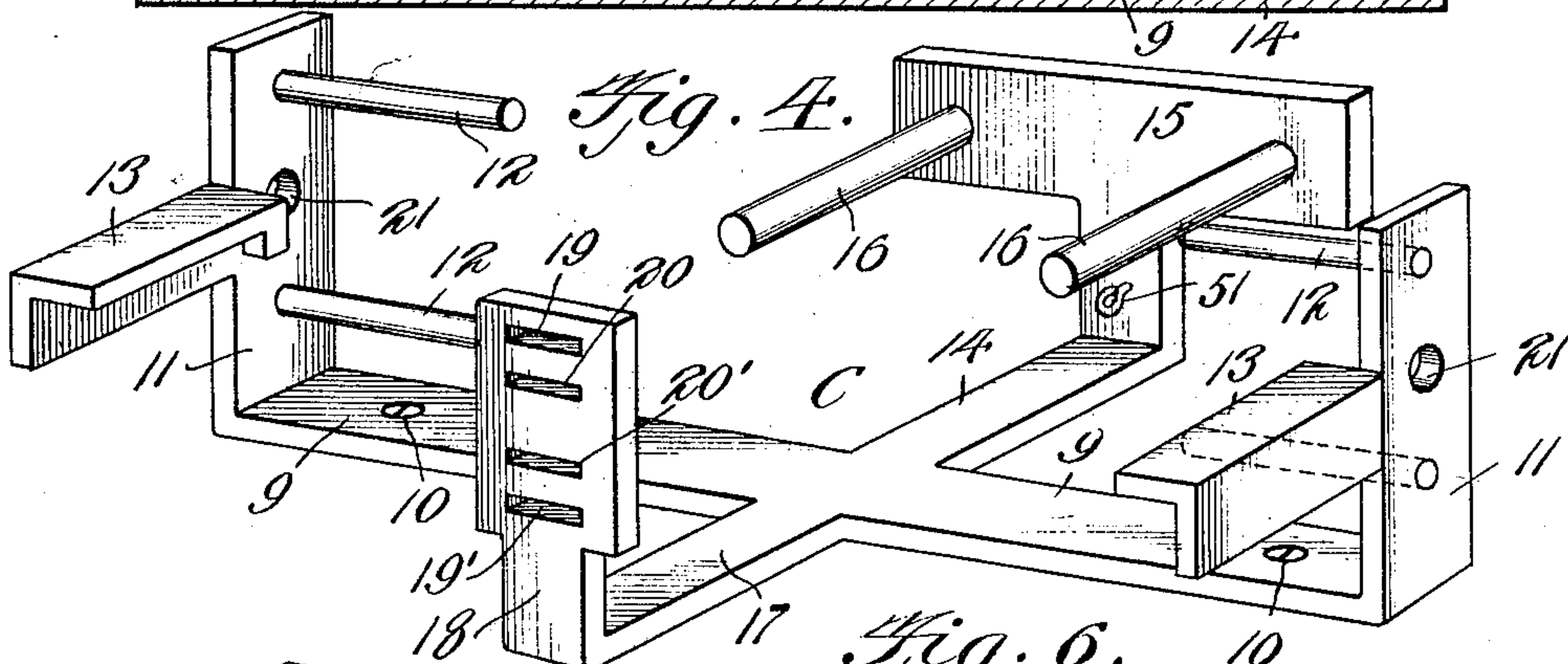


Fig. 6.

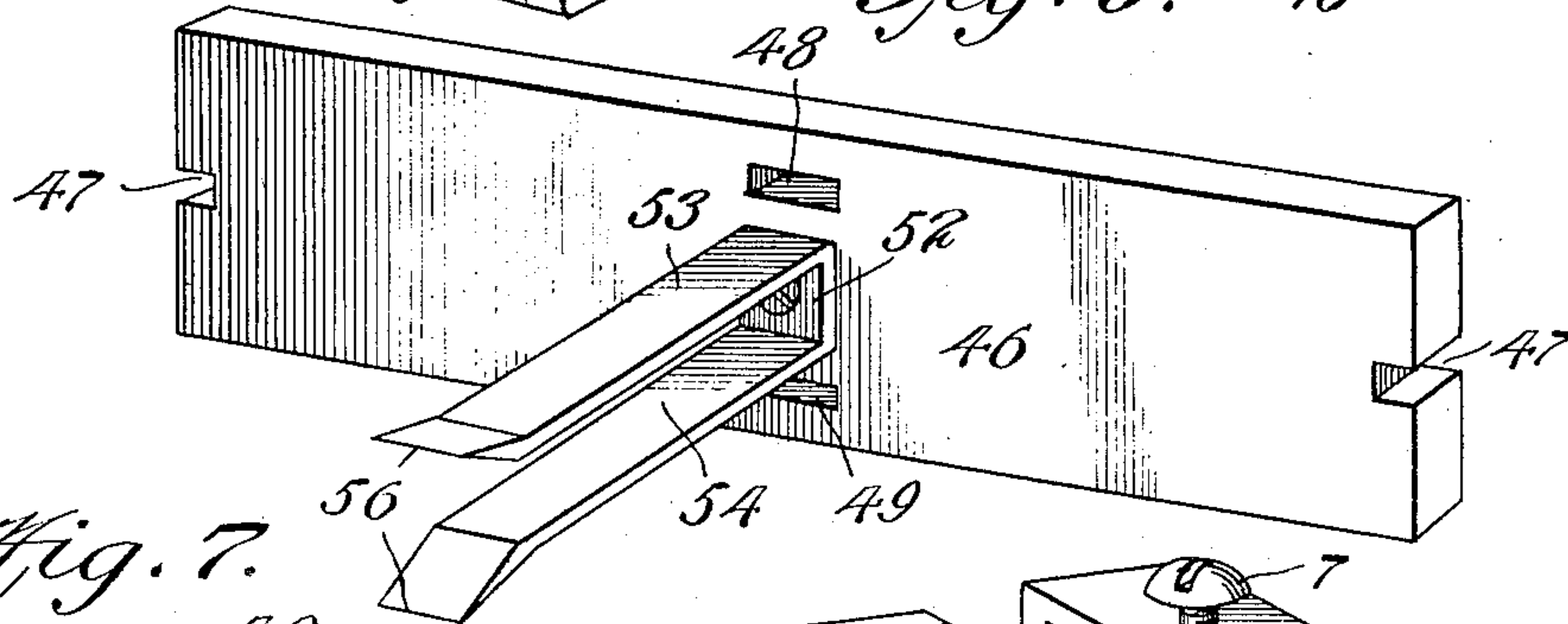


Fig. 7.

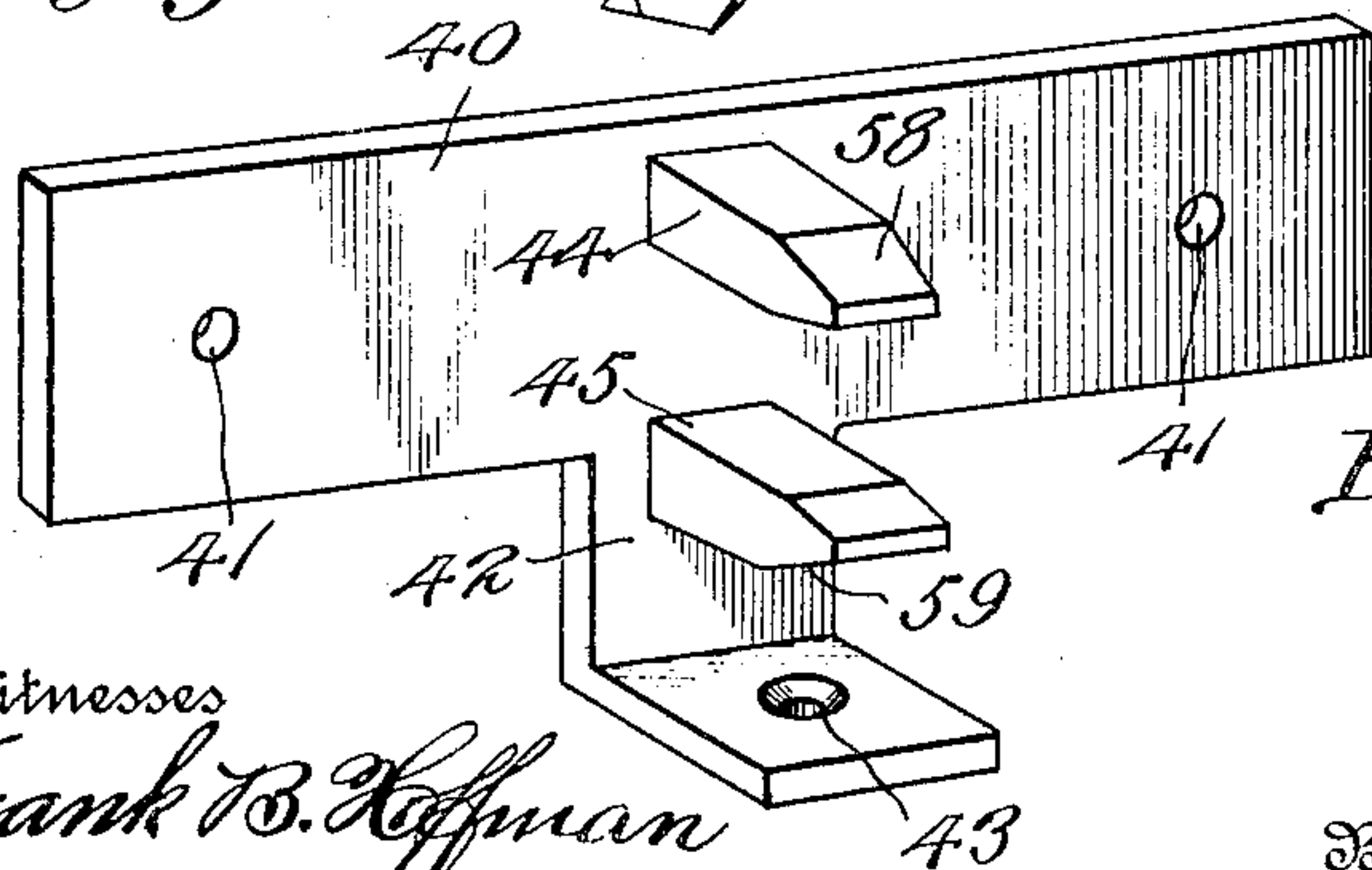
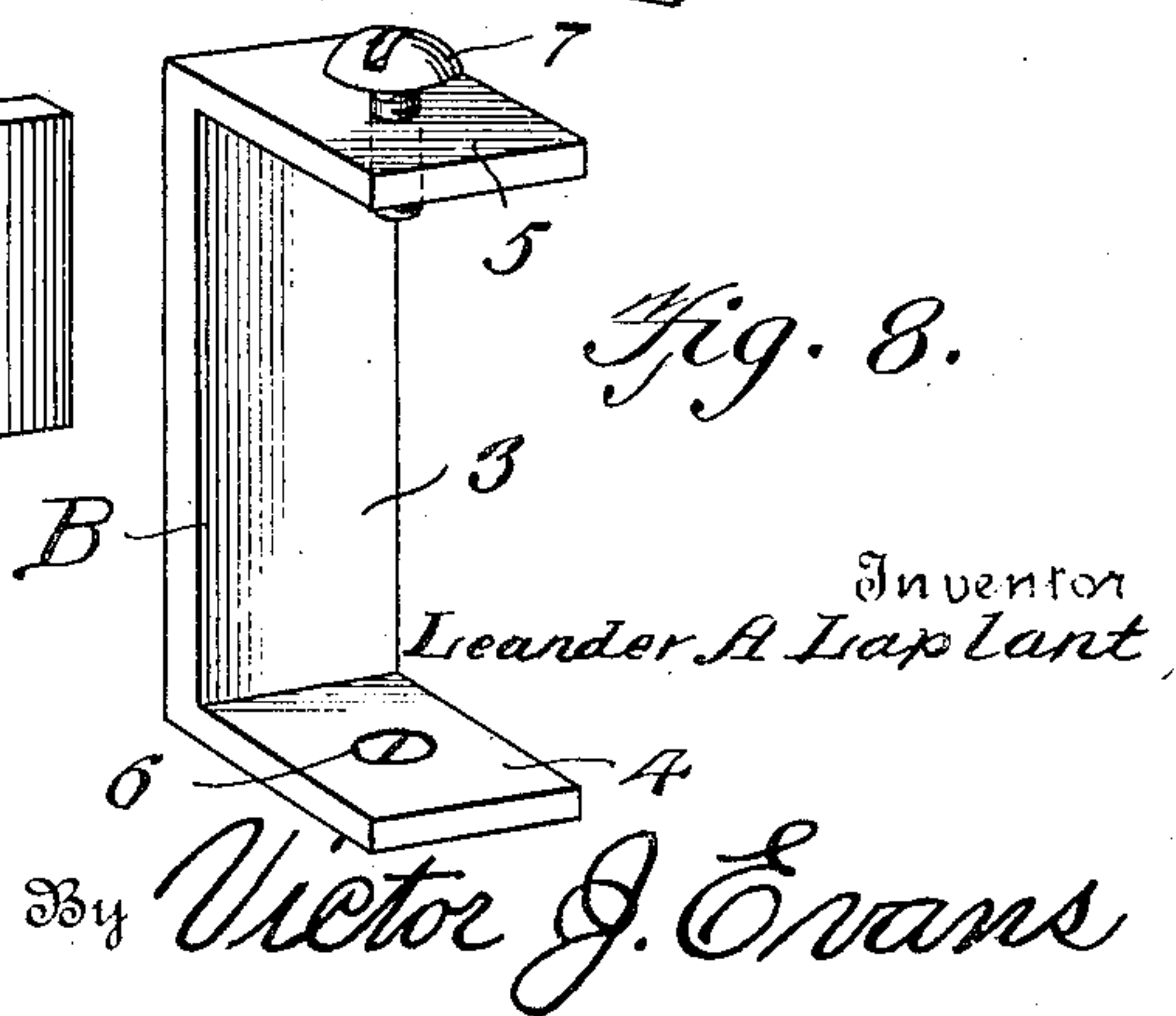


Fig. 8.



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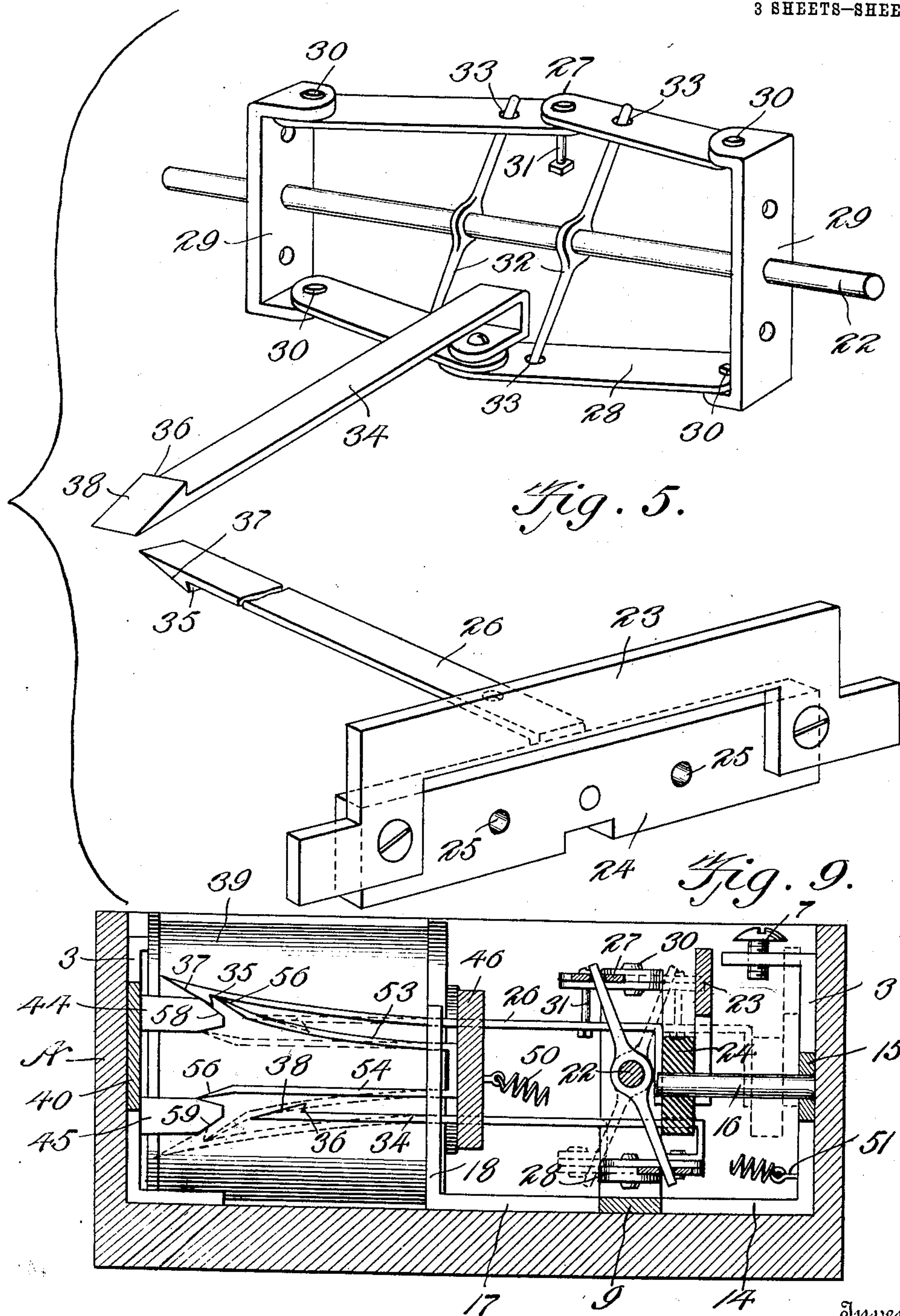
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

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AUTOMATIC CIRCUIT-CLOSER.

994,170.

Specification of Letters Patent.

Patented June 6, 1911.

Application filed April 8, 1910. Serial No. 554,205.

To all whom it may concern:

Be it known that I, LEANDER A. LAPLANT, a citizen of the United States, residing at Plattsburg, in the county of Clinton and State of New York, have invented new and useful Improvements in Automatic Circuit-Closers, of which the following is a specification.

This invention relates to controlling switches designed for use in lighting or power circuits of any voltage, and is of that type which is opened and closed by electrical means included on a low voltage system.

The invention has for one of its objects to improve the simple construction and operation of an apparatus of this character so that it shall be comparatively simple and inexpensive to manufacture, reliable and efficient in use and of such design as to afford a maximum safety from shocks and fire.

Another object of the invention is the provision of a quick make and break switch having a novel toggle mechanism for moving the bridging contact of the switch to and from open and closed position.

A further object is the provision of a novel and efficient electromagnetically actuated means operating through the toggle mechanism to throw the bridging contact member.

An additional object is to provide a novel frame-work for supporting the various parts of the apparatus within a porcelain or other outlet box or casing.

With these objects in view, and others as will appear as the description proceeds, the invention comprises various novel features of construction and arrangement of parts which will be more fully hereinafter described, and set forth with particularity in the claims appended hereto.

In the accompanying drawings which illustrate one embodiment of the invention: Figure 1 is a plan view of the open side of the box showing the internal mechanism, the switch being closed. Fig. 2 is a vertical sectional view on the line 2—2 of Fig. 1. Fig. 3 is a vertical sectional view on the line 3—3 of Fig. 1. Fig. 4 is a perspective view of the supporting frame of the switch. Fig. 5 is a perspective view of the toggle mechanism and bridging contact. Fig. 6 is a perspective view of the armature on the electro-magnets. Fig. 7 is a perspective

view of the electro-magnet supports. Fig. 8 is a perspective view of one of the binding posts. Fig. 9 is a view similar to Fig. 3, showing the moving parts of the switch in the opposite extreme or open-circuit position.

Similar reference characters are employed to designate corresponding parts throughout the several views.

The switch in the present instance is designed more especially for use in controlling a circuit from a remote point, but it is to be understood that it is not necessarily limited to this use. Furthermore, the switch can be designed for circuits of any voltage where it is desired to provide an automatic control for the same.

Referring to the drawings, A designates a porcelain or other insulated box or casing in which the switch proper is housed, and this casing is provided with notches or recesses 1 at two of its corners for the main wires of the high voltage circuit to be controlled, and is also provided at the other corners with notches or recesses 2 for the terminal wires of the low voltage controlling circuit, there being binding posts B, as shown in Fig. 8, secured in the casing or box adjacent the corners thereof. Each binding post consists of a metal piece 3 having an apertured base portion 4 and a laterally extending arm 5 and through the aperture of the base portion passes a screw 6 for securing the binding post to the bottom of the casing, and in the arm 5 is a threaded screw 7 for clamping the wire thereto. The binding posts of the high voltage circuit will, of course, be of greater current capacity than those for the low voltage circuit.

The switch mechanism is a self-contained structure, and the various parts thereof are mounted in a cruciform supporting frame C, as seen in Fig. 4, the arms 9 of which are secured to the bottom of the casing or box A by screws 10. Upon loosening these screws the frame with its attached parts is removable as a unit. The arms 9 are provided with upwardly extending terminal members 11 which have inwardly extending spaced rod-like guides 12 for supporting parts of the toggle mechanism, and projecting laterally from the members 11 are horizontal guides 13 on which the armature of

the electro-magnet slides. The arm 14 of the frame C has an upwardly extending T-shaped member 15 that is provided with spaced inwardly extending horizontal rod-like guides 16 that form supports for the bridging contact of the switch. The remaining arm 17 on the frame C has an upstanding member 18 provided with slots 19, 19' and 20, 20'. The members 11 are provided with apertures 21 at points centrally between the guides 12 to receive the ends of a horizontal rod 22 that extends entirely across the frame to support parts of the toggle mechanism.

When the frame C is positioned in the box or casing A, the arm 14 will be disposed at the side where the high voltage binding posts are located since the bridging contact or bar 23 is arranged this side of the frame. This bar 23 has its central portion arched and the extremities are adapted to engage the binding posts B. On the bar 23 is secured a strip of insulating material 24 that has openings 25 through which loosely pass the rod-like guides 16 to thus slidably support the bridging contact 23. Secured to the insulating piece 24 is a horizontally disposed member 26 arranged at right angles to the contact 23 and between the guides 16 and this member 26 connects the bridging contact with the toggle mechanism. This toggle mechanism consists of a pair of upper links 27 and a pair of lower links 28, and the outer ends of both sets of links are connected with vertically disposed yokes 29 which slide back and forth on the rod-like guides 12 of the supporting frame C and on the shaft 22, the links being hingedly connected at 30 with the said yokes. The inner ends of the upper links are hingedly connected together by a pin 31 which passes through the member 26 of the bridging contact. Two levers 32 loosely fulcrumed on the shaft 22 connect the corresponding links 27 and 28 together so that the said toggles will operate simultaneously in opposite directions, and the said levers are connected with the links by the ends of the levers extending freely through the openings 33 in the links. The member 26 of the bridging contact is continued beyond the toggle links 27 and is slidable through the upper slot 19 of the member 18, and connected with the links 28 is a member 34 disposed parallel with the member 26 and slidable through the lower slot 19' of the said member 18. The free ends of the members 26 and 34 are provided with shoulders 35 and 36, and beyond the shoulders the said members are provided with beveled faces 37 and 38 for a purpose hereinafter to be explained.

The electro-magnets 39 are disposed at the side of the toggle mechanism opposite from the bridging contact 23 and they are secured to a yoke strip or bar 40 by screws

or other fastenings passing through the opening 41, Fig. 7, and screwed into the cores of the electro-magnets, and on the yoke piece 40 is a depending L-shaped member 42 which is secured to the bottom of the casing A by a screw or other fastening 43. On the yoke 40 are formed abutments 44 and 45 disposed between the electro-magnets and arranged in the path of the members 26 and 34 so as to spring the latter out of normal position when they are engaged with the abutments in the operation of the switch.

The armature 46 may be made in the form of a solid or laminated bar and the ends are recessed as at 47 so as to receive the guides 13 of the frame C, the armature being slidable back and forth on the guides by energizing and deenergizing the magnets. The armature has slots 48 and 49 through which the members 26 and 34 of the toggle mechanism slide. The armature is normally held away from the polar faces of the electro-magnets by means of a spring 50 connected with the center of the armature and fastened to a hook 51 on the member 15 of the frame C. On the armature 46 is secured a horizontally disposed U-shaped device 52 having spring members 53 and 54, the free extremities of which are slightly deflected outwardly and formed into knife edges 56 to engage the shoulders 35 and 36 of the members 26 and 34.

Springs are employed in connection with the toggle mechanism to cause the last part of the movement to be more rapid than the first part. These springs, as shown in Figs. 1 and 2, are disposed on the ends of the shaft or rod 22 and being of the helical compression type they are confined between the arms 11 of the supporting frame C and the yokes or slides 29 to which the toggle links are connected. As the slides 29 move outwardly, as the toggle links straighten, the springs are compressed and as soon as the central pivots or joints of the toggle links pass the dead centers the springs immediately expand so that the toggle links are suddenly collapsed to cause the quick movement of the bridging contact. The springs 60 are compressed during the first part of the movement of the armature, under the attraction of the electro-magnets, the springs thus acting in opposition to the latter. As soon as the toggle links pass their dead centers, the springs will act in conjunction with the electro-magnets, so that the combined forces will impart a sudden movement to the bridging contact.

In describing the operation of the switch, it will be assumed that the parts are in the position shown in Fig. 3, which represents the bridging contact in closed circuit position to permit current to flow through the circuit controlled by the switch. It will be understood that the electro-magnets 39 will

be connected in an auxiliary or low potential circuit that will have a switch located in a remote power house from which the engineer can open and close the main circuit by merely closing and opening the manual switch in the power house for energizing the electro-magnets 39. When the electro-magnets 39 are energized, the armature 46 will be attracted or moved to the left. During the first part of this movement, the spring 53 of the armature will engage the shoulder 35 of the upper toggle member 26 and cause the said member to move with the armature. During this movement, the springs 50 and 60 will be placed under tension and the toggle links will be shifted until the parts are in the full line position, shown in Fig. 9. As stated before, the last part of the movement of the armature and parts moved thereby will take place suddenly owing to the expansion of the spring 60 when the toggle links pass their dead centers. It will be noted that the upper member 26 strikes the beveled surface 58 of the upper abutment 44 and the member is thereby deflected from its normal position. The lower toggle member 34 moves in the opposite direction from the upper member 25, but is prevented from engaging the lower spring 54 of the armature, since the abutment 45 will hold the member 34 depressed by the bevel 38 sliding on the bevel 59 of the abutment, until the free end of the spring 54 has passed the shoulder 36 of the member 34. In other words, when either member 26 or 34 of the toggle mechanism moves with the armature by the engagement of one spring thereof with one of said members, the other member will be prevented from engaging the other spring of the armature as it passes. The switch having been opened, it is merely necessary for the engineer at the power house to cut out of circuit the electro-magnets 39. The electro-magnets thus become deenergized and allow the armature to return to normal position by the contraction of the spring 50. Since the armature and its springs are free and independent from the toggle mechanism, the latter will be unaffected when the armature is moved to normal position by the spring 50. When it is desired to again close the main circuit, the engineer at the power house again closes the secondary circuits to energize the electro-magnets 39. By so doing, the lower spring 54 of the armature comes into play by engaging the lower toggle mechanism member 34 to shift the parts to the position shown by dotted lines, Fig. 9, the bridging contact being quickly thrown to closed-circuit position. Upon again opening the secondary circuit, the electro-magnets 39 will be deenergized to allow the armature to return from the position shown in Fig. 9 to that shown in Fig. 3. It will thus be seen that the electro-magnets must be en-

energized and deenergized each time the switch is either opened or closed. In other words, on the alternate strokes of the armature in the same direction, the switch opens and closes.

From the foregoing description taken in connection with the accompanying drawings, the advantages of the construction and of the method of operation will be readily apparent to those skilled in the art to which the invention relates, and while I have described the apparatus which I now consider to be the best embodiment thereof, I desire to have it understood that the apparatus shown is merely illustrative and that such changes may be made when desired as are within the scope of the claims.

What I claim as new and desire to secure by Letters Patent is:

1. The combination of a switch including a movable element, a toggle mechanism to which the element is connected, an electrically actuated device movable in one direction to operate through the mechanism for moving the element to open or closed position and movable in the opposite direction independently of the mechanism to open and close the switch by successive movements of the device.

2. The combination of a switch including a movable element, a toggle mechanism connected with the element and including separate members, an armature, means on the armature for engaging one member during one movement of the armature to open the switch and for engaging the other member during the next movement of the armature in the same direction to close the switch, and an electro-magnet for operating the armature.

3. The combination of a switch including a movable element, an operating mechanism therefor including separate members, a reciprocatory device engaging one member to throw the switch open when the device moves on one stroke and engaging the other member during the next similar stroke for throwing the switch closed, and means for moving the said device more rapidly during the last part of its stroke.

4. The combination of a switch including a movable element, a toggle mechanism connected therewith, separate members connected with the toggle mechanism and operating in opposite directions, and means for successively engaging the members to move the element to open and closed positions.

5. The combination of a switch including a movable element, a mechanism including oppositely acting toggle links, a member connected with each set of links, one of the members being connected with the said element, and a reciprocatory device arranged to engage on one stroke one of the members for opening the switch and on the next simi-

lar stroke to engage the other member for closing the switch.

6. The combination of a switch including a movable element, a mechanism including oppositely acting toggle links, a member connected with each set of links, one of the members being connected with the said element, and an electrically operated device movable between the members and adapted during one stroke to engage one member so as to move the switch element open, and on the next similar stroke to engage the other member to move the switch element closed.

7. The combination of a switch including a movable element, separate sets of toggle links operatively connected to move simultaneously in opposite directions, a connection between the toggle links and element, and a single electrical means operating through the toggle links to move the element to open position upon energizing and de-energizing the said means and to move the element to closed position upon again energizing and deenergizing the said element.

8. The combination of a switch including a movable element, separate pairs of oppositely acting toggle links operatively connected together, means for connecting the toggle links with the said element, separate members connected respectively with the said pairs of links, a reciprocatory device, and separate members on the device one to engage one of the first mentioned members during one stroke of the device and the other to engage the other first mentioned member during the next similar stroke of the device for moving the switch element to open or closed position.

9. A switch including a movable element, an operating mechanism connected therewith and including members movable in opposite directions, a device mounted for reciprocation and including separate means to successively engage the members on the successive strokes of the device to move the element to open or closed position, and actuating means for the said device, said actuating means including springs adapted to be placed under tension during the first part of the movement of the said means and to coact with the latter during the final part of the movement.

10. The combination of a switch including a movable element, a mechanism for actuating the same including oppositely acting members each having a shoulder, a device having a spring for engaging the shoulder of each member to actuate the said mechanism, and means for preventing one spring from engaging its companion member while the other spring is moving its companion member.

11. The combination of a switch includ-

ing a movable element, operating means therefor including spaced resilient members movable simultaneously in opposite directions, a device having means movable between the members for engaging the latter one at a time to throw the switch element to open or closed position and means for preventing the first mentioned means from engaging one of the members during the rearward movement thereof while the means is moving the other member forwardly.

12. In a switch operating device, the combination of oppositely actuated members operatively connected with the movable element of the switch, an armature, an electromagnet for operating the armature, a pair of members on the armature arranged one to engage one of the first mentioned members during one stroke of the armature and the other to engage the other first mentioned members during the next stroke of the armature in the same direction, and stationary means separate from the members for permitting one member of the armature to pass the adjacent member of the switch operating device while the other armature member is engaged with and moves the other member of the said device.

13. A switch operating mechanism including oppositely acting spaced members, each member having a beveled free extremity and a shoulder adjacent thereto, a reciprocatory device including springs movable together and arranged to engage the shoulders of the said members, electrical means for actuating the said device, and separate abutments with which the beveled ends of the members engage to hold each member out of the path of the adjacent spring of the device while the other spring is engaged with and moving the other member.

14. A switch operating mechanism including oppositely acting members, an armature, springs on the armature to each engage one of the members on the alternate stroke of the armature, an electro-magnet for moving the armature in a direction to actuate the members, and means for moving the armature in the opposite direction while the members remain idle.

15. In a switch operating mechanism, the combination of separate pairs of toggle links operatively connected with the movable element of the switch, means for connecting the links together to operate simultaneously in opposite directions, supports for the links mounted to move toward and away from each other during the movement of the links, and electrically operated means for alternately throwing the links in opposite directions.

16. In a switch throwing mechanism, the combination of separate sets of toggle links, means for connecting the links to the movable element of the switch, yokes to which

the outer ends of both sets of links are pivotally connected, members connecting the corresponding links of both sets together for simultaneous movement in opposite directions, and actuating means for the links.

17. In a switch throwing mechanism, the combination of separate sets of toggle links, means for connecting the links to the movable element of the switch, yokes to which the outer ends of both sets of links are pivotally connected, members connecting the corresponding links of both sets together for simultaneous movement in opposite directions, and an electro-magnetically operated armature for alternately reversing the position of the links to open and close the switch.

18. In a switch operating mechanism, the combination of separate sets of toggle links, yokes to which the links are pivotally connected, supporting means on which the yokes move back and forth, a member connected with each set of links, a reciprocatory device arranged to engage during one stroke one of the members while moving freely past the other member and vice versa on the next stroke, and means for connecting the corresponding links of both sets together for simultaneous movement in opposite directions.

19. A switch operating mechanism comprising a supporting frame, guides thereon, a shaft on the frame, yokes movable back and forth on the guides and shaft, sets of toggle links connected with the yokes and disposed at opposite sides of the shaft, a rocking element fulcrumed on the shaft and loosely connected with the corresponding links of both sets, means for connecting the links with the movable element of the switch, and means arranged to operate alternately first on one set of the links and then on the other set to throw the switch element open or closed.

20. A switch operating mechanism including oppositely acting members operatively connected with the movable element of the switch, abutments with which each member engages and is sprung to one side, and a device alternately engaging the members to operate the same, the said device being movable past the laterally sprung member without engaging the same.

21. In a switch operating mechanism, the combination of oppositely acting members operatively connected with the movable element of the switch, an armature through which the members extend, said members and armature being independently movable, a pair of springs on the armature arranged to respectively engage the members alternately, a slotted device through which the members and springs slide, and spaced abutments arranged in the path of the respective members to spring the same out of their nor-

mal path for permitting each spring to pass the adjacent member while such spring and member are moving in opposite directions.

22. In a switch, the combination of a movable element through which circuits pass, a toggle mechanism operatively connected with the element, electro-magnets, an armature disposed between the electro-magnets and toggle mechanism, and means for operatively connecting the armature with the mechanism to open and close the switch and permitting the armature to return to normal position after the switch is either opened or closed.

23. In a switch, the combination of a supporting frame, a contact element movably mounted thereon, a toggle mechanism mounted on the frame, an armature mounted on the frame, means on the armature for engaging the toggle mechanism to move the switch contact element to open or closed positions, and electro-magnets supported independently of the frame for actuating the armature.

24. In a switch, the combination of a supporting frame, a contact element movably mounted thereon, a toggle mechanism mounted on the frame, an armature mounted on the frame, means on the armature for engaging the toggle mechanism to move the switch contact element to open and closed positions, electro-magnets supported independently of the frame for actuating the armature, and an inclosing case in which the electro-magnets and frame with its attached parts are mounted.

25. In a switch, the combination of a supporting frame, a contact element movably mounted thereon, a toggle mechanism mounted on the frame, an armature mounted on the frame, means on the armature for engaging the toggle mechanism to move the switch contact element to open and closed position, electro-magnets supported independently of the frame for actuating the armature, an inclosing case in which the electro-magnets and frame with its attached parts are mounted, combined binding posts and contacts secured in the casing in such position as to be engaged by said movable contact, and binding posts in the casing for connecting the magnets in a circuit.

26. In a switch, the combination of a frame, a toggle mechanism mounted thereon, an armature movably supported at opposite ends on the frame, a bridging contact on the frame and operatively connected with the mechanism, and an electro-magnet for operating the armature.

27. In a switch mechanism of the class described, a casing, a frame removably mounted therein, a toggle mechanism mounted on the frame, a bridging contact mounted on the frame and connected with the toggle mechanism and disposed at one side

thereof, an armature mounted on the frame and disposed at the opposite side of the mechanism, electro-magnets in the casing in coöperative relation with the armature, and
5 means between the armature and mechanism for actuating the latter.

28. In a switch, the combination of a toggle mechanism, a bridging contact actuated by the mechanism, an armature, electro-magnets for the armature, a yoke for the
10 magnets, separate devices on the armature alternately engaging the mechanism for reversely actuating the same, and means on the said yoke for holding one device out of
15 operative relation to the mechanism while the other device is actuating the mechanism.

29. In a switch, the combination of a movable contact element, an electro-magnet, a toggle mechanism between the magnet and
20 element, an armature attracted by the electro-magnet to operate through the said mechanism to move the element to open circuit position during one energization of the magnets and to closed circuit position
25 during the next energization of the magnets, and means operating on the toggle mechanism to accelerate the last portion of the movement of the contact element.

30. A switch comprising a movable contact element, a toggle mechanism connected with the element, an armature, means between the armature and toggle mechanism for reversing the latter by the succeeding

similar stroke of the armature, an electro-magnet for actuating the armature, and
35 springs first placed under tension during the initial part of the movement of the toggle mechanism and operating to cause a quick movement of the mechanism.

31. In a quick make and break switch, a
40 toggle mechanism comprising oppositely moving separate sets of links, yokes to which the links are connected, springs pressing on the yokes and arranged to be compressed while the links are straightening
45 and to expand after the links pass their dead centers to effect a quick movement, operating means for the toggle mechanism, and a switch element connected with the toggle
50 mechanism.

32. In a switch, a cruciform supporting frame, upwardly extending members on two oppositely disposed arms on the frame, armature guides on the members, toggle mechanism supporting means on each member, a
55 member on one arm having means for supporting a bridging contact, and a member on the remaining arm provided with spaced slots.

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

LEANDER A. LAPLANT.

Witnesses:

NAPOLÉON A. GALLAUT,
BESSIE MCKEAN.