

**No. 656,571.**

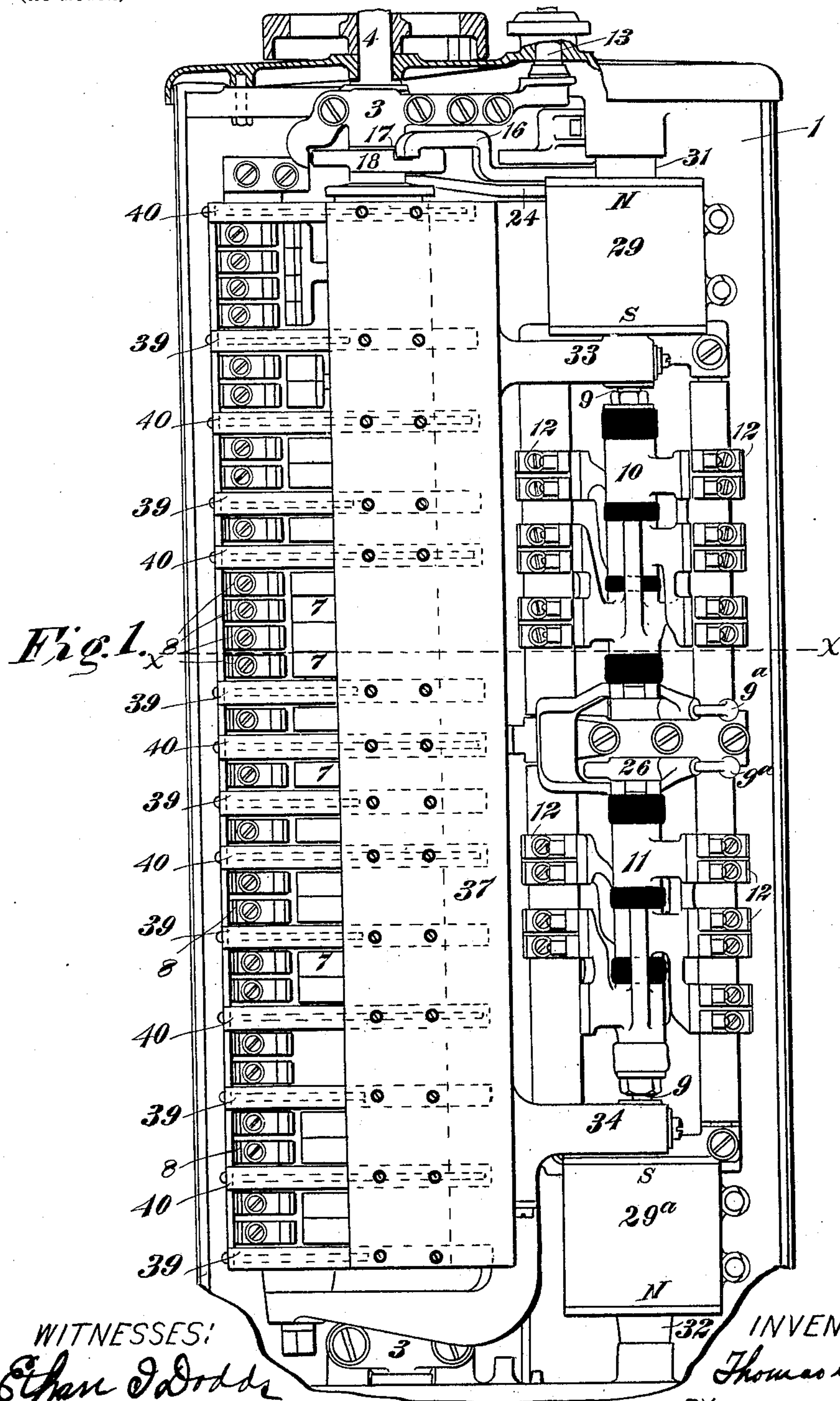
Patented Aug. 21, 1900.

**T. S. PERKINS.**  
**CONTROLLER FOR ELECTRIC MOTORS.**

(Application filed Jan. 13, 1900.)

(No Model.)

3 Sheets—Sheet 1.



WITNESSES:

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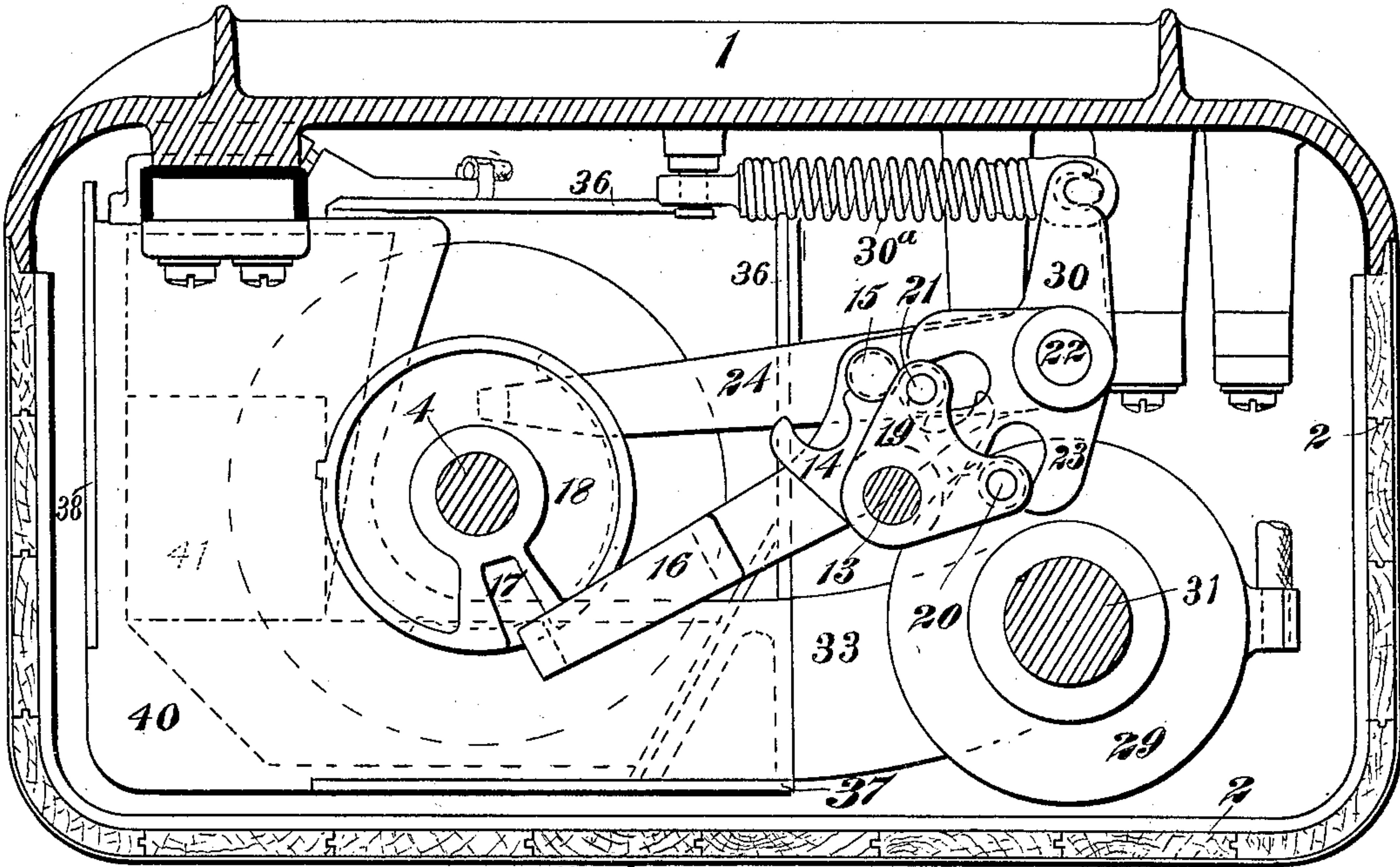


Fig. 2.

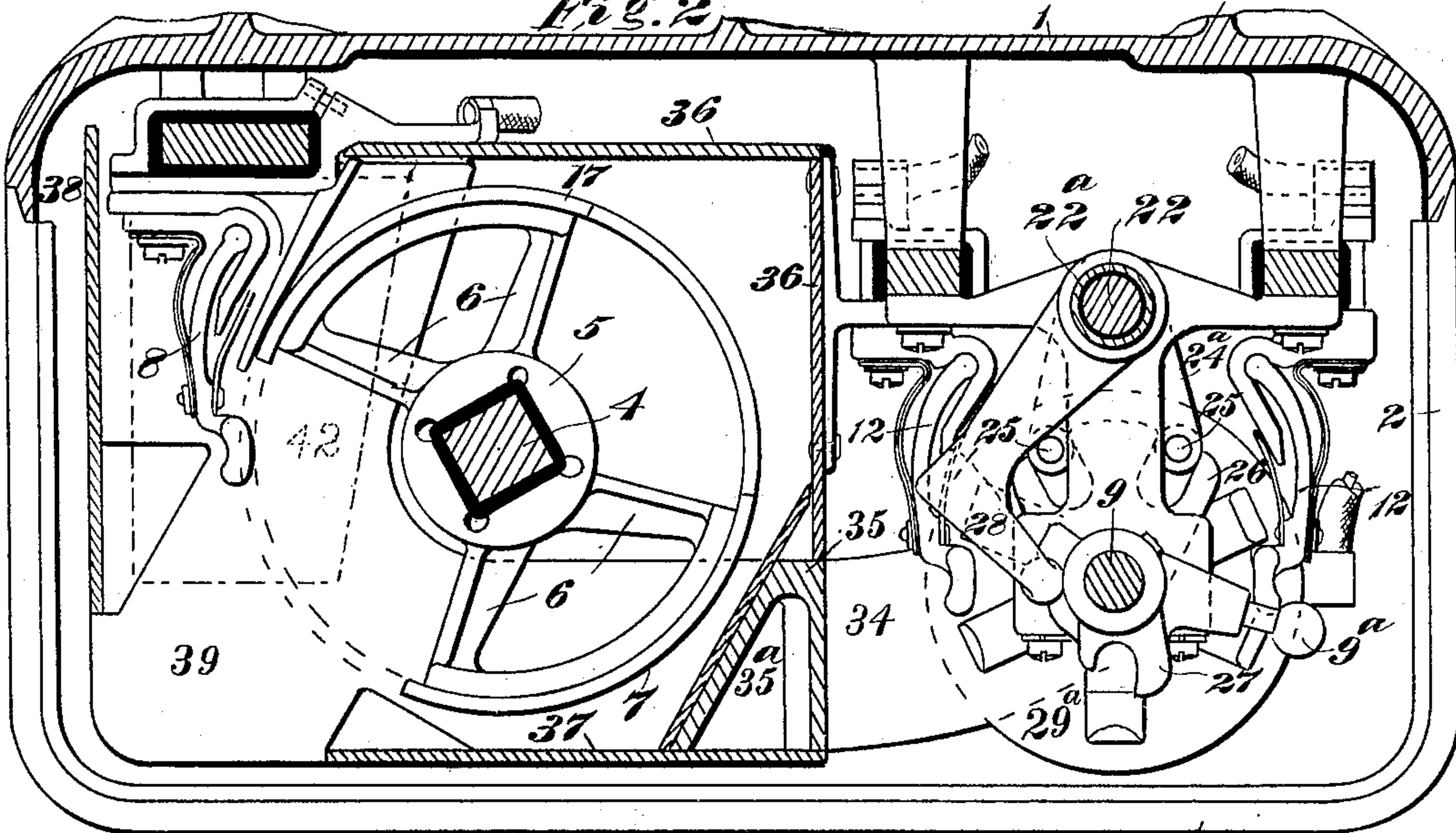


Fig. 3.

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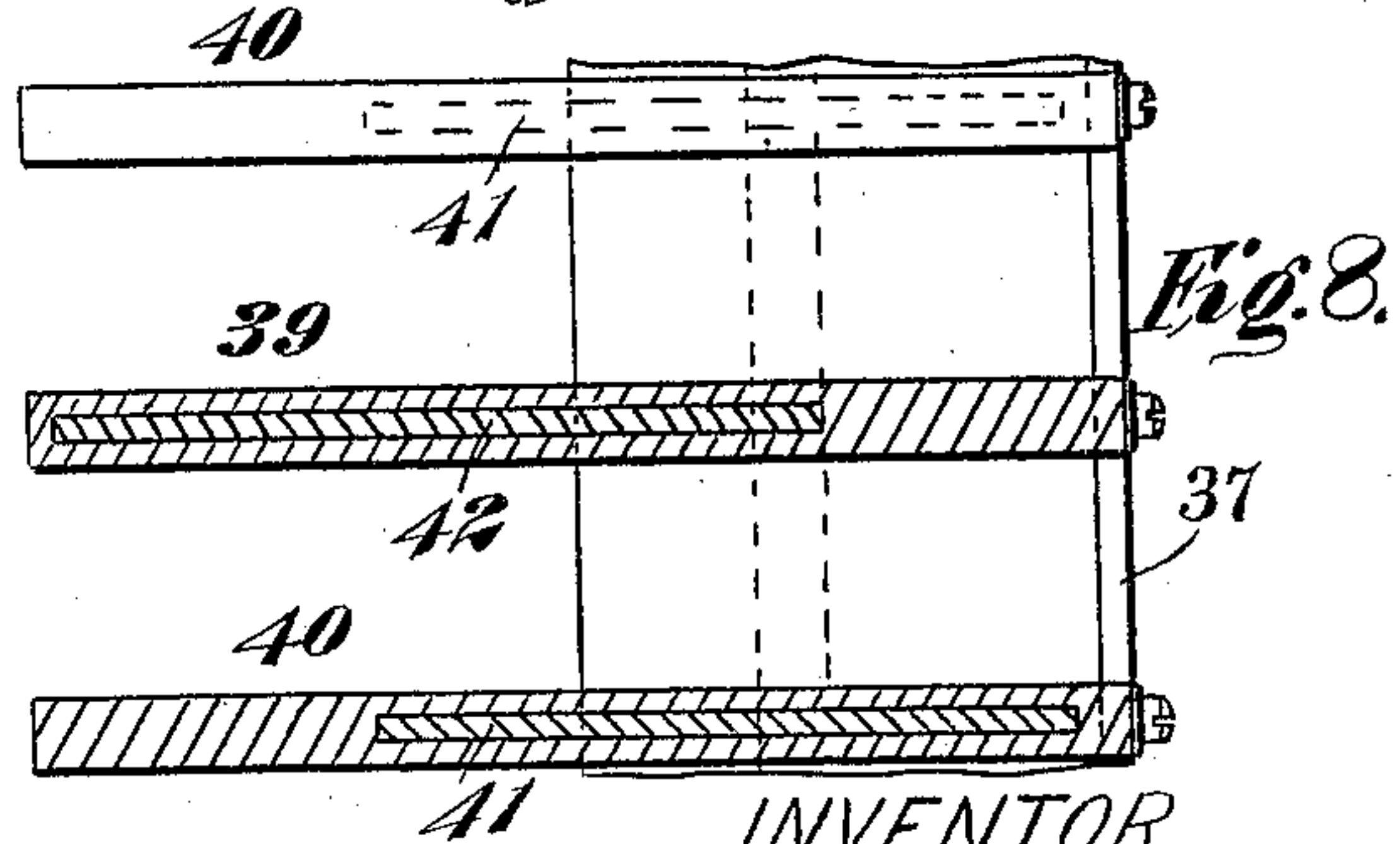
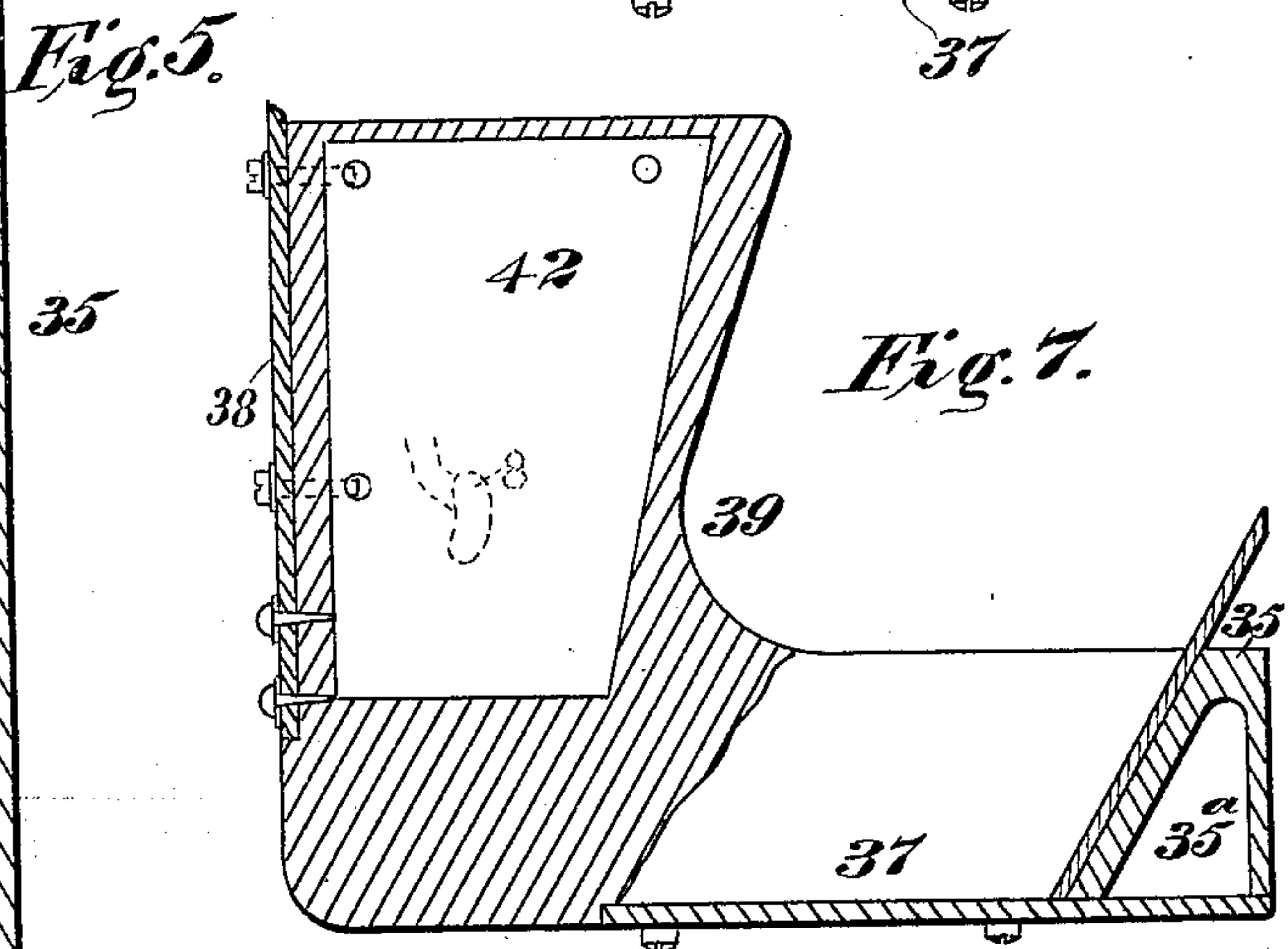
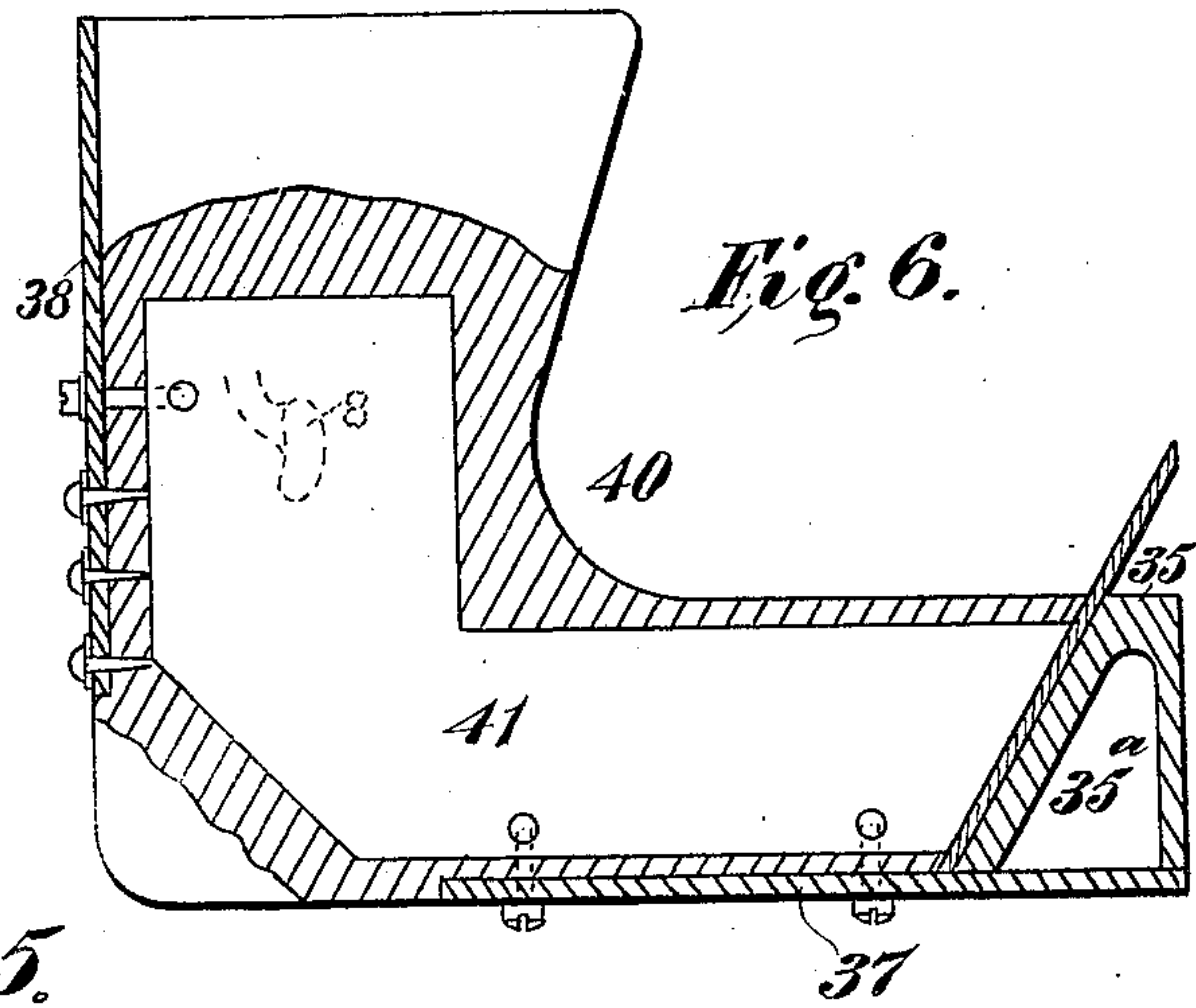
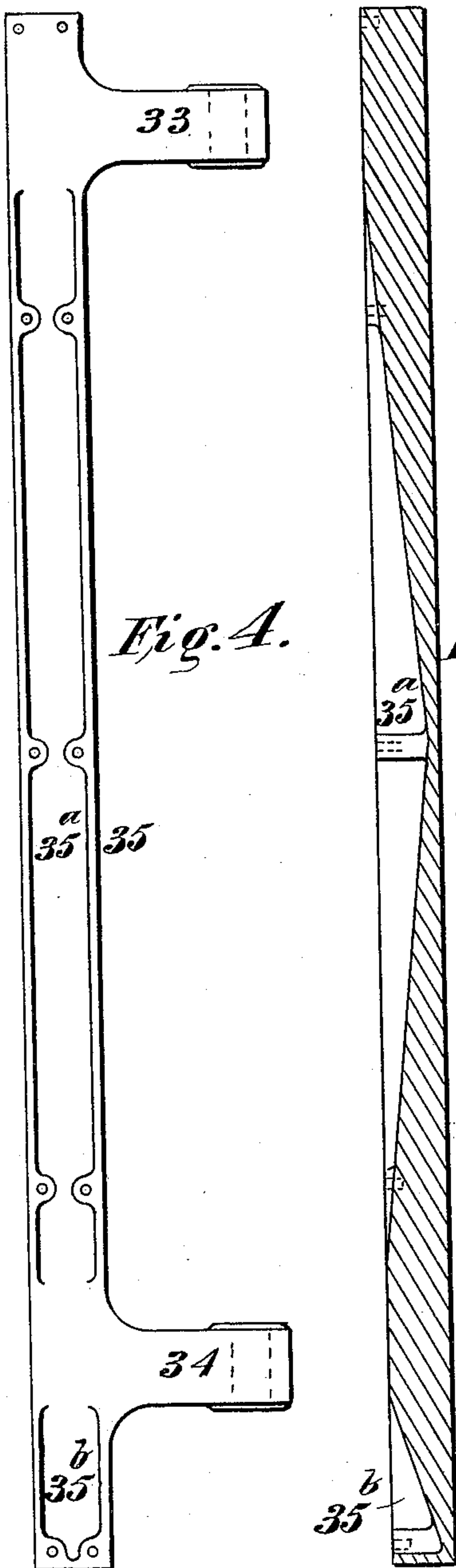
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# UNITED STATES PATENT OFFICE.

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## CONTROLLER FOR ELECTRIC MOTORS.

SPECIFICATION forming part of Letters Patent No. 656,571, dated August 21, 1900.

Application filed January 13, 1900. Serial No. 1,365. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS STEEL PERKINS, a citizen of the United States, residing at Idlewood, in the county of Allegheny and State of Pennsylvania, have invented an Improvement in Controllers for Electric Motors, of which the following is a specification.

My invention relates to apparatus employed for controlling electric motors, and has particular reference to such controllers as are employed in connection with motors utilized for propelling railway-vehicles, although not necessarily restricted to such use.

The object of my invention is to provide a new and improved means for extinguishing the arcs which form between the stationary and movable contacts of a controller when the movable member is rotated to make circuit changes, vary resistance, or open the circuit, such means being more effective in operation than anything of a similar character known to me as heretofore employed for these purposes.

With this end in view I have devised the means shown in the accompanying drawings, in which—

Figure 1 is a front elevation of a controller, parts being broken away and the front portion of the casing and the wiring being omitted. Fig. 2 is a plan view of the operating mechanism, the casing being shown in section. Fig. 3 is a section taken on line  $xx$  of Fig. 1. Figs. 4 and 5 are respectively a front elevation and a longitudinal sectional view of one of the pole-pieces for the blow-out magnets. Fig. 6 is a view, partially in plan and partially in section, of one of the arc-shields. Fig. 7 is a view similar to Fig. 6 of an arc-shield of different construction. Fig. 8 is a view, partially in end elevation and partially in section, of three arc-shields and a portion of a pole-piece of the blow-out magnets.

The details of construction are as follows:

The back portion or base 1 of the frame is or may be of usual construction, but as here illustrated and utilized should be formed of iron or steel in order that it may serve in part as the path for the magnetic flux. The front and side portions 2 of the casing may

be of any suitable form or material, here shown as made of sections of wood fastened together by tongues and grooves. The back or base 1 is provided at each end with suitable bearings 3, in which is mounted the shaft 4 of a drum 5, the latter being provided with arms 6, on which are mounted contact strips or plates 7, of suitable form and arrangement for engagement with the stationary contact-fingers 8. These strips 7 are arranged both circumferentially and longitudinally of the drum in such manner and are so interconnected as to cooperate with the contact-fingers corresponding thereto and provide the circuit changes necessary or desired in order to start, stop, and regulate the speed of the motor or motors in connection with which the controller is used. All of these features are well known in the art and need not be more specifically described.

Mounted beside the main controller-drum 5, within the casing, are two shafts 9 in alignment, respectively, provided with drums 10 and 11, each of which is provided with a pin 9<sup>a</sup> for locking it to and unlocking it from its shaft. Suitable contact-fingers 12 are located at the opposite sides of drums 10 and 11 in order to cooperate with the contact-strips thereon to insure the reversal of the motor-circuits and the cutting of either motor out of circuit when desired.

The combined cut-out and reversing-switch is shown as of the same type as that set forth in Patent No. 611,465, granted to the Westinghouse Electric and Manufacturing Company, as assignee of H. P. Davis, September 27, 1898, the means employed for operating such switch being different from what is there shown, however, as regards certain structural details.

The reversing-switch handle (not shown) is mounted upon the upper end of a reversing-switch shaft 13 that projects through the top of the frame. The shaft 13 is provided with a head 14, having three notches, with one of which a pin 15 on interlocking lever 16 is always in engagement. When the pin is in the middle notch, as indicated in Fig. 2, the free end of lever 16 engages in a notch 17



in a disk 18, mounted on controlling-drum shaft 4, so as to prevent the rotation of the drum. When the pin 15 is in either of the side notches of the head 14, the controller-drum is free to rotate throughout its range of movement. The shaft 13 is provided also with a head 19, having two rollers 20 and 21. Another shaft 22 is mounted in suitable bearings at the rear of the reversing-switch shaft 9 and is provided with a head 23, having two notches in position to be respectively engaged by the rollers 20 and 21 in the head 19 to rock the shaft 22 as the shaft 13 is turned in one direction or the other. The shaft 22 is surrounded by a sleeve or hollow shaft 22<sup>a</sup>, which is provided with an arm 24, the free end of which engages with a stop (not shown) on the disk 18 when one of the reversing and cut-out switch drums is released from its shaft and turned into position to cut out one of the motors, this construction and arrangement being such as to prevent rotation of the main drum beyond the positions corresponding to series connection of the motors when one of the motors is out of circuit. The shaft 22 is also provided with a head 24<sup>a</sup>, having rollers 25, that engage with notches in a head 26, in which the adjacent ends of the shafts 9 are seated. The means for throwing lever 24 into position to engage the stop on the disk 18 when either reversing-switch drum is unlocked from its shaft and rotated to inoperative position by its pin 9<sup>a</sup> comprises a notched cam 27 and an arm 28, the inner end of which is fastened to the sleeve or hollow shaft 22<sup>a</sup>. The usual arm 30 and spring 30<sup>a</sup> are employed for exerting a constant force tending to throw the interlocking lever 16 out of engagement with the notch 17.

In order to insure rupture of the arcs that form between the contact-fingers 8 and the plates 7 on the drum 5 when the said parts are separated, I provide two electromagnets 29 and 29<sup>a</sup>, one at or adjacent to each end of the controller-frame, they being so wound and connected in circuit that the outer ends have like polarity and the inner ends also like polarity of the opposite sign. The magnets 29 and 29<sup>a</sup> are respectively mounted upon rods 31 and 32 of iron or steel, which are either integral with or joined to the base, so as to constitute rigid supports and also provide good magnetic circuits. Mounted upon the inner ends of the rods 31 and 32 are two arms 33 and 34 of an iron or steel bar 35, which bar serves as pole-pieces for the magnets. This bar 35 is of substantially the same length as the controller-drum, and in order to lighten it as much as possible without interfering with its functions it is provided with a channel 35<sup>a</sup>, which extends from points near its ends to its middle, this channel gradually increasing in depth from its outer ends to its middle portion. One of the outer ends of the bar is also provided with a channel 35<sup>b</sup>, having an inclined bottom, as indicated in Figs. 5 and 6. The rear side of the drum and also the side adja-

cent to the reversing and cut-out drums are partially inclosed by means of plates or boards 36, preferably of insulating material, and a similar board 37 extends longitudinally of the bar 35 and projects over the top of the drum. These boards or plates are preferably formed of pressed asbestos or some other suitable refractory and non-conducting material. The side of the controller-drum opposite the reversing and cut-out switch is also preferably partially inclosed by a plate 38 of similar material to that already referred to. A series of plates 39 and 40 of approximately L shape and formed of pressed asbestos or some other suitable refractory insulating material are fastened to the plate or board 37 in planes at right angles to said plate and are so located as to project over the drum and between such of the contact-strips and fingers as are likely to be subject to injury by reason of the arcs which form between them. These approximately L-shaped plates I term "arc-shields," and they will be herein designated as such.

It will be readily seen that the iron or steel base 1 of the controller and such parts of like or similar material as are jointed directly thereto constitute one of the pole-pieces for each of the electromagnets and that the bar 35 constitutes the other pole-pieces of these magnets. While these parts alone would serve to conduct the magnetic flux in such manner and in such degree as to effect to some extent an extinguishment of the arcs, which tend to injure the controller-contacts, yet the flux would not be utilized to the degree and in the manner which would be most effective and desirable. It is for the purpose of utilizing substantially all of the flux for the purpose indicated and in such manner as will enable it to do its work most effectively that I have provided the means to be now described.

The arc-shields 39 and 40, so far as the external contour is concerned, are all of substantially the same form and dimensions; but they differ materially as to internal construction, the shields 40 being provided with iron or steel plates 41 embedded therein, which extend from a point in close proximity to the bar 35 to a point just below the contact portions of the fingers 8. The shields 39 are each provided with an embedded plate 42, of iron or steel, that extends from a point in close proximity to the inner end of the shield to a point slightly above the contact portions of the fingers. The construction is clearly indicated in Figs. 6, 7, and 8 and also by broken lines in Fig. 1. These plates may be of different form from what is shown and may be fastened in position by means of screws, as indicated, or otherwise, if desired.

In order to describe the operation of my invention, it may be assumed for convenience that the outer ends of the electromagnets are north poles and the inner ends are south poles, and consequently when the magnets are in circuit the flux will pass from the outer ends of the magnets through the base of the con-



troller and from the base into the plates 42 in the arc-shields 39 to substantially the point where the contact portions of the fingers are located, and since these plates terminate just beyond these points the flux will pass across the fingers and into the adjacent arc-shield plates 41, and thence through such plates to the bar 35 and back to the south poles of the magnets. By reason of this construction and arrangement of parts substantially the entire flux passes transversely across the paths of the arcs in lines the general direction of which is substantially parallel to the axis of the drum, and consequently the arcs are blown outward between the arc-shields and away from both them and the drum and finger-contacts, it being understood that the circuit connections are properly arranged to insure this outward direction of blow whenever possible. It follows, therefore, that not only are the arcs promptly extinguished by the magnetic flux, but they are extinguished in such manner that substantially no injury results to any of the adjacent parts of the controller.

I have not deemed it necessary to illustrate and describe the electric circuits of the controller and the motors in connection with which it is used, since such circuits and motors are in general well known in the art. As regards the electromagnets they may be maintained in circuit throughout the period of operation of the controller or they may be so arranged as to be cut out of circuit during relatively-long periods of running within which no circuit changes are made.

While I have illustrated and described specifically the mechanism for practicing my invention, I desire it to be understood that such mechanism may be varied within reasonable limits as regards form, location, and arrangement of parts without departing from the spirit and scope of the invention.

I claim as my invention—

1. In a controller for electric motors, the combination with a movable member having suitably arranged and connected contact-pieces, of cooperating contact-fingers, one or more electromagnets, and arc-shields provided with magnetic-flux conductors, which project between adjacent fingers and into proximity to the pole-pieces of the magnet or magnets.

2. In a controller for electric motors, the combination with a movable member having suitably arranged and connected contact-pieces, of cooperating contact-fingers, one or more electromagnets, and arc-shields having magnetic-flux conductors embedded therein, which project between adjacent fingers and into proximity to the pole-pieces of the magnet or magnets.

3. In a controller for electric motors, the combination with a movable member having suitably arranged and connected contact-pieces, of cooperating contact-fingers, one or more electromagnets having a plurality of

open magnetic circuits, and arc-shields having embedded magnetic-flux conductors located in such circuits, in position to direct the flux transversely across the paths of the arcs and longitudinally of the controller-drum.

4. In a controller for electric motors, the combination with a movable member having suitably arranged and connected contact-pieces, of cooperating contact-fingers, one or more electromagnets, and arc-shields provided with magnetic-flux conductors which project between adjacent fingers and alternately into proximity to opposite pole-pieces of the magnet or magnets.

5. In a controller for electric motors, the combination with a movable member having suitably arranged and connected contact-pieces, of cooperating contact-fingers, one or more electromagnets, and arc-shields alternately provided with long and short iron plates, which respectively project from points between adjacent fingers to opposite pole-pieces of the magnet or magnets.

6. In a controller for electric motors the combination with a movable member having suitably arranged and connected contact-pieces, of cooperating fingers, one or more electromagnets, and arc-shields of refractory, non-conducting material provided with embedded flux-conductors which project between adjacent fingers and alternately into proximity to opposite pole-pieces of said magnet or magnets.

7. In a controller for electric motors, the combination with a movable member having suitably arranged and connected contact-pieces, of cooperating contact-fingers, one or more electromagnets having pole-pieces which extend substantially the length of the movable member of the controller, and arc-shields projecting between adjacent fingers and having embedded therein iron plates that alternately project into proximity to opposite pole-pieces of said magnet or magnets.

8. In a controller for electric motors, the combination with a drum and cooperating contact-fingers, of one or more electromagnets having pole-pieces extending longitudinally of the drum and arc-shields projecting between adjacent fingers and provided with magnetic-flux conductors which alternately project from points adjacent to the contact portions of the fingers to opposite pole-pieces of the magnet or magnets, whereby the arc-intercepting paths of the flux are longitudinal of the drum and the arcs are blown outward and away from the adjacent parts of the controller.

In testimony whereof I have hereunto subscribed my name this 11th day of January, A. D. 1900.

THOMAS S. PERKINS.

Witnesses:

WESLEY G. CARR,  
W. SUMNER SEIBERT.