

No. 626,371.

Patented June 6, 1899.

C. L. DUENKEL.

DEVICE FOR REMOVING AND REPLACING FUSES.

(Application filed Jan. 26, 1898.)

(No Model.)

4 Sheets—Sheet 1.

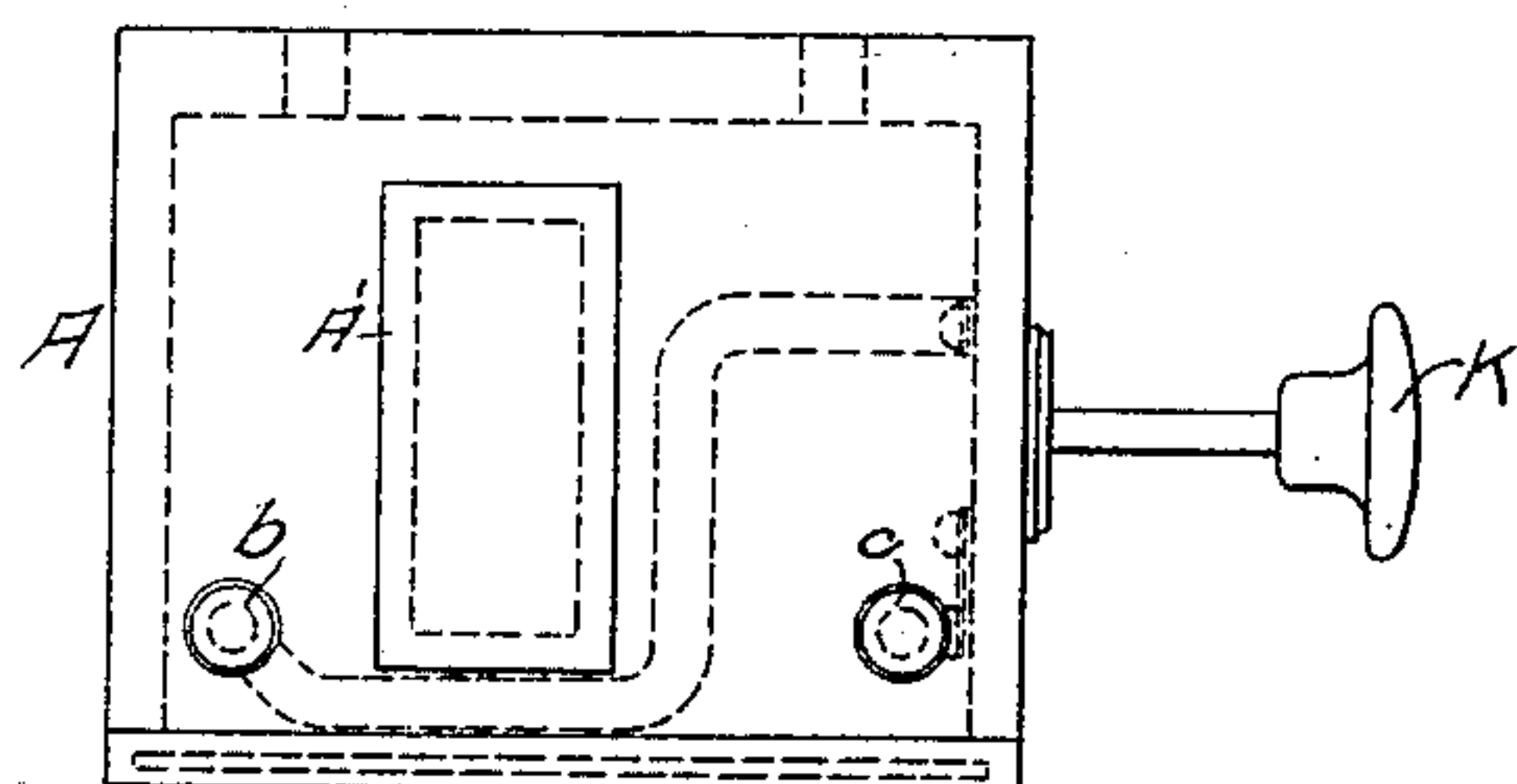


Fig. 1.

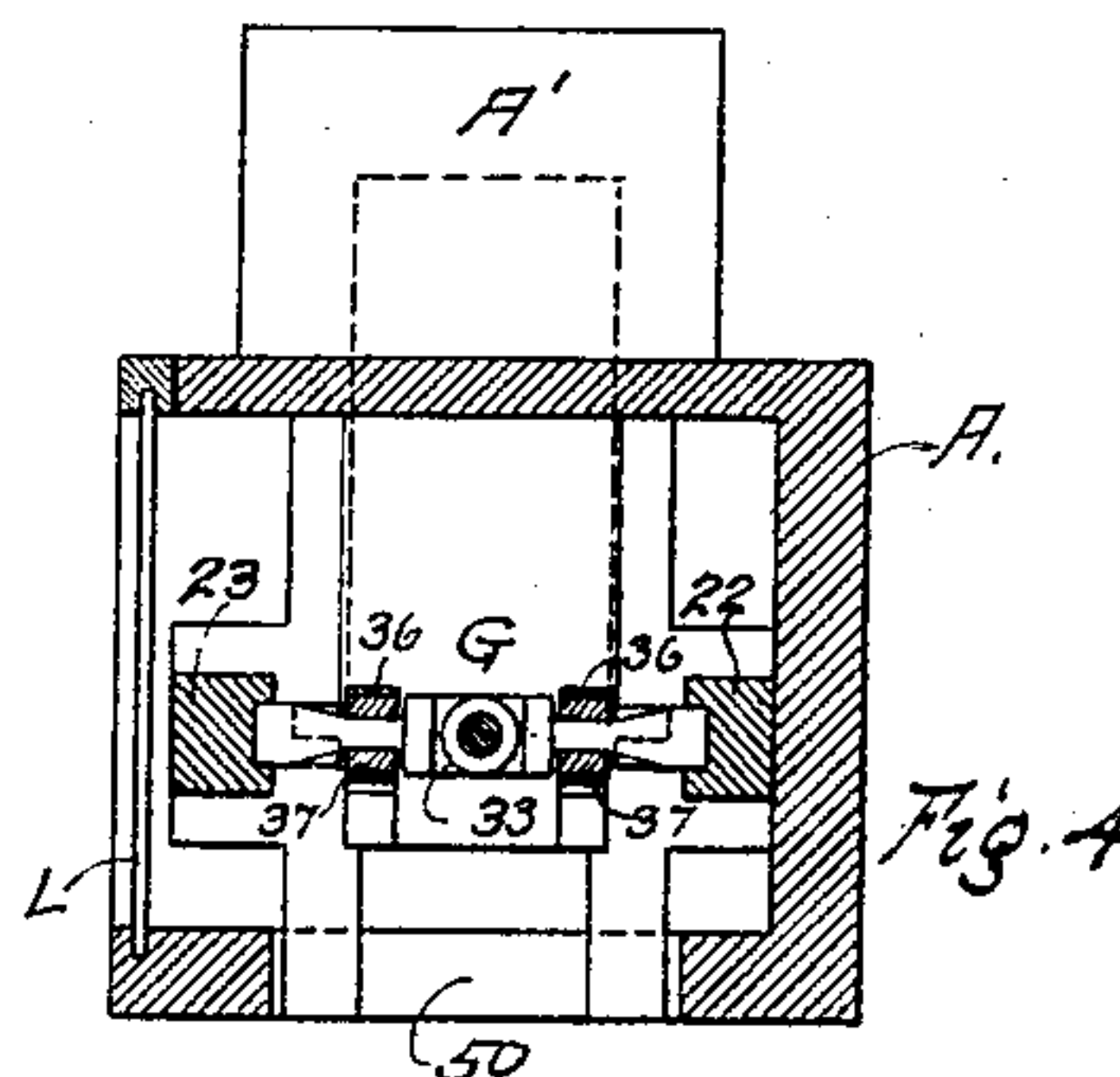


Fig. 4.

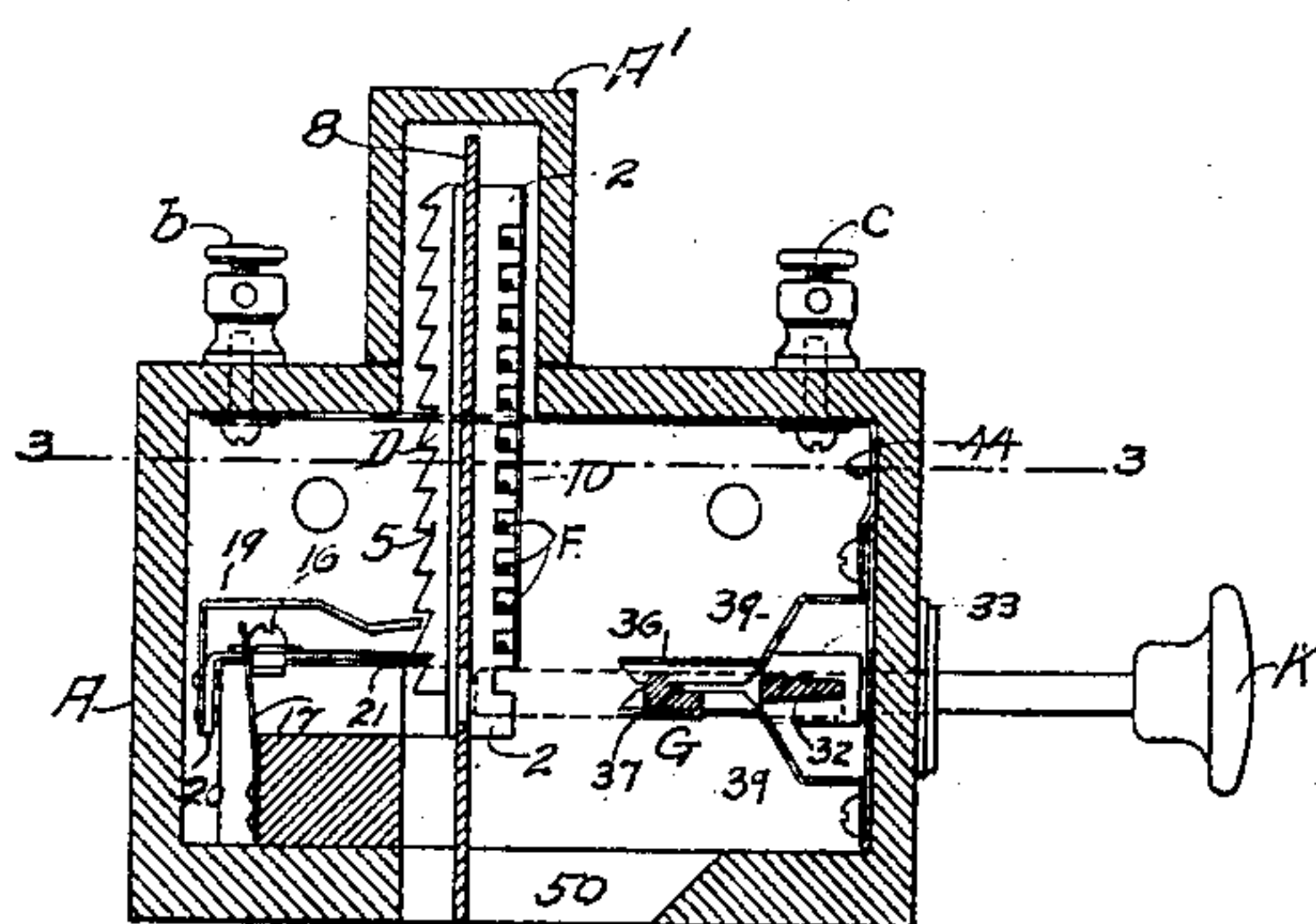


Fig. 2.

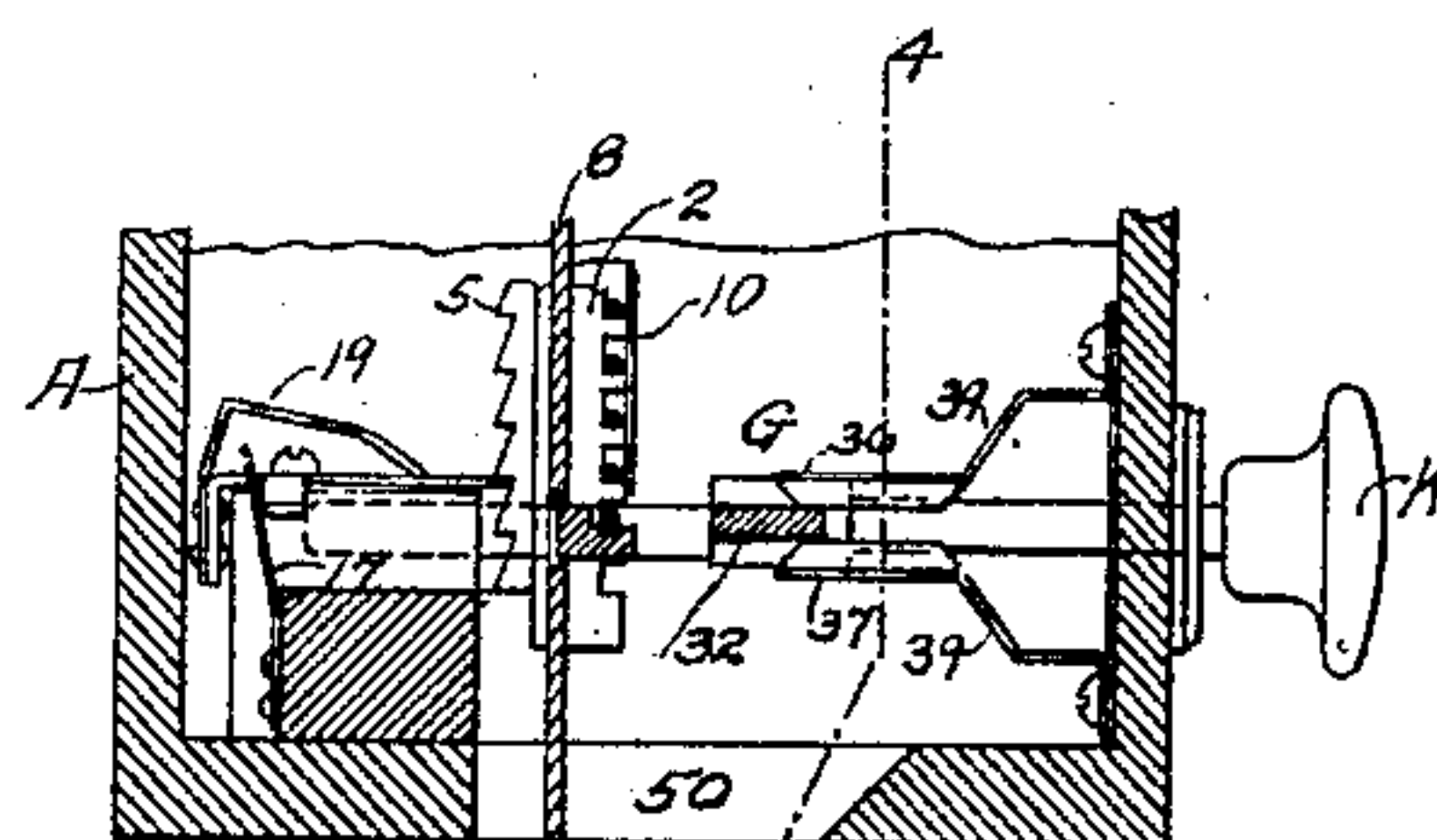


Fig. 5.

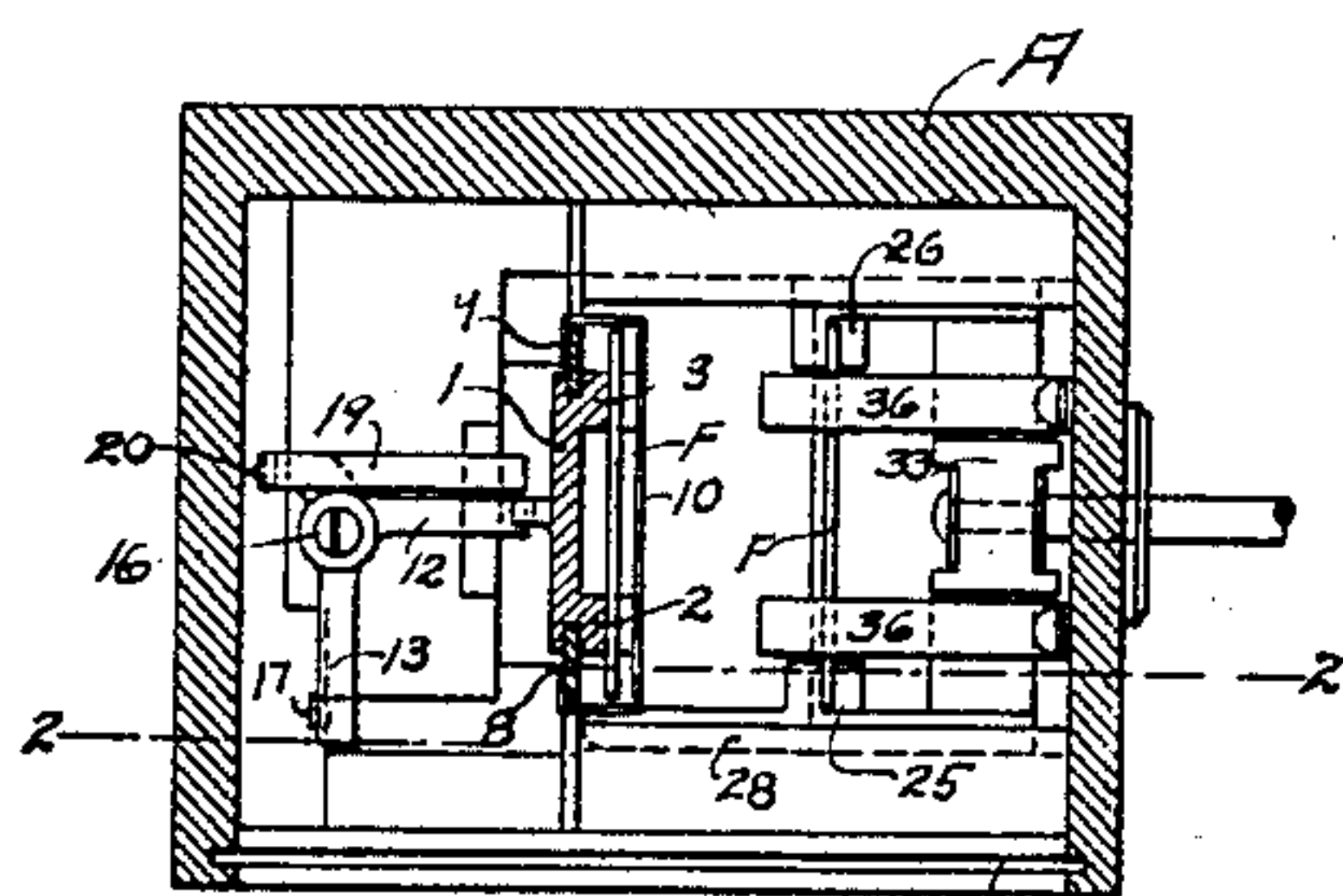


Fig. 3.

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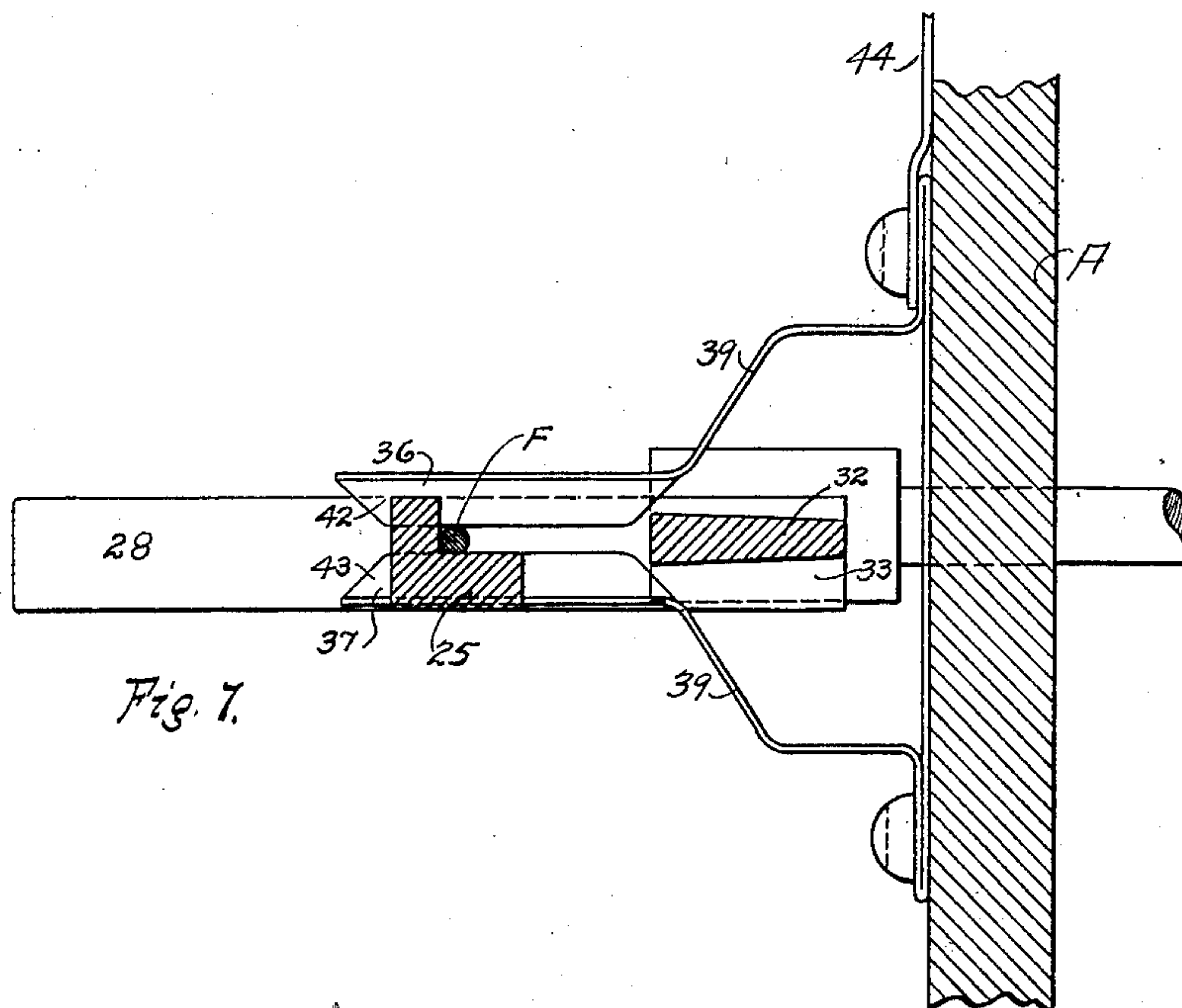
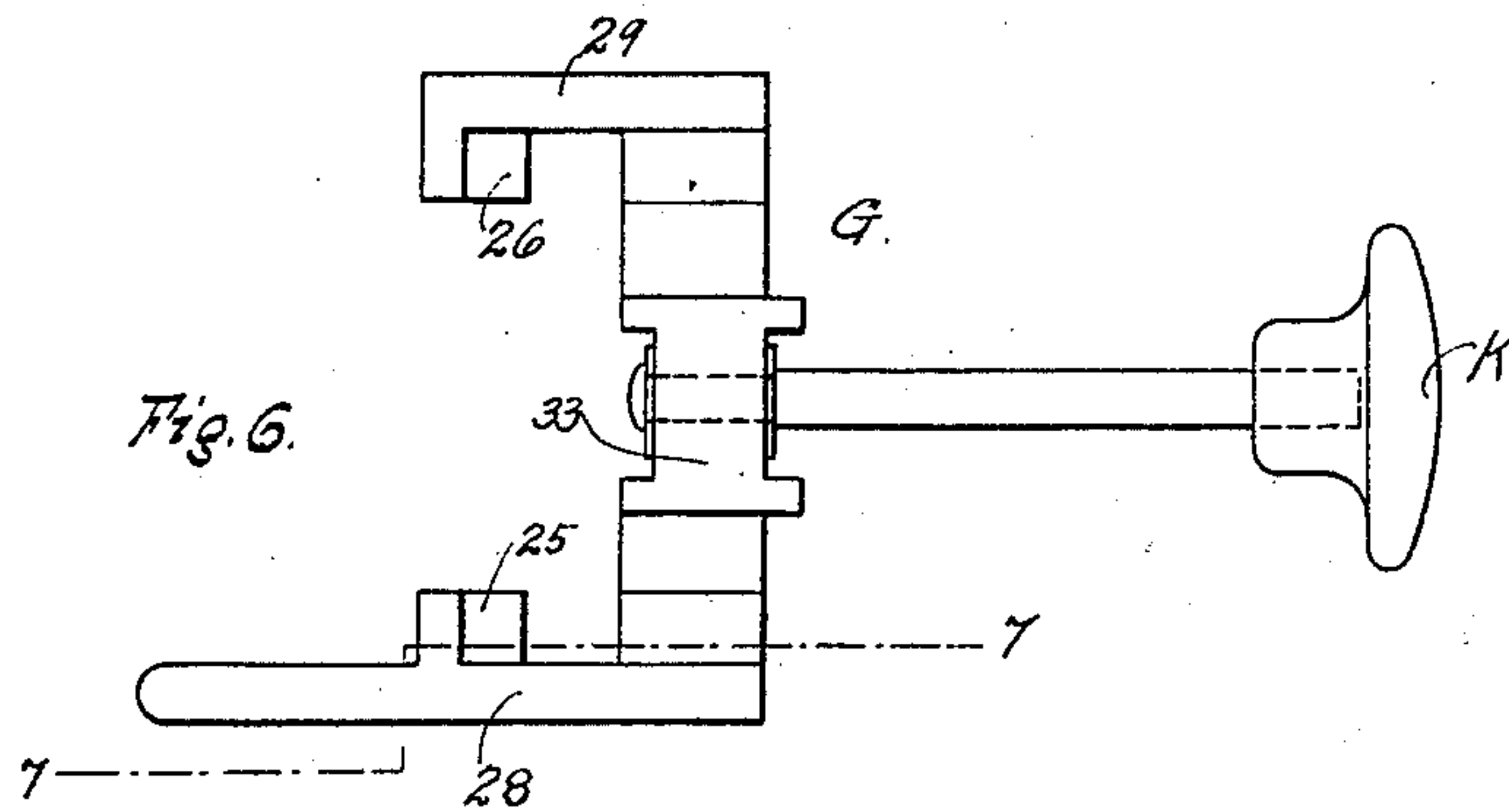
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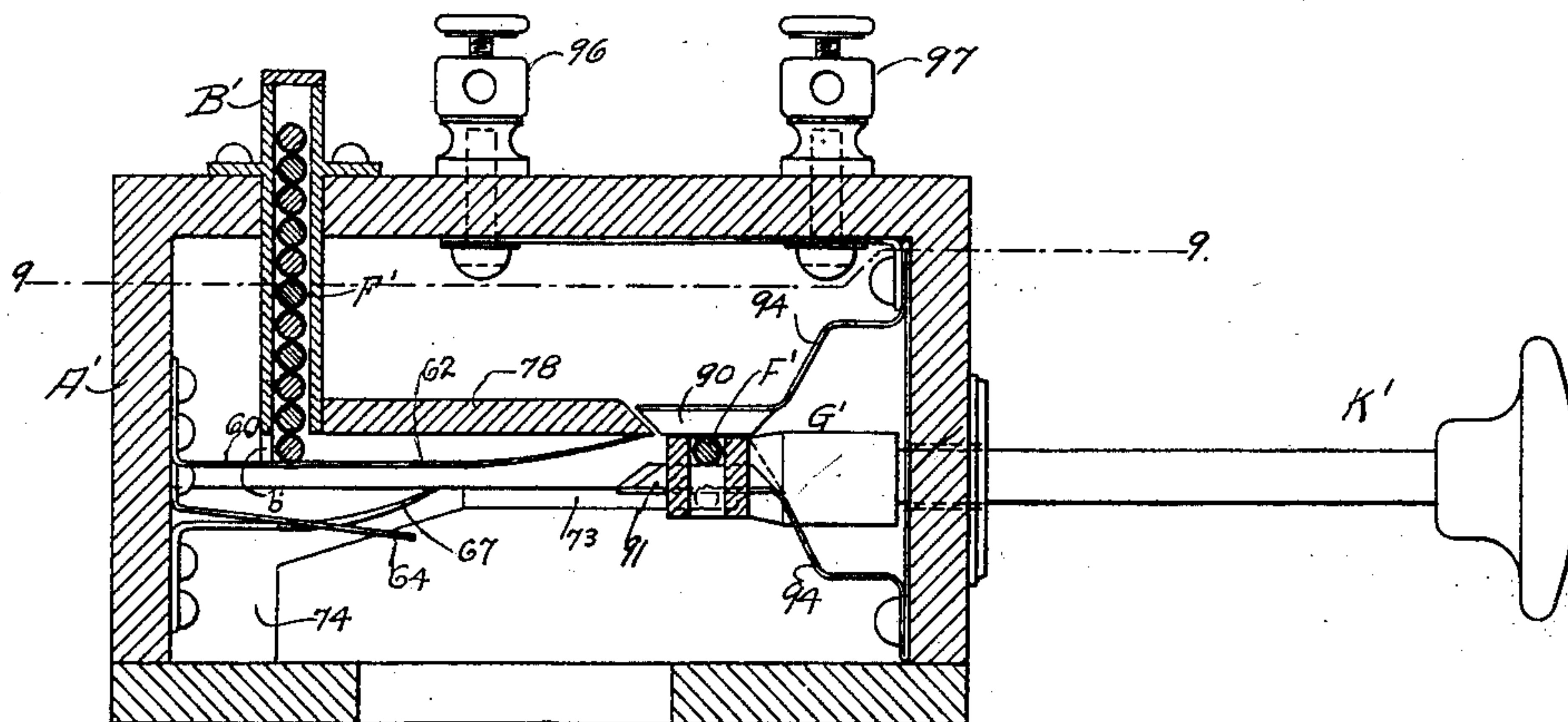


Fig. 8.

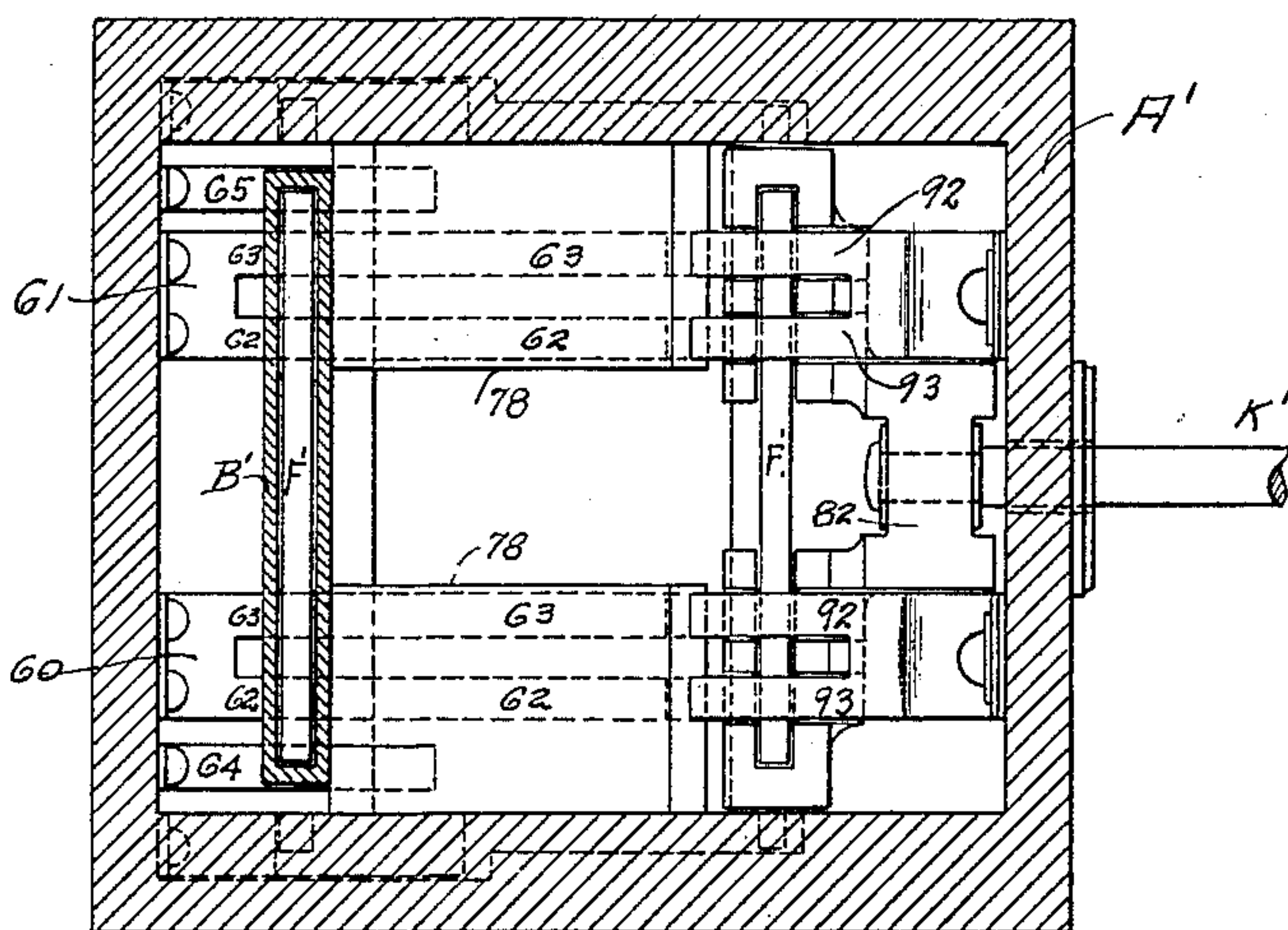


Fig. 9.

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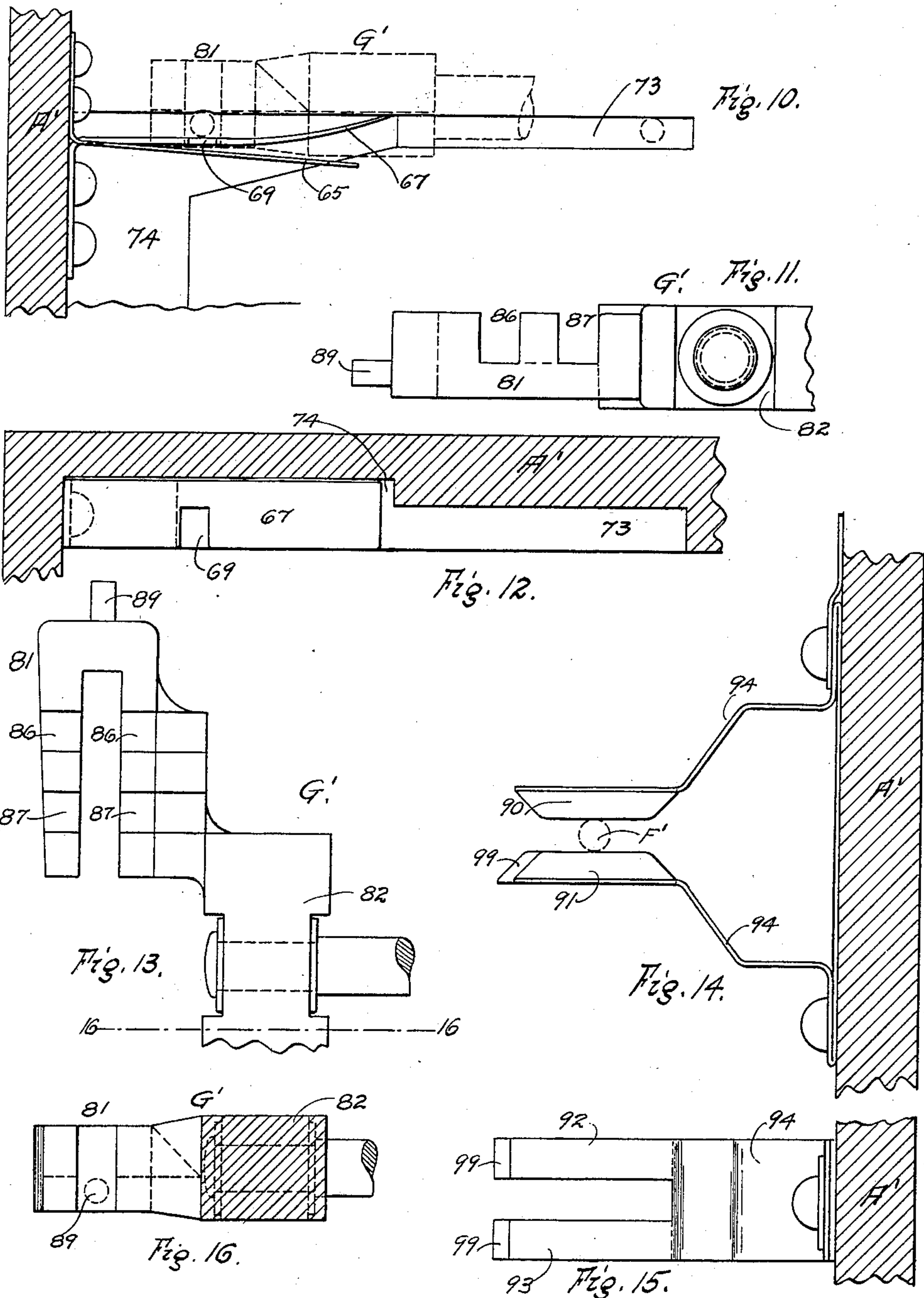
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4 Sheets—Sheet 4.



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# UNITED STATES PATENT OFFICE.

CHARLES L. DUENKEL, OF JERSEY CITY, NEW JERSEY.

## DEVICE FOR REMOVING AND REPLACING FUSES.

SPECIFICATION forming part of Letters Patent No. 626,371, dated June 6, 1899.

Application filed January 26, 1899. Serial No. 703,454. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES L. DUENKEL, a citizen of the United States, residing at Jersey City, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Devices for Removing and Replacing Fuses, of which the following is a specification.

My invention relates to improvements in devices for extracting and replacing fuses in electrical installations.

It is the purpose of the invention to provide simple means, readily and instantly operated in case of emergency, for removing burned-out fuses and substituting new fuses at the proper position in electric circuits and without necessitating changing or disturbing the terminals between which the fuse is held or any other part of the plant. In this respect my device has great advantages over the existing arrangements, wherein the fuses are screwed, clamped, or bolted to the terminals in such manner that it is always a matter of some time and much inconvenience to remove a fuse in case of burning out and replace it with a new one, and of course during this time the current is either entirely interrupted or interfered with, which interruption or interference is a cause of most serious inconvenience in the present complicated use of electricity for light, heat, power, and other purposes.

Essentially my invention consists in the combination, with a receptacle for fuses and suitable terminals connected with the current-wires and which hold the fuse in normal position to complete the circuit, of a shiftable fuse receiver or carrier, hereinafter simply designated the "receiver," which is constructed and arranged to remove the burned-out fuse from said terminals to receive a new fuse from the receptacle and to carry this new fuse to and position it properly between the terminals to again complete the circuit. This combination, which I believe to be broadly novel in the art, enables the attendant to replace the burned-out fuse with a new one in hardly more than a few seconds by the simple expedient of shifting the receiver and without disturbing any part of the installation.

As the essentials of the invention are broadly novel and as they may be combined

in various ways, I hereinafter indicate several of these ways.

Referring to the drawings which accompany this specification to aid the description, Figure 1 is a plan of the device. Fig. 2 is a vertical section thereof on the plane of the line 2 2 of Fig. 3. Fig. 3 is a horizontal section on the plane of the line 3 3 of Fig. 2. Fig. 4 is a vertical section, partly in elevation, on the plane of the line 4 4 of Fig. 5. Fig. 5 is a broken vertical section on the same plane as Fig. 2, but showing the receiver advanced to receive a new fuse from the receptacle. Fig. 6 is a plan, on large scale, of the receiver and operating-handle. Fig. 7 is a broken vertical section, on a still larger scale, of the receiver and terminals in the same position as in Fig. 2. Fig. 8 is a vertical longitudinal section, partly in elevation, of one modification of the device, and wherein the gravity of the fuses feeds them into the receiver. Fig. 9 is a plan on the plane of the line 9 9 of Fig. 8. Fig. 10 is an enlarged detail showing the arrangement of springs and grooves at one side of the box for guiding the receiver. Fig. 11 is an enlarged broken elevation of the inner end of the receiver, showing one half thereof as it appears from the left of Fig. 8 and both halves being of similar shape. Fig. 12 is a broken horizontal section of one wall of the box, showing a groove and one of the guiding-springs. Fig. 13 is a broken plan view of the receiver on the scale of Fig. 11. Fig. 14 is an elevation of a pair of terminal clamps, and Fig. 15 is a plan of the clamps of a pair. Fig. 16 is a cross-section and elevation on the plane of the line 16 16 of Fig. 13.

The device is contained in box A, made of hard wood or other non-conducting material and provided with a hood A' of the same material, *b c* being binding-posts for the terminal circuit-wires. A rack D, which constitutes in this construction the fuse-receptacle, reciprocates in said box and hood and is constructed of any suitable material, preferably brass, and with a body 1 and arms 2 3, each of which is formed on its front or right face as a rack to support a number of fuses F, as shown. On the rear or left face of body 1 is a toothed rib 5, adapted to engage a trip, as hereinafter described. Rack D is guided by ways, 8 9, fixed in the box and hood and en-



gaging grooves in said rack, as shown, and a shield 10, also fixed in the box and hood, prevents the fuses F from falling from the rack. Hood A' is made removable, so as to permit

5 of withdrawing and filling rack D.

The rack-trip is a bent lever 12 13, pivoted at 16 and normally held by spring 17 in the position of Figs. 2 and 3, wherein arm 12 engages under one of the teeth on said rib 5 and

10 supports said rack. A spring 19, carried on an arm 20 of said trip, normally stands to one side and clear of said teeth, Fig. 3.

The fuse-receiver G, preferably shaped in plan and section as shown, respectively, in

15 Figs. 6 and 7, and preferably constructed of insulating material, as "fiber," shifts in guideways 22 23, also of insulating material, as hard wood, Fig. 4. Said receiver G is essentially an open frame, with brackets 25 26

20 formed on the side pieces 28 29 to support the ends of the fuse when it enters the said receiver from the receptacle. One of said side pieces, as 28, is extended backwardly, forming an arm which engages arm 13 of the trip

25 when the receiver is in the inner position of Fig. 5, and by thus turning arm 12 of the trip out of and spring 19 into engagement with the teeth on the rib 5 permits rack D to descend one tooth and deliver one fuse F to receiver

30 G, the ends of said fuse being then supported on the brackets 25 26, Fig. 6. A cross-piece 32, fixed between the side pieces 25 26, constitutes a scraper for removing burned-out fuses from the clamps. It is preferably tapered, as shown. At its central portion this

35 cross-piece 32 is thickened, as at 33, the shoulders of the part 33 moving closely past the inner edges of the said clamps and serving as scrapers to remove any bits of molten fuse. Said terminal clamps 36 37 are in pairs, there

40 being a similar pair near each end of the fuse, Fig. 3, and are constructed of copper or other elastic strips reinforced where they are to clamp the fuse by metal bars 42 43, the ends

45 of which are inwardly beveled, as shown. The greater mass of said bars 42 43 diminishes the heating effect at the points of contact with the fuse. The strips of each terminal are preferably formed of a single strip of metal 39,

50 bent to the shape shown in Figs. 2 and 7 and screwed to the box, 44 being a connection from one of the aforesaid binding-posts—in this instance from post c—and there being a similar connection from post b to the other terminal.

55 A rod K, with knob and working through box A, serves to shift the receiver G.

To permit inspection, one side of box A is closed by a glass plate L, which slides in grooves, so as to give access to the interior.

60 The device is operated in the following manner, supposing the parts in the position of Fig. 2, wherein a fuse F is clamped at each end by a pair of the terminal clamps and completes the circuit: If a fuse burns out, the

65 attendant grasping the handle-knob pushes receiver G inwardly, piece 32 separating the clamps, so that the ends of the burned-out fuse

fall into the box and drop through the opening 50 in the bottom thereof, and the shoulders of block 33 scraping the inner edges of

70 said terminals clean of any bits of molten fuse. As said receiver G reaches its inmost position, wherein said brackets 25 26 are directly under the lowermost fuse on rack D, the side piece 28 throws the trip clear of the

75 teeth on the back of the rack, at the same time bringing spring 19 under a tooth. The weight of the rack D now causes it to descend one tooth or until the end of the spring 19 is arrested by the top of the plate 21, Fig. 2.

80 Now the lowermost fuse is just resting on the brackets 25 26, and the attendant by drawing out the receiver carries this new fuse to its proper position between the terminal clamps

85 at the end of the outer motion, the said terminals again clamping the ends of the fuse as the piece 32 moves out of the clamp.

Figs. 8 to 16, inclusive, illustrate one modification of the device particularly adapted to

90 larger fuses and indicate how the essentials of the invention may be embodied in various ways. Referring to said Figs. 8 to 16, A' is the box, and B' the hood, which hood is extended down into the box, as shown, and is

95 open at its lower end, the hood also being arranged to be removable from the box. A pair of plate-springs 60 61, each provided with separated tongues 62 63, as shown in Fig. 9, are secured immediately below and under

100 each side of said hood, being bent up at their free ends, as shown in Fig. 8. Said springs 60 61 respectively support opposite ends of the lowest fuse. Below and outwardly from

105 said springs 60 61 are springs 64 65, preferably bent downward, as shown, and nearly at the same level as said springs 64 65; but in the chambered parts 74 of the grooves 73,

110 formed in opposite sides of the box A', are upwardly-curved springs 67 67, Figs. 8, 10, and 12. Slots 69 in said springs 67 permit the guide-pins of the receiver G' to ascend, as hereinafter described. Cross-partitions

115 78, preferably beveled at the front ends, are placed at a level to hold springs 60 61 normally in proper position to permit of the feed of the fuses F' into the receiver G'.

120 Said receiver G', preferably of insulating material, is equipped with two yokes 81, one yoke at each side, connected by a middle portion 82, to which is attached the handle-rod K', Figs. 9, 11, 13, and 16. The walls of each yoke have two recesses 86 87, into which the

125 tongues of said springs 60 61 enter as said receiver G' moves inward. The terminal clamps are arranged in pairs, one pair for each end of the fuse F' and respectively connected with binding-posts 96 97. Said clamps

130 are constructed as follows: The ends of the strips 94 are formed with leaves 92 93, on which are bars 90 91, and the lower clamps lie in the bottoms of the recesses 86 87 of the yokes 81, so that said clamps contact with the ends of the fuse F' and complete the circuit

when the receiver is in the position of Fig. 8.



The ends of said bars 90 91 of the clamps are preferably beveled, as shown, and I prefer to put non-conducting material 99 on the inner ends of the lower clamps. The operation is as follows, supposing the parts in the position of Fig. 8: If a fuse burns out, the attendant pushes the receiver inwardly, thereby freeing the clamps from the fuse. As the receiver G' moves inward, carrying the ends of the fuse, the tongues of springs 60 61, entering the recesses 86 87 of the yokes 81, push the ends of the burned-out fuse down through said yokes until they fall out of the receiver and through the open bottom of the box A'.

As the receiver continues to move inwardly the pins 89 engage under the springs 67, so that said pins descend along the inclined walls of chambers 74, depressing the receiver G'; but presently the springs 64 engage under the yokes 81, and when the pins 89 come in line with the slots 69 of springs 67 said springs 64, together with the weight of knob and handle K', raise the receiver to the position of the dotted lines of Fig. 10, the inner walls of said yokes 81 standing up in the slot b', which is formed in the lower parts of the inner wall of hood B'. Now the attendant draws the receiver G' outwardly, thereby separating the lowest fuse from the receptacle and drawing it forward. As the receiver moves forward the pins 89 pass over and by the ends of springs 67, and the ends of the fuse pass over springs 60 61, which support the fuse until its ends pass over the lower bars of the terminal clamps. When the receiver returns to its original position, the new fuse will be clamped between the bars of the terminal clamps and the circuit will be again closed.

Manifestly in its essentials the foregoing modification comprises the same elements of a receptacle for fuses, terminals, and a shiftable receiver as did that form of the device first described, and it is also manifest that springs as well as gravity may be used to move the rack or fuses toward the receiver.

Now, having described my improvements, I claim as my invention—

1. The combination in a fuse remover and replacer, of a receptacle for fuses, terminals, and a shiftable fuse-receiver adapted to receive a fuse from said receptacle and transfer it to a position of contact with said terminals, substantially as described.

2. The combination in a fuse remover and replacer, of a receptacle for fuses, terminals,

a shiftable fuse-receiver adapted to receive a fuse from said receptacle and transfer it to a position of contact with said terminals, and means for removing a burned-out fuse from contact with said terminals as the said receiver shifts, substantially as described.

3. The combination in a fuse remover and replacer, of a removable receptacle for fuses, a fuse-receiver adapted to shift past the line of motion of said receptacle, a trip adapted to be operated by said receiver for controlling the movement of said receptacle, and terminals arranged to contact with the fuse when transferred by the receiver, substantially as described.

4. The combination in a fuse remover and replacer, of a movable receptacle for fuses, a trip to control the motion of said receptacle, a shiftable fuse-receiver adapted to operate said trip and transfer a fuse from said receptacle, and terminal clamps adapted to engage said fuse when transferred by said receiver, substantially as described.

5. The combination in a fuse remover and replacer, of a movable receptacle for fuses, a trip to control the motion of said receptacle, a shiftable fuse-receiver, adapted to operate said trip and transfer a fuse from said receptacle, terminal clamps adapted to engage said fuse when transferred, and means on said receiver for opening said clamps and removing a burned-out fuse and pieces thereof from said clamps, substantially as described.

6. The combination in a fuse remover and replacer, of a shiftable receptacle for fuses, a trip provided with means for normally holding said receptacle stationary and also with means for limiting the motion of said receptacle, terminal clamps connected with a circuit, and a shiftable receiver provided with means for operating said trip and said clamps and adapted to transfer a fuse from said receptacle to contact with said clamps, substantially as described.

7. In a fuse remover and replacer, the combination of terminals of a circuit, and a shiftable fuse-carrier which is normally empty and is adapted to receive and remove a burned-out fuse from and to receive and convey another fuse to contact with said terminals, substantially as described.

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Witnesses:

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