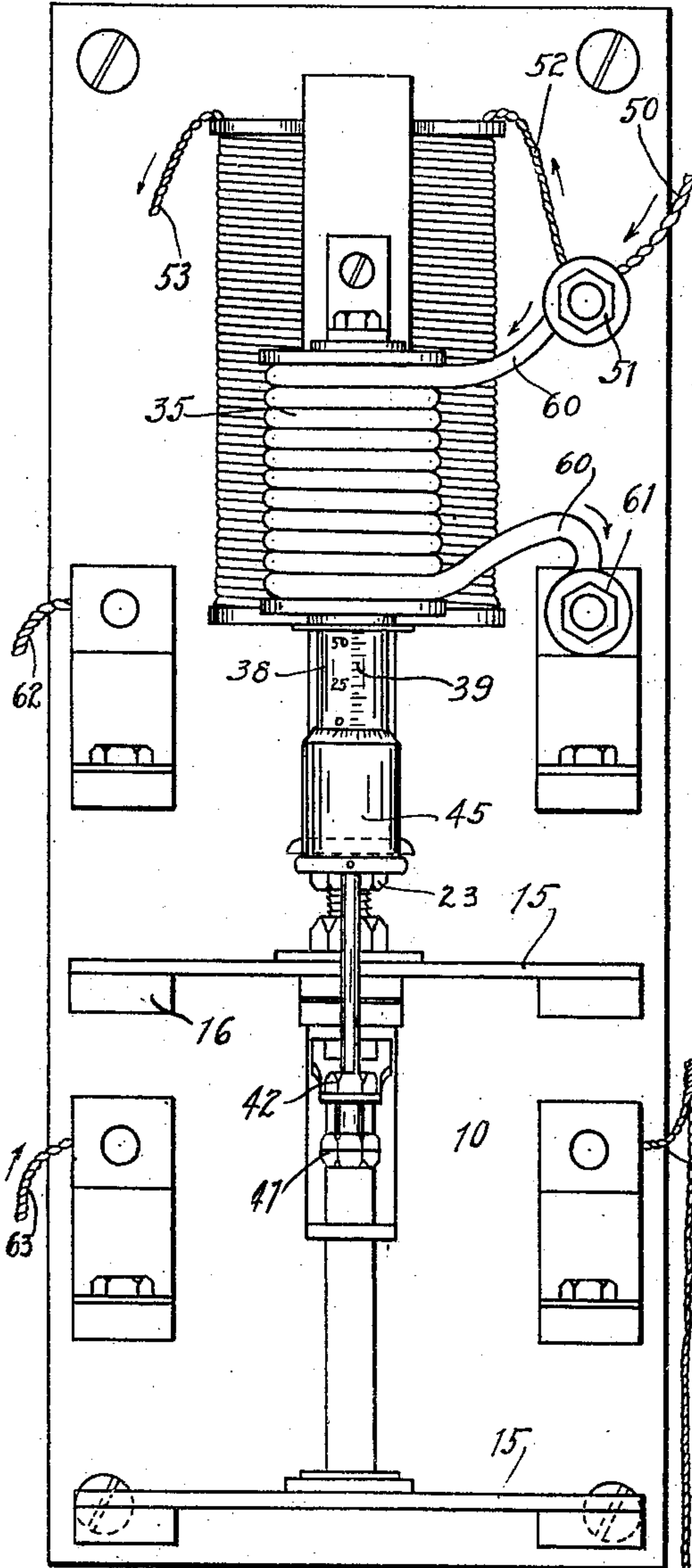


W. S. RYAN.  
CIRCUIT BREAKER.  
APPLICATION FILED SEPT. 12, 1908.

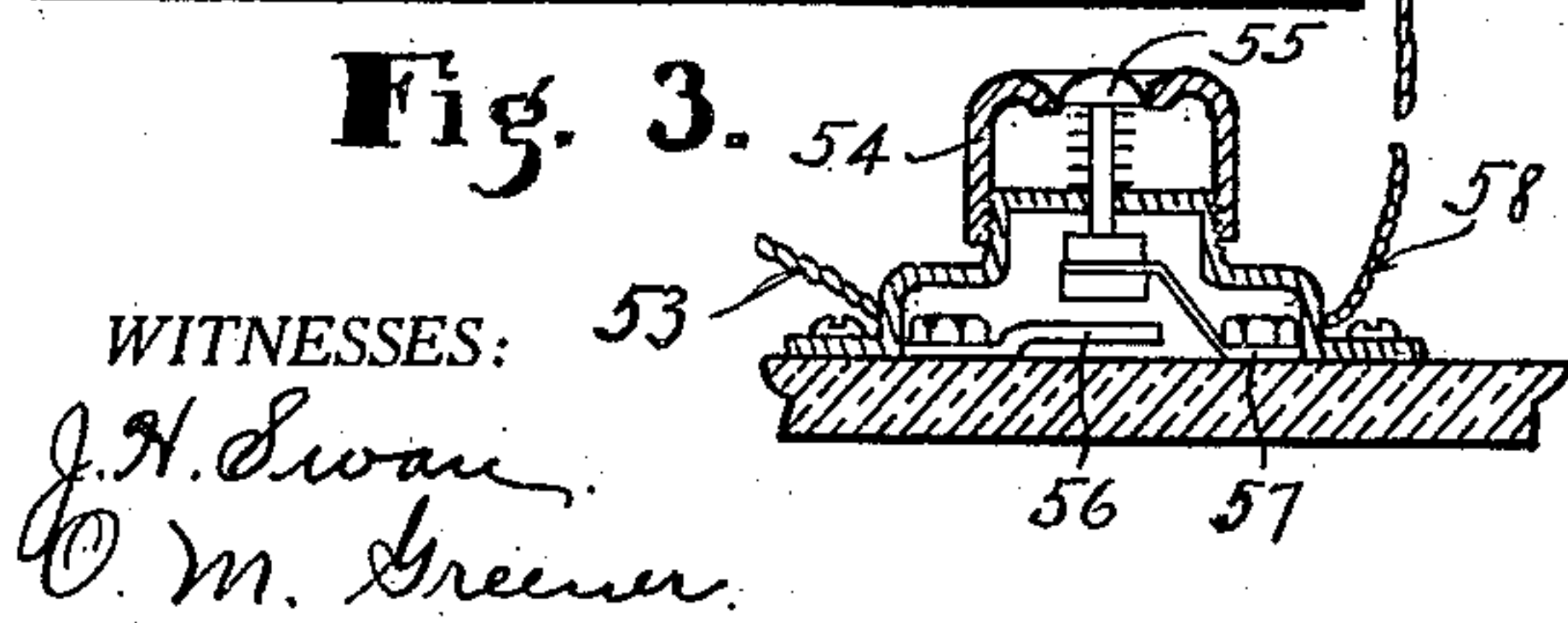
991,546.

Patented May 9, 1911.

**Fig. 1.**



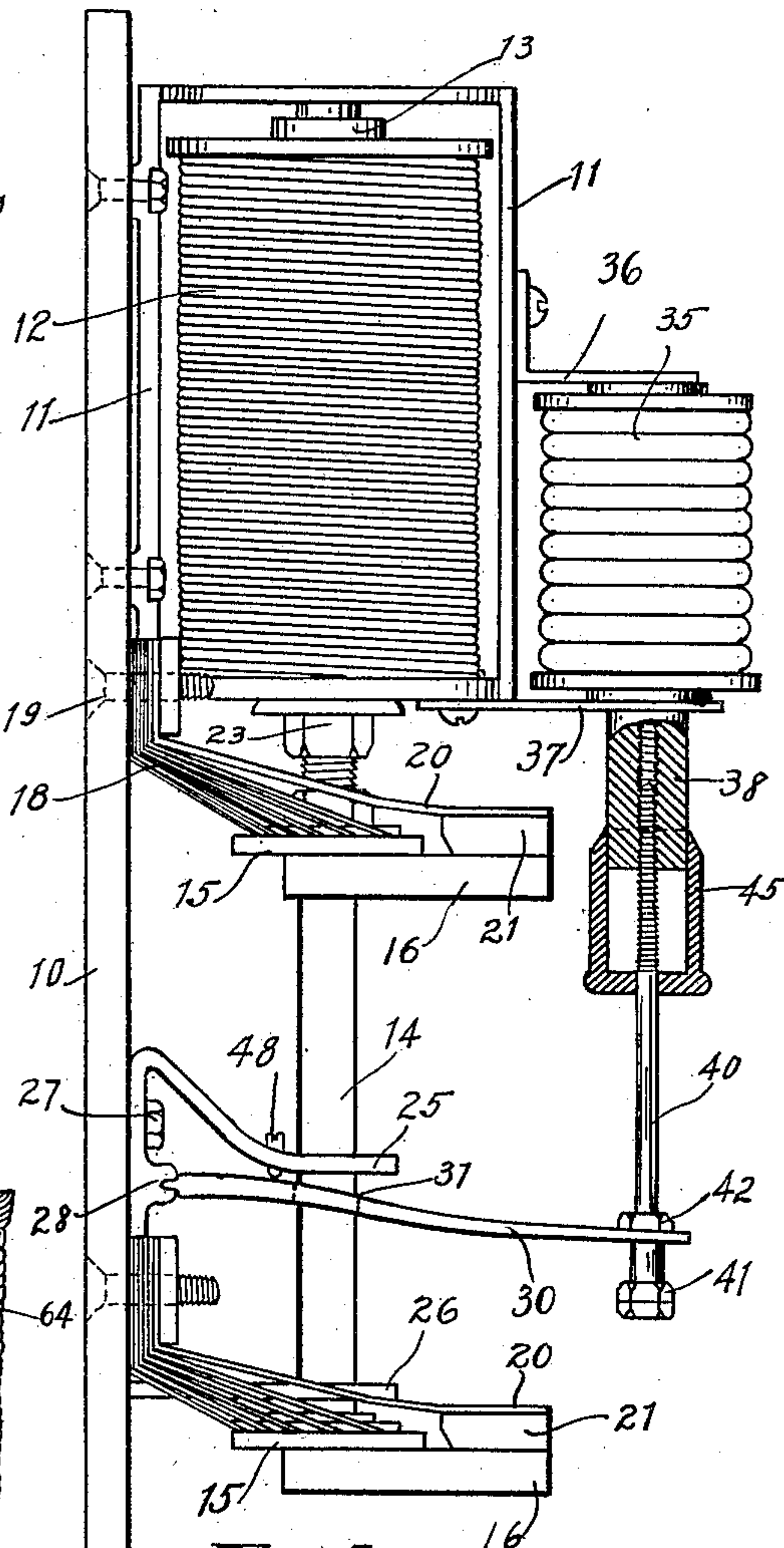
**Fig. 3.**



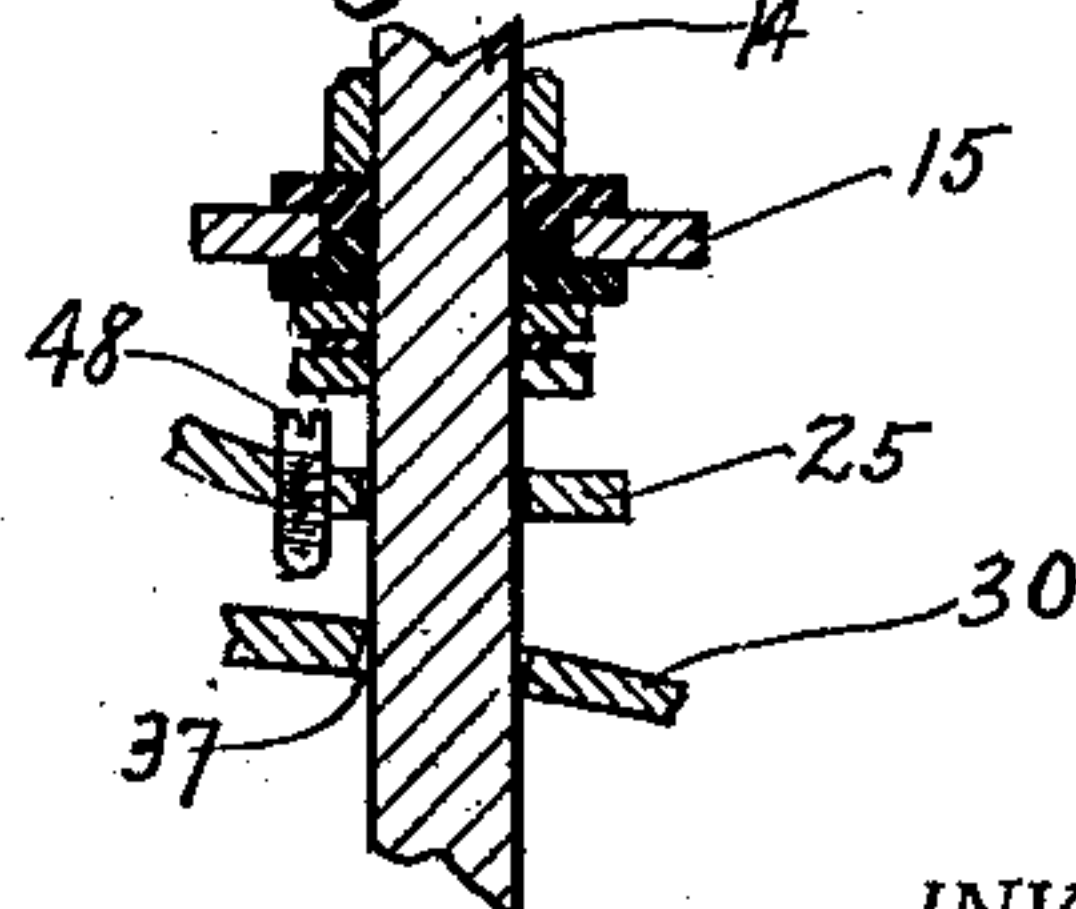
WITNESSES:

J. H. Swan.  
O. M. Greener.

**Fig. 2.**



**Fig. 4.**



INVENTOR.

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# UNITED STATES PATENT OFFICE.

WALTER S. RYAN, OF MUNCIE, INDIANA.

## CIRCUIT-BREAKER.

991,546.

Specification of Letters Patent.

Patented May 9, 1911.

Application filed September 12, 1908. Serial No. 452,744.

*To all whom it may concern:*

Be it known that I, WALTER S. RYAN, of Muncie, county of Delaware, and State of Indiana, have invented a certain new and useful Circuit-Breaker; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which like letters refer to like parts.

10 The object of this invention is to provide an extremely sensitive circuit breaker which is entirely automatic. It can be operated, if desired, with a pilot switch and is readily adjustable to the work desired of the switch.

15 In carrying out this object one feature of the invention consists in providing a switch which is closed by a solenoid and held closed by mechanical means and released by another and smaller solenoid and given the opening impulse by a spring and the opening movement of the switch is caused by gravity. This makes a very effective switch and the small solenoid has the very slight function of releasing the clutch or other means for holding the switch closed. Therefore in this device I avoid the use of electric means for holding the switch closed and especially for opening the switch. The switch is opened by a spring and by gravity, and electric means is employed merely for releasing the clutch.

Another feature of the invention employed along with the foregoing is the provision of a core for the small solenoid which is adjustably connected with the means for releasing the clutch that holds the switch closed and providing on said core a graduated scale whereby the position of said core with reference to its solenoid can be set or adjusted to suit the work desired.

40 In operation, when the current through the small solenoid becomes greater than that indicated by the scale on the core, the core will be actuated, the clutch released and the switch opened. But when the current through the small solenoid is less than that indicated on the core, the core will not be affected by the current in said small solenoid and the switch will remain closed. For that purpose said small solenoid is a very coarsely wound one so as to admit a wide range of current through said solenoid.

50 The full nature of this invention will be understood from the accompanying drawings and the following description and claims.

In the drawings Figure 1 is a front elevation of the circuit breaker open. Fig. 2 is a side elevation of the circuit breaker closed, with parts in central vertical section. Fig. 3 60 is a central vertical section of the pilot switch for operating said circuit breaker. Fig. 4 is a central vertical section through a part of the switch rod and associated parts, as shown in Fig. 1. 65

In detail the drawings herein show a base-plate 10 made of slate or like material and upon it there is secured a bracket 11, carrying a relatively large solenoid 12 which is provided with a core 13 rigidly connected 70 with the switch bar 14, said solenoid, core and switch bar being vertically disposed and the switch bar extending downwardly from the solenoid. Said switch bar has two switch plates 15 secured to it, being horizontal copper plates and on the under side of each edge of said plates there is a carbon block 16. Four sets of copper contact strips 18 may be secured to the base plate by screws 19. The ends of the contact strips of each set project forwardly and overlap each other. These four sets of contact strips are arranged in two horizontal pairs, one set of each pair on each side of the center of the device, as shown in Fig. 1, so that each contact plate 15, when elevated, will come in contact with a pair of sets of contact strips 18, as shown in Figs. 1 and 2. Upon each set of contact strips 18 there is secured a copper spring 20 that overlaps and extends 75 beyond the upper contact strip of each set and it has on its outer end a carbon block 21 so arranged that as the switch is closing the carbon blocks 21 on the springs 20 will be engaged by the carbon block 16 on the switch plates 15 and the free ends of said springs 20 will be pushed upwardly so that said springs will be put under tension. The switch continues to close until the switch plates 15 come in full contact with the strips 18. The upward movement of the switch plates and the bar 14 which carries them is stopped by the adjustable stop nut 23 on the lower end of the core 13. The switch bar 14 is guided in its vertical movement by the 80 guide arms 25 and 26 that are secured to the base plate by the screws 27 and extend forwardly therefrom. Upon said bed plate there is a fulcrum lug 28 in which a clutch bar 30 at one end is fulcrumed. This bar 110 30 has an aperture 31 in it through which the bar 14 loosely projects so that it auto-



5 matically clutches the bar 14 after the latter has been raised to its highest position and starts to settle. In such clutching movement the outer end of the clutch bar 30 moves downwardly slightly.

10 With the foregoing arrangement it is obvious that as soon as the outer or free end of the clutch bar 30 is raised it will elevate the switch bar 14 and then the springs 20 which are all under tension at the time will give the sudden opening movement of the switch which will be completed by gravity, bringing the switch bar, plate 15 and bar 14 down to their lower positions, as shown in Fig. 1.

15 To release the clutch bar 30 a small solenoid 35 is mounted between the two arms 36 and 37 from the bracket 11 and the core 38 of said small solenoid is provided with a graduated scale 39 indicating amperage or current values. There is a rod 40 adjustably connected with said core 38 and which extends down to and is connected with the clutch bar 30 for actuating it. Said rod 40 at its upper end is threaded to enter the threaded hole in the lower end of the core 38. The rod 40 at its lower end has nuts 41 and 42 thereon, the latter being adjustable and said nuts being separated so that the lower nut 41 will strike and suddenly release the clutch at the upper limit of movement of the solenoid 35.

The adjustment of the core 38 with reference to the solenoid 35 is accomplished by the sleeve 45 which is secured on the rod 40 surrounding the core 38 so that as the core 38 is screwed up or down on the rod 40 the clutch 30 will be released by a smaller or greater value of current through the solenoid, respectively. For this purpose the solenoid is very coarsely wound so that it will permit the passage of currents of widely varying values. The numeral or graduation mark on the core 38 which registers with the upper end of the sleeve 45 indicates substantially the value of the current through the solenoid 35 at which the switch will open. Therefore, if one wishes the device set so the switch will open when the current exceeds 25 amperes, the core 38 is turned on the threaded upper end of the rod 40 until the graduation mark 25 on the core is opposite the upper end of the sleeve 45. If it is desired that the switch do not open until the current exceeds 50 amperes, the core is screwed until the numeral 50 thereon registers with the upper end of the sleeve 45. When the current then exceeds the value indicated by the scale, the core will be started in its upward movement and as it moves upwardly the influence of the solenoid thereon increases proportionately to the upward movement until it is stopped. The upward movement of the solenoid would of course be limited by the clutch bar 30 which is stopped by an adjustable stop-plug 48 in the bar 25.

The circuits are as follows: The current comes in over wire 50 to the binding post 51 and through wire 52 and thence through solenoid 12 out through wire 53 to the pilot switch 54, which may be a push-button switch, as shown, or any other well known form of switch. With the switch button 55 pushed downwardly the current passes through switch plates 56 and 57 to the wire 58. When the current passes through this circuit just described, the solenoid 12 will be energized and the switch closed in the manner specified. The clutch bar 30 then locks the switch closed and the push-button 55 of the pilot switch being released, the circuit described is broken. Then the current comes in over wire 50, passes through wire 60 to the small solenoid 35 and out through the binding post 61, which is electrically connected with one set of the spring contacts 18. Thence the current passes through the upper switch plate 15, it being closed, and out over wire 62 to the work, and back through wire 63 to one of the lower sets of contact strips and through the lower switch plate 15 and out over the wire 64.

The switch will remain in the closed position and the current pass over this last named circuit until the current becomes greater than desired and indicated by the scale on the core 38, whereupon it will automatically open the switch in the manner heretofore described and break the circuit. The switch will then remain open until the push-button 55 is again operated.

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

1. An automatic circuit breaker including a switching means, a clutch for holding it in closing position, a solenoid, a core therefor provided with graduations indicating current values, and a rod adjustably connected with said core for operating said clutch, said rod being provided with an indicating means that indicates the position of the core with relation to the solenoid, substantially as set forth.

2. An automatic circuit breaker including a switching means, a clutch for holding it in closing position, a solenoid, a core therefor provided with graduations indicating current values, a rod adjustably connected with said solenoid for operating said clutch, and an indicating sleeve secured to said rod and loosely surrounding said solenoid, whereby said scale and the upper end of said sleeve will indicate the value of current passing through said solenoid that is required to actuate the solenoid.

3. An automatic circuit breaker including a switching means, a clutch bar for holding it in the closing position, a solenoid that is relatively coarsely wound, a core therefor that is graduated from the lower end upwardly to indicate current values, and a con-

nection with said core for actuating said clutch bar, which is provided with indicating means with reference to the scale on the core, and a scale on the core to indicate the  
5 value of the current required to release the switch.

In witness whereof, I have hereunto af-

fixed my signature in the presence of the witnesses herein named.

WALTER S. RYAN.

Witnesses:

A. C. SILVERBURG,  
L. L. BRACKEN.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,  
Washington, D. C."

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