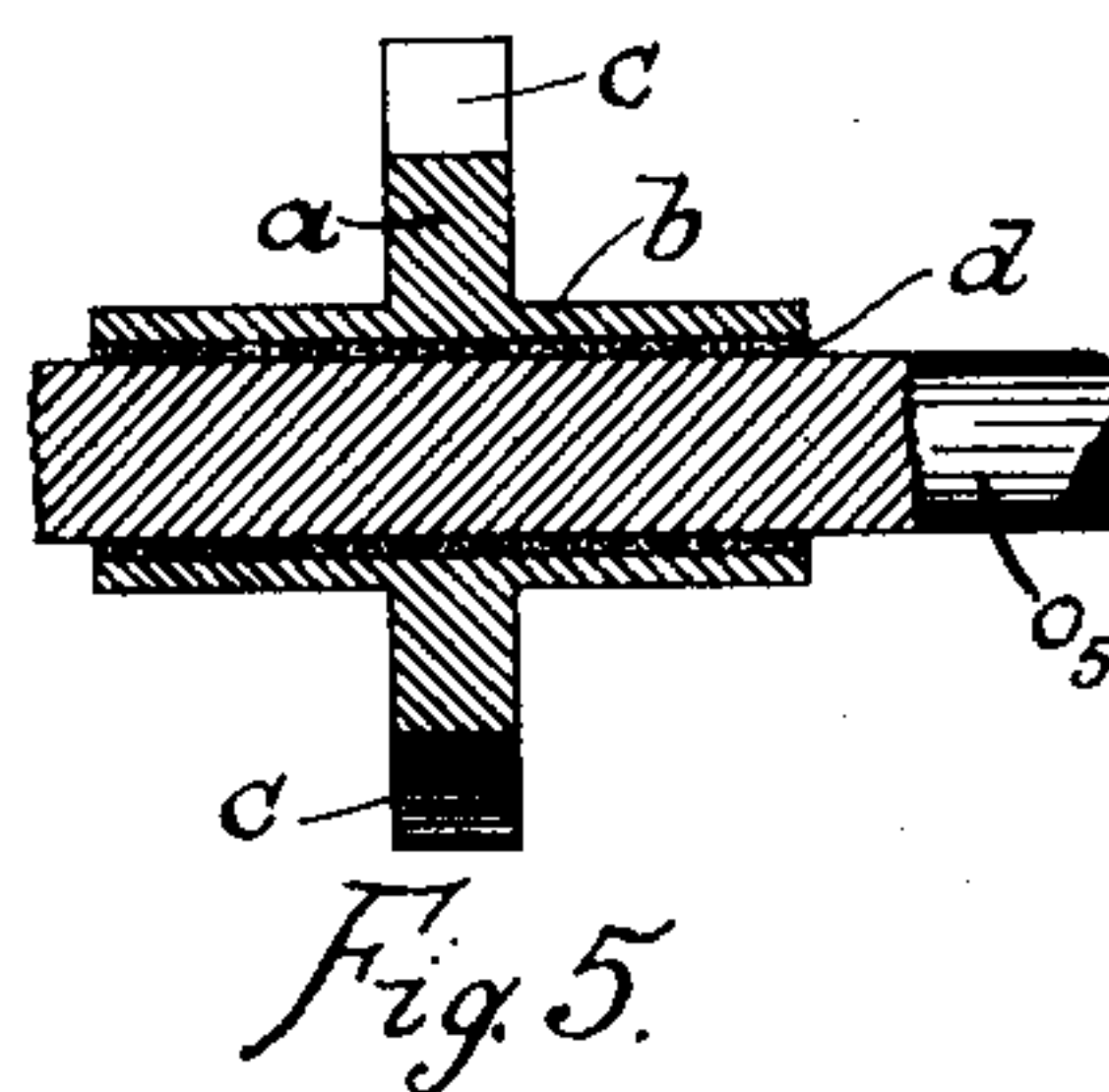
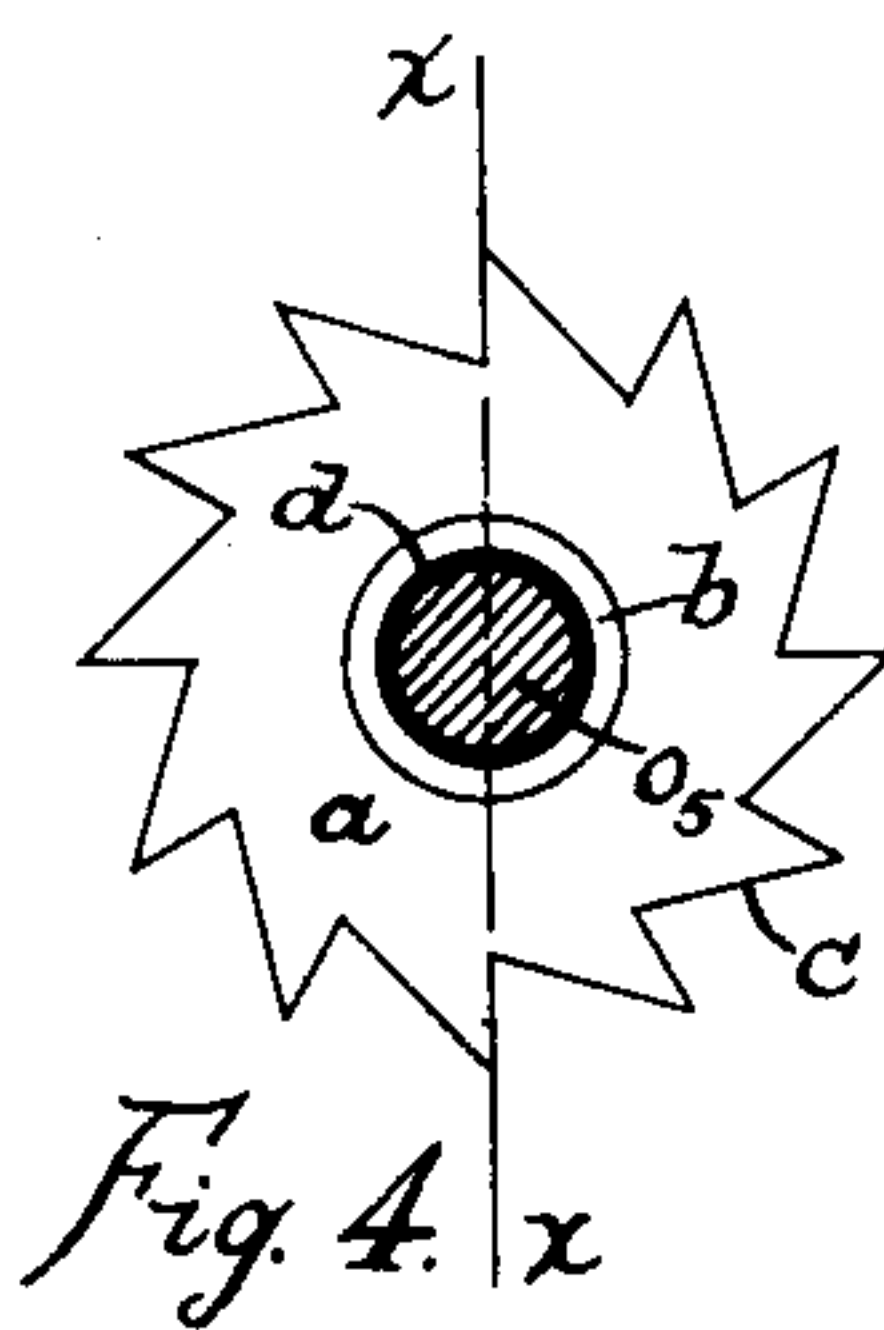
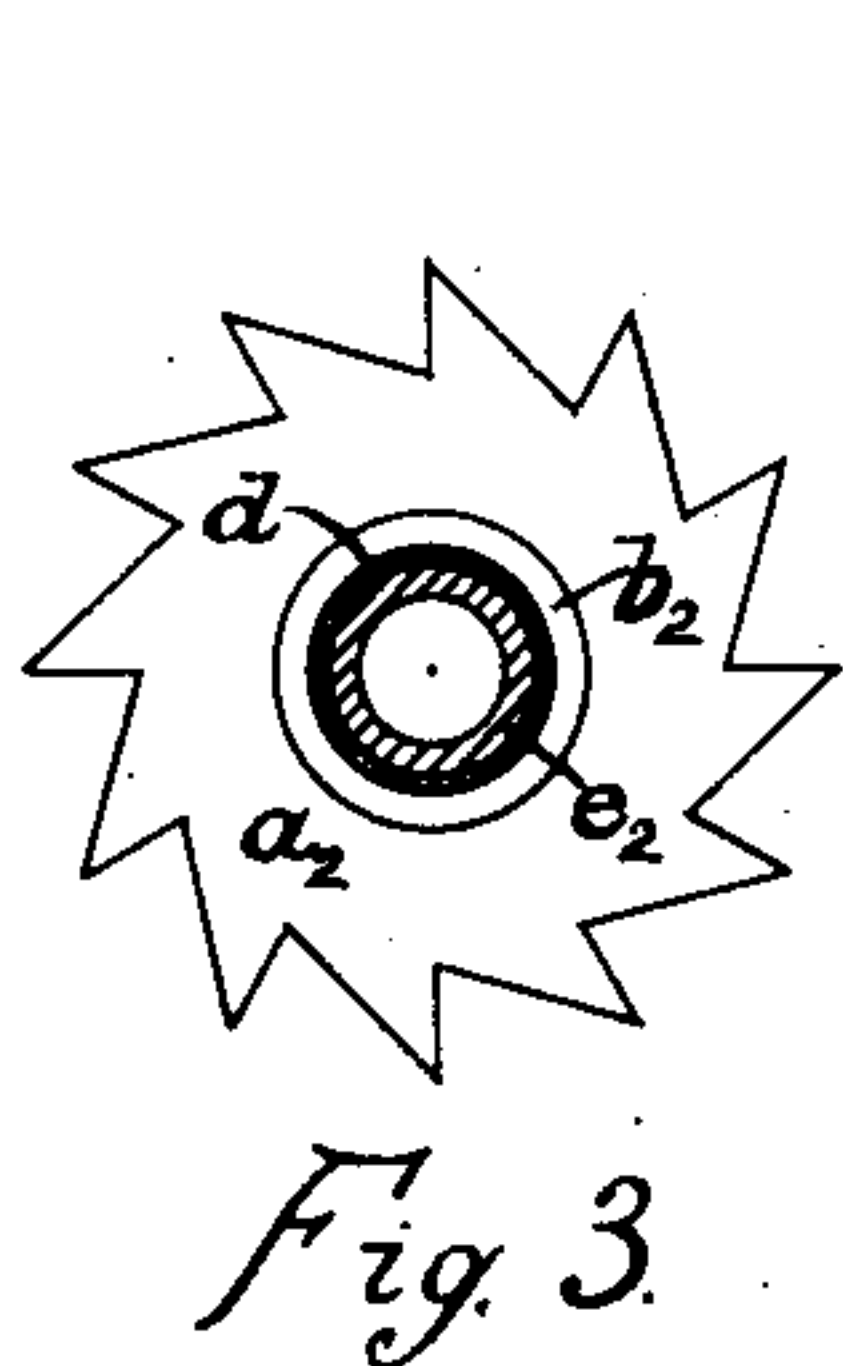
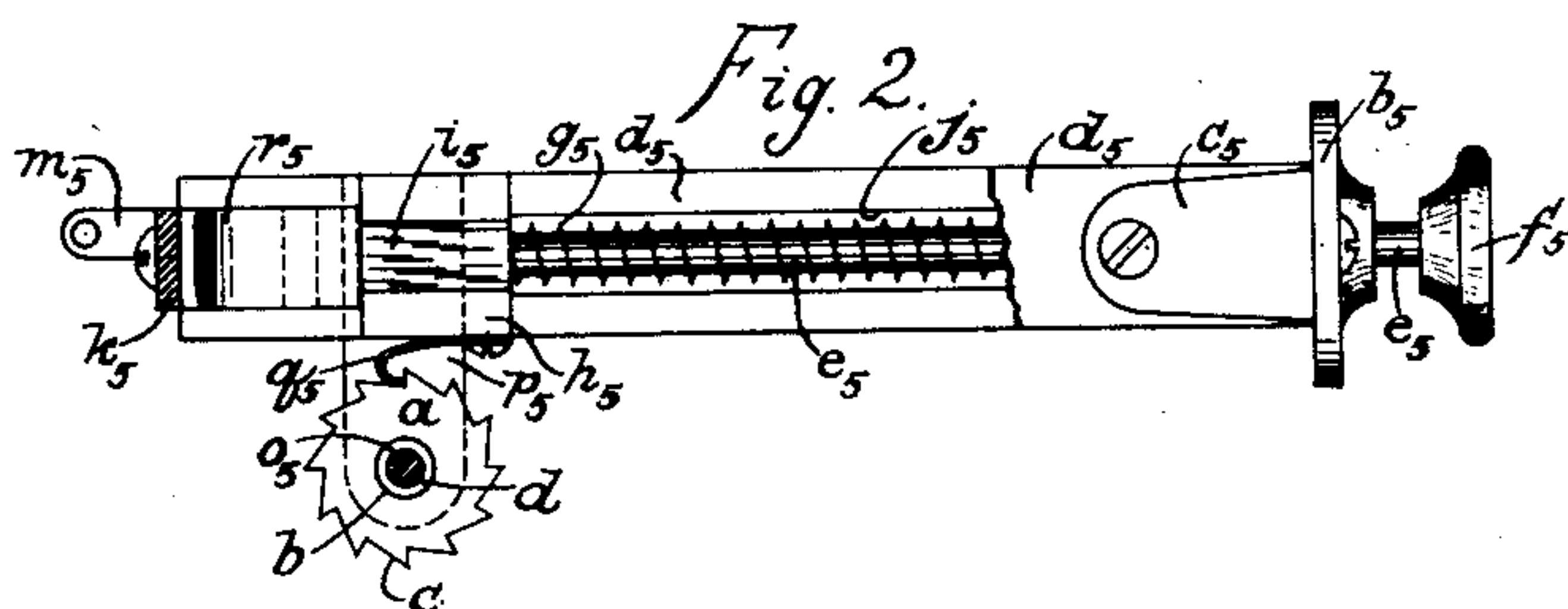
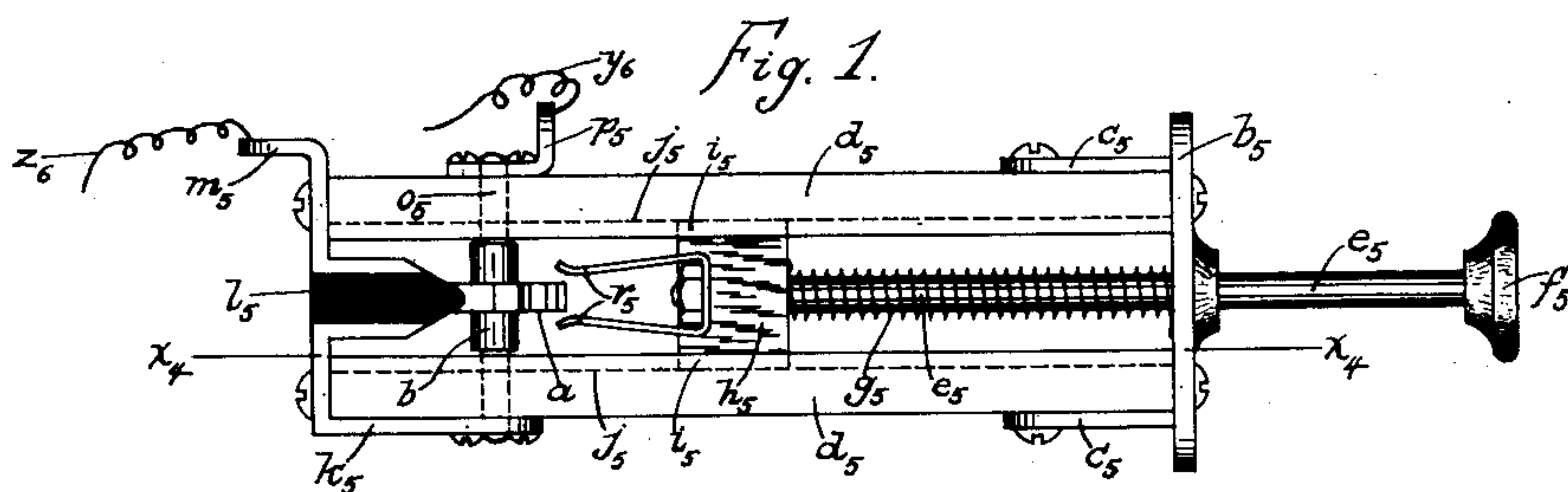


E. W. LEEPER.  
THERMO ELECTRIC CIRCUIT BREAKER.  
APPLICATION FILED DEC. 14, 1906.

997,924.

Patented July 11, 1911.



WITNESSES:  
*Frank B. Cook.*  
*Frederick R. Parker.*

INVENTOR: *Edward W. Leeper.*

# UNITED STATES PATENT OFFICE.

EDWARD W. LEEPER, OF CHICAGO, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO  
FRANK B. COOK, OF CHICAGO, ILLINOIS.

## THERMO-ELECTRIC CIRCUIT-BREAKER.

997,924.

Specification of Letters Patent.

Patented July 11, 1911.

Original application filed May 28, 1904, Serial No. 210,308. Divided and this application filed December 14, 1906. Serial No. 347,873.

*To all whom it may concern:*

Be it known that I, EDWARD W. LEEPER, a citizen of the United States of America, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Thermo-Electric Circuit-Breaker, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

My invention relates to electro-thermal cut-outs or switches, and more particularly to the self-soldering type of such devices.

The principal objects of my invention are to provide an electro-thermal cut-out or switch which may be adapted for use in connection with either large or small currents; to provide such an electro-thermal device which is self-contained, or in other words a complete unit in itself; to provide simplicity of construction and accessibility in such a device; and to construct such a cut-out or switch so that it may be utilized as a push-button device.

This invention is a division of my application entitled thermo-electric circuit breakers, filed May 28, 1904, Serial No. 210,308.

In my present invention I employ a heat-producing conductor, preferably a straight piece of resistance wire, upon which is soldered a rotary detent, or toothed wheel, by heat-susceptible material which is readily affected by heat. The heat produced in the said conductor by an abnormally large current therein softens the heat-susceptible material and thereby allows the said detent to turn upon the said conductor and release a spring-controlled mechanism which operates circuit controlling means. When the heat-susceptible material becomes cool, the said detent is thereby secured to the heat-producing conductor and is then ready to reengage the spring-controlled mechanism. The heat-producing conductor may be a solid conductor or a hollow conductor, whichever is required to suit the conditions under which it is to operate.

In this invention the spring-controlled mechanism, the heat-producing means, and the rotary detent, are all carried by a suitable frame or casing, the said mechanism preferably working in guides in the said

casing and being provided with a push-button for resetting the device to operative position.

I will more particularly describe my invention by reference to the accompanying drawings, in which,—

Figure 1 is a plan view of the device of the invention, showing same in an operated position; Fig. 2 is a cross-sectional view of Fig. 1, taken on line  $x_1-x_1$  thereof, with portions shown in elevation, showing the device in a set position; Fig. 3 is side elevation of the rotary detent secured to a hollow heat-producing conductor by heat-susceptible material; Fig. 4 is a side view of the rotary detent secured to a solid heat-producing conductor by heat-susceptible material; and Fig. 5 is a cross-sectional view of Fig. 4, taken on line  $x-x$  thereof.

Like characters refer to like parts in the several figures.

The insulating head or slide  $h_5$  is provided with projections  $i_5$  thereon adapted to slide in the grooves  $j_5$  of guides  $d_5$  and is mounted on the end of pin  $e_5$  which extends through the front plate  $b_5$  to the push-button  $f_5$ . The switch blades  $r_5$  are secured to the head  $h_5$ , preferably as shown, and are adapted to engage the contact members  $m_5$  and  $k_5$  which are insulated from each other by the insulating block  $l_5$ , when the switch is closed. The heat-producing conductor  $o_5$  carrying the toothed wheel  $a$  which is secured thereto by heat-susceptible material  $d$ , is supported by a bracket  $p_5$  and a projecting portion of  $k_5$ . The toothed wheel  $a$  is preferably provided with a sleeve portion  $b$  which extends along the conductor  $o_5$  so as to give a larger soldering surface. The catch spring  $q_5$  is secured to the head  $h_5$  and is adapted to engage a tooth  $c$  of wheel  $a$  when the device is set for operation. When the device is set for operation, the switch then being closed, the head  $h_5$  is slid along the guides  $d_5$  by means of the push-button  $f_5$ , until the switch blades  $r_5$  engage the contact members  $m_5$  and  $k_5$  and the catch spring  $q_5$  engages a tooth  $c$  of wheel  $a$  and thus holds the head  $h_5$  in this position against the tension of the spring  $q_5$  which now tends to open the switch. The



circuit through the device is from line conductor  $z_6$  through contact member  $m_6$ , switch blades  $r_6$ , contact member  $k_6$ , resistance conductor  $o_6$ , bracket  $p_6$ , and line conductor  $y_6$ .

5 When an abnormally large current traverses the heat-producing conductor  $o_6$  the heat produced therein softens the heat-susceptible material  $d$  and allows the toothed wheel  $a$  to be turned upon conductor  $o_6$  by the spring  $q_6$ , due to the tension of spring  $g_5$  which slides the head  $h_6$  to the position shown in Fig. 1 and thereby opens the switch, the spring  $q_6$  being released from the wheel  $a$  which is now turned to a new position upon conductor  $o_6$ . When the heat-susceptible material cools and hardens, the wheel  $a$  is resoldered to conductor  $o_6$  in its new position. The device may now be reset for another operation, the catch spring  $q_5$  engaging a new tooth  $c$  of wheel  $a$  and thereby holding the head  $h_6$  in operative position against the tension of spring  $g_5$ . Now the device may be operated again by an abnormally large current in the conductor

25  $o_5$ . The device may be operated and reset, as just described, as many times as desired. The front plate  $b_5$  may be mounted to a suitable support in any desirable position, as, for example, to the face of a switch-board in front of the operator. The position of the push-button  $f_5$  shows to the operator whether the device is set for operation or is operated.

It will be readily seen from the drawings that the operating spring  $g_5$ , the plunger  $e_5$ , the head or slide  $h_5$ , and the switch blades  $r_5$ , are all carried by the guides or casing  $d_5$   $d_5$ , and that the rotary dent  $a$  and the heat-producing conductor  $o_5$  are also carried by the said guides  $d_5$   $d_5$ , thus making a self-contained unit of the device.

40 In Fig. 3,  $e_2$  is a hollow heat-producing conductor. The toothed wheel  $a_2$  is secured to the conductor  $e_2$  by heat-susceptible material  $d$ .  $b_2$  is the hub on wheel  $a_2$ .

45 I do not wish to limit this invention to the particular details of construction as herein shown, as many modifications may be made therein without departing from the scope of the invention.

50 Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is—

1. An electrical protector unit comprising a rotary detent normally held against operation by heat-susceptible material, heating means associated with the heat-susceptible material to soften same upon the passage of an abnormally large current, circuit-controlling means associated with the detent and controlled thereby, means for placing the circuit-controlling means under control of the detent, a coil spring for operating the circuit-controlling means and a frame-like support carrying the elements specified, the coil spring being within the frame-like support,

all constituting a single unit substantially as described.

2. In an electro-thermal protector, a rotary detent normally held against operation by heat-susceptible material, means for heating the heat-susceptible material to allow the detent to operate, means for engaging the detent and tending to operate same, a coil spring, and a plunger adapted to be depressed against the tension of the coil spring to set the apparatus for operation, the plunger being operated by the coil spring when the apparatus operates.

3. An electrical protector comprising a suitable support, an electro-thermal switch carried by the support, a plunger for setting the device to operative position, and a coil spring against which the plunger is depressed when the apparatus is set, the coil spring being arranged to operate the plunger upon abnormal electrical conditions in the device.

4. In a device of the character described, a frame-like support, an electro-thermal device carried by the said support, a plunger for setting the device for operation and carried within the said frame-like support, and a coil spring for operating the said plunger upon abnormal current conditions in the device, and also carried within the said frame-like support.

5. An electro-thermal device comprising a rotary detent operable upon abnormal electrical conditions, means for engaging the detent to operate same and having a plunger adapted to be depressed to set the said engaging means, and a coil spring acting on the plunger to operate same when the detent releases the said engaging means.

6. An electrical protector unit comprising a rotary detent operable upon abnormal electrical conditions, means for engaging the detent to operate same and thereby control a circuit, a plunger associated with the said engaging means and a coil spring acting on the said plunger whereby the said engaging means is disengaged from the detent under abnormal electrical conditions.

7. An electro-thermal device comprising a pair of guides carrying a thermally-operable device, a slide carried between the guides and carrying switching means, and means for engaging the thermally-operable device to operate same under abnormal heating; a plunger attached to the said slide and provided with a push-button to be depressed to set the device for operation, and a coil spring surrounding the plunger and acting on the said slide to operate the apparatus, the coil spring 8 being put under tension by depressing the push button.

8. In a device of the character described, a frame-like support, an electrothermal switch carried thereby, a plunger for setting the switch and carried within the said support



port, and a coil spring acting on the said plunger whereby the switch is operated upon an excess of current in the device.

9. In a device of the character described, 5 a frame-like support, an electrothermal device comprising a rotary detent operable upon abnormal electrical conditions and carried by the said support, means for engaging the detent to operate same and having 10 a plunger adapted to be depressed to set the said engaging means, the plunger being carried within the said frame-like support, and a coil spring acting on the plunger to operate same when the detent releases the 15 said engaging means, the coil spring being also carried within the said frame-like support.

10. A device of the character described, 20 comprising a pair of parallel guides carrying an electrothermal switch, a slide carried between the guides and carrying a detent for holding the switch in set position, a plunger attached to the said slide, a push button on one end of the plunger for setting 25 the switch for operation, and a coil spring surrounding the plunger and acting on the said slide to operate the switch, the said coil

spring and plunger being carried between the said guides and the said coil spring being put under tension for operating the 30 switch by depressing the push button.

11. In apparatus of the class specified, a heat cartridge embodying in its construction both self-soldering thermally-operable 35 excess current mechanism, and circuit-controlling mechanism coöperating therewith, said cartridge having a sliding member operable from the exterior of the cartridge and extending into the same and arranged 40 to reset the cartridge after operation.

12. A heat cartridge comprising a heating device, a self-soldering wheel, a spring-actuated plunger extending from the interior to the exterior of said cartridge, said plunger 45 being provided with means for engaging said wheel.

As inventor of the foregoing I hereunto subscribe my name in the presence of two subscribing witnesses, this 11th day of December, 1906.

EDWARD W. LEEPER.

Witnesses:

FRANK B. COOK,

FREDERICK R. PARKER.