

No. 800,831.

PATENTED OCT. 3, 1905.

C. A. ROLFE.  
ELECTRICAL PROTECTIVE DEVICE.

APPLICATION FILED DEC. 29, 1903.

2 SHEETS—SHEET 1.

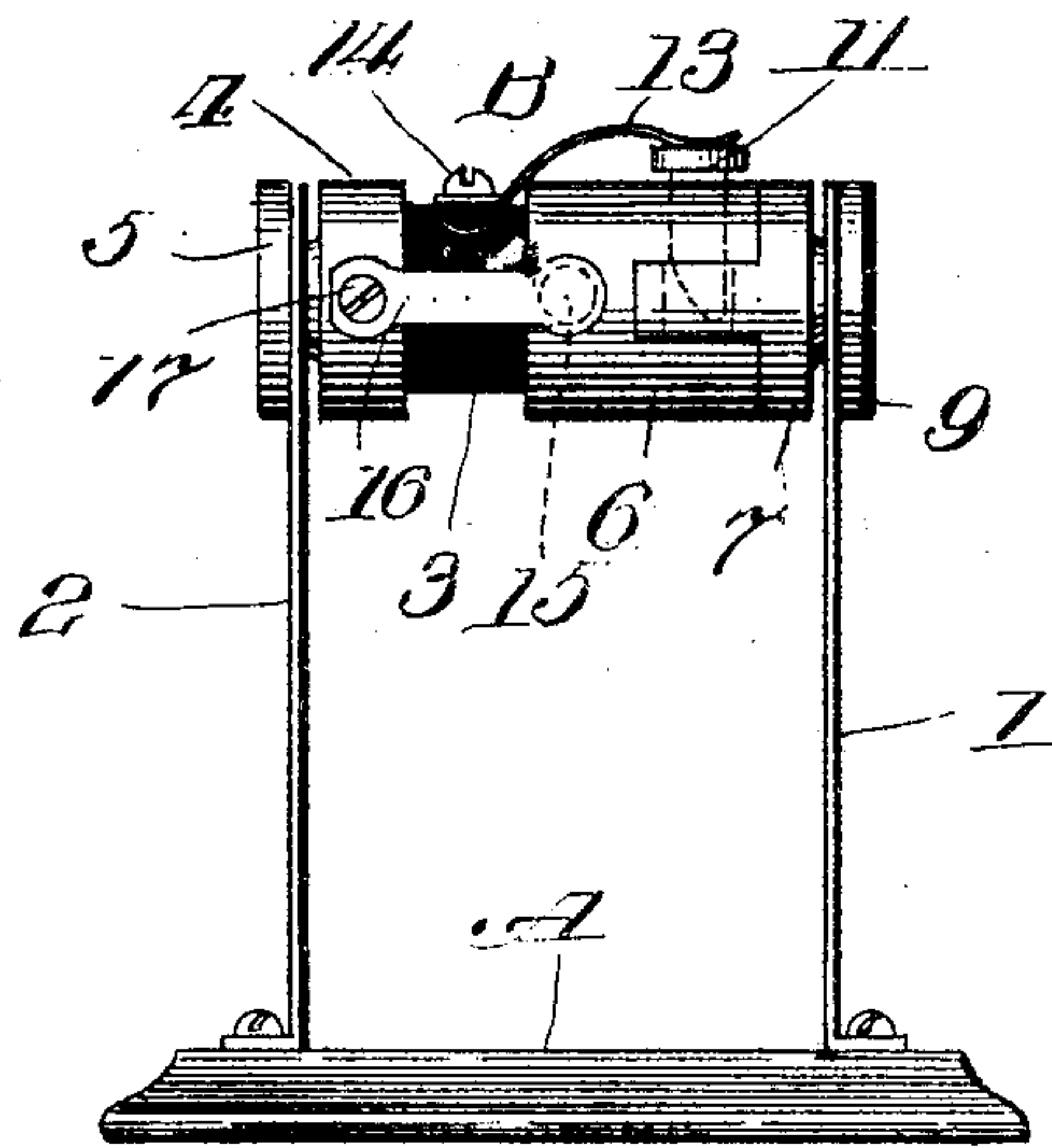


Fig. 1.

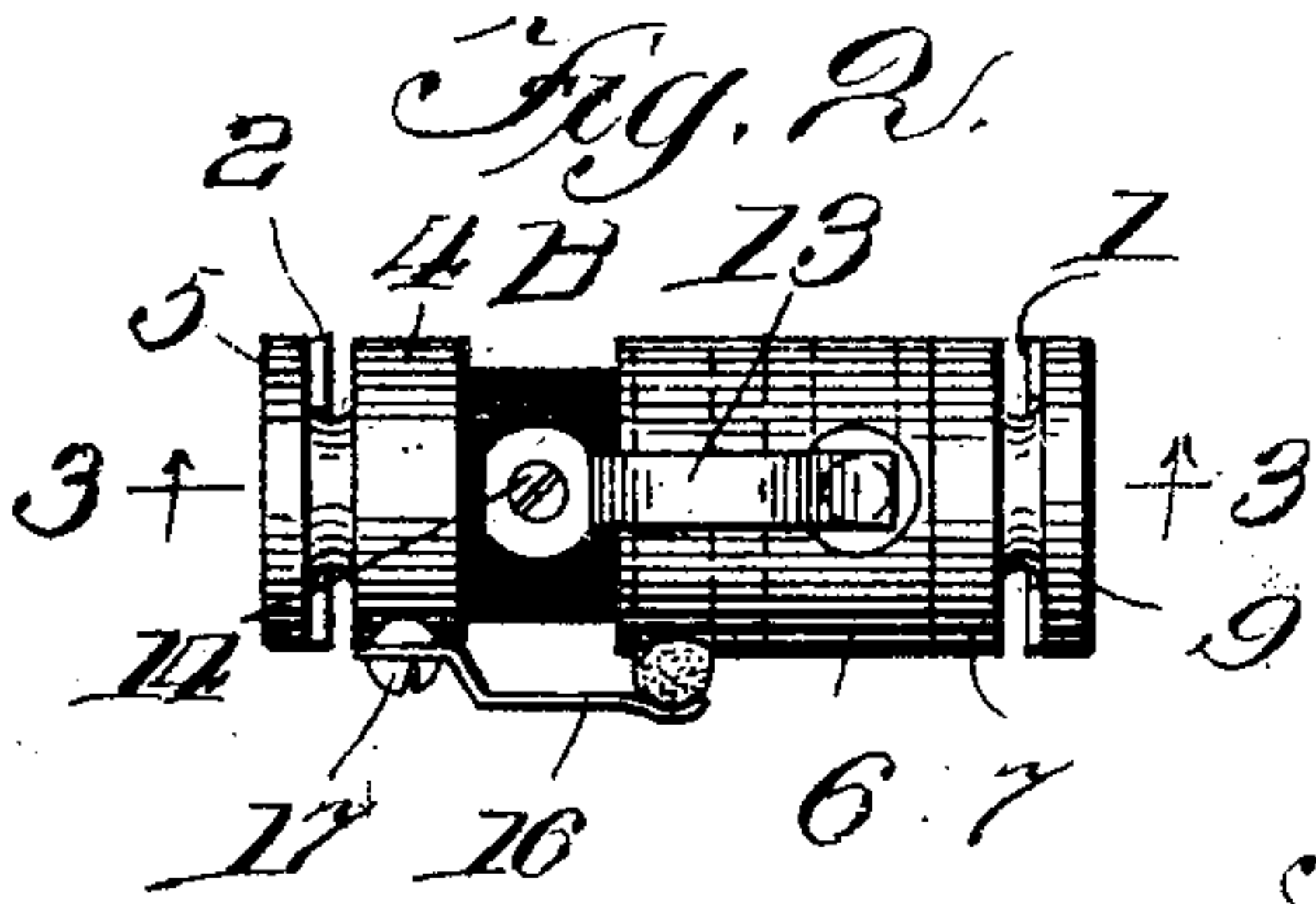


Fig. 2.

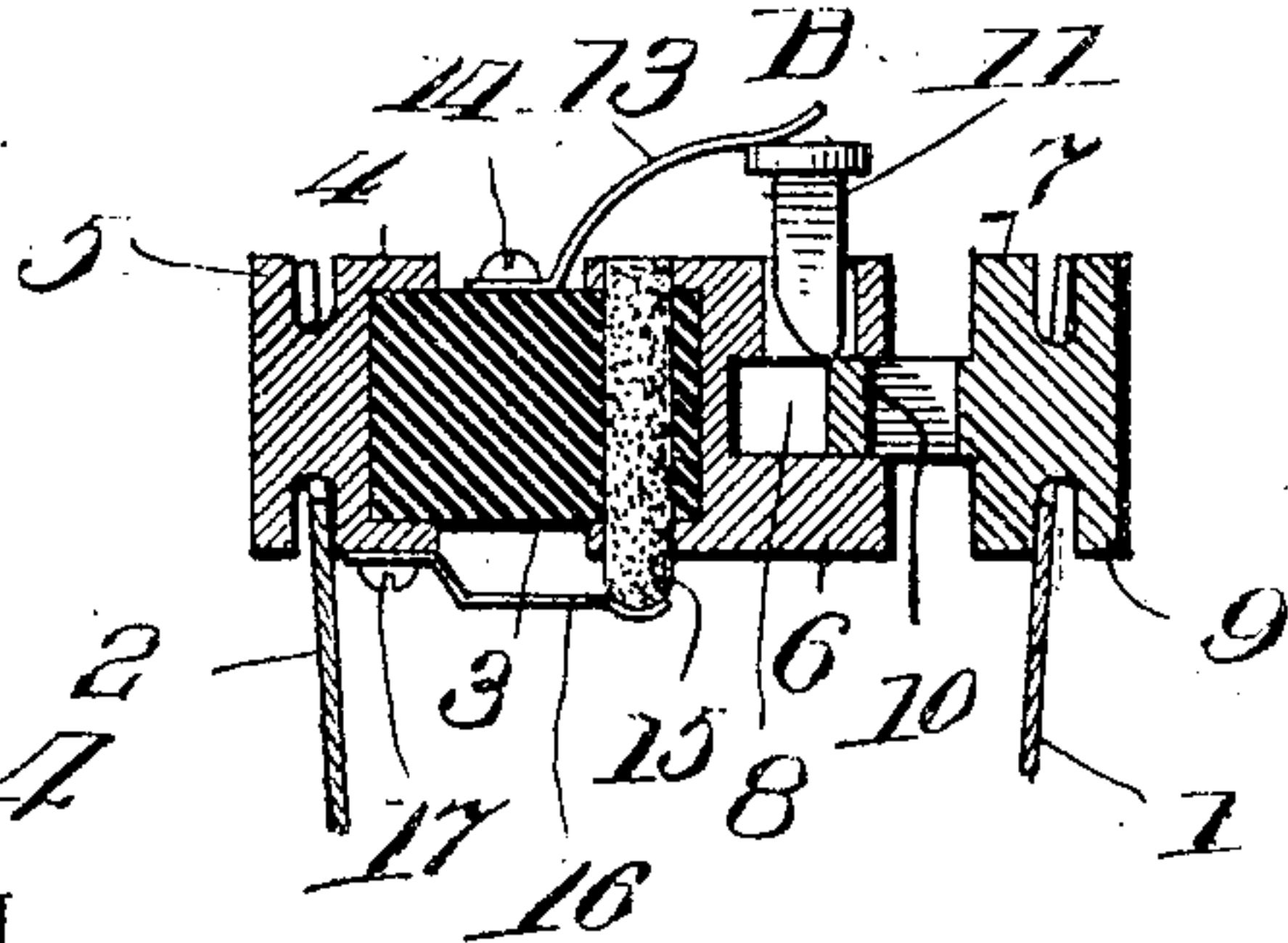


Fig. 3.

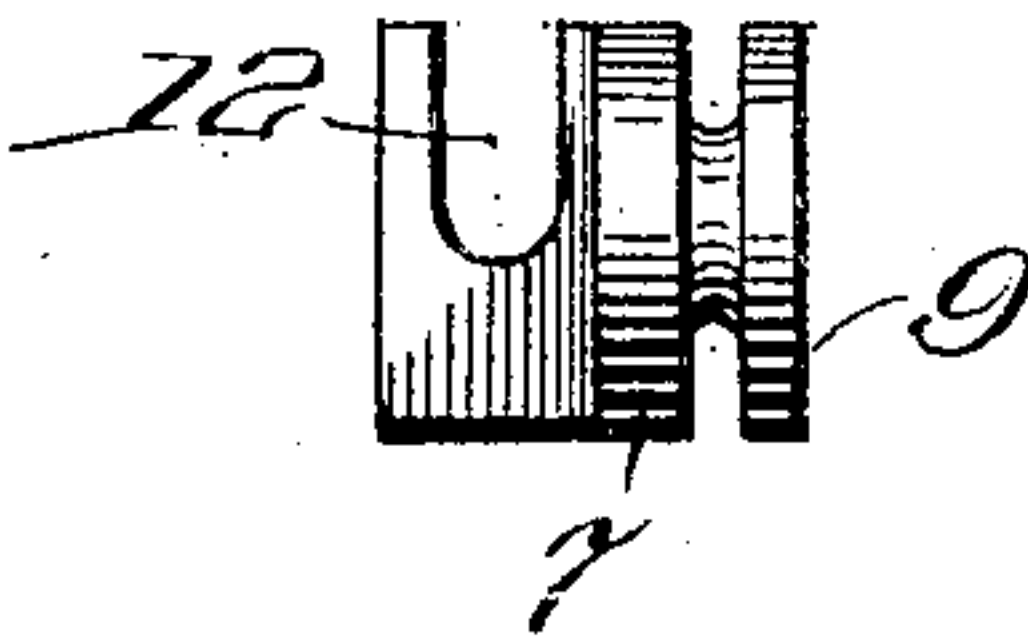


Fig. 4.

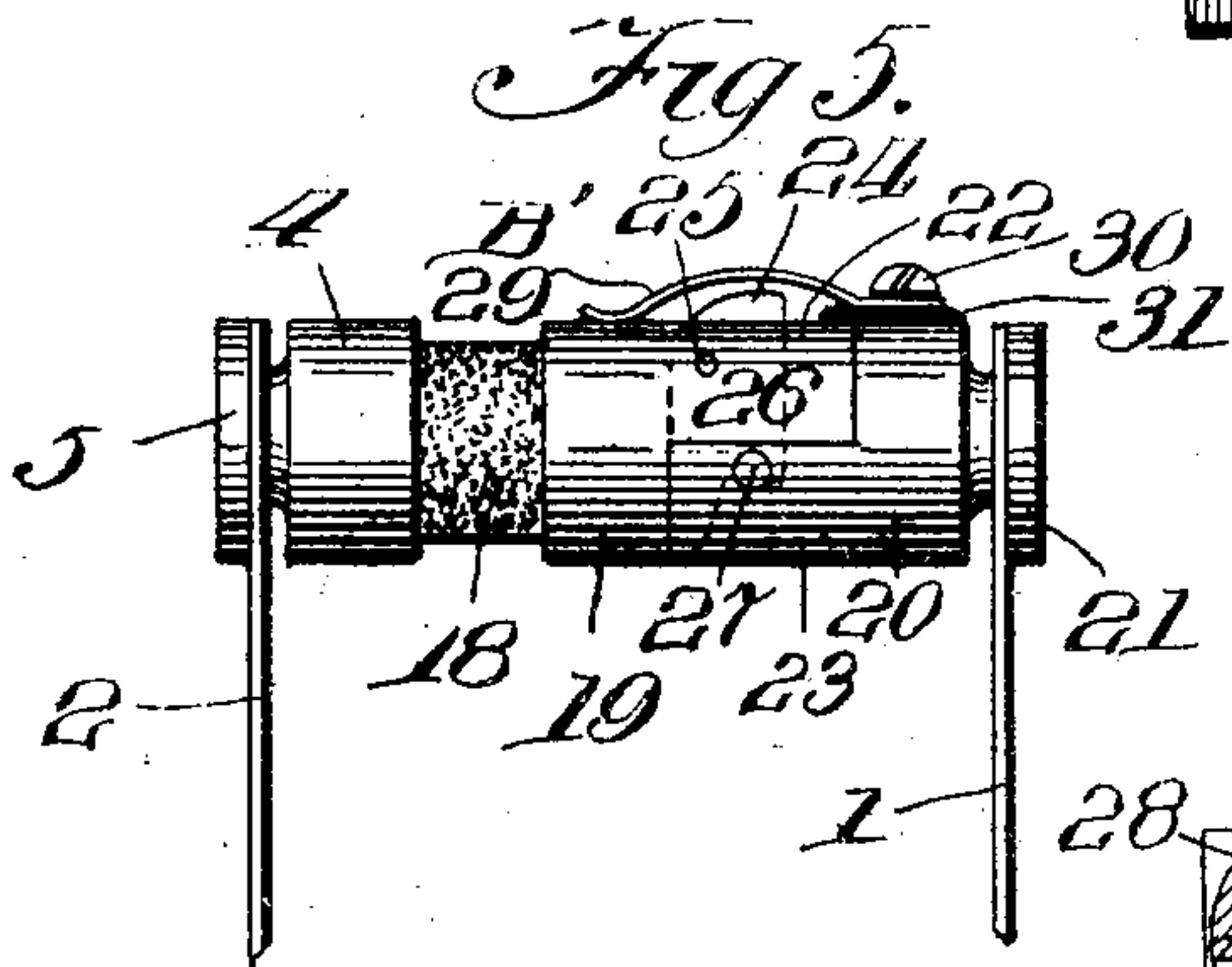


Fig. 5.

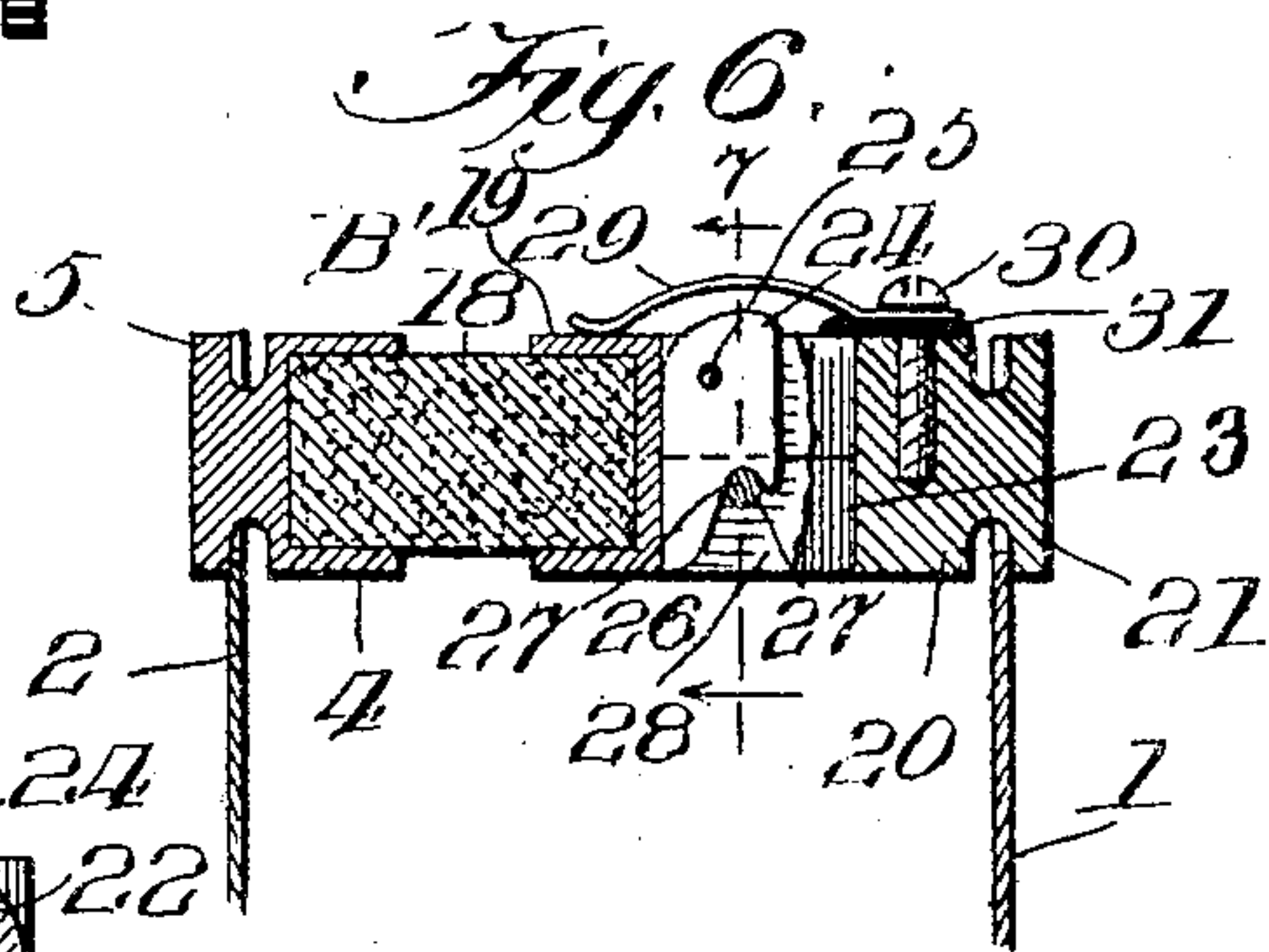


Fig. 6.

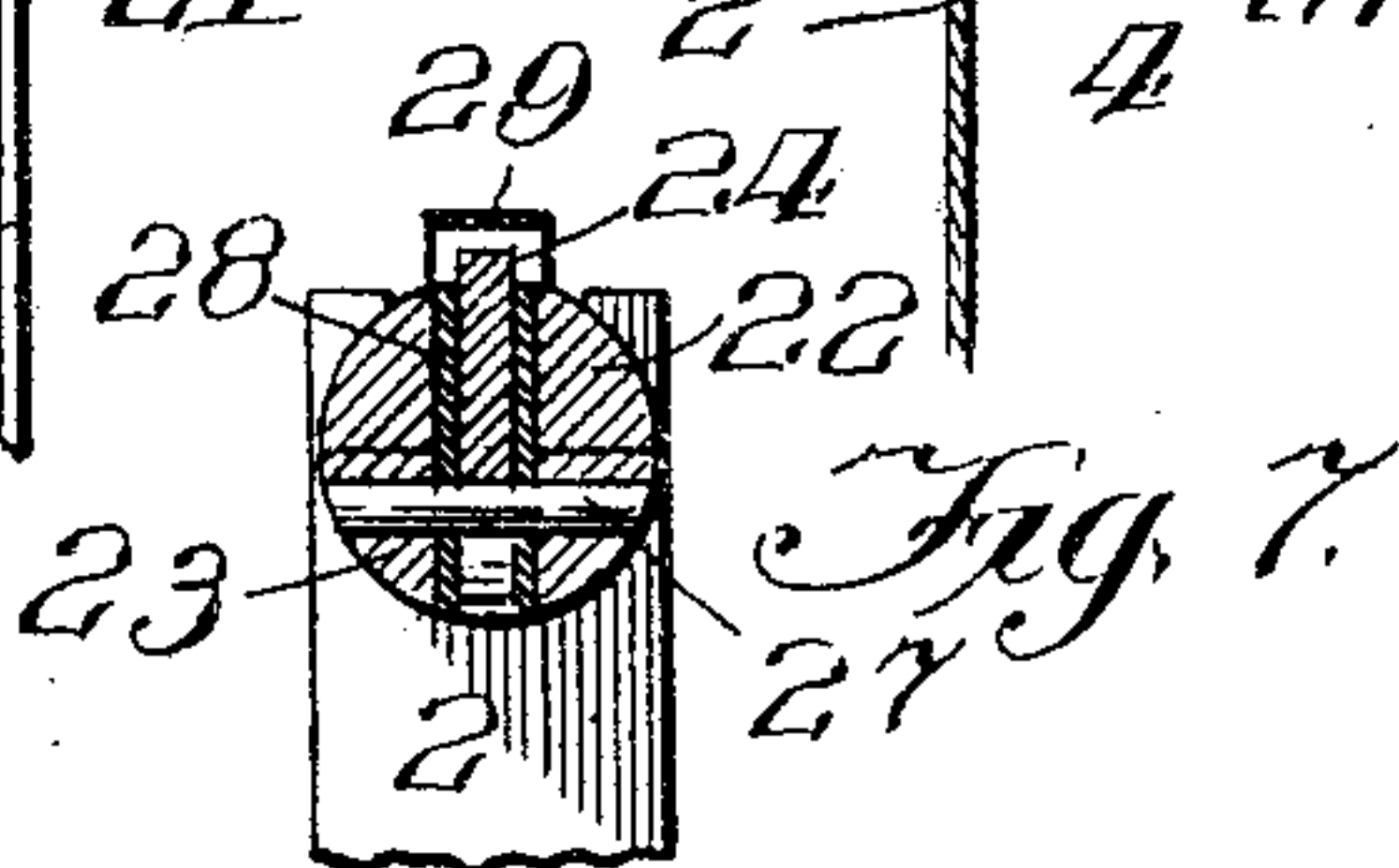


Fig. 7.

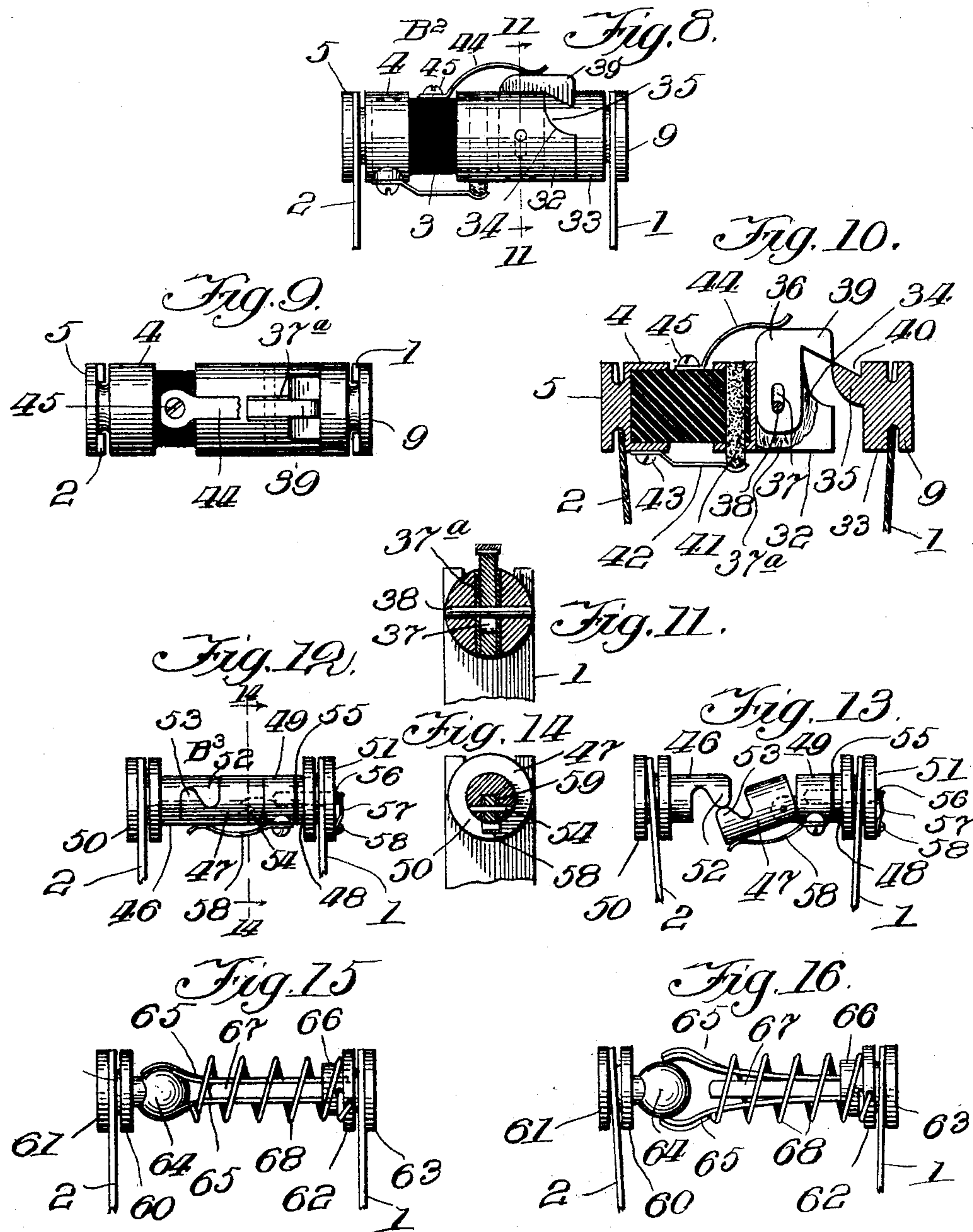
Witnesses:  
H. S. Gaither  
J. C. Lee

Inventor:  
Charles A. Rolfe  
by A. Miller Befield  
Attorney

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2 SHEETS—SHEET 2.



Witnesses:  
H. S. Gaither  
J. C. Lee

Inventor  
Charles A. Rolfe  
by A. Miller Belfield  
attorney



# UNITED STATES PATENT OFFICE.

CHARLES A. ROLFE, OF ADRIAN, MICHIGAN, ASSIGNOR, BY MESNE ASSIGNMENTS, TO ROLFE ELECTRIC CO., OF ROCHESTER, NEW YORK, A CORPORATION OF NEW YORK.

## ELECTRICAL PROTECTIVE DEVICE.

No. 800,831.

Specification of Letters Patent.

Patented Oct. 3, 1905.

Application filed December 29, 1903. Serial No. 187,042.

*To all whom it may concern:*

Be it known that I, CHARLES A. ROLFE, a citizen of the United States, residing at Adrian, in the county of Lenawee and State of Michigan, have invented a certain new and useful Improvement in Electrical Protective Devices, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to protective devices for protecting low-tension circuits—such as telephone, fire-alarm, police-telegraph, and the like—from injury by the powerful currents of electric lighting and trolley circuits.

Prominent objects of the invention are to provide a simple, practical, and inexpensive device of the class specified, to make it unnecessary to replace or repair the device or any of its parts after an operation, and to accomplish this result in a simple and expeditious manner.

In the accompanying drawings, Figure 1 is a side elevation of a protective device embodying my invention. Fig. 2 is a plan view of the same. Fig. 3 is a longitudinal section of the upper part of the device in process of operation. Fig. 4 is a view of a detail of construction. Figs. 5 and 6 are a side elevation and a longitudinal section, respectively, of a modified form of device. Fig. 7 is a cross-section taken on line 7-7 in Fig. 6. Figs. 8, 9, and 10 are respectively a side elevation, a top plan, and a longitudinal section, of another modification, the device being shown in process of operation in Fig. 10. Fig. 11 is a cross-section taken on line 11-11 in Fig. 8. Figs. 12 and 13 are side elevations of another modification, the device being shown in process of operation in Fig. 13. Fig. 14 is a cross-section taken on line 14-14 in Fig. 12. Figs. 15 and 16 are side elevations of a modified form of the device, Fig. 16 showing the same in process of operating.

Referring first to the device shown in Figs. 1 to 4, inclusive, A is an insulating-base made of wood, porcelain, or other insulating substance and of any convenient form and size. Upon this are mounted two line-springs 1 and 2, which rise from the base and tend to spring away from one another, the upper ends of these line-springs being forked. A heat-cartridge B is mounted upon the line-springs

1 and 2 and holds these springs under tension and against separation from one another. The heat-cartridge B comprises a block 3 of insulating material, preferably ebonite or hard rubber, a terminal 4, secured thereto and having a head 5, and a coupling device consisting of coupling members 6 and 7. The coupling member 6 is secured to the insulating-block 3 and is constructed with a slot or recess 8, and the member 7 is made in the form of a terminal having a head 9 and also having a tongue or projection 10, which is adapted to fit and slide in the slot 8 in the member 6. The member 6 is provided with a vertical aperture which is adapted to receive a pin or plug 11, and the member 7 is provided with a slot 12, whose inner end is adapted to register with the aperture in the member 6 when the tongue 10 is inserted and confined in the slot 8. The pin 11 is soldered by soft solder adapted to melt or soften on the development of a moderate excess of heat in its position in the aperture of the member 6 and the slot of the member 7. A spring 13 is secured, as by a screw 14, to the insulating-block 3 and extends over the head of the pin 11, exerting thereon a tendency to push said pin downwardly. A stick or pencil 15 of high-resistance graphite adapted to generate heat on the passage of an unduly strong current through the device is confined in a suitable aperture formed in the block 3, and its upper end rests against the upper edge of the metallic coupling member 6. A contact-spring 16 is secured, as by a screw 17, to the terminal 4 and extends therefrom to and below the lower end of the graphite stick 15, with which it makes contact. The circuit is made through the heat-cartridge through the coupling members 6 and 7, graphite stick 15, spring-contact 16, and terminal 4. This device operates as follows: The normal condition of the device is as shown in Fig. 1, in which the coupling members 6 and 7 are held in engagement by the pin 11, the latter being in a downward position and the line-springs 1 and 2 being engaged by the heads 5 and 9, so as to hold said springs under tension. As long as the current remains normal the device remains in this condition. When, however, an unduly strong current traverses the circuit, the graphite stick 15 becomes heated thereby, and it sufficiently heats the coupling member 6 to



soften or melt the solder holding the pin 11 in position, whereupon the tension exerted by the line-springs 1 and 2 causes the coupling member 7 to be withdrawn from the member 6, as shown in Fig. 3, the pin 11 being by this action elevated, as shown in said figure. Upon the withdrawal of the member 7 from the member 6 to such an extent as to separate the tongue 10 from its slot 8 the circuit is broken between these coupling members. At such time the spring 13 immediately acts to depress the pin 11, forcing it down into its normal position, and on the cooling of the device the solder about such pin hardens, thereby holding the pin again fast in its position. To place the device again in condition for operation, the coupling member 7 is again placed in engagement with the coupling member 6 by inserting the tongue 10 into the slot 8 from one side, it being seen that this will be permitted by reason of the crosswise slot 12 in the member 7. The device is thus restored to its normal condition without repair or replacement of any parts and is ready for another operation.

Referring next to the device in Figs. 5, 6, and 7, a suitable base (not shown) and line-springs 1 and 2 are provided as before, and these are held under tension by a heat-cartridge B', which is supported by such springs. The cartridge B' comprises a terminal 4, having a head 5, a block or cylinder 18, of high resistance graphite, adapted to become heated on the passage of a moderately-excessive current, and a coupling comprising coupling members 19 and 20. The coupling member 19 is secured to one end of the graphite cylinder 18, and the member 20 is made in the form of a terminal having a head 21 adapted to engage the line-spring 1. The members 19 and 20 have overlapping portions 22 and 23, the former being located above the latter, and these portions are longitudinally slotted, as shown in Fig. 7. In this slot is arranged a latch or catch 24, which is pivoted at 25 to the overlapping portion 22 of the member 19. The lower portion of the catch 24 is made with a hook 26, and a pin 27 is secured to the overlapping portion 23 of the member 20 and is adapted to engage the hook 26 of the catch 24. A small quantity 28 of solder is arranged in the slot on either side of the catch 24. A spring 29 is secured, as by a screw 30, to the coupling member 20. This spring is insulated from such member, however, by a strip 31 of insulation. The circuit through this device is made through the coupling members 19 and 20, the graphite cylinder 18, and the terminal 4. The operation of the device is as follows: Under normal conditions the device is as shown in the figures, with the coupling members 19 and 20 held in engagement by the catch 24, which in turn is held against movement about its pivot 25 by the solder 28. Relative movement vertically of the members

19 and 20 is prevented by the spring 29. When an unduly-strong current traverses the circuit and the cylinder of graphite is heated, the solder 28 is softened, thereby loosening the catch 24, whereupon the line-springs 1 and 2 draw the coupling members away from one another and separate the same so as to open the circuit. In this movement the pin 27 passes under the hook 26 of the catch 24, in so doing elevating said catch, and as soon as said pin has passed under said catch and is free therefrom the spring 29 comes into contact with the catch and presses it downwardly, thereby restoring it to its original position. In this position it is resoldered by the hardening of the solder 28, when the device cools off.

Referring to the device shown in Figs 8 to 11, inclusive, a heat-cartridge B<sup>2</sup> is shown, mounted similarly to the heat-cartridge of the preceding devices. This cartridge B<sup>2</sup> comprises a terminal 4, having a head 5, a block or cylinder 3, of insulating material, preferably hard rubber, and a coupling comprising metallic coupling members 32 and 33. The member 32 is secured to one end of the insulating-block 3 and has its other end slotted or forked, the forked portions of which are cut away at 34, Fig. 10. The coupling member 33 is made in the form of a terminal and is provided with a head 9, adapted to engage the line-spring 1. It is also constructed with a projection or tongue 35, adapted to fit in the recesses 34 34 and extending from side to side of the member 32. A vertically-movable latch 36 is arranged in the forked or slotted end of the member 32 and surrounded by solder 37<sup>a</sup>, adapted to melt or soften on the application of a moderate excess of heat. The catch 36 is provided with a slot 37, and a pin 38 is passed through the member 32 and through the slot 37 in the catch 36. The latter has an overhanging portion or lip 39, adapted to engage a corresponding recess 40 in the member 32. A graphite stick or pencil 41, adapted to become heated on the passage of an unduly-strong current, is secured in position at one end of the block 3, its upper end making contact with the member 32. A contact-spring 42 is secured, as by a screw 43, to the terminal 4, and its other end is extended below and placed in contact with the lower end of the graphite stick 41. A spring 44 is secured, as by a screw 45, to the upper side of the block 3 and is extended over to the upper face of the catch 36, on which it rests, tending normally to depress said catch. The circuit through this heat-cartridge from one line-spring to another is by way of the coupling members 32 and 33, the graphite stick 41, the contact-spring 42, and the terminal 4. The operation of the device is as follows: Under normal conditions the device is as shown in Fig. 8, with the coupling members 32 and 33 in engagement with one another through the latch 36, which is held



against movement by the solder 37<sup>a</sup>. When an excessive current traverses the device, the graphite stick 41 becomes heated, thereby heating and softening or melting the solder 37<sup>a</sup>, which releases the catch 36. The tension of the line-springs 1 and 2 then causes the coupling members 32 and 33 to move away from one another, the catch 36 being elevated by such action. This movement continues until the member 33 is withdrawn sufficiently to separate it from the member 32, thereby opening the circuit. As soon as the member 33 is freed from the catch 36 the spring 44 depresses the catch 36, causing it to resume its normal position, where it is resoldered by the hardening of the solder 37<sup>a</sup> on the cooling of the device. To place the heat-cartridge in position for another operation, the member 33 is reengaged with the member 32 by sliding the former sidewise, so that the tongue 35 comes into the recess formed by the forked end of the member 32 and the lip 39 of the catch 36.

Referring to the arrangement shown in Figs. 12, 13, and 14, a heat-cartridge B<sup>3</sup> is shown comprising a pair of coupling members 46 and 47, a terminal 48, and an intermediate member 49. The coupling member 46 and the terminal 48 are provided with heads 50 and 51, respectively, to engage the line-springs. The members 46 and 47 are constructed with noses 52 and 53, respectively, adapted to engage one another, and the member 47 is pivoted at 54 to the intermediate member 49. The latter is in turn secured to the terminal 48, but insulated therefrom by a strip of insulation 55. A stick of graphite 56 is arranged in a bore formed in the parts 48 and 49, and a spring-contact 57 is secured by a screw 58 to the terminal 48 and arranged to rest against the outer end of the graphite stick 56. A spring 58 is secured to the intermediate member 49 and extended under the coupling member 47 to near the free end thereof, tending normally to elevate said member. A small quantity 59 of solder is associated with the pivotal joint of the member 47. The circuit is made from the line-springs through this heat-cartridge by way of the terminal 48, the graphite stick 56, the intermediate member 49, and the coupling members 47 and 46. The device operates as follows: Under normal condition the coupling members 46 and 47 are in engagement with one another, being so held by the solder 59. When an unduly-strong current traverses the circuit, the graphite stick 56 becomes heated to an extent to melt or soften the solder 59, whereupon the coupling member 46 is freed. The line-springs thereupon move the coupling members 46 and 47 longitudinally, the member 47 swinging about its pivotal connection, as shown in Fig. 13. This movement is continued so that the noses of these members sep-

arate from one another, thereby opening the circuit. When said members are freed from one another, the spring 58 acts to elevate the member 47 and restore the same to its normal position. The solder 59 thereupon hardens, resoldering said member 47 in its normal condition. The two parts of the cartridge are reengaged by reengaging the members 46 and 47, whereupon the device is in condition for another operation.

In the arrangement shown in Figs. 15 and 16 is a heat-carriage B<sup>4</sup>, comprising a terminal 60, having a head 61, a second terminal 62, having a head 63, and a ball-and-socket joint consisting of a ball 64, conveniently forming part of the terminal 60, and spring socket members 65 65, embedded and secured in a block 66 of insulation, which is secured to the terminal 62. Between the spring socket members 65 is a quantity of solder 67, and surrounding these members is a coil 68 of insulated wire. One end of this coil is connected with the terminal 62 and the other end is connected with one of the spring members 65, so that the circuit between the line-springs through the heat-carriage B<sup>4</sup> is from the terminal 62 to the coil 68, thence to one of the spring members 65, and thence to the head 64.

The device in normal condition is shown in Fig. 15 and in operated condition in Fig. 16, it being seen that the device is operated by the softening of the solder 67, thereby permitting the ball or head 64 to be withdrawn from the spring members 65. After operation the spring members 65 return to their original condition and are resoldered by the hardening of the solder 67.

It will be seen that changes and modifications can be made in the arrangements hereinbefore set forth without departing from the spirit of my invention and also that other forms of devices embodying the invention can be devised.

What I claim is—

1. An electrical-circuit protector comprising thermally-operable securing means consisting of coupling members, and having provisions for automatically resetting itself in operative condition.

2. An electrical-circuit protector comprising securing means consisting of coupling members, said protector having provisions for automatically resoldering itself in operative condition.

3. An electrical-circuit protector comprising a pair of supporting-strips and a heat-cartridge consisting of coupling members, said cartridge having provisions for automatically resoldering itself in operative condition.

4. In apparatus of the class specified, a self-restoring heat-cartridge constructed with separable members.

5. In apparatus of the class specified, a heat-cartridge comprising separable members, one



of which has provisions for automatically resetting itself in normal condition after separation.

6. In apparatus of the class specified, a heat-cartridge comprising separable members, automatically-restorable engaging means, a material susceptible to heat normally holding said engaging means in engagement, and a heat-concentrating device adapted to affect said material on the passage of an unduly-strong current.

7. In apparatus of the class specified, a heat-cartridge comprising a pair of separable members each provided with a coupling member, one of said coupling members being automatically restorable, material susceptible to heat, normally holding said automatically-restorable coupling member in engagement with the other coupling member, and a heat-concentrating device adapted to affect said material on the passage of an unduly-strong current.

8. In apparatus of the class specified, a heat-cartridge comprising separable terminals provided with coupling members one of which has provisions for automatically resoldering itself, and a heat-concentrating device.

9. In apparatus of the class specified, a heat-cartridge comprising separable terminals each provided with a coupling member, one of which has means for restoring itself automatically to operative condition, a quantity of solder holding said self-restoring member in condition to engage the other coupling member, and a heat-concentrating device adapted to soften or melt said solder on the passage of an unduly-strong current.

10. In apparatus of the class specified, a heat-

cartridge comprising separable terminals each provided with a coupling member, one of which has a movable part adapted to be moved in being disengaged from the other, material susceptible to a moderate excess of heat, holding said movable coupling part in engaging position, a heat-concentrating device adapted to affect said material on the passage of an unduly-strong current, and means for restoring said movable coupling member to normal condition after the separation of said members.

11. In apparatus of the class specified, a heat-cartridge comprising a pair of separable terminals each provided with a coupling member, one of which has a movable part arranged to be moved by the separation of the terminals, solder holding said movable member normally against movement, a heat-concentrating device, and means for restoring said movable member to normal condition, substantially as described.

12. In apparatus of the class specified, a heat-cartridge comprising a pair of separable terminals each provided with a coupling member, one of which is provided with a catch to engage the other member, solder for holding said catch normally in engaging position, a heat-concentrating device, and spring means for restoring the catch to normal position, substantially as described.

In witness whereof I hereunto subscribe my name this 16th day of November, A. D. 1903.

CHARLES A. ROLFE.

Witnesses:

A. MILLER BELFIELD,  
I. C. LEE.