

No. 816,443.

PATENTED MAR. 27, 1906.

C. E. EVELETH.
EXPULSION FUSE.
APPLICATION FILED MAY 14, 1904.

Fig. 1

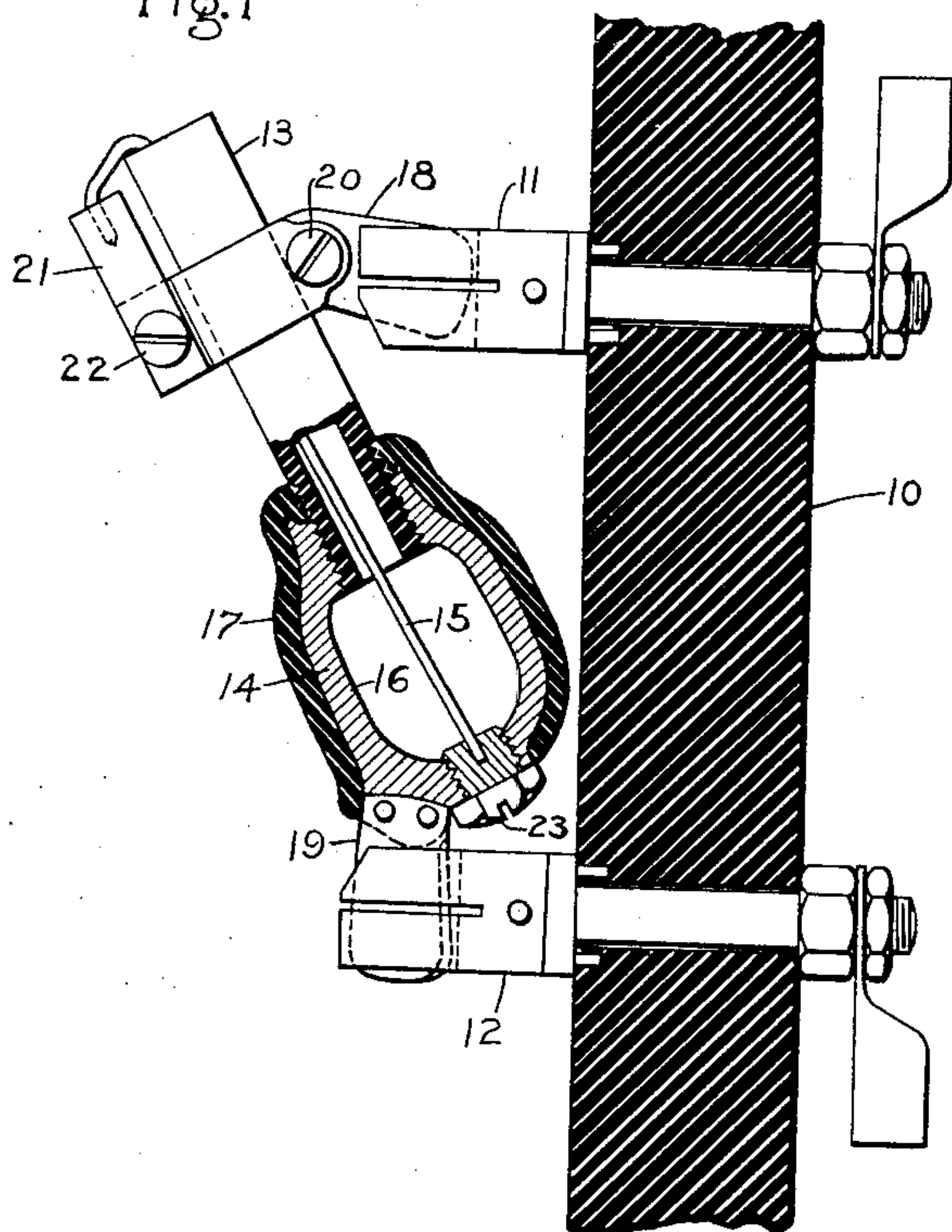


Fig. 2

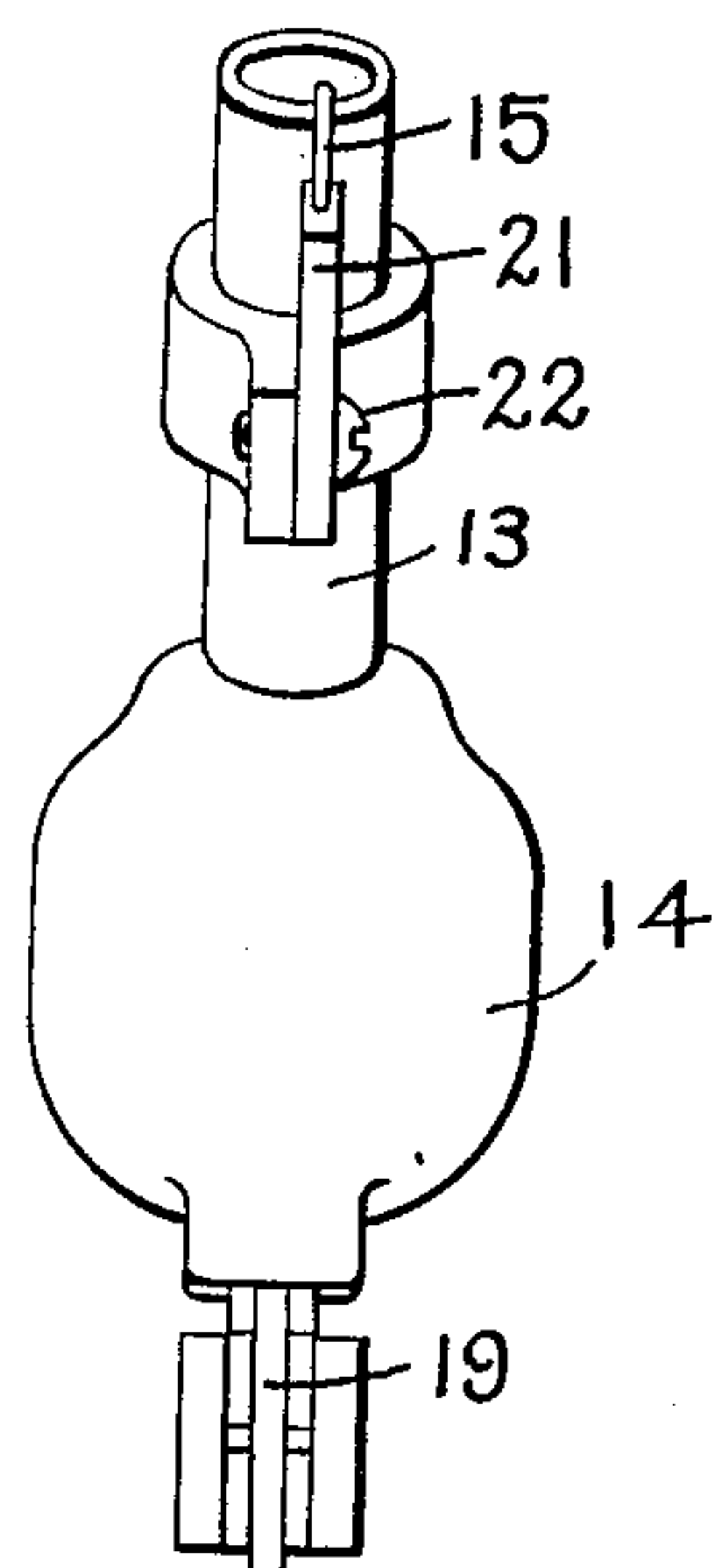


Fig. 3

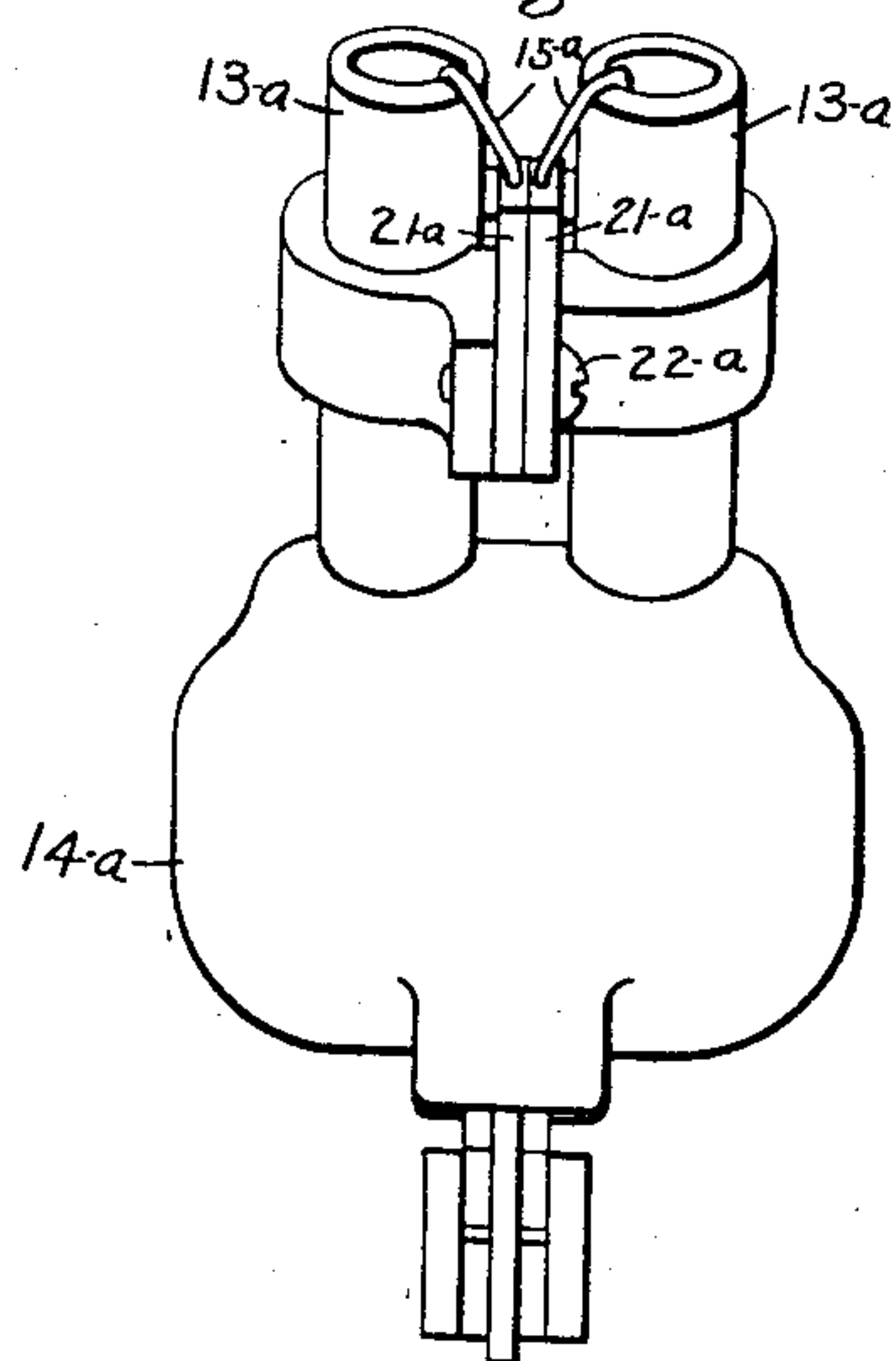
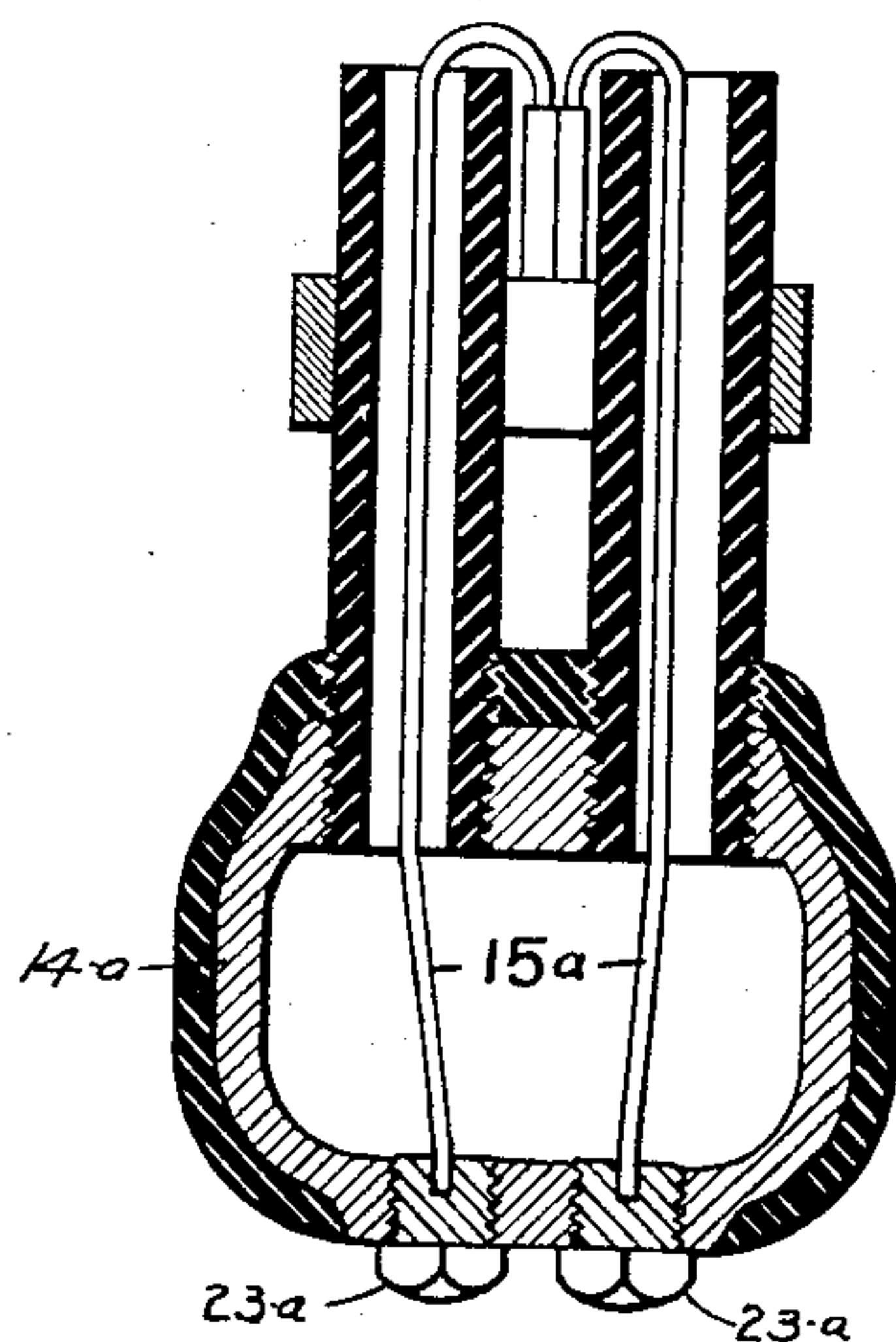


Fig. 4



Witnesses

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UNITED STATES PATENT OFFICE.

CHARLES E. EVELETH, OF SCHENECTADY, NEW YORK, ASSIGNOR TO
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EXPULSION-FUSE.

No. 816,443.

Specification of Letters Patent.

Patented March 27, 1906.

Application filed May 14, 1904. Serial No. 208,037.

To all whom it may concern:

Be it known that I, CHARLES E. EVELETH, a citizen of the United States, residing at Schenectady, in the county of Schenectady and State of New York, have invented certain new and useful Improvements in Expulsion-Fuses, of which the following is a specification.

My invention relates to thermal cut-outs or fuses for electric circuits of the type in which a fuse-wire or other vaporizable conductor gives way under the heating action of the current passing through it whenever such current exceeds a definite amount. In the employment of fuses of this type on circuits of high voltage and large amperage an arc is formed which follows the fuse-wire as it volatilizes, and it is necessary to provide some means for interrupting this arc. In one type of fuse, known as the "expulsion" type, this is accomplished by expelling the gases and vapors developed by the arc away from the fuse-conductor with sufficient force to snap the arc. My invention relates particularly to this type of fuse and is in the nature of an improvement on the fuse disclosed in Patent No. 712,107, granted October 28, 1902, to M. O. Troy.

In carrying out my invention I employ an inclosing envelop for the fuse-wire, which comprises an open-ended tubular portion and an enlarged portion or chamber in communication therewith. The fuse-wire extends throughout the length of the envelop through both portions. With this organization when the current in the circuit exceeds the capacity of the fuse the fuse-wire is destroyed, the arc extinguished, and the circuit interrupted. As the fuse-wire breaks down it is volatilized by the arc, and the resulting gases and vapors, which constitute a more or less effective conductor for the arc, are forced from the open end of the tube by the pressure of the expanding gases within. This pressure is greatest at the closed or chambered end of the fuse by reason of the greater volume of air at that point with which the metal vapors may combine to form the gases. Furthermore, this diluted vapor in the chambered portion is not so rich in metal, and hence less conductive

than that formed in the tubular portion, and therefore when expelling the latter it also decreases the conductivity of the gases remaining in the envelop, thus exerting an additional influence, tending to extinguish the arc. It will also be apparent that under conditions where the fuse-wire is gradually heated it will first break down in the enlarged portion of the envelop, since at that point its distance from the heat-conducting walls of the envelop is greatest. When so operating, the gases will first be evolved in the enlarged portion of the envelop and will there expand and effectively extinguish the arc by forcing the conductive vapors formed later in the tubular portion out of its open end.

Another feature of my invention consists in arranging the fuse in such relation to the supporting-base or switchboard that the conducting gases and vapors are expelled away from the terminal clips to which the fuse is connected, thus reducing the possibility of a short circuit between the clips through the expelled conducting-gases, as is sometimes the case where the discharge from the fuse is directly upward.

Another feature of the invention consists in locating the fuse with reference to its supporting-clips so that the recoil due to the expulsion of the gases will be in a direction to more firmly seat the fuse in the clips. This action is in opposition to the action of the magnetic field in the neighborhood of the clips, which, without this provision or its equivalent, would often be sufficient to throw the fuse bodily away from the board out of its clips.

These and other features of my invention will more fully appear upon reference to the following detailed description of one embodiment of the invention, taken in connection with the accompanying drawings, and the scope of the invention will be particularly pointed out in the appended claims.

In said drawings, Figure 1 is a side elevation of a fuse constructed in accordance with my invention, a portion of the fuse and the support being shown in section; Fig. 2 is a front elevation of the same; Fig. 3 is a front elevation of a modification; and Fig. 4 is a

section of the modification, taken on a plane extending through the center of the tubes forming part of the envelop of the fuse.

Throughout the figures like characters refer to like parts.

Referring in detail to the drawings, 10 designates a support of insulating material, which may be a slab of marble or like material, constituting a portion of the switchboard or a separate and independent base. Mounted upon this support are vertically-arranged terminals 11 and 12, which take the form of spring-clips and which extend through the support 10 and are provided at their rear ends with any suitable means for connecting them in circuit with the line.

The fuse proper consists, essentially, of a fuse-wire and an envelop therefor comprising a tubular portion 13 and an enlarged portion or chamber 14, through both of which the fuse-wire 15 extends. The tube 13 is composed of indurated fiber or other non-conducting non-inflammable material, and the chamber 14 comprises a bulb 16, composed of gun-metal or other material adapted to withstand high pressure, covered on its outer surface with a layer or coating of insulating compound 17. The fuse is adapted to be removably connected to the spring-clips 11 and 12 by means of the contact-blades 18 and 19, located adjacent to its opposite ends and on opposite sides of its median line. The contact 18 is securely clamped to the outside of the tube 13 in any suitable manner. In the present case this is accomplished by making the contact integral with a split ring which is clamped to the tube 13 by means of a screw 20. The ring is also provided with a projection to which the fuse terminal block 21 is removably secured by a screw 22. The lower contact 19 is connected directly to the bulb 16. The fuse-wire 15 is soldered or otherwise secured to a screw-plug 23, which is screwed into a threaded opening at the lower end of the bulb 16, adjacent to the contact 19 and in line with the opening of tube 13, while its upper end is similarly secured to the terminal block 21. When it is desired to insert the fuse-wire, the block 21 is inserted through the opening at the lower end of the bulb 16 and passes through and out of the upper end of the tube 13. Then when the plug 23 is screwed into place the block 21 is drawn down and made fast by the screw 22. From this it will be seen that the circuit from the terminal 11 to the terminal 12 is completed as follows: terminal 11, contact 18, block 21, fuse-wire 15, plug 23, bulb 16, contact 19, and terminal 12.

By locating the main portion of the fuse between the terminal clips 11 and 12 at an angle to the support 10 and with the closed

end adjacent to the support the recoil resulting from the expulsion of the gases tends to seat the contacts 18 and 19 more firmly in the clips, and thus counteract the magnetic action between the said terminals which tends to expel the fuse bodily from the clips. Furthermore, the discharge of the gases outward and upward away from the vicinity of the clips reduces to a great extent the likelihood of a short circuit between said clips, due to the presence of conducting vapors and gases in their vicinity.

It is apparent that my invention may be embodied in many different forms, and in Figs. 3 and 4 I have indicated a modification which is similar in construction to that just described and which gives a very compact fuse of a larger capacity which may be used in connection with the same switchboard-terminals. In this modification a chamber 14^a, of somewhat larger capacity than the chamber 14, is employed, and in communication with this are two tubes 13^a 13^a. The fuse-wire 15 is also replaced by two fuse-wires 15^a. These wires are connected at their lower ends, as in the preceding case, to plugs 23^a and at their upper ends to similar terminal blocks 21^a. The fuse-wires are placed in position in the manner previously described, and the terminal blocks are finally secured by a common connecting-screw 22^a.

From the above description of the construction and operation of my fuse it will be apparent that by reason of the enlarged chamber at the closed end of the fuse-envelop a large volume is subjected to the heating action of the arc and is brought under pressure, so that there results a prolonged blast through the tubular portion of the envelop which is instrumental in preventing the arc from hanging over between the fuse-terminals. In other words, by reason of this chamber a prolonged blast is given rather than a short blast, as would be the case where the tube is not provided with such an enlarged portion.

It will be apparent to those skilled in the art that many alterations and modifications may be made in the forms of the invention above described without departing from the spirit and scope of my invention. I therefore do not wish to be limited to the specific matter disclosed, but aim to cover by the terms of the appended claims all such alterations and modifications.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. A thermal cut-out or fuse, comprising an inclosing envelop consisting of an open-ended tubular portion and an enlarged portion or chamber having unyielding walls throughout, and a fuse-wire extending through said tubular and enlarged portions.

2. A thermal cut-out or fuse, comprising an inclosing envelop consisting of an open-ended tubular portion and an enlarged portion or chamber at or near one end thereof, said chamber having unyielding walls throughout and a fuse-wire surrounded by air and extending throughout the length of said envelop.

3. A thermal cut-out or fuse, comprising an inclosing envelop consisting of a tubular portion having one end open and terminating at its other end in an enlarged portion or chamber having unyielding walls throughout, and a fuse-wire extending through the said tubular and enlarged portions.

4. A thermal cut-out or fuse, comprising an inclosing envelop consisting of a tubular portion having one end open and terminating at its other end in an enlarged closed portion or chamber having unyielding walls throughout, and a fuse-wire surrounded by air and extending throughout the length of said envelop.

5. A thermal cut-out or fuse, comprising an inclosing envelop consisting of an open-ended non-conducting tube and an enlarged portion or chamber, said chamber being composed of pressure-resisting material and having unyielding walls throughout, and a fuse-wire extending through said tubular and enlarged portions.

6. A thermal cut-out or fuse, comprising an inclosing envelop consisting of an open-ended non-conducting tube and an enlarged portion or chamber, said chamber being composed of pressure-resisting material and having unyielding walls throughout, and a fuse-wire surrounded by air and extending throughout the length of said envelop.

7. A thermal cut-out or fuse, comprising an inclosing envelop consisting of a tubular portion having one end open and terminating at its other end in an enlarged portion or chamber having unyielding walls throughout, and a fuse-wire extending through said chamber and tubular portion beyond its open end and fixed to the outside of said tubular portion.

8. The combination with circuit-terminals, of a thermal cut-out or fuse, comprising an inclosing envelop provided with contacts adapted to be connected to said terminals, said envelop consisting of an open-ended tubular portion and an enlarged portion or chamber having unyielding walls throughout, and a fuse-wire in circuit with said contacts extending through the said enlarged and tubular portions.

9. The combination with circuit-terminals, of a thermal cut-out or fuse, comprising an inclosing envelop consisting of a tubular portion and an enlarged portion or chamber, an

upper contact secured to the outside of said tubular portion, a lower contact secured to said enlarged portion, and a fuse-wire connected to the interior of said chamber and electrically connected to the lower contact and extending through said chamber and tubular portion beyond the open end of the latter into electrical connection with the upper contact.

10. A thermal cut-out or fuse, comprising a fuse-wire and an inclosing envelop therefor consisting of an open-ended tubular portion and an enlarged portion or chamber, said chamber being composed of material having higher pressure-resisting properties than said tubular portion and having unyielding walls throughout.

11. A thermal cut-out or fuse, comprising a fuse-wire and an inclosing envelop therefor consisting of a tubular portion having a non-conducting inner surface and an enlarged portion or chamber having an inner surface of conducting material and unyielding walls throughout, said fuse-wire being connected to the inner surface of the said chamber and extending therefrom through said tubular portion.

12. A thermal cut-out or fuse, comprising a fuse-wire and an inclosing envelop therefor consisting of a tubular portion having a non-conducting inner surface and an enlarged portion or chamber having a conducting inner surface, a contact electrically connected to the inner surface of said chamber, and a contact secured to the outer surface of said tubular portion, said fuse-wire being connected to the inner surface of said chamber and extending therefrom through said tubular portion beyond its open end into electrical connection with the adjacent contact.

13. The combination with a pair of fixed circuit-terminals, of a tubular fuse directly connected to and mechanically supported by said terminals and extending obliquely to a line joining said terminals.

14. The combination with a pair of fixed circuit-terminals, of a tubular fuse connected to and mechanically supported by said terminals, said fuse having its axis extending in front of one terminal and in rear of the other.

15. The combination with a pair of fixed circuit-terminals, of a removable tubular fuse directly connected to and mechanically supported by said terminals and extending obliquely to a line joining said terminals.

16. The combination with a pair of fixed circuit-terminals, of a tubular fuse removably connected to and mechanically supported by said terminals, said fuse having its axis extending in front of one terminal and in rear of the other.

17. The combination of a support, termi-

nal clips extending from one face thereof, and
a tubular fuse removably secured thereto and
having the end of the tube adjacent to said
support closed, said fuse lying with its closed
5 end between said clips and its open end pro-
jecting away from said support.

18. The combination of a vertical support,
vertically-disposed terminals thereon, and a
tubular fuse removably secured thereto and
10 having the end of the tube adjacent to said
support closed and the open end extending
upward and away from said support.

19. The combination with a pair of cir-
cuit-terminals of a tubular fuse having an
open end pointing away from said terminals 15
and connected thereto so as to be more firmly
seated in said terminals by the recoil caused
by the blowing of the fuse.

In witness whereof I have hereunto set my
hand this 13th day of May, 1904.

CHARLES E. EVELETH.

Witnesses:

BENJAMIN B. HULL,
HELEN ORFORD.