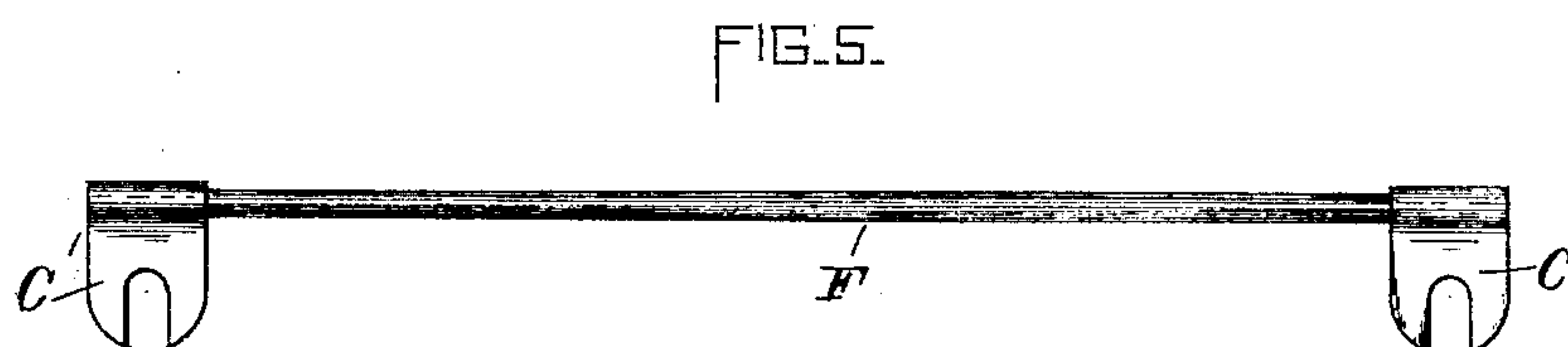
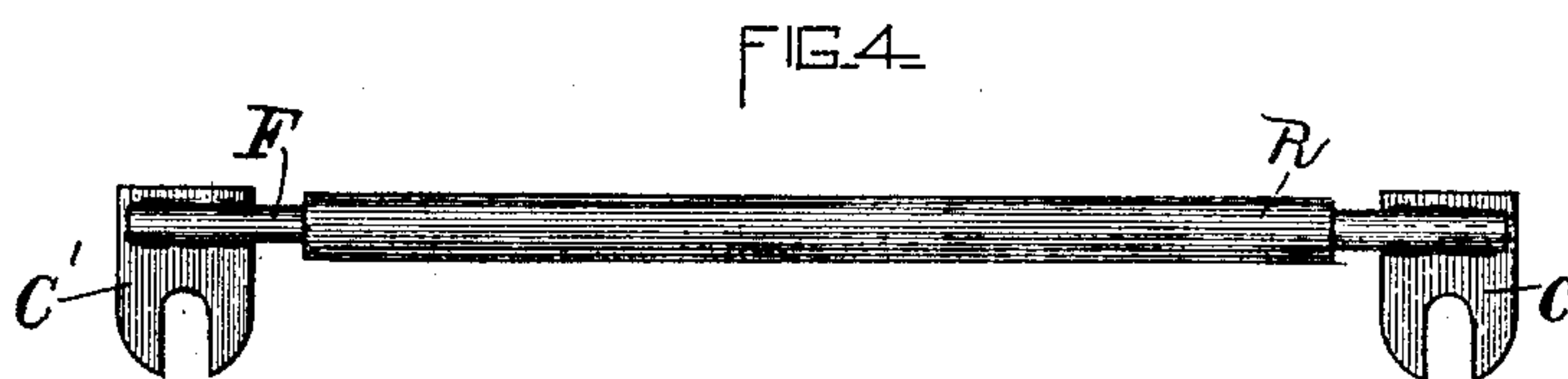
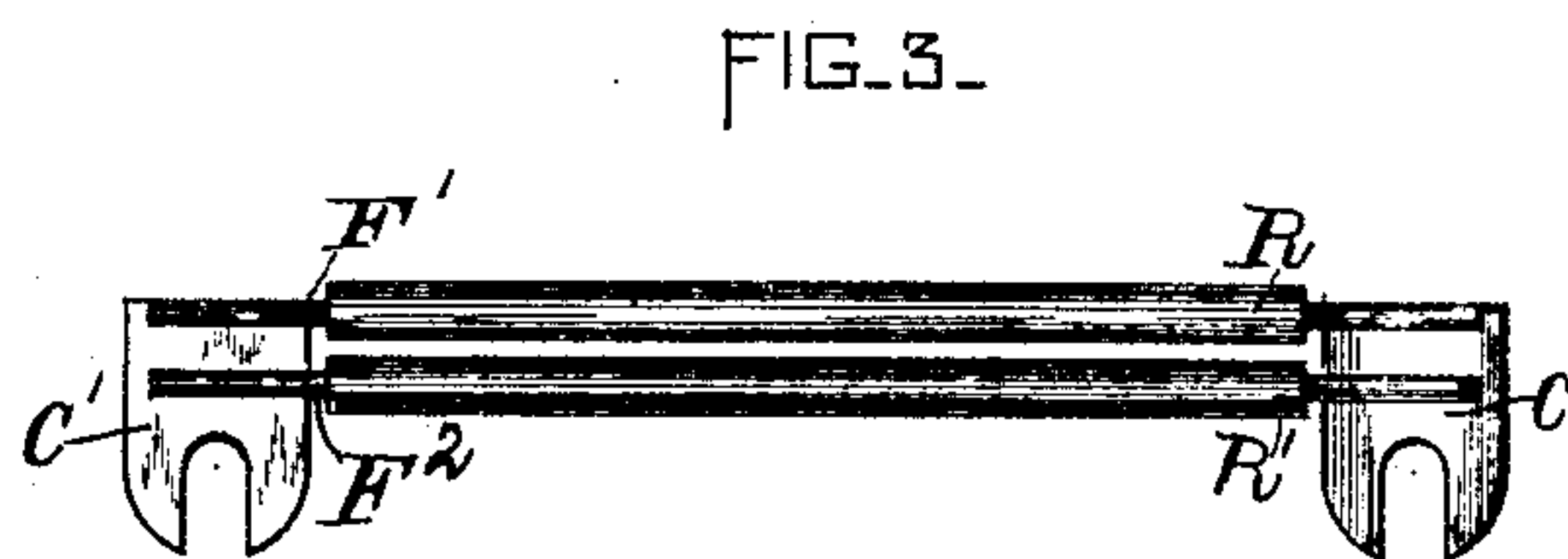
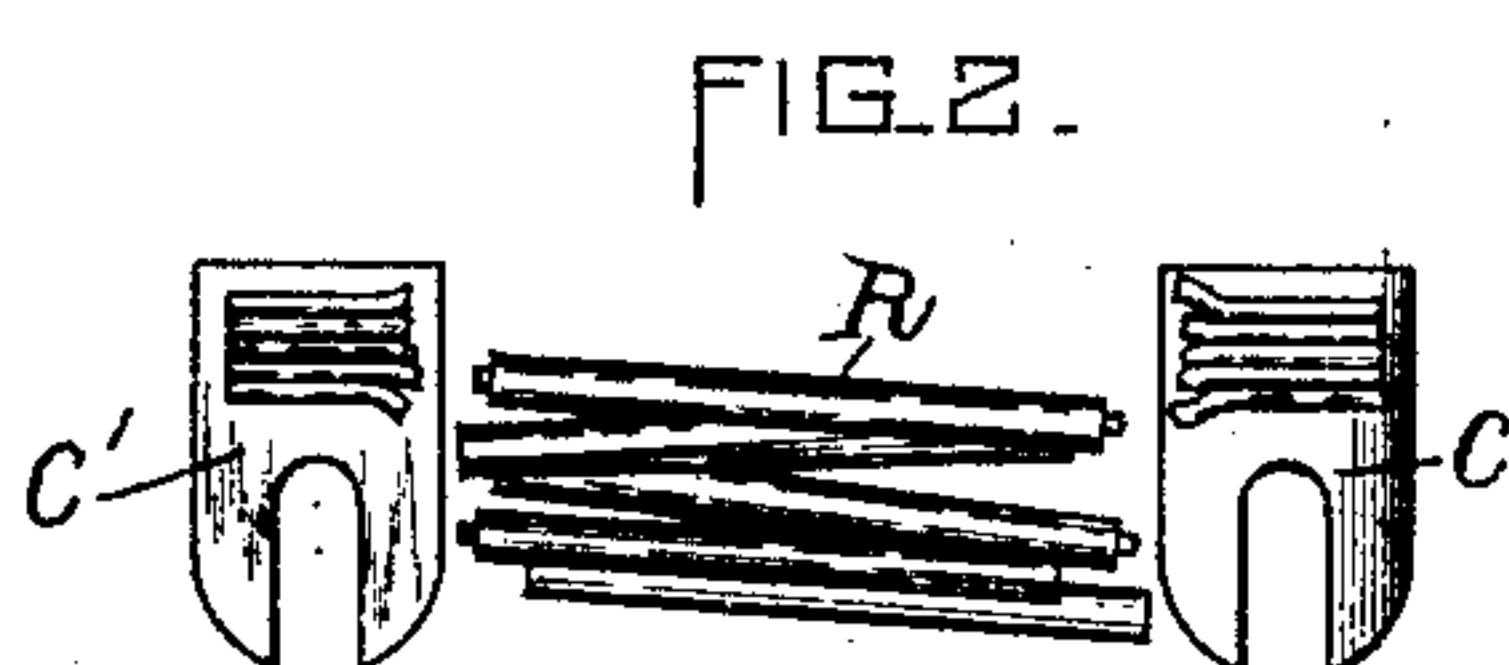
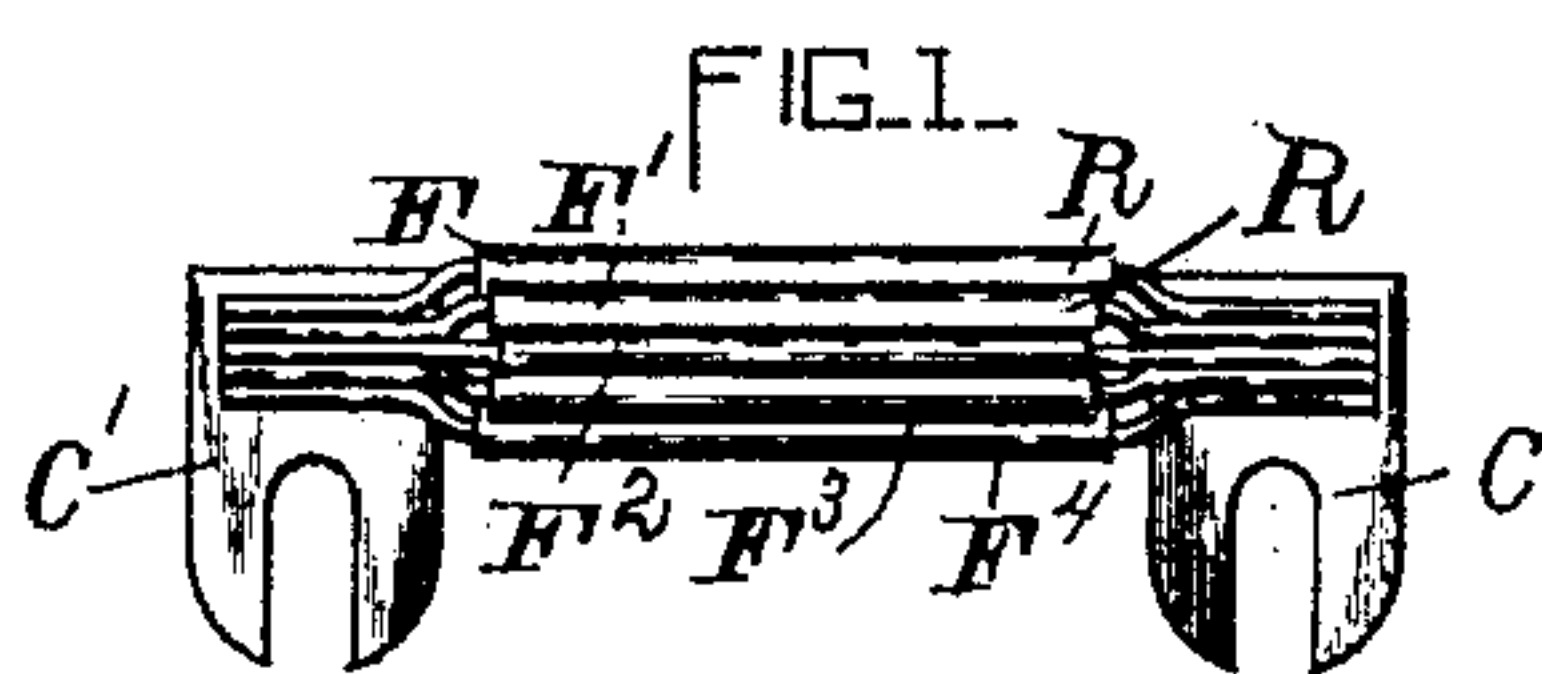


(No Model.)

E. W. RICE, Jr.
ELECTRIC FUSE CUT-OUT.

No. 462,452.

Patented Nov. 3, 1891.



WITNESSES.

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UNITED STATES PATENT OFFICE.

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ELECTRIC FUSE CUT-OUT.

SPECIFICATION forming part of Letters Patent No. 462,452, dated November 3, 1891.

Application filed October 18, 1890. Serial No. 368,537. (No model.)

To all whom it may concern:

Be it known that I, EDWIN WILBUR RICE, Jr., a citizen of the United States, residing at Lynn, county of Essex, and State of Massachusetts, have invented a certain new and useful Improvement in Fuses, of which the following is a specification.

My present invention relates to an improved fuse or thermal cut-out for the protection of electric circuits. Its object is to secure a fuse which may be relied upon to disrupt an electric circuit with certainty, even though the potential and current be very considerable, and, furthermore, to do this without allowing the formation of destructive arcs between the fuse ends or terminals.

On circuits of constant potential, where the voltage is as high as three hundred to five hundred volts and upward, or on alternating-current circuits of about one thousand volts and a current exceeding eight or ten ampères, it has hitherto been necessary to employ fuses of great length, because the metal vaporized by the arc is a good conductor and the electric current follows the arc stream, which is maintained by the vaporization of the fuse-terminals. This difficulty has been successfully avoided when handling currents of moderate potential and volume by placing around the fuse-wire an insulating-tube of such dimensions that the metallic vapors formed are expelled from the ends of the tube and the arc stream thus interrupted; but when dealing with currents of greater volume the certainty and efficiency of the fuse may be still further enhanced by dividing the total current among a number of fusible connections, so that the current upon any individual one will be correspondingly reduced and kept down to six or ten ampères or thereabout.

In my present invention I make use of the principle just outlined, and accordingly provide a plurality of fuse-wires, which are attached to a common set of contact-terminals, but insulated throughout the greater portion of their length, one from the other, the combined electrical capacity of the fuse-wires thus arranged being made equal to that of a single fuse, such as would ordinarily be employed for a like line-current.

In the accompanying drawings, Figure 1

illustrates a fuse fashioned in accordance with my invention. Fig. 2 illustrates the effect caused by the blowing of such a fuse upon interrupting the electric circuit which it is designed to protect. Fig. 3 illustrates a fuse designed for a moderate strength of current—say from fifteen to thirty ampères—and embodying the principles of my invention. Figs. 4 and 5 respectively show different forms of fuses previously known for purposes of comparison with the improved forms seen in the other views.

In Fig. 1 C C' are caps of metal serving as terminals, by which the fuse may be coupled up in the electric circuit which it is to protect, and to these terminals, respectively, the fuse-wires F F' F², &c., are electrically and mechanically attached, as by soldering. These fuse-wires are insulated one from the other throughout the greater portion of their length, and the preferred means employed for the purpose consist of sheaths R R' R², &c., which surround the fuse-wires separately, as shown, and will preferably be made of a flexible insulating material, such as soft rubber, though glass, porcelain, or other insulating substances may be used. The fuse-wires and insulation are bundled up together, as shown, so that the wires are supported and held in place, the whole forming a fuse not unlike others previously used in appearance or in its facility for being quickly inserted in circuit. Electrically, however, the different fuse-wires are distinct. When this compound fuse is placed in an electric circuit and the fuse-wires melted by the current, they do not give way simultaneously, but successively, the fuse-wire with the least resistance melting first and the others quickly following. The action is, however, almost instantaneous, and in practice I find that there is noticeable only a quick sharp snap like that produced by the explosion of a percussion-cap, and the circuit is interrupted without the formation of any perceptible arc.

Another important advantage of the improved fuse is that I am enabled to decrease the distance between the contact-terminals—i. e., the length of the fuse-wires—considerably without lessening the certainty with which the fuse interrupts the circuit. To show this,

I have indicated in Fig. 5 a fuse comprised of a single fuse-wire such as would ordinarily be used to disrupt a constant-potential circuit of, say, five hundred volts, though in my
 5 experiments a fuse of even this comparatively great length has repeatedly failed to do so without the formation of an arc between the terminals.

Fig. 4 likewise illustrates another known
 10 construction, in which the fuse-wire is covered with an insulating-tube. The length of the fuse-wire may be somewhat shorter than that of the form illustrated in Fig. 5; but a still further considerable decrease may be
 15 made in a fuse fashioned after my invention. Generally the number of parallel fuse-wires will be proportioned approximately to the strength of the current in the circuit to be interrupted. Thus, while in Fig. 2 I have shown
 20 five such fuse-wires arranged in multiple, this number will be increased or decreased in accordance with the character of the circuit in which the fuse is to be placed. Where the current is not more than twenty amperes, or
 25 thereabout, a fuse such as shown in Fig. 3 suffices; but as the potential and current are increased the number of fuse-wires in multiple should be correspondingly increased in order to secure the best results.

30 I am aware that the principle underlying this invention is not broadly new, for it has been proposed heretofore to subdivide the current through a plurality of fusible connections; but so far as known this is the first
 35 time that it has been proposed to construct a fuse forming an article of manufacture complete in itself, comprising insulated parallel fusible connections, all attached to a common

set of terminals, whereby the fuse as a whole is adapted to be readily inserted in the elec- 40
 tric circuit which it is to protect.

What I claim as new, and desire to secure by Letters Patent, is—

1. A fuse for the protection of electric circuits, comprising a plurality of fuse-wires 45
 bundled together, each insulated by a separate insulating-sheath and all attached to a single set of terminals, furnishing means for including the fuse in an electric circuit.

2. A fuse for the protection of electric cir- 50
 cuits, consisting of the enlarged end terminals, the fuse-wires bundled together and attached thereto, and a separate insulating-tube inclosing each such fuse-wire, as described.

3. A fuse for the protection of electric cir- 55
 cuits, consisting of a plurality of fuse-wires connected in multiple between and attached to a single set of contact-terminals and insulated one from the other for a portion of their length with a flexible insulating material, the 60
 said fuse-wires and insulating material being bundled together, so that the wires are supported and held in place, as described.

4. As an article of manufacture, an electric fuse consisting of contact-terminals and 65
 multiple fuse-wires attached thereto and bundled together with intervening insulating material, insulating the wires one from another for a portion of their length, as described. 70

In testimony whereof I have hereunto set my hand this 15th day of October, 1890.

EDWIN WILBUR RICE, JR.

Witnesses:

JOHN W. GIBBONEY,
 ELIHU THOMSON.