

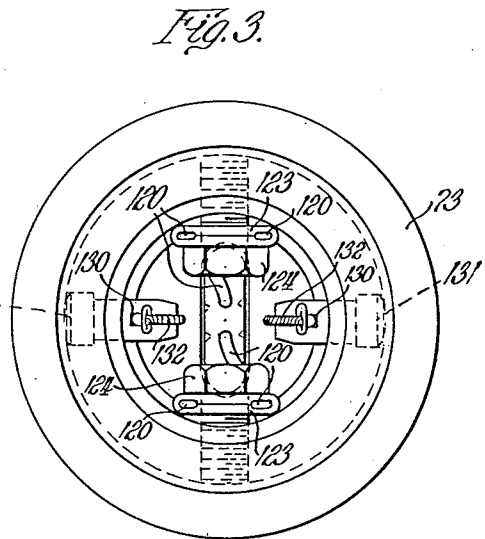
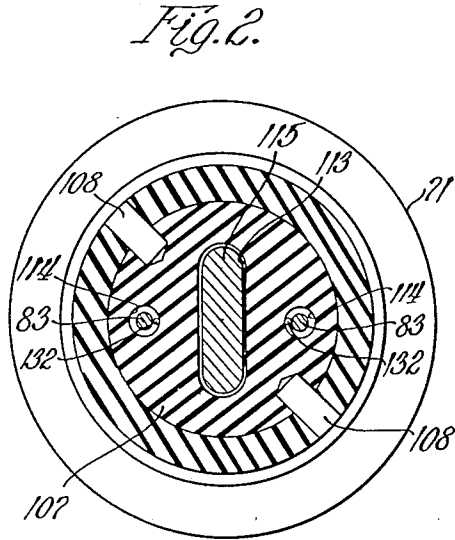
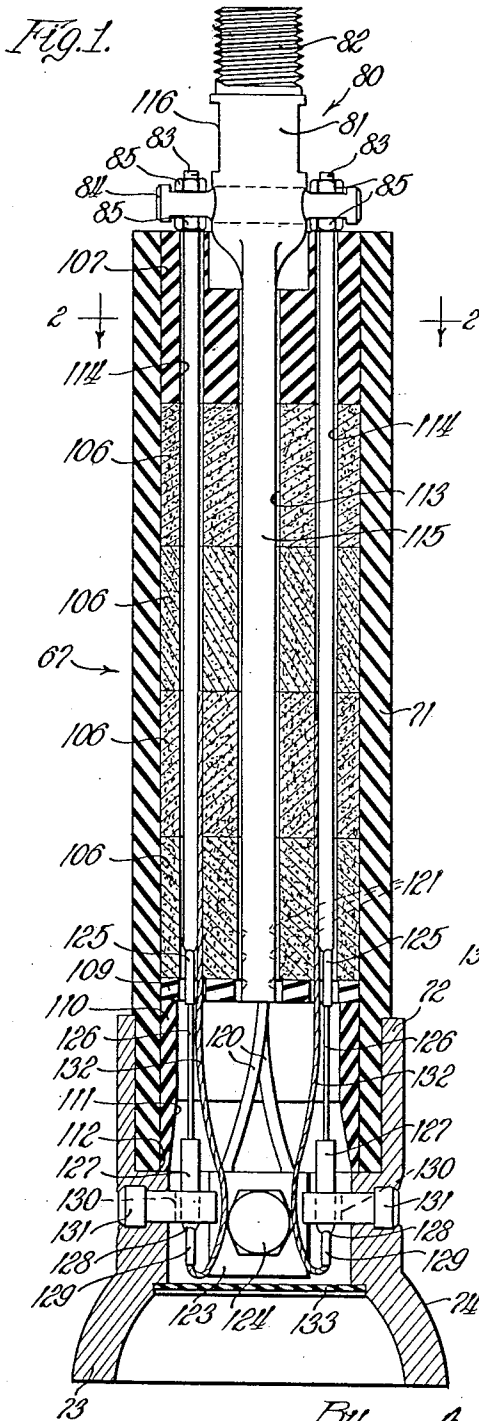
Dec. 19, 1939.

H. A. TRIPLETT

2,183,729

FUSE CONSTRUCTION

Original Filed Aug. 13, 1938 3 Sheets-Sheet 1



Inventor  
Hugh A. Triplett

By Brown, Jackson, Butler & Quinn

Attys.

Dec. 19, 1939.

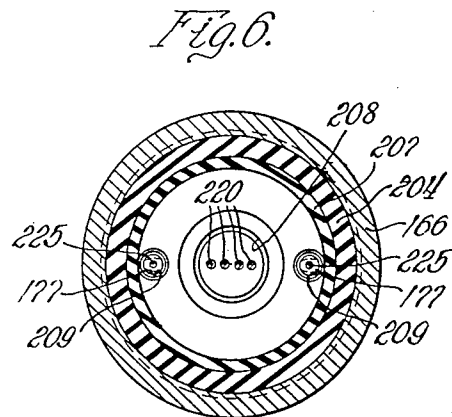
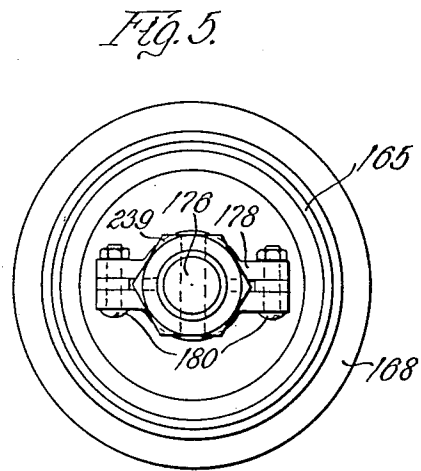
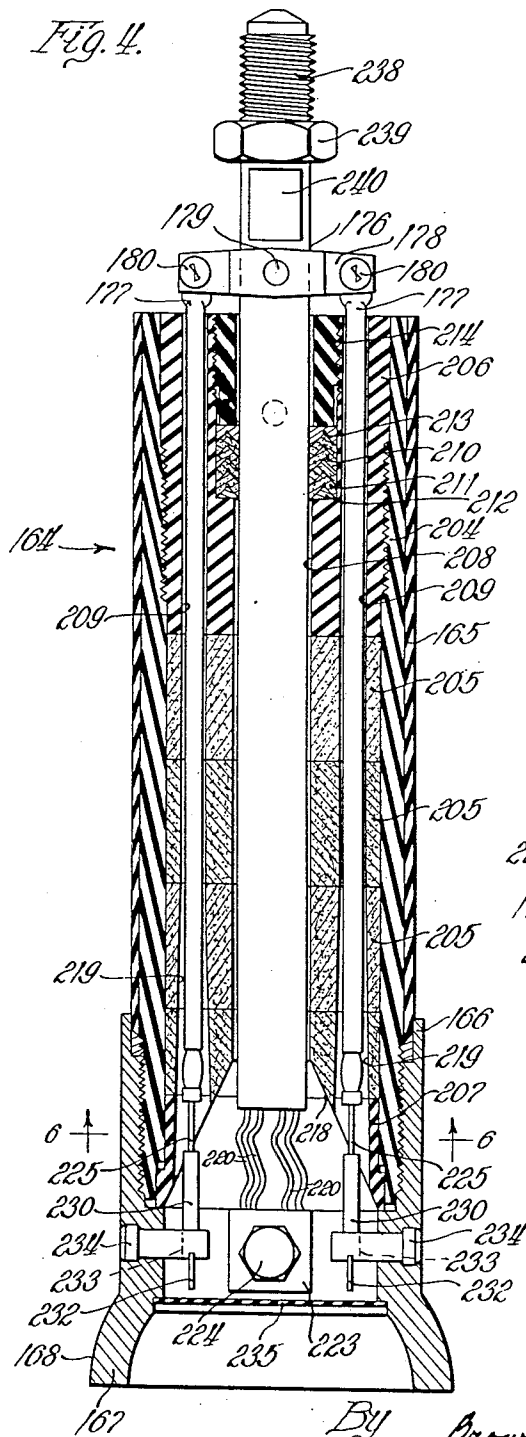
H. A. TRIPLETT

2,183,729

FUSE CONSTRUCTION

Original Filed Aug. 13, 1938

3 Sheets-Sheet 2



*Inventor*  
*Hugh A. Triplett*

*By* *Brown, Jackson, Butcher & Dixon*  
*Attys.*

Dec. 19, 1939.

H. A. TRIPLETT

2,183,729

FUSE CONSTRUCTION

Original Filed Aug. 13, 1938

3 Sheets-Sheet 3

Fig. 7.

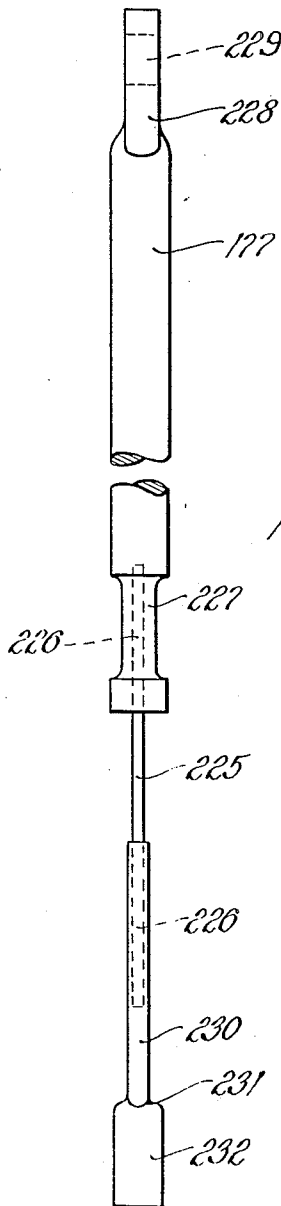


Fig. 8.

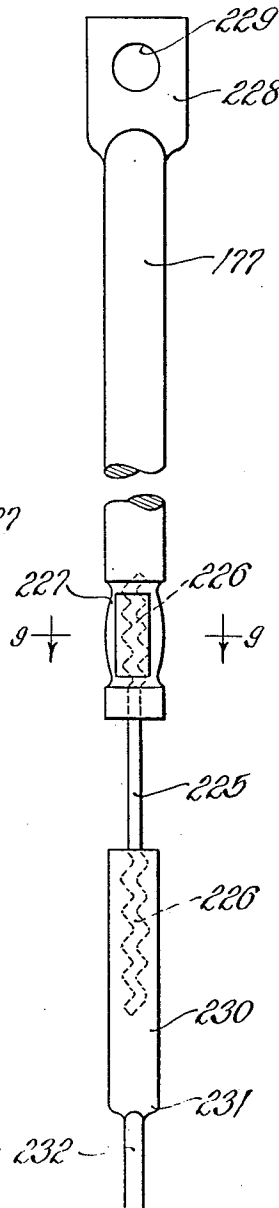
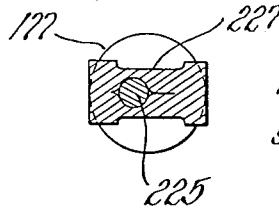


Fig. 9.



Inventor  
Hugh A. Triplett  
By Brown, Jackson, Butcher & Dixon  
Attys.

## UNITED STATES PATENT OFFICE

2,183,729

## FUSE CONSTRUCTION

Hugh A. Triplett, Wilmette, Ill., assignor to  
Schweitzer & Conrad, Inc., Chicago, Ill., a  
corporation of Delaware

Original application August 13, 1938, Serial No.  
224,696. Divided and this application May 8,  
1939, Serial No. 272,341

28 Claims. (Cl. 200—120)

My invention relates, generally, to circuit interrupters. This application is a divisional application of my copending application Serial No. 224,696, filed August 13, 1938. It has particular relation to the renewable cartridge disclosed in said application, which is intended for use in a circuit interrupter having normal rated current carrying capacities of 400 to 1000 amperes at 7500 volts, and which are capable of interrupting fault currents of 300 to 75000 amperes at this voltage.

The object of my invention, generally stated, is to provide an improved form of cartridge for a heavy duty circuit interrupter that shall be simple and efficient in operation and which may be readily and economically manufactured and installed.

An object of my invention is to provide for opening a circuit operating at a relatively high voltage in which a relatively large current flows and at the same time employing the same apparatus for interrupting relatively small currents in the circuit.

A further object of my invention is to provide, in a renewable fuse cartridge, for aligning it in proper relation to its operating mechanism.

Still another object of my invention is to provide for withstanding comparatively high operating stresses that are imposed on the movable terminal of a high ampere capacity circuit interrupter of the solid material type.

A still further object of my invention is to minimize the flow of the products of the arc, formed on blowing of a circuit interrupter of the solid arc extinguishing material type, back past its main terminal.

A further object of my invention is to minimize the flow of the products of the arcs, formed on blowing of a circuit interrupter of the solid arc extinguishing material type, back past its main and auxiliary rod-like terminals.

Another object of my invention is to substantially uniformly distribute tension stress among the auxiliary terminals of a circuit interrupter of the solid arc extinguishing material type employing a relatively large main rod-like terminal and a plurality of auxiliary rod-like terminals.

Other objects of my invention will, in part, be obvious and in part appear hereinafter.

My invention, accordingly, is disclosed in the embodiments thereof shown in the accompanying drawings, and it comprises the features of construction, combination of elements and arrangement of parts which will be exemplified in the constructions hereinafter set forth, and the

scope of the application of which will be indicated in the appended claims.

For a more complete understanding of the nature and scope of my invention, reference may be had to the following detailed description, taken in connection with the accompanying drawings, in which:

Figure 1 is a longitudinal sectional view of one embodiment of a replaceable fuse cartridge constructed in accordance with this invention;

Figure 2 is a detail sectional view taken along the line 2—2 of Figure 1;

Figure 3 is a bottom plan view of the fuse cartridge shown in Figure 1;

Figure 4 is a longitudinal sectional view of another embodiment of the replaceable fuse cartridge;

Figure 5 is a top plan view of the fuse cartridge shown in Figure 4;

Figure 6 is a detail sectional view taken along the line 6—6 of Fig. 4;

Figure 7 is a view, in side elevation, of one of the auxiliary terminals employed in the fuse cartridge shown in Figure 4;

Figure 8 is a view, in front elevation, of the auxiliary terminal shown in Figure 7; and

Figure 9 is a detail sectional view taken along the line 9—9 of Figure 8.

In my copending application, referred to hereinbefore, I have disclosed how a replaceable fuse cartridge per se can be mounted on one insulator and connected to one line terminal thereat. The other line terminal is mounted on another insulator spaced from the one insulator and this insulator carries an operating mechanism which may be spring actuated and which is arranged to be mechanically connected to the movable terminal assembly of the fuse cartridge. An electrical connection is also provided between the movable terminal assembly and the other line terminal. The present invention is particularly directed to the features of construction of the various embodiments of the replaceable fuse cartridge shown and described in the application of which this application is a division.

Referring now particularly to Figures 1, 2 and 3 of the drawings, it will be observed that the reference character 67 designates, generally, a replaceable fuse cartridge or circuit interrupter that is arranged to be mounted on suitable support means and to be connected to an operating mechanism. The circuit interrupter or replaceable fuse cartridge 67 is somewhat similar in construction to that shown in my copending application, Serial No. 85,700, filed June 17, 1936, and

and assigned to the assignee of this application.

The circuit interrupter 67 is provided with a tubular housing or fuse tube 71, having a ferrule or terminal 72 at its lower end. Since it is desirable to permit considerable latitude in positioning of the circuit interrupter 67 relative to the operating mechanism which is provided for opening the circuit, in order to avoid the requirement of accurate alignment therebetween insofar as the supports therefor are concerned, a ball and socket joint is provided for mounting the circuit interrupter 67 on its support member. The ball and socket joint is provided in part by an extension 73 depending from the ferrule or terminal 72, which constitutes the ball member and has a convex spherical surface 74 for engaging a correspondingly shaped surface on the support member (not shown). Suitable clamp means are provided for securing the extension 73 in place on the support means, as will be readily understood.

The circuit interrupter 67 is provided with a movable terminal assembly, shown generally at 80. It comprises a main terminal 81, the upper end of which is threaded as indicated at 82 to permit coupling to the operating mechanism (not shown), together with auxiliary terminals 83. The terminals 81 and 83 are rod-like in character. The auxiliary terminals 83 extend through a cross-member 84 that extends transversely through the main terminal 81 and they are adjustably secured by suitable nuts 85.

As previously indicated, the circuit interrupter 67 is provided with a tubular housing or fuse tube 71. The fuse tube 71 is preferably formed of relatively rigid and strong insulating material such as a phenolic condensation product which is provided with a filling of solid arc extinguishing material, such as boric acid, which may be inserted as a single body or in several sections 106, as shown. At its upper end the fuse tube 71 is provided with a plug 107 of fiber or the like that is held in position by suitable dowel pins 108 (Figure 2). At its lower end the fuse tube 71 is provided with a retaining washer 109 and a sleeve 110, both preferably formed of fiber, with the sleeve 110 forming an arcing chamber with the lower end flared outwardly as indicated at 111. The lower end of the sleeve 110 abuts a shoulder 112 of the ferrule or terminal 72.

The solid arc extinguishing material 106, the plug 107, and the retaining washer 109 are provided with a centrally located main bore 113 and a pair of symmetrically disposed auxiliary bores 114. The auxiliary bores 114 are circular in cross-section, as shown in Figure 2, and are positioned on opposite sides of the main bore 113. By providing two auxiliary bores 114 and two auxiliary rod-like terminals 83, it is possible to provide a balanced construction in which the extremely high stresses imposed by a suitable retracting spring (not shown) may be resisted without permitting any binding action to take place while the terminal assembly 80 is being withdrawn from the fuse tube 71. As shown in Figure 2, the main bore 113 is generally oblong in shape for receiving a correspondingly shaped arcing terminal 115 which constitutes an extension of the main terminal 80.

In order to facilitate gripping the main terminal 80 and threading it into a retracting member (not shown), its opposite sides 116 are slabbed off to receive the jaws of a wrench.

At its lower end the main arcing terminal 115 is provided with a plurality of fusible elements

120. The fusible elements 120 are preferably formed of silver wire and their size and number depends upon the rating of the circuit interrupter 67. For purposes of illustration I have shown four fusible elements 120. The lower end of the main arcing terminal 115 is longitudinally drilled in order to receive one end of each of the fusible elements 120. The opposite sides of the lower end of the main arcing terminal 115 are then forced inwardly, as at 121, by a suitable tool, such as a punch, in order to hold the fusible elements 120 firmly in place in good electrical contact with the main arcing terminal 115. The lower ends of each pair of fusible elements 120 are secured in terminal sleeves 123 which are deformed thereon to provide proper electrical and mechanical connection. The terminal sleeves 123 are provided with centrally located apertures through which screws 124 may be inserted for clamping them in position on the inner surface of the ferrule or terminal 72.

It is desirable that no tension stress be applied to the fusible elements 120 in order that their time-current characteristics will be unaffected. The stress that would otherwise be applied thereto in opposing the biasing action of a spring, not shown, is transmitted through the auxiliary arcing terminals 83. At their lower ends, as indicated at 125, these auxiliary arcing terminals 83 are flattened onto strain elements 126 that may be formed of high strength wire such as nickel-chromium wire. The lower ends of the strain elements 126 are secured in the upper ends 127 of tubular terminals 128 that are flattened thereon. The lower ends 129 of the tubular terminals 128 are flattened at right angles to the upper portions 127 to provide for holding them in slotted openings 130 in inwardly extending pins 131. Flexible leads 132, formed preferably of insulated magnet wire, are secured in the deformed lower end portions 129 of the tubular terminals 128 and they extend considerable distances inside of the auxiliary bores 114. A disc 133, preferably formed of a suitable transparent material such as mica, serves to close the lower end of the ferrule or terminal 72.

On operation of the circuit interrupter 67, it will be understood that the fusible elements 120 are first melted, since they carry the major portion of the current. The entire flow of current is then transferred to the strain elements 126, which immediately melt. Since the flexible leads 132 extend into the auxiliary bores 114 a considerable distance, and further, since they are provided with a slight insulating coating such as an enamel coating, an arc or arcs are first formed within the auxiliary bores 114 and at some distance from their lower ends. In the event that the fault current is of comparatively low value, the arc or arcs may be extinguished within the auxiliary bores 114. It will be understood that, as soon as the strain elements 126 are released, the terminal assembly 80 is no longer restrained and begins to move upwardly, thereby withdrawing the main arcing terminal 115 and the auxiliary terminals 83 through their respective bores 113 and 114.

However, if the fault current is of such a value that it cannot be interrupted in the auxiliary bores 114, then an arc is formed in the main bore 113 between the main arcing terminal 115 and the ferrule or sleeve 72 or metal parts connected thereto. The large current arcs will then be extinguished in the main bore 113 by the evolution of water vapor in the now well-known manner.

The main bore 113 is generally oblong or rectangular in cross-section in order to provide additional space for the auxiliary bores 114 while still maintaining a sufficient body of the solid arc extinguishing material 106. The cross-sectional area of the auxiliary bores can then be increased to increase the range of interrupting capacity thereof.

Another embodiment of my invention is illustrated in Figures 4 through 9, to which reference will now be had.

It will be observed that the reference character 164 designates, generally, a replaceable fuse cartridge or circuit interrupter that contains certain features of construction not found in the circuit interrupter 67 shown in Figures 1, 2 and 3 and previously described. The circuit interrupter 164 is provided with a tubular housing or fuse tube 165 having at its lower end a ferrule or terminal 166. For the reasons set forth, it is desirable to mount the circuit interrupter 164 so that it will have some latitude of movement relative to its operating mechanism (not shown). For this purpose a ball and socket supporting structure is provided which is similar to that illustrated, in part, in Figure 1 of the drawings and described hereinbefore.

As shown, the ferrule or terminal 166 is provided with a ball member 167 the outer surface 168 of which is convex and spherical for engaging a correspondingly shaped surface on its support structure. Suitable clamp means are provided for securing the ball member 167 in place.

The circuit interrupter 164 is provided with a main terminal 176 and a pair of auxiliary terminals 177, both the main and auxiliary terminals being rod-like in character. The auxiliary terminals 177 are secured to a yoke or evenner 178 that is pinned at 179 to the main terminal 176. Screws 180 extending through the two members forming the yoke or evenner 178, Figure 5, serve to hold the auxiliary terminals 177 thereto.

It will be observed that the tubular housing or fuse tube 165 constitutes a relatively thin shell.

It is preferably formed of a phenolic condensation product and is provided with a liner 204 that may be formed of fiber. Inside the liner 204 a filling of a solid arc extinguishing material, such as boric acid, is provided in a plurality of sections 205. A plug 206, preferably formed of fiber, is threaded into the fiber liner 204, as shown, at the upper end of the housing. A retaining ring 207, also preferably formed of fiber, is provided below the lower section 205 of the solid arc extinguishing material for holding it in place. The sections of solid arc extinguishing material 205, the plug 206, and the retaining ring 207 are provided with a centrally located main bore 208 and a pair of auxiliary bores 209 for receiving the main and auxiliary terminals 176 and 177, respectively. The main and auxiliary terminals 176 and 177 are rod-like in character and circular in cross-section. The diameters of their respective bores 208 and 209 are such that only sufficient clearance is provided to permit the terminals to be freely withdrawn therethrough. In other words, the main and auxiliary terminals 176 and 177 substantially fill their respective bores 208 and 209 so that relatively little, if any, of the products of the arc or arcs formed on operation of the circuit interrupter 164 are permitted to flow back therethrough past the terminals 176 and 177.

With a view to further preventing the backward flow of the products of the arcs past the

main terminal 176, a packing is provided at the upper end of the bore 208. As illustrated, the bore 208 is enlarged as indicated at 210 for receiving several layers of chevron packing 211 which may be positioned on top of a spreader ring 212. A compression ring 213 is positioned on top of the upper layer of packing 211 and a gland 214, preferably formed of a phenolic condensation product, is threaded into the threaded upper end of the enlarged recess 210 in the fiber plug 206. The gland 214 is screwed downwardly sufficiently far to compress the layers of packing 211 and to move them into pressure-tight engagement with the cylindrical main terminal 176. However, it is only tightened sufficiently far to provide this pressure-tight relation without substantially preventing the main terminal 176 from being freely withdrawn through the main bore 208.

It will be observed that the layers of chevron packing 211 are so disposed that opposition to the flow of gas in the direction of movement of the terminal 176 increases as the gas pressure in the main bore 208 increases. While this tends to retard the movement of the terminal 176 somewhat, it will be understood that it is permissible since, under such conditions, a relatively great pressure is exerted on the lower end of the terminal 176 by the gases evolved under heavy overload conditions. If desired, the auxiliary terminals 177 may be provided with chevron packing as is the main terminal 176, for the same purpose. However, it will not ordinarily be necessary to provide this additional packing.

With a view to facilitating the outward flow of the products of the arc or arcs, the lower ends of the main and auxiliary bores 208 and 209 are flared outwardly as shown at 218 and 219, respectively.

The main terminal 176 is provided at its lower end with a plurality of fusible elements 220. Preferably, the fusible elements 220 are formed of a silver wire and, as previously indicated, their number and size will depend upon the rating of the circuit interrupter 164. For illustrative purposes, four fusible elements 220 have been shown. The lower ends of the fusible elements 220 are secured in a terminal sleeve 223 that is deformed thereon. The terminal sleeve 223 is provided with a suitable aperture through which a screw 224 may be placed for securing it in good contact engagement with the inner surface of the ferrule or terminal 166.

Strain elements 225, preferably formed of nickel-chromium alloy, are provided for restraining the auxiliary terminals 177 and for relieving the fusible element 220 of stress that would otherwise be imposed thereon. As shown more clearly in Figures 7, 8 and 9 of the drawings, the ends 226 of the strain element 225 are corrugated to facilitate holding of the same. The lower end of the auxiliary terminal 177 is provided with a suitable longitudinally extending aperture into which the upper end 226 of the strain element 225 may be inserted. As indicated at 227, the lower end of the auxiliary terminal 177 is deformed onto the upper end 226 of the strain element 225 so that it is mechanically held in place and, at the same time, good electrical contact is provided therewith. The upper end of the auxiliary terminal 177 is flattened as indicated at 228 and is provided with an aperture 229 through which the screw 224 may be placed. The lower end of the strain element 225 is positioned in the upper end 230 of a sleeve 231. The

end 230 is then deformed onto the corrugated lower end 226 for providing mechanical and electrical connection thereto. The lower end 232 of the sleeve 231 is deformed at right angles to the other end 230 for positioning across a slotted opening 233 in a pin 234, Figure 4, which extends inwardly from the ferrule or terminal 166. It will be noted that two pins 234 are provided, one for each of the auxiliary terminals 177. After the upper end portions 230 of the sleeves 231 have been positioned in the slots 233 in the pins 234, the ends thereof are closed to prevent disengagement thereof.

The lower end of the ferrule or terminal 166 is closed by a disc 235 that is preferably formed of transparent material such as mica.

It will be noted that the upper end of the main terminal 176 is threaded at 238 for insertion in a suitable threaded boss of the operating means (not shown). A lock nut 239 is provided for holding the main terminal 176 in position once it has been set in place. The opposite sides of the main terminal 176 are slanted off, as indicated at 240, to facilitate the engagement of the jaws of a wrench for turning it into place.

On operation of the circuit interrupter 164, the fusible elements 220 (Figure 4) are first melted, whereupon the entire flow of current is transferred to the strain elements 225, which melt and form an arc or arcs between the auxiliary terminals 177 and the corresponding portions 230 of the sleeves 231. If the fault current is comparatively slight, the arc or arcs formed will be drawn and entirely extinguished in one or both of the auxiliary bores 209. However, if the fault current to be interrupted is outside of the range of the auxiliary bores 209, then an arc will strike between the main terminal 176 and the terminal or ferrule 166, or some of its inwardly projecting parts, and will be drawn into the main bore 203 on continued movement of the main terminal 176 therethrough, where it will be extinguished due to the evolution of water vapor from the walls thereof.

Since certain further changes may be made in the foregoing constructions, and different embodiments of the invention may be made without departing from the scope thereof, it is intended that all matter described hereinbefore or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim as my invention:

1. In a circuit interrupter, in combination, arc extinguishing material providing a main bore and a plurality of auxiliary bores, the cross sectional area of said main bore being relatively large and the cross sectional area of each auxiliary bore being relatively small, a stationary terminal at one end of said bores, and main and auxiliary relatively infusible terminals in said main and auxiliary bores, respectively, substantially filling the same and adapted on being moved away from said stationary terminal to draw an arc first in one or more of the auxiliary bores and subsequently in the main bore if the arc in the auxiliary bore or bores is not extinguished.

2. In a circuit interrupter, in combination, arc extinguishing material providing a main bore and a plurality of auxiliary bores, said bores being parallel to each other and the cross-sectional area of said main bore being relatively large and the cross sectional area of each auxiliary bore being relatively small, a stationary terminal at

one end of said bores, and main and auxiliary relatively infusible terminals in said main and auxiliary bores, respectively, substantially filling the same and adapted to be simultaneously moved away from said stationary terminal to draw an arc first in one or more of the auxiliary bores and subsequently in the main bore if the arc in the auxiliary bore or bores is not extinguished.

3. In a circuit interrupter, in combination, a housing, an arcing terminal carried by said housing, a filling of solid arc extinguishing material in said housing having a main bore and a plurality of auxiliary bores, a main arcing terminal and a plurality of auxiliary arcing terminals in said main and auxiliary bores respectively, and fusible means interconnecting said main and auxiliary arcing terminals and said arcing terminal carried by said housing.

4. In a circuit interrupter, in combination, a housing, an arcing terminal carried by said housing, a filling of solid arc extinguishing material in said housing having a main bore and a plurality of auxiliary bores, a main arcing terminal and a plurality of auxiliary arcing terminals in said main and auxiliary bores, respectively, fusible means interconnecting said main arcing terminal and said arcing terminal carried by said housing, and strain means interconnecting said auxiliary arcing terminals and said arcing terminal carried by said housing, said fusible means being adapted to blow before said strain means on operation of the cartridge, said strain means relieving said fusible means of stress otherwise imposed thereon.

5. In a circuit interrupter, in combination, a housing, an arcing terminal carried by said housing, a filling of solid arc extinguishing material in said housing having a main bore and an auxiliary bore, a main arcing terminal and an auxiliary arcing terminal in said main and auxiliary bores, respectively, a fuse wire secured at one end to said main arcing terminal, a relatively infusible terminal secured to the other end of said fuse wire, means securing said relatively infusible terminal to said arcing terminal carried by said housing, and a strain wire interconnecting said auxiliary terminal to said arcing terminal carried by said housing.

6. In a circuit interrupter, in combination, a housing, an arcing terminal carried by said housing, a filling of solid arc extinguishing material in said housing having a main bore and a plurality of auxiliary bores, a main arcing terminal and a plurality of auxiliary arcing terminals in said main and auxiliary bores, respectively, a plurality of pairs of fuse wires secured at one end to said main arcing terminal, a relatively infusible terminal secured to the other end of each pair of fuse wires, means individually securing each relatively infusible terminal to said arcing terminal carried by said housing, and a plurality of strain wires interconnecting said auxiliary arcing terminals and said arcing terminal carried by said housing for relieving said fusible means of stress otherwise imposed thereon.

7. In a circuit interrupter, in combination, a housing, an arcing terminal carried by said housing, a filling of solid arc extinguishing material in said housing having a main bore and a plurality of auxiliary bores, a main arcing terminal and a plurality of auxiliary arcing terminals in said main and auxiliary bores, respectively, means operatively interconnecting said main and auxiliary arcing terminals for movement as a unit, and fusible and strain means interconnecting said

main and auxiliary arcing terminals, respectively, and said arcing terminal carried by said housing.

8. In a circuit interrupter, in combination, a housing, an arcing terminal carried by said housing, a filling of solid arc extinguishing material in said housing having a main bore and a plurality of auxiliary bores, a main arcing terminal and a plurality of auxiliary arcing terminals in said main and auxiliary bores, respectively, means operatively interconnecting said main and auxiliary arcing terminals for movement as a unit, fusible and strain means interconnecting said main and auxiliary arcing terminals, respectively, and said arcing terminal carried by said housing, and flexible conducting means connected to said arcing terminal carried by said housing and extending into each of said auxiliary bores for causing arcs to be drawn therein.

9. In a circuit interrupter, in combination, a housing, an arcing terminal carried by said housing, a filling of solid arc extinguishing material in said housing having a main bore and an auxiliary bore, a main rod-like arcing terminal and an auxiliary rod-like arcing terminal in said main and auxiliary bores, respectively, the cross sectional areas of said main and auxiliary rod-like arcing terminals being such as to substantially fill their respective bores, and fusible means interconnecting said main and auxiliary arcing terminals and said arcing terminal carried by said housing.

10. In a circuit interrupter, in combination, a housing, an arcing terminal carried by said housing, a filling of solid arc extinguishing material in said housing having a main bore and an auxiliary bore, a main rod-like arcing terminal and an auxiliary rod-like arcing terminal in said main and auxiliary bores, respectively, the cross-sectional areas of said main and auxiliary rod-like arcing terminals being such as to substantially fill their respective bores, fusible means interconnecting said main arcing terminal and said auxiliary arcing terminal and said arcing terminal carried by said housing, said fusible means being adapted to blow before said strain means on operation of the interrupter, the arc produced on blowing of said strain means being formed between said arcing terminal carried by said housing and the adjacent end of said auxiliary arcing terminal.

11. In a circuit interrupter, in combination, a housing, an arcing terminal carried by said housing, a filling of solid arc extinguishing material in said housing having a main bore and an auxiliary bore, a main rod-like arcing terminal and an auxiliary rod-like arcing terminal in said main and auxiliary bores, respectively, the cross sectional areas of said main and auxiliary rod-like arcing terminals being such as to substantially fill their respective bores, fusible means interconnecting said main arcing terminal and said arcing terminal carried by said housing, strain means interconnecting said auxiliary arcing terminal and said arcing terminal carried by said housing, said fusible means being adapted to blow before said strain means on operation of the interrupter, the arc produced on blowing of said strain means being formed between said arcing terminal carried by said housing and the adjacent end of said auxiliary arcing terminal, and an arcing chamber individual to each of said main and auxiliary arcing terminals, each arcing chamber being flared outwardly in the direction

of said arcing terminal carried by said housing to facilitate the flow of the products of the arcs formed on blowing of said fusible and strain means.

12. In a circuit interrupter, in combination, a housing, an arcing terminal carried by said housing, a filling of solid arc extinguishing material in said housing having a main bore and a plurality of auxiliary bores, a main rod-like arcing terminal and a plurality of auxiliary rod-like arcing terminals in said main and auxiliary bores, respectively, the cross sectional areas of said main and auxiliary rod-like arcing terminals being such as to substantially fill their respective bores, and fusible means interconnecting said main and auxiliary arcing terminals and said arcing terminal carried by said housing.

13. In a circuit interrupter, in combination, a housing, an arcing terminal carried by said housing, a filling of solid arc extinguishing material in said housing having a main bore and a plurality of auxiliary bores, a main rod-like arcing terminal and a plurality of auxiliary rod-like arcing terminals in said main and auxiliary bores, respectively, the cross sectional areas of said main and auxiliary rod-like arcing terminals being such as to substantially fill their respective bores, fusible means interconnecting said main arcing terminal and said arcing terminal carried by said housing, and strain means interconnecting said auxiliary arcing terminals and said arcing terminal carried by said housing, said fusible means being adapted to blow before said strain means on operation of the interrupter, the arc or arcs produced on blowing of said strain means being formed between said arcing terminal carried by said housing and the adjacent ends of said auxiliary arcing terminals.

14. In a circuit interrupter, in combination, a housing, an arcing terminal carried by said housing, a filling of solid arc extinguishing material in said housing having a main bore and a plurality of auxiliary bores, a main rod-like arcing terminal and a plurality of auxiliary rod-like arcing terminals in said main and auxiliary bores, respectively, the cross sectional areas of said main and auxiliary rod-like arcing terminals being such as to substantially fill their respective bores, fusible means interconnecting said main arcing terminal and said arcing terminal carried by said housing, strain means interconnecting said auxiliary arcing terminals and said arcing terminal carried by said housing, and an arcing chamber individual to each of said main and auxiliary arcing terminals, each arcing chamber being flared outwardly in the direction of said arcing terminal carried by said housing to facilitate the flow of the products of the arcs formed on blowing of said fusible and strain means.

15. In a circuit interrupter, in combination, a housing, an arcing terminal carried by said housing, a filling of solid arc extinguishing material in said housing having a bore extending there-through, a rod-like arcing terminal movable through said bore between which and said arcing terminal carried by said housing an arc is formed on operation of the interrupter, and packing means in said bore cooperating with said rod-like arcing terminal for substantially preventing the passage therepast of the products produced by said arc.

16. In a circuit interrupter, in combination, a housing, an arcing terminal carried by said housing, a filling of solid arc extinguishing material in said housing having a main bore and an auxil-

lary bore, a main rod-like arcing terminal and an auxiliary rod-like arcing terminal in said main and auxiliary bores, respectively, fusible means interconnecting said main and auxiliary arcing terminals and said arcing terminal carried by said housing, and packing means in said main bore cooperating with said main rod-like arcing terminal for substantially preventing the passage therepast of the products of the arc produced in said main bore on operation of the interrupter.

17. In a circuit interrupter, in combination, a housing, an arcing terminal carried by said housing, a filling of solid arc extinguishing material in said housing having a main bore and an auxiliary bore, a main rod-like arcing terminal and an auxiliary rod-like arcing terminal in said main and auxiliary bores, respectively, the cross sectional areas of said main and auxiliary rod-like arcing terminals being such as to substantially fill their respective bores, fusible means interconnecting said main and auxiliary arcing terminals and said arcing terminal carried by said housing, and packing means in said main bore cooperating with said main rod-like arcing terminal for substantially preventing the passage therepast of the products of the arc produced in said main bore on operation of the interrupter.

18. In a circuit interrupter, in combination, a housing, an arcing terminal carried by said housing, a filling of solid arc extinguishing material in said housing having a main bore and a plurality of auxiliary bores, a main rod-like arcing terminal and a plurality of auxiliary rod-like arcing terminals in said main and auxiliary bores, respectively, the cross-sectional areas of said main and auxiliary rod-like arcing terminals being such as to substantially fill their respective bores, fusible means interconnecting said main and auxiliary arcing terminals and said arcing terminal carried by said housing, and packing means in said main bore cooperating with said main rod-like arcing terminal for substantially preventing the passage therepast of the products of the arc produced in said main bore on operation of the interrupter.

19. A replaceable fuse cartridge for mounting on support means for interconnecting a pair of line terminals and disposed to be tensioned by external spring means comprising, in combination, a tubular housing, a pair of arcing terminals between which an arc is adapted to be formed, one being stationarily mounted with respect to said tubular housing and adapted to be connected to one line terminal, and the other being movable and adapted to be connected to the other line terminal, fusible means interconnecting said arcing terminals, and means on said housing for mounting the same on said support means and automatically aligning the housing with said support means.

20. In a circuit interrupter, in combination, arc extinguishing material providing a main bore and a plurality of auxiliary bores, a stationary arcing terminal at one end of said bores, a main arcing terminal and a plurality of auxiliary arcing terminals in said main and auxiliary bores, respectively, adapted to be tensioned for moving the same away from said stationary arcing terminal to draw an arc between said stationary arcing terminal and one end of said main and auxiliary arcing terminals, first in one or more of the auxiliary bores and finally in the main bore if the arc in the auxiliary bore or bores is not extinguished, and means interconnecting

the other ends of said main and auxiliary arcing terminals in such manner that tension stress applied to said main arcing terminal is substantially uniformly distributed among said auxiliary arcing terminals.

21. In a circuit interrupter, in combination, arc extinguishing material providing a main bore and a plurality of auxiliary bores, a stationary arcing terminal at one end of said bores, a main arcing terminal and a plurality of auxiliary arcing terminals in said main and auxiliary bores, respectively, adapted to be tensioned for moving the same away from said stationary arcing terminal to draw an arc between said stationary arcing terminal and one end of said main and auxiliary arcing terminals, first in one or more of the auxiliary bores and finally in the main bore if the arc in the auxiliary bore or bores is not extinguished, and evenner means interconnecting the other ends of said main and auxiliary arcing terminals to substantially uniformly distribute tension stress applied thereto among said auxiliary arcing terminals.

22. In a circuit interrupter, in combination, a housing, an arcing terminal carried by said housing, a filling of solid arc extinguishing material in said housing having a main bore and a plurality of auxiliary bores, a main arcing terminal and a plurality of auxiliary arcing terminals in said main and auxiliary bores, respectively, fusible means connecting one end of each of said main and auxiliary arcing terminals and said arcing terminal carried by said housing, and means interconnecting the other ends of said main and auxiliary arcing terminals in such manner that tension stress applied to said main arcing terminal is substantially uniformly distributed among said auxiliary arcing terminals.

23. In a circuit interrupter, in combination, a housing, an arcing terminal carried by said housing, a filling of solid arc extinguishing material in said housing having a main bore and a plurality of auxiliary bores, a main arcing terminal and a plurality of auxiliary arcing terminals in said main and auxiliary bores, respectively, fusible means connecting one end of each of said main and auxiliary arcing terminals and said arcing terminal carried by said housing, and evenner means interconnecting the other ends of said main and auxiliary arcing terminals to substantially uniformly distribute tension stress applied thereto among said auxiliary arcing terminals.

24. In a circuit interrupter, in combination, a housing, an arcing terminal carried by said housing, a filling of solid arc extinguishing material in said housing having a main bore and a plurality of auxiliary bores, a main arcing terminal and a plurality of auxiliary arcing terminals in said main and auxiliary bores, respectively, fusible means connecting one end of each of said main and auxiliary arcing terminals and said arcing terminal carried by said housing, means mechanically and electrically interconnecting the other ends of said main and auxiliary arcing terminals, and manually operable means for adjusting the interconnecting means to effect desired distribution of tension stress among said auxiliary arcing terminals.

25. In a circuit interrupter, in combination, a tubular housing, a terminal carried by said housing, a filling of solid arc extinguishing material in said housing having a central main bore and a pair of auxiliary bores on opposite sides of the main bore, the main bore having a generally rectangular and relatively large cross section and

the auxiliary bores having relatively small cross sections, main and auxiliary terminals in said main and auxiliary bores, said main terminal conforming to and substantially filling said main bore, and fusible means interconnecting said main and auxiliary terminals and said terminal carried by said housing.

26. In a circuit interrupter, in combination, a housing, an arcing terminal carried by said housing, a filling of solid arc extinguishing material in said housing having a bore extending there-through, a rod-like arcing terminal movable through said bore between which and said arcing terminal carried by said housing an arc is formed on operation of the interrupter, and packing means in said bore cooperating with said rod-like arcing terminal for substantially preventing the passage therepast of the products produced by said arc, said packing means being arranged and adapted to increase its resistance to the flow of said products as the pressure thereof increases.

27. In a circuit interrupter, in combination, a housing, an arcing terminal carried by said housing, a filling of solid arc extinguishing material in said housing having a bore extending there-through, a rod-like arcing terminal movable through said bore between which and said arcing terminal carried by said housing an arc is formed

on operation of the interrupter, and packing means in said bore cooperating with said rod-like arcing terminal for substantially preventing the passage therepast of the products produced by said arc, said packing means including one or more V-shaped rings substantially concentric with said rod-like arcing terminal with the tip of the V pointing in the direction of movement thereof away from said arcing terminal.

28. A replaceable fuse cartridge for mounting on support means for interconnecting a pair of line terminals and disposed to be tensioned by external spring means, in combination, a tubular housing, an arcing terminal carried by said housing, a filling of solid arc extinguishing material in said housing having a bore extending there-through, a rod-like arcing terminal movable through said bore between which and said arcing terminal carried by said housing an arc is formed, fusible means interconnecting said arcing terminals, packing means in said bore cooperating with said rod-like arcing terminal for substantially preventing the passage therepast of the products produced by said arc, and means on said housing for mounting the same on said support means and automatically aligning the housing with said support means.

HUGH A. TRIPLETT.