

May 20, 1941.

L. R. LUDWIG ET AL

2,243,040

CIRCUIT INTERRUPTER

Filed March 22, 1939

2 Sheets-Sheet 1

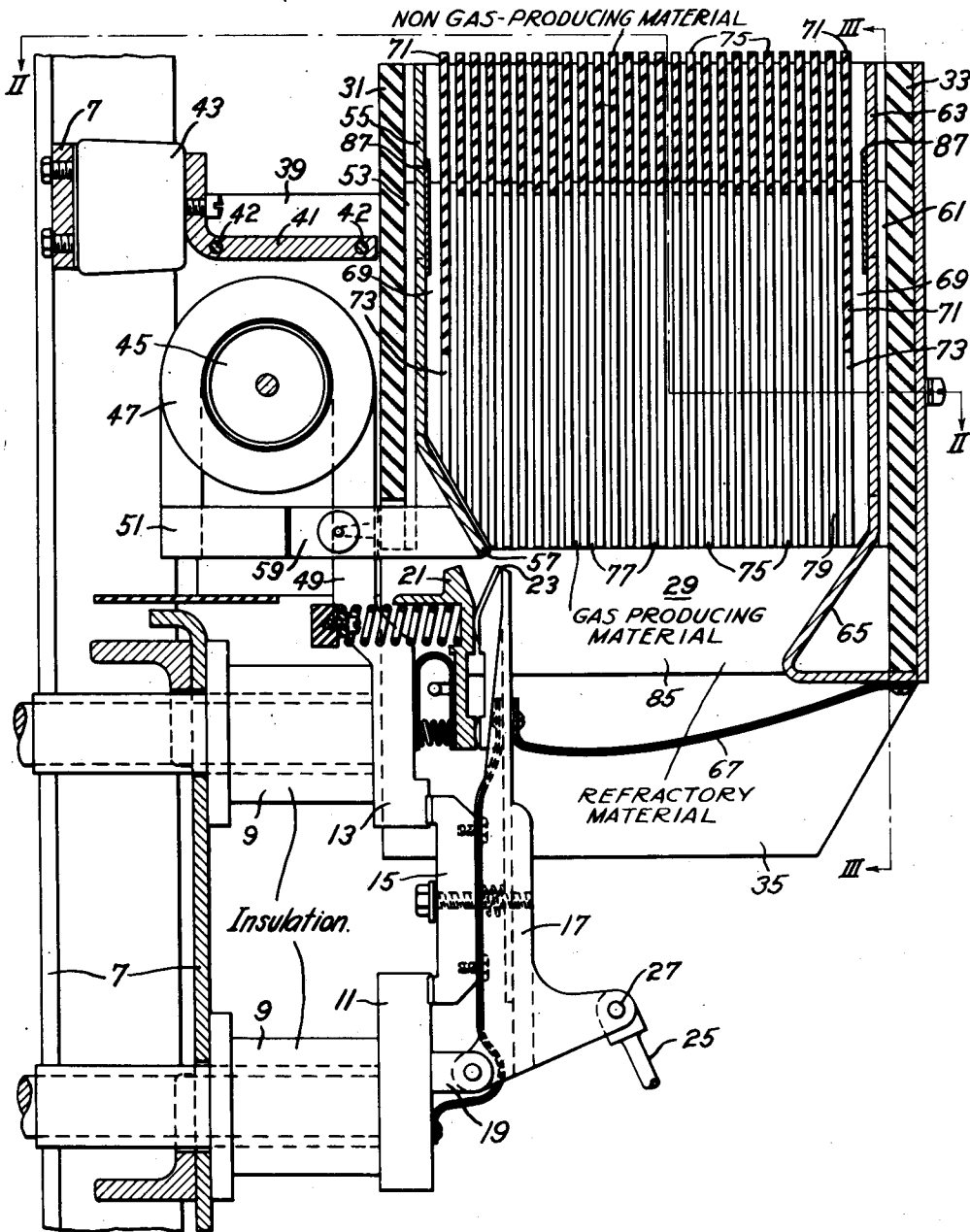


Fig. 1.

WITNESSES:

Wm. B. Sellers
Walter E. Mueller

INVENTORS

Leon R. Ludwig, Herbert L. Rawlins
and Robert H. Nau.

BY
Ralph Z. Swingle
ATTORNEY

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2 Sheets-Sheet 2

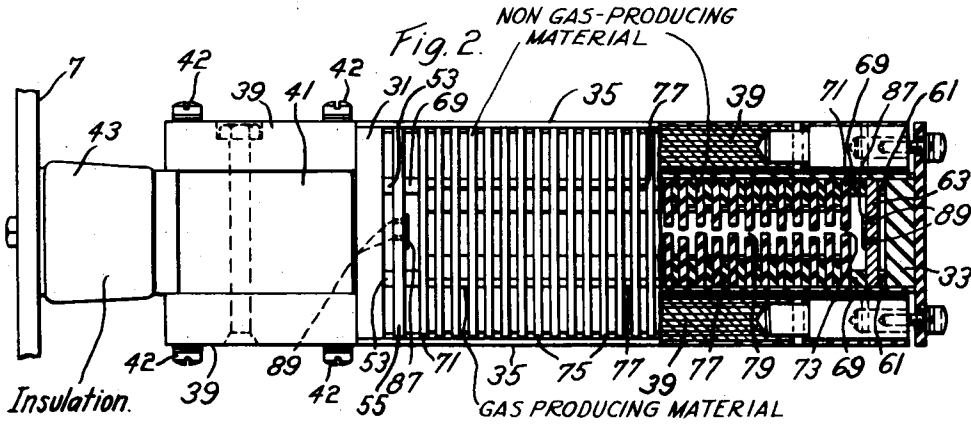


Fig. 4.

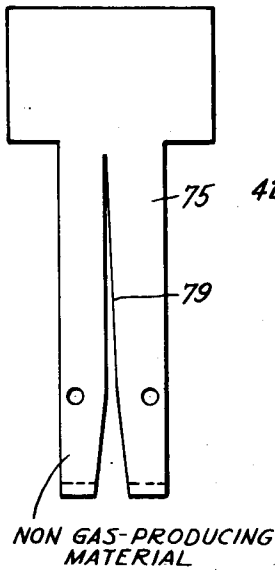


Fig. 3.

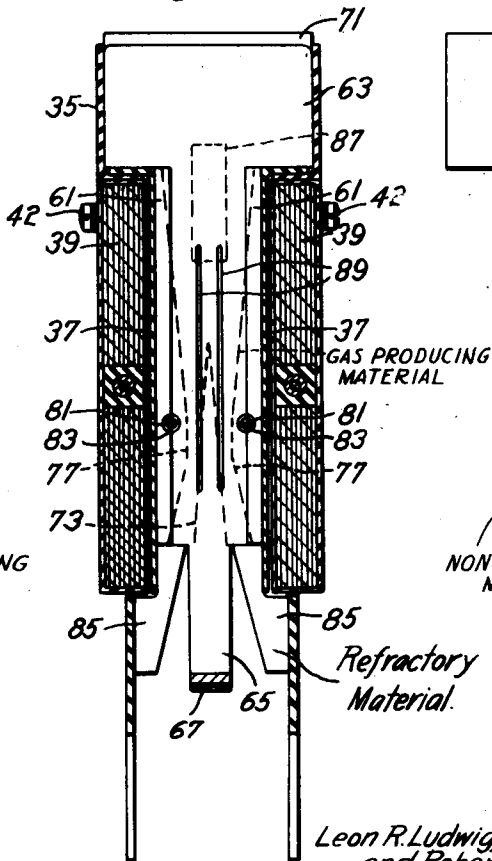
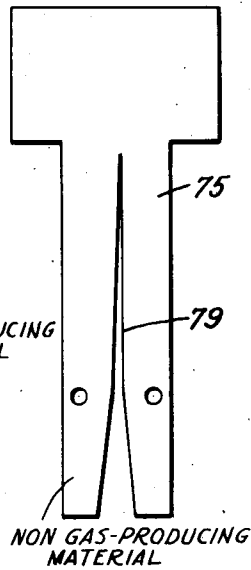


Fig. 5.



WITNESSES:

Wm. B. Sellers.
Walter E. Mueller

INVENTORS

Leon R. Ludwig, Herbert L. Rawlins,
and Robert H. Nau.

BY

Ralph H. Swingle
ATTORNEY

UNITED STATES PATENT OFFICE

2,243,040

CIRCUIT INTERRUPTER

Leon R. Ludwig, Herbert L. Rawlins, and Robert H. Nau, Wilkensburg, Pa., assignors to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania

Application March 22, 1939, Serial No. 263,440

18 Claims. (Cl. 200—149)

This invention relates to circuit interrupters, and more particularly to arc extinguishing structures for circuit interrupters of the air brake type.

In the application of L. R. Ludwig, Serial No. 216,884, filed July 1, 1938, and assigned to the assignee of this application is shown and described an arc extinguishing structure for circuit interrupters of the air break type in which arc extinction is accomplished by the lateral movement of an established arc toward the closed ends of a series of tapered notches formed in spaced plates of insulating material. Lateral movement of the arc, as set forth in the aforesaid Ludwig application, is obtained by a magnetic field self-induced in plates of magnetic material disposed adjacent the arc receiving notches. This magnetic field is also relied upon to produce a blast of un-ionized gas through the arc while the arc is held substantially immovable against the closed ends of the slots or notches in the plates of insulating material.

The general principles set forth in the said Ludwig application Serial No. 216,884 are embodied in an interrupter for higher voltages shown and described in the application of R. C. Dickinson et al., Serial No. 261,240, filed March 11, 1939, and assigned to the assignee of this application. In the Dickinson application, Serial No. 261,240, an arcing plate is provided at each end of the stack of refractory plates between which an arc is adapted to be established. Arc extinction in this instance is accomplished by moving the arc laterally between the arcing plates against the closed ends of the slots in the plates of refractory material and by subjecting the arc to a blast of deionizing gas produced by the action of the magnetic field causing arc movement.

The improved operation of the arc extinguishing device of the aforesaid Dickinson et al. application is, in part, predicated upon the use of slotted shield plates adjacent the arcing plates so arranged as to prevent the formation of hot cathode terminals upon the arcing plates, thereby reducing the vaporization of the contact metal to a minimum so as to materially increase the breakdown voltage between the arcing plates.

The principal object of our invention is to further improve the operation of circuit breakers of the aforesaid type so as to materially extend the interrupting capacity of such breakers with respect to both the current and voltage ranges interrupted.

A further object of our invention is to provide an arc extinguishing structure for circuit interrupters of the aforesaid type having a higher interrupting capacity than devices heretofore known, but which is capable of bringing about arc extinction in a shorter period of time.

We have discovered that the improved operation as set forth above can be obtained by increasing the intensity of the gas blast through the arc while the latter is held against further movement at the ends of the tapered slots in the plates of refractory material. The requisite increase in intensity of the gas blast through the arc may be obtained by the provision of an improved field structure as well as means along the arc passage for generating additional quantities of deionizing gas. The production of a structure whereby the foregoing is accomplished therefore constitutes a further object of our invention.

Still another object of our invention resides in the provision of an improved arc extinguishing structure of the aforesaid type in which provision is made for freely venting the arc gases around the arcing plates to enhance arc movement along these plates.

Other objects and advantages relate to structural features of the arc extinguishing device and will appear more fully in the following description when read in connection with the accompanying drawings in which:

Figure 1 is a fragmentary elevation view partially in section showing the circuit interrupter of our invention;

Fig. 2 is a sectional view of the interrupter shown in Fig. 1 as viewed along the line II—II of that figure;

Fig. 3 is a sectional view of the arc extinguishing device shown in Fig. 1 taken along the line III—III thereof, and

Figs. 4 and 5 are elevation views of two different plate structures used in the arc extinguishing device of our invention.

Referring to the drawings, reference number 7 designates a framework upon which is supported a pair of spaced insulators 9. Respectively mounted upon the insulators 9 are main contact terminals 11 and 13. The contact terminals 11 and 13 are adapted to be connected by a main bridging member 15 carried by a movable contact arm 17 pivoted at its lower end to a bracket 19 carried by the stationary terminal member 11. A yielding supported arcing contact 21 is electrically connected to the stationary terminal 13. The contact arm 17 also carries a movable arcing contact 23 which is adapted to cooperate with the arcing contact 21. Movement of the contact arm 17 to the open and closed positions may be accomplished by an operating rod 25 pivoted to the arm 17 at 27 and actuated by a suitable operating mechanism, as, for example, the mechanism more fully shown and described in the application of G. G. Grissinger et al. Serial No. 261,242, filed March 11, 1939, and assigned to the assignee of this application.

Movement of the contact structure to the open circuit position establishes an arc between the

arcing contacts 21 and 23 and the arc is adapted to be extinguished by an arc extinguishing device generally indicated at 29. The arc extinguishing device 29 consists of a generally rectangular casing having back and front support plates 31 and 33 each of which are constructed of insulating material.

Secured to the sides of the support plates 31 and 33 are cover plates 35 having rectangular recessed portions 37 intermediate the top and bottom edges thereof as more clearly shown in Fig. 3.

The arc extinguishing structure 29 is adapted to be supported in sliding engagement with a pair of laminated field pole members 39 which register with the recessed portions 37. The field pole members 39 extend substantially the entire length of the arc extinguishing device 29 and beyond the left-hand edge thereof, and are preferably secured to opposite sides of an angular bracket 41 of non-magnetic material by screws 42 as clearly shown in Figs. 1 and 2. The bracket 41 is, in turn, secured to an insulator 43 mounted upon the frame 7. The pole pieces 37 are also joined near their left-hand end by a core 45 of magnetic material.

Encircling the core 45 is a field coil 47 having one end thereof connected by the conductor 49 to the stationary terminal 13. The other end of the coil 47 is connected to a stationary blade 51 of a disconnect switch, the purpose of which will appear more fully hereinafter. Disposed adjacent the back support plate 31 and spaced therefrom by two insulating strips 53 is an arcing plate 55 of copper or other suitable conducting material. The lower end of the arcing plate 55 is inclined to the right as shown at 57.

The portion 57 of the arcing plate 55 has secured thereto a pair of switch blades 59 which extend to the left through a suitable aperture in the support plate 31 and are adapted to make contact with the switch blade 51. Thus, it is seen that the disconnect structure comprising the switch blades 51 and 59 permit removal of the arc extinguishing device 29 by sliding the same to the right on the field pole pieces 39. Inasmuch as the disconnect feature and removability of the arc extinguishing device from the breaker are only incidental to the instant invention, and are claimed in the aforesaid application of G. G. Grissinger et al., it is believed that the foregoing brief description thereof will suffice for the particular purpose at hand.

Disposed adjacent the front support plate 33 and held in spaced relation with respect thereto by a pair of spacing strips 61 is a second arcing plate 63 also of copper or other suitable conducting material. The lower end of the arcing plate 63 is provided with an arc receiving extension 65 which, in turn, is connected by a flexible shunt 67 to the moving contact arm 17.

Disposed adjacent each of the arcing plates 55 and 63 and spaced therefrom by strips 69 of insulating material, is a shield plate 71 of non-gas-producing or refractory insulating material having a slot 73 extending inwardly from the lower end thereof and of a form more clearly shown in Fig. 3. Arranged between the two plates 71 are a plurality of plates 75 also of refractory material which are maintained in spaced relation with respect to each other and the plates 71 by spacing plates 77 of gas producing insulating material such as hard fibre or the like. Each of the plates 75 has an elongated tapering slot 79 extending from the lower end thereof upwardly as more clearly shown in Figs. 4 and 5. The slots 79,

as shown in Figs. 4 and 5, are inclined alternately to the right and the left of the center line so as to provide a staggered arrangement. The staggered arrangement of the slots in the plates of refractory material is a feature more fully described and claimed in the co-pending application of L. R. Ludwig et al. Serial No. 249,210, filed January 4, 1939, and assigned to the assignee of this application. The arcing plates 55 and 63, as well as the plates 71, 75 and 77, are assembled on a pair of tie bolts 81 extending between the support plates 31 and 33. The bolts 81 are preferably insulated from the plate structure by a sleeve 83 of insulating material.

Placed below the plate 75 and secured to each wall member 35 is a lining member 85 of refractory material having inclined inner surfaces so as to substantially form a continuation of the arc passage defined by the slots 79 in the plates 75. As is to be noted from Figs. 1 and 3 the lining members 85 are disposed upon each side of the separable arcing contacts 21 and 23 and serve to direct an arc established between these contacts into the slot structure of the plates 75. The operation of the device is as follows:

In operating the circuit interrupter to the open circuit position, the contact arm 17 is rotated clockwise causing an arc to be established between the arcing contacts 21 and 23. As the movable arcing contact 23 reaches the full open position adjacent the arc receiving extension 65, the right-hand end of the arc is transferred to this extension. Arc transfer is readily accomplished due to the loop circuit provided between the arcing contact 21, the arcing contact 23 and the contact arm 17 which is electrically connected to the stationary terminal 11. This loop circuit is maintained following the transfer of the arc from the contact 23 to the extension 65 by virtue of the shunt connection 67 between the extension 65 and the contact arm 17. The left-hand end of the arc also transfers readily to the inclined extension 57 of the arcing plate 55, since the arcing contact 21 assumes a position directly underneath the extension 57 when the arcing contact 23 is withdrawn from the contact 21. As soon as the left-hand end of the arc transfers to the extension 57 an electrical circuit is then established from the terminal 13, connection 49 to the coil 47, switch blade 51, blades 59 to the extension 57 through the arc to the arcing plate 63, the extension 65, shunt 67, contact arm 17 and the stationary terminal 11. The arc current flowing through the coil 47 thus produces a strong magnetic field in the core 45 which, in turn, is caused to flow between the field pole members 39 across the slots 79 in the plates 75. The magnetic field thus established causes the arc to be quickly moved upwardly along and between the arcing plates 55 and 63 towards the closed ends of the slots 79.

It will be noted, however, that the plates 71 of refractory material have a slot 73 therein which has a depth considerably less than the depth of the slots 79 of the plates 75. A portion near the terminal ends of the arc will therefore be impeded whereas the intermediate section of the arc between the plates 71 will be permitted to continue its upward movement to the ends of the slot 79. The section of the arc between the arcing plate 55 and its corresponding plate 71, as well as the section of the arc between the arcing plate 63 and its corresponding plate 71, will, however, be moved upwardly by the action of the magnetic field. Elongation of these particular

sections of the arc will continue until the arc can no longer be maintained due to excessive lengthening thereof. The arcs at the terminals will therefore re-strike at a point closer to the upper end of the slots 73 in the plates 71. This action, as more clearly set forth and described in the aforesaid application of R. C. Dickinson et al. occurs with such rapidity that cold cathode terminals are produced upon the arcing plates 55 and 63, thus materially reducing the amount of vaporization of metal as a result of the ends of the arc forming terminals upon these plates.

In order to further reduce deterioration of the contact surfaces of the plates 55 and 63, portions thereof as shown at 87 are covered with a relatively thin plate of high melting point arc resisting metal, for example, a tungsten alloy containing tungsten and silver is suitable for this purpose. Furthermore, in order to facilitate the rapid movement of the terminal ends of the arc along the arcing plates 55 and 63, these plates are preferably slotted as shown at 89 in Figs. 2 and 3. The slots 89 through the arcing plates permit the arc gases along the plates to vent therethrough into the space between the arcing plates and the end support plates, thereby relieving the pressure ahead of the arc and thus facilitating its upward movement. The portion of the arc between the plate 71 is driven by the strong magnetic field to the ends of the slots 79 where it is permitted to play. The spacing between the plates 75, however, is so selected that with the particular magnetic field used there will be substantially no bowing or looping of the arc in the spaces between the plates. The magnetic field also creates a blast of unionized gas in the direction of arc movement which passes laterally through the arc and thereby aids in extinguishing the arc. We have discovered however, that the blast of gas created by the action of a magnetic field alone is insufficient for effectively bringing about circuit interruption at higher voltages.

In order to materially extend the voltage as well as the current range of circuit interrupters of the type herein described, we have supplemented the blast of gas produced by magnetic action with a blast derived from the action of the arc during its upward movement upon plate means of insulating material. In this instance, the spacing plates 77 disposed between the plates 75 of refractory material have opposed inner edges disposed on each side of the slots 79 of such form to provide a constricted portion intermediate the ends of the slots. Thus as the arc moves upwardly the heat thereof reacts upon the spacing plates 77 to generate additional quantities of un-ionized gas which combine with the gas blast produced by the magnetic action to bring about arc extinction. It will be noted as more particularly shown in Fig. 3 that the generally arcuate construction of the spacing plates 77 provides a constricted or throat area in the spaces between the plates 75 at a point intermediate the ends of the slots 79. Thus the arc has very little effect in producing additional quantities of deionizing gas as it enters the lower ends of the slots 79.

Appreciable gas generation by the action of the arc upon the spacing plate 77 does not take place until the arc reaches the constricted portion between opposed spacing members 77. The gas thus generated at the constricted or throat portion is permitted to expand and be moved upwardly due to the increasing cross section of the

vent area between the plate 75 in an upward direction. Flow of the arc gases in a direction opposite to movement of the arc is prevented by the throat portion provided by the tapered lining members 85, the upper sides of which extend inwardly a distance beyond the opposed edges of the spacing plates 77. By way of example, the plates 75 of refractory non-gas-forming material may vary in thickness from $\frac{1}{8}$ to $\frac{1}{4}$ inch, and may be spaced from each other from $\frac{1}{8}$ to $\frac{1}{4}$ inch. Successful operation of the interrupting device has been obtained when the slot 79 in the plate 75 is substantially $8\frac{1}{2}$ inches in length and has a width of $\frac{1}{4}$ inch at its closed end, and tapered outwardly to a width of approximately $\frac{7}{8}$ inch at the open end of the slot. Improved results have also been obtained when the slots 79 were displaced from $\frac{1}{4}$ to $\frac{1}{8}$ inch to either side of the center line of the plate and with plates so arranged as to form a staggered slot relation.

When using a plate construction as above defined, we have found it desirable to employ a shield plate 71 of similar construction to the plate 75 with the exception that the slots therein are substantially only $4\frac{3}{4}$ inches in length. By utilizing this construction, metallic deposits from vaporization of the lower portions of the arcing plates 55 and 63 are prevented from being carried into the upper portions of the slots 79 of the plates 75, and thereby materially increase the breakdown voltage across these plates.

An interrupter of the foregoing description is capable of successfully interrupting alternating current circuits of 43,000 amperes at 2300 volts, 22,000 amperes at 4000 volts, or 8000 amperes at 5550 volts.

Although we have shown and described a specific circuit interrupting structure, it is to be understood that the same is for the purpose of illustration and that changes and modifications may be made by those skilled in the art without departing from the spirit and scope of the appended claims.

We claim as our invention:

1. In a circuit interrupter, means defining an arc passage which progressively decreases in width from one side thereof to the other, said arc passage defining means including both refractory and gas producing insulating material, means for venting said arc passage, means for establishing an arc in said passage, means for moving the arc laterally toward the constricted side of said arc passage, means for producing a blast of deionizing gas from a plurality of independent sources and means for subjecting said arc to said blast of deionizing gas derived from said plurality of independent sources, at least a portion of said gas being produced by the action of said arc upon said gas producing insulating material.

2. In a circuit interrupter, means of insulating material substantially free of material which gives off gas when acted upon by an arc, defining an arc passage of considerable length and which progressively decreases in width from one side thereof to the other, said means of insulating material having a plurality of venting passages therethrough communicating with at least the more restricted side of said arc passage, means for establishing an arc in the enlarged portion of said arc passage, magnetic means for moving the arc laterally to the restricted side of said arc passage, said magnetic means coacting with the arc stream to cause a blast of un-ionized gas to flow laterally through said arc, means respon-

sive to the lateral movement of said arc for producing an additional quantity of un-ionized gas from an independent source, and means for causing said additional quantity of un-ionized gas to flow through said arc.

3. In a circuit interrupter, means of insulating material substantially free of material which gives off gas when acted upon by an arc, defining an arc passage of considerable length and which progressively decreases in width from one side thereof to the other, said means of insulating material having a plurality of venting passages therethrough communicating with at least the more restricted side of said arc passage, means for establishing an arc in the enlarged portion of said arc passage, magnetic means for moving the arc laterally to the restricted side of said arc passage, said magnetic means reacting with the arc to cause a blast of un-ionized gas to flow laterally through said arc, and means along said arc passage which gives off a gas under the influence of an arc to provide an additional blast of un-ionized gas through the arc.

4. In a circuit interrupter, a plurality of spaced plates of insulating material which is substantially free from material which gives off gas when acted upon by an arc, said plates having tapered arc receiving notches extending inwardly from one end thereof and terminating in a constricted tip, means for establishing an arc in said notches, means for moving the arc laterally into the constricted tips at the closed ends of said notches, and means disposed between a plurality of said plates of insulating material which gives off un-ionized gas when acted upon by an arc to subject the arc to a blast of un-ionized gas.

5. In a circuit interrupter, a plurality of spaced plates of insulating material, said plates having tapered arc receiving notches extending inwardly from one end thereof and being substantially free from material which gives off gas when acted upon by an arc, said notches decreasing progressively in width in a direction towards the closed ends thereof, means spacing said plates of insulating material from each other which gives off a gas when acted upon by an arc, means for establishing an arc in said notches, and means for setting up a magnetic field across said notches to move the arc laterally against the closed ends thereof, said magnetic field producing a blast of un-ionized gas through the arc to aid in extinguishing the arc, said spacing means being disposed along the sides of said notches to cause an additional blast of gas through the arc in response to the action of the arc on said spacing means following a predetermined movement of the arc toward the closed ends of said notches.

6. In a circuit interrupter, a plurality of plates of refractory material, said plates having elongated V-shaped slots extending inwardly from one end thereof and which terminate in a constricted tip, plate means of material which gives off a gas when acted upon by an arc for spacing said refractory plates from each other, means for establishing an arc in said slots, and means for setting up a magnetic field across said slots for moving said arc laterally into the constricted tips at the closed ends of said slots, said magnetic field producing a blast of un-ionized gas through said arc, said plate means spacing said plates of refractory material being disposed on each side of said slots and having opposed inner edges to provide a constricted space intermediate the ends of said slots for causing said arc to react upon said plate means while passing through said

constricted space to create an additional blast of un-ionized gas through the arc.

7. In a circuit interrupter, means of insulating material defining an arc passage having a generally V-shaped cross section, an arc terminal member at each end of said arc passage, casing means disposed about the outer sides of each arc terminal member to provide a vent passage therealong, means for establishing an arc in said passage between said arc terminal members, and means for moving the arc between said arc terminal members towards the constricted side of said arc passage, said arc terminal members having apertures therethrough to enable the arc gases to flow into said vent passages for reducing the arc gas pressure in the region of said arc terminal members to thereby facilitate arc movement along said arc terminal members.

8. In a circuit interrupter, means of insulating material defining an arc passage having a generally V-shaped cross section, an arc terminal member at each end of said arc passage, means defining a vent passage along the outer side of each arc terminal member, means for establishing an arc in said passage between said arc terminal members, and means for moving the arc between said arc terminal members towards the constricted side of said arc passage, said arc terminal members being slotted in the direction of arc movement to enable the arc gases to flow into said vent passages for reducing the arc gas pressure in advance of the arc to facilitate arc movement along said arc terminal members.

9. In a circuit interrupter, an arc extinguishing device comprising a casing, an arcing plate disposed adjacent to and in spaced relation with each end of said casing, means of insulating material defining an arc passage disposed in spaced relation between said arcing plates, separable contacts operable to establish an arc in said arc passage between said arcing plates, and means for moving the arc laterally between said arcing plates, said arcing plates having apertures therethrough to permit arc gases to be discharged into the spaces between said arcing plates and the ends of said casing.

10. In a circuit interrupter, an arc extinguishing device comprising a casing, an arcing plate at each end of said casing, means of insulating material defining an arc passage between said arcing plates, means for establishing an arc between said arcing plates and means for moving the arc laterally with the ends thereof in engagement with said arcing plates, said arcing plates being spaced from the ends of said casing and said means of insulating material to provide a vent passage on each side of said plates.

11. In a circuit interrupter, an arc chute including at least one arc horn, contact means comprising a stationary contact supported for limited movement toward and away from the arc receiving end of said arc horn, a coating movable contact adapted when in the closed circuit position to hold said stationary contact away from said arc horn, means for biasing said stationary contact toward said moving contact to maintain a predetermined contact pressure, and means for operating said movable contact to open circuit position to establish an arc between said contacts, said biasing means moving said stationary contact into alignment with the arc receiving end of said arc horn upon separation of said contact to facilitate transfer of one end of said arc onto said arc horn.

12. In a circuit interrupter, an arc chute in-

cluding at least one arc horn, a stationary contact mounted for limited transverse movement with respect to the arc receiving end of said arc horn, means biasing said stationary contact into alignment with the arc receiving end of said arc horn, a movable contact arranged to make and break connection with said stationary contact when the latter is in alignment with said arc horn, and operating means for said movable contact for moving and holding said stationary contact out of alignment with said arc horn against the action of said biasing means.

13. In a circuit interrupter, an arc chute including at least one arc horn, a stationary contact mounted for limited movement from a closed circuit position away from the arc receiving end of said arc horn to an open circuit position closely adjacent but not touching said arc horn, spring means biasing said stationary contact to said open circuit position, a movable contact arranged to make and break connection with said stationary contact when the latter is in said open circuit position, operating means for said movable contact, said operating means normally holding said movable contact in the closed circuit position against the bias of said spring means, and releasing said stationary contact when said movable contact is moved to the open circuit position, and a blow-out coil connected between said arc horn and said stationary contact adapted to be energized when one end of the arc drawn between said contacts is transferred from said stationary contact to said arc horn.

14. In a circuit interrupter, separable contact means for establishing an arc, an arc chute having side and end walls providing an entrance opening adjacent said separable contacts, the inner opposed surfaces of said side walls diverging from each other from a point near the entrance opening to provide an exit opening of greater cross sectional area than said entrance opening, a plurality of spaced partitions of insulating material in said arc chute extending transversely of the arc path, means for moving the arc laterally into engagement with said partitions and means for subjecting the arc to a cross blast of gas, said diverging side walls being formed at least in part of a material which gives off gas when acted upon by an arc for subjecting the arc to an additional blast of gas, said diverging side walls providing passages between said partitions of progressively increasing area in the direction of arc movement whereby the back pressure is decreased and the effectiveness of the gas blast to extinguish the arc is increased.

15. In a circuit interrupter, separable contact means for establishing an arc, an arc chute having side and end walls providing an entrance opening adjacent said separable contacts, the inner opposed surfaces of said side walls diverging from each other from a point near the entrance opening to provide an exit opening of greater cross sectional area than said entrance opening, a plurality of spaced partitions of insulating material in said arc chute extending transversely of the arc path, said partitions having V-shaped slots therein extending inwardly from a point adjacent said separable contacts, means for moving the arc laterally into said V-shaped slots, means for subjecting the arc to a cross blast of gas while in said slots, said diverging side walls being formed at least in part

of a material which gives off gas when acted upon by an arc for subjecting the arc to an additional blast of gas, said diverging side walls providing a flared exhaust opening from the arc chute whereby the back pressure is decreased and the effectiveness of the gas blast to extinguish the arc is increased.

16. In a circuit interrupter, separable contact means for establishing an arc, an arc chute having side and end walls providing an entrance opening adjacent said separable contacts, the inner opposed surfaces of said side walls diverging from each other from a point near the entrance opening to provide a flared exhaust opening of greater cross sectional area than said entrance opening, a plurality of spaced plates of insulating material substantially free of material which gives off gas when acted upon by an arc in said chute extending transversely of the arc path, said plates having an elongated tapered notch therein extending inwardly from a point adjacent said separable contacts, means for moving the arc laterally into said notches, means for subjecting the arc to a lateral blast of gas, said diverging side walls being formed of fiber to provide an additional blast of gas through the arc in response to the action of the heat of the arc upon said side walls, said flared exhaust opening greatly reducing the back pressure within the arc chute whereby the effectiveness of the gas blast to extinguish the arc is increased.

17. In a circuit interrupter, a plurality of spaced plates of insulating material that is substantially free of material which gives off gas when acted upon by an arc, said plates having tapered slots therein to form an arc passage that decreases in width from one side thereof to the other, means for establishing an arc in said passage, means for moving said arc laterally towards the constricted side of said passage, means for subjecting said arc to a blast of unionized gas, and means of insulating material which gives off gas when acted upon by an arc disposed between a plurality of said first named plates of insulating material, said gas forming insulating material being positioned on either side of said arc passage and being arranged more closely to said slots at a point intermediate the ends thereof than at a point beyond the closed ends of said slots to subject the arc to an additional quantity of arc extinguishing gas as the arc is moved toward the constricted side of said arc passage.

18. In a circuit interrupter, a plurality of slotted plates of refractory material defining an arc passage having a tapered cross section, means of gas forming insulating material spacing said plates of refractory material, means for establishing an arc in said arc passage, means for moving said arc towards the constricted side of said arc passage, and means for subjecting said arc to a blast of arc extinguishing gas, said gas forming spacing material being arranged generally on opposite sides of the slots forming said arc passage and spaced from the slots a distance to prevent direct contact of the arc on said gas forming material but to cause the heat of the arc to liberate an additional quantity of arc extinguishing gas to assist arc extinction.

LEON R. LUDWIG.
HERBERT L. RAWLINS.
ROBERT H. NAU.