

Feb. 16, 1954

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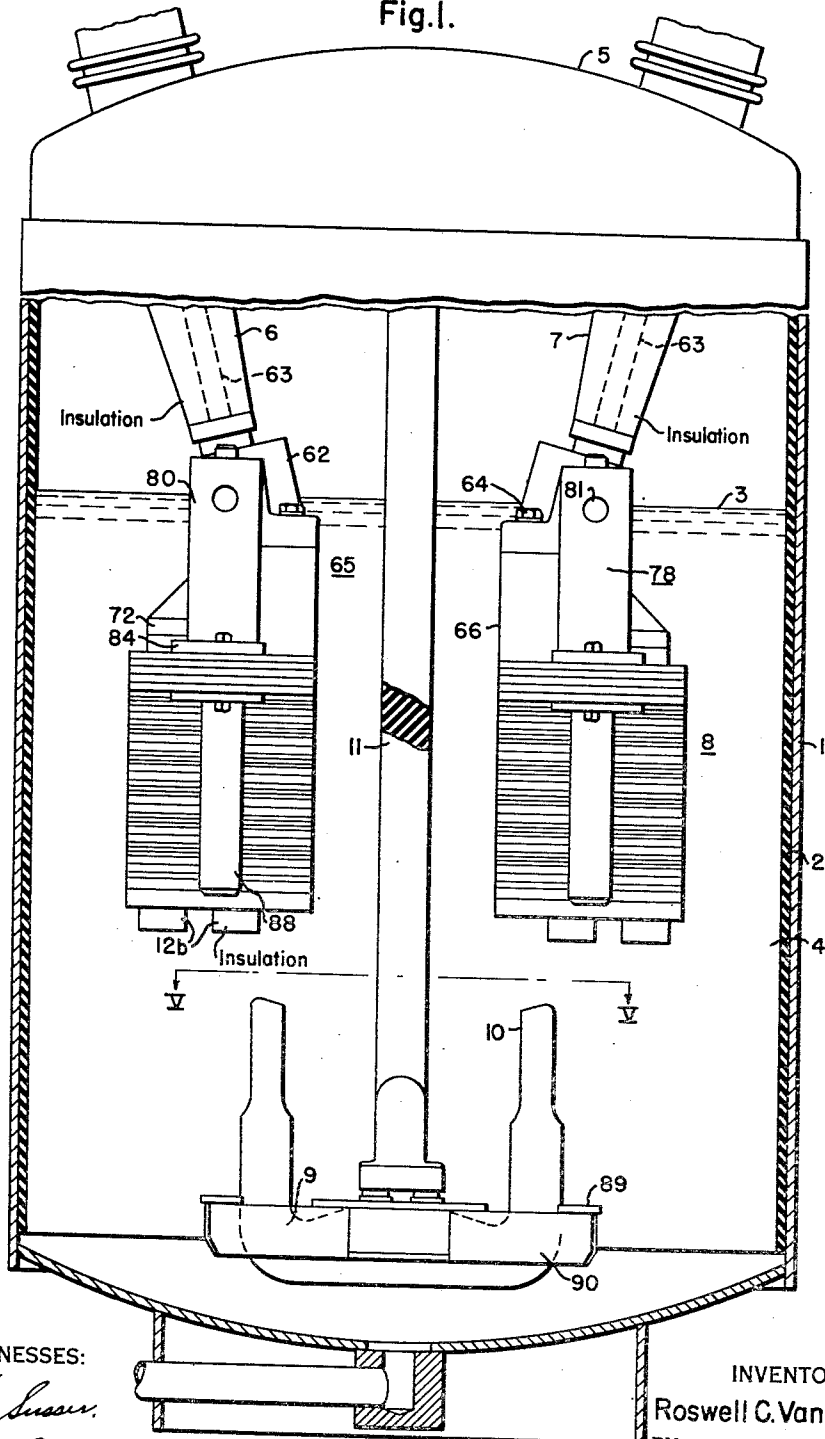
2,669,628

LIQUID BREAK CIRCUIT INTERRUPTER

Filed Jan. 5, 1950

4 Sheets-Sheet 1

Fig. 1.



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LIQUID BREAK CIRCUIT INTERRUPTER

4. Sheets-Sheet 2



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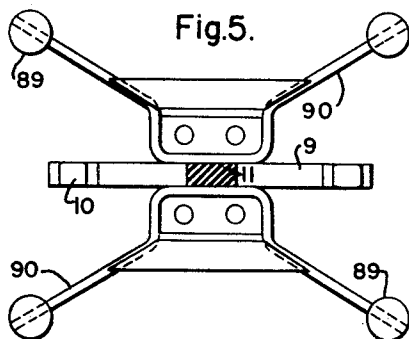
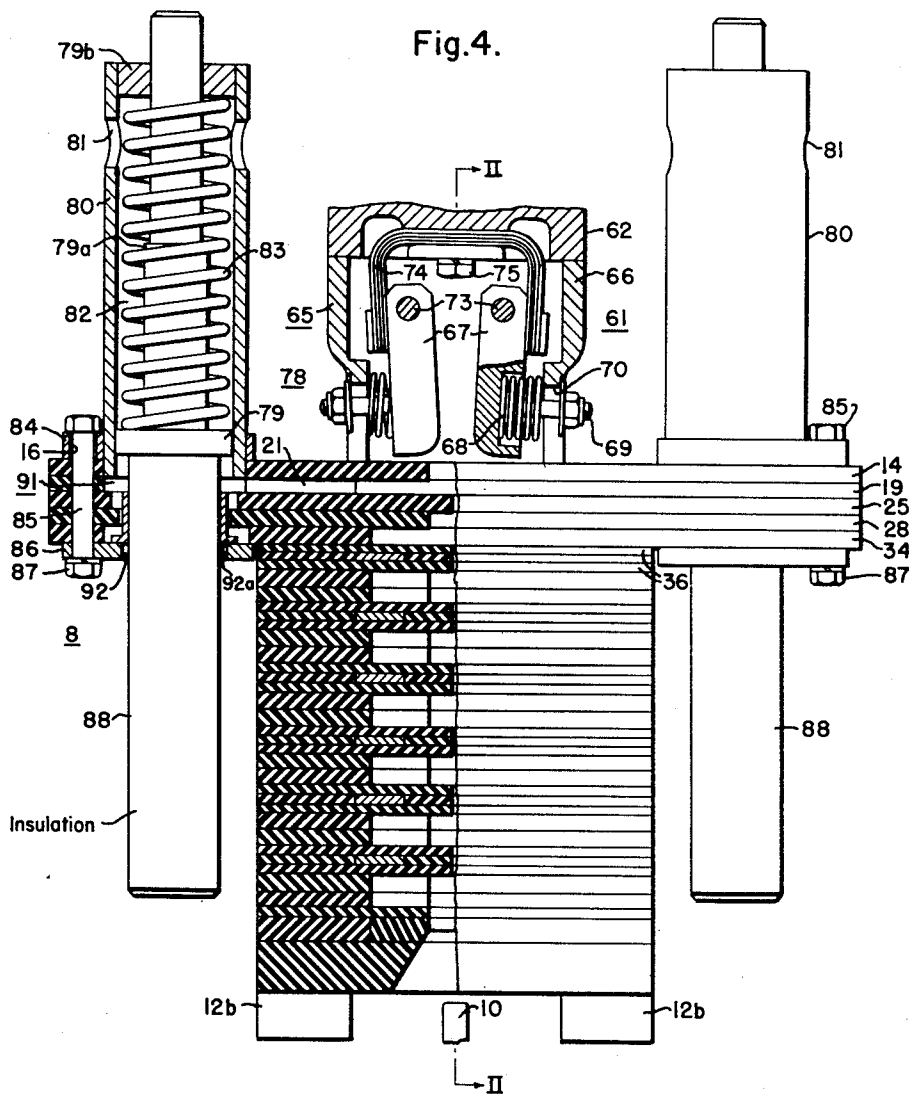
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LIQUID BREAK CIRCUIT INTERRUPTER

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4 Sheets-Sheet 3



WITNESSES:

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LIQUID BREAK CIRCUIT INTERRUPTER

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4 Sheets-Sheet 4

Fig. 8.

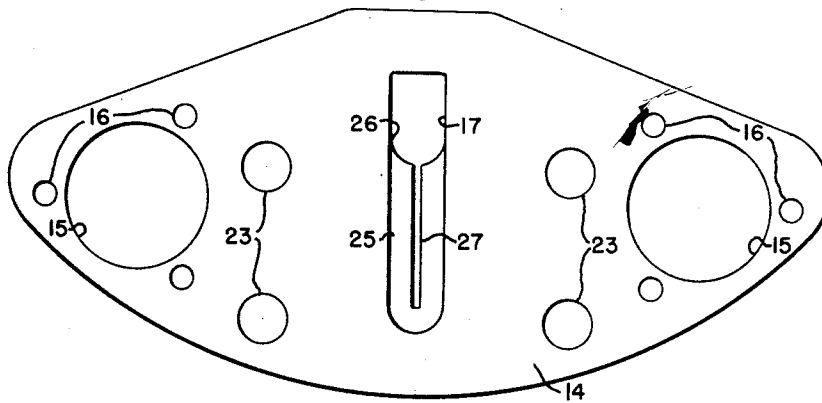


Fig. 9.

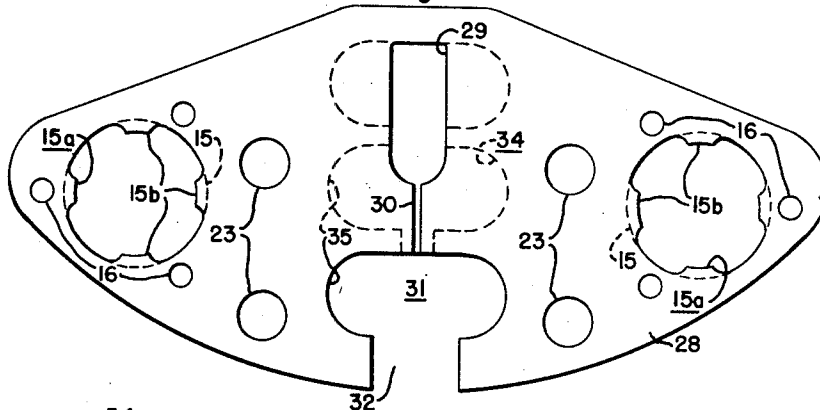


Fig. 10.

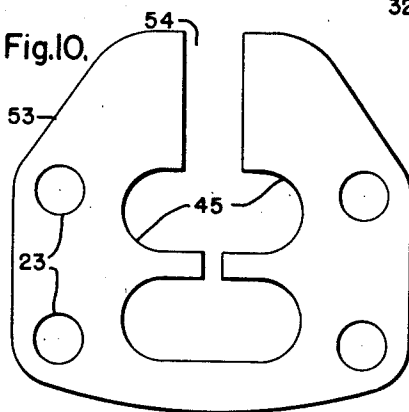
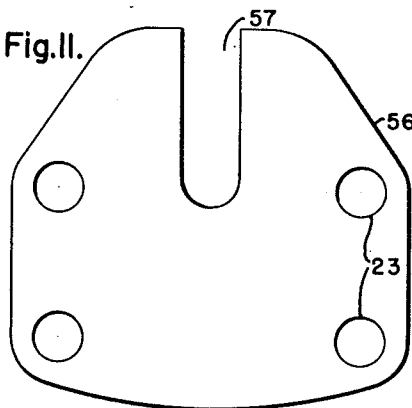


Fig. 11.



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UNITED STATES PATENT OFFICE

2,669,628

LIQUID BREAK CIRCUIT INTERRUPTER

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Application January 5, 1950, Serial No. 136,931

15 Claims. (Cl. 200—150)

1

This invention relates to circuit interrupters in general, and more particularly to arc-extinguishing structures for circuit interrupters of the liquid break type.

A general object of my invention is to provide an improved piston construction for rendering an arc-extinguishing device of the liquid break type more effective during the interruption of low currents, such as charging currents.

A more specific object is to provide an improved piston construction in which a pair of cooperating pistons are disposed on opposite sides of the arc passage, and to direct the liquid flow from the piston chambers in such a manner as to effectively cooperate with the normal functioning of the arc-extinguishing device. Such a construction is particularly effective when utilized with an arc-extinguishing device of the type in which the established arc is drawn in a narrow slot disposed in fiber plates, some of which contain U-shaped iron plates which distort the magnetic field about the established arc and thereby cause its lateral movement.

Another object is to provide an improved piston construction, preferably of the twin acting type, in conjunction with an arc-extinguishing device of the type in which U-shaped magnetic plates are employed to effect lateral movement of the arc within the slot, and to dispose suitable venting means therein which cooperates both with the magnetic action and also with the piston action to effectively bring about the interruption of low currents, such as charging currents.

A further object of my invention is to provide a device of the foregoing type in which the piston construction may be rendered inoperative due to the high pressure during high current interruption when the piston action is not required, and yet to have the arc-extinguishing device function as effectively during such high current interruption as if the piston means were not present.

Further objects and advantages will readily become apparent upon reading the following specification taken in conjunction with the drawings in which,

Figure 1 is a side elevational view, with the tank in vertical section, of an improved circuit interrupter embodying my invention, the con-

2

tact structure being shown in the fully open circuit position;

Fig. 2 is an enlarged vertical sectional view taken on the line II—II of Fig. 4 of the right-hand arc extinguishing unit of Fig. 1, the contact structure being shown in the partly open circuit position;

Fig. 3 is a sectional view taken along the line III—III of Fig. 2 looking in the direction of the arrows;

Fig. 4 is an end elevational view, partially in vertical section, taken along the line IV—IV of Fig. 3, of my improved arc-extinguishing unit;

Fig. 5 is a plan view in section taken along the line V—V of Fig. 1, looking in the direction of the arrows, and

Figs. 6–11 are plan views of some of the plates employed in my improved arc-extinguishing device.

Referring to the drawings, and more particularly to Fig. 1 thereof, the reference numeral 1 designates a tank, having an interiorly disposed insulating liner 2, filled to the level 3 with a suitable arc-extinguishing liquid 4, in this instance circuit breaker oil.

Depending from the cover 5 of the tank 1 are two terminal bushings 6, 7, to the lower ends of which depend identical arc-extinguishing units or devices, generally designated by the reference character 8. The arc-extinguishing units 8 are electrically interconnected, in the closed circuit position, not shown, by a conducting bridging member 9 having upstanding movable contact portions 10. In the closed circuit position the movable contacts 10 are moved up interiorly within the units 8 by an insulating lift rod 11. The lift rod or operating rod 11 is actuated by any suitable mechanism, which forms no part of my invention.

Referring to Figs. 2–4, which more clearly illustrate the internal construction of the arc-extinguishing units 8, it will be observed that the units 8 are constructed of a plurality of contiguously disposed insulating plates of the proper configuration, and are maintained in abutting engagement by a plurality of, in this instance four, tie rods 12. The steel bolts 12 have insulating sleeves 12a disposed thereabout with molded insulated heads 12b at their lower ends. The topmost insulating plate of the unit 8 is herein

3

designated by the reference numeral 14, and is shown more clearly in Fig. 8. The fiber plate 14 has a pair of apertures 15 or other apertures 16, the purpose for which will be more fully explained hereinafter. The plate 14 also has an enlarged slot 17 formed therein.

Immediately below the top plate 14 is an insulating flow plate, herein designated by the reference numeral 19, and shown more clearly by the full lines of Fig. 3. It will be observed that the flow plate 19 has apertures 15' formed therein which communicate by passage means 20, in this instance comprising a pair of inlet passages 21, which lead from the apertures 15' to an enlarged cutout portion 22. The enlarged cutout portion 22 communicates with a narrow slot 13. The flow plate 19 also has the small apertures 16 formed therein. The flow plate 19, as well as the top plate 14, in addition has apertures 23 provided therein to accommodate the tie rods 12.

Immediately below the flow plate 19 is an insulating plate herein designated by the reference numeral 25 and shown more clearly in Fig. 8. The plate 25 has the apertures 15, 16 and 23, and in addition has an enlarged slot or orifice 26, which partially registers with the enlarged slot 17 of the plate 14. The orifice 26, however, communicates with a narrow slot 27 as more clearly shown in Fig. 8.

Immediately below the plate 25 is a vent plate 28 shown more clearly by the full lines of Fig. 9. The vent plate 28 has a slot 29 formed therein, which communicates by means of a narrow slot 30 to an enlarged portion 31 which vents out of the unit 8 by means of a communicating vent passage 32. The plate 28 also has the apertures 16 and 23. It will also be observed that the plate 28 has provided therein an irregular aperture 15a, which with the exception of the projections 15b is the same size as the aperture 15 heretofore described and the purpose for which will appear more clearly hereinafter.

The next plate in the arc-extinguishing device 8 is a second vent plate herein designated by the reference numeral 34, and shown more clearly by the dotted lines in Fig. 9. It will be noted that the vent plate 34 is provided with a plurality of communicating pockets 35, which communicate by means of the vent passage 32 to the region exteriorly of the unit 8.

The next plate in the unit 8 is herein designated by the reference numeral 36, and is shown more clearly by the full lines in Fig. 6 with the iron plate 37 omitted. In other words, the plate 36 has the external outline as shown in full lines in Fig. 6, but is provided with an enlarged slot 38, which communicates by means of a narrow slot 39 to an enlarged portion 40. The plate 36 is herein termed a guard plate, the reason for which will appear more clearly hereinafter.

The next plate in the unit 8 is herein termed a liner insulating plate 41, and is shown more clearly by the full lines in Fig. 6. The liner plate 41 has the enlarged slot 38 communicating with the narrow slot 39, which in turn communicates with the enlarged portion 40. The U-shaped iron plate 37, previously mentioned, is of the same thickness as the liner plate 41 and is inserted therein, as shown more clearly in Fig. 6. It will be noted that the liner plate 41 protects the legs 42 of the U-shaped iron plate 37 from the arc which is drawn within the arcing slot or passage 43. Immediately below the liner plate 41 with its iron plate 37 is a second guard plate 36.

Then follows two insulating pocket and vent

4

plates 44 more clearly shown in Fig. 7. The pocket and vent plate 44 has provided therein, as do the other plates, the apertures 23 to accommodate the tie rods 12, and in addition has a plurality of communicating pockets 45, which vent out of the unit 8 by means of a vent passage 46.

Then follows a group consisting of two guard plates 36 and a liner plate 41 with its inserted iron plate 37, two more pockets and vent plates 44, a third grouping of the guard plates 36 between which is disposed a liner plate 41 and its inserted iron plate 37.

Then follows two pocket plates 47 having the same configuration as the pocket and vent plate 44 with the exception that the vent passage 46 is omitted by the integrally formed portion 48. Then follows another grouping of two guard plates 36 with an interposed liner 41 with its iron plate 37, which grouping is followed by two more plates 47 previously described. Then follows a vented guard plate 49 which has the same configuration as the guard plate 36 previously described but the enlarged slot 38 communicates with the region exteriorly of the unit 8 by means of a vent passage 50, which is formed by elongating the passage 38 by the dotted lines 51 of Fig. 6. Then follows a vented liner plate 52, which has the same configuration as the liner plate 41 with the exception that the enlarged slot 38 communicates by means of a vent passage 50 to the region outside of the unit 8. Then follows a second vented guard plate 49.

Then follows two vent and pocket plates 53 more clearly shown in Fig. 10. Each vent and pocket plate 53 has four pockets 45, which communicate with a vent passage 54 to the region exteriorly of the unit. Then follows a second grouping of two vented guard plates 49 with an interposed vented liner plate 52 with its iron plate 37. Then follows two more vent and pocket plates 53. Then follows a side vented plate 56 having a configuration more clearly shown in Fig. 11. The plate 56 has the apertures 23 and has an open slot 57 formed therein. The next two plates 58 and 59 have essentially the open slots 57 formed therein.

When the several plates are stacked upon the tie rods 12 and thereby disposed in contiguous relation, the slots 26, 38 align to form the arcing passage or slot 43 within which the arc 60 is drawn. The arc 60 naturally has a magnetic field surrounding it which is distorted by the presence of the iron plates 37. The result of the distorted magnetic field is to draw the arc from the arcing passage 43 through the several narrow slots 27, 30, 39 to the enlarged portions 40, where the arc is positioned in a turbulent region in which it is bombarded by gas and unionized liquid particles resulting from the action of the arc 60 upon the oil disposed in the pockets 45. Furthermore the venting passages 46 provided in the vent plates 44 permit the unionized gas and liquid particles to pass out of the unit 8 transversely of the arc stream 60 to effect its extinction. The greater the current magnitude passing through the arc 60 the more the arc 60 will be forcibly drawn to the right, as viewed in Fig. 2, toward the vents 46 where it will be bombarded more intensely as a result of the increased pressure formed thereat.

The stationary contact structure 61 will now be described. The stationary contact structure 61 includes an adapter 62 which is screwed onto the lower ends of the terminal studs 63 passing interiorly through the bushings 6, 7 and is

clamped thereto by nuts and bolts not shown. The adapter 62 is secured by bolts 64 (Fig. 1) to the stationary contact housing 65 which in this instance comprises a casting 66. The casting 66 encloses a pair of stationary contacts 67 which grip the upper ends of the sides of the movable contact 10. The inward biasing action is exerted by contact springs 68 surrounding studs 69 fixed to and movable with the contacts 67. The studs 69 extend through slots 70 formed in the side walls of the casting 65 so that they are free to move.

The tie rods 12 of the unit 8 pass through apertures formed in side lugs 72 (Fig. 1) integrally formed with the side walls of the casting 66. The contacts 67 are mounted on a pair of pins 73, the latter being journaled within the end walls of the casting 66. The contacts 67 are connected by a flexible shunt 74, which is secured to the adapter 62 by means of a bolt 75.

I provide an arc horn 76 extending within the upper slot 17 of the top plate 14, to which the upper terminal end of the arc 60 may attach. To facilitate the interruption of low currents, such as charging currents, which form little pressure within the arcing passage 43 of the unit 8, and which are also acted upon laterally with little magnetic force, I provide a piston means, generally designated by the reference numeral 78, and comprising a twin pair of coaxing pistons 79 (Fig. 4) on opposite sides of the arc passage 43 and movable within piston chambers 80.

Preferably, the piston cylinders 80 have apertures 81 provided at their upper ends to freely vent the region 82 in back of the pistons 79. A pair of piston springs 83 (Fig. 4) are disposed within the piston cylinders 80 and serve to bias the pistons 79 downwardly in a working direction to force liquid, in this instance oil, through the inlet passages 21 and into the arc passage 43.

The lower end of the piston cylinder 80 is secured as by welding or brazing to a metallic apertured plate 84 which has three apertures 16 provided therethrough. Three bolts 85 pass through the several apertures 16 provided in the plate 84 and also through the apertures 16 of the upper five insulating plates of the unit 8. A second metallic plate 85 is provided with three such apertures 16 formed therein. The bolts 85 also pass through the plate 86, and nuts 87 are employed to secure the two clamping plates 84, 86 rigidly in place on opposite sides of the upper five plates of the unit 8. The pistons 79 have a lower extending insulating portion 88, which is picked up during the closing stroke by bumpers 89 secured by brackets 90 to the bridging member 9.

Preferably during such a closing stroke, oil is admitted to the region 91 below the pistons 79 past a valve 92a, which rests upon the plate 86, and also through the passages 21. Consequently, during such a closing operation, when the bumpers 89 have picked up the piston extensions or rods 88, the valve 92a will be lifted by suction to permit oil outside of the unit 8 to pass through the aperture 92 of the plate 86 and into the region 91. As mentioned, oil will also be drawn through the passages 21.

In the closed circuit position of the interrupter, the lift rod 11 has moved the contacts 10 upwardly into engagement with the stationary contacts 67, and the bumpers 89 have moved the pistons 79 to their upward charged position with the springs 83 compressed. During the opening operation, when the lift rod 11 moves down carry-

ing with it the contacts 10 and the bumpers 89, if the pressure is relatively low within the unit 8, as caused by the interruption of low currents, such as charging currents, the springs 83 will overcome the pressure existing within the arc passage 43 and will force the pistons 79 downwardly, keeping the valve sleeve 92a closed and forcing oil through the inlet passages 21 on both sides of the arc passage 43 and toward the arc 60. This oil will be forced through the orifice restriction 26 of plate 25 and transversely of the arc 60 out through the vents 32, 46 provided in the plates 28, 34 and 44, and also downwardly within the arcing passage 43 to the vent 93 disposed at the lower end of the unit 8.

The entrance of such fresh oil into the arc passage 43 under pressure, as caused by the springs 83, will quickly extinguish any such low current arc.

From the foregoing description of my improved interrupter, it will be apparent that I have provided an improved piston construction in which a pair of cooperating twin pistons 79 are disposed on opposite sides of the arcing passage 43 and serve to intensify the oil action upon the arc 60 during low current interruption, when the pressure normally generated by the arc is relatively low.

During the interruption of high currents, the increased pressure, consequently formed, may stall, or even back up the pistons 79 so that they are rendered inoperative. It will be noticed that each piston 79 has a stop 79a which, upon engagement with the plate 79b, prevents further upward movement of the piston 79. Subsequently, upon a subsidence of the pressure within the arcing passage 43, following extinction of the arc 60, the pistons 79 will only then be effective to force a flushing flow of oil through the inlet passages 21 and into the arc passage 43 to wash contaminated oil through the vent passages 32, 46 and also out the lower vent 93 of the unit 8.

The operation of the piston means 78 cooperates in the aforescribed novel manner with the magnetic action exerted by the magnetic plates 37 upon the arc 60. In other words, the oil under pressure entering through the inlet passages 21 and through the orifice 26 assists the magnetic biasing force exerted by the plates 37 to move the arc 60 back through the narrow slots 27, 39 and toward the enlarged portions 40 adjacent the vents 32, 46, in which position the arc is subjected to an intense transverse oil blast produced not only by the decomposition of the oil within the pockets 35, 45, but also by the oil blast emerging from the inlet passages 21. The combination of such oil blasts is effective to quickly cause the extinction of the arc 60 during low current interruption, when the normal magnetic action exerted upon the arc 60 by the plates 37 is relatively weak.

It will moreover be noted that the incorporation of the piston means 78 in no manner has an injurious effect upon the normal functioning of the magnetic extinguisher 8 during the interruption of relatively high currents. In such a case, the pistons 79 are merely stalled by the high pressure in their upper position, and the normal magnetic extinguishing action is carried on within the unit 8. In such case, the pistons 79 are subsequently effective to produce the flushing flow of oil, as previously described.

Although I have shown and described a specific structure, it is to be clearly understood that the same was merely for the purpose of illustration,

7

and that changes and modifications may readily be made therein by those skilled in the art, without departing from the spirit and scope of the appended claims.

I claim as my invention:

1. A circuit interrupter of the liquid break type including means at least partly of insulating material defining an elongated arcing slot, contact means for establishing an arc along said slot, venting means disposed along one side of the arcing slot, magnetic means for biasing the arc laterally within the arcing slot toward said venting means, piston means movable during the opening operation independently of the contact means for forcing liquid into the arcing slot adjacent one end thereof and toward said venting means, and the piston means forcing liquid to flow longitudinally along the slot in the direction of arc lengthening at the point where the arc is initially established.

2. A circuit interrupter of the liquid break type including means at least partly of insulating material defining an elongated arcing slot, contact means for establishing an arc along said slot, venting means disposed along one side of the arcing slot, magnetic means for biasing the arc laterally within the arcing slot toward said venting means, piston means including a pair of pistons disposed on opposite sides of the arcing slot movable during the opening operation independently of the contact means for forcing liquid into the arcing slot adjacent one end thereof and toward said venting means, and the piston means forcing liquid to flow longitudinally along the slot in the direction of arc lengthening at the point where the arc is initially established.

3. A circuit interrupter of the liquid break type including means at least partly of insulating material defining an elongated arcing slot, contact means for establishing an arc along said slot, venting means disposed adjacent one end of the arcing slot, magnetic means for biasing the arc laterally within the arcing slot toward said venting means, piston means movable during the opening operation independently of the contact means for forcing liquid into the arcing slot adjacent one end thereof and toward said venting means, and the piston means forcing liquid to flow longitudinally along the slot in the direction of arc lengthening at the point where the arc is initially established.

4. A circuit interrupter of the liquid break type including means at least partly of insulating material defining an elongated arcing slot, contact means for establishing an arc along said slot, venting means disposed adjacent one end of the arcing slot, magnetic means for biasing the arc laterally within the arcing slot toward said venting means, piston means including a pair of pistons disposed on opposite sides of the arcing slot movable during the opening operation independently of the contact means for forcing liquid into the arcing slot adjacent one end thereof and toward said venting means, and the piston means forcing liquid to flow longitudinally along the slot in the direction of arc lengthening at the point where the arc is initially established.

5. A circuit interrupter of the liquid break type including means at least partly of insulating material defining an elongated arcing slot, contact means for establishing an arc along said slot, venting means disposed along one side of the arcing slot and adjacent one end thereof, magnetic means for biasing the arc laterally within the arcing slot toward said venting means, piston

8

means movable during the opening operation independently of the contact means for forcing liquid into the arcing slot adjacent one end thereof and toward said venting means, and the piston means forcing liquid to flow longitudinally along the slot in the direction of arc lengthening at the point where the arc is initially established.

6. A circuit interrupter of the liquid break type including means at least partly of insulating material defining an elongated arcing slot, contact means for establishing an arc along said slot, venting means disposed along one side of the arcing slot and adjacent one end thereof, magnetic means for biasing the arc laterally within the arcing slot toward said venting means, piston means including a pair of pistons disposed on opposite sides of the arcing slot movable during the opening operation independently of the contact means for forcing liquid into the arcing slot adjacent one end thereof and toward said venting means, and the piston means forcing liquid to flow longitudinally along the slot in the direction of arc lengthening at the point where the arc is initially established.

7. A circuit interrupter of the liquid break type including an arc-extinguishing unit immersed within an arc-extinguishing liquid, the unit comprising a plurality of insulating plates disposed in contiguous relationship, certain of said plates having slots provided therein to form upon alignment an elongated arcing passage, a stationary contact disposed adjacent one end of the arcing passage, a movable contact movable along said arcing passage out of engagement from the stationary contact to establish an arc therebetween along said arcing passage, one or more of the end plates adjacent said end of the arcing passage having portions projecting laterally beyond the rest of the plates, a pair of piston cylinders disposed at the projecting portions of the said one or more plates on opposite sides of the arcing passage, a pair of pistons movable within said piston cylinders independently of the contacts, means biasing said pistons to move within said piston cylinders in a direction toward the other end of the arcing passage, one of said projecting end plates having a pair of communicating inlet passages communicating from the piston cylinders to the arcing passage on opposite sides thereof, and means movable with the movable contact and separable from the pistons for charging the latter during the closing operation.

8. A circuit interrupter of the liquid break type including an arc-extinguishing unit immersed within an arc-extinguishing liquid, the unit comprising a plurality of insulating plates disposed in contiguous relationship, certain of said plates having slots provided therein to form upon alignment an elongated arcing passage, a stationary contact disposed adjacent one end of the arcing passage, a movable contact movable along said arcing passage out of engagement from the stationary contact to establish an arc therebetween along said arcing passage, one or more of the end plates adjacent said end of the arcing passage having portions projecting laterally beyond the rest of the plates, a pair of piston cylinders disposed at the projecting portions of the said one or more plates on opposite sides of the arcing passage, a pair of pistons movable within said piston cylinders independently of the contacts, means biasing said pistons to move within said piston cylinders in a direction toward the other end of the arcing passage, one of said pro-

jecting end plates having at least an inlet passage leading from one of said piston cylinders to the arcing passage, and means movable with the movable contact and separable from the pistons for charging the latter during the closing operation.

9. A circuit interrupter of the liquid break type including an arc-extinguishing unit immersed within an arc-extinguishing liquid, the unit comprising a plurality of insulating plates disposed in contiguous relationship, certain of said plates having slots provided therein to form upon alignment an elongated arcing passage, a stationary contact disposed adjacent one end of the arcing passage, a movable contact movable along said arcing passage out of engagement from the stationary contact to establish an arc therebetween along said arcing passage, one or more of the end plates adjacent said end of the arcing passage having portions projecting laterally beyond the rest of the plates, a pair of piston cylinders disposed at the projecting portions of the said one or more plates on opposite sides of the arcing passage, a pair of pistons movable within said piston cylinders independently of the contacts, means biasing said pistons to move within said piston cylinders in a direction toward the other end of the arcing passage, one or more of the projecting end plates having inlet passages communicating from the piston cylinders to the arcing passage, and means movable with the movable contact and separable from the pistons for charging the latter during the closing operation.

10. A circuit interrupter of the liquid break type including an arc-extinguishing unit immersed within an arc-extinguishing liquid, the unit comprising a plurality of insulating plates disposed in contiguous relationship, certain of said plates having slots provided therein to form upon alignment an elongated arcing passage, a stationary contact disposed adjacent one end of the arcing passage, a movable contact movable along said arcing passage out of engagement from the stationary contact to establish an arc therebetween along said arcing passage, one or more of the end plates adjacent said end of the arcing passage having portions projecting laterally beyond the rest of the plates, a pair of piston cylinders disposed at the projecting portions of the said one or more plates on opposite sides of the arcing passage, a pair of pistons movable within said piston cylinder independently of the contacts, means biasing said pistons to move within said piston cylinders in a direction toward the other end of the arcing passage, one of said projecting end plates having a pair of communicating inlet passages communicating from the piston cylinders to the arcing passage on opposite sides thereof, the pistons having extensions, the movable contact carrying a pair of bumpers, and the bumpers charging the pistons during the closing operation of the interrupter.

11. A circuit interrupter of the liquid break type including an arc-extinguishing unit immersed within an arc-extinguishing liquid, the unit comprising a plurality of insulating plates disposed in a contiguous relationship, certain of said plates having slots provided therein to form upon alignment an elongated arcing passage, a stationary contact disposed adjacent one end of the arcing passage, a movable contact movable along said arcing passage out of engagement from the stationary contact to establish an arc therebetween along said arcing passage, one or

more of the end plates adjacent said end of the arcing passage having portions projecting laterally beyond the rest of the plates, a pair of piston cylinders disposed at the projecting portions of the said one or more plates on opposite sides of the arcing passage, a pair of pistons movable within said piston cylinders independently of the contacts, means biasing said pistons to move within said piston cylinders in a direction toward the other end of the arcing passage, one of said projecting end plates having a pair of communicating inlet passages communicating from the piston cylinders to the arcing passage on opposite sides thereof, and a valve disposed adjacent the working end of each piston cylinder.

12. A circuit interrupter of the liquid break type including an arc-extinguishing unit immersed within an arc-extinguishing liquid, the unit comprising a plurality of insulating plates disposed in contiguous relationship, certain of said plates having slots provided therein to form upon alignment an elongated arcing passage, a stationary contact disposed adjacent one end of the arcing passage, a movable contact movable along said arcing passage out of engagement from the stationary contact to establish an arc therebetween along said arcing passage, one or more of the end plates adjacent said end of the arcing passage having portions projecting laterally beyond the rest of the plates, a pair of piston cylinders disposed at the projecting portions of the said one or more plates on opposite sides of the arcing passage, a pair of pistons movable within said piston cylinder independently of the contacts, means biasing said pistons to move within said piston cylinders in a direction toward the other end of the arcing passage, one of said projecting end plates having a pair of communicating inlet passages communicating from the piston cylinders to the arcing passage on opposite sides thereof, the pistons having extensions, the movable contact carrying a pair of bumpers, the bumpers charging the pistons during the closing operation of the interrupter, and a valve disposed adjacent the working end of each piston cylinder.

13. A circuit interrupter of the liquid break type including means at least partly of insulating material defining an elongated arcing slot, contact means for establishing an arc along said arcing slot, an orifice restriction through which the arc is initially drawn disposed at one place along said slot, venting means for the arcing slot disposed axially on one side of the orifice restriction, piston means for forcing liquid into the arcing slot disposed axially on the other side of the orifice restriction, and magnetic means for biasing the arc laterally within the arcing slot.

14. A circuit interrupter of the liquid break type including means at least partly of insulating material defining an elongated arcing slot, contact means for establishing an arc along said arcing slot, an orifice restriction through which the arc is initially drawn disposed at one place along said slot, venting means for the arcing slot disposed axially on one side of the orifice restriction, piston means for forcing liquid into the arcing slot disposed axially on the other side of the orifice restriction, and magnetic means for biasing the arc laterally within the arcing slot toward said venting means.

15. A circuit interrupter of the liquid break type including means at least partly of insulating material defining an elongated arcing slot, contact means for establishing an arc along said

11

arc ing slot, an orifice restriction through which the arc is initially drawn disposed at one place along said slot, venting means for the arc ing slot disposed axially on one side of the orifice restriction, piston means for forcing liquid into the arc ing slot disposed axially on the other side of the orifice restriction, and the arc moving laterally within the arc ing slot on said one side of the orifice restriction and becoming extinguished.

ROSWELL C. VAN SICKLE.

12

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