Jan. 23, 1951 R. E. FRIEDRICH ET AL 2,538,774

CIRCUIT INTERRUPTER

Filed May 2, 1947 2 Sheets-Sheet 1

Fig. 6.

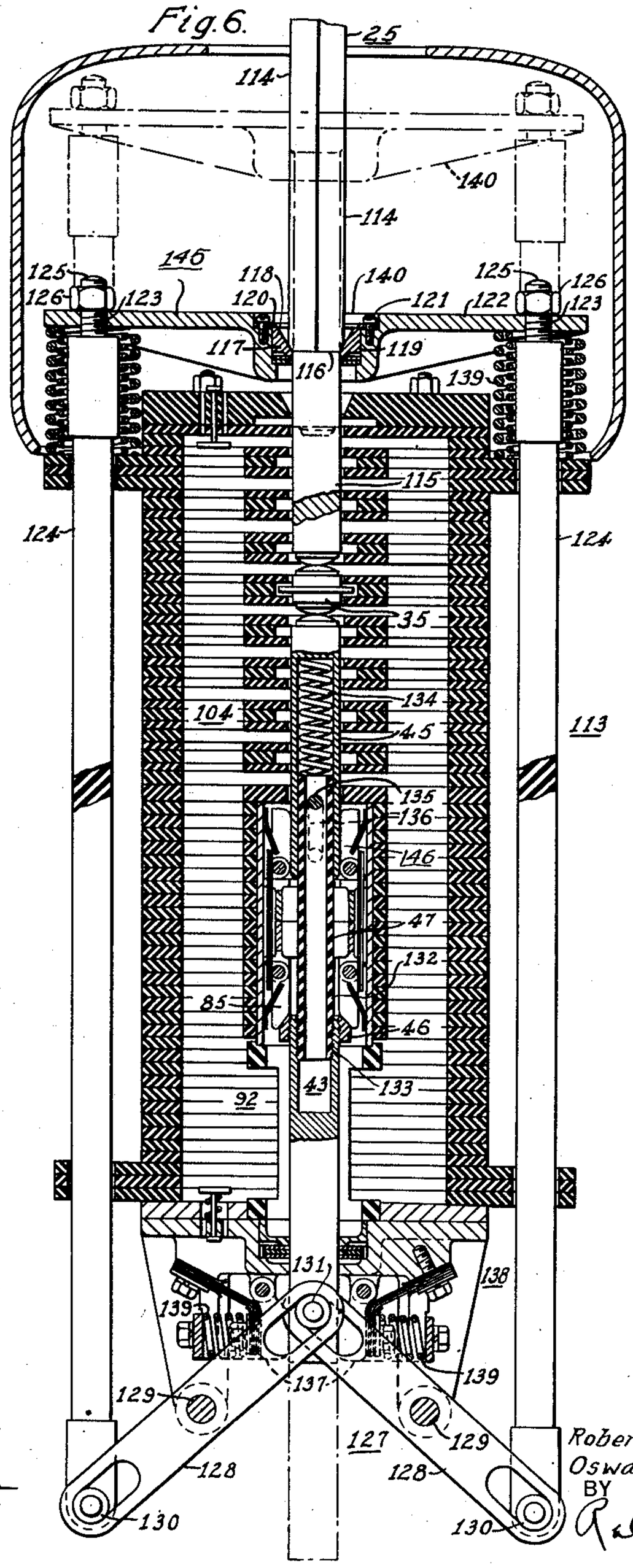
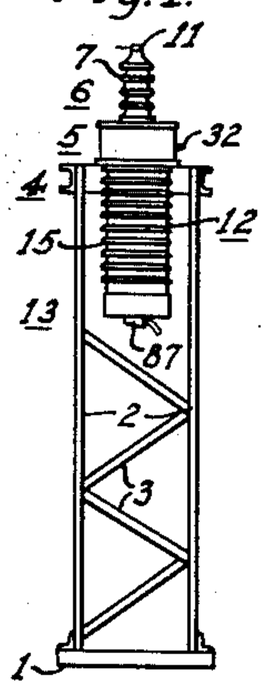


Fig. 1.



WITNESSES:

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Fig. 2.

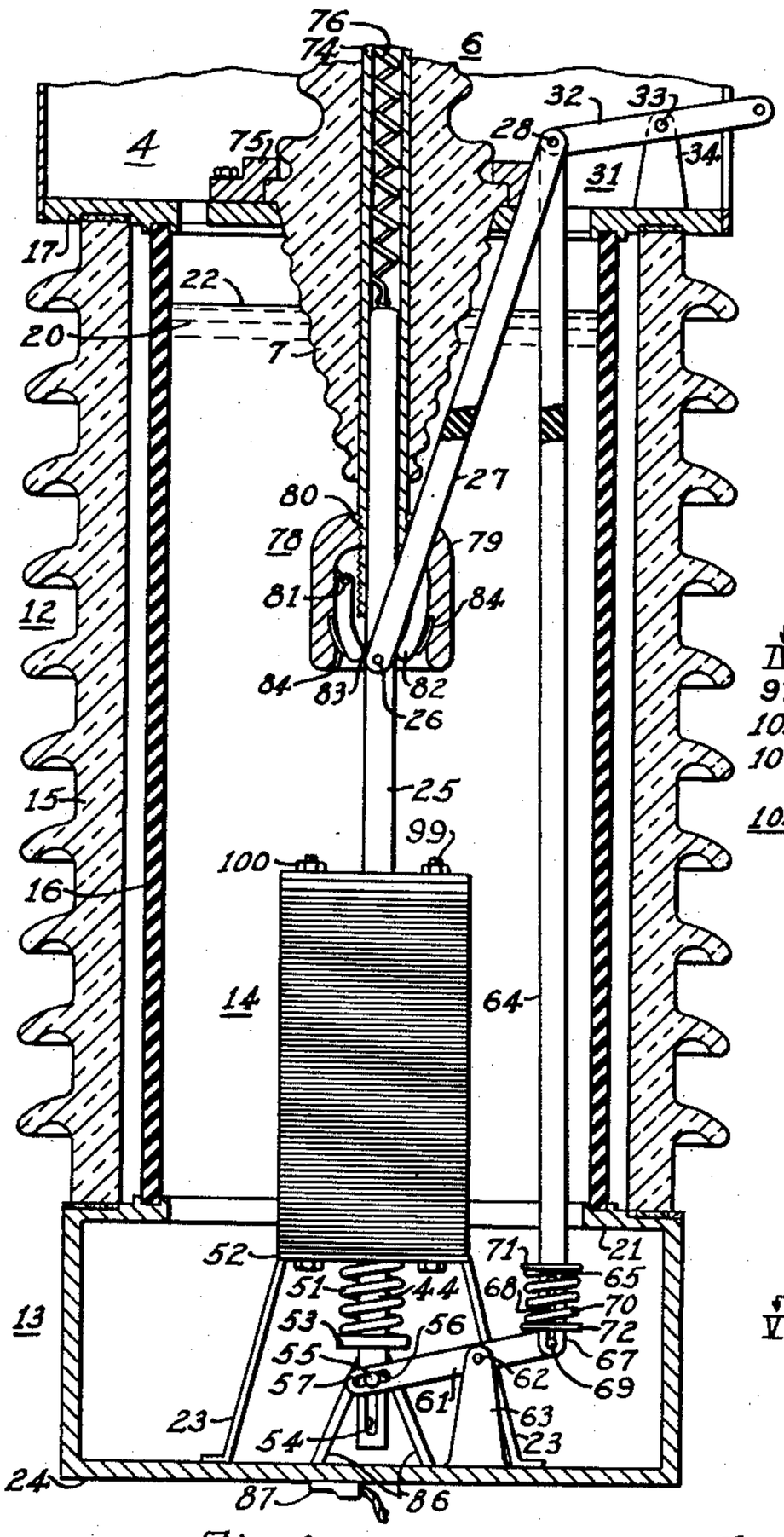


Fig. 3.

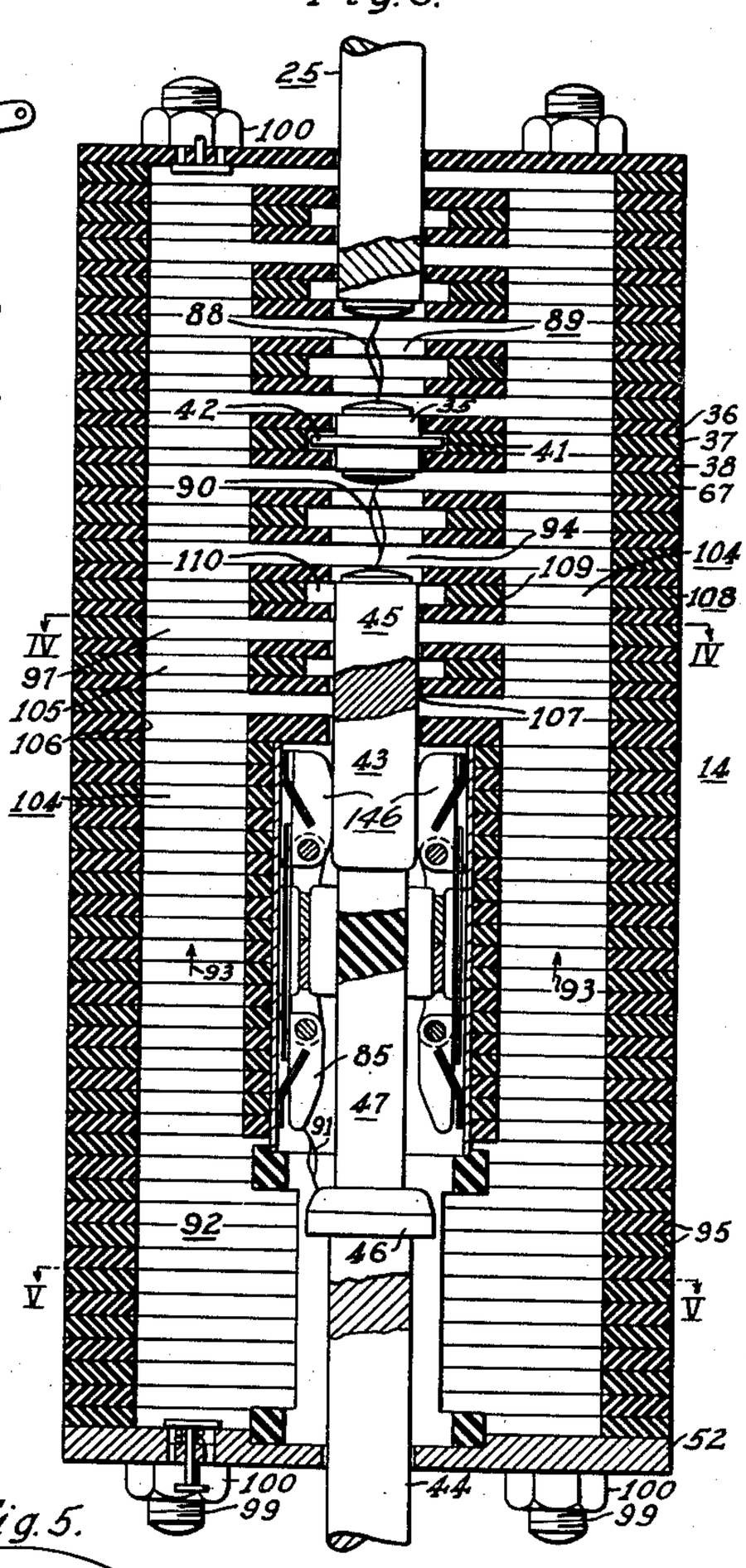


Fig. 4.

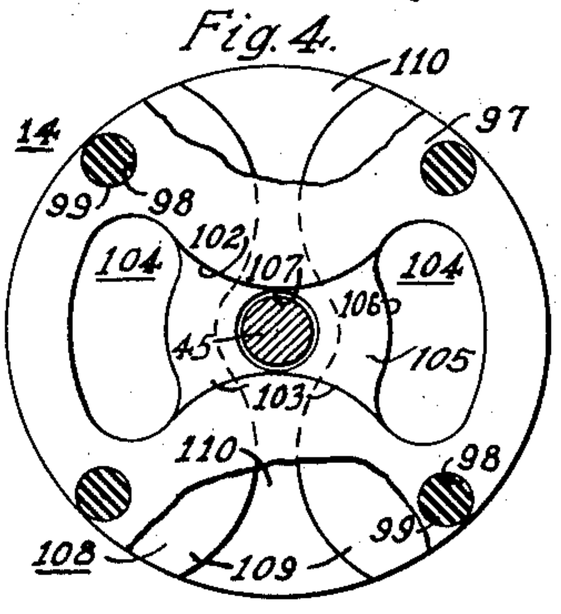
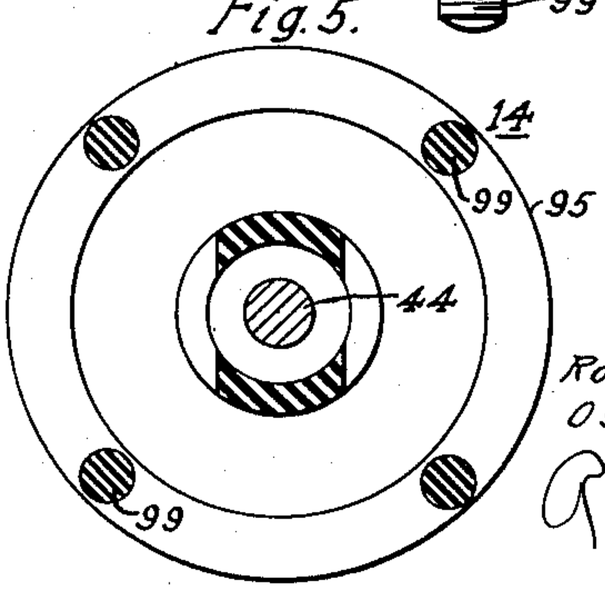


Fig. 5.



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UNITED STATES PATENT OFFICE

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CIRCUIT INTERRUPTER

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Application May 2, 1947, Serial No. 745,542

8 Claims. (Cl. 200—145)

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This invention relates to circuit interrupters, in general, and, more particularly, to arc-extinguishing structures and operating mechanisms therefor.

The principal object of our invention is to provide an improved circuit interrupter of the high-voltage type in which the operating mechanism for the moving contact structure is simplified.

Another object is to provide an improved circuit interrupter having an improved arrangement of pressure and interrupting gaps so that for high-voltage application the pressure formed at the pressure gap may be utilized to send fluid toward the one or more interrupting gaps.

Another object is to provide an improved operating mechanism in which a movable actuating structure may be disposed at one end of an elongated arc-extinguishing unit with means for transferring such motion to the contact structure at the other end of said arc-extinguishing unit.

Another object is to provide an improved moving contact structure having insulating and conducting portions so that two or more serially related gaps may be conveniently and rapidly established.

Another object is to provide an improved circuit interrupter with an improved operating mechanism to establish a pressure gap and two serially related interrupting gaps.

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

Figure 1 is a side elevational view of a circuit interrupter embodying our invention;

Fig. 2 is an enlarged fragmentary side elevational view, partially in section, of the circuit interrupter of Fig. 1, the contact structure being shown in the closed circuit position;

Fig. 3 is an enlarged vertical sectional view through the improved arc-extinguishing unit of Fig. 2, the contacts being shown in the partially open circuit position;

Fig. 4 is a sectional view on a reduced scale taken along the line IV—IV of Fig. 3;

Fig. 5 is a sectional view on a reduced scale taken along the line V—V of Fig. 3; and

Fig. 6 is a vertical sectional view of a modified type of arc-extinguishing unit, the contacts being shown in the closed circuit position.

Referring to the drawings, and more particularly to Fig. 1 thereof, the reference numeral 1 designates a base which supports vertically extending angle irons 2. The angle irons 2 are braced by diagonally extending metallic braces 3, also preferably formed of angle iron. The upper

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ends of the angle irons 2 support a grounded support means generally designated by the reference numeral 4 which supports a circuit interrupter generally designated by the reference numeral 5.

Referring more particularly to Fig. 2, it will be observed that terminal bushing means 6, in this instance including a high voltage condenser bushing 7, extends through the grounded support means 4 and is supported thereby. The line terminal 11 is disposed at the upper end of the bushing 7 and is shown more clearly in Fig. 1.

We have provided insulating casing means generally designated by the reference numeral 12, depending from the support means 4, being supported thereby. A base section, generally designated by the reference numeral 13, is supported in clamping relationship with the lower end of the casing means 12. The base section 13 supports an arc-extinguishing unit generally designated by the reference numeral 14.

Preferably the insulating casing means 12, depending from the support means 4, includes a hollow porcelain column 15, interiorly of which is positioned an insulating cylindrical casing 16. The casing 16 is clamped at its upper end to the plate 17 forming a part of the grounded support means 4. The lower end of the casing 16 is clamped to an inwardly extending plate portion 21 of the base section 13. Thus, the insulating cylinder 16 is put under tension, and the hollow porcelain column 15 is maintained in compression. A suitable arc-extinguishing fluid 20, in this instance circuit breaker oil, fills the casing 16 to the level 22.

The arc-extinguishing unit or elongated arcing chamber 14 is supported above the base section 13 by means of upwardly extending supports 23, the latter resting against the base plate 24 of the base section 13 and suitably secured thereto as by welding.

Movable into and out of the arc-extinguishing unit 14 is an upper movable rod-shaped contact 25 which is pivotally connected at 26 to an insulating operating rod 27, the latter being pivoted at 28 to an operating means generally designated by the reference numeral 31 and being supported by the grounded support means 4. More specifically, the operating means 31 includes an operating crank 32 which is pivotally mounted at 33 to a pair of fixed brackets 34, only one of which is shown in Fig. 2. The brackets 34 may be integrally formed with the plate 17 of the support means 4. Suitable mechanism (not shown) may be employed to cause rotative actuating motion of the operating crank 32.

Certain features of the mounting construction

herein disclosed are set forth and claimed in United States patent application, Serial No. 591,047, filed April 30, 1945, by Leon R. Ludwig and Benjamin P. Baker, now Patent No. 2,534,920, granted Dec. 19, 1950, and assigned to the same assignee as the instant application.

Referring to Fig. 3, which shows more clearly than does Fig. 2 the internal construction of the arc-extinguishing unit or arcing chamber **14**, it will be observed that the upper movable contact **25** in the closed circuit position makes contact with an intermediate or relatively stationary contact **35**, the latter being fixedly mounted in place by the cooperation of three insulating plates **36**, **37**, and **38**. The insulating plate **37** has a recess **41** formed therein within which is positioned a flange portion **42** integrally formed with the intermediate contact **35**. Also cooperable with the intermediate contact **35** is a lower movable rod-shaped contact assembly **43** including an operating rod **44** formed of conducting material and having a pair of rod-shaped movable contacts **45**, **46** operatively connected by an insulating rod portion **47**. The rod portion **47** formed of insulating material may be threadedly secured to the movable contacts **45**, **46** so that the entire movable contact assembly **43** moves as a unit in response to vertical reciprocating motion of the operating or contact rod **44**.

As more clearly shown in Fig. 2, the contact rod **44** is biased downwardly in the circuit opening direction by a compression spring **51**, the latter being seated between the bottom plate **52** of the unit **14** and a flange **53** secured to the operating rod **44**. The lower end of the contact rod **44** has a slot **54** formed therein within which is slidably guided a pivot pin **55**, the latter being extended through slots **56** formed in the leg portions **57** of a bifurcated lever **61** mounted on a stationary pivot **62**. The stationary pivot **62** is supported by a pair of brackets **63** extending upwardly from the base plate **24** of the housing or base section **13**. Extending longitudinally of the arc-extinguishing unit **14** exteriorly thereof and positioned within the casing **16** is an insulating operating rod **64**, the upper end of which is pivotally connected to the operating crank **32** by the pivot **28**. The lower end of the operating rod **64** is bifurcated as at **65** and the two leg portions **67** thereof have slots **68** provided therein within which is slidably guided a pin **69** which extends transversely of the right-hand end of the lever **61**. A compression spring **70** surrounds the bifurcated portion **65** of the operating rod **64** being disposed between a flange **71** rigidly secured to the operating rod **64** and a movable washer **72** slidable about the leg portions **67** and making abutting engagement with the lever **61**.

The upper movable contact **25** is telescopically guided by a conducting tube **74** which passes interiorly through the bushing **7**, the latter being clamped by a flange clamp **75** to the top plate **17** of the interrupter. Disposed interiorly of the conducting tube **74** is a tension spring **76** which biases the upper movable contact **25** upwardly in a circuit opening direction. Threadedly secured to the lower end of the conducting tube **74** is a slider contact assembly generally designated by the reference numeral **78** and including a housing **79** threadedly secured as at **80** to the exterior surface of the conducting tube **74**. Pivotally mounted within the housing **79** on pivot pins **81** are a plurality of, in this instance two, slider contact segments **82** having their contact portions **83** biased inwardly by leaf springs **84**. Con-

sequently, the electrical circuit passes from the conducting tube **74** through the contact assembly **78** to the contact rod **25** from whence the circuit passes through the intermediate contact **35**, movable contact **45** of movable contact assembly **43**, through a plurality of longitudinally extending stationary contact segments **85** to the movable contact **46** of the movable contact assembly **43**. The circuit then extends through the lower contact rod **44** to a pair of slider contacts **86** which bear inwardly upon the outer surface of the conducting operating rod **44**. After passing through the slider contacts **86**, the circuit passes through the conducting base plate **24** to the lower line terminal **87** of the interrupter.

During the opening operation, suitable means (not shown), which is responsive to either manual operation or to the presence of excessive current conditions existing in the circuit controlled by the interrupter, is operative to cause clockwise rotative motion of the operating crank **32** about the pivot **33**. The clockwise motion of operating crank **32** simultaneously causes upward motion of both operating rods **27** and **64**. The operating rod **27** being pivotally connected at **26** to the upper movable contact **25** causes upward separating motion of the same away from the intermediate contact **35** to draw an interrupting arc **88**, as shown more clearly in Fig. 3. The interrupting arc **88** is established within an interrupting chamber, generally designated by the reference numeral **89** and more fully described hereinafter.

The upward motion of the operating rod **64** causes counterclockwise rotation of the lever **61** to thereby permit the compression spring **51** to force the flange **53** and operating rod **44** downwardly. The downward motion of the contact rod **44** simultaneously establishes an interrupting arc **90** between the contacts **35**, **45** and a pressure-generating arc **91** between the contacts **46**, **85** within a pressure-generating chamber **92**. In other words, one or a first movable contact **45** of the movable contact assembly **43** separates from the first relatively stationary contact **35** to establish a first or an interrupting arc **90**. The other movable contact **46** of the movable contact assembly **43** separates from the other or second relatively stationary contact **85** to establish a second or a pressure-generating arc **91**. The third movable contact **25** separates from the first relatively stationary contact **35** to establish a third or an interrupting arc **88**.

Since the unit **14** is immersed in oil, and consequently oil exists within the pressure-generating chamber **92**, the arc **91** acting upon the oil within the pressure-generating chamber **92** will cause the oil under pressure to flow upwardly, as indicated by the arrows **93**, to flow into the interrupting chamber **89** and also into the interrupting chamber **94**. The oil flowing into the interrupting chambers **89**, **94** extinguishes the interrupting arcs **88**, **90**.

It will be observed that a plurality of ring-shaped plates formed of insulating material and designated by the reference numeral **95** form the pressure-generating chamber **92** in which the pressure-generating arc **91** is established. Further, a plurality of insulating suitably configured plates form the interrupting chambers **89** and **94**. The interrupting chambers **89**, **94** assume a shape as more fully set forth in United States Patent 2,406,469, issued August 27, 1946 to Leon R. Ludwig, Winthrop M. Leeds and Benjamin P. Baker,

and assigned to the assignee of the instant application.

For the purpose of understanding our invention, it is merely necessary to state that there are three types of insulating plates utilized in the interrupting chambers 89, 94. The first type is herein called an insulating inlet plate, is designated by the reference numeral 97 and has a configuration more clearly shown in Fig. 4. The insulating inlet plate 97 has apertures 98 for the reception of a plurality of, in this instance four, insulating tie rods 99, which in cooperation with nuts 100 serve to hold the several insulating plates fixedly in position. The inlet plate 97 has a cutout portion 102 formed therein which provides a pair of opposed inlet passages 103 leading toward each other from two vertical flow passages generally designated by the reference numeral 104 and leading upwardly from the pressure-generating chamber 92. The second type of insulating plate is herein termed an orifice insulating plate and is designated by the reference numeral 105. The configuration of the orifice plate 105 is more clearly shown in Fig. 4.

It will be noted that the orifice insulating plate 105 has two kidney-shaped openings 106 which assist in forming the vertical flow passages 104. The orifice plate 105 also has centrally formed therein an orifice 107 through which one of the interrupting arcs 88, 90 is drawn. It will be noted that an orifice insulating plate 105 is positioned on both sides of each inlet plate 97.

The third type of insulating plate employed in the interrupting sections is termed an insulating vent plate and is designated generally by the reference numeral 108. The insulating p ate 108 is composite and formed by the cooperation of two identical halves indicated by the reference numeral 109 and shown more clearly by the cut-a-way portions of Fig. 4. Each of the halves 109 is held rigidly in position by two insulating tie rods 99. The cooperation of the halves 109 form a plurality of, in this instance two, opposed vent passages designated by the reference numeral 110. Also, each of the halves 109 is formed with a kidney-shaped opening 106 to form upon alignment with the other plates the vertical flow passages 104.

From the foregoing description, referring to Fig. 3, it will be apparent that upon the establishment of the pressure-generating arc 91 and the interrupting arcs 88, 90 within the interrupting chambers 89, 94, oil under pressure will flow upwardly through the two vertical flow passages 104, as designated by the arrows 93, to flow radially inwardly through the opposed inlet passages 103 to strike interrupting arcs 88, 90 and pass upwardly and downwardly through the orifices 107 provided by the insulating orifice plates 105 to exhaust out of the unit 14 through the opposed vent passages 110. It will be apparent that by this interrupting construction, which is claimed in the aforesaid Patent 2,406,469, an intimate engagement of the oil with the interrupting arc 88, 90 is thereby obtained.

Following extinction of the arcs the contact rod 44 continues to be moved downwardly by the operating rod 64, and the upper movable contact 25 continues to be moved upwardly in its opening direction to provide an isolating gap in the circuit by the withdrawal of the movable contact 25 out of the arc-extinguishing unit 14. The provision of the slot 54 in the lower end of the

contact rod 44 permits a relatively greater travel of the operating rods 27, 64 in response to continued clockwise rotation of the operating crank 32 than would otherwise be permitted. This is necessary to permit a greater amount of travel of the upper movable contact 25 relative to the lower contact rod 44 inasmuch as the upper movable contact 25 moves upwardly completely out of the extinguishing unit 14 in the open circuit position of the interrupter to provide an isolating gap.

It will be noted that the flange 71 in cooperation with the compression spring 70 and slidable washer 72 provides the requisite contact pressure in the closed circuit position of the interrupter, as shown in Fig. 2. Thus, a certain amount of overtravel of the operating rod 64 relative to the lever 61 is permitted by virtue of the presence of slots 68.

From the foregoing description, it will be apparent that we have provided an improved circuit interrupter of the type establishing simultaneously a pressure-generating arc and two serially related interrupting arcs with effective flow conditions being achieved to bring about interruption of the interrupting arcs 88, 90. The mechanism herein shown is simple in construction and provides the requisite contact pressure in the closed circuit position. It will be observed that the contact segments 85 provide conducting means 146 which spans or parallels the insulating rod portion 47 of the movable contact assembly 43 when in the closed circuit position. During the opening operation the upper ends of the contact segments 85 bear against the movable contact 45 of the movable contact assembly 43, and the pressure-generating arc 91 is drawn between the contact portion 46 of the operating rod 44 and the lower ends of the contact segments 85.

Referring to Fig. 6, it will be noted that we have provided a modified type of arc-extinguishing unit or device generally designated by the reference numeral 113 which may be used in place of the unit 14 of Fig. 2. An upper movable rod-shaped contact 25 has an upper square portion 114 and a lower cylindrical portion 115. The line of division between the square and cylindrical portions 116 consequently has four projecting corner portions 117 which serve to engage a ring 118 fixedly secured in a recess 119 of a yoke or actuating member 122 by a ring plate 120 and screws 121. A pair of operating rods 124 extend longitudinally externally of the unit 113 and have their upper ends 125 projecting through a pair of apertures 123 provided in the yoke 122. Nuts 126 rigidly secure the operating rods 124 fixedly to the yoke 122 so that the downward motion of the yoke 122, as caused by engagement of the corner portions 117 of movable contact 25 with ring 118, will cause downward motion of both the yoke 122 and the two operating rods 124.

Lever means 127, including levers 128 rotatively mounted at fixed pivots 129, are pivotally secured at 130 to the lower ends of the two operating rods 124. The inner ends of the levers 128 make pivotal engagement at 131 to the lower movable contact assembly or contact means 43. The movable contact assembly 43, as before, has a pair of movable contacts 45, 46 associated therewith operatively connected by an insulating portion 47. The insulating portion 47 includes an insulating tube 132, the lower end of which is threadedly secured as at 133 to the movable contact 46.

To provide the requisite contact pressure in the closed circuit position of the interrupter, as shown in Fig. 6, we have provided a lost-motion connection between the insulating tube 132 and the upper movable contact 45 of the movable contact assembly 43. In other words, we have disposed a compression spring 134 between the upper interior end of the tubular movable contact 45 and the upper end of the insulating tube 132 to bias the two apart. We have provided a pin 135 which passes through the insulating tube 132 in fixed relation thereto. The pin 135 passes outwardly through slots 136 provided in the lower end of the movable tubular contact 45 of the contact assembly 43. This permits slight relative motion between the movable contact 45 of contact assembly 43 and the insulating tube 132.

Thus during the closing operation when the upper movable contact 25 strikes the yoke 122 thereby causing upward motion of the movable contact assembly 43, the two movable contacts 25, 45 may strike the stationary intermediate contact 35 and compress the spring 134 to provide the contact pressure between contacts 35, 45. This permits the movable ring-shaped pressure-generating contact 46 to strike the stationary contact segments 85 to make firm engagement therewith.

In the closed circuit position of the interrupter, as shown in Fig. 6, the electrical circuit therethrough includes upper movable contact rod 25, intermediate stationary contact 35, movable contact 45 of movable contact assembly 43, stationary contact segments 85, lower movable contact 46 of movable contact assembly 43, slider contacts 137 to the lower casting 138. The circuit extends from the lower casting 138 to suitable line terminal means 87 (Fig. 2).

During the opening operation, suitable mechanism (not shown) is operable in response to manual operation or to excessive current conditions existing in the circuit controlled by the interrupter to cause upward opening motion of the upper movable contact 25. This permits the compression springs 139 to cause following upward movement of the yoke 122 and the two operating rods 124 in response to the initial upward motion of the movable contact 25.

The upward motion of the two operating rods 124 causes downward motion of the movable contact assembly 43 to thereby establish a pressure-generating arc between the contacts 46, 85 and an interrupting arc between the interrupting contacts 35, 45. The internal plate construction of the unit 113 is identical to that of the unit 14 previously described in connection with Figs. 1–5; consequently, a further description thereof appears unnecessary. It suffices to say in explanation of this embodiment of our invention, as shown in Fig. 6, that oil under pressure is forced upwardly through the vertical flow channels 104 from the pressure-generating chamber 92 to cause radially inward flow of fluid within the inlet passages 103 to strike the two interrupting arcs (not shown) and pass through the orifices 107 provided in the insulating orifice plates 105. After passing through the orifices 107, the oil is forced out of the unit 113 through the oppositely disposed vent passages 110. Interruption soon occurs, and the continued upward motion of the upper movable contact 25 out of the unit 113 as indicated by the dotted lines 140 interposes an isolating gap in the circuit.

It will be observed that in this embodiment of our invention, we have provided an improved

contact construction and an improved operating mechanism of simplified type for operation of the same. The rod means 145, which we have provided, including the yoke 122 and the operating rods 124, has a portion 118 which abuts the contact rod 25 near the end of the closing stroke to thereby interconnect motion of the contact rod 25 and motion of the lever means 127. The contact structure is operable to establish a pressure-generating and two interrupting arcs, and fluid under pressure from the pressure-generating arc causes rapid extinction of the interrupting arcs.

From the foregoing description it will be apparent that we have provided an improved arc-extinguishing structure forming a single pressure-generating break and two serially related interrupting breaks. Furthermore, we have disclosed a novel, simple mechanism for positively actuating the contact structure of the circuit interrupter to thereby provide a high speed type of circuit interrupter.

Although we have shown and described specific structures, it is to be clearly understood that the same were merely for the purpose of illustration, 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.

We claim as our invention:

1. In a circuit interrupter, a relatively stationary contact, a movable contact assembly movable linearly and including two movable contacts spaced along the direction of motion and operatively connected by an insulating portion, one movable contact separating from the relatively stationary contact to establish an arc, another relatively stationary contact electrically isolated from the first said relatively stationary contact, the other movable contact separating from the second said relatively stationary contact to establish a second arc and to have only the insulating portion therebetween in the open position, means electrically connecting the said other relatively stationary contact to the first said movable contact and paralleling the insulating portion during and after the time of arc extinction so that the two arcs will be serially related and there will be a clear non-paralleled gap between the first said relatively stationary contact and the first said movable contact in the open position, and a third movable contact separable from the first said relatively stationary contact to establish a third serially related arc.

2. In a circuit interrupter, means defining a pressure-generating chamber, means defining two interrupting chambers, a relatively stationary contact, another relatively stationary contact electrically isolated from the first said relatively stationary contact, a movable contact assembly movable linearly and including two movable contacts spaced along the direction of motion and operatively connected by an insulating portion, one movable contact separating from the first said relatively stationary contact to establish an interrupting arc within one of the interrupting chambers, the other movable contact separating from the said other relatively stationary contact to establish a pressure-generating arc within the pressure-generating chamber and to have only the insulating portion therebetween in the open position, means electrically connecting the said other relatively stationary contact to the first said movable contact

and paralleling the insulating portion during and after the time of arc extinction, a third movable contact, means causing the separation of the third movable contact from the first said relatively stationary contact to establish another interrupting arc within the other interrupting chamber, and passage means interconnecting the pressure-generating chamber with both interrupting chambers.

3. In a circuit interrupter, a relatively stationary contact, a movable contact assembly movable linearly and including two movable contacts spaced along the direction of motion and operatively connected by an insulating portion, one movable contact separating from the relatively stationary contact to establish an arc, another relatively stationary contact electrically isolated from the first said relatively stationary contact, the other movable contact separating from the second said relatively stationary contact to establish a second arc and to have only the insulating portion therebetween in the open position, means electrically connecting the said other relatively stationary contact to the first said movable contact and paralleling the insulating portion during and after the time of arc extinction so that the two arcs will be serially related, a third movable contact separable from the first said relatively stationary contact to establish a third serially related arc, an operating rod operatively connected to the movable contact assembly, another operating rod operatively connected to the third movable contact, and means for simultaneously causing the actuation of both operating rods.

4. In a circuit interrupter, means defining a pressure-generating chamber, means defining two interrupting chambers, a relatively stationary contact, another relatively stationary contact electrically isolated from the first said relatively stationary contact, a movable contact assembly movable linearly and including two movable contacts spaced along the direction of motion and operatively connected by an insulating portion, one movable contact separating from the first said relatively stationary contact to establish an interrupting arc within one of the interrupting chambers, the other movable contact separating from the said other relatively stationary contact to establish a pressure-generating arc within the pressure-generating chamber, a third movable contact, means paralleling the insulating portion and electrically connecting the said other relatively stationary contact to the first said movable contact during and after the time of arc extinction, means causing the separation of the third movable contact from the first said relatively stationary contact to establish another interrupting arc within the other interrupting chamber, passage means interconnecting the pressure-generating chamber with both interrupting chambers, an operating rod operatively connected to the movable contact assembly, another operating rod operatively connected to the third movable contact, and means for simultaneously causing the actuation of both operating rods.

5. In a circuit interrupter, grounded support means, terminal bushing means extending through the support means, insulating casing means depending from the grounded support means, a base section supported by the casing means, an arc-extinguishing unit supported by the base section, a relatively stationary contact, a movable contact assembly movable linearly and including two movable contacts spaced along the

direction of motion and operatively connected by an insulating portion, one movable contact separating from the relatively stationary contact to establish an arc, another relatively stationary contact electrically isolated from the first said relatively stationary contact, the other movable contact separating from the second said relatively stationary contact to establish a second arc and to have only the insulating portion therebetween in the open position, means paralleling the insulating portion and electrically connecting the said other relatively stationary contact to the first said movable contact during and after the time of arc extinction so that the two arcs will be serially related, a third movable contact separable from the first said relatively stationary contact to establish a third serially related arc, and operating means supported by the support means for simultaneously actuating the third movable contact and the movable contact assembly.

6. In a circuit interrupter, grounded support means, terminal bushing means extending through the support means, insulating casing means depending from the grounded support means, a base section supported by the casing means, an arc-extinguishing unit supported by the base section, means defining a pressure-generating chamber, means defining two interrupting chambers, a relatively stationary contact, another relatively stationary contact electrically isolated from the first said relatively stationary contact, a movable contact assembly movable linearly and including two movable contacts spaced along the direction of motion and operatively connected by an insulating portion, one movable contact separating from the first said relatively stationary contact to establish an interrupting arc within one of the interrupting chambers, the other movable contact separating from the said other relatively stationary contact to establish a pressure-generating arc within the pressure-generating chamber, means electrically connecting the said other relatively stationary contact to the first said movable contact during and after the time of arc extinction, a third movable contact, means causing the separation of the third movable contact from the first said relatively stationary contact to establish another interrupting arc within the other interrupting chamber, and passage means interconnecting the pressure-generating chamber with both interrupting chambers.

7. In a circuit interrupter, grounded support means, terminal bushing means extending through the support means, insulating casing means depending from the grounded support means, a base section supported by the casing means, an arc-extinguishing unit supported by the base section, means defining a pressure-generating chamber, means defining two interrupting chambers, a relatively stationary contact, another relatively stationary contact electrically isolated from the aforesaid contact, a movable contact assembly movable linearly and including two movable contacts spaced along the direction of motion and operatively connected by an insulating portion, one movable contact separating from the first said relatively stationary contact to establish an interrupting arc within one of the interrupting chambers, the other movable contact separating from the said other relatively stationary contact to establish a pressure-generating arc within the pressure-generating chamber, means electrically connecting the said other

relatively stationary contact to the first said movable contact during and after the time of arc extinction, a third movable contact, means causing the separation of the third movable contact from the first said relatively stationary contact to establish another interrupting arc within the other interrupting chamber, passage means interconnecting the pressure-generating chamber with both interrupting chambers, and operating means supported by the grounded support means for simultaneously actuating the movable contact assembly and the third movable contact.

8. In a circuit interrupter, an arc-extinguishing unit, a yoke member disposed at one end of the unit, two operating rods secured to the ends of the yoke member and extending longitudinally of the unit, lever means disposed adjacent the other end of the unit, contact means operatively

linked to the lever means, a movable contact having a shoulder portion thereon, and the shoulder portion striking the yoke member during the closing operation to cause actuation of the contact means.

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OSWALD VON MEHREN.

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