

Sept. 13, 1938.

J. D. WOOD

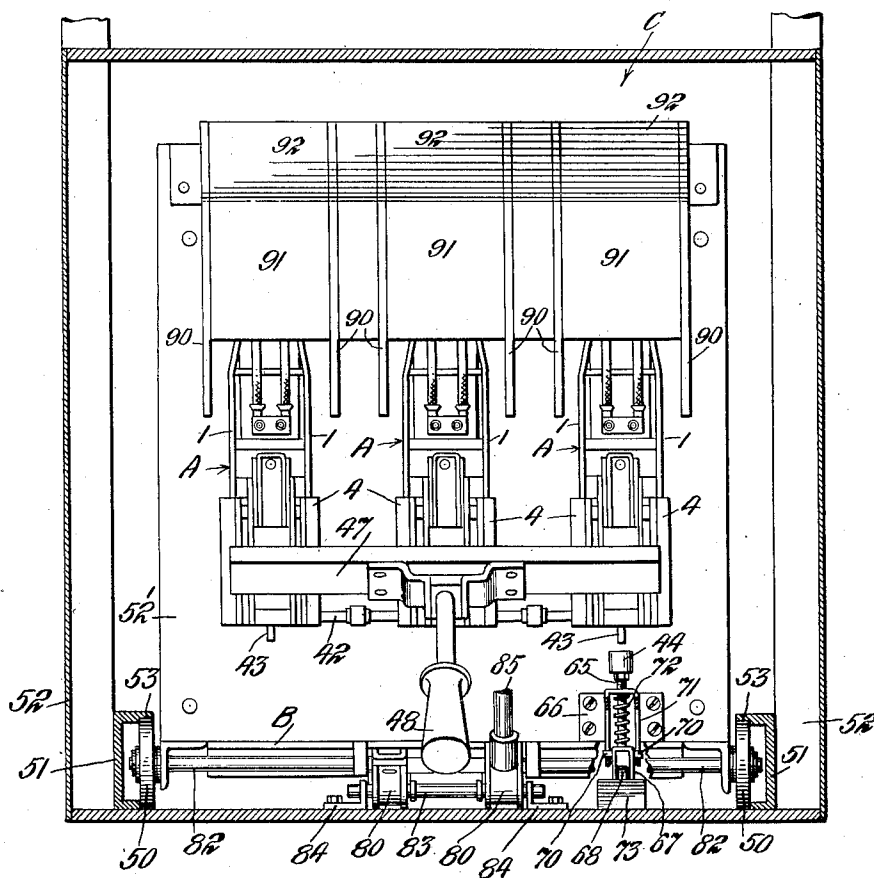
2,129,723

CIRCUIT BREAKER

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Fig. 1.



INVENTOR

JOSEPH D. WOOD

BY

Lawrence K. Sager
his ATTORNEY

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J. D. WOOD

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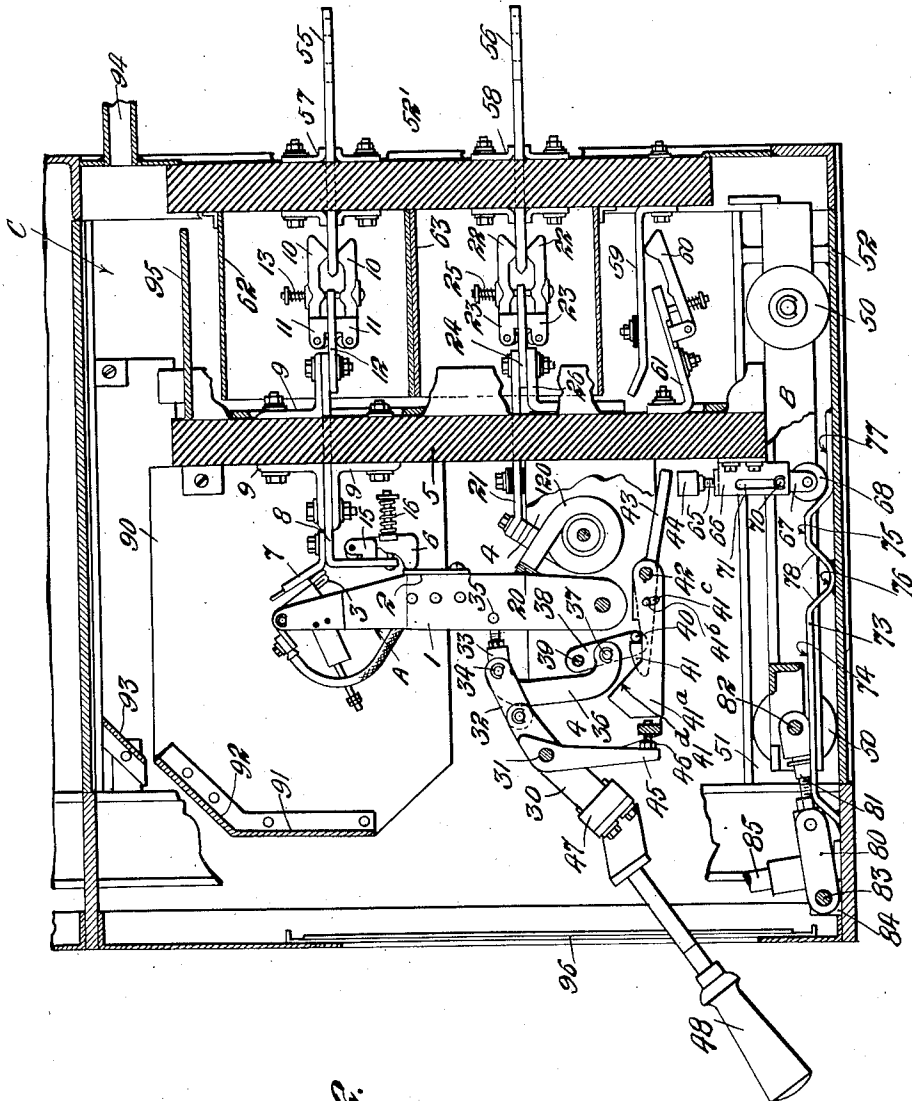


Fig. 2.

INVENTOR
JOSEPH D. WOOD
BY
Lawrence K. Sager
his ATTORNEY

Sept. 13, 1938.

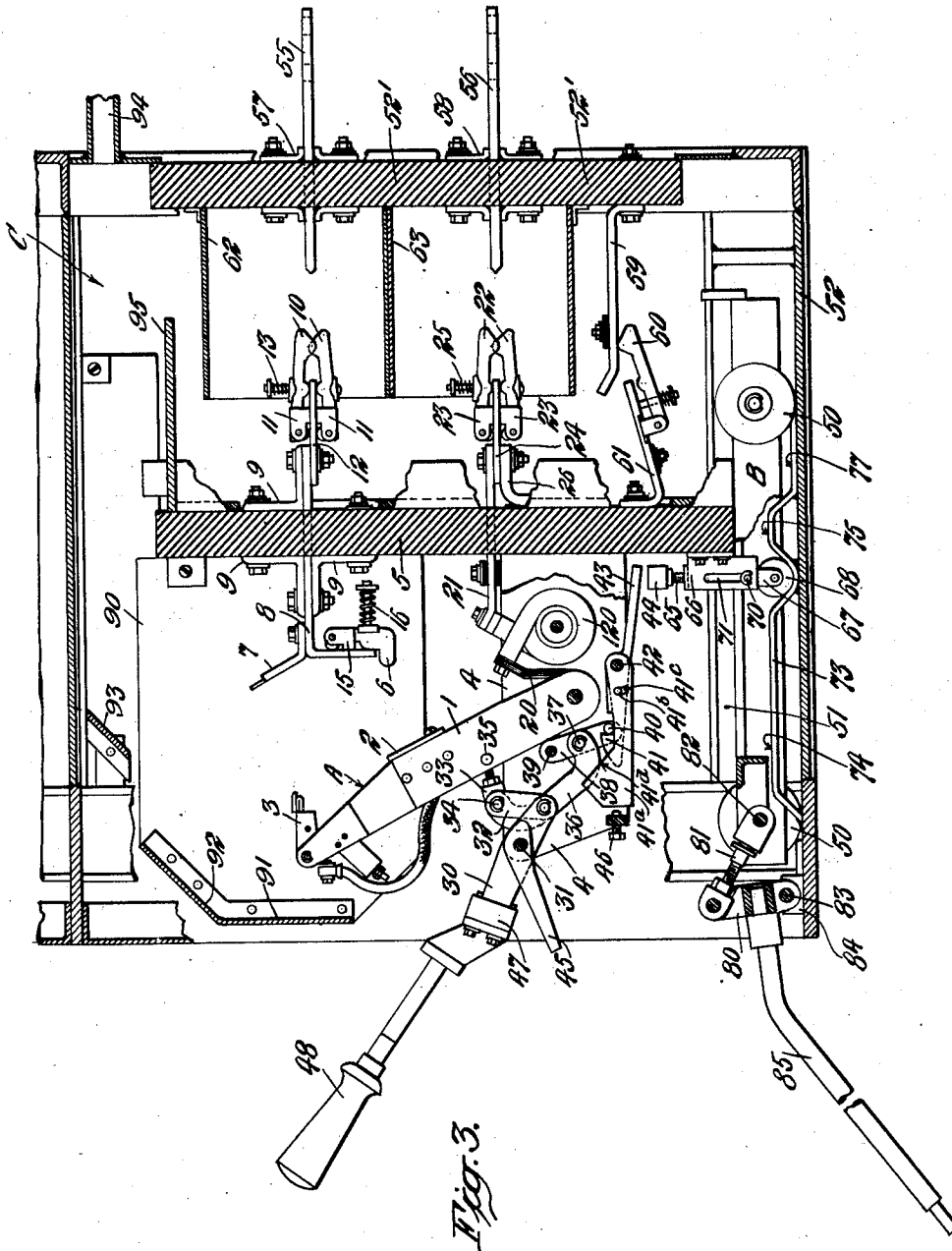
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CIRCUIT BREAKER

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3 Sheets-Sheet 3



INVENTOR
JOSEPH D. WOOD
BY
Lawrence K. Sager
his ATTORNEY

UNITED STATES PATENT OFFICE

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CIRCUIT BREAKER

Joseph D. Wood, Bethlehem, Pa., assignor to
Roller-Smith Company, a corporation of New
York

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7 Claims. (Cl. 175-298)

This invention relates to circuit breakers and more particularly to air circuit breakers of the cubicle type in which one or more circuit breakers and their associated apparatus are mounted as a unit on a movable frame or truck which is movable into or out of a cubicle by which the busses and connections are permanently supported. The truck carries yieldable movable contacts which engage fixed contacts on the cubicle for connecting the circuit breaker to the busses. These connections are automatically broken when the truck is moved from operating position, as for purposes of inspection or repair.

One object of the invention is to provide a circuit breaker assembly of the above type in which the circuit breaker is automatically tripped when the truck is moved from operating position and in which the circuit breaker cannot be closed except when the truck is in operating position or in test position. Another object is to provide a circuit breaker of the above type having means for guiding the truck into the proper operating position and securing the same in such position. Another object is to provide means for safely guiding from the cubicle, without injury to the equipment or danger to the attendant, the hot gases produced by the arc. Another object is to provide a durable, efficient and commercially practical device of the type above indicated. Various other objects and advantages will be apparent as the nature of the invention is more fully disclosed.

The invention is capable of application to various purposes and will be understood from the following description and accompanying drawings which disclose a specific embodiment thereof.

In the drawings, Fig. 1 is a front elevation of the circuit breaker assembly with the front of the cubicle removed, certain parts of the assembly being omitted for clarity of the drawings; Fig. 2 is a longitudinal section of the assembly showing the truck in operating position in the cubicle; Fig. 3 is a longitudinal section similar to Fig. 2 but showing the truck in intermediate or test position in the cubicle.

Referring to the drawings, a three-pole circuit breaker having poles A is shown mounted as a unit on a truck B which is positioned within a fixed cubicle C. Each pole of circuit breaker A is shown as comprising a movable element or arm 1 carrying a main contact 2, and an auxiliary contact 3. Each arm 1 is pivotally mounted at its lower end between brackets 4 fixed to a vertically positioned insulating panel 5 supported by the truck B. The panel 5 carries main contacts 6

which respectively cooperate with the main contacts 2 of the arms 1, and auxiliary contacts 7 which respectively cooperate with the auxiliary contacts 3 of the arms 1, said panel contacts being mounted on conductors 8 which are secured by suitable brackets 9 to the panel 5. The conductors 8 extend to the back of the panel and carry at their free ends yieldable contacts 10 which are pivotally mounted on brackets 11 secured to extensions 12 of the conductors 8 and are normally pressed toward each other by springs 13.

The main contacts 6 are pivoted to brackets 15 carried by the conductors 8 and are held in pressure engagement with the main movable contacts 2 by springs 16. The auxiliary contacts 3 are pivotally mounted on their arms 1 and are provided with springs which tend to hold the same in engagement with the auxiliary contacts 7 and permits the contacts 3 to wipe along the contacts 7 during the opening movement of the circuit breaker. Connection is made to the contacts 2 and 3 of the arms 1 by flexible conductors 20 and trip coils 20 which are connected to conductors 21 extending through the panel 5 and carrying spring contacts 22 which are pivotally mounted on brackets 23 carried by extensions 24 of the conductors 21 and are pressed toward each other by springs 25. The conductors 21 are secured to the panel 5 by brackets 26.

Each arm 1 is controlled by a pair of levers 30 pivoted at 31 between the brackets 4. The ends of the levers 30 are pivoted to links 32 which are in turn pivoted to a link 33 at 34. The link 33 is pivoted at 35 to the arm 1. From the pivot 34 extends a link 36 which is pivoted at 37 to a link 38. The link 38 is pivoted at 39 between the brackets 4 and carries a pin 40 at its lower end which is engaged by a latch 41 for normally restraining the link 38 in fixed position. The latch 41 is loosely mounted on a rod 42 journaled in the brackets 4, the rod being extended at its free end 43 to be engaged by a trip plunger 44 to be described. The rod 42 extends across the entire assembly in insulated sections and carries the latch 41 for each circuit breaker A. Projecting elements 41a are fixed to the rod 42 at the sides of latches 41 and each latch has a pin 41b at its side projecting into a slot 41c formed in each element 41a. A stop member 45 is secured to the levers 30 and engages an adjustable stop 46 to limit the closed position of the circuit breaker. The usual trip coils are provided to control the latch of each contact arm. The levers 30, associated with each of the circuit breakers A, are connected to a cross-bar 47 having a handle 48

which provides manual control for operating all poles of the circuit breakers in unison.

Fig. 2 shows the circuit breaker in closed position, the latches 41 of each contact arm engaging the pin 40 to retain the breaker in closed position. In this position, the toggle formed by the levers 30 and the links 32 is slightly over-set. If it be desired to open the breaker manually, the handle is moved from the position shown in Fig. 2 to the position shown in Fig. 3, the upward movement of the handle causing the links 32 to be moved downwardly and move the parts to the open position shown in Fig. 3, the pins 40 being still retained by the latches 41. If the breaker be opened automatically by the tripping of any one of the latches 41 by the usual overload or voltage trip coils, then such latch releases its pole of the breaker and its opening movement causes its pin 40 to engage the inclined edge 41d of the element 41a forcing it downwardly and thereby turning shaft 42. This causes each of the remaining poles to be tripped by the elements 41a forcing the pins 41b of the other latches downwardly. In this opening action, the handle 48 remains in the position shown in Fig. 2 and the spring pressure tending to open the breaker swings the contact arms 1 in a counter-clockwise direction with reference to Fig. 2 to the open position. In order to reclose the breaker under this condition, the handle 48 must first be raised to bring the parts in the position shown in Fig. 3, after which the handle can be depressed to close the breaker. It will be appreciated that during this closing movement, the tripping of any one of the latches 41 will cause the breaker to open and cause the parts to move to the trip-free position even though the handle 48 be held in the lower closing position. In order to reclose the breaker the handle must again be raised to bring the parts to the position shown in Fig. 3.

While a particular type of circuit breaker has been described, it is to be understood that the invention is not limited thereto but that any form of circuit breaker may be substituted therefor.

The panel 5 is carried by the truck frame having wheels 50 which permit the frame and associated mechanism to be moved as a unit. These wheels 50 are guided in the cubicle C by channels 51 carried by the fixed frame 52 of the cubicle and the channels are recessed, as at 53, to receive and guide the wheels and thereby position the truck.

The cubicle frame has an insulating panel 52' mounted at the rear, through which pass fixed contact members 55 and 56 which are supported respectively by brackets 57 and 58 which are fixed to the panel 52'. The contact members extend within the cubicle in positions to be engaged by the spring contacts 10 and 22 respectively. The contact members 55 and 56 also extend outwardly at the back of the cubicle where they are adapted to be connected to the usual busses (not shown). An auxiliary contact member 59 is also carried by the panel 52' and engages a spring contact 60 which is carried by a conductor 61 mounted on the panel 5. The auxiliary contact member 59 extends within the cubicle substantially beyond the contact members 55 and 56 for the purpose to be described and various similar additional control contacts may be provided according to particular requirements. The portions of the contact members 55 and 56 within the cubicle are housed within insulating shields 62 and 63.

The trip plunger 44 is carried on a shaft 65 which is slidably mounted within a bracket 66 secured to the panel 5 and which carries at its lower end a fork 67 in which a roller 68 is journaled. A

pin 70 carried by the fork 67 extends through elongated slots 71 in the bracket 66 to control the vertical movement of the plunger 44. A spring 72 normally holds the assembly in its lower position. The wheel 68 engages a track 73 which is secured to the frame 52 of the cubicle and is provided with raised sections 74 and 75 and with depressed sections 76 and 77. The raised sections 74 and 75 hold the wheel 68 and the plunger 44 in a raised position with the plunger 44 engaging the free end 43 of the latch 41 and operating the same to release the pin 40 to open the breaker. When the wheel 68 engages either of the depressed sections 76 or 77 the plunger 44 releases the free end 43 of the latch 41 and permits the operation of the circuit breaker to be controlled by the handle 48 or by the trip coil in the usual manner. The depressed section 77 of the track is positioned so that the wheel 68 engages the same when the truck is in operating position in the cubicle. The depressed portion 76 is positioned so that the wheel engages the same when the truck is in an intermediate or test position. It will be noted that in these two positions only, can the circuit breaker be closed, as in all other positions where the wheel engages the raised portions 74 and 75 the plunger 44 automatically operates the trip mechanism to trip the circuit breaker.

The contact members 55, 56 and 59 are so arranged that contact is made with the spring contacts 10, 22 and 60 when the truck is in operating position as shown in Fig. 2. When the truck is in the intermediate or test position as shown in Fig. 3, the spring contacts 10 and 22 are disengaged from the contact members 55 and 56 but the contact between the contact member 59 and the spring contact 60 remains closed and likewise any other similar control contacts. Thus in this position the circuit breaker main contacts are disconnected from the line, whereas the auxiliary contacts 59 and 60 and similar control contacts remain closed and may be used for test purposes. It is evident that these contacts can be used for various purposes, for example, in the circuit of automatic trip or closing coils of the circuit breaker to permit operation thereof when the truck is in test position.

The sections 74, 75, 76 and 77 of the track 73 are connected by inclined cam surfaces 78 so that the trip mechanism is automatically actuated in response to movement of the truck when the wheel 68 rides up on a raised portion. Thus if the breaker truck is in operating position as shown in Fig. 2 and the breaker is closed, the breaker will be automatically opened by any outward movement of the truck before disconnection of the contacts with the various conductors 55 and 56 and protects the latter from arcing effects. When the truck is moved outwardly from test position, the raised portion 74 insures that the breaker will be automatically opened before being removed from the cubicle.

For locking the truck securely in operating position and for forcing it into position, a pair of toggle mechanisms is provided each comprising links 80 and 81. The links 81 are pivoted at 82 to the truck frame. The links 80 are connected to a removable bar 83 which is held in brackets 84 secured to the cubicle frame 52. An operating handle 85 is connected to one of the links 80 to permit manual operation thereof. After the truck has been advanced near the test position as shown in Fig. 3, the bar 83 is inserted to connect the links 80 to the frame 52. Thereafter movement of the handle 85 exerts a force 71

through the force multiplying links 80 and 81 for forcing the truck into operating position. When in this position it is permanently secured by the links 80 and 81 forming a toggle as illustrated in Fig. 2.

Each circuit breaker A is mounted between a pair of shields 90 of insulating material which extend from above to below the arcing contacts so as to confine and isolate the arcing effects when the circuit breaker is opened. A vertical shield or baffle 91 is connected across the front of the various shields 90 and a similar inclined shield or baffle 92 is positioned above the shield 91 and forms an inclined guide which directs the hot gases upwardly and to the rear. A stationary inclined shield 93 is mounted across the top of the cubicle at the front portion in a position to form substantially a continuation of the inclined shield 92 to assist in directing the gases to the rear. A vent 94 is formed at the rear of the cubicle near the top and may be connected to a suitable duct (not shown) to conduct the exhaust gases away. A shield 95 may be secured to the frame 5 to direct the gases to the duct 94 and away from the contacts 10. It is to be understood that the various sides of the cubicle are closed and that a removable cover or door 96 closes the front thereof, no louvers in the front being required.

In the opening of a circuit breaker of this type, particularly under heavy currents, the hot gases produced by the arc, unless properly controlled, are likely to injure the equipment. The present construction provides means to direct the gases upwardly and rearwardly through the vent 94, and to cool the gases by contact with cool surfaces thereby preventing injury to the apparatus and protecting the front of the cubicle from gaseous discharges. The baffles 91, 92, 93 and 95 serve to direct the gases in the manner above indicated and control them until their energy is dissipated.

Although a specific embodiment of the invention has been disclosed, it is evident that it can be applied to various types of apparatus and that various changes and modifications may be made therein without departing from the scope of the invention.

I claim:

1. The combination of a circuit breaker, a fixed support, a frame carrying said circuit breaker and movable towards and from said support, separable contacts carried by said support and said frame to connect said circuit breaker to an external line, and means located permanently at a fixed distance from the contacts carried by said fixed support and active upon movement of said frame away from said fixed support for tripping said circuit breaker before said frame has moved sufficiently to open said separable contacts.

2. The combination of a circuit breaker, a fixed support, a frame carrying said circuit breaker and movable towards and from said support into operating or test positions, separable contacts carried by said support and said frame to connect said circuit breaker to an external line, and means located permanently at a fixed distance from the contacts carried by said fixed support and engaging said circuit breaker to prevent closing of said circuit breaker except when said frame is in said operating or test positions.

3. The combination of a circuit breaker, tripping means therefor, a fixed support, a frame carrying said circuit breaker and movable towards and from said support into operating or test positions, separable contacts carried by said support and said frame to connect said circuit breaker to an external line, and means located permanently at a fixed distance from the contacts carried by said fixed support for actuating said tripping means and for rendering said actuating means inoperative when the frame is in said operating or test positions.

4. The combination of a circuit breaker, a fixed support, a frame carrying said circuit breaker and movable towards and from said support, separable contacts carried by said support and said frame to connect said circuit breaker to an external line, tripping means for said circuit breaker comprising a member movable with said frame and a stationary track located permanently at a fixed distance from the contacts carried by said fixed support and cooperating with said member to trip said circuit breaker when the frame is in certain positions with reference to said fixed support.

5. The combination of a circuit breaker, a fixed support, a frame carrying said circuit breaker and movable towards and from said support, separable contacts carried by said support and said frame to connect said circuit breaker to an external line, tripping means for said circuit breaker comprising a plunger associated with said frame, and a stationary cam member located permanently at a fixed distance from the contacts carried by said fixed support and cooperating with said plunger to trip said circuit breaker when the frame is in certain positions with reference to said support.

6. The combination of a circuit breaker, a fixed support, a frame carrying said circuit breaker and movable towards and from said support, separable contacts carried by said support and said frame to connect said circuit breaker to an external line, tripping means for said circuit breaker comprising a plunger carried by said frame, a roller operating said plunger and a stationary track engaging said roller and located permanently at a fixed distance from the contacts carried by said fixed support to actuate said tripping means, said track being formed to release said tripping means when the frame is in certain positions with reference to said support.

7. The combination of an air circuit breaker, a cubicle enclosing said circuit breaker, insulating shields at the sides of the circuit breaker contacts, a vent from the upper part and rear of said cubicle, a baffle located across the front of said shields and supported by said shields and inclined to direct towards said vent the hot gases produced by the arc, and an inclined baffle supported on said cubicle above said first named baffle and inclined to cooperate therewith to direct towards said vent the hot gases produced by the arc.

JOSEPH D. WOOD.