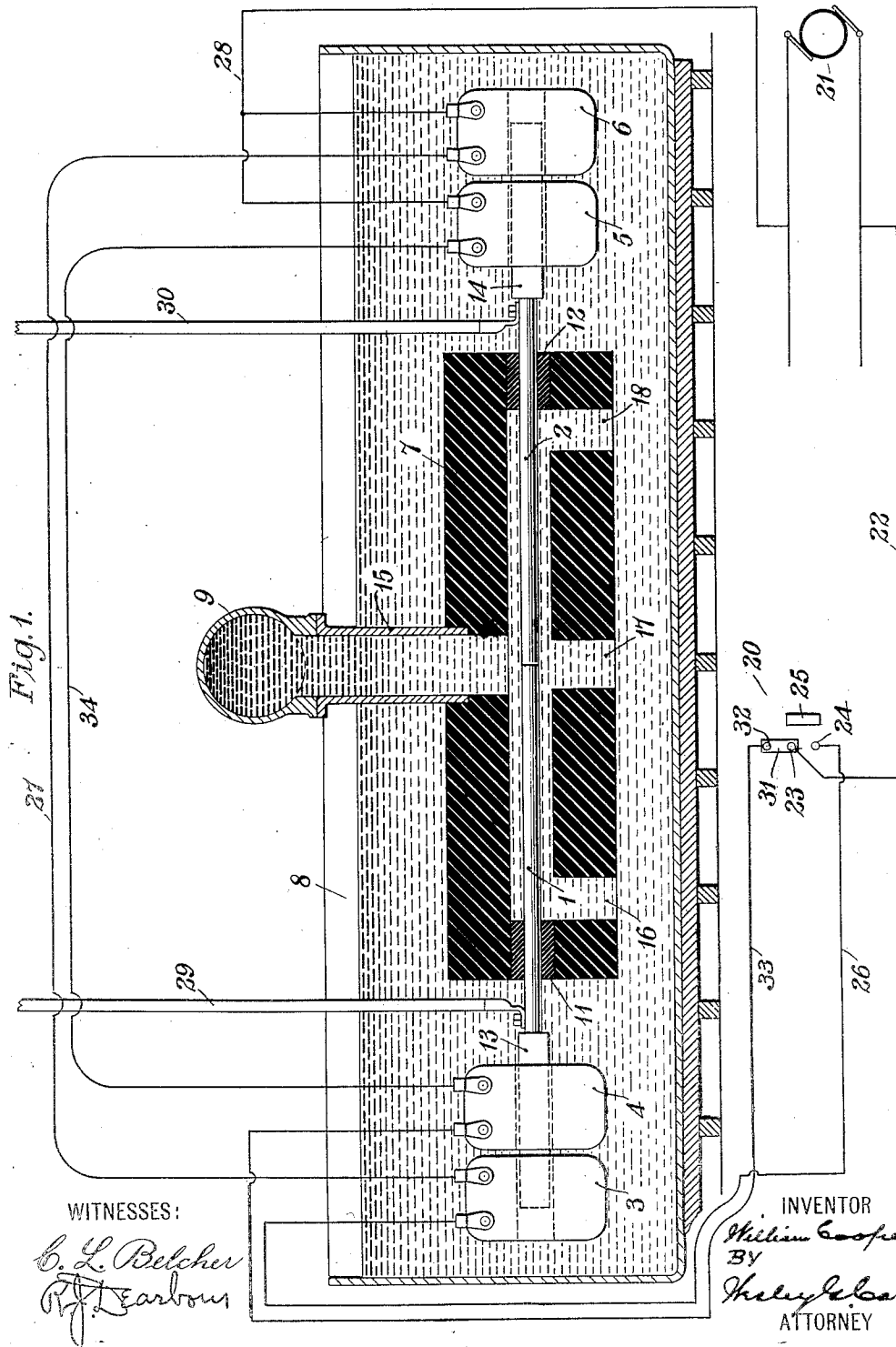


1,140,957.

2 SHEETS—SHEET 1.



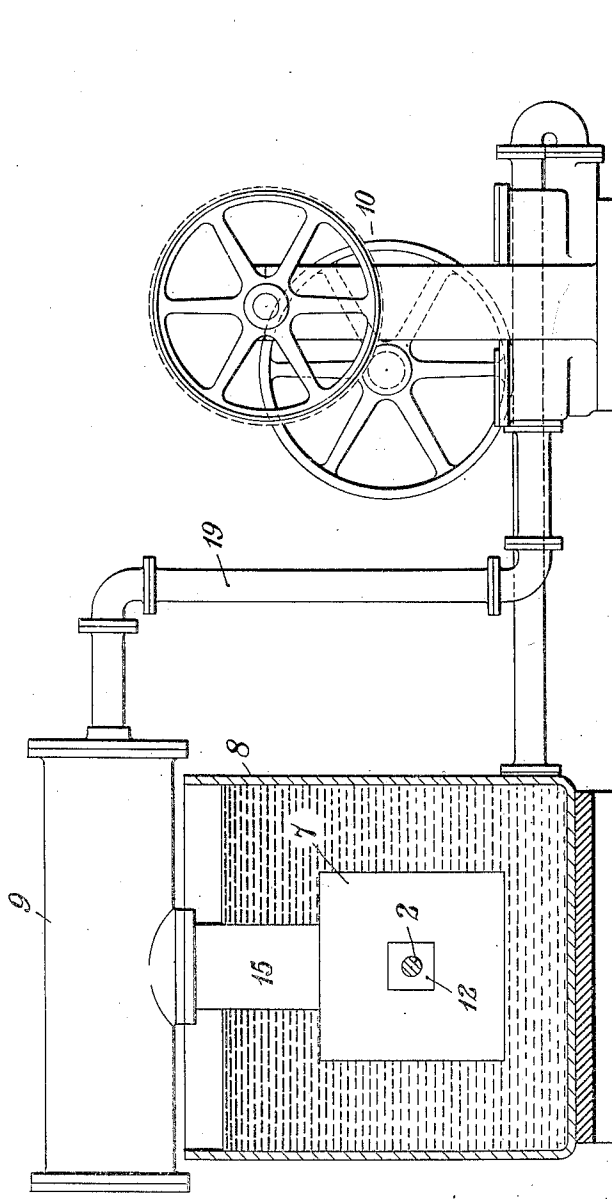
W. COOPER.
CIRCUIT INTERRUPTER.
APPLICATION FILED JULY 28, 1909.

1,140,957.

Patented May 25, 1915.

2 SHEETS—SHEET 2.

Fig. 2.



WITNESSES:

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CIRCUIT-INTERRUPTER.

1,140,957.

Specification of Letters Patent.

Patented May 25, 1915.

Application filed July 28, 1909. Serial No. 509,982.

To all whom it may concern:

Be it known that I, WILLIAM COOPER, a citizen of the United States, and a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Circuit-Interrupters, of which the following is a specification.

My invention relates to circuit interrupters and it has for its object to provide a device of this character that shall be simple and durable in construction and adapted to successfully interrupt high-voltage circuits and that shall require only a relatively short degree of separation between simple engaging contact members.

Circuit breakers which have heretofore been constructed for interrupting very high-voltage circuits have usually been provided with contact members that were widely separated from each other in breaking the circuit so that the devices were relatively complicated and expensive in construction. As supplemental to the main contact members, arcing contact members are usually provided which are intended to prevent deterioration of the main contact members.

According to my present invention, it is only necessary to utilize contact members of the simplest conceivable structure (although any suitable contact structure may be employed) since special means is provided for quenching the electric arcs as soon as they are formed by the separation of the members.

Figure 1 of the accompanying drawings is a partially diagrammatic view of a circuit interrupter constructed in accordance with my invention and circuit connections whereby the device may be controlled from a remote point. Fig. 2 is an end elevation of the device shown in Fig. 1.

Referring to the drawings, the circuit interrupter here shown comprises cooperating contact members 1 and 2, operating magnet coils 3, 4, 5 and 6, an inner pressure chamber 7 into which the contact ends of the members 1 and 2 project, a fluid-containing tank or casing 8 in which the aforesaid parts are immersed, a storage tank or reservoir 9 and a fluid-pumping device 10 which is adapted to maintain a predetermined pressure within the reservoir 9.

The contact members 1 and 2 may be of any suitable form, but I prefer to use abutting rods or bars of conducting material

which are adjustably mounted in bearings 11 and 12 located in the walls of the inner chamber 7 and the outer ends of which are secured to magnetizable core members 13 and 14 which are actuated by the magnet coils 3, 4, 5 and 6, as hereinafter pointed out.

A connection is established from the storage reservoir 9 to the inner pressure chamber 7 through a pipe 15, and the arrangement of parts is such that, when the circuit interrupter is closed, the abutting ends of the contact members 1 and 2 are located directly beneath the end of the pipe 15 which is substantially vertical and enters the inner chamber at the middle point of its upper wall.

The chamber 7 is provided with three outlet passages 16, 17 and 18, the combined cross sectional area of which is substantially equal to the corresponding area of the inlet pipe 15. The outlet 17 is directly opposite the inlet pipe and the outlets 16 and 18 are located in the bottom wall of the inner chamber at its respective ends adjacent to the bearings 11 and 12 through which the contact members project.

The operation of the device is as follows: The fluid pump 10 is continuously operated by any suitable means which is adequate, in capacity, to maintain a predetermined pressure in the storage reservoir 9 to which it is connected by a pipe 19. Fluid is supplied to the pump from the tank 8 which is, in turn, supplied from the outlet ports 16, 17 and 18 of the inner chamber 7. By this means, a continuous circulation of fluid is established from the storage reservoir 9, through the inner chamber 7 into the tank or casing 8, through the ports 16, 17 and 18. When it is desired to interrupt the electric circuit which is established through the contact members 1 and 2, a master controller 20 may be actuated to move its contact segment 25 into engagement with contact terminals 23 and 24 and thus complete a circuit from any suitable source, such as generator 21, through conductor 22, contact terminal 23, contact segment 25, contact terminal 24, conductor 26, magnet coil 3, conductor 27, magnet coil 6 and conductor 28 to the opposite terminal of the generator. The magnet coils 3 and 6 being thus energized, the core members 13 and 14 will be drawn outwardly and thus separate the contact members 1 and 2. As the contact members 1 and

2 are separated, the main circuit, which is established through conductor 29, contact members 1 and 2 and conductor 30, is interrupted and the arc, which is established by the separation of said contact members is immediately quenched by the rush of fluid, which is preferably transformer oil, from the end of the pipe 15 through the space between the separated ends of the contact members and out through the passage 17, branch streams being maintained outwardly along the contact members and through the passages 16 and 18.

In order to close the circuit breaker, the master controller is actuated to move its contact segment 31 into engagement with the stationary contact terminals 23 and 32 and thus establish a circuit from the generator 21 through conductor 22, contact terminals 23, contact segment 31, contact terminal 32, conductor 33, magnet coil 4, conductor 34, magnet coil 5 and conductor 28. The coils 4 and 5 will be thus energized and will act upon the core members 13 and 14 to move the contact members 1 and 2 into engagement with each other, as shown in Fig. 1.

I am aware that circuit interrupters have been provided in which a circulation of oil or other liquid is established upon the separation of the contact members, but, before a circulation of this character is sufficiently augmented to be of service, the electric arc has usually assumed such proportions as to materially injure both the contact members and the insulating properties of the oil.

It is evident that operating magnets 3, 4, 5 and 6 may be replaced by any other suitable means for governing the movement of the contact members, but, as already pointed out, I have chosen the simplest possible contact structure and method of operating the same in order to emphasize the fact that the positive and continuous liquid circulation which I employ renders a wide separa-

tion of the contact members and a complicated structure unnecessary.

I claim as my invention:

1. A circuit interrupter comprising relatively movable contact members, a continuously maintained body of insulating liquid in which said members are immersed, and means for maintaining a continuous localized liquid circulation both laterally and longitudinally with reference to the contact members and in engagement therewith.

2. A circuit interrupter comprising an insulating chamber immersed in a continuously maintained body of insulating liquid and having an inlet port and a plurality of spaced outlet ports, separable contact members extending into said chamber and having normally abutting faces located in proximity to the inlet port and one of the outlet ports, a conduit connected to said inlet port, and means for forcing liquid through said conduit to maintain a continuous circulation thereof around the abutting faces of the contact members.

3. A circuit interrupter comprising an insulating chamber immersed in a continuously maintained body of insulating liquid and having an inlet port and a plurality of outlet ports, separable contact members extending into said insulating chamber to make normal abutting contact with each other, a conduit connected to said inlet port, and means for forcing liquid through said conduit to maintain a continuous circulation thereof transversely around the abutting ends and longitudinally around the shanks of the contact members.

In testimony whereof, I have hereunto subscribed my name this 14th day of July, 1909.

WILLIAM COOPER.

Witnesses:

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B. B. HINES.