No. 747,853. PATENTED DEC. 22, 1903.

A. R. CHEYNEY.

RETARDING DEVICE FOR ELECTRIC CIRCUIT BREAKERS.

APPLICATION FILED APR. 16, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

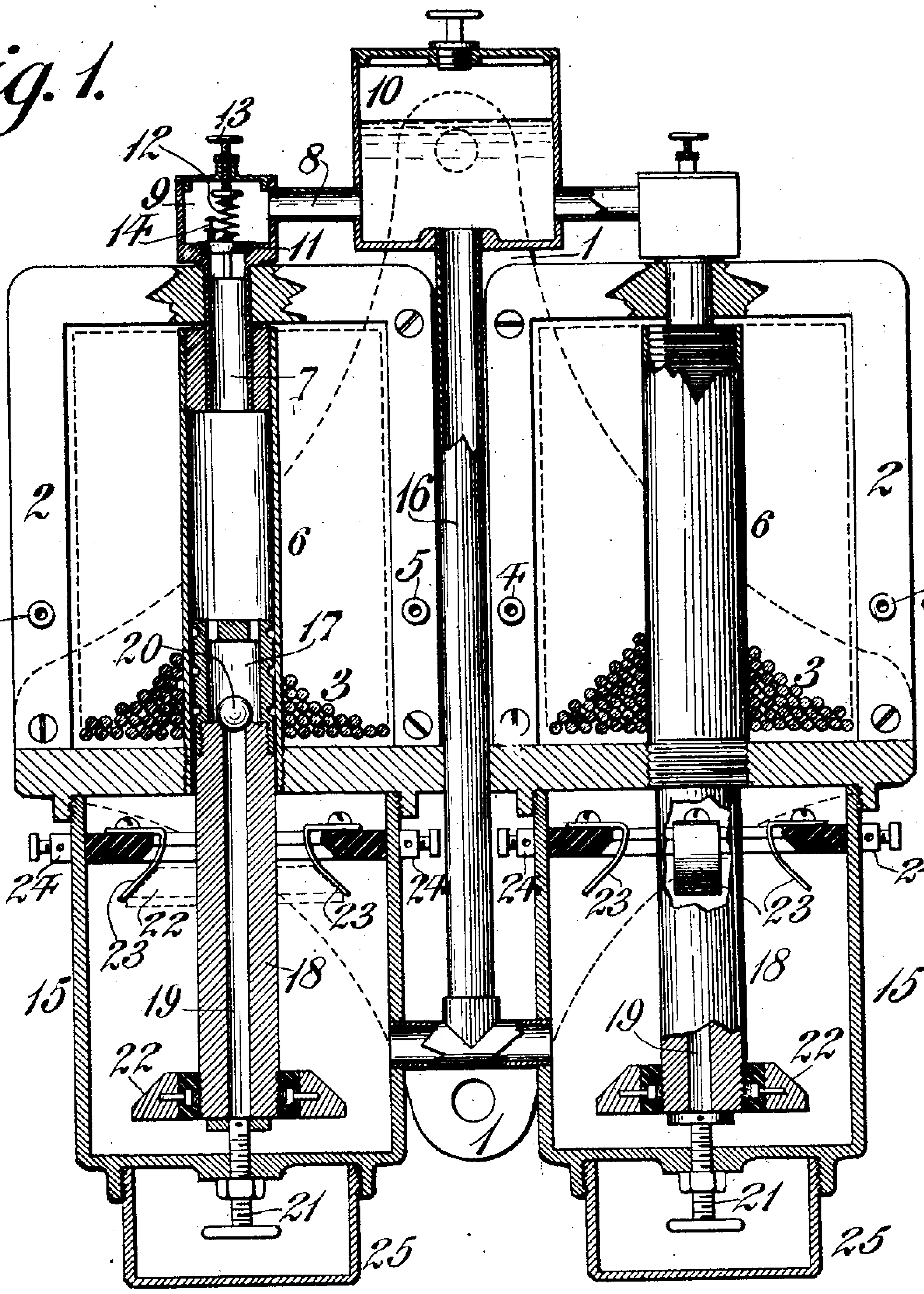


Fig. 2.

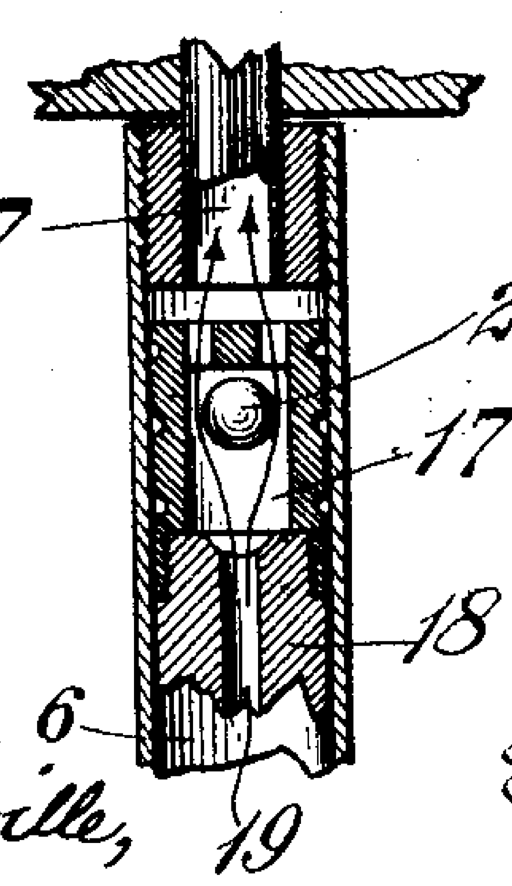
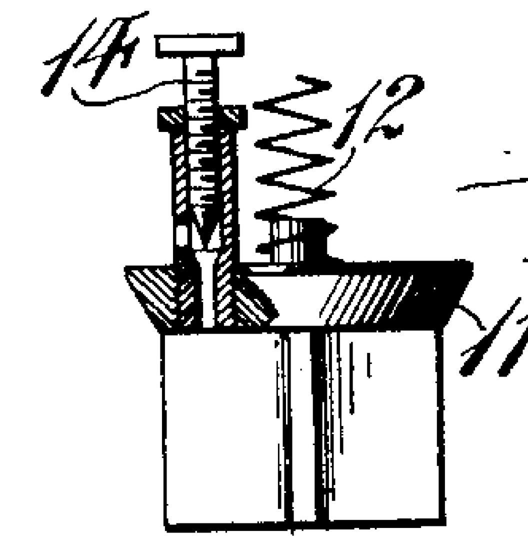


Fig. 3.



Witnesses

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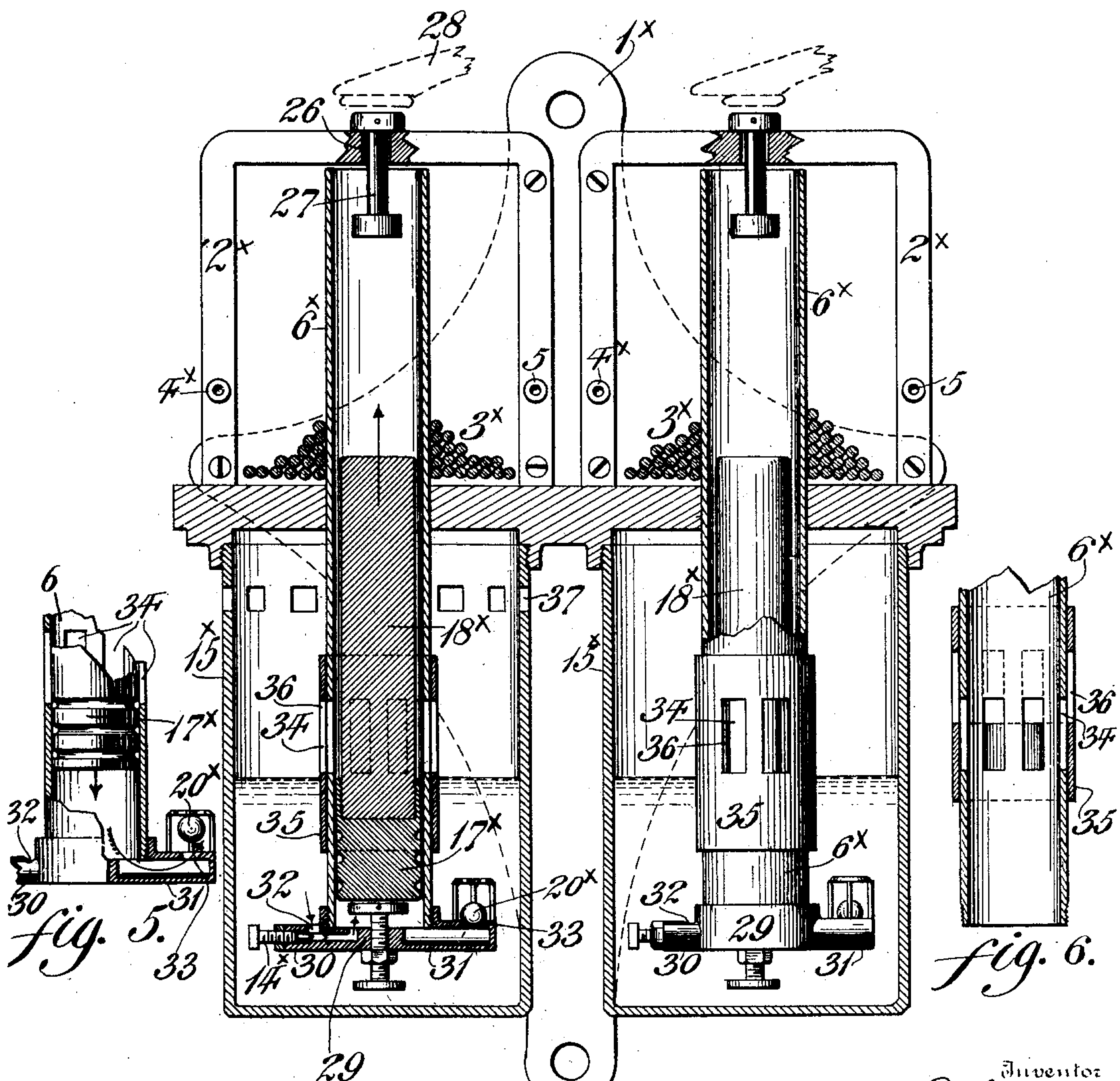
NO MODEL. 2 SHEETS—SHEET 2.

Fig. 4.



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UNITED STATES PATENT OFFICE.

ALGERNON R. CHEYNEY, OF PHILADELPHIA, PENNSYLVANIA.

RETARDING DEVICE FOR ELECTRIC-CIRCUIT BREAKERS.

SPECIFICATION forming part of Letters Patent No. 747,853, dated December 22, 1903.

Application filed April 16, 1903. Serial No. 152,858. (No model.)

To all whom it may concern:

Be it known that I, ALGERNON R. CHEYNEY, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Improvement in Retarding Devices for Electric-Circuit Breakers, of which the following is a specification.

My invention relates to a retarding device for electric-circuit breakers; and it consists of means for introducing a time element or retardation of the movement of a solenoid-core.

It further consists of novel details of construction, all as will be hereinafter fully set forth.

Figure 1 represents a partial elevation and a partial vertical section of a portion of a circuit-breaker embodying my retarding device. Figs. 2 and 3 represent a vertical section of certain detached valves. Fig. 4 represents, in partial elevation and in partial vertical section, a modified form of my device. Figs. 5 and 6 represent a vertical section of a detached valve and a shutter, respectively.

Similar numerals of reference indicate corresponding parts in the figures.

Referring to Figs. 1, 2, and 3 of the drawings, 1 designates a bracket or back adapted to support a case 2, in which is a solenoid-coil 3, the ends of which connect with binding-posts 4 and 5. Within and insulated from the coil 3 is a cylinder 6, making at its upper end a fluid-tight connection through passages 7 and 8 and valve-chamber 9 with a reservoir 10. A release or emergency valve 11 closes the upper end of the cylinder 6. It is held to its seat by a spring 12, the thrust of which may be adjusted by a screw 13. A needle-valve 14 opens from the cylinder 6. As shown, it is placed in the release-valve 11. Tightly secured below the case 2 is a cup 15, also connected by a passage 16 with the reservoir 10. From a hollow piston 17 in the cylinder 6 depends a hollow metal core 18, the axial bore 19 of which is closed at its upper end by a ball-valve 20. The lower end of the core 18 normally rests on a disk on the end of a vertically-adjustable screw 21, passing through the bottom of the cup 15. A jam-nut may be placed on the screw 21 to prevent its accidental displacement. Near the lower end of the core 18 is a contact-ring 22, which may be insulated from the core 18, as shown. Near the upper end of the cup 15 are pairs (one or more) of contact-springs 23, electrically connected with binding-posts 24, exterior to the cup, from which wires lead to any desired form of circuit-breaker (not shown) by which the main circuit may be interrupted. To catch any possible leakage of oil, a cap 25 may be secured at the bottom of the case 15. The cap also serves to prevent meddling with the set-screw 21.

By means of the screw 21 the air-gap at the head of the core 18 or, in other words, the withdrawal of the core from the coil 3 may be adjusted, so that the flow of normal current through the coil 3 leaves the core as shown in Fig. 1. It is understood that the chamber 9, passages 7, 8, and 16, cylinder 6, bore 19, and cup 15 are filled with oil, glycerin, or other liquid, which also rises into the reservoir 10, these together forming a circulating system. It is clear that as the reservoir 10 is located at the highest point of this system any slight loss, as by leakage, will only tend to deplete the reservoir, leaving the circulating system complete and the core and contacts always submerged. It is also clear that any increase of current, caused, *e. g.*, by a short circuit in the main line, will act to draw up into the coil the core 18. The upward passage of the core necessarily forces before it the oil in the cylinder 6, which must pass through the valve-chamber 9 into the reservoir 10, whence it flows back to the cup 15. With a moderate increase of the main-line current the oil will flow through the needle-valve 14, permitting the core to rise slowly, but with a speed proportioned to the increased energy. When the core reaches its fully-raised position, as shown in dotted lines, Fig. 1, the conducting-ring 22 connects a pair of the contact-springs 23. A current then flows to the trip-coil of a circuit-breaker by which main-line current is interrupted. This cuts off all flow through the coil 3, when the core 18 drops back to its normal position, the ball 20 rising from its seat to permit the oil to flow up through the bore 19. By this means normal conditions are instantly restored and the device is again ready for action in case of another excess of current. If the main-line current is at any time greatly increased, the core 18 will be raised with such force as to lift from its seat the release-valve 11, thus permitting a more rapid circulation of the oil and a correspondingly prompter action of the circuit-breaker. As both the needle-valve 14 and the main valve 11 are adjustable, the time element for both ordinary and dangerous overloads may be accurately adjusted.

In Figs. 4, 5, and 6 of the drawings is shown a modified form of my device adapted to act mechanically on the trip-lever of a circuit-breaker. (Not shown.) The bracket $1^{\times}$, case $2^{\times}$, and solenoid $3^{\times}$ are substantially as above described. The cylinder $6^{\times}$ extends through the bottom of the case $2^{\times}$ and nearly to the bottom of the cup $15^{\times}$. Passing through an aperture 26 in the top of the case $2^{\times}$ is a striker 27, headed at each end to prevent its displacement. Above the striker 27 is the end of a lever 28, connected mechanically with the trip of the circuit-breaker. The piston $17^{\times}$ is in this case below the core $18^{\times}$ and slides smoothly in the lower part of the cylinder $6^{\times}$.

Secured to the lower end of the cylinder $6^{\times}$ is a foot 29, having tubular offsets 30 and 31. In one of these is an aperture 32, adjustable by a needle-valve $14^{\times}$. In the other offset is an aperture 33, closed by a ball-valve $20^{\times}$. In the cylinder $6^{\times}$, near its lower end, are vertical slots 34. Tightly fitting around the cylinder is a vertically-adjustable sleeve or shutter 35, having slots 36 corresponding in number with the slots 34 and adapted to move in and out of register therewith. Near the upper end of the cup $15^{\times}$ may, if desired, be cut one or more apertures 37.

The operation is as follows: As before, the adjustment is such that the normal current is insufficient to raise the core $18^{\times}$. The cup $15^{\times}$ being partly filled with oil or the like any upward movement of the core is retarded by the slow flowing of the oil through the aperture 32 into the space behind the piston $17^{\times}$. As soon as the lower end of the piston reaches the apertures 34 in the cylinder $6^{\times}$ this retardation ceases and the core shoots upward, striking sharply against the striker 27, by which motion is communicated to the lever 28. The return of the core to its normal position is facilitated by the valve 33, which rises to permit outflow of oil from the cylinder $6^{\times}$.

It is evident that the raising of the slide 35 (shown in Fig. 6) will increase the time element in the action of the circuit-breaker. If the cup $15^{\times}$ is tightly fitted to the bottom of the case $2^{\times}$, as shown at the right side of Fig. 4 of the drawings, the upward movement of the case will be somewhat resisted by the partial exhaustion of air from the cup. I may therefore provide an aperture 37 in the wall of the cup to admit air thereto. It is clear that this second form of my device differs functionally from the first only in substituting a mechanical for an electrical connection between the solenoid-core and the operation of the circuit-breaker.

The advantage of the retardation of the circuit breaking is that it permits momentary overloads due to sudden changes of speed or voltage and allows time for the blowing out of safety-fuses on subfeeders.

In both Figs. 1 and 4 the device is shown in duplicate. It is evident that any number of such current-breakers may be grouped together as desired.

It will be evident that various changes may be made by those skilled in the art which may come within the scope of my invention, and I do not, therefore, desire to be limited in every instance to the exact construction herein shown and described.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a solenoid, a coil, a core, a cylinder in said coil adapted to contain a liquid and a plurality of successively-operative means for the emission of liquid from said cylinder during the entrance of said core.

2. In a solenoid, a coil, a core, a cylinder in said coil adapted to contain a liquid, a plurality of valves for the emission of liquid from said cylinder during the entrance of said core and means for resisting the opening of one of said valves whereby said valves are rendered successively operative.

3. In a solenoid, a coil, a core, a cylinder in said coil adapted to contain a liquid, a plurality of valves for the emission of liquid from said cylinder during the entrance of said core and adjustable means for resisting the opening of one of said valves whereby said valves are rendered successively operative.

4. In a solenoid, a coil, a core, a cylinder in said coil adapted to contain a liquid, a needle-valve in said cylinder for regulating the emission of such liquid therefrom and a larger emergency-valve adapted to permit a more rapid emission of liquid from said cylinder.

5. In a solenoid, a coil, a core, a cylinder in said coil, a reservoir and passages connecting said reservoir with said cylinder adjacent both its ends, said reservoir, cylinder and passages forming a circulatory system of which said reservoir is the highest portion.

6. In a solenoid, a coil, a core, a cylinder in said coil, a contracted passage above said cylinder, a reservoir located above said cylinder, a cup in which said core is normally supported and a passage from said reservoir to said cup whereby the movement of said core may be retarded by the circulation of a liquid through said cylinder, reservoir and passage to said cup.

7. In a solenoid, a coil, a tubular core, a cylinder in said coil, a contracted passage above said cylinder, a reservoir also above said cylinder, a cup in which said core is normally supported, said core, cylinder, reser-

voir, passage and cup forming together a connected system through which liquid may be circulated by the movement of said core.

8. In a solenoid, a coil, a tubular core, a cylinder in said coil, a liquid-circulating system of which said cylinder forms a part and a check-valve carried by said core whereby the entering movement of said core into said coil causes a circulation of the liquid in said system while its withdrawal is effected without producing such circulation.

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Witnesses:

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