F. MACKINTOSH.

LIQUID RHEOSTAT.

APPLICATION FILED DEC. 18, 1908.

963,163. Patented July 5, 1910.

Fig. 1.

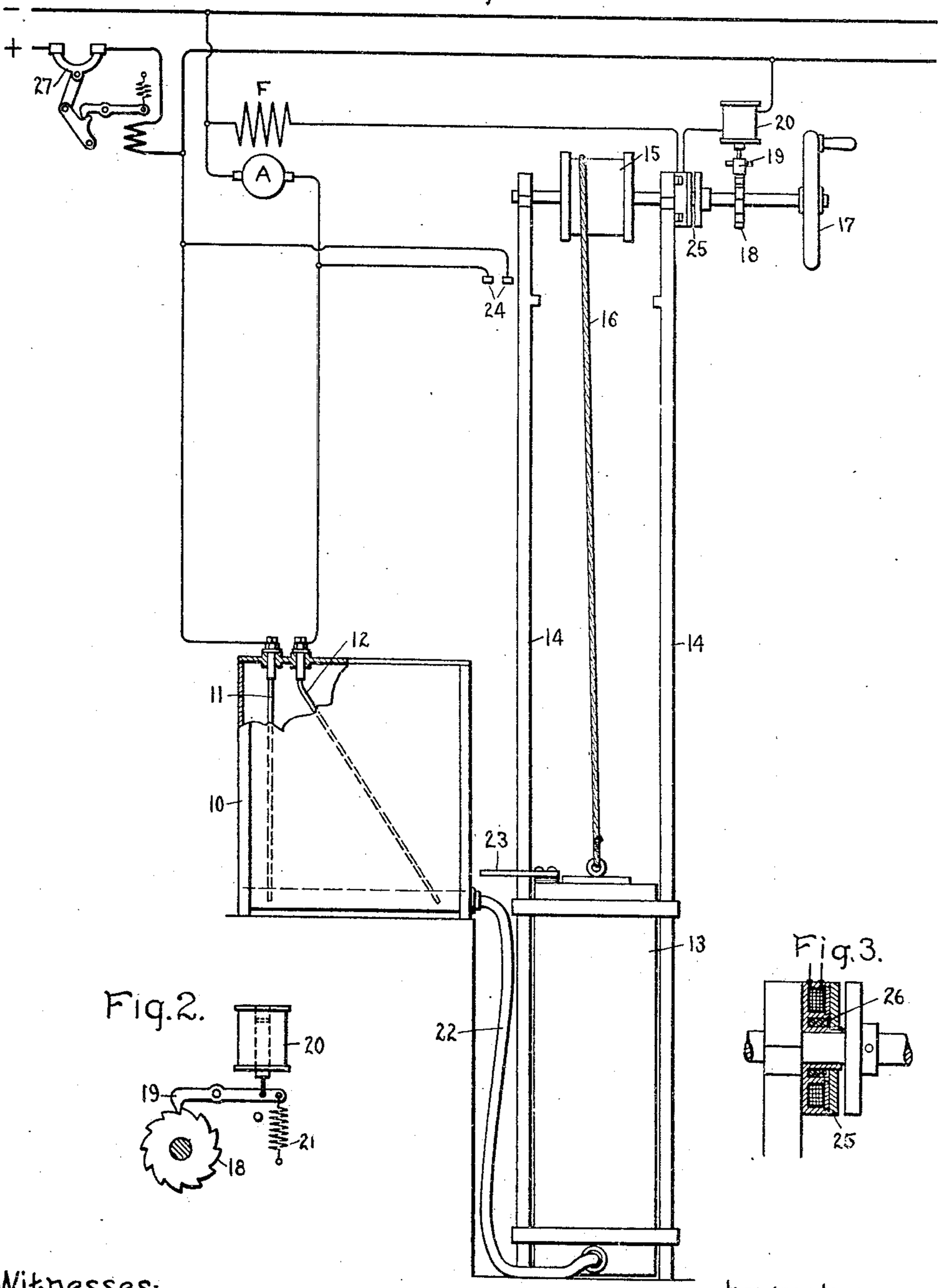

Fig. 2.

Fig. 3.

Witnesses:

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UNITED STATES PATENT OFFICE.

FREDERICK MACKINTOSH, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

LIQUID RHEOSTAT.

963,163. Specification of Letters Patent. Patented July 5, 1910.

Application filed December 18, 1908. Serial No. 468,096.

To all whom it may concern:

Be it known that I, FREDERICK MACKINTOSH, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Liquid Rheostats, of which the following is a specification.

This invention relates to liquid rheostats for controlling electric motors and the like and has for its object the provision of a device of this character which is adapted to a variety of uses in connection with both the starting and running of electric motors, generators, etc., which will be cheap of construction, simple of operation and at the same time thoroughly efficient, safe and durable.

My invention relates more specifically to water rheostats for use in connection with the starting of electric motors.

One of the objects of my invention is to provide a water rheostat with no-voltage release mechanism, whereby, upon the failure of voltage, the parts will be immediately brought back to starting position.

Another object of my invention is to provide a liquid rheostat in which the resistance can only be cut out at a definite speed regardless of the speed of actuation by the operator.

Other objects of my invention will appear in the course of the following specification, in which I have shown my invention embodied in concrete form for the purposes of illustration.

In the drawings disclosing one form of my invention, Figure 1 shows my complete device in a somewhat diagrammatic form, the circuit connections being likewise shown; Fig. 2 shows a detail of the no-voltage mechanism; and Fig. 3 shows a detail of the brake mechanism.

Referring to the drawing, 10 represents a tank or fluid container which may be of any desired shape or size. This tank is preferably fixed as shown and provided with two electrodes 11 and 12, which are inclined with respect to each other so as to shorten the path between them as the fluid rises in the tank. Adjacent this fixed tank 10 is a movable auxiliary tank 13 which, for the purpose of illustration, I have shown as elongated. This tank is arranged to move vertically upon guide bars 14. At the top of these guide bars is mounted a drum 15 over which passes a rope or cable 16, the lower end of which is attached to the tank. This drum is turned by a hand wheel 17. A ratchet wheel 18 is mounted on the drum shaft so as to be engaged by the pawl 19, which is held in engagement with the ratchet wheel by no-voltage magnet 20. A spring 21 is arranged to draw the pawl away from the ratchet wheel when the former is released by the magnet 20. A flexible pipe 22 connects the lower part of tank 10 with the lower part of auxiliary tank 13, so that when the latter is raised and lowered, the water will be transferred back and forth between the tanks so that the water level in the tank 10 will be correspondingly raised and lowered. A bridging contact 23 is mounted upon the top of the auxiliary tank 13 and is arranged to bridge contacts 24 when the tank reaches the upper limit of its movement. A friction brake 25 is normally held out of operation by a coil in series with the motor field F and no-voltage magnet 20. Upon the failure of voltage the brake disk is applied by means of a spring 26 to retard the downward movement of tank 13.

The arrangement of circuits and mode of operation are as follows: Normally the parts are in the position shown in Fig. 1, that is, the auxiliary tank 13 is in its lowermost position. When the line switch or circuit breaker 27 is closed, current will pass from the positive main, through the resistance offered by the water or other liquid in the tank 10, between the electrodes 11 and 12, thence through the armature A and back to the negative main. By turning the hand wheel 17 the tank 13 is raised and the level of the water in tank 10 is accordingly raised, so as to reduce the resistance between the electrodes. The speed with which the resistance is cut out, or in other words, the speed at which the water rises in the tank 10 will be independent of the movement of the hand wheel 17 so that the operator cannot start up the motor too quickly. When the tank 13 reaches its uppermost position, in which the tank 10 is practically filled, the contacts 24 are bridged and the electrodes 11 and 12 short-circuited. The tank is held in this position by means of the pawl 19. Upon failure of voltage the pawl will be released and the spring 21 will draw the pawl out of

engagement with the ratchet wheel and allow the tank 13 to descend, being retarded by brake 25. The water from tank 10 will thereupon flow back into tank 13 and restore the parts to starting position.

It will be understood, of course, that the arrangement herein shown and described is merely typical and intended for purposes of illustration, since various modifications of my invention will suggest themselves to those skilled in the art without departing from the spirit of my invention, the scope of which is set forth in the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. A rheostat comprising a fluid container provided with electrodes, an auxiliary container having a fluid conducting connection therewith, and means for raising and lowering one of said containers with respect to the other and a no-voltage device for controlling the auxiliary container.

2. A rheostat comprising a fixed fluid container provided with electrodes, an auxiliary container having fluid conducting connections therewith, and means for raising and lowering the auxiliary container with respect to the fixed container and a no-voltage device for controlling the auxiliary container.

3. A rheostat comprising a fluid container provided with electrodes, an auxiliary container having fluid conducting connections therewith and biased to a predetermined position, means for raising and lowering one of said containers with respect to the other, and a no-voltage magnet for controlling the movement to said position.

4. A rheostat comprising a fixed fluid container provided with electrodes, a movable auxiliary container having fluid conducting connection therewith, means for raising said auxiliary container, and no-voltage mechanism for holding the same in raised position.

5. A rheostat comprising a fixed fluid container provided with electrodes, a movable auxiliary container having fluid conducting connection therewith, means for raising one of said containers, and no-voltage mechanism for holding the same in raised position.

6. A rheostat comprising a fluid container provided with electrodes, an auxiliary container having fluid conducting connection therewith, means for raising and lowering one of said containers with respect to the other, and means for short-circuiting the electrodes after a predetermined movement.

7. A rheostat comprising a fluid container provided with electrodes, a movable auxiliary container having fluid conducting connection therewith, means for raising said auxiliary container, and means for short-circuiting the electrodes after a predetermined movement of said container.

8. A rheostat comprising a fixed fuel container provided with electrodes, a movable auxiliary container having fluid conducting connection therewith, means for raising said auxiliary container, means for short-circuiting the electrodes after a predetermined movement, and a no-voltage mechanism for holding said container in raised position.

In witness whereof, I have hereunto set my hand this 15th day of December, 1908.

FREDERICK MACKINTOSH.

Witnesses:

BENJAMIN B. HULL,

HELEN ORFORD.