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H. W. CHENEY.

LIQUID RHEOSTAT.

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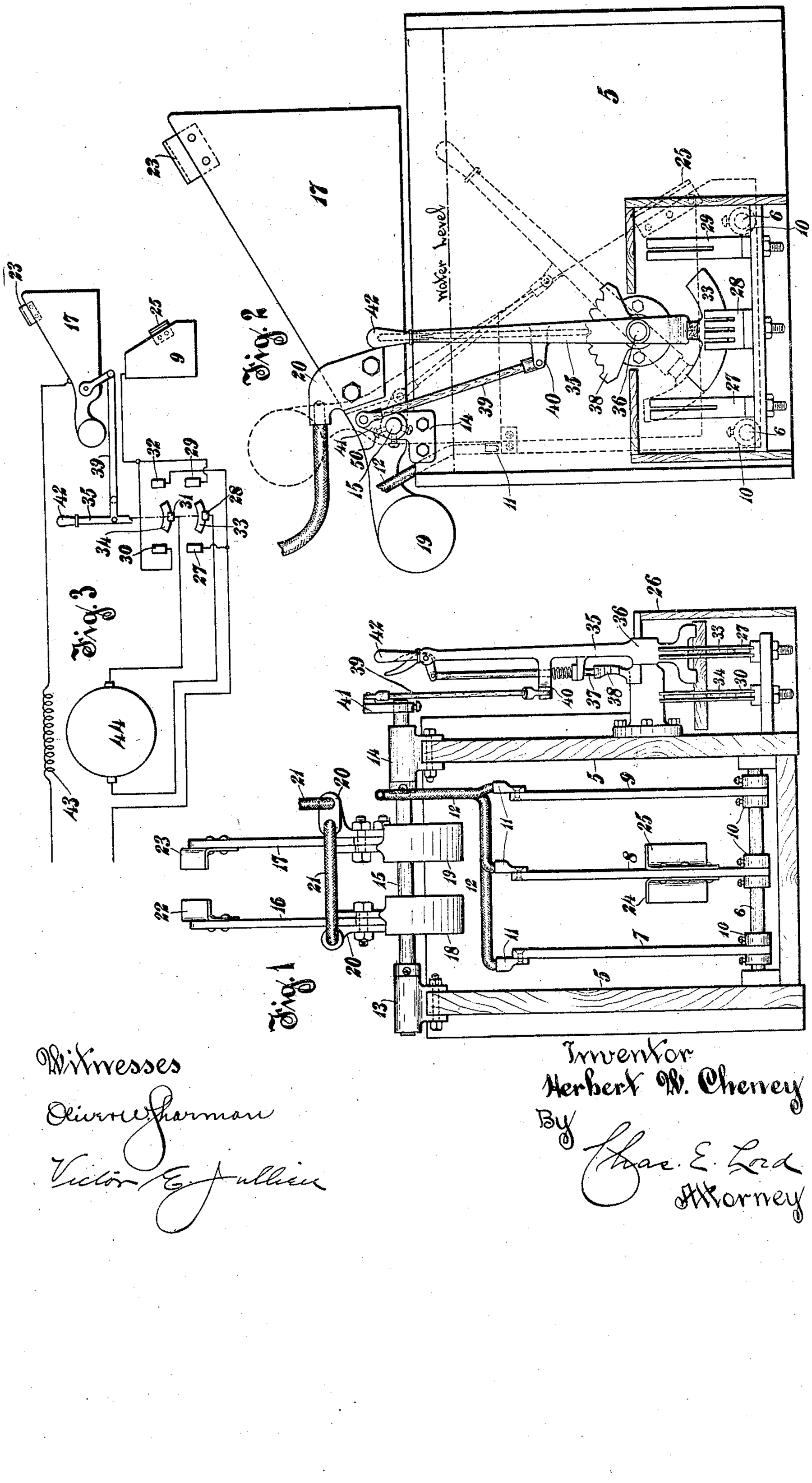

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LIQUID RHEOSTAT.

No. 891,232. Specification of Letters Patent. Patented June 23, 1908.

Application filed October 31, 1906. Serial No. 341,382.

To all whom it may concern:

Be it known that I, HERBERT W. CHENEY, a citizen of the United States, residing at Norwood, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Liquid Rheostats, of which the following is a full, clear, and exact specification.

My invention relates to liquid rheostats, and although capable of general use, it is particularly applicable for starting electric motors.

Where currents of very large amperage are to be regulated, or where a heavy load is to be placed on a generator, such as is necessary while testing machines, the liquid rheostat presents many advantages. Certain of the liquid rheostats now in common use are open to a variety of objections and it is therefore the object of my present invention to overcome these objections by employing a rheostat very simple in construction, compact in form and adapted for use in a great number of places; and to so combine it with a reversing switch that the two may be used together.

As shown, my invention is applied for starting electric motors, but obviously it is not limited to such use.

In one aspect my invention consists of a controller comprising a liquid rheostat, a reversing switch, and a common operating handle for the rheostat and reversing switch.

In a more specific aspect my invention comprises the combination of a liquid rheostat having fixed and movable plates, a reversing switch, and a common operating handle for the reversing switch and the movable plates so constructed and connected that when the reversing switch has been thrown in either direction the movable plates may be actuated throughout their range of movement without interrupting or changing the circuit connections of the reversing switch.

The details of my invention will be better understood from the following description and accompanying drawings and the novel features thereof will be definitely set forth in the claims.

Figure 1 is an end elevation of my improved rheostat, some parts being shown in section; Fig. 2 is a front elevation of the same, with the inclosing casing for the reversing switch shown in section; and Fig. 3 is a diagram showing my rheostat as connected for starting an electric motor.

The rheostat is made in the form of a water-tight rectangular wooden box or receptacle 5 containing water or other liquid and open at the top. Two rods 6 extend across the interior of this box near the bottom thereof. On these rods are supported a plurality of fixed plates 7, 8 and 9, these plates being adjustably fastened on the rods by means of collars 10. At the top of the plates 7, 8 and 9 are connectors 11 in which are placed the ends of conductors 12, joined in common to one side of the electrical circuit.

At the top of two sides of the receptacle 5 are placed bearings 13 and 14 in which is journaled a shaft 15. Mounted on this shaft are movable plates 16 and 17 counterbalanced by weights 18 and 19 and adjustably fastened to the shaft by screws 50. The plates 16 and 17 alternate in position with the plates 7, 8 and 9. In connectors 20 attached to the plates 16 and 17 are the ends of cables 21 which are connected in multiple to the other side of the electrical circuit. The plates 16 and 17 are normally in the position shown in Fig. 2 entirely out of the receptacle 5, but they can be lowered into the receptacle and immersed to a greater or less degree in the contents thereof by rotating the shaft 15. When the plates are fully immersed in the water in the receptacle 5, contacts 22 and 23 carried by them respectively engage with contacts 24 and 25 carried by the middle fixed plate 8 to short-circuit the liquid part of the rheostat and connect the two sides of the circuit together metallically.

Attached to the front of the box 5, is a smaller casing 26 for a reversing switch. In this casing are placed six fixed contacts 27 to 32, connected as shown in Fig. 3. With these fixed contacts coöperate two movable contacts 33 and 34. The movable contacts are arranged to always engage with the contacts 28 and 31 respectively and to be normally out of engagement with any of the other contacts but movable to engage either with the contacts 29 and 32 respectively, or 27 and 30 respectively. The movable contacts of this reversing switch are mounted on but insulated from a lever 35, pivoted at 36 to swing in either direction from the vertical position in which it is shown in Fig. 2. A manually released latch 37 is normally spring pressed into engagement with one of

the notches of the stationary notch plate 38 to hold the lever with its connected parts in any desired position. A connecting rod 39 of wood or other insulating material extends between a projection 40 on the lever 35 and the end of an arm 41 fixed on the end of the shaft 15. Thus the same handle 42 at the end of lever 35 is arranged to operate both the reversing switch and the movable plates of the rheostat.

When the handle 42 is in the vertical position as shown in Fig. 2, the movable contacts of the reversing switch engage only with the fixed contacts 28 and 31 respectively, and the movable plates 16 and 17 of the rheostat are entirely out of the water, as indicated. As the handle is moved toward either side of the vertical, the movable contacts of the reversing switch are swung to engage with others of the fixed contacts and the movable plates of the rheostat are lowered toward the water in the receptacle 5, and into it to complete the circuit after the reversing switch has made contact at one side or the other. In Fig. 3 this circuit is shown as the circuit of a motor whose field and armature are represented at 43 and 44 respectively, the direction of current through the armature being reversed by the reversing switch. When the handle has been moved far enough for the latch 37 to engage the first notch on either side of the center of the notch plate 38 small portions of the plates 16 and 17 are immersed in the water and the resistance of the rheostat is at its maximum. As the lever 35 is moved farther from the vertical the movable contacts of the reversing switch merely slide between the parts of the fixed contacts without changing the connections, and the plates 16 and 17 of the rheostat are lowered deeper into the water to diminish the resistance of the rheostat both because of the greater immersed area of said plates and because of the lessening of the distance between them and the fixed plates. When the lever 35 has been moved as far as possible from the vertical and the plates 16 and 17 have been lowered into the water to their utmost, the projections 22 and 23 engage with the projections 24 and 25 to short-circuit the liquid part of the rheostat and allow as high an electromotive force as possible to be impressed upon the motor to be regulated.

By moving the lever 35 backward toward the vertical, the resistance in the motor circuit can be increased and the circuit finally broken. By moving said lever to different sides of the vertical, similar results can be obtained, save that the motor rotates in the opposite direction.

Many modifications in the precise arrangements herein shown and described may be made without departing from the spirit of my invention. For instance the number of fixed and movable plates of the rheostat may be anything desired and the precise method of connecting the reversing switch and the rheostat may be widely varied. All such modifications which come within the scope of my invention I aim to cover in the following claims.

What I claim as my invention is:—

1. A controller comprising a liquid rheostat, a reversing switch, an operating handle for the reversing switch, and mechanical connections from said handle to the rheostat to operate the latter in the same direction when the handle is moved in either direction from its central position.

2. The combination of a liquid rheostat having fixed and movable plates, a reversing switch, and a common operating handle for the reversing switch and the movable plates so constructed and connected that when the reversing switch has been thrown in either direction the movable plates may be actuated throughout their range of movement without interrupting or changing the circuit connections of the reversing switch.

3. A water rheostat comprising a receptacle for the water, a fixed plate immersed in the water therein, and a movable plate which may be variably immersed in the water, in combination with a reversing switch and an operating handle therefor, and mechanical connections from the handle to the movable plate so arranged that the plate is moved in the same direction for a movement of the handle in either direction from its central position.

4. In a water rheostat, the combinatio. of a receptacle for the water, a plurality of connected fixed plates forming one electrode, a plurality of connected pivoted plates forming the other electrode, means for rotating the latter plates to vary their depth of immersion, and means for adjusting the perpendicular distance between adjacent plates.

5. In a water rheostat, the combination of a receptacle for the water, a plurality of connected fixed plates forming one electrode, a plurality of connected pivoted plates forming the other electrode, means for rotating the latter plates to vary their depth of immersion, and means for short-circuiting the liquid when the pivoted plates are most deeply immersed, said means being then immersed in the liquid.

6. In a water rheostat, the combination of a receptacle for the water, a plurality of connected fixed plates forming one electrode, a plurality of connected pivoted plates forming the other electrode, means for rotating the latter plates to vary their depth of. immersion, and projections from the electrodes arranged to engage when the rotatable plates are most deeply immersed.

7. In a water rheostat, the combination of a receptacle for the water, a plurality of con-

nected fixed plates forming one electrode, a plurality of connected pivoted plates forming the other electrode, means for rotating the latter plates to vary their depth of immersion, said fixed plates alternating in position with said pivoted plates, and means within the receptacle for short-circuiting the liquid part of the rheostat when the rotatable plates are most deeply immersed.

8. In a water rheostat, the combination of a receptacle for the water, a plurality of connected fixed plates forming one electrode, a plurality of connected pivoted plates forming the other electrode, means for rotating the latter plates to vary their depth of immersion, and projections from the electrodes arranged when the rotatable plates are most deeply immersed to engage to short-circuit the liquid of the rheostat.

9. In a water rheostat, the combination of a receptacle for the water, relatively movable plates, at least some of which can be variably immersed in the water in the receptacle, said plates forming the rheostat electrodes, and means within the receptacle for short-circuiting the liquid part of the rheostat when all the plates are immersed to a predetermined point.

10. In combination, a liquid rheostat having a fixed plate and a counterbalanced movable plate, a reversing switch, and a common operating handle for the reversing switch and the movable plate.

11. A water rheostat comprising a receptacle for the water, fixed plates immersed in the contents of said receptacle, and counterbalanced movable plates which may be variably immersed in said contents, in combination with a reversing switch, and a common operating handle for the reversing switch and the movable plates.

12. In a water rheostat, the combination of a receptacle for the water, an electrode formed of a plurality of connected fixed plates, a second electrode formed of a plurality of connected pivoted plates, all of said plates being laterally adjustable, and means for rotating the pivoted plates to vary their depth of immersion.

13. In a water rheostat, the combination of a receptacle for the water, an electrode formed of a plurality of connected fixed plates, a second electrode formed of a plurality of connected pivoted plates, said pivoted plates being laterally adjustable, and means for rotating the latter plates to vary their depth of immersion.

14. In a water rheostat, the combination of a receptacle for the water, an electrode formed of a plurality of connected fixed plates, said plates being laterally adjustable, a second electrode formed of a plurality of connected pivoted plates, and means for rotating the latter plates to vary their depth of immersion.

In testimony whereof I affix my signature, in the presence of two witnesses.

HERBERT W. CHENEY.

Witnesses:
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