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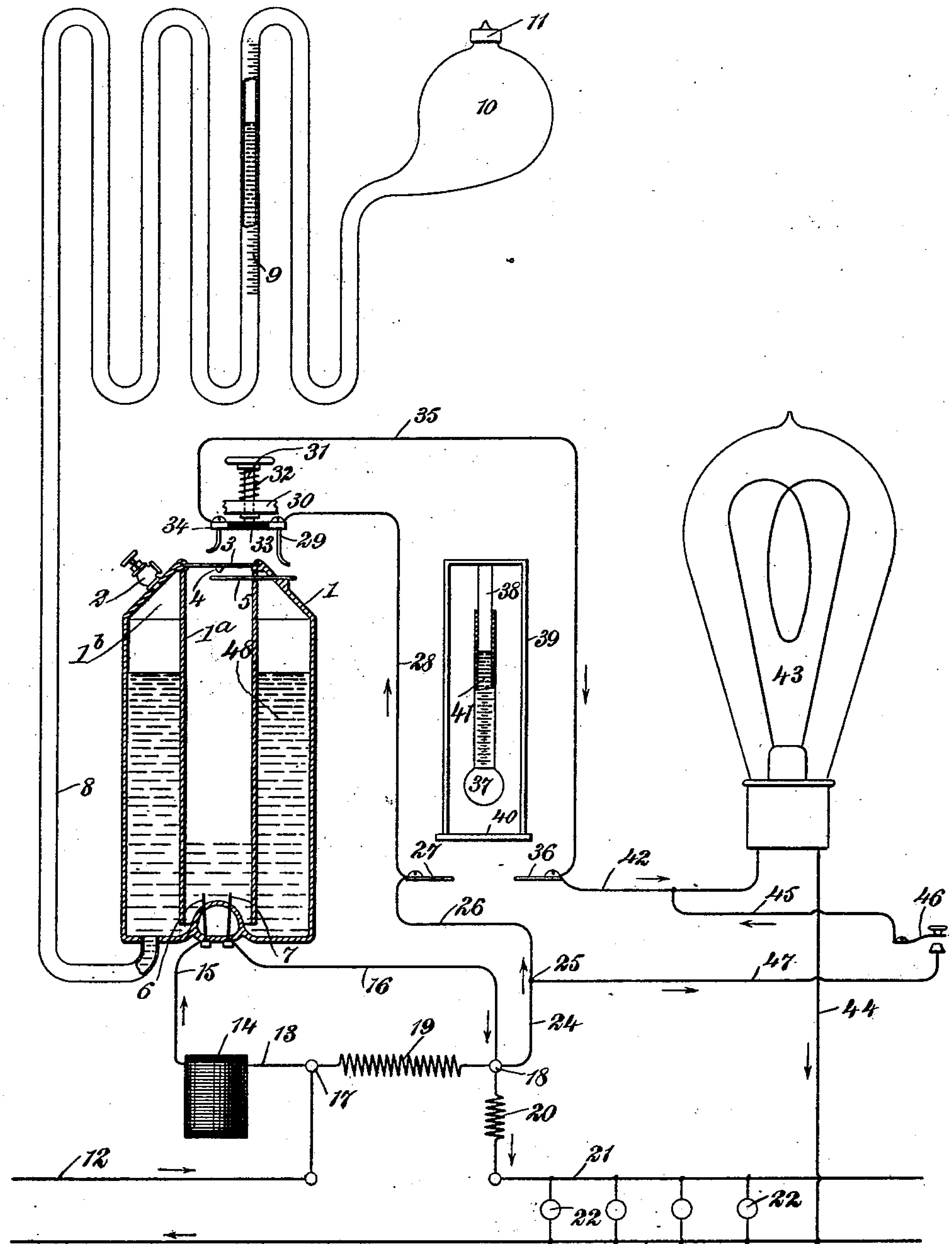
W. A. SHERLOCK.

AMPERE HOUR METER.

(Application filed June 18, 1902.)

(No Model.)



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AMPERE-HOUR METER.

SPECIFICATION forming part of Letters Patent No. 714,046, dated November 18, 1902.

Application filed June 18, 1902. Serial No. 112,163. (No model.)

To all whom it may concern:

Be it known that I, WALTER A. SHERLOCK, a citizen of the United States, and a resident of San Francisco, in the county of San Francisco and State of California, have invented new and useful Improvements in Ampere-Hour Meters, of which the following is a full, clear, and exact description.

My invention relates to ampere-hour meters, my object more particularly being to produce a neat, compact, and reliable amperemeter which after being used can be readily restored to its condition before it is again used.

Reference is to be had to the accompanying drawing, forming a part of this specification, in which the figure represents my invention as applied to a system of electric-light wiring.

A hollow vessel 1, made preferably of heavy glass, is provided with a valve 2 and with a diaphragm 3, the latter being of platinoid sealed into the glass and provided with a contact-point 4. Mounted within the hollow vessel 1 and depending from the top thereof is a tube 1^a. The connection of the tube with the top of the vessel is air-tight, while the lower end of the tube is open, as shown. An electrode 5 is sealed into the glass vessel 1, the arrangement being such that when the diaphragm 3 is depressed a contact is made between the contact-point 4 and the electrode 5. Into the bottom of the vessel are sealed electrodes 6 7, preferably of platinum, exposing but little surface. A sinuous tube 8, provided with graduations 9, is sealed into the bottom of the glass vessel 1 and is provided with a pear-shaped bulb 10, this bulb being surmounted by a valve 11. An electric-light main 12 is connected with a wire 13, which is in turn connected with a coil 14, of fine wire. From this coil a wire 15 leads to the electrode 6. From the other electrode 7 a wire 16 leads to a junction 18. Between the junction 18 and a junction 17 is a resistance-coil 19. Connected with the junction 18 is another resistance-coil 20, which leads to the wire 21, feeding the lamps 22, these lamps being connected between the wires 21 and 23. The resistance 19 should be sufficient to force a small portion of the current through the coil 14 and the electrolyte.

From the junction 18 a wire 24 leads upward through a junction 25, and from the junction 25 a wire 26 leads to a contact 27, from which contact a wire 28 leads to a spring-electrode 29. Upon a bracket 30 is mounted a sliding stem 31, normally pressed upward by a spiral spring 32. This sliding stem carries a disk 33, preferably of vulcanite, and is provided with spring tongue-contacts 29 and 34. The contact 34 is by means of a wire 35, connected with a contact 36. Adjacent to the contacts 27 and 36 is a small thermometer 37, provided with a liquid 41, preferably mercury, upon which a piston 38 is mounted so as to move therewith.

A frame 39 is rigidly connected with the piston 38. The bottom of this frame 39 is formed of a metallic bar 40, which is free to close electric communication between the contacts 27 and 36 when the piston 38 is lowered by the shrinkage of the liquid 41 in the thermometer. By this arrangement when the thermometer drops to a predetermined point—say zero, centigrade—the metallic bar 40 is brought into engagement with the contacts 27 and 36, thereby forming a bridge over which the current may pass. From the contact 36 a wire 42 leads to the incandescent lamp 43, this lamp being connected by a wire 44 with the electric-light main 23. From the wire 42 another wire 45 leads to a push-button or key 46, and from this member another wire 47 leads back to the junction 25. The electrolyte 48 in the vessel 1 is preferably composed of distilled water admixed with a small proportion of sulfuric acid. Such an electrolyte offers less resistance when heated than when cooled—that is to say, when the temperature of such an electrolyte is raised its conductivity is increased. In the case of the resistance-coil 14, however, the conductivity decreases with the heat. The resistance-coil 14 and the electrolyte 48 are intended to balance each other in the manner of electrical resistance. If they are mutually heated, the increase in the conductivity of the electrolyte is compensated by the decrease of the conductivity of the resistance-coil and its connection, and vice versa. The idea is to prevent changes in temperature from unduly affecting the accuracy of the meter.

When the push-button 46 is closed, the lamp 43 is lighted, thereby raising the temperature of the surrounding objects.

The operation of my device is as follows: The several parts being connected as indicated, the current from the main 12 passes up to the junction 17, where it divides into two branches commensurate with the conductivity of two circuits. The greater portion of the current traverses the resistances 19 and 20 and thence goes directly through the lamps 22 to the main 23. A small portion of the current passes from the junction 17 through wire 13, resistance-coil 14, wire 15, electrode 6, electrolyte 48, electrode 7, wire 16, junction 18, resistance-coil 20, wire 21, and lamps 22 to the main 23. This decomposes the electrolyte 48 in the tube 1^a, and the gases thus dissociated accumulate in the upper portion of the tube 1^a, thereby forcing the electrolyte 48 downward and forcing a part of the same into the tube 8, as at 1^b. Above the liquid in the vessel 1 is a body of air of substantially constant volume, which acts as a cushion and forces a part of the liquid 48 out into the sinuous tube 8. The quantity thus displaced may be read by means of the graduations 9 on the tube 8. After a predetermined number of amperes have passed through the apparatus the liquid in the tube reaches the pear-shaped bulb 10. When this result is accomplished, the limit of the meter is reached and the apparatus should be restored to its former condition.

In order to restore the electrolyte to the vessel 1, the movable stem 31 is depressed once or twice by the fingers, thereby causing the contact-point 4 to engage and disengage the electrode 5. The spring-contacts 34 and 29 meanwhile engage the platinoid diaphragm 3 and the outer end of the electrode 5. Sparks are thus produced by the members 4 and 5 inside of the glass vessel 1, and by causing the union of the dissociated gases they produce a partial vacuum, whereupon the ordinary atmospheric pressure forces the electrolyte from the tube 8 back into the tube 1^a. If desired, the valve 2 may be opened while the gases are exploded in order that the air confined in the space 1^b may have a free vent. If this is done, the same volume of air should be subsequently replaced in the space 1^b.

When the operative desires to take his periodical reading of the meter, he depresses the push-button 46, thereby lighting the lamp 43 and allowing the same to remain lighted for a short interval. The lamp should be arranged in such a position as to heat as equally as practicable the electrolyte 48, the resistance-coil 14 and its immediate connections, and the thermometer 37.

The object in lighting the lamp is to raise the temperature of the thermometer, the electrolyte, and the resistance-coil to a predetermined temperature in order that the expansion or contraction of the gases by heat or cold may not interfere with the accuracy of the meter.

Suppose now that the general temperature drops down to zero. The electrolyte is prevented from freezing, because when the thermometer causes the bar 40 to be lowered and a short circuit is formed from the contact 27 over to the contact 36 the lamp is automatically lighted, the current passing from the wire 26 through the contacts mentioned, through the wire 42 and lamp 43 directly to the main 23. As soon as the temperature is raised a little above zero the bar 40 is lifted from the contacts 27 and 36, the lamp thus being extinguished. By this arrangement the electrolyte is prevented from freezing. The scale 9 preferably denotes ampere-hours, so that the reading of the meter is directly in units thereof.

I find from experience that the meter above described is quite accurate. I prefer a current of one hundred and twenty volts and of any amperage suitable for ordinary incandescent lighting.

Of course for warm climates the use of the incandescent lamp is unnecessary.

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

1. An ampere-hour meter, comprising a receptacle containing an electrolyte, of a kind in which the electrical conductivity is increased by heat, means for passing a current through said electrolyte for the purpose of producing gases, means for measuring the volume of said gases, a resistance, the conductivity of which is diminished by heat, said resistance being in circuit with said electrolyte, and means controllable at will for heating said electrolyte, said gases and said resistance to a predetermined temperature.

2. An ampere-hour meter, comprising a receptacle containing an electrolyte of a kind in which the electrical conductivity is increased by heat, means for passing a current through said electrolyte for the purpose of producing gases, means for measuring the volume of said gases, a resistance, the conductivity of which is diminished by heat, said resistance being in circuit with said electrolyte, a member controllable at will for heating said electrolyte, said gases and said resistance, to a predetermined temperature, and mechanism for automatically actuating said member, in case the general temperature reaches a predetermined minimum limit.

3. An ampere-hour meter, comprising a closed vessel containing an electrolyte, a sinuous hollow passage connected with said vessel for receiving a portion of said electrolyte, said passage being provided with a graduated scale, and means controllable by an electric current, for dissociating gases from said electrolyte within said closed vessel, thereby displacing the portion of said electrolyte from said vessel into said passage.

4. An ampere-hour meter, comprising a closed vessel containing an electrolyte, a sinuous passage connected with said vessel for receiving a portion of said electrolyte, said passage being provided with a graduated scale, means controllable by an electric current for dissociating gases from said electrolyte, thereby displacing a portion of said electrolyte from said vessel into said passage, and means controllable at will, for causing said gases to recombine within said vessel, thus restoring the original volume of said electrolyte therein.

5. An ampere-hour meter, comprising a closed vessel containing an electrolyte, electrical mechanism for disintegrating said electrolyte, thus dissociating the gases thereof and thereby displacing a portion of said electrolyte, a hollow passage connected with said vessel and free to receive a quantity of said electrolyte displaced therefrom, means for indicating the amount of electrolyte thus displaced, and an electric mechanism controllable at will, for causing the recombination of said gases within said vessel, thereby producing a partial vacuum therein and forcing the displaced portion of the electrolyte back into said closed vessel.

In testimony whereof I have signed my name this specification in the presence of two subscribing witnesses.

WALTER A. SHERLOCK.

Witnesses:
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