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W. I. THOMSON.

LOW WATER ALARM.

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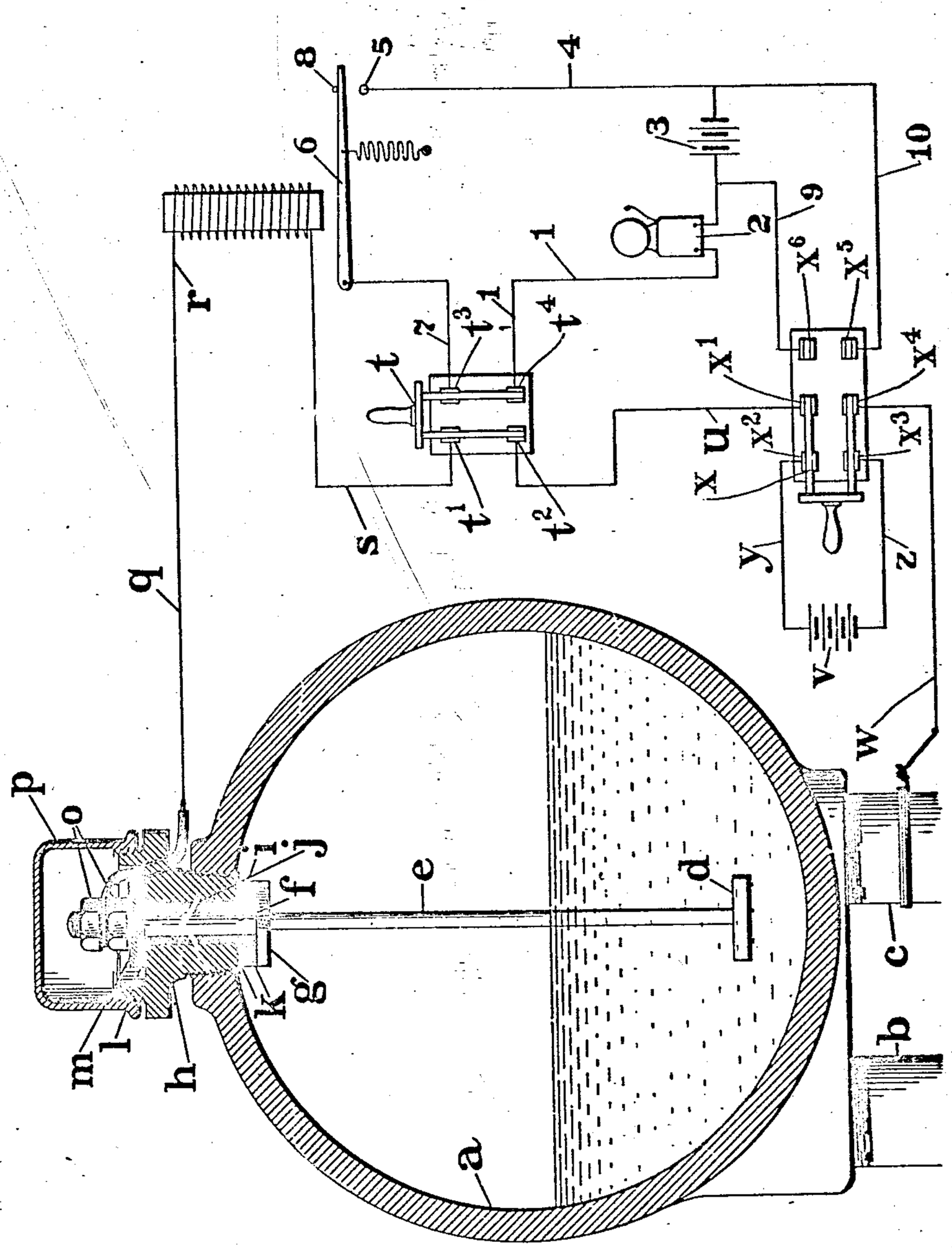

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LOW-WATER ALARM.

No. 838,823. Specification of Letters Patent. Patented Dec. 18, 1906.

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To all whom it may concern:

Be it known that I, WILLIAM I. THOMSON, residing at Newark, in the county of Essex, State of New Jersey, have invented certain new and useful Improvements in Low-Water Alarms, of which the following is a full, clear, and exact description.

My invention relates particularly to a low-water alarm for a hot-water car-heating system; but it will be understood that the invention, with slight changes in the details of the construction, can be utilized in other situations. It must be understood, therefore, that the invention is not limited to hot-water heating systems, but for the purpose of convenience, clearness, and conciseness I shall describe the invention as applied to a hot-water heating system for cars, making reference to the Baker system as an example of a system with which my invention can be incorporated.

My invention has for its further object to provide means in alarm systems generally whereby upon the occurrence of an alarm a test may be made to ascertain whether or not the contingency for which the alarm has been provided has happened or whether some defect exists in the system by reason of which a false alarm may have been given.

In the accompanying drawing I have shown a diagrammatic view, partly in sectional detail, of a low-water alarm and circuit connections embodying my invention.

As is well known, the Baker heating system for heating cars consists, in the main, of a stove supplied with a coil of pipe within the fire-pot end of an expansion-drum on the roof or above the stove and connecting by a riser with the upper end of the coil, and a system of pipes extending from the expansion-drum down to the floor of the car and under the seats. This circuit of pipes is filled with salt water or brine up to the overflow of the expansion-drum, which is then closed tightly. When the water becomes heated in the normal operation of the system and expands, the whole system is subjected to pressures up to two hundred or three hundred pounds per square inch. Under these circumstances a leak often occurs in some out-of-the-way place, which is not readily discoverable and which is consequently not discovered. In consequence the water leaking from the pipe system causes the water in the drum and coil to recede, and the coil in consequence burns out, and the car is sometimes damaged by the hot pipes.

The various low-water alarms depending upon floats which make an electrical contact upon the water receding from the drum are open to the serious objection that the contacts become corroded by the salt water and the spray and the alarm is not given when it is most needed. This same corrosive action constitutes an objection to alarms with hinged or sliding parts which are supposed to move when the water recedes, but which in reality become covered with salt and rust, generally stick, and are consequently unreliable.

In the construction in which my invention is embodied and which is shown in the drawings there are no moving parts or floats. An iron plate is held about one inch above the bottom of the drum upon a suitable rod and insulated from the drum, and the circuit of a relay is completed through the salt water in the drum, so that so long as the water-level remains high enough in the drum the relay will hold the alarm apparatus out of action. When the water recedes, the circuit is opened, thereupon causing the relay to release its armature to complete a local circuit and ring a bell to call the porter's attention to the fact that the fire or steam in the fire-pot of the stove or the transfer-heaters must be shut off. The relay and its battery may be placed in any convenient position and the relay connected in the electric system of the cars, just like an additional push-button in the ordinary call-circuit for the porter of the car.

In the drawing I have shown, by way of example, one embodiment of the complete invention wherein means for testing are provided, the closed-circuit alarm system proper being combined with an open-circuit testing system, which may be of any desired character, but which may conveniently be the ordinary call-circuit of the car, which being in constant use is constantly under supervision, whereas the alarm-circuit being used only in emergencies is not under such rigid observation.

Having described my invention in general terms, I will proceed to describe the specific embodiment shown in the drawings.

In the drawing, *a* is a section of the cast-

iron drum of a hot-water heating system partly filled with salt water. Communicating with this drum is the ascending leg or riser-pipe *b* of the hot-water heating system, which also includes a stove or transfer-heater. (Not shown.) The descending leg *c* of the same circulating system leads from the drum. An iron plate *d* is supported a short distance above the bottom of the tank upon an iron rod *e*, which screws into the iron stud *f*. This stud *f* is provided with a shoulder *g*, insulated from a screw-plug *h* by means of a mica washer *i* and a fiber sleeve *j*, suitable lead washers *k* being used, if desired. The iron stud *f* is further provided with mica and iron washers *l m*, respectively, and a plurality of nuts *o* for effecting electrical connections. An ordinary pipe-cap *p*, screwed over the plug, protects the connection from the weather, and a wire *q*, connected to the stud, leads through a hole in the casting or plug *h* to the relay *r*. The relay *r* is connected by a wire *s* to one contact t' of a suitable knife-switch or other desired switch *t*. The other contact t^2 of the switch *t* is connected by wire *u* with one pivotal connection x' of the switch *x*. A wire *y* connects one contact x^2 with one pole of the battery *v*, and a wire *z* connects the other pole of the battery *v* with the contact x^3 of the switch *x*. The other pivotal connection x^4 of the switch *x* is connected by a wire *w* to the pipe *c* or any other pipe or part in electrical connection with the cast-iron drum *a*. The circuit connections just described are those of the closed-circuited alarm system proper.

The local circuit of the relay is as follows: A wire 1 leads from the contact t^4 of the switch *t* to a bell 2, thence by battery 3 to wire 4 to the back contact 5 of the relay armature 6, which is connected by wire 7 to the contact t^3 of the switch *t*.

The operation of the apparatus so far described will be readily understood. So long as the iron plate *d* is immersed in the water the battery-circuit *v* will be complete and the armature 6 will be held against its front stop 8. When the water recedes below the iron plate, the relay-circuit is thereby broken and the armature 6 will swing against the back-stop 5, closing the local bell-circuit and giving the alarm. It will be obvious, however, that as the battery *v* is constantly on closed circuit it will eventually fail, and this too would cause the alarm to be given.

In order to provide means for readily determining whether or not the alarm has been properly given or whether or not the battery has failed, I connect one pole of the battery 3 by a wire 9 to the contact x^6 of the switch *x* and the other pole of the battery 3 by wire 10 with another contact x^5 of the switch *x*. This battery 3 being on open circuit will be constantly in condition for action, and when the alarm is given in order to make the required test the switch *x* may be swung from the contacts x^2 x^3 to the contacts x^5 x^6, thereby inserting the battery 3 into the main alarm-circuit. If the alarm has been given by reason of a failure of the battery and the circuit is otherwise complete, the armature of the relay will be drawn up and the bell will cease ringing. If, however, the circuit is broken at any point—for instance, if the liquid-level in the drum is below the electrode or contact *d*—no current will flow through the main alarm-circuit from the battery 3 and the bell 2 will continue to ring, thus indicating positively that the water is low in the drum.

The object of making the plate *d* and the rod *e* of iron is to prevent making an electric battery, which would of course occur if the drum-casing and the plate *d* were of different metals. The lead washers *k* on each side of the mica washer *i* is to make a tight joint. It is quite difficult to make an insulated joint tight when subjected to two hundred or three hundred pounds pressure; but I have found that a thin sheet of lead on the sides of the mica will effectually make a tight joint.

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

1. In a system of the class described, in combination, a receptacle adapted to contain a liquid, a relatively insulated terminal within said receptacle adapted to be electrically connected therewith by said liquid, indicating means, a source of electric current adapted to be placed in circuit with said indicating means, means adapted upon connection between said terminal and said receptacle being broken to complete said circuit through said indicating means, a source of electric current within said last-mentioned means, and means adapted to substitute said first-mentioned for said last-mentioned source of current.

2. In a system of the class described, in combination, a circuit comprising normally closed circuit-breaking means and a source of current, a second circuit comprising indicating means and a source of current, means adapted upon said first-mentioned circuit being broken to complete said second circuit, and means adapted to substitute said second source of current for said first source of current in said first circuit.

3. In a system of the class described, in combination, a metallic receptacle adapted to contain a saline liquid, a relatively insulated terminal of a similar metal within said receptacle and normally projecting within said liquid, a circuit comprising said terminal and a source of current, a second circuit comprising indicating means and a source of current, means adapted upon said first circuit becoming broken to close said second circuit and operate said indicating means, and

means adapted to substitute said second source of current for said first source in said first circuit.

4. In a system of the class described, in combination, a metallic receptacle adapted to contain a saline liquid, a relatively insulated terminal of a similar metal within said receptacle and electrically connected therewith by said liquid, a circuit comprising said terminal and a source of current, indicating means, means adapted to render operative said indicating means on said circuit becoming broken, a second source of current, and means adapted to substitute said second for said first source of current in said circuit.

5. In a system of the class described, in combination, a metallic receptacle adapted to contain a saline liquid, a terminal of a similar metal within said receptacle and normally connected therewith by said liquid, insulating means interposed between said terminal and said receptacle, metallic means relatively soft with respect to said receptacle interposed between said insulating means and the parts upon which the said insulating means are mounted, a normally closed circuit comprising said terminal and a source of current, a normally open circuit comprising indicating means and a second source of current, means adapted upon said liquid breaking electrical connection between said terminal and said receptacle to close said second circuit and render operative said indicating means, and means adapted to substitute said second for said first source of current in said first circuit.

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Witnesses:
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