No. 678,925. Patented July 23, 1901.

C. E. ZIMMERMANN.

HIGH OR LOW WATER ALARM.

(Application filed Aug. 1, 1900.)

(No Model.) 2 Sheets—Sheet 1.

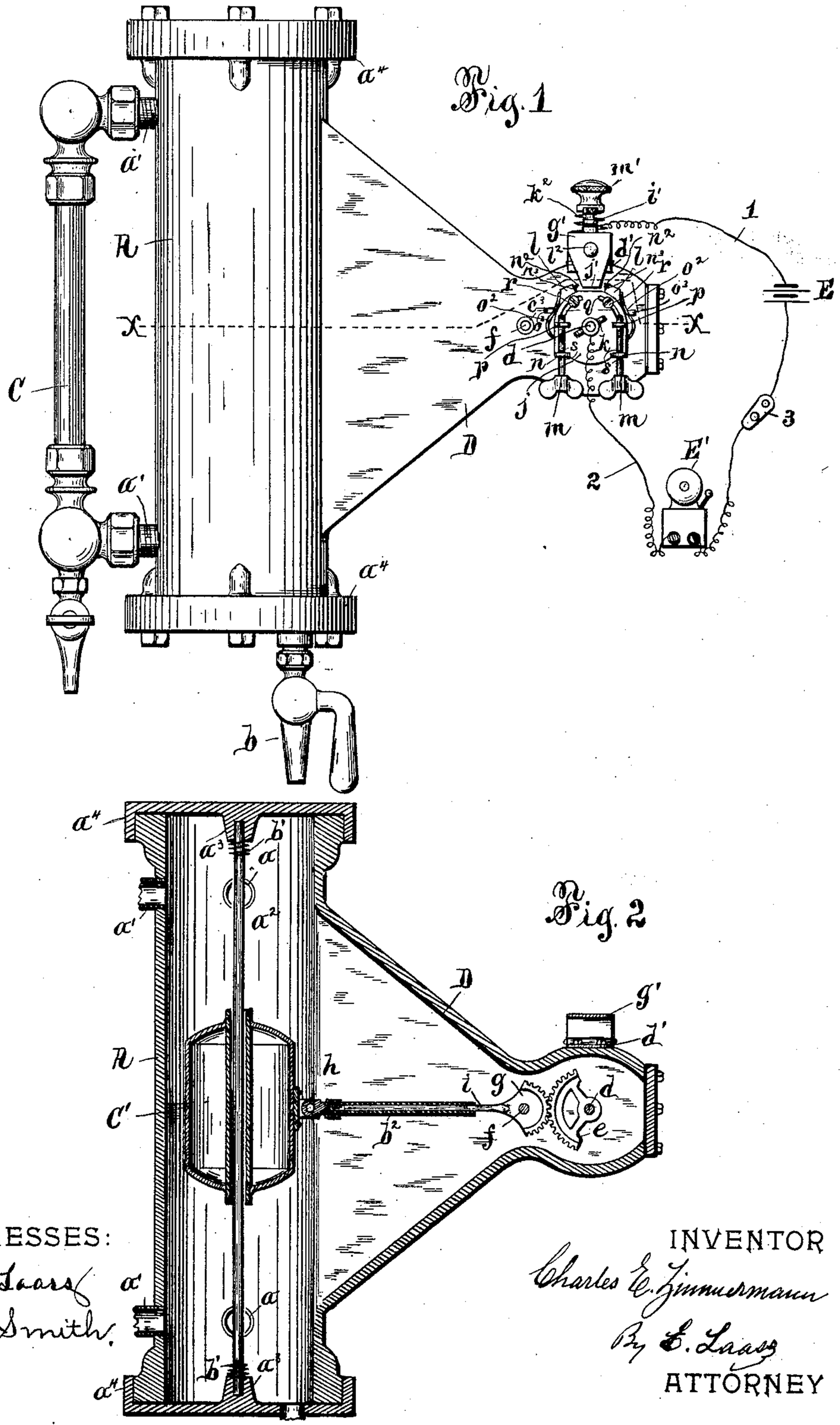

Fig. 1

Fig. 2

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Fig. 3

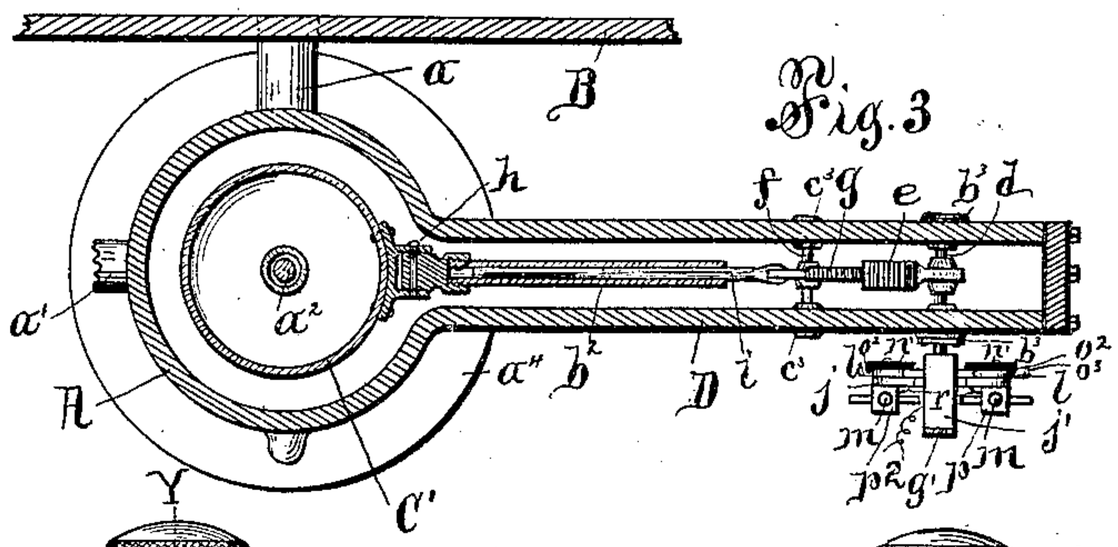


Fig. 4

Fig. 5

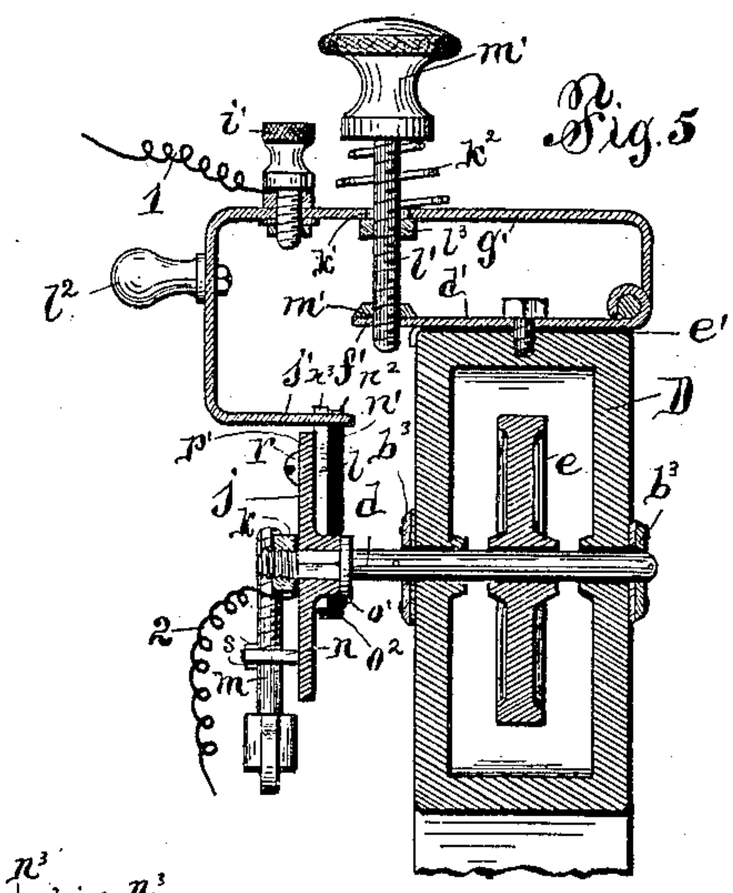


Fig. 6

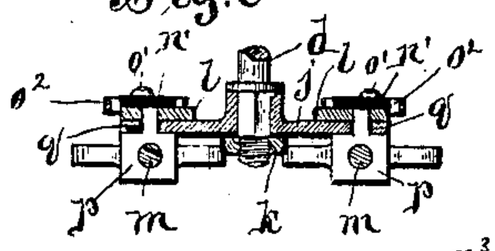


Fig. 8

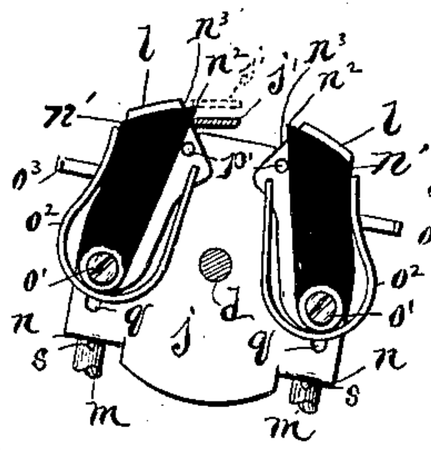


Fig. 7

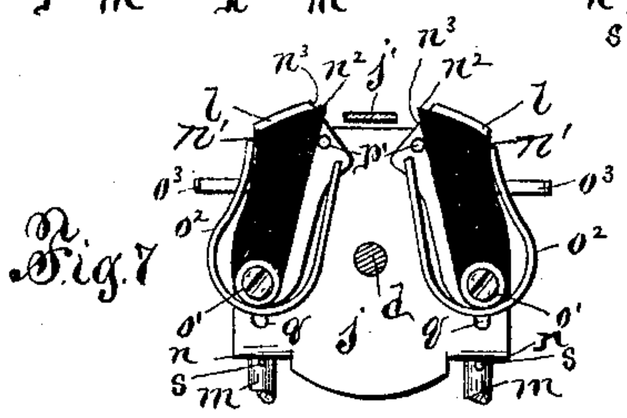


Fig. 9

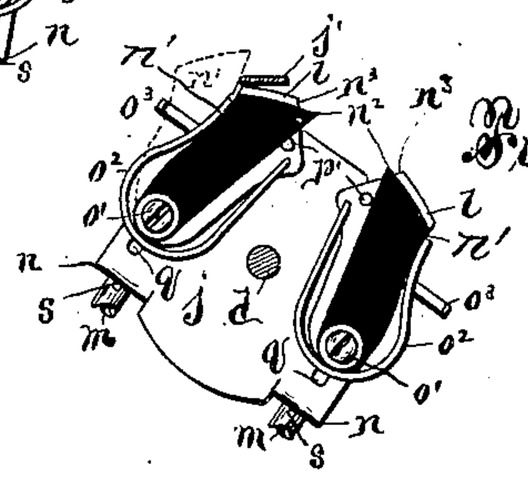
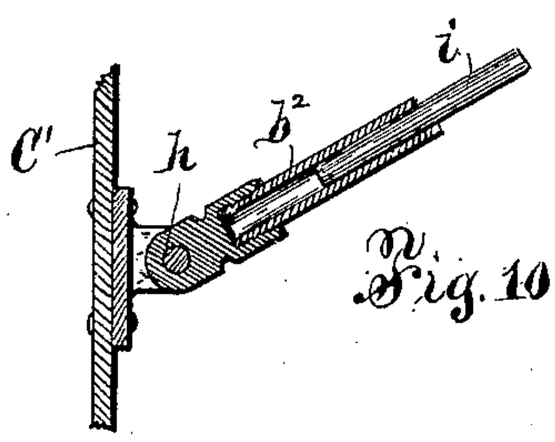


Fig. 10



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UNITED STATES PATENT OFFICE.

CHARLES E. ZIMMERMANN, OF SYRACUSE, NEW YORK.

HIGH OR LOW WATER ALARM.

SPECIFICATION forming part of Letters Patent No. 678,925, dated July 23, 1901.

Application filed August 1, 1900. Serial No. 25,510. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. ZIMMERMANN, a citizen of the United States, and a resident of Syracuse, in the county of Onondaga, in the State of New York, have invented new and useful Improvements in High or Low Water Alarms, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention relates to the class of high and low water alarms in which an electric signal is employed and is controlled by the usual float disposed within a water column or chamber communicating with a boiler or tank.

The main object of the present invention is to employ electrical devices which shall operate automatically to sound an alarm and in which the circuit can be opened by hand during the sounding of said alarm, and, furthermore, to provide means for temporarily maintaining the circuit opened, whereby the same will be again automatically closed to sound a second alarm. The purpose of said second alarm is to insure attention to the boiler of the person in charge in case he fails to act after breaking the circuit, and thus serves as a safeguard.

The invention consists of a high and low water alarm comprising, essentially, an electric circuit including a signal, a circuit-closer operating automatically to sound an alarm, means to operate the circuit-closer by hand to break the circuit, and a detent temporarily maintaining the circuit open, whereby a second alarm will be automatically sounded, as hereinafter more fully described, and set forth in the claims.

In the accompanying drawings, Figure 1 is a front view of my improved high and low water alarm. Fig. 2 is a longitudinal section of the same. Fig. 3 is a transverse section on line X X in Fig. 1. Fig. 4 is an enlarged front view of the electrical devices. Fig. 5 is a vertical transverse section on line Y Y in Fig. 4. Fig. 6 is a horizontal transverse section on line Z Z in Fig. 4. Figs. 7, 8, and 9 are enlarged detail rear face views of the disk which constitutes an electric terminal, showing the circuit making and breaking devices in their different positions. Fig. 10 is an enlarged detail longitudinal section of the extensible connection of the float.

Referring to the drawings, A represents the water-column, which communicates with the boiler or tank B by means of pipes *a a* in the well-known manner and is provided with the usual blow-off cock *b*.

C denotes the well-known water-gage, which is attached to the water-column by means of the usual pipes *a′ a′*.

C′ is the float, which is disposed within the water-column and is provided with a vertical guide-rod a^2, secured at its ends in sockets a^3 a^3, formed in the heads or caps a^4 a^4 of said water-column. To the end portions of the guide-rod a^2 I prefer to attach coiled springs *b′ b′* for the purpose of cushioning the float when it ascends or descends to the ends of the water-column, thereby relieving the various mechanisms connected to the float from jar and strain.

D represents a hollow arm, which extends from and communicates with one side of the water-column and is preferably formed integral therewith, as clearly shown in Figs. 2 and 3.

E represents the batteries of an electric circuit, which is composed of the wires 1 and 2. E′ represents a bell, which is included in the circuit, and 3 denotes the usual and well-known switch.

The outer end of the hollow arm D is preferably formed with an enlargement for the purpose of supporting the electrical devices and to accommodate the gearing employed, which will be shortly described. Extending transversely through the enlarged portion of the arm D is a rock-shaft *d*, which has its front end projecting outside of the arm, and to said shaft within the arm is secured a segmental gear *e*. Adjacent to the shaft *d* and parallel thereto is another rock-shaft *f*, extending through the arm D, to which latter shaft is secured a segmental gear *g*, which meshes with the first-named gear *e*. The face of the gear *g* is somewhat narrower than that of the other gear for the purpose of grinding out the sediment which is liable to collect between the gears.

The float C′ and the gear *g* are united by an automatically-extensible connection, which is essential to allow the float to ascend and

descend and at the same time impart a uniform movement to the gears. Said connection consists, preferably, of a sleeve b^2, extending lengthwise through the arm D and pivoted at one end to said float, as indicated at h, and a rod i, sliding in said sleeve and rigidly secured at its outer end to the aforesaid gear, as clearly shown in Figs. 2, 3, and 10.

I provide suitable packing for the shafts d and f, as indicated at b^3 and c^3, respectively, to prevent leakage of the water.

On the projecting end of the rock-shaft d is mounted a metal disk j, which is rigidly secured thereto by means of a thumb-screw k, applied to a screw-threaded portion of the shaft, whereby said disk receives oscillatory motion. Said disk j constitutes one of the terminals of the electric circuit, the wire 2 being connected thereto by the thumb-screw k, which serves as a binding-screw. Therefore the shaft d is insulated from the arm D, as clearly shown in Fig. 5.

$l\ l$ denote two contact-pieces, which consist of metallic plates secured adjustably to the back of the disk j, which adjustment is provided for the purpose of setting said contact-pieces a greater or less distance apart. Said adjustment is effected by means of screws $m\ m$, passing freely through ears $n\ n$, projecting from the front face of the disk j and engaging screw-threaded eyes $o\ o$, formed in similar ears $p\ p$, which latter ears are rigidly secured to said contact-pieces $l\ l$ and project through segmental slots $q\ q$, formed in the disk. To retain said contact-pieces in their adjusted positions, set-screws $r\ r$ are provided. The screws $m\ m$ are provided with transverse pins directly above and below the ears $n\ n$, as shown at $s\ s$, to prevent longitudinal movement of the screws.

On top of the enlargement of the hollow arm D is rigidly secured a plate d', which is insulated from the arm, as shown at e', and is formed with an extension f' at its front end, as clearly shown in Fig. 5.

g' represents a metallic arm which forms the other terminal of the electric circuit and is hinged at its rear end to the corresponding end of the plate d', the wire 1 of the circuit being connected to said arm by means of the usual binding-screw i'. The front end portion of the arm g' forms the circuit-closer (indicated at j') and is disposed between the contact-pieces $l\ l$ on the aforesaid disk j, and thus is adapted to engage either contact-piece, according to the movement of the disk, which movement is controlled by the ascent and descent of the float C', and the arm is provided with a handle l^2, by which to raise the circuit-closer to break the circuit, as hereinafter more fully described. Said arm g' is formed with a hole k', through which freely passes a screw l', which engages a screw-threaded eye m', formed in the aforesaid extension f' of the plate d', and is provided with a nut l^3 under the arm, whereby the free end of the arm can be adjusted to set the circuit-closer j' a proper distance from the contact-pieces. In order to allow the arm g' to yield when the circuit-closer engages the contact-pieces, I provide a coiled spring k^2, which surrounds the screw l' and is disposed between the arm and head m' of the screw.

$n'\ n'$ represent two detents, which are employed for the purpose of temporarily holding the circuit-closer j' out of engagement with the contact-pieces $l\ l$ after said circuit-closer has been raised to break the circuit, and they consist of plates of insulating material, which are pivoted to the lower portions of the contact-pieces, as indicated at $o'\ o'$. Said detents are formed with points $n^2\ n^2$, which project over the inclined edges $n^3\ n^3$ of the contact-pieces and extend above the circuit-closer j', whereby they are adapted to engage said circuit-closer when the aforesaid disk j is turned, as clearly shown in Figs. 4, 7, 8, and 9. To allow the detents to yield when they engage the circuit-closer, I provide springs $o^2\ o^2$, which are preferably of U shape and are attached at one end to the inner edges of the contact-pieces $l\ l$ and extend under the pivoted ends of the detents and bear with their other ends on the outer edges of the same. Said springs also serve to force the detents to their normal positions when released from their engagement with the circuit-closer.

$o^3\ o^3$ denote stops, which are employed for the purpose of limiting the outward movement of the detents, so as to protect the springs from breaking, and they consist, preferably, of arms projecting from the outer edges of the contact-pieces $l\ l$ and formed with shoulders at their ends, which the detents engage, although any other form of stop may be used.

I also provide stops $p'\ p'$ to limit the inward movement of the detents, which latter stops consist of pins projecting from the rear face of the contact-pieces $l\ l$, as shown in Figs. 7, 8, and 9.

The operation of my described apparatus is as follows: When the float C' is midway between the ends of the water-column A, the circuit-closer j' is between the contact-pieces $l\ l$ and out of engagement therewith. Thus the circuit is open. In case the water in the boiler to which the water-column is connected rises or drops from the water-line the float ascends or descends in the usual manner, whereby the gears g and e are operated by means of the sleeve b^2 and sliding rod i, which connect the float and gear g, as hereinbefore described. By either movement of the float the said gears actuate the rock-shaft d, whereby the disk or terminal j is turned and one of its contact-pieces $l\ l$ brought with its inclined edge against the circuit-closer j', and thus the alarm is sounded, and at the same time the point of the adjacent detent is made to engage the circuit-closer, as shown in Fig. 8. When the parts are in the position just described, the float has made a partial ascent or descent. By lifting the free end of the

arm or terminal g' by means of the handle l^2 the circuit will be broken, and at the same time the detent yields and is disengaged from the circuit-closer and is forced back to its normal position, whereby the circuit-closer will ride on the same when dropped, and is thus held up out of contact with the contact-piece l to maintain the circuit open, as shown in Fig. 9. As the float continues to move the disk is turned farther, whereby the contact-piece is again brought with its inclined edge against the circuit-closer and a second alarm thereby sounded. The circuit-closer rides on said inclined edge and then on the top edge of the contact-piece. Thus the alarm continues to sound, the float at this time being near the bottom or top of the water-column. It will be understood that when tho float has reached the end of its travel the circuit-closer will still rest upon the top edge of the contact-piece, and to stop the alarm from sounding and maintain the circuit broken it is necessary to operate the switch 3. (Shown in Fig. 1.) Water is then pumped into the boiler or drawn off, as may be required, in the usual and well-known manner, whereby the float is moved to its normal position—*i. e.*, midway between the ends of the water-column—as shown in Fig. 2. Thus the disk or terminal j is turned back to allow the arm g' to drop, and the circuit-closer will again be disposed between the contact-pieces $l\,l$, after which the switch 3 is to be closed. It will be seen that it is not necessary to operate the switch 3 in order to move the disk back to its normal position, as this can be done while the alarm is sounding. In case the arm g' is not lifted by reason of the person in charge failing to hear the alarm the circuit-closer j' will carry the free end of the detent n' with it and will ride continually on the contact-piece l and the alarm will sound until the switch 3 is operated or the disk is turned in the manner hereinbefore described. The spring o^2 allows the detent to yield sufficiently to permit the circuit-closer to ride on the top edge of the contact-piece and forces the same back to its normal position.

What I claim as my invention is—

1. A high and low water alarm comprising a normally open electric circuit including a signal, a circuit-closer operating automatically to sound an alarm, means to operate said circuit-closer by hand to break the circuit, and a detent adapted to temporarily maintain the circuit-closer in its circuit-breaking position whereby the same shall again operate automatically to sound a second alarm substantially as described.

2. A high and low water alarm comprising a normally open electric circuit including a signal, a yielding circuit-closer operating automatically to sound an alarm, means to operate said circuit-closer by hand to break the circuit, and a yielding detent adapted to temporarily maintain the circuit-closer in its circuit-breaking position whereby the same shall again automatically operate to sound a second alarm substantially as described.

3. In a high and low water alarm, the combination with a water-column and a float therein, of a normally open electric circuit including a signal, one terminal of the circuit actuated by the float, a circuit-closer on the other terminal, means to operate the circuit-closer by hand to break the circuit, and a detent temporarily maintaining the circuit-closer in its circuit-breaking position whereby two alarms shall be sounded substantially as described.

4. In a high and low water alarm, the combination with a water-column and a float therein, of a normally open electric circuit including a signal, an oscillatory electric terminal actuated by said float, a pair of contact-pieces carried on said terminal, a yielding electric terminal, a circuit-closer on the latter terminal and disposed between said contact-pieces, and detents adapted to engage said circuit-closer for the purpose set forth.

5. In a high and low water alarm, the combination with a water-column and a float therein, of a normally open electric circuit including a signal, an oscillatory electric terminal actuated by said float and provided with a pair of contact-pieces, a yielding electric terminal, a circuit-closer on the latter terminal and disposed between said contact-pieces, and a yielding detent secured to each contact-piece and adapted to engage the circuit-closer for the purpose set forth.

6. In a high and low water alarm, the combination with a water-column and a float therein, of a normally open electric circuit including a signal, an oscillatory upright disk actuated by said float and constituting one of the electric terminals and provided with a pair of contact-pieces, and a vertically-yielding electric terminal formed with a circuit-closer disposed between said contact-pieces substantially as described.

7. In a high and low water alarm, the combination with a water-column and a float therein, of a normally open electric circuit including a signal, an oscillatory upright disk actuated by said float and constituting one of the electric terminals and provided with a pair of contact-pieces, a vertically-yielding electric terminal formed with a circuit-closer disposed between said contact-pieces, and yielding insulating-detents pivoted to said contact-pieces and adapted to engage said circuit-closer for the purpose set forth.

8. In a high and low water alarm, the combination with a water-column and a float therein, of a normally open electric circuit including a signal, an oscillatory disk constituting one of the electric terminals and actuated by said float, a pair of contact-pieces secured to said disk, a vertically-movable arm constituting the other electric terminal and formed with a circuit-closer disposed between said

contact-pieces, a yielding insulating-detent carried on each of said contact-pieces and adapted to engage the circuit-closer to hold the same temporarily away from the contact-pieces, springs allowing said detents to yield and forcing the same to their normal positions, and stops limiting the movements of said detents substantially as described.

9. In a high and low water alarm, the combination with a water-column and a float therein, of a normally open electric circuit including a signal, an oscillatory disk actuated by said float and constituting one of the electric terminals, a pair of contact-pieces secured to said disk and adjustable toward and from each other, a vertically-movable electric terminal, a circuit-closer on the latter terminal and disposed between said contact-pieces, and adjustable toward and from the aforesaid disk substantially as described.

10. In a high and low water alarm, the combination with a water-column and a float therein, of a normally open electric circuit including a signal, an oscillatory disk actuated by the float and constituting one of the electric terminals, a pair of contact-pieces secured to said disk, a pivoted arm constituting the other electric terminal, a circuit-closer formed on said arm and disposed between said contact-pieces, and a detent secured movably on each contact-piece and adapted to engage the circuit-closer for the purpose set forth.

11. In a high and low water alarm, the combination with a water-column and a float therein, of an arm formed on and extending from the side of said water-column, a normally open electric circuit including a signal, an oscillatory disk pivoted to said arm and constituting one of the terminals of the circuit, mechanism imparting movement from the float to said disk, a pair of contact-pieces secured to said disk, a plate rigidly secured to said arm, and an arm pivoted to said plate and constituting the other electric terminal and formed with a circuit-closer disposed between said contact-pieces substantially as described.

12. A high and low water alarm comprising a normally open electric circuit including a signal, a suitably-pivoted upright disk constituting one of the terminals of the circuit and provided on its upper portion with two contact-pieces, a vertically-movable pivoted arm constituting the other electric terminal, a screw by which to adjust said arm vertically, and a coiled spring allowing said arm to yield for the purpose set forth.

13. The combination with a water-column and a float therein, of a normally open electric circuit including a signal, an oscillatory disk constituting one of the electric terminals and provided with a pair of contact-pieces, the other electric terminal disposed between said contact-pieces, gearing actuating said disk, and an extensible connection between said float and gears substantially as described.

14. The combination with a water-column and a float therein, of a normally open electric circuit including a signal, a rock-shaft, a disk secured to said shaft and constituting one of the terminals of the circuit, mechanism transmitting motion from the float to said shaft, a pair of contact-pieces secured to said disk, and a circuit-closer disposed between said contact-pieces and connected to the other electric terminal substantially as described.

15. The combination with a water-column and a float therein, of a hollow arm extending from and communicating with the side of the water-column, a normally open electric circuit including a signal, a pair of rock-shafts journaled in the outer end of said hollow arm, a disk secured to one of said shafts outside of the hollow arm and constituting one of the electric terminals, a pair of contact-pieces secured to said disk, meshing gears secured to said rock-shafts within the hollow arm, an extensible connection between said gearing and the aforesaid float also within the hollow arm, a vertically-yielding arm pivoted on top of the hollow arm and constituting the other electric terminal and formed with a circuit-closer disposed between said contact-pieces, and insulating-detents pivoted to said contact-pieces for the purpose set forth.

16. The combination with a water-column and a float therein, of a normally open electric circuit including a signal, a hollow arm extending from and communicating with one side of said water-column, a pair of transverse rock-shafts journaled on the outer end of said arm, a disk secured to one of said shafts and constituting one of the terminals of the circuit, and provided with a pair of contact-pieces, meshing gears secured to said rock-shafts, a sleeve pivoted at one end to the aforesaid float, a sliding rod in said sleeve rigidly secured at its outer end to one of said gears, a guide-rod for said float, a yielding terminal supported on the hollow arm and formed with a circuit-closer disposed between said contact-pieces, and yielding detents pivoted to said contact-pieces adapted to engage said circuit-closer for the purpose set forth.

17. The combination with a water-column and a float therein, of a normally open electric circuit including a signal, an oscillatory electric terminal provided with a pair of contact-pieces, gearing actuating said terminal, an automatically-extensible connection between said gearing and the float, and the other electric terminal having a circuit-closer connected thereto and disposed between said contact-pieces substantially as described.

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