(No Model.) 2 Sheets—Sheet 1.

C. H. WICKERSHAM.

ELECTRIC WATER LEVEL INDICATOR.

No. 350,279. Patented Oct. 5, 1886.

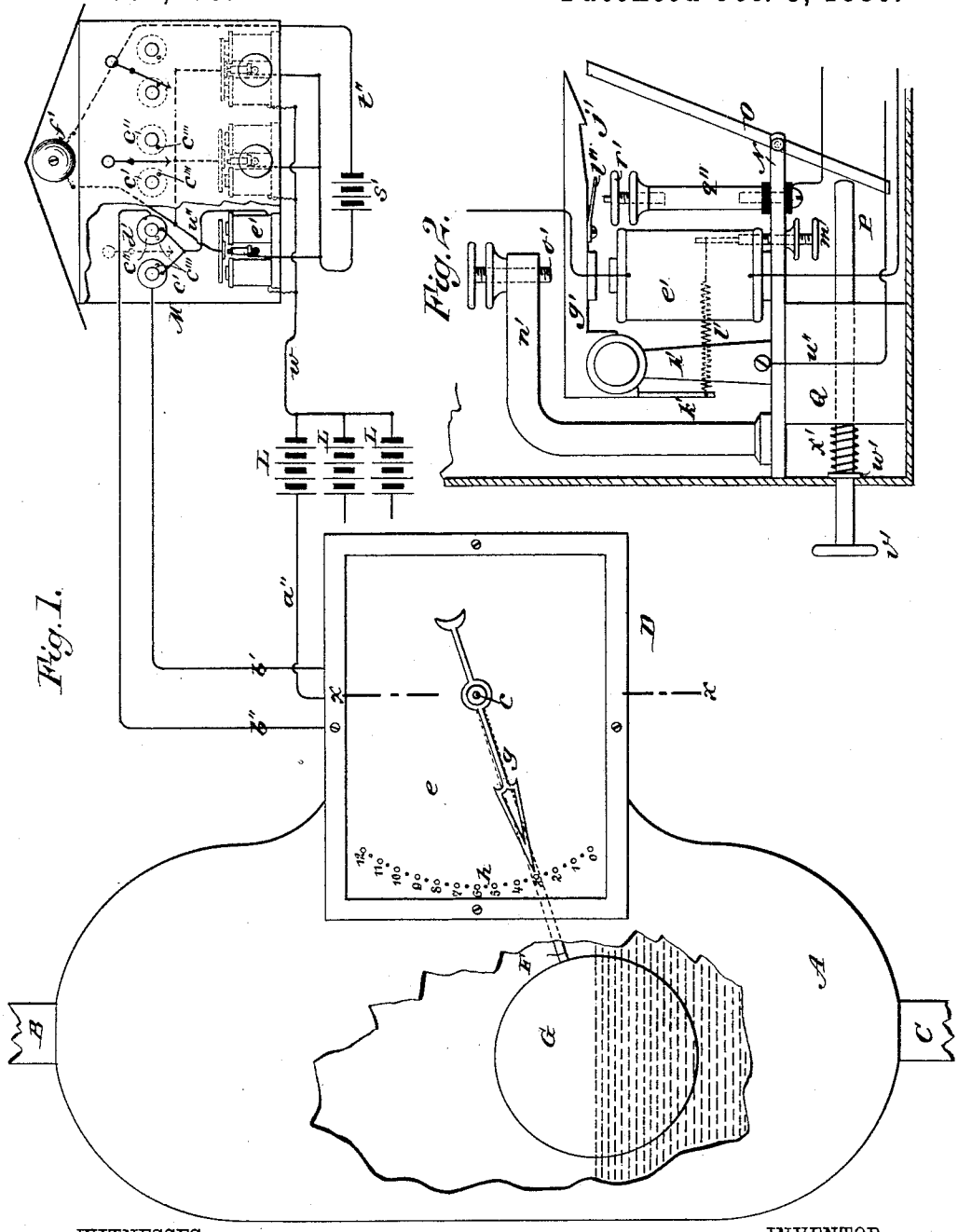


Fig. 1.

Fig. 2.

WITNESSES:

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C. Sedgwick

INVENTOR:

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(No Model.) 2 Sheets—Sheet 2.

C. H. WICKERSHAM.

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Fig. 4.

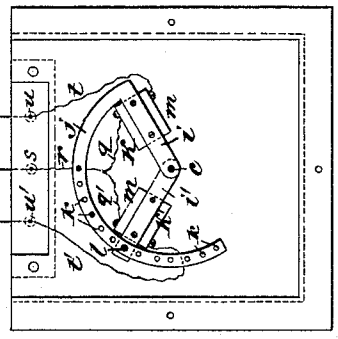


Fig. 6.

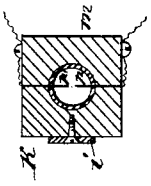


Fig. 7.

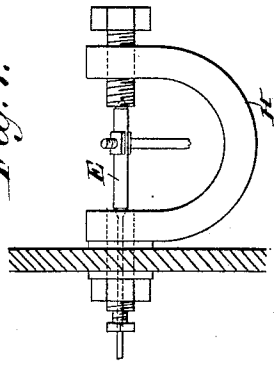


Fig. 5.

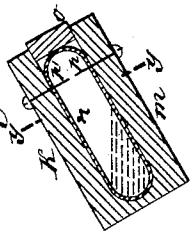
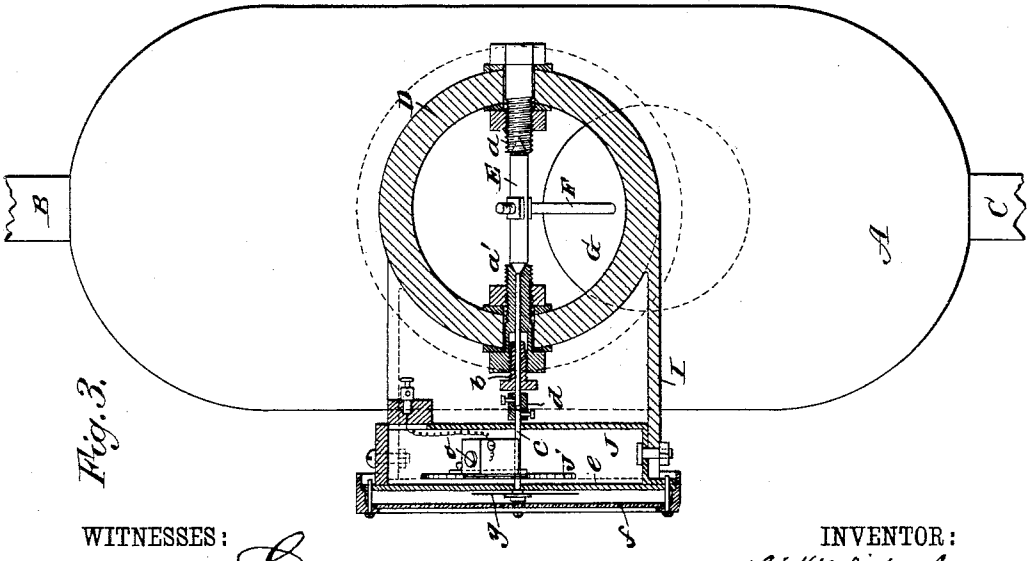


Fig. 3.



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UNITED STATES PATENT OFFICE.

CHARLES H. WICKERSHAM, OF POTTSTOWN, PENNSYLVANIA.

ELECTRIC WATER-LEVEL INDICATOR.

SPECIFICATION forming part of Letters Patent No. 350,279, dated October 5, 1886.

Application filed May 12, 1886. Serial No. 201,964. (No model.)

To all whom it may concern:

Be it known that I, CHARLES H. WICKERSHAM, of Pottstown, in the county of Montgomery and State of Pennsylvania, have invented a new and useful Improvement in Electric Water-Level Indicators for Steam-Boilers, of which the following is a specification, reference being had to the annexed drawings, forming a part thereof, in which—

Figure 1 is a side elevation, partly in section, of my improved indicator. Fig. 2 is an enlarged transverse section of a part of the indicating apparatus. Fig. 3 is a vertical transverse section taken on line *x x* in Fig. 1. Fig. 4 is a detail view of the circuit-controlling apparatus. Fig. 5 is a longitudinal section of one of the circuit makers and breakers. Fig. 6 is a transverse section taken on line *y y* in Fig. 5. Fig. 7 is a detail view of the pivots of the float-arm.

Similar letters of reference indicate corresponding parts in the different figures of the drawings.

The object of my invention is to construct an electric water-level indicator for steam-boilers, which will constantly indicate, by means of an index and dial, the height of the water, and show its rise and fall in inches and fractions thereof; also to provide an electric annunciator with visible and audible signals for indicating at any distant point the variation of the water-level in the boiler beyond the prescribed limits; also in the case of a series of boilers to indicate in which one the water is too high or too low.

It also consists in means for stopping the audible alarm after attention has been called to the condition of the boiler, without in any way affecting the visible signal, the visible signal being controlled entirely by the water-level of the boiler.

It also further consists in means for adjusting the devices so as to give the signals at any point in the rise or fall of the water.

The float-chamber A is connected with the steam and water room of the boiler by the pipes B C, which are of sufficient size to permit of a free circulation of water and steam to and from the float-chamber A. The float-chamber A is provided on one side thereof with an extension, D, in which is journaled the float-spindle E, carrying the float-arm F, to the end of which is secured the float G, which is sustained by the water contained in the chamber A.

The spindle E turns in conical adjustable bearings *a a'*. The bearing *a'* is made tubular, and the spindle E is reduced in diameter and extends through the bearing, and through a stuffing-box, *b*, in the end thereof, outside of the float-chamber extension D. The bearings of the spindle E are made as light as possible consistent with strength to reduce friction, and to diminish the work of the float G. The bearings *a a'* are formed of bronze or unoxidizable metal, and are preferably inserted through the sides of the float-chamber extension D, and secured by nuts and packed to prevent the escape of water or steam around them, (as shown in Fig. 3;) but I do not confine myself to this construction, as the spindle may be supported by a yoke, H, attached to one wall of the float-chamber, or to the shell of the boiler, as shown in Fig. 7.

The extension D is provided with a shelf, I, upon which is secured a case, J, which contains the circuit making and breaking mechanism and the index and dial. In the case J is journaled a spindle, *c*, which is connected with the float-spindle E by the coupling *d*. The case J is provided with a dial, *e*, on the front thereof, which is covered by a glass plate, *f*. The spindle *c* passes through the case J and projects beyond the dial *e*, to receive the index *g*, which is placed parallel with the float-arm F, and which moves along the curved graduated scale *h*. In the case J and upon the spindle *c* is secured an arm, *i*, carrying at its outer end a curved bar, *j*, forming a semicircle, with the spindle *c* as a center. The arm *i'* is placed loosely upon the spindle *c*, its free end touching one side of the curved bar *j*. The curved bar *j* is provided with a series of holes, *k*, in any one of which may be inserted the bolt *l*, which fastens the arm *i'* to the curved bar *j*, so that the arms *i i'* move together when the spindle *c* is turned.

Upon each arm *i i'* is secured a circuit-closer, K K', consisting of a block, *m*, of wood or other suitable non-conductor, in which is formed a cavity for receiving a glass bulb, *n*, which is secured therein by a stopper, *o*, plati-

num wires *p p'* being fused in diametrically-opposite sides of the bulb *n*, with the points of the wires near each other, but not in contact. Before sealing the bulb is partly filled with mercury.

The arm *i*, carrying the circuit-closer K, is adjusted relative to the water-level and the float, so that the float will tilt it sufficiently to cause the mercury contained by the circuit-closer to complete the circuit between the platinum wires *p p'* when the water is at the highest point, and the arm *i'*, carrying the circuit-closer K', is adjusted along the curved bar *j*, so that it will tilt sufficiently to cause the mercury to complete the circuit between the wires *p p'*, when the water in the boiler descends to a point at which it is desirable to give the alarm. The upper platinum wires, *p'*, are connected by flexible conductors *q q'* with a wire, *r*, leading to the binding-post *s*, and the platinum wires *p* are connected by flexible conductors *t t'* with the binding-posts *u u'*.

Each boiler is provided with a closed circuit-battery, L, and where a number of indicators are employed one pole of each battery may be connected with a single return-wire, *w*. The binding-posts *s u w'* are insulated from each other, and the binding-post *s* is connected with the battery L by the wire *a''*, and from the binding-posts *u u'* wires *b' b''* lead to the annunciator M. The annunciator M is provided with as many indexes and as many pairs of annunciator-magnets as there are boilers in the series.

Each annunciator in the present case consists of two electro-magnets, *c' c''*, between the poles of which is suspended a needle, *d'*, of magnetic material. Stop-pins *c'''* are placed near the poles of the magnets to prevent the actual contact with the poles of the magnet. The wires *b' b''* communicate with the magnets *c' c''*, respectively, and the remaining terminals of the helices are connected with each other and with the relay-magnet *e'*. The current sent over the wires *b' b''* will affect one or the other of the magnets *c' c''*. When the circuit-closer K is operative, the annunciator-needle will be moved in one direction, indicating high water, and when the circuit-closer K' is in action the needle will be moved in the opposite direction, indicating low water. The remaining terminal of the relay-magnet *e'* is connected with the return-wire *w*, so that whenever the annunciator indicates high or low water the current operating the annunciator will also operate the relay, so that an alarm will be given upon the bell *f'* in the manner presently to be described.

The relay consists of the magnet *e'*, of the usual construction, and an armature-lever, *g'*, pivoted on the standard *h'*, and carrying a contact-spring, *l''*. The free end of the armature-lever *g'* is provided with a catch, *j'*, and the pivoted end is provided with an arm, *k'*, for receiving one end of the retractile spring *l'*, the opposite end of which is connected, by means of a thread, with a tension-screw, *m'*, projecting upward through the base N of the relay. An arm, *n'*, supported by the base and extending over the top of the armature-lever *g'*, supports a screw, *o'*, for limiting the upward movement of the armature-lever *g'*. To the base of the relay is secured an insulated standard, *q''*, supporting in the top thereof a contact-screw, *r'*, which is in the path of the contact-spring *l''*, carried by the armature-lever *g'*, so that when the armature-lever is drawn down an electric contact is established between the spring *l''* and the screw *r'*. The standard *q''* of each relay is connected with one pole of the local battery *s'*, the other pole of which is connected by a wire, *t''*, with one binding-post of the electric alarm-bell *f'*, which is of the ordinary construction, and therefore needs no description, the other binding-post of the bell being connected by the wire *w''* with the post *h'*, supporting the armature-lever.

To the base N is pivoted a lever, O, the longer arm of which extends upward into position to engage the catch *j'* and be engaged thereby. The shorter arm of the lever O projects below its pivot in position to be engaged by the push-rod P, which extends through the support Q of the relay and through the casing of the annunciator, and is provided with a knob or handle, *v'*, and with a collar, *w'*. Between the support Q and the collar *w'* on the rod P is placed a spiral spring, *x'*, which abuts against the support Q and presses the rod P outward.

When the circuit is completed through the relay-magnet *e'* and the spring *l''* is brought into contact with the contact-screw *r'*, the local circuit is completed through the spring and contract-screw and the current from the battery *s'* flows through the wire *t''*, through the magnet of the bell *f'*, wire *u''*, post *h'*, armature-lever *g'*, spring *l''*, and screw *r'*, back to the battery. The bell continues to sound so long as the circuit is closed by either of the circuit-closers K K'; but as soon as the circuit of the battery L is opened by the movement of one or the other of the circuit-closers K K' the armature-lever *g'* is released, when it is raised by the action of the spring *l'* and the local circuit is broken.

The annunciator-needle *d'* acts with the alarm-bell *f'* so long as the local circuit is controlled by the circuit-closers K K'; but should it be found desirable to stop the audible alarm it may be accomplished by pushing the button *v'*, so as to turn the lever O on its pivot, and by the engagement of the longer arm of the lever with the inclined face of the catch *j'* raise the armature-lever *g'* sufficiently to disengage the contact-spring *l''* from the contact-screw *r'*, and thus break the local circuit and stop the audible alarm without interfering with the annunciator-needle *d'*, which continues to indicate the state of the water in the boiler so long as the current from the battery L continues to flow through the wire *b'* or *b''*. The relay-magnet *e'* remains active and holds the armature-lever down in contact with the upper end of the lever O; but when the circuit of

the battery L is broken by the movement of the circuit-closers K K′ the armature-lever g' is released, when it is raised by the spring l', and the lever O, being released from the catch j', falls away out of the path of the armature-lever, so that when the circuit is again closed by the circuit-closers K K′ the armature-lever g' will be free to carry the contact-spring l'' downward into contact with the screw r', when the operation just described will be repeated.

In my improved water-level indicator the circuit-closing devices are hermetically sealed and protected from dust or accident, so that the action of the circuit-closers is always positive. The index g is arranged parallel with the float-rod F, so that it always points to the center of the float, and thus affords a positive means of adjustment.

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

1. The combination, with the float-spindle E, of the auxiliary spindle c, the mercurial circuit-closers K K′, the arm i, secured to the spindle c and provided with the curved bar j, the arm i', placed loosely on the spindle c and adjustable along the bar j, the flexible conductors $q\,q'\,t\,t'$, and means, substantially as herein described, for indicating an electric contact formed by either of the circuit-closers K K′, as specified.

2. The combination, with the float G and spindle E, of the auxiliary spindle c, the arm i, fixed to the spindle c, and provided with the curved apertured bar j, the arm i', placed loosely on the spindle c and adjustable along the curved bar j, the circuit-closers K K′, carried by the arms $i\,i'$, the index g and graduated scale h, and an electric annunciator connected with the circuit-closers K K′, substantially as herein shown and described.

3. In a water-level indicator for steam-boilers, the combination, with the relay-magnet e' and armature-lever g', provided with the catch j', of the contact-spring l'', the contact-screw r', and the lever O, for holding the spring l'' out of contact with the screw r', substantially as herein shown and described.

4. In a water-level indicator for steam-boilers, the combination, with the relay-magnet e', and armature-lever g', provided with the catch j', of the contact-spring l'', the contact-screw r', the lever O, for holding the spring l'' out of contact with the screw r', and the spring-acted push-rod P, for operating the lever O, substantially as herein shown and described.

5. The combination, with the float G and spindle E, of the auxiliary spindle c, the fixed circuit-closer K, and the adjustable circuit-closer K′ carried thereby, the annunciator-magnets $c'\,c''$, the annunciator-needle d', the relay-magnet e', the armature-lever g', and contact-spring l'', carried thereby, contact-screw r', the electric bell f', and the electrical conductors connecting the bell, relay and annunciator magnets, and the local and main batteries, substantially as herein shown and described.

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Witnesses:

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WILLIAM M. BUNTING.