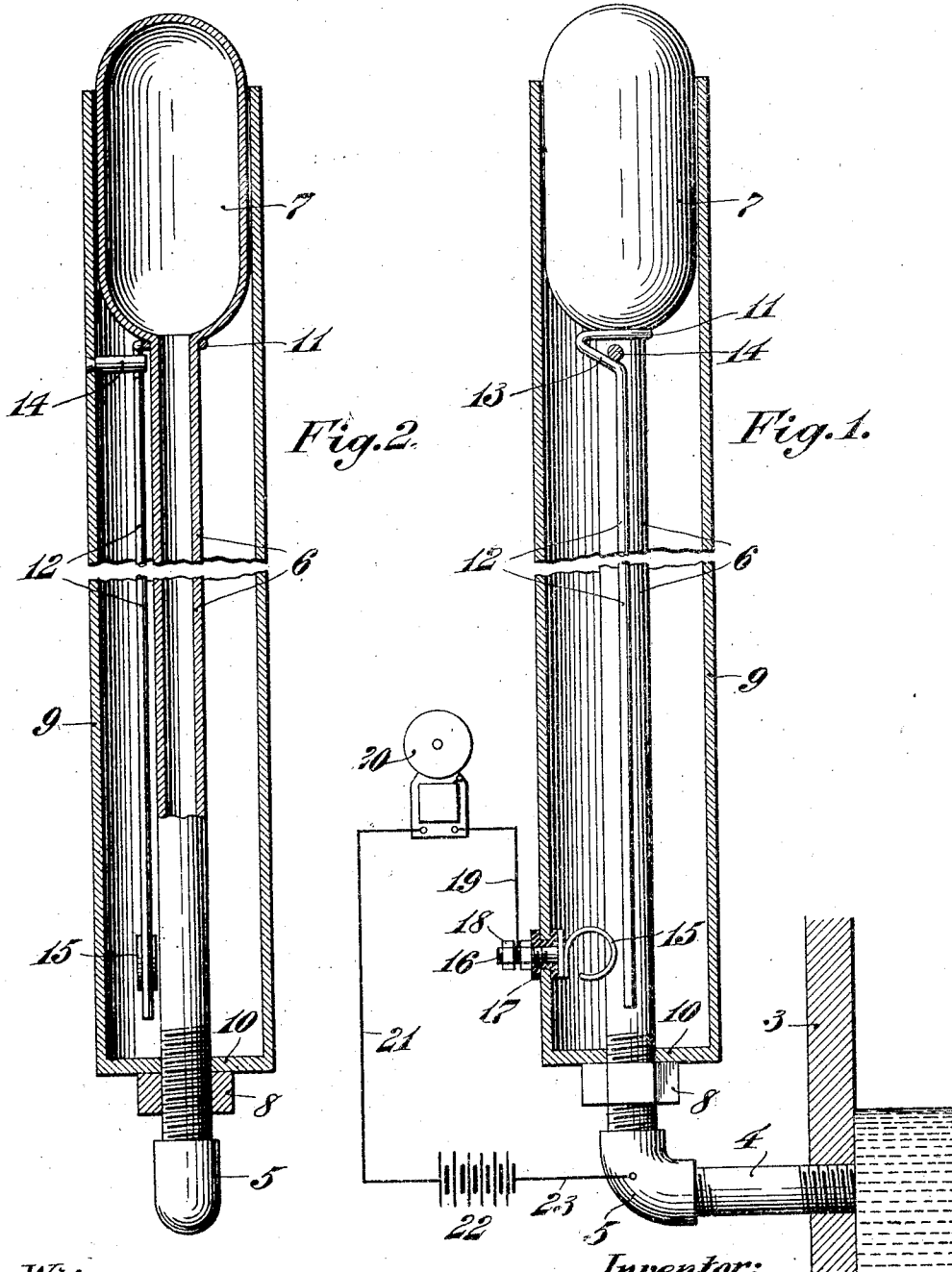


C. W. FORD.
LOW WATER ALARM.
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LOW-WATER ALARM.

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To all whom it may concern:

Be it known that I, CLARENCE W. FORD, a citizen of the United States, residing at Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Low-Water Alarms, of which the following is a specification.

My invention relates to low water alarms, that is to say, to devices for signaling or indicating when the water in steam boilers falls below the predetermined level, and it relates more specifically to apparatus for establishing or completing an electric circuit, in which an alarm device is included, when the aforesaid condition occurs.

The principal object of my invention is to provide a simple and efficient apparatus for establishing or closing an electric circuit when the water in the boiler falls below the desired level, this object being accomplished through the differential expansion of certain parts of the apparatus causing other elements of the same to contact and thereby complete the circuit, this action taking place when the water is drained from the apparatus and steam is admitted on account of the water falling below the level at which the apparatus is connected to the shell or other suitable part of the boiler.

The nature and characteristic features of my invention will be more readily understood from the following description, taken in connection with the accompanying drawings forming part hereof, in which—

Figure 1 is a view, partly in section and partly in elevation, of an apparatus embodying the main features of my present invention, the electric circuit being shown diagrammatically in connection therewith; and Fig. 2 is a view similar to Fig. 1, the section being taken transversely thereto, and certain of the interior parts being also shown in section.

Referring to the drawings, in the particular embodiment of my invention therein shown, 3 is the shell of the boiler into which is threaded a horizontal pipe 4 at a location corresponding to that of the lowest desirable level of the water contained within the boiler.

5 is an elbow or other suitable pipe fitting which supports and establishes communication with a vertical expansion tube 6 which is preferably made of brass or other suitable material having a higher coefficient

of expansion than other parts of the structure. At the top end of the tube 6 is an enlarged portion 7 forming a chamber which insures the efficient operation of the apparatus as will hereinafter be more fully set forth.

Threaded on the lower end of the pipe 6 above the elbow 5 is a nut 8 which serves as a means of support and adjustment for a pipe 9 which surrounds the pipe 6 and its enlarged portion 7. The pipe 9, preferably made of iron or other suitable material having a lower coefficient of expansion than the tube 6, constitutes a housing for the protection of the working parts of the apparatus and also acts as a support for certain of the essential elements. The pipe 9 is provided at its lower end with a disk-like portion 10 which rests upon the nut 8, and after the final adjustment of the apparatus is obtained the disk 10, nut 8, and pipe 6 are all preferably brazed together to form a practically integral structure which will maintain the proper adjustment of the working parts and prevent unskilled persons from tampering with the apparatus.

Secured by brazing or in any other suitable manner to the tube 6, at its upper end immediately below the enlarged portion 7, is an encircling portion 11 of a spring steel finger 12 which extends downwardly alongside of the pipe 6. The finger 12 has an offset portion 13 adjacent the end which is secured to tube 6 which offset portion 13 forms a shoulder against which a pin 14 bears. The pin 14 is rigidly secured in the outer surrounding pipe 9 and is practically a unitary portion of the supporting housing. The lower end of the pipe or housing 9 also supports a stationary contact spring 15 which is secured thereto by means of a screw 16 which is electrically insulated from the housing 9 by means of a bushing 17 made of any suitable insulating material. The contact spring 15 is arranged adjacent the lower end of the depending spring 12 but is normally out of contact with the same. The screw 16 which supports the stationary contact spring 15 is provided with a nut 18 for the purpose of securing an electric wire 19 thereto, which wire 19 forms part of the electric circuit and is connected with an alarm bell 20 from whence extends a wire 21 which is connected to a battery 22 or other suitable source of electrical energy, the battery being also electrically connected

by means of a wire 23 to any suitable part of the apparatus, the same being shown for convenience connected to the elbow 5.

The operation of the apparatus is as follows:—So long as the water in the boiler is maintained above the level of the connection of the horizontal pipe 4, the vertical expansion tube 6 and its enlarged portion or chamber 7 will be maintained full of water, and on account of being arranged outside of the boiler, the temperature of the water contained therein will fall below that of the water within the boiler, and the parts will be maintained in the position substantially as shown in Fig. 1 of the drawings. When, however, the water falls below the level of the connecting pipe 4, the water within the tube 6 and its enlarged portion 7 will be drained back into the boiler and steam will enter the tube 6 and the higher temperature of the steam will cause the tube to expand, carrying with it the spring 12 and causing the shoulder 13 to bear harder against the projecting pin 14 which is carried by the outer tube or housing 9. The pressure which is thus exerted against the shoulder 13 will cause the lower end of the spring wire 12 to be deflected and brought against the stationary contact spring 15 and the electric circuit will thereby be closed and the alarm bell 20 will be sounded. The purpose of the enlarged portion 7 at the upper end of tube 6 is to form a chamber which not only presents a greater surface for the condensation of the steam which might otherwise remain in the tube 6 and prevent the water from entering the same, but also has been found in practice to cause the apparatus to act more efficiently and positively than when said enlarged portion is omitted.

Having thus described the nature and characteristic features of my invention what I claim as new and desire to secure by Letters Patent is:—

1. In a device of the character described, in combination with a boiler, an expansion tube in communication therewith, a contact element carried by said expansion tube comprising an elongated finger fixedly secured at one end to said expansion tube, a shoulder on said finger adjacent the fixed end thereof, a housing, a projection carried by said housing engaging said shoulder, and a stationary contact member supported adjacent the free end of said finger.

2. In a device of the character described, in combination with a boiler, an expansion tube in communication therewith, a contact member fixedly secured at one end to said expansion tube and comprising an elongated finger having an offset portion forming a shoulder adjacent the fixed end of said finger, a pipe forming a housing surrounding said expansion tube, a pin mounted in said housing engaging the offset portion of

the finger, and a stationary contact member supported by the housing adjacent the free end of said finger.

3. In a device of the character described, in combination with a boiler, an expansion tube in communication therewith, means controlled by said tube for establishing an electric circuit, and an enlarged portion constituting a chamber at the end of said tube.

4. In a device of the character described, in combination with a boiler, an expansion tube in communication therewith, an enlarged portion constituting a chamber at the end of said tube, a contact element fixedly secured at one end to said expansion tube and comprising an elongated finger, a stationary contact member supported adjacent the free end of said contact finger, and means for deflecting said finger when said tube is expanded.

5. In a device of the character described, in combination with a boiler, an expansion tube in communication with the boiler, an enlarged portion constituting a chamber at the end of said tube, a contact element fixedly secured at one end to said expansion tube and comprising an elongated finger, a stationary contact member supported adjacent the free end of said contact finger, and means for deflecting said finger when said tube is expanded comprising a shoulder on said finger adjacent the fixed end thereof, a housing, and a projection carried by said housing engaging said shoulder.

6. In a device of the character described, in combination with a boiler, an expansion tube in communication therewith, an enlarged portion constituting a chamber at the end of said tube, a contact member fixedly secured at one end to said expansion tube and comprising an elongated finger having an offset portion forming a shoulder adjacent the fixed end of said finger, a housing, a projection carried by said housing engaging the offset portion of the finger, and a stationary contact member adjacent the free end of said finger.

7. In a device of the character described, in combination with a boiler, an expansion tube in communication therewith, an enlarged portion constituting a chamber at the end of said tube, a contact member fixedly secured at one end to said expansion tube adjacent the enlarged end thereof and comprising an elongated finger extending along the side of said tube and having an offset portion forming a shoulder adjacent the fixed end of said finger, a housing, a projection carried by said housing engaging the offset portion of the finger, and a stationary contact member adjacent the free end of said finger.

8. In a device of the character described, in combination with a boiler, an expansion tube in communication therewith, an en-

larged portion constituting a chamber at the
end of said tube, a contact member fixedly
secured at one end to said expansion tube
and comprising an elongated finger having
5 an offset portion forming a shoulder adja-
cent the fixed end of said finger, a pipe
forming a protective housing surrounding
said expansion tube, a pin mounted in said
housing engaging the offset portion of the
10 finger, and a stationary contact member

supported by the housing adjacent the free
end of said finger.

In testimony whereof, I have hereunto
signed my name in the presence of two wit-
nesses.

CLARENCE W. FORD.

Witnesses:

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