C. E. BROAD.

WATER LEVEL INDICATOR.

APPLICATION FILED DEC. 24, 1917.

1,308,620. Patented July 1, 1919.

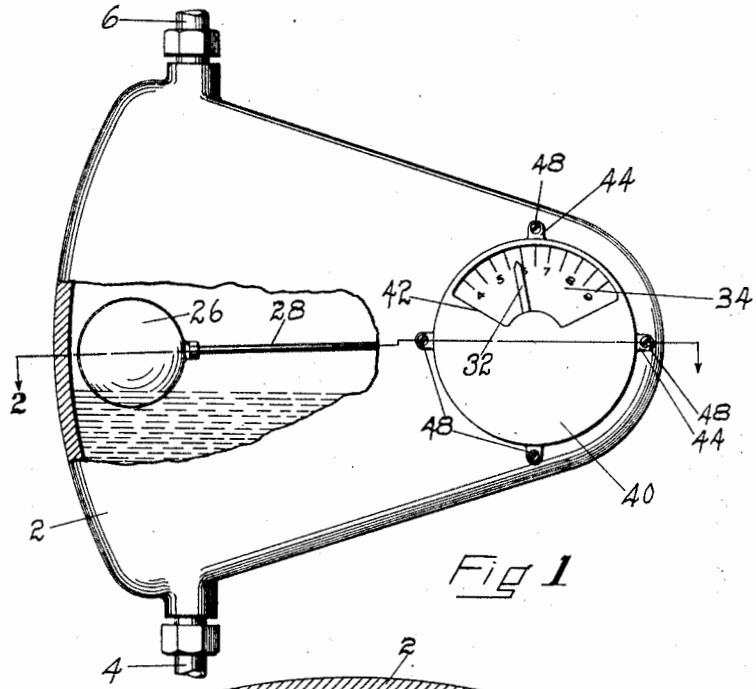

Fig 1

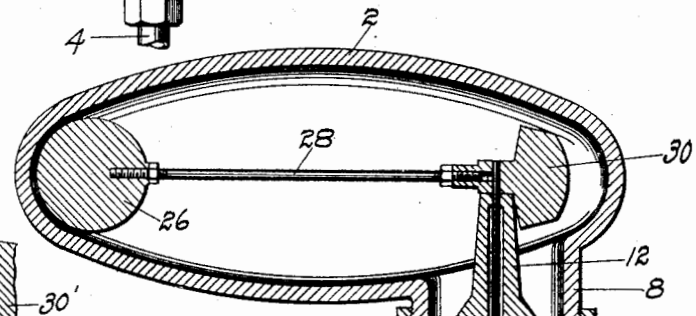

Fig 2

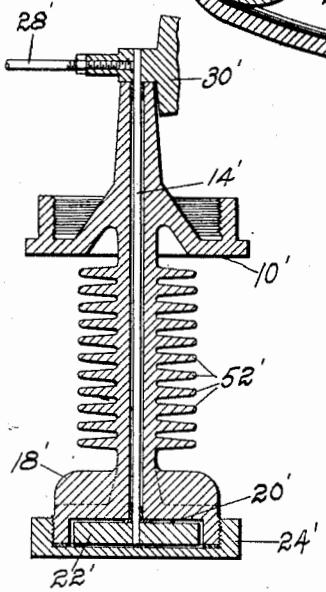

Fig 3

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WATER-LEVEL INDICATOR.

1,308,620. Specification of Letters Patent. Patented July 1, 1919.

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To all whom it may concern:

Be it known that I, CHARLES E. BROAD, a citizen of the United States, residing at Newton, in the county of Middlesex and State of Massachusetts, have invented certain Improvements in Water-Level Indicators, of which the following description, in connection with the accompanying drawings, is a specification, like reference characters on the drawings indicating like parts in the several figures.

This invention relates to water level indicators for boilers and the like and is particularly concerned with the requirements of devices of this character for use on high pressure steam boilers.

As is well understood by those skilled in this art, the bursting of the gage glass or water level indicator of a steam boiler in which a high pressure is carried may have very disastrous results to those in the immediate vicinity. Various expedients have been adopted to reduce the danger attending accidents of this character and one form of indicating apparatus proposed with this end in view comprises a float arranged to rise and fall with changes in the level of the water in the boiler, a magnet connected with said float to be moved as the float rises and falls, a casing inclosing these parts, and a needle outside the casing but within the field of force of the magnet so that it follows the movements of the magnet and thus indicates the changes in the water level. Indicating devices of this character are well adapted to withstand high pressures, and while they have been used to a considerable extent on water tanks, gasolene tanks and the like, and to some extent on boilers in which a relatively low pressure is maintained, they have never proved successful, so far as I have been able to learn, on high pressure boilers due to the fact that the high temperatures necessarily maintained in these high pressure installations de-magnetize the magnets and thus render the indicator totally inoperative.

The present invention aims to devise an indicating apparatus of the general character just described which can be successfully used on high pressure boilers and in other places where the liquid under observation is maintained at a high temperature. The invention also aims to improve the mechanical construction of apparatus of this character with a view particularly to reducing the friction, simplifying the construction, reducing the liability of inaccuracy or breakage due to corrosion of parts and generally improving the construction of apparatus of this type. It is also an object of the invention to improve the construction of the floats used in such apparatus.

The manner in which it is proposed to accomplish these objects will be readily understood from the following description of the embodiment of the invention at present preferred and the novel features will be particularly pointed out in the appended claims.

Referring now to the accompanying drawing:

Figure 1 is a front elevation of an apparatus embodying this invention, a part of the casing of the apparatus being broken away to show the interior construction;

Fig. 2 is a cross sectional view taken substantially on the line 2—2, Fig. 1; and

Fig. 3 is a cross sectional view of a modified construction of casing section.

The apparatus shown comprises a hollow casing or container 2 designed to be placed in communication with the boiler, or other device with which the apparatus is used, by means of suitable pipe connections 4 and 6 so that the water level in the container will rise and fall with the changes in level in the boiler. This container is provided with a neck 8 normally closed by a screw threaded cap 10 which is provided with a central extension 12 designed to form a bearing for one end of a shaft 14. This shaft extends longitudinally through the bore in the extension 12 and through a pipe or tube 16, one end of which is threaded into the cap 10 and the other end of which is threaded into a member 18. This member is constructed to form a bearing for the other end of the shaft 14 and also is recessed, as indicated at 20, to form a chamber for a bar magnet 22 which is mounted on the forward end of the shaft 14. The front of this chamber is closed by a cap 24 threaded on to the member 18. Mounted fast on the opposite end of the shaft 14 is a float 26 that is connected to the shaft by a stem 28 and is partially counterbalanced by a weight 30.

Any suitable form of float construction may be employed. I prefer, however, to use a solid float rather than a hollow float of the type more commonly used since the latter

floats are liable to corrode after a time and become leaky, thus either rendering the indicator inaccurate or totally inoperative. Accordingly, I prefer to make the float of some material, such for instance, as aluminum, which may be heavier than water, and then to counterbalance this member with some metal, such for instance, as lead, of greater density than the float and of such a mass that it will cause the float to ride buoyantly on the surface of the water even if, without such a counterbalance, this float would sink. A construction of this character is far more reliable than are the floats more commonly used, and it avoids the danger of disturbing the accuracy of the readings of the indicator caused by the leakage of the float or its absorption of water, due to its porosity. It will be understood that the term "solid float" is used to differentiate the float above described from those which depend for their buoyancy upon some peculiar shape rather than upon the displacement of water by the solid material of the float. By properly counterbalancing a float of this character it may be made to ride as buoyantly on the surface of the water as would a hollow float, even though the solid float is made of such material that it would sink or substantially submerge if it were not counterbalanced. Obviously the counterbalance could be mounted, if desired, so that it would always be out of water.

It will now be evident as the water level in the container 2 rises and falls the float 26 will rise and fall and thus turn the shaft 14 about its axis. The shaft, of course, transmits this turning motion to the bar magnet 22. The movements of the magnet are followed by a pointer or indicator 32 pivoted co-axially with the shaft 14 and mounted outside the magnet chamber but within the field of force of the magnet. This pointer plays over a suitably graduated dial 34. In the construction shown the pointer 32 is rotatably mounted on a pin that projects from the face of the dial plate 34. This dial is cupped or provided with a peripheral upstanding flange on which rests a glass face plate 36. A sheet metal ring or collar 38 encircles the flange of the dial plate 34 and has its edge soldered or otherwise secured to the peripheral flange of a plate 40 that overlies the face plate 36 and is cut out to afford a view of the part of the dial over which the pointer moves. Several small ears 44 are secured to both the members 34 and 38 by rivets 46, Fig. 2, and screws 48 extend through these ears and fasten the dial and the other parts secured thereto to the face of the cap 24. The members 18 and 24 preferably are made of brass, bronze or some non-magnetic material so that they do not short-circuit the lines of force of the magnet 22.

It is obvious that when this apparatus is used on a steam boiler, the steam will force its way along the shaft 14 into the magnet chamber 20 and, if the pressure carried on the boiler is high enough, the heat so transmitted to the magnet will de-magnetize it, thus rendering the apparatus inoperative. In order to prevent this action I have located the magnet at a point relatively remote from the container 2 in which the float is mounted, and I have provided the pipe 16 that connects the magnet chamber with the float chamber with a sleeve 50 having a series of radiating disks or fins 52 projecting therefrom. This sleeve is brazed or fitted closely on the pipe 16 so that it is in intimate contact with it and thus will conduct heat readily to the fins 52 which, in turn, will dissipate it in the surrounding atmosphere. The pipe is made of such a length that it will accommodate the required number of these radiating fins to prevent the transmission of a sufficient degree of heat to the magnet to de-magnetize it. This construction maintains a water seal around the shaft 14 at practically all times. The radiating members can readily be proportioned in accordance with the conditions existing in the installation with which the apparatus is to be used so that all danger of de-magnetizing the magnet will be eliminated.

Fig. 3 shows a construction in which the cap 10, pipe 16 and the members 18, 50 and 52 are integral, primed reference numerals being used to designate the parts corresponding to those shown in Fig. 2. This entire member may be cast in one piece and a hole drilled therethrough for the shaft 14. Bearing bushings are then inserted in the opposite ends of this hole to receive the shaft.

It will be noted that the construction provided by this invention eliminates all danger of the bursting of the indicator due to the usual causes of such accidents in the common types of water level indicators. That is, the entire casing within which the magnet, float and other parts to which the steam is admitted are inclosed, may be made of such substantial construction that there is no possibility of bursting; and, being made of metal, these parts are not liable to breakage due to sudden changes in temperature or to any ordinary blow that might break a gage glass or other fragile type of indicator. Furthermore this construction has been found through actual use on boilers in which exceptionally high pressures are carried to overcome completely the difficulty heretofore experienced with the de-magnetizing of the magnet. The moving parts of the apparatus are all of sturdy construction so that there is no danger of breakage of the parts due to corrosion and they are so arranged

that corrosion is not liable to interfere with the movements of the parts.

While I have herein shown and described the best embodiment of the invention of which I am at present aware, it is obvious that the invention may be embodied in other forms than that shown without departing from the essential spirit of the invention.

What I claim as new is:

1. A water level indicating apparatus for high pressure boilers having, in combination, a float, a magnet located at a point relatively remote from said float, means connecting said float and magnet arranged to transmit motion from the float to the magnet, a casing inclosing said float, magnet and transmission means, and including an elongated portion provided with heat radiating means serving to prevent the transmission of a high degree of heat to said magnet, and indicating means arranged to follow the movements of said magnet through the action thereon of the field of force of the magnet.

2. A water level indicating apparatus for high pressure boilers, having, in combination, a float, a magnet, means connecting said float and magnet and arranged to transmit motion from the float to the magnet, a casing inclosing said float, magnet and transmission means and including an elongated member between said float and magnet through which said connections extend and whereby the magnet is located at a point relatively remote from the float, said member being provided with heat radiating means and said casing being constructed to maintain a water seal between said float and magnet.

3. A water level indicating apparatus, having, in combination, a float, a magnet, a shaft connecting said float and magnet and arranged to transmit motion from the float to the magnet, a casing inclosing said float, magnet and shaft and having bearings supporting said shaft for rotation about its longitudinal axis, and indicating means arranged to follow the movements of said magnet through the action thereon of the field of force of the magnet.

4. A water level indicating apparatus for high pressure boilers, having, in combination, a float, a magnet mounted at a point relatively remote from said float, a shaft on which said magnet is mounted arranged to be turned about its axis by the movements of said float, a casing provided with chambers for said float and magnet and having a connection between said chambers through which said shaft extends, means for radiating the heat from said connection, and indicating means positioned adjacent to but outside of said magnet chamber and within the field of force of the magnet, whereby it is operative to follow the movements of said magnet through the action thereon of the field of force of the magnet.

5. A water level indicating apparatus for high pressure boilers, having, in combination, a float, a magnet mounted at a point relatively remote from said float, means connecting said magnet and float and arranged to transmit motion from the float to the magnet, a casing provided with chambers for said float and magnet and inclosing the parts of said apparatus to which steam is admitted, heat-radiating means between said float and magnet chambers constructed and arranged to prevent the transmission of a sufficient degree of heat to said magnet to de-magnetize it, and indicating means outside of said magnet chamber but mounted within the field of force of the magnet and arranged to follow the movements of said magnet through the action thereon of the field of force of the magnet.

6. A water level indicating apparatus for high presure boilers, having, in combination, a float, a magnet, a shaft rotatable about its longitudinal axis connecting said float and magnet to transmit motion from the float to the magnet, a casing inclosing said float and magnet and including an elongated member between said float and magnet and through which said shaft extends whereby the magnet is located at a point relatively remote from the float and the heat that would otherwise be transmitted from the neighborhood of the float is dissipated before it reaches the magnet, and indicating means arranged to follow the movements of said magnet through the action on said means of the field of force of the magnet.

In testimony whereof I have signed my name to this specification.

CHARLES E. BROAD.