(No Model.) 2 Sheets—Sheet 1.

J. ROBINSON & D. DONALD.

WATER GAGE FOR STEAM BOILERS.

No. 588,605. Patented Aug. 24, 1897.

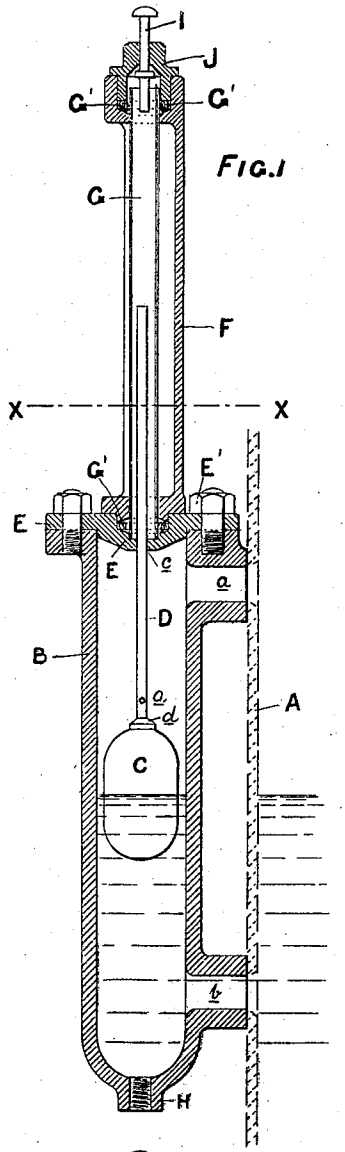


FIG. 1

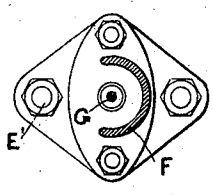


FIG. 2

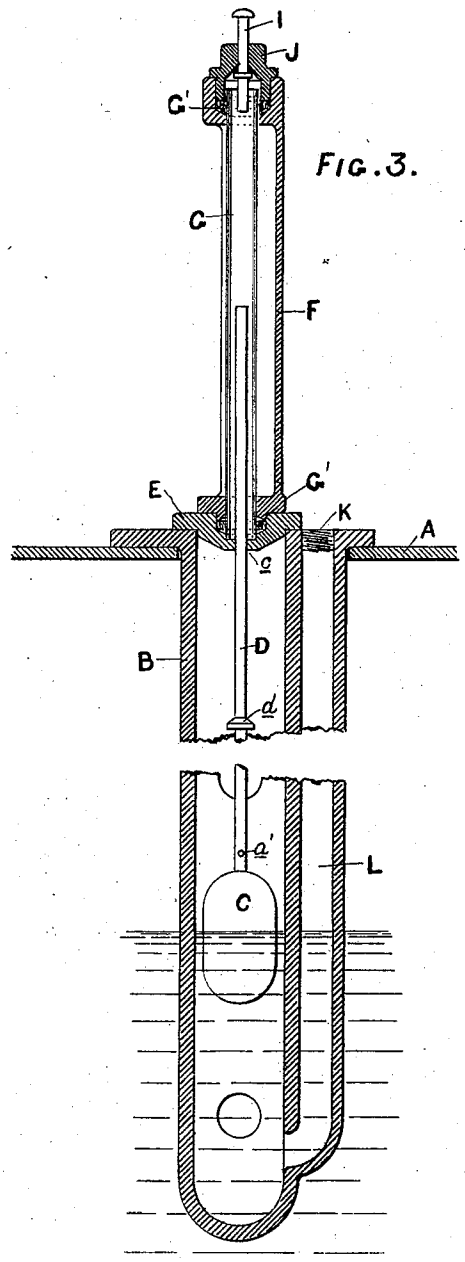


FIG. 3.

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(No Model.) 2 Sheets—Sheet 2.

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FIG. 5

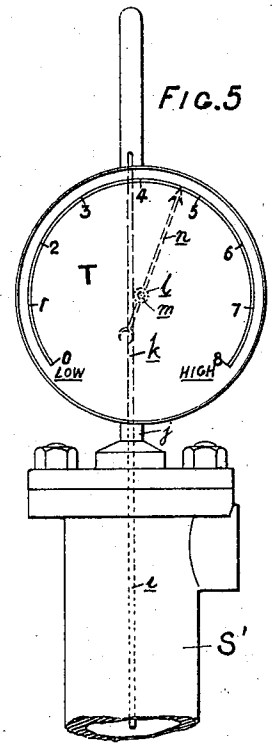


FIG. 4

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UNITED STATES PATENT OFFICE.

JAMES ROBINSON, OF LEEDS, AND DAVID DONALD, OF PENRYN, ENGLAND, ASSIGNORS OF THREE-FOURTHS TO EDWIN C. J. DE VIS, OF CLEVELAND, OHIO, AND THOMAS F. CRADDOCK, OF LONDON, ENGLAND.

WATER-GAGE FOR STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 588,605, dated August 24, 1897.

Application filed August 12, 1896. Serial No. 602,468. (No model.) Patented in England November 22, 1892, No. 21,654.

To all whom it may concern:

Be it known that we, JAMES ROBINSON, residing at Leeds, in the county of York, and DAVID DONALD, residing at Penryn, in the county of Cornwall, England, subjects of the Queen of Great Britain, have invented certain new and useful Improvements in Water-Gages for Steam-Boilers, of which the following is a specification, reference being had therein to the accompanying drawings, and for which Letters Patent No. 21,654 were granted to us by Great Britain November 22, 1892.

The invention has reference to an improved apparatus for indicating water-levels in steam-boilers; and the object of the invention is to provide simple, reliable, and efficient means whereby the water-level in the boilers or the level of liquids under pressure in tanks can be ascertained.

A further object is to decrease the liability of fracturing the gage-glass and, still further, to so construct the gage that if a fracture should occur the rush of water contained in the boilers or tanks which results when ordinary gage-glasses are broken will be prevented.

To this end the invention consists in the peculiar construction, arrangement, and combination of the parts hereinafter described, and fully set forth in the drawings, in which—

Figure 1 is a vertical central section of the improved gage, illustrating the same arranged outside of a boiler. Fig. 2 is a section taken on line *x x*, Fig. 1. Fig. 3 is a vertical section of a gage similar to Fig. 1, illustrating the same with only the part at which the indications are seen arranged outside of the boiler. Fig. 4 is a vertical central section through the gage, showing the same applied to the end plate of a boiler and provided with a modified form of float for raising the indicating-needle; and Fig. 5 shows our invention as applied to a gage provided with a hand and dial indicating on a circular scale the fluid-level.

The invention will be described and shown as used in connection with an ordinary steam-boiler, a portion of which is represented in Fig. 1 by the reference-letter A.

B is a metallic vessel or tube preferably, though not necessarily, circular in form and connected in any suitable manner to the boiler, said vessel or tube being provided with ports *a* and *b*, which are adapted to communicate with the interior of the boiler. The lower port *b* communicates with the water-space of the boiler and the upper port *a* with the steam-space thereof.

C is a float of any suitable form made, preferably, of hollow metal, adapted to rest upon the water and to fit easily in the vessel or tube B. To the float is secured an indicating stem or needle D, which may be solid in construction, or preferably, a tube open at the top and perforated at the lower part, as at *a'*, to permit steam to pass therethrough.

The vessel B is provided at the top with a head E, apertured at *c*, said head being secured to the vessel by means of suitable bolts E'. Through this aperture the stem is adapted to pass and to fit therein in such manner that the water of condensation formed above the apertured head may readily pass therethrough.

F is a bracket or holder suitably secured to the head E, adapted to receive and hold securely a closed tube G, preferably of transparent material, such as glass. The holder is apertured to correspond with the aperture in the head E and is provided at top and bottom with suitable packings G', which hold the closed tube securely in position, the said holder passing nearly around the closed tube and acting as a protector for the same.

When the steam first enters the vessel B, it passes up into the transparent tube G through the steam-passage in the stem and likewise through the aperture in the head E. It then rapidly condenses, and the water of condensation falls to the bottom of the tube. In case a solid stem is employed the steam has only one passage through which it may pass to reach the transparent chamber—namely, the apertured head. When the steam rises through this passage, the tendency is to force the water of condensation back into the tube, and thus obscure to view the stem. To obviate this defect, the steam-passage in the stem is introduced. When the steam condenses, the water of condensation collects at

the bottom of the transparent tube and the passage for the steam through the apertured head is partially closed. The steam therefore rises through the unrestricted passage in the stem, thus filling the tube G. The pressure of the steam in the vessel B and transparent tube are equal, but in addition to the steam-pressure in the tube is the increased pressure caused by the weight of the water of condensation, which balance of pressure causes at all times the steam to enter the tube G through the passage in the stem, and thus permits the water of condensation to fall back through the apertured head into the vessel beneath.

Upon the stem D or upon the float C is formed a collar or valve *d*. This collar is for the purpose of closing the aperture *c*, if the glass tube G be fractured or is removed, thereby preventing any considerable escape of steam or fluid through the opening, as the float will then be forced upward, so that the said collar or valve will seat itself against the lower side of the aperture *c*.

H is a blow-out cock located at the end of the vessel B, by means of which the action of the float may be tested and also the passage may be cleared of sediment.

I is a thrust-piece, adapted to work in the packed gland J for the purpose of enabling the stem D to be forced down after the tube G has been put in place and so move the valve *d* away from the aperture *c*.

In Fig. 3 a gage is shown similar to that illustrated in Fig. 1, but in a different position from the latter with respect to the boiler, the chamber B being located entirely within said boiler. In this location of the gage a test-cock K is located at the top of the chamber B and communicates with the interior thereof by means of the passage L.

When the apparatus is in operation, the water in the vessel B will be at the same level as that in the boiler, the float C will rest on the water in the chamber, and the stem D, seen through the glass tube G, will indicate the level of the liquid and any variation thereof in the vessel B and consequently in the boiler.

Any suitable part or parts of the gage may be provided with a scale to indicate levels, or the stem may have a scale thereon and then the glass or transparent part of the gage may be so reduced as to admit of one or two only of the divisions being seen at one time, thereby indicating the position of the float and consequently the water-level.

Fig. 4 illustrates a modified form of float and manner of operation, in which the float is shown as a ball N within the boiler proper, provided with a bent lever-arm O, fixedly secured thereto. This lever-arm is adapted to extend through a slot P in the end plate of the boiler into a chamber Q, formed by a hood Q′, which is fixed rigidly and steam-tight to the boiler-plate, where it is pivotally secured at R. The horizontal portion of the arm S is adapted to bear against the stem of the gage and raise or lower the same according to the position of the float, thereby indicating the water-level within the boiler. In this modification a collar *e* is attached to the lower end of the stem, which, when the glass of the tube is fractured, will fly up and close the opening around the stem, leaving the movement of the float unaffected by such fracture. At or near the top of the bracket that holds the glass tube is applied a pusher or stem *f*, which is operated by a screw-thread or other suitable means having for its object the double purpose of testing the action of the float by forcing it under the surface of the water and allowing it to rise by its buoyancy and also to push the needle or stem, with its collar, away from its seat when a new glass has been applied. In this arrangement the opening P is in the steam-space and the steam is adapted to enter the upper part of the gage through the passage *g* in the stem *h*.

In Fig. 5 our improved gage is shown in connection with devices whereby the float in its movement is adapted to cause an index-finger contained in a transparent chamber, said chamber being equivalent to a transparent tube, to be operated in a circular path over a scale, the movement of the float being conveyed to the index-finger in any suitable way. In this figure S′ represents a float-chamber, and *i* the rod or stem of the float. This stem passes through a guide at *j* into the transparent chamber T, where it operates through suitable mechanism a hand or pointer *n*, secured to a spindle *m*, mounted in bearings in the interior of the chamber T. As the float rises and falls with the level of the liquid in the chamber S′ the spindle *m* will be operated by the stem, causing the hand or pointer *n* to travel over a scale of inches, which may be marked on the transparent face of the chamber T or on a dial contained inside of the chamber, the position to which the hand of the pointer is moved thus indicating on the scale the height in inches of the fluid in the vessel.

Having thus described our invention, what we claim, and desire to secure by Letters Patent, is—

1. The combination with a boiler or receptacle for holding liquids under pressure, of a transparent inclosing casing communicating therewith, a stem arranged within the casing, a portion of which is adapted to extend below said casing into the receptacle with which the casing communicates; said stem being further provided with a steam-passage therethrough, extending from the lower end to near the top, and having a port at its upper end through which the steam in the receptacle enters the casing, a float adapted to rest upon the liquid in the boiler, and connections between the float and stem whereby the latter may be raised or lowered as the liquid rises or falls.

2. The combination with a boiler or recep-

tacle for holding liquids under pressure, of a transparent inclosing casing communicating therewith, a stem arranged within the casing and extending below the same, a valve mounted upon said stem below the casing for the purpose described, a float adapted to rest upon the liquid, and connections between the stem and float whereby the former may be operated as the liquid rises or falls.

3. The combination with a boiler or receptacle for holding liquids under pressure, of a transparent inclosing casing communicating therewith, a stem arranged within the casing, a portion of which is adapted to extend below said casing into the receptacle with which the casing communicates; said stem being further provided with a steam-passage therethrough extending from the lower end to near the top, and having a port at its upper end through which the steam in the receptacle enters the casing, a valve arranged upon the stem below the casing, a float adapted to rest upon the liquid in the boiler, and connections between the float and stem whereby the latter may be raised or lowered as the liquid rises or falls.

4. In combination with a boiler or receptacle for holding liquids under pressure, of a vessel communicating with the interior thereof, a transparent inclosing casing mounted upon the vessel and having communication with the same, a stem located within the casing, a packed gland, and thrust-piece, in the top of the inclosing casing, a float arranged upon the surface of the liquid, and connections between the float and stem whereby the latter may be raised or lowered as the liquid rises or falls, substantially as described.

5. In combination with a boiler or receptacle for holding liquids under pressure, of a vessel communicating with the interior thereof, said vessel being provided with an apertured head E, a transparent inclosing casing arranged upon the vessel and having communication therewith, a stem provided with a passage *g* located within the casing and adapted normally to extend below the same, a collar arranged upon the stem adapted at certain times to bear against the apertured head E, a packed gland and thrust-piece therein, arranged in the top of the casing, a float adapted to rest upon the surface of the liquid, and connections between the float and stem whereby the latter may be raised or lowered as the liquid rises or falls, substantially as and for the purpose described.

In testimony whereof we affix our signatures in presence of two witnesses.

JAMES ROBINSON. [L. S.]
DAVID DONALD. [L. S.]

Witnesses to signing by James Robinson:
HENRY S. LENTZ,
ALEX. I. CLIFFORD.

Witnesses to signing by David Donald:
A. POLLARD,
O. DAVIES.