(No Model.) 2 Sheets—Sheet 1.

# J. HOPKINSON & J. LOWIS.

## WATER GAGE.

No. 589,259. Patented Aug. 31, 1897.

Fig. 1.

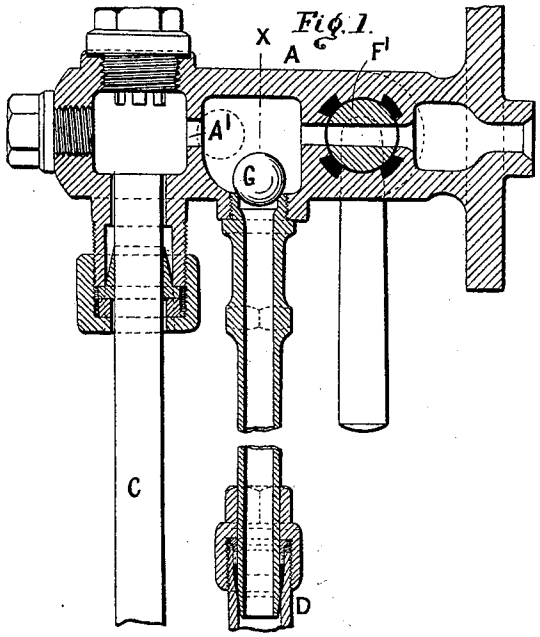
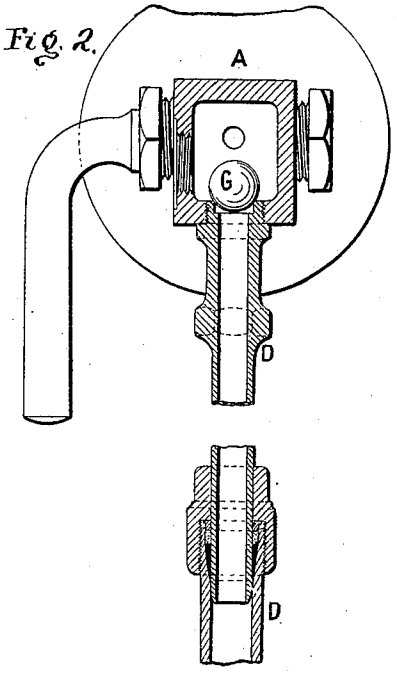
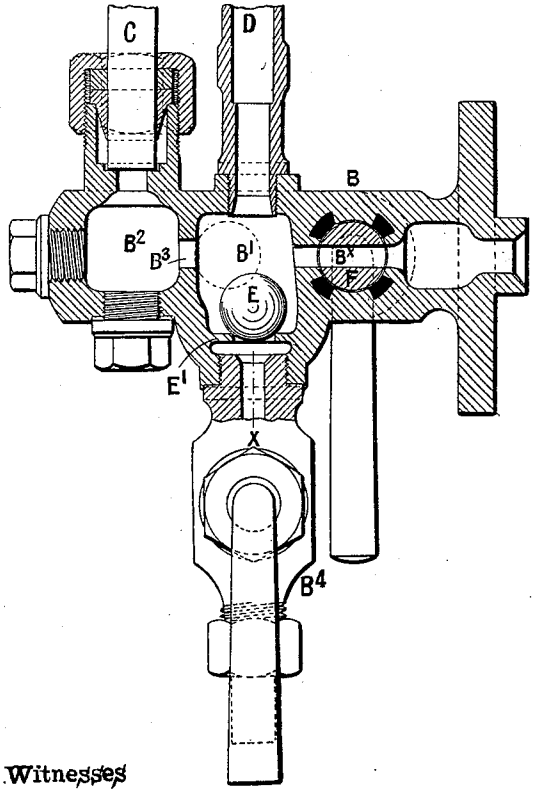



Fig. 2.



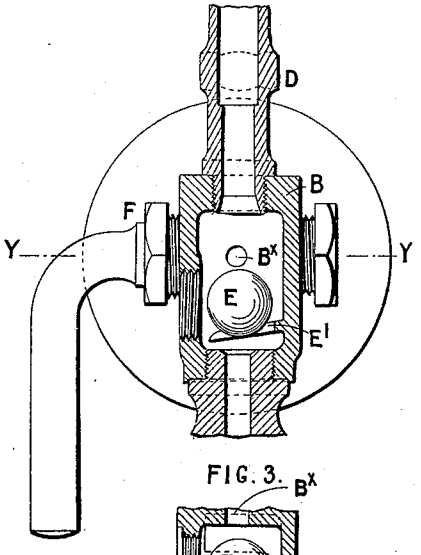
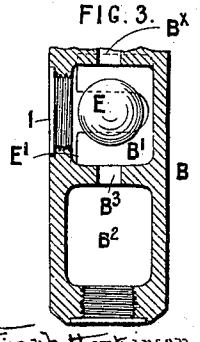




FIG. 3.




Witnesses

Dennis Bumby.

Inventors Joseph Hopkinson and John Lowis

by James L. Norris.

Attorney.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

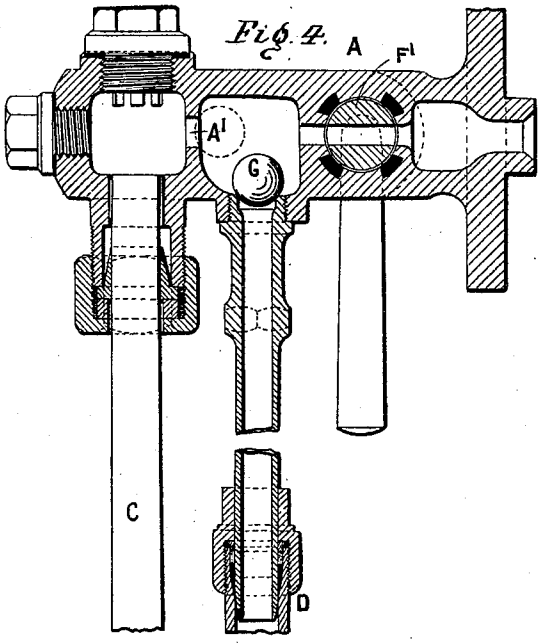
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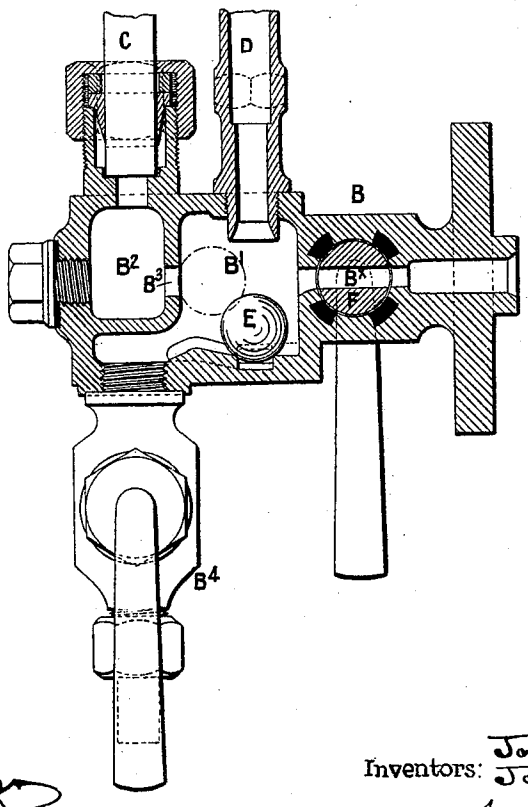
# J. HOPKINSON & J. LOWIS.

## WATER GAGE.

No. 589,259. Patented Aug. 31, 1897.

Fig. 4.




Witnesses:

Dennis Sumby.

Inventors: Joseph Hopkinson
John Lowis

by James L. Norris.

Attorney

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

# UNITED STATES PATENT OFFICE.

JOSEPH HOPKINSON AND JOHN LOWIS, OF HUDDERSFIELD, ENGLAND, ASSIGNORS TO J. HOPKINSON & CO., LIMITED, OF SAME PLACE.

## WATER-GAGE.

SPECIFICATION forming part of Letters Patent No. 589,259, dated August 31, 1897.

Application filed December 19, 1896. Serial No. 616,304. (No model.)

*To all whom it may concern:*

Be it known that we, JOSEPH HOPKINSON, of J. Hopkinson & Co., Limited, engineers, and JOHN LOWIS, works manager, subjects of the Queen of Great Britain, residing at Huddersfield, in the county of York, England, have invented certain new and useful Improvements in Water-Gages, of which the following is a specification, reference being had to the accompanying drawings.

Our invention relates to improvements in water-gages of that class which have ball or other valves in the steam and water arms for preventing the escape of steam and water when the glass bursts, and which have a supplementary or back tube forming a communication between the said steam and water arms, as described in the specification of prior patent, No. 481,493.

The particular objects of our invention are to provide for greater efficiency in the working of such gages not only when the glass tube bursts, but at other times—such, for instance, as when the cocks are operated for the purpose of blowing through the thoroughfares when the gage-glass is intact, or when a new glass has been inserted and the cocks are operated so as to put the gage in work again. Under these or any other conditions, when the gage-glass is intact and the cocks in the steam and water arms are opened, a full thoroughfare between the gage-glass and the boiler is insured, and therefore there is an absolutely accurate indication of the water in the boiler shown in the gage-glass.

In gages of this class hitherto constructed to accomplish these objects, we have employed, for instance, a by-pass in the steam-arm of the gage or other auxiliary devices. In our present invention we dispense with these special provisions and devices and construct a gage embodying the safety features set forth, at the same time free from the objections hitherto existing, and also absolutely certain and reliable in action, and efficient for its purpose.

Our improvements are illustrated in the accompanying drawings, in which—

Figure 1 shows, in vertical section, the construction and arrangement of the parts of our improved water-gage. Fig. 2 is a vertical section on the line $x\,x$, Fig. 1. Fig. 3 is a horizontal section on the line $y\,y$, Fig. 2. Fig. 4 is a vertical section illustrating a modification in the construction of the said water-gage.

Like letters indicate the same parts throughout the drawings.

A is the steam-arm; B, the water-arm; C, the glass tube, and D the back tube.

According to our invention instead of the automatic or ball valve E being placed in a chamber $B^2$ immediately below the glass, as heretofore, we construct the lower or water arm B of the gage with a space or chamber B′ below the back tube D and the ball-valve E is placed therein. This chamber is in communication with the boiler by the passage $B^{\times}$, with the top or steam arm by the back tube D, and with the space or chamber $B^2$ immediately under the gage-glass by the passage $B^3$, which forms the seat for the valve to shut off the escape of water when the gage-glass bursts. This chamber is also in communication with the try-tap $B^4$.

The ball-valve E is placed in the aforesaid chamber, supported on a rest or floor E′, and the upper surface of the ball is preferably below the level of the passage $B^{\times}$, and at the top of the back tube, on a seat or support, we place the ball-valve G, and by the peculiar combination and arrangement of the automatic ball-valves E and G with the chambers and thoroughfares we secure advantages which are the objects of our invention and at the same time simplify the construction of the gage and render it more durable than heretofore.

It will be seen that when the gage-glass C bursts the pressure in the top and bottom arms A and B forces the balls E and G to their respective seats, as shown in dotted lines, and therefore shuts off the escape of both water and steam. After the cocks F and F′ in these arms are closed for the purpose of inserting a new glass, and when the try-tap $B^4$ is opened, the contents of the top and bottom arms A and B are run away through the aforesaid tap. The arms are then empty and free from pressure, the balls fall from their seats, and the proper condition of the gage is restored ready for the cocks being opened between the

boiler and the gage-glass. When in this condition, if the cock F in the lower arm is opened the pressure is so admitted to the gage-glass that there is no preponderating pressure in the back tube sufficient to force the ball G in the top arm to its seat A′ or retain it there, and a true water-level is indicated in the gage-glass. Further, if the cock of the top arm is first opened while the gage is in the before-named condition the pressure is so admitted to the gage-glass that the balls do not close the passages between the glass and the boiler, but will allow the free flow of steam and water.

It will be seen that the chamber B′, which contains the ball-valve E, has four passages or apertures, as hereinbefore set forth, and that the try-tap $B^4$ is connected with the gage-glass through the aperture $B^3$, so that under all circumstances a free and uninterrupted flow can be obtained through the steam and water arms, respectively, by opening the try-cock $B^4$.

Our present invention effectually avoids the liability of indicating a false water-level, which might occur with the parts constructed as shown in the patent referred to. By the relative positions of the cock, the ball, and the back tube described in the present application the action is rendered more certain and reliable. For instance, if the cock in the bottom arm of the patented construction is opened first while the the gage-glass is intact, both balls are liable to be blown to their seats, thus closing the thoroughfare between the boiler and the gage-glass, which would likely result in indicating a false water-level. In the patent referred to a by-pass or supplemental thoroughfare of comparatively small area or capacity is employed, and if this by-pass becomes choked the true indication of the water-level may not be indicated.

In the present invention the ball in the water-arm is placed in a chamber immediately below the back tube at a suitable height below the thoroughfare leading to the boiler, and from the said chamber there are two outlets, one to the gage-glass and one to the back tube, so that when the cock in the water-arm is opened the action of the current is such that the ball is not blown to its seat $B^3$ and the communication between the gage-glass and the boiler is never interrupted.

What we claim is—

1. In a safety water-gage the combination of steam and water arms connected by a gage-glass C and a tube D, a try-cock connected to the water-arm, a chamber B′ below the tube D, a ball-valve in said chamber, and thoroughfares forming communications between said chamber and the boiler, the tube D, the gage-glass, and the try-cock, substantially as described.

2. In a safety water-gage the combination of a steam-arm A and water-arm B connected by a gage-glass C and a tube D, a try-cock $B^4$ connected to the water-arm, a chamber B′ in the water-arm below the tube D said chamber communicating with the boiler, the tube D, the gage-glass C and the try-cock $B^4$, a ball E in the chamber B′ adapted to close the passage $B^3$ leading to the gage-glass, the top of said ball when resting on the floor of the chamber being below the level of the passage $B^\times$ leading to the boiler, and a ball G in the steam-arm adapted to close the passage A′ leading to the gage-glass, substantially as described.

In testimony whereof we have hereunto set our hands this 17th day of November, 1896.

JOSEPH HOPKINSON.
JOHN LOWIS.

Witnesses:
FRED SWIFT,
GEORGE HELM.