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D. G. CAMERON.

AUTOMATIC BOILER GAGE.

APPLICATION FILED APR. 30, 1906.

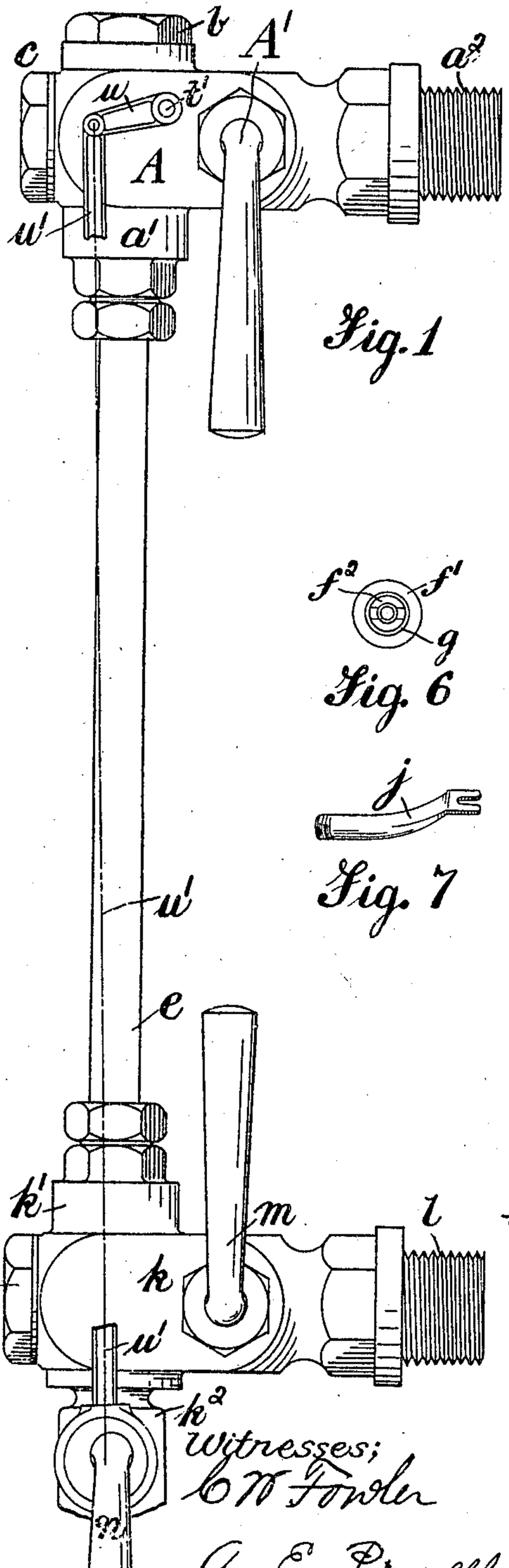

Fig. 1

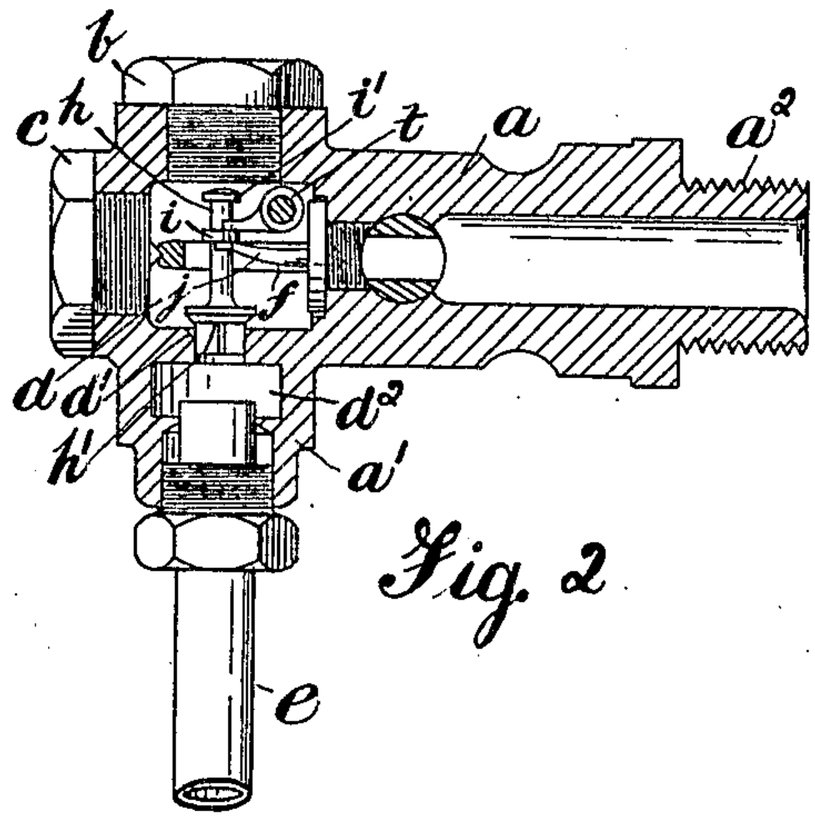

Fig. 2

Fig. 6

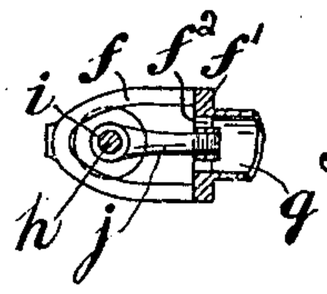

Fig. 4

Fig. 7

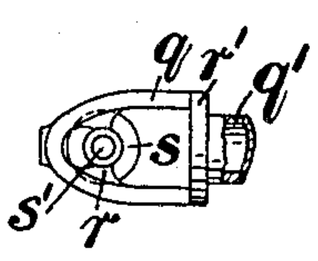

Fig. 5

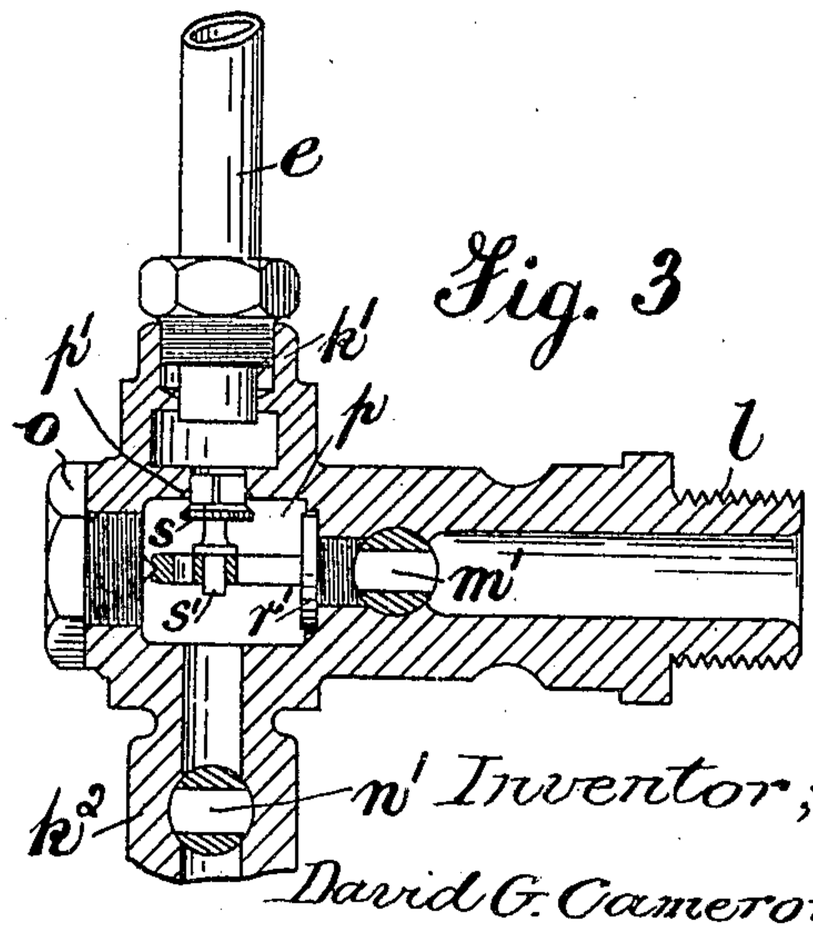

Fig. 3

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UNITED STATES PATENT OFFICE.

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AUTOMATIC BOILER-GAGE.

No. 843,192. Specification of Letters Patent. Patented Feb. 5, 1907.

Application filed April 30, 1906. Serial No. 314,597.

To all whom it may concern:

Be it known that I, DAVID GRAY CAMERON, a subject of the King of England, and residing at 111 Rodney road, New Kent Road, London, England, engineer, have invented a new and useful Improvement in Automatic Boiler-Gages, of which the following is a full, clear, and exact description, and for which I have applied for Letters Patent in Great Britain, dated February 13, 1906.

This invention has reference to an automatic boiler-gage which while enabling the gage-glass to be blown through will automatically, if the glass be broken, prevent the discharge of steam or water from the boiler through the gage.

A chamber above the gage-glass is fitted with a valve which is normally held off its seat by a Bourdon-tube support. This tube so long as it is acted on by the pressure of steam in the boiler maintains the valve in the lifted position, so that steam can pass through the valve-seating into the gage-glass. If, however, the glass should become broken from any cause, the supporting extremity of the Bourdon tube falls and the valve seats itself, cutting off the discharge of steam through the broken glass. In order that the gage-glass may be blown through when it is desired, a supplementary pivoted finger or lever is arranged to be brought into action by the operation of one of the cocks, and thereby to prevent the falling and closing of the valve, so that although the Bourdon-tube support will fall the valve will still remain raised.

The invention is illustrated upon the accompanying drawings, in which—

Figure 1 is an elevation of an automatic boiler-gage constructed in accordance with the invention. Fig. 2 is a sectional view of the upper part of the gage, and Fig. 3 is a similar view of the lower part. Figs. 4 and 5 are sectional plan views of the upper or steam valve and the lower or water valve, respectively. Fig. 6 is an end view of Fig. 4. Fig. 7 is a perspective view of the Bourdon tube removed.

The upper union A is shown composed of horizontal and vertical arms a a' and is provided with means for attachment to the boiler, such as the screw-threaded portion a^2, and with screw-plugs b c, whereby access can be had to a chamber d in the body of the union. This union is also provided with a screwed extension into which may be fitted, by means of a rubber packing or the like, in any ordinary manner the gage-glass e. The chamber d, which is above the gage-glass, is provided with a valve-seat d' and a passage d^2, whereby communication may be made from the chamber and to the gage-glass through the seating d'. Projecting laterally into this chamber is a bridge f, provided with a cross-piece f'' and with means for attachment to the union. Thus I have shown the bridge f having a screwed stem g, whereby it may be screwed into the horizontal arm a. The cross-piece f'', which may assume the form of a recessed or cut-away disk, as shown, is provided with steam-passages f^2 in the form of perforations. The bridge is provided with a forked support composed of a Bourdon tube, which passes through and is at one end seated in the cross-bar f''. This support is, as stated, forked at its free end, and such end embraces a valve-stem h, carrying at its lower end a head h' and having collars i i' upon the stem. The one collar i bears upon the Bourdon-tube fork j, (in Fig. 2,) and the valve h h' is thus prevented from closing upon its seat d' so long as the free end of the Bourdon tube is held up or curved up by the pressure of steam in the boiler. When, however, the Bourdon tube falls at its forked extremity, the valve is free to drop onto its seat d', and steam-pressure will maintain it closed and prevent the egress of steam through the broken gage-glass.

The union A is fitted with a cock A′ of any ordinary type, whereby a passage may be opened through the horizontal arm a of the union. The passage is shown open in Fig. 2.

The gage-glass e is shown seated at its other end in the vertical arm k' of the second union k, and it is packed in any convenient manner. The union k is provided with means for attachment to the boiler, such as the screw-threaded portion l, and with a water-cock m. A drain-cock or blow-through cock n is provided upon an extension k^2 of the union k. The plugs of these two cocks are shown in Fig. 3 as m' and n', respectively. The union k is further fitted with a screw-plug o and with a chamber p, similar to the chamber d. A bridge q, having a screwed shank q' and cross-bars r r', is screwed into the horizontal arm k of the union, and the bar

r forms a guide for the stem s' of a valve s. This chamber can communicate with the water-space of the boiler through the cock $m\,m'$, and the valve s is adapted to be upheld by the pressure of water when the gage-glass breaks against a seating p', arranged in the chamber p.

It will thus be understood that if the cocks A′ and m be turned so that they open the passages in the unions steam will flow from the boiler into the gage-glass through chamber d and water will pass from the boiler through chamber p into the glass e, so as to indicate the water-level in the ordinary manner of gage-glasses. As before stated, the tube is normally curved to hold the valve off its seat. The pressure within the tube and in the chamber d produces no distortion at all so long as both these regions have the same pressure—that is to say, in the ordinary working when both have the actual boiler-pressure the valve is held off its seat and the steam has free access through the segmental slots f^2 to the chamber d and glass tube e. Upon breakage of the glass, however, a rush of steam occurs through these slots f^2, the chamber d, and the glass e to the atmosphere. The pressure in the chamber d immediately falls to an extent determined by the relative passage areas of this chamber and the broken end of the glass. The resulting pressure will be to a slight extent affected by the friction of the flow of steam through the various passages and its expansion; but substantially the Bourdon effect will determine the pressure-head in the chamber d. Now the pressure within the tube j remains approximately the same as before, since it falls short of the boiler-pressure only by the friction of flow through the horizontal arm a and the steam-cock A′. The tube is therefore subject to a greater internal than external pressure, with the result that it straightens, the forked extremity drops, the valve is allowed to seat itself, and the flow of steam through the broken glass is stopped. So soon as this flow ceases the pressure in the chamber d attains the same value as that in the boiler and the tube j. The tube therefore endeavors to resume its normal curvature and in so doing to lift the valve h'; but the pressure of boiler-steam upon the upper face of this valve maintains it closed in spite of the effort of the tube j to raise the same. The water-cock m having been closed and the valve s caused to fall, a new gage-glass may be inserted. The cock m is then again opened, the water flows into the glass, and the boiler-pressure is communicated to the under side of the valve h'. The latter is then approximately in equilibrium and allows itself to be raised by the tube j, when the normal working is resumed.

If it were desired to blow through the gage-glass and the latter were intact, upon opening the drain-cock n the valve h would close and prevent the passage of steam. So in order to permit the valve h to remain lifted it is provided with means independent of the Bourdon-tube support for keeping it in the raised position. The valve-stem h' is provided with a second collar i' at its extremity, and this collar can be engaged by the extremity of a finger or rocking lever t, pivoted at t' in the chamber d in such a way that the lever t can be rotated to meet the collar i' and prevent the latter from falling, although the support j be withdrawn from the collar i. The lever t is rotated in any convenient manner, and in the drawings I have shown the pivot t' provided with a second lever-arm u outside the union A. This lever may be connected, by means of a rod or link u', to the water-cock m, so that when the latter is closed the lever u will be raised and the lever-finger t placed under the collar i'. By preference the rod u is connected to an eccentric-strap operated by an eccentric mounted on the stem of the cock m, so that the rotation of the handle results in the rod u' being raised or lowered.

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

1. An automatic boiler-gage comprising unions to the boiler a gage-glass seated in said unions, cocks opening passages through said unions, chambers in said unions, valves mounted in said chambers, seats for said valves in said chambers, said valves being adapted to close upon said seats, means for maintaining the steam-valve off its seat, said means comprising a normally contracted member adapted to be expanded to seat the steam-valve by the pressure of steam in the boiler.

2. An automatic boiler-gage comprising cock-fitted unions passing steam and water to the gage-glass, chambers in said unions, bridge-pieces in said chambers, valves passing through said bridge-pieces and mechanical means for utilizing the pressure of steam in the boiler to seat the steam-valve when the gage-glass is ruptured and the pressure therein is reduced below boiler-pressure, as above described.

3. An automatic boiler-gage comprising means for securing steam and water chambers to the boiler, cocks and passages in said chambers, a glass gage connecting said chambers, bridge-pieces secured across the chambers and having cross-pieces provided with steam-passages, valves in the chambers, said chambers having seats for the valves, a tube in one of the chambers and connected with the steam-valve, said tube being normally curved to hold the steam-valve off its seat, and said tube adapted to be straightened out when the pressure in the steam-chamber falls below boiler-pressure whereby the valve is seated.

4. In a boiler-gage, a steam-union having a chamber provided with a valve-seating, a bridge-piece with passages for steam and a Bourdon tube having an extremity normally directed upwardly and adapted to be straightened out by the pressure of steam in the boiler, and a valve having a collar supported upon said tube extremity, said valve being adapted to close on its seat when the tube extremity drops, as above described.

5. In a boiler-gage, a chambered union capable of passing steam to a gage-glass, a valve-seat in said chamber, a bridge-piece with passages for steam, a Bourdon tube fixed to the bridge-piece and having a forked extremity, a valve-stem in said chamber embraced by said fork, a collar upon said stem resting upon said extremity when directed upward, said valve being adapted to prevent automatically the passage of steam through the union to the glass when the latter becomes broken.

6. In a boiler-gage, a chambered union passing steam to a gage-glass, a bridge-piece transverse of said chamber, a Bourdon tube having a forked extremity, a valve-stem embraced by the said forked extremity, a second chambered union passing water to the said gage-glass, a second bridge-piece transverse of said second chamber, valves extending through said bridge-pieces, valve-seats in said chambers, said valves being adapted to close on their seats when said gage-glass is broken.

7. In a boiler-gage, the combination of a chambered union connecting with the boiler, a Bourdon tube within the chamber of said union, a valve within said chamber and normally held off its seat by the tube, said tube being normally curved and being adapted to straighten out under the influence of boiler-pressure, to seat the valve, whereby the further escape of steam past the valve is prevented, said tube automatically lifting the valve from its seat when the pressure in the chamber substantially equals the boiler-pressure.

8. In a boiler-gage, a steam-union, a Bourdon tube having an upstanding extremity, a valve within said union, a collar upon the stem of said valve intermediate of its length, said collar resting on the upstanding extremity of said tube, a second collar at the upper end of said valve-stem a lever pivoted on said union, an operative connection to said lever, said lever being adapted to locate itself below said upper collar and to prevent the valve from falling.

9. In a boiler-gage, the combination with a steam-union having a chamber with a valve-seat, and a valve in said chamber, of a bridge-piece having a cross-piece, a Bourdon tube having an open end fixed in the cross-piece in the path of the steam entering said chamber, said tube having its free end extending into the middle portion of the bridge-piece, and engaging said valve and said cross-piece having passages for the admission of steam to the chamber.

10. In a boiler-gage, the combination with a steam-union having a chamber with a valve-seat, and a valve in said chamber, of a bridge-piece having a cross-piece, a Bourdon tube having an open end fixed in the cross-piece in the path of the steam entering said chamber said tube having its free end forked and extending into the middle portion of the bridge-piece and having a threaded portion at its opposite end by which it is fixed to the bridge-piece, and said cross-piece having passages for the admission of steam to the chamber.

11. A boiler-gage comprising steam and water unions having internal chambers, cocks to said unions permitting the passage of fluid, bridge-pieces in said chambers, valves arranged in said chambers adapted normally to be held off seats in said chambers, a Bourdon tube capable of normally supporting the steam-valve and maintaining it lifted by means of a collar on its stem, and means for independently maintaining the steam-valve lifted without the assistance of said Bourdon tube.

12. A boiler-gage comprising steam and water unions, chambers in said unions, valves supported in said chambers and seats for said valves in said chambers, a gage-glass between said unions, a Bourdon tube for holding the steam-valve normally off its seat said tube being operatable by the steam-pressure in the steam-union to seat said valve, a cock to said steam-union, a drain-cock and a water-cock to said water-union, supplementary means for holding the said steam-valve off its seat said supplementary means being operated by the actuation of one of the cocks to the water-union, substantially as above described.

In testimony whereof I affix my signature in presence of two witnesses.

DAVID GRAY CAMERON.

Witnesses:
VICTOR F. FEENY,
CYRIL J. FEENY.