H. R. FAY.

WATER GAGE.

APPLICATION FILED FEB. 1, 1911.

1,005,424. **Patented Oct. 10, 1911.**

3 SHEETS—SHEET 1.

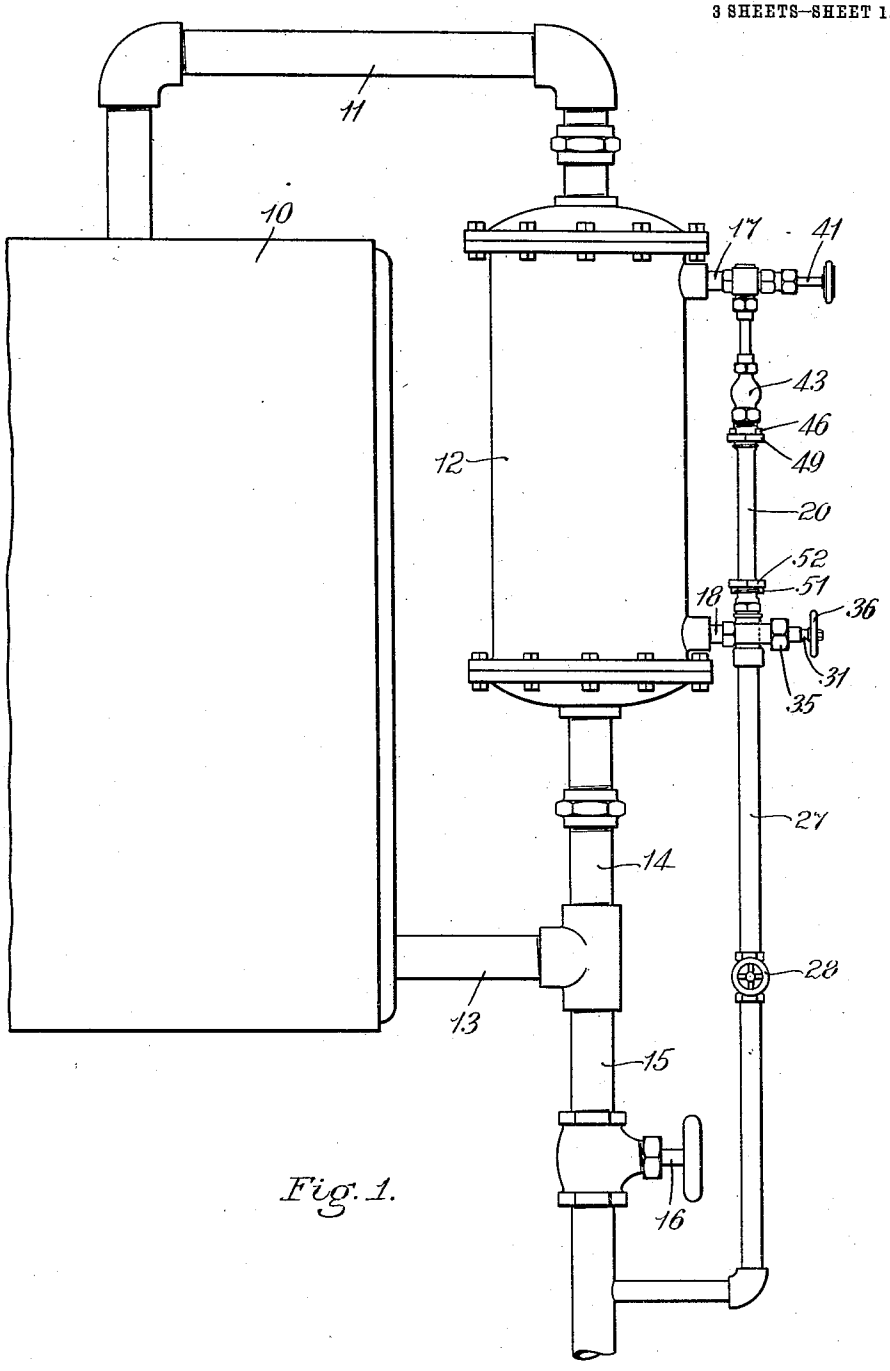

Fig. 1.

Witnesses.
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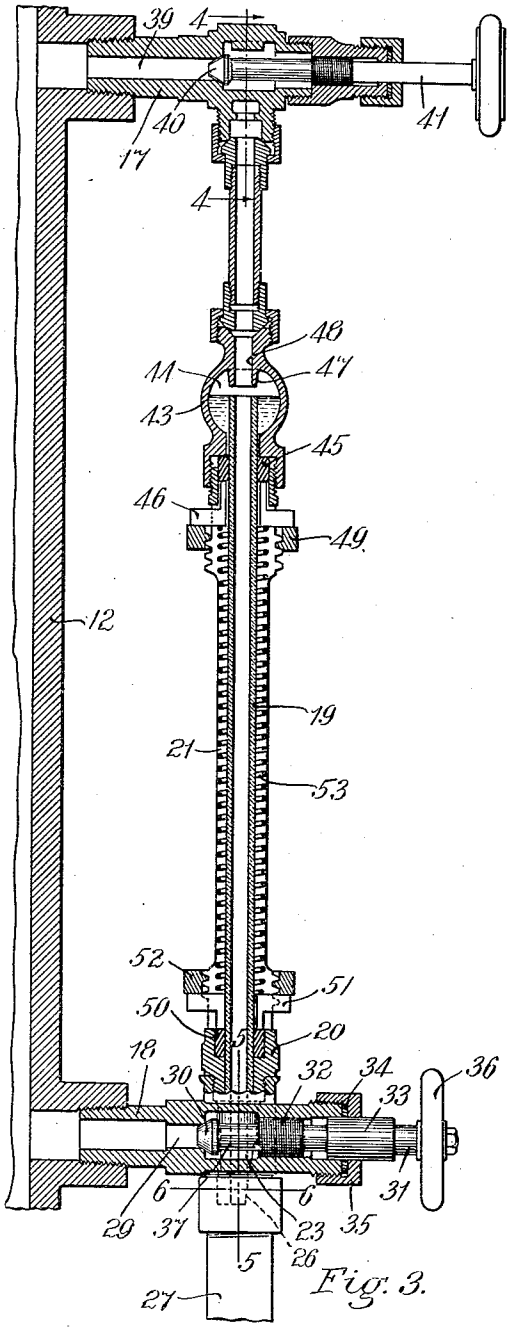

Fig. 3.

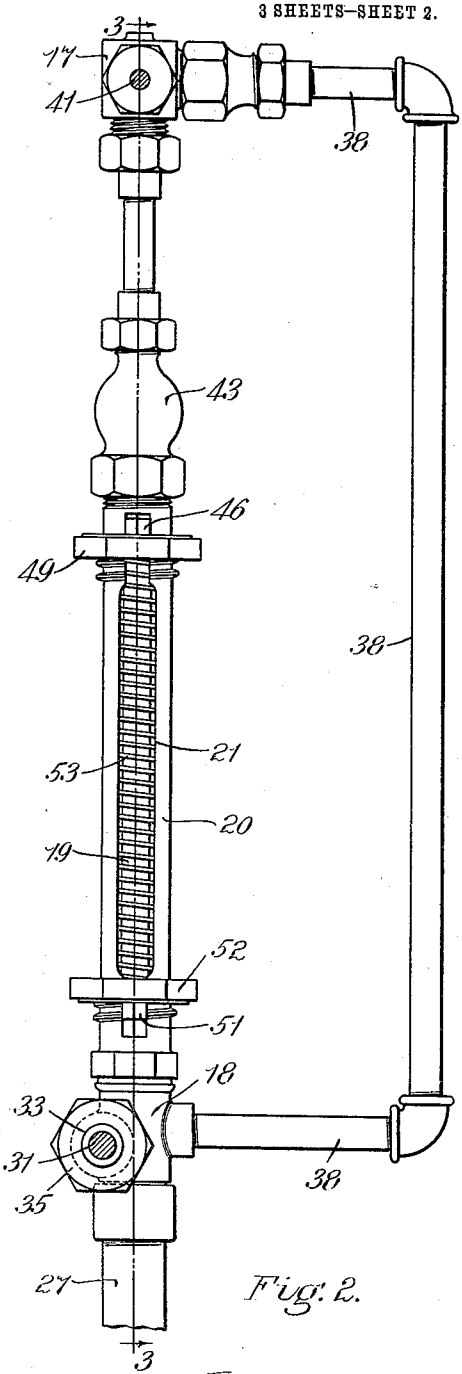

Fig. 2.

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3 SHEETS—SHEET 3.

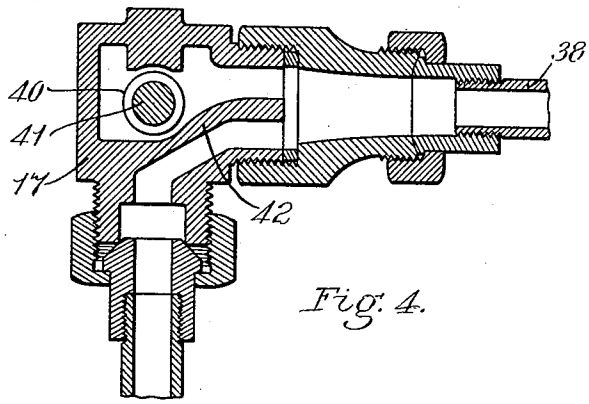

Fig. 4.

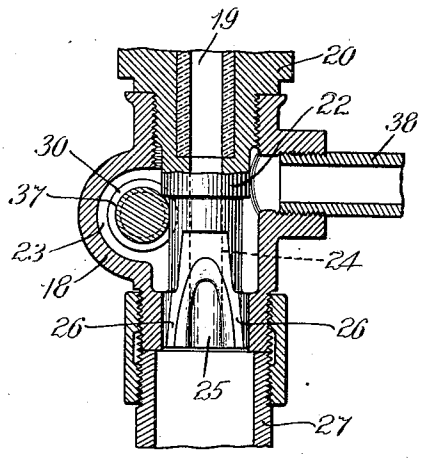

Fig. 5.

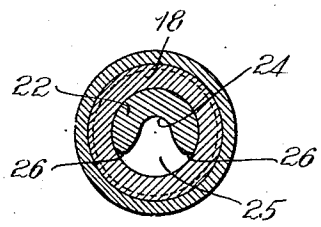

Fig. 6.

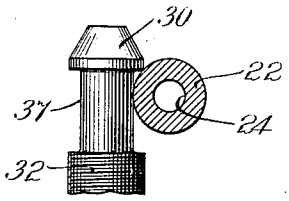

Fig. 7.

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UNITED STATES PATENT OFFICE.

HENRY R. FAY, OF WEST NEWTON, MASSACHUSETTS.

WATER-GAGE.

1,005,424. Specification of Letters Patent. Patented Oct. 10, 1911.

Application filed February 1, 1911. Serial No. 605,851.

To all whom it may concern:

Be it known that I, HENRY R. FAY, a citizen of the United States, residing at West Newton, in the county of Middlesex and State of Massachusetts, have invented new and useful Improvements in Water-Gages, of which the following is a specification.

This invention relates to improvements in water gages for steam boilers and the like and relates more particularly to water gages of the type in which a tubular water-glass is employed, although some of its features are applicable to other types of gages.

The invention has for its principal object to provide a water gage the passages of which may be easily and conveniently cleaned and which shall be safe and reliable in its action.

Another object is to provide means to prevent what is known as cutting of the water glass by the steam adjacent to the top of the glass, especially at the upper packing ring. This so-called cutting of the glass is caused principally by an imperceptible or almost imperceptible leakage of steam between the water glass and the upper packing ring and in time the glass becomes so badly worn and grooved as to make it necessary to replace the same.

Another object is to provide means to prevent the surging of the water in the boiler from breaking the water glass by what is known as a "water hammer" action.

Another object is to facilitate the removal of the valve and stem of the water-base for the purpose of cleaning the water passages and to provide means whereby this valve shall be normally locked so as not to be blown out by the pressure and yet may be conveniently removed for the purpose of cleaning, when desired.

Still another object is to provide means normally urging the glands against their respective packing rings around the water-glass, and further to prevent pieces of broken water-glass from flying.

A still further object is to provide means whereby the bubbles caused by foaming in the boiler are deflected from the water-glass and whereby the water or considerable of the water may be diverted from the water-glass when the water-glass is broken and whereby by closing the steam valve and opening the water valve water is allowed to pass upwardly through a bubble pipe and downwardly through the glass, thereby enabling the water to be blown downwardly through the glass to carry out any sediment that may be therein.

Still other objects and advantages will appear hereinafter.

To these ends, the invention consists in the novel features of construction and in the combination and arrangement of parts set forth in the following specification and particularly pointed out in the claims.

Referring to the drawings: Figure 1 is an elevation of a water gage embodying my invention, shown connected up to a water column and boiler together with the blow-off pipe and its valve. Fig. 2 is a front elevation of the water gage alone, two of the valve stems being shown in section. Fig. 3 is a sectional view taken on the irregular line 3—3 of Fig. 2, looking toward the right. Fig. 4 is an enlarged detail sectional view taken on line 4—4 of Fig. 3, looking toward the left. Fig. 5 is an enlarged sectional view, partly in elevation taken on line 5—5 of Fig. 3, looking toward the left. Fig. 6 is an enlarged detail plan section taken on line 6—6 of Fig. 3. Fig. 7 is a detail plan, partly in section, showing the coöperative action of the extension of the water-glass guard with the valve of the water-base illustrating the manner in which said extension locks said valve against being blown out by the steam pressure.

Like numerals refer to like parts throughout of several views of the drawings.

In the drawings, 10, see Fig. 1, is a boiler which may be of any usual or desired construction connected by a steam pipe 11 to the upper end of a water column 12 and connected by water pipes 13 and 14 to the bottom of said water column. A blow-off pipe 15 connected to the water pipe 14 is provided with a suitable shut-off valve 16. The parts just described are of usual construction.

Referring now particularly to Figs. 2 and 3, 17 is a steam connection leading from the upper portion of the water column 12 and 18 is a water connection which may be termed a water-base leading from the lower portion of said water column. Interposed between and communicating with the connections 17 and 18 is a water-glass 19, preferably of the tubular type. This water-glass is preferably inclosed by a water-glass guard 20 having suitable apertures 21 on

opposite sides thereof through which the water in the glass may be viewed. This water glass guard which preferably has screw-threaded engagement with the water-base 18, as shown in Fig. 5, is preferably provided with a depending extension 22 located within a chamber 23 formed within the water-base 18. This depending extension 22 is provided with a passage 24 communicating with the lower end of the water-glass 19 and having an outlet orifice 25 formed partly in the bottom of said extension and partly in the side thereof, that is to say said extension is preferably cut off on one side, as shown in Figs. 5 and 6, in such a manner as to form an orifice located partly in the side of said extension and, moreover, in such a manner as to form two wings 26. Preferably, these wings contact with the internal surface of the water-base 18 in such a manner that when the water glass guard 20 is unscrewed and again screwed into its place, said wings clean out the downwardly extending passage. This downward outlet of the water-base 18 is connected by a blow-off connecting pipe 27 to the blow-off pipe 15 below the valve 16 and the pipe 27 is provided with a suitable shut-off valve 28, see Fig. 1. It will be observed that although the wings 26 contact with the internal surface of the water-base 18, yet the orifice 25 constitutes a means of communication between the water glass 19 and the chamber 23. This chamber is connected by a passage 29 to the bottom of the water column 12 and the communication between the bottom of the water column and the bottom of the water-glass through this passage is controlled by a suitable valve 30. The construction and arrangement of this valve forms one of the important features of my invention. Heretofore, valves of this class have been so constructed that in order to remove the same for the purpose of cleaning out the water-base, it was necessary to remove a hood containing the packing and having a packing gland attached thereto. According to my invention, however, this is not necessary, since the valve 30 is provided with a stem 31 having a screw-threaded portion 32 larger in diameter than the valve 30 and having screw-threaded engagement with the water-base 18 and, moreover, said valve stem is provided with a cylindrical portion 33 larger in diameter than the screw-threaded portion, this cylindrical portion passing through a packing ring 34 and gland 35 to the exterior of the water-base. The stem 31 is provided as usual with a suitable handle 36 by means of which the same may be rotated. It will thus be seen that owing to this construction the valve and its stem may be unscrewed and entirely withdrawn from the water-base without removal of the usual hood with its attached parts and this construction, moreover, results in a saving in cost of manufacture and a simplification of the construction owing to the fact that the hood is eliminated.

Although the screw-threaded portion 32 of the valve stem prevents the valve from being blown out by the pressure, yet to make the valve perfectly safe and to assure it against being blown out by the pressure, I provide suitable means to normally lock the same against withdrawal from the water-base, such means preferably consisting of the extension 22 of the water-glass guard, and to this end the valve stem 31 is provided with a reduced portion 37 between the valve 30 and the screw-threaded portion 32 and into the annular groove formed by this reduced portion the extension 22 projects, as shown in Figs. 5 and 7, particularly in Fig. 7. It will be evident by an inspection of Fig. 7 that although the valve 30 may be drawn back sufficiently to unseat the same, yet the extension 22 constitutes a positive stop limiting the movement of the valve 30 and its stem 31 in an outward direction. When, however, the glass guard 20 is removed its extension 22 being withdrawn from the water-base 18 permits the valve 30 and its stem 31 to be unscrewed and withdrawn freely.

The water-base 18 is preferably connected to the steam connection 17 by a bubble pipe 38, see Figs. 2, 4 and 5, which preferably communicates with the chamber 23 at the upper portion of the same and at a point some distance from the entrance of the passage 29 into said chamber. One advantage of this bubble pipe is that bubbles coming from the bottom of the water column and which would otherwise pass upwardly through the water-glass are deflected or diverted by the depending extension 22, since the inlet of said extension is at a point considerably below the passage 29 and the point of connection of the bubble pipe 38 into the chamber 23 so that it is evident that the bubbles must pass from the passage 29 around the extension 22 and into the bubble pipe 38.

Referring now to Fig. 3, it will be seen that the steam connection 17 is provided with a passage 39 leading to the upper portion of the water column 12 and controlled by a suitable valve 40 provided with a stem 41 and constructed in the usual and well known manner.

Referring to Fig. 4, it will be observed that the bubble pipe 38 is connected to the side of the steam connection 17 and said steam connection is provided with a wall 42 constituting a means which while it normally allows the steam to pass down into the water-glass 19 tends to deflect the steam from the water-glass to the bubble pipe in case the water-glass should break. The

steam connection 17 is connected by suitable connections to a casing 43 forming a condensation and cushioning chamber 44 into which the upper end of the water-glass 19 extends. This condensation and cushioning chamber forms one of the important features of my invention. One of its advantages is that it prevents what is known as steam cutting of the upper portion of the water-glass owing to leakage of the steam around the upper packing ring. It is quite common, especially at high pressures, for the steam to leak in this manner imperceptibly or almost imperceptibly and thus wear away the water-glass, making it thin and also grooved around its upper portion particularly on the external surface of the glass and sometimes to a certain extent on the internal surface. The casing 43 is preferably connected to the water-glass guard 20 by having screw-threaded engagement therewith and seated in the lower part of the casing 43 is a packing ring 45 surrounding the water glass and held against its seat by a suitable gland 46. Since the water-glass 19 projects upwardly into the chamber 44 a considerable distance, there is provided in said chamber surrounding said water-glass a reservoir so to speak in which condensation collects up to the level of the top of the glass and the water overflows into the inside of the glass and trickles down on the internal surface thereof. This body of water effectually prevents the steam from working downwardly between the packing ring 45 and the water-glass 19 and thus positively prevents the steam cutting of the glass which would otherwise occur. The chamber 44 also serves another useful purpose which has been referred to hereinbefore, viz., it forms a cushioning chamber which, when the water surges in the boiler prevents the "water hammer" action from bursting the water-glass, as is sometimes the case.

Preferably, the casing 43 is provided with a depending tubular projection 47 whose passage 48 communicates with the steam connection 17. This depending tubular projection provides an annular cushioning space surrounding the same and which serves to confine a body of steam of substantially larger area than the area of the interior of the water glass so that when the water surges upwardly in the glass in a locomotive or marine boiler a cushioning action takes place which prevents the surging of the water from breaking the glass. The effect of the chamber surrounding the depending tubular projection 47 is practically the same as that of the air dome of a pump in producing a cushioning action. The size of the chamber, in practice, depends upon the circumstances. In some cases, as, for example, where there is an abrupt turn in the steam connections very close to the water glass and which would seriously obstruct the water as it surges upwardly in the glass, the chamber surrounding the depending projection should be made very large. It will be understood from the foregoing that although the water may rise into the interior of and upwardly beyond the lower end of the projection 47 and although the water may be obstructed above that point, yet the cushioning chamber surrounding the depending tubular projection 47 will confine a body of steam above the water in the glass and the elasticity of the steam will prevent the shock from breaking the water glass.

The gland 46 is preferably divided or split, as will be apparent from an inspection of Figs. 2 and 3, particularly Fig. 2, and is held against the packing ring 45 by a nut 49 having screw-threaded engagement with the water-glass guard 20, this splitting of the gland facilitating its removal through the apertures 21 when the glass is removed. The water-glass is provided at its lower end with a suitable packing ring 50 against which a divided gland 51 is forced by means of a nut 52 having screw-threaded engagement with the water-glass guard 20.

Interposed between the interior of the water-glass guard 20 and the water-glass 19 is an extensible means 53 having lateral openings and preferably consisting of a helical spring bearing at its upper end against the gland 46 and at its lower end against the gland 51, thus urging the glands against their respective packing rings and, moreover, acting to hold the two parts of each divided gland together as a pair. When the nut 49 is unscrewed and dropped down, the spring 53 will act to hold the two parts of the gland together as a pair and hold them against the packing ring 45 until the gland is drawn downwardly by the hand against the tension of the spring. The spring acts in a similar manner upon the gland at the bottom. This spring also has the further advantage of constituting a guard to prevent the pieces of the water glass from flying in case the glass should be broken, and thus the spring performs two functions.

In operation the water valve 30 and the steam valve 40 are, of course, unseated and the steam reaches the water-glass by passing around the wall 42 and the water reaches the glass by passing downwardly around the extension 22 and thence upwardly into its passage 24. If, however, the glass should be broken, the valve 28 which is preferably located at some distance away may be opened, thus connecting the water gage to the blow-off pipe. When this occurs, the water or a large part of the water will be diverted from the glass and will flow downwardly through the pipe 27 which is made of such diameter as to afford a very free

passage for the water. The steam and water valves 40 and 30 may then be shut off and the water-glass replaced by a new one in a well known manner.

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

1. A water gage having, in combination, a water-glass arranged with one end above the other, a casing forming a cushioning chamber located above and adjacent to the upper end of said glass and communicating therewith, said casing being provided with an upwardly extending passage, and a tubular projection surrounding said passage and projecting downwardly into said chamber.

2. A water gage having, in combination, a valve casing, a valve located in said casing and provided with a stem having screw-threaded engagement with said casing, said stem having a cylindrical portion larger in diameter than the screw-threaded portion thereof and extending to the exterior of said casing, a packing surrounding said cylindrical portion of said stem, and means to lock said valve and stem against withdrawal from said casing.

3. A water gage having, in combination, a valve casing, a valve located in said casing and provided with a stem having screw-threaded engagement with said casing, said stem having a cylindrical portion larger in diameter than the screw-threaded portion thereof and extending to the exterior of said casing, a packing surrounding said cylindrical portion of said stem, and a tubular member extending into said valve casing and constituting a means to lock said valve and stem against withdrawal from said casing.

4. A water gage having, in combination, a valve casing, a valve located in said casing and provided with a stem having screw-threaded engagement with said casing, said stem having a cylindrical portion larger in diameter than the screw-threaded portion thereof and extending to the exterior of said casing, a packing surrounding said cylindrical portion of said stem, and a tubular member located at one side of and laterally engaging a portion of said valve to lock said valve and stem against withdrawal from said casing.

5. A water gage having, in combination, a valve casing, a valve located in said casing and provided with a stem having screw-threaded engagement with said casing, said stem having a cylindrical portion larger in diameter than the screw-threaded portion thereof, and extending to the exterior of said casing, a packing surrounding said cylindrical portion of said stem, said stem having a reduced portion between said valve and said screw-threaded portion, and a tubular member located at one side of said reduced portion in position to be engaged by said valve, whereby said valve and stem are locked against withdrawal from said casing.

6. A water-gage having, in combination, a water-glass, a tubular member into which said glass extends, and a casing with which said member has screw-threaded engagement, said casing having a passage into which said tubular member extends, and said member being provided with lateral wings located in said passage.

7. A water gage having, in combination, a water-glass, a water-base to which the lower end of said water glass is connected, a steam connection to which the upper end of said water glass is connected, said water base having therein a chamber, a depending tubular member located in but separated from the sides of said chamber and communicating with the lower end of said water-glass, said member having an opening at its lower end, and a bubble-pipe connected at its lower end to one side of said chamber and at its upper end to said steam connection, said water-base having a valve controlled water inlet communicating with said chamber at a different point from the point of connection of said bubble-pipe with said chamber.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

HENRY R. FAY.

Witnesses:
LOUIS A. JONES,
SADIE V. MCCARTHY.