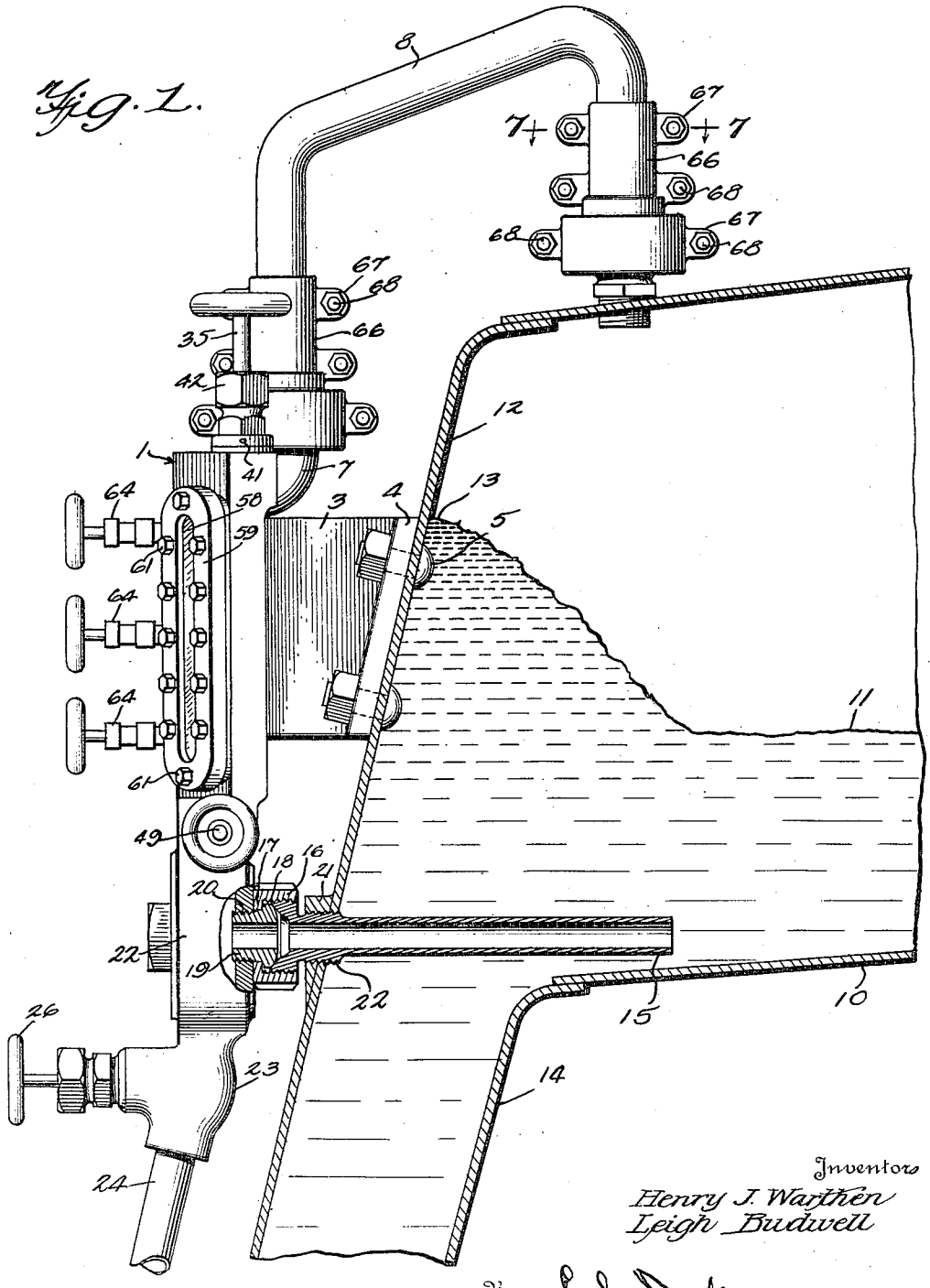
Feb. 6, 1923. 1,444,016

H. J. WARTHEN ET AL.
COMBINED WATER COLUMN AND WATER GLASS.
FILED JAN. 24, 1922. 3 SHEETS-SHEET 1

Fig. 1.



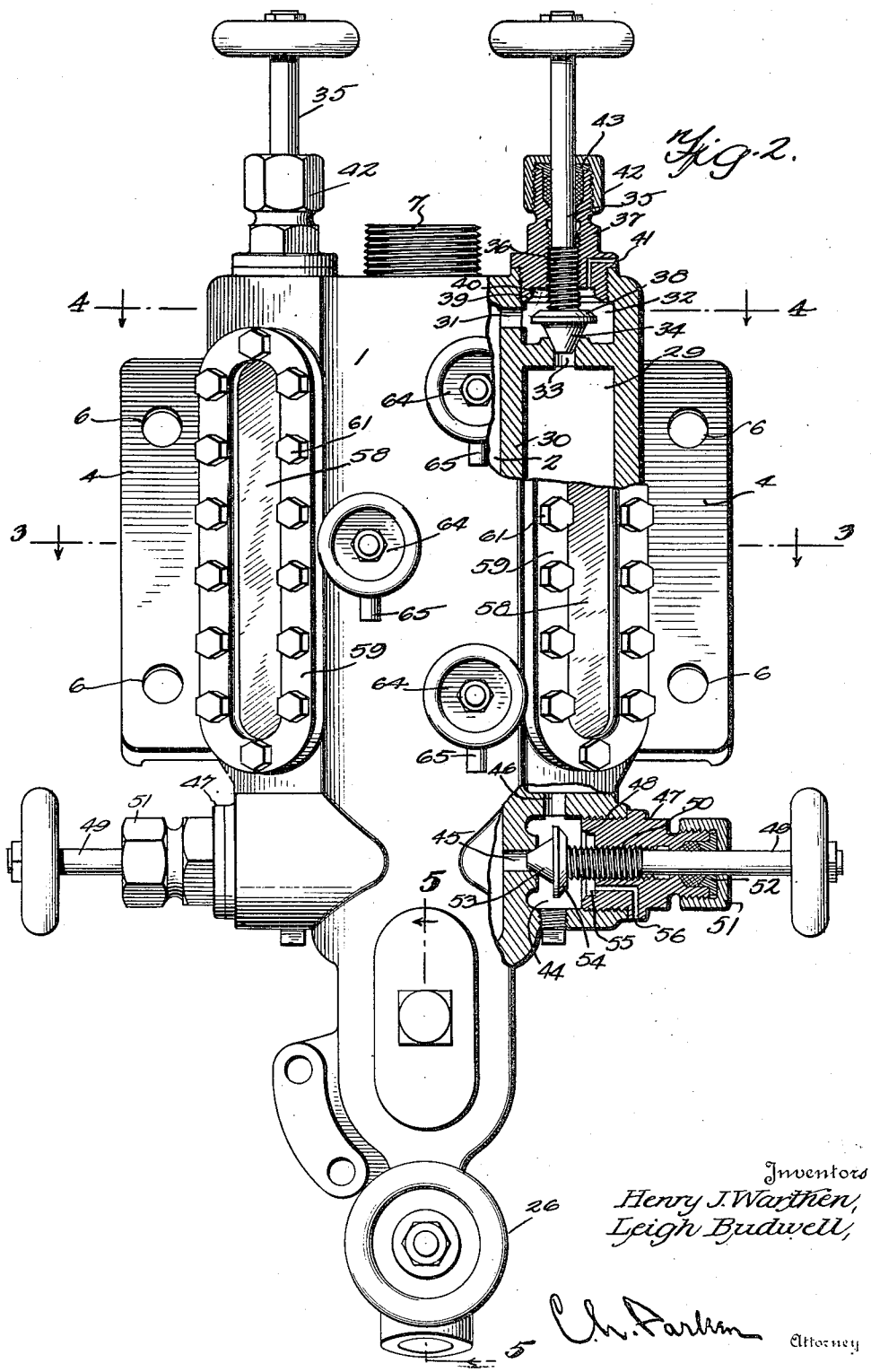
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COMBINED WATER COLUMN AND WATER GLASS.

FILED JAN. 24, 1922. 3 SHEETS-SHEET 3

Fig. 3.

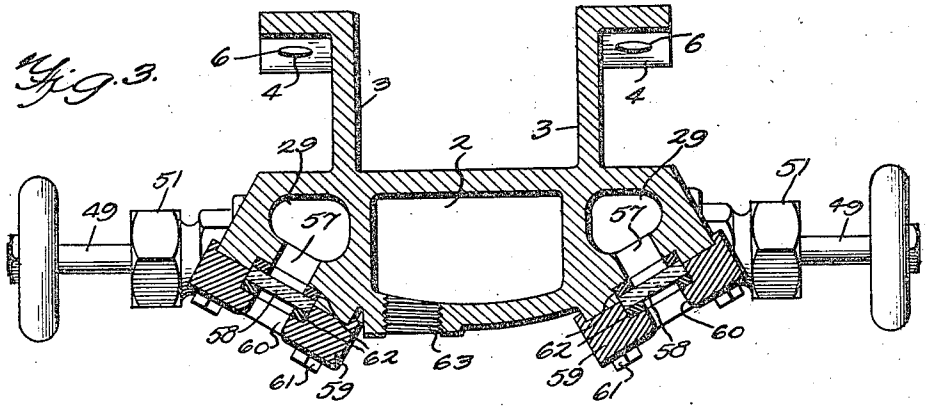


Fig. 4.

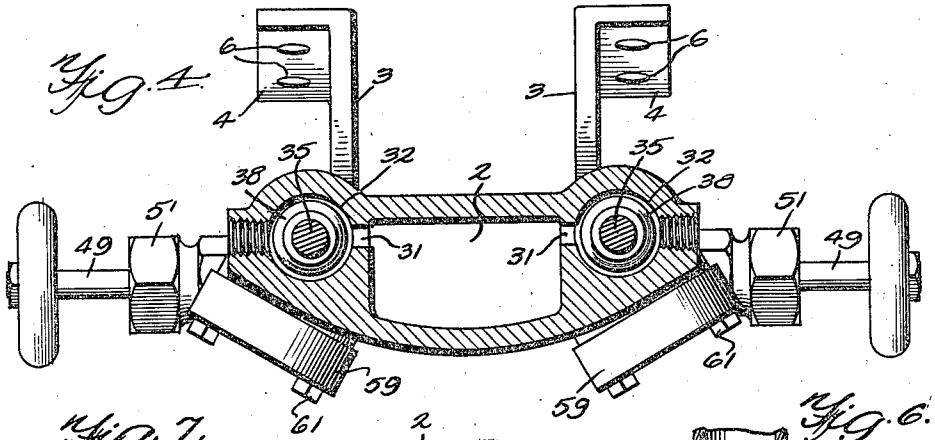


Fig. 7.

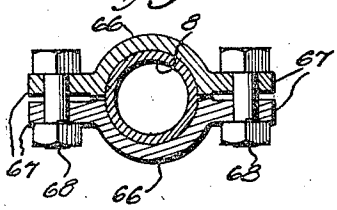
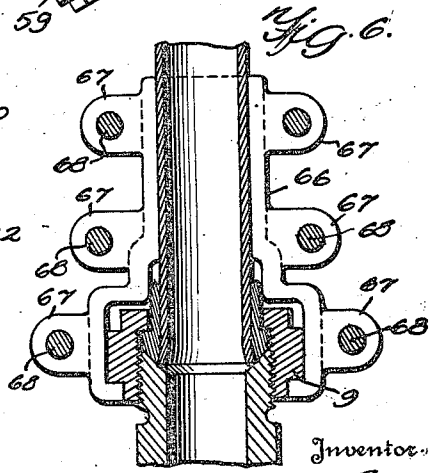


Fig. 5.

Fig. 6.



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Patented Feb. 6, 1923. 1,444,016

UNITED STATES PATENT OFFICE.

HENRY J. WARTHEN AND LEIGH BUDWELL, OF RICHMOND, VIRGINIA.

COMBINED WATER COLUMN AND WATER GLASS.

Application filed January 24, 1922. Serial No. 531,435.

To all whom it may concern:

Be it known that we, HENRY J. WARTHEN and LEIGH BUDWELL, citizens of the United States, residing at Richmond, in the county of Henrico and State of Virginia, have invented certain new and useful Improvements in Combined Water Columns and Water Glasses, of which the following is a specification.

This invention relates to combined water glasses and gage cocks, and it comprises a body having upper and lower connections adapted to be secured to a boiler, said body being provided with a passage therein forming a water column, and being further provided with a second passage connected therewith at the top and bottom, and means for retaining the water glass in said second passage.

The present application is a continuation in part of our copending application Serial No. 477,304, filed June 13, 1921.

In the usual arrangement of water glasses and gage cocks, it has been customary to directly secure the water column to the back head of the boiler at such location above the crown sheet as desired. The water glass is generally secured to the back head of the boiler, the usual arrangement being to have the lower or water connection at or near a position corresponding to the level of the crown sheet of the boiler while the top or steam connection is located at a point within the steam space where dry steam may be obtained.

A recent improvement in boiler construction is the introduction of a water column. This water column is designed to permit connections of greater area to the boiler and these connections are so arranged as to obtain more accurately, the true level of the water above the crown sheet. It has been found by actual tests that the water nearest the back head of a boiler rises to a level several inches higher than the level of the water actually over the crown sheet, this piling or building up of the water being due to the rapid circulation and ebullition through arch tubes and in the narrow space between the back head sheet and the fire box sheet. By making the water column connections of sufficient area and by arranging the lower or water connection so that it clears the innermost projection on the back head, it is possible to obtain more accurate readings from the water cocks and water glasses connected to the water column than to the boiler itself.

There are, however, certain objections to the present construction of water columns and water glasses. The water column at present employed is supported by brackets and spaced a considerable distance from the boiler, whereby vibration occurring during the operation of the locomotive results in leaks and breakage of connections. The arrangement is open to the further objection that where the back head throttle lever connections are employed, it has been necessary to change the design of the throttle lever as the water column interferes with the operation of this lever. In the constructions now employed, the water glass is separate from the water column and is connected thereto by means of pipes or tubes of considerable length and small area. This results in the water quickly cooling to a temperature far below that of the water in the boiler or the water column, and as the density of water varies with the temperature, the water in the water glass indicates an inaccurate level. These small tubes or pipes frequently become filled with boiler sediment or scale and furnish inaccurate readings of the water level, resulting in boiler explosions with loss of life and damage to property.

In the present invention, we have provided a combined water glass and water column arranged within a single housing having a passage therein to form a water column with the usual gage cocks arranged thereon and having a second passage arranged adjacent the water column to form the water glass chamber.

In the accompanying drawings, we have shown several embodiments of the invention. In this showing:

Figure 1 is a sectional view of a portion of the boiler showing one form of the invention applied thereto,

Figure 2 is a front elevation of the device, parts being shown in section,

Figure 3 is a section taken on line 3—3 of Figure 2,

Figure 4 is a similar view on line 4—4 of Figure 2,

Figure 5 is a detail sectional view taken on line 5—5 of Figure 2,

Figure 6 is a detail sectional view of the connection of the steam pipe with the boiler, and,

Figure 7 is a section taken on line 7—7 of Figure 1.

Referring to the drawings, the reference numeral 1 designates generally the body or housing in which the water column and water glass are arranged. The body may be formed in any suitable manner, but we find it advantageous to cast it as an integral structure. A vertical cavity or passage 2 is arranged within the housing, this passage forming a water column. The housing is provided with a pair of flanges 3, having offset portions 4, permitting the housing to be attached directly to the boiler. As shown, bolts or studs 5 are passed through openings 6 in the offsets 4, and through openings in the boiler sheet to secure the device in position. The housing is provided at its upper end with an offset threaded projection 7 connected to a pipe 8 which in turn, is connected through a union 9 to the boiler above the water level.

The crown sheet of the boiler is shown at 10, the water level 11 being normally above the crown sheet. Adjacent the back head 12 of the boiler, the water builds up to a level 13, several inches higher than the level of the water over the crown sheet. This is due to the rapid circulation of the water and its passage through the narrow space between the back head sheet 12 and a back fire box sheet 14. It has been found that in addition to the difference in the water levels at 11 and 13, the T iron braces employed to support the back head 12 of the boiler set up eddy currents within the water adjacent the head 12. To overcome inaccuracies in readings, the lower end of the housing is connected to the water space of the boiler by a pipe 15 which extends inwardly to a point beyond the false level in the boiler (see Figure 1). The outer end of this pipe is threaded and is received in the internally threaded end of a spanner nut 16. The spanner nut is provided at its opposite end with an internal shoulder 17 adapted to bear against a shoulder 18 formed upon a nipple 19. The opposite end of the nipple 19 is threaded for engagement with an opening 20 in the bottom of the housing. It will be apparent that communication is afforded between the interior of the boiler and the interior of the housing through the pipe 15, and nipple 19. At the point where the pipe 15 passes through the head 12, the latter is provided with a projection 21, preferably welded thereto and the head 12 and projection 21 are provided with threaded openings to receive a second threaded portion 22, formed upon the pipe 15. The provision of the projection 21 permits of a rigid engagement between the pipe 15 and the head 12.

The lower portion 22 of the housing 1 communicates with a valve chamber 23 in which is mounted a valve 24, normally engaging the valve seat 25. The valve 24 may be operated by the usual handle 26. When the valve 24 is open, communication is afforded between the valve housing 27 and a drain pipe 28. A housing is provided with a passage or passages 29 in which the water glasses are arranged, the passages being separated from the passages 2 by vertical walls 30. Adjacent the top of the housing, ports 31 extend through the walls 27 to permit communication between the passage 2 and the passages 29. As shown in Figure 2, a chamber 32 is formed above the passage 29 and communicates therewith through a port 33. The port 33 is provided at its upper end with a valve seat adapted to receive a valve 34 formed upon a valve stem 35. The valve stem 35 is threaded, as at 36 and is adapted to engage within threads formed in a housing 37. The valve stem 35 is provided with a second valve 38 adjacent the valve 34, and arranged oppositely thereto. The valve housing 37 is provided in its lower end with a valve seat 39 adapted to be engaged by the valve 38 and the valve housing is provided above the seat 39 with an annular recess 40. Communication between the recess 40 and the atmosphere is afforded by means of a port 41 for a purpose to be described.

The upper end of the valve housing 37 is provided with the usual packing nut 42, and packing gland 43.

The lower end of the passage 2 communicates with a chamber 44, by means of a port 45, the port being provided with a valve seat formed on the end remote from the water column. As shown, the passage 29 communicates with the chamber 44 by means of a port 46. The chamber 44 is provided with a valve housing 47, having a valve seat 48 arranged therein, in alinement with the port 45. The valve casing 47 has a valve stem 49 arranged therein, the stem 49 being threaded, as at 50 for engagement with threads formed within the valve housing. The valve housing 47 is provided with the usual packing nut 51 and packing gland 52. The inner end of the valve stem is provided with a pair of oppositely arranged valves 53 and 54, the valve 53 being adapted to engage the seat formed in the end of the passage 45 while the valve 54 is adapted to engage the seat 48. The valve housing 47 is provided with an annular recess 55 formed adjacent the seat 48, and this recess communicates with the atmosphere through a port 56.

Each passage 26 is arranged in communication with a slot 57 (see Figure 3) formed in the outer face of the housing and a water

glass 58 is adapted to be arranged over this slot. The water glass is retained in position by means of a frame comprising a plate 59 having a central slot 60. The plate is bolted directly to the housing by means of bolts 61 and suitable packing 62 is arranged on each side of the water glass.

The front of the water column is provided with threaded openings 63, in which gage cocks 64 of the usual type are received, the gage cocks being provided with outlets 65.

It has been found in the operation of devices of this character employing steam pipes similar to the pipe 8 that the excessive vibration experienced during the operation of the locomotive results in the cracking or fracturing of the pipe 8 adjacent its connections to the water column and to the boiler. To overcome this defect, we provide a joint re-enforcing member comprising a pair of substantially semi-cylindrical complementary members 66 provided with ears 67 having openings to receive bolts 68. The upper end of the complementary sections 66 has an internal diameter substantially equal to the diameter of the pipe 8 to snugly receive the same. The lower end of the member 66 has an enlarged internal diameter to receive the nut 9 of the union. It will be obvious that by clamping the member 66 tightly about the pipe 8 and the union, that the pipe and union will be securely braced against the destructive effects of jars and vibrations.

In operation, the device is connected to the water space of the boiler by means of the pipe 15 and to the steam space by means of the pipe 8. The water and steam flow into the water column 2. The gage cocks 64 are employed in the usual manner, being opened to determine the water level within the water column. In normal operation, the valve 38 is in engagement with the seat 39 while the valve 54 is in engagement with the seat 48, the valves 34 and 53 thus being open. Steam and water flow into the water glass passages 29 through the ports 31 and 33, and ports 46 and 48 respectively, permitting readings to be obtained through the glass 58. When the valves are in the position just described, it will be obvious that the ports 41 and 56 are not in communication with the chambers 32 and 44. If for any reason, it is desired to remove one of the passages 29 from operation, the valves 34 and 53 are closed. When it is desired to place this passage 29 in operation, the valves 38 and 54 are closed upon their respective seats. If the engineer closes the valve 38 and neglects to close the valve 54, steam will pass through the ports 31 and 33, downwardly through the passage 29 and port 46, an blow outwardly to the atmosphere through the port 56, thus warning the engineer that the valve 54 has not been closed. Similarly, the port 41 serves as a warning when the valve 38 is not closed.

Any sediment or impurities in the water deposited in the water column may be drained through the drain pipe 28 by opening the valve 24. The drain pipe 28 may lead to any suitable point of discharge. The water glasses also may be drained by closing the valves 34 and 53, thus opening the valve 54 and permitting passage of water and steam from the chamber 44 through the port 56. When a water glass is broken, the valves 34 and 53 may be closed and a new water glass placed in position, without removing the boiler pressure.

It will apparent that the construction of the water column and water glass within a single housing, connected by ports of inappreciable length, prevents the water from being cooled before it reaches the water glass and thus eliminates inaccurate readings due to this cause. The extension of the pipe 15 into the boiler a sufficient distance to extend into that portion of the boiler where a normal water level exists also prevents inaccurate readings due to connections with the space immediately within the back sheet of the boiler where a false water level exists. The device arranged in a single housing is more compact and may be arranged closer to the back sheet of the boiler, removing the possibility of accidental breakage and eliminating inconveniences caused by the present type of water columns and water glasses projecting into the path of the throttle lever.

The provision of a valve housing cast integral with the main housing is advantageous, as it permits the device to be closed or cut off from the drain pipe if the drain pipe becomes loose. In actual practice, the drain pipe or a water column frequently becomes disconnected from the water column due to vibration or other causes, and when the valve is arranged in the drain pipe, it is impossible to prevent the steam and water in the boiler from flowing into the cab of the locomotive. When a water column of the present construction is used, the valve 24 may be closed and the escape of steam and water prevented.

It is to be understood that the form of our invention herewith shown and described is to be taken as a preferred example of the same, and that various changes in the shape, size, and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjointed claims.

Having described our invention, we claim:

1. A combined water column and water glass comprising a housing divided by a wall to form a water column and a water glass passage, said water column being adapted to communicate at its upper and

lower ends with a boiler, said wall being provided in each end with an opening affording communication between said column and said passage, and a sight glass closing said passage, thereby forming a water gage.

2. A combined water column and a water glass comprising a housing divided by a wall to form a water column and a water glass passage, said water column being adapted to communicate at its upper and lower ends with a boiler, said water column being provided with a plurality of openings, gage cocks arranged in said openings, said wall being provided in each end with an opening affording communication between said column and said passage, and a water glass carried by said passage.

3. A combined water column and water glass comprising a housing divided by a wall to form a water column and a water glass passage, said water column being adapted to communicate at its upper and lower ends with a boiler, said wall being provided in each end with an opening affording communication between said column and said passage, valves controlling communication through said openings, and a water glass carried by said passage.

4. A combined water column and water glass comprising a housing divided by a wall to form a water column and a water glass passage, said water column being adapted to communicate at its upper and lower ends with a boiler, a water glass carried by said passage, said wall being provided in each end with an opening affording communication between said column and said passage, a valve arranged in said upper opening to control the passage of fluid therethrough, and a valve arranged in said lower passage, said valve being adapted to close communication between said column and said passage and permit communication between said passage and the atmosphere.

5. A combined water column and water glass comprising a housing divided by a wall to form a water column and a water glass passage, said water column being adapted to communicate at its upper and lower ends with a boiler, said wall being provided in each end with an opening affording communication between said column and said passage, a water glass carried by said passage, a valve casing formed in the lower part of said housing, a valve arranged therein, and a drain pipe connected to said casing.

6. A combined water column and water glass comprising a housing divided by a wall to form a water column and a water glass passage, said water column being adapted to communicate at its upper and lower ends with a boiler, a gage glass carried by said passage, and valves arranged adjacent opposite ends of said passage, said valves being adapted to selectively afford communication between said column and the ends of said passages, and between the ends of said passages and the atmosphere.

7. A combined water column and water glass comprising a housing divided by a wall to form a water column and a water glass passage, said water column being adapted to communicate at its upper and lower ends with a boiler, a gage glass carried by said passage, said housing being provided with a chamber arranged adjacent each end of said passage, said wall being provided with ports in its upper and lower ends communicating between said column and said chambers, said housing being provided with openings communicating between said passage and said chambers, a valve casing arranged in the upper end of said housing, said valve casing being provided with a valve seat and being further provided with a port communicating between said valve seat and the atmosphere, a pair of valves carried by said valve casing, one of said valves being adapted to engage the seat in said valve casing, the other of said valves being adapted to engage the opening communnicating between the upper chamber and said passage, a valve casing arranged in the lower end of said housing, said valve casing being provided with a valve seat and being further provided with a port communicating with said valve seat and the atmosphere, and a pair of valves carried by said valve casing, one of said valves being adapted to engage the seat in said valve casing, the other of said valves being adapted to engage the port communicating between said water column and said lower chamber.

8. A combined water column and water glass comprising a housing including a water column, said housing being provided with a chamber arranged adjacent each end of said water column and being further provided adjacent each end with an opening communicating between said water column and said chambers, a water sight gage arranged between said chambers, each of said chambers being provided with an opening communicating between the chambers and said gage, a valve casing arranged in each of said chambers, each valve casing including a valve seat having a port communicating between the valve seat and the atmosphere, and a pair of valves mounted in each of said valve casings, one valve of each pair being adapted to control communication between said water gage and said water column, the other valve of each pair being adapted to engage said valve seats.

In testimony whereof we affix our signatures.

HENRY J. WARTHEN.
LEIGH BUDWELL.