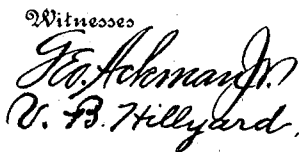


961,008.

2 SHEETS--SHEET 1.

Fig. 1.



By *Victor J. Evans*
Attorney

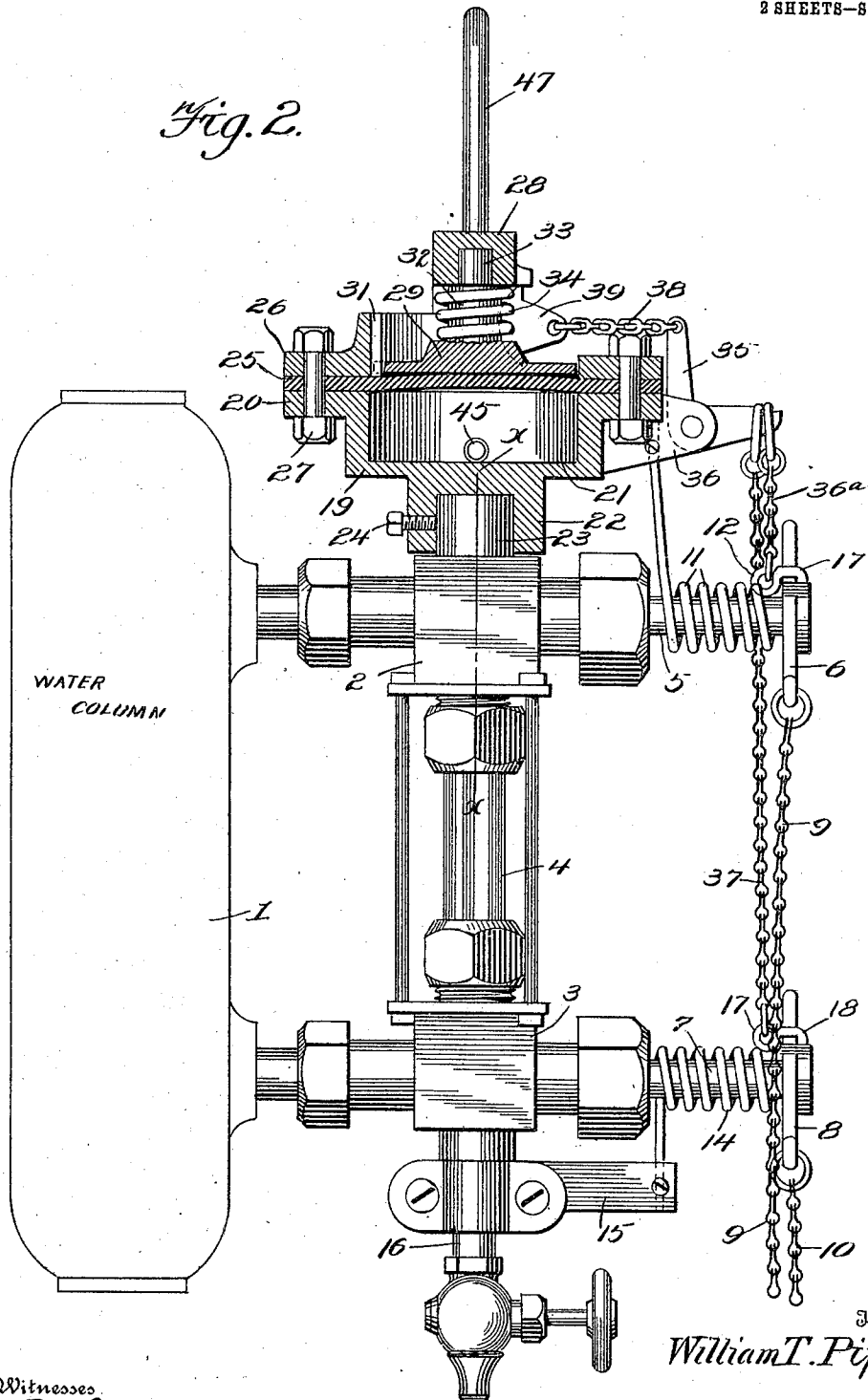
W. T. PIPER.
STEAM BOILER GAGE.
APPLICATION FILED MAR. 31, 1909.

961,008.

Patented June 7, 1910.

2 SHEETS—SHEET 2.

Fig. 2.



Inventor
William T. Piper

By Victor J. Evans

Attorney

Witnesses
J. A. Schman
V. B. Hillyard.

UNITED STATES PATENT OFFICE.

WILLIAM T. PIPER, OF NORTH ANDOVER, MASSACHUSETTS.

STEAM-BOILER GAGE.

961,008.

Specification of Letters Patent.

Patented June 7, 1910.

Application filed March 31, 1909. Serial No. 486,928.

To all whom it may concern:

Be it known that I, WILLIAM T. PIPER, a citizen of the United States, residing at North Andover, in the county of Essex and State of Massachusetts, have invented new and useful Improvements in Steam-Boiler Gages, of which the following is a specification.

The purpose of this invention is to provide a sight gage for steam boilers and like generators which may be operated by hand or work automatically to shut off both the steam and water in the event of the sight tube becoming broken, the valve operating mechanism being of such construction and arrangement as to admit of either manual or automatic operation of the valves under existing conditions as the exigencies of the case may require.

The chief intent of the invention is to supply novel mechanism for automatically actuating the valve which is positive, certain, and instantaneous in action so as to effect a closing of the valves the instant the sight tube becomes broken thereby preventing a waste of steam or water which in escaping may produce disastrous results.

The invention also contemplates a novel arrangement of devices independent of the automatic actuating means whereby the valve may be worked by hand without disturbing the automatic mechanism, the latter always remaining in prime condition for instantaneous operation under abnormal conditions to effect a closing of the valves provided the same are open at the instant of breakage of the sight tube.

The drawings illustrate an embodiment of the invention but it is to be understood that the same is susceptible of various changes in form, proportion and minor details of construction within the scope of the appended claims without departing from the nature of the invention.

The improvement consists of the novel features, details of construction and combinations of parts which hereinafter will be more particularly set forth, illustrated and finally claimed.

In the drawings hereto attached forming a part of the specifications: Figure 1 is a view in elevation of a steam boiler gage constructed in accordance with and embodying the essential features of the invention. Fig. 2 is a side view of the parts shown in Fig. 1, the valve actuating means being in

section. Fig. 3 is a vertical central section of the upper valve fitting, on the line $x-x$ of Fig. 2. Fig. 4 is a top plan view of the gage disconnected from the water column.

Corresponding and like parts are referred to in the following description and indicated in all the views of the drawings by the same reference characters.

The water column 1 may be of any construction and is illustrated to show the application of the invention. The numeral 2 designates the upper valve fitting, the numeral 3, the lower valve fitting and the numeral 4, the glass sight tube, such parts being of ordinary construction and arrangement. The valve stem 5 of the upper valve fitting 2 is provided at its outer end with a cross bar 6 and the valve stem 7 of the lower valve fitting 3 is provided with a cross bar 8. The cross bars 6 and 8 project in opposite directions from their respective valve stems a like distance, and to their outer ends are connected chains 9 and 10, or like means to admit of operating the valves by hand from a convenient position. The chains or connections 9 are attached to opposite ends of the cross bar 6 and the chains or connections 10 are attached to the outer ends of the cross bar 8 thereby admitting of either valve being independently opened or closed without affecting the other. A spring 11 of the helical or coil type is mounted upon the valve stem 5 and one end is connected to a part of the valve fitting, and the other end is formed into an eye 12 and a hook 13, the latter engaging over an arm of the cross bar 6. A similar helical or coil spring 14 is mounted upon the valve stem 7 and one end is connected to an arm 15 clipped or otherwise attached to the blow off pipe 16 connected with the lower valve fitting 3 and the other end is formed into an eye 17 and a hook 18, the latter engaging over an arm of the cross bar 8. The springs 11 and 14 under normal conditions exert a force tending to close the valves 2 and 3 so as to shut off the steam and water automatically in the event of the sight tube 4 breaking.

Mounted upon the upper valve fitting 2 is a fitting 19 having an outer flange 20 and a chamber 21. A collar 22 upon the lower side of the fitting 19 receives an extension 23 at the upper end of the valve fitting 2, and a set screw 24 threaded into an opening formed in a side of the collar 22 serving to secure the fitting 19 in place. A diaphragm

25 closes the upper side of the chamber 21 and may be of any material adapted to be flexed at the center according as the chamber 21 is subjected to internal pressure or a partial vacuum is created therein. A ring 26 confines the outer edge of the diaphragm 25 to the flange 20 of the fitting 19, bolts or fastenings 27 passing through registering openings in the parts 20, 25 and 26 and serving to secure the same. An arch 28 is formed with or connected to the ring 26 and constitutes an overhanging portion for a purpose presently to be explained.

A follower 29 is mounted upon the diaphragm 25 and is moved thereby. The follower consists of a plate or disk loosely fitted within the ring 26 and prevented from turning by an interlocking connection therewith, said follower having a notch 30 in an edge to receive a rib 31 projected from the inner wall of the ring 26 and extending vertically. The follower has a centrally disposed stem 32 which is reduced at its upper end, the reduced portion 33 fitting an opening formed in the lower side of the arch or overhanging portion 28 thereby retaining the follower in proper position. A spring 34 mounted upon the downward stem 32 normally exerts a downward pressure upon the follower 29. When the diaphragm 25 is moved upward by pressure from within the chamber 21, the follower 29 is pressed upward and the spring 34 compressed, the upward movement of the follower being limited by the shoulder at the base of the reduced portion 33 of the stem 32 coming in contact with the lower side of the arch 28.

A bell crank 35 is pivotally mounted between spaced ears 36 projected from the fitting 19. The horizontal arm of the bell crank 35 is connected with the ends of the respective springs 11 and 14 provided with the parts 12 and 13, and 17 and 18, so as to hold the said parts normally in a given position. The outer portion of the horizontal arm of the bell crank 35 is shouldered as indicated most clearly in Figs. 2 and 4 to limit the inward movement of the parts connected therewith. A chain or like flexible connection 36^a is attached at its lower end to the eye 12 and is provided at its upper end with a ring or link to engage over the shouldered end of the bell crank 35. A similar connection 37 is attached at its lower end to the eye 17 of the spring 14 and its upper end has a ring or link likewise adapted to engage the shouldered end of the bell crank 35 as indicated most clearly in Fig. 2. A chain or like connection 38 is attached at one end to the vertical arm of the bell crank 35 and is provided at its opposite end with a tumbler 39 which, under normal conditions, is held between the follower 29 and the arch or overhanging portion 28. The tumbler 39 may be of any

construction so long as it forms securing means for the connection 38 and is adapted to be held between the cooperating parts 28 and 29. The relative position of the tumbler is immaterial within the scope of the invention. The ends of the tumbler 39 are pointed and are adapted to engage notches or projections of the parts 28 and 29. When the follower 29 is pressed upward to the limit of its movement the tumbler 39 is engaged by the parts 28 and 29 and retained in place thereby supporting the outer ends of the respective springs 11 and 14 elevated under tension in position to exert a force for closing the valves the instant the tumbler 39 is released due to breakage of the sight tube 4 or from some such cause.

The upper valve fitting 2 is provided with the hollow extension 23 and with a partition 40 in which a centrally disposed opening is formed, a nozzle 41 projecting downward from said partition 40 in line with the opening thereof. The partition 40 subdivides the casing into an upper chamber 42 and a lower chamber 43. The steam from the steam space of the boiler or generator is adapted to enter the chamber 42. The opening 44 formed in the lower or coupling end of the fitting 2 is in line with the sight tube 4 and the nozzle 41 and flares in opposite directions from a central point. The chamber 43 is in communication with the chamber 21 of the fitting 19 by means of a pipe 45 which is provided with a valve 46 and with an upwardly extending loop 47 to prevent siphoning of the liquid contained in the chamber 21 and thereby insuring a full supply of water within the chamber 21 under normal conditions.

In the practical operation of the invention, it being assumed that the parts are properly assembled and set for automatic operation, the fittings 2 and 3 have connection with the steam and water spaces respectively of the boiler or generator to which the gage is coupled. The chamber 21 of the fitting 19 is filled with water which is subjected to boiler pressure by steam from the chamber 43 passing through the pipe 45. If it be required to close either one or both of the valves 2 and 3, the chains or connections 9 and 10 may be operated thereby moving the respective cross bars 6 and 8, the arms of said cross bars leaving the hooks 13 and 18 of the springs 11 and 14, said springs being held under tension by the tumbler 39, bell crank 35 and cooperating parts in the manner herein stated. If during the time that the valves 2 and 3 are open and the self-closing mechanism is set, the sight tube 4 should become broken, the steam from the boiler will enter the upper chamber 42 of the valve fitting 2 and pass through the nozzle 41 across the chamber 43 and through the opening 44 thereby creating a suction in

the chamber 43 in the well known manner of a twyer, with the result that a suction is created in the pipe 45 thereby drawing off the water or other liquid from the chamber 21 of the fitting 19 and permitting the diaphragm or like pressure-controlled part to move downward or into the chamber 21 and the follower 29 being unsupported moves under the action of the spring 34 and releases the tumbler 39, thereby permitting the bell-crank 35 to move and the springs 11 and 14 to come into play and automatically close the valves 2 and 3 and thereby prevent the escape of steam and water.

Having thus described the invention, what is claimed is:

1. In a water gage for steam boilers comprising a sight tube, and steam and water valves, means cooperating with each of said valves normally tending to effect a closing thereof, restraining means for preventing operation of the valve closing means and holding said valves open, and means utilizing the steam at boiler pressure to hold the said restraining means in operative position under normal conditions and to release said valve closing means when the steam pressure is reduced under abnormal conditions to admit of the automatic closing of the said valves.

2. A steam boiler water gage comprising a sight tube and steam and water controlling valves, the latter adapted to be operated by hand at all times, means cooperating with said valves to automatically close the same and to admit of their free operation by hand, restraining means for preventing operation of the valve closing means and holding said valves open, and means utilizing the steam at boiler pressure to hold the said restraining means in operative position under normal conditions and to release said valve closing means when the steam pressure is reduced under abnormal conditions to admit of the automatic closing of the said valves.

3. In a gage of the character described, the combination of a valve, a spring normally under tension arranged to cooperate with said valve to effect a closing thereof without interfering with the free movement of said valve by hand, restraining means for preventing operation of said spring and the closing of the valve thereby, and means utilizing the steam at boiler pressure to hold the said restraining means in operative position under normal conditions and to release said spring when the steam pressure is reduced under abnormal conditions to admit of the automatic closing of the valve by the action of the spring.

4. In a gage of the character described, the combination of a valve fitting, a spring adapted to close the valve of said fitting, restraining means for preventing operation

of said valve closing spring, a follower cooperating with said restraining means, and means utilizing the steam at boiler pressure to operate said follower to hold said restraining means in operative position under normal conditions and adapted to release the restraining means when the steam pressure is reduced under abnormal conditions to admit of the automatic closing of the valve.

5. In a gage of the character described comprising a chambered valve fitting and a spring normally tending to close the valve of said fitting, a second chamber having communication with the chamber of said valve fitting, a follower, restraining means for preventing operation of said spring normally held in operative position by said follower, and means for supplying steam at boiler pressure to said second chamber to hold the follower in operative position under normal conditions and to permit operation of said follower to release said restraining means when the steam pressure is reduced under abnormal conditions to admit of automatic closing of the valve by means of the spring.

6. In a gage of the character described, a valve fitting having its valve stem provided with a projection, a spring cooperating with the projection of said valve spring and normally tending to close the valve, restraining means for preventing operation of the valve closing spring, and means utilizing the pressure of the steam under normal conditions to hold said restraining means in operative position and adapted to release said restraining means when the steam pressure is reduced under abnormal conditions, the parts admitting of manual operation of the valve at all times without disturbing the automatic valve closing means.

7. In a gage of the character described comprising a valve having a stem, a projection on said stem, a spring cooperating with the projection of the valve stem and normally tending to close the valve, a bell crank, connecting means between an arm of the bell crank and said spring, means connected with the other arm of the bell crank to hold said spring in restraint, and means utilizing the pressure of the steam under normal conditions for preventing operation of the valve closing spring and holding said valve open and adapted to release said valve closing spring when the steam pressure is reduced under abnormal conditions to admit of the automatic closing of the valve.

8. In a gage of the character described comprising a sight tube, and steam and water valves fitted thereto, the fitting of the steam valve comprising chambers separated by a partition provided with a nozzle, a controller fitting having a chamber in communication with the chamber of said steam valve

fitting located between the partition and the end in communication with the sight tube, a follower arranged to operate in the chamber of said controller fitting and actuated by
 5 variation of pressure within the chamber of said controller fitting, a valve closing spring, and means for holding said spring in restraint and secured by said follower under normal conditions but released when the
 10 pressure within the chamber diminishes thereby releasing the valve closing spring and permitting the same to close the valve.

9. In a gage of the character described comprising a sight tube, a valve fitting comprising a chamber, a spring for closing said valve, a controller fitting having communication with the chamber of the valve fitting having direct communication with said sight tube, a follower arranged to operate in the
 20 chamber of said controller fitting and actuated by a change of pressure therein, a tumbler secured by said follower, connecting means between the tumbler and said valve closing spring to hold the latter in restraint
 25 under normal conditions.

10. In a gage of the character described comprising a sight tube, and a valve fitting, the latter comprising an upper and a lower chamber, a controller fitting having a chamber in communication with the lower chamber of said valve fitting, a follower arranged to operate in the chamber of said controller fitting, a spring for closing said valve, and means for holding said spring in restraint
 30 and held fast by means of said follower and adapted to be released when the pressure within the chamber of the controller fitting diminishes from abnormal cause.

11. In a gage of the character described,
 40 comprising a sight tube and a valve fitting embodying relatively upper and lower cham-

bers, a controller fitting having a chamber, a pipe connecting the chamber of said controller fitting with the lower chamber of the valve fitting and having an upwardly extended portion to prevent siphoning of the liquid from the chamber of said controller fitting, a follower arranged to operate in the chamber of said controller fitting by the change of pressure therein, a spring normally tending to close the valve of said valve fitting, and means for holding said spring in restraint and coöperating with said follower and adapted to be released when the follower moves by reason of diminished pressure within the chamber of the controller fitting.

12. A gage of the character described comprising a sight tube, steam and water valves, the steam valve having relatively upper and lower chambers, a controller fitting having a chamber in communication with the lower chamber of the steam valve fitting, a follower arranged to operate in the chamber of said controller fitting, cross bars fast to the stems of the respective valves, springs mounted upon said valve stems and having portions normally extending across the path of said cross bars to operate the same to close the valves, and means for normally holding said springs under tension and held by said follower, and adapted to be released when the pressure within the chamber of the aforesaid controller fitting diminishes from abnormal cause.

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

WILLIAM T. PIPER.

Witnesses:

EDMUND S. COLBY,
 RUTH. H. PIPER.