

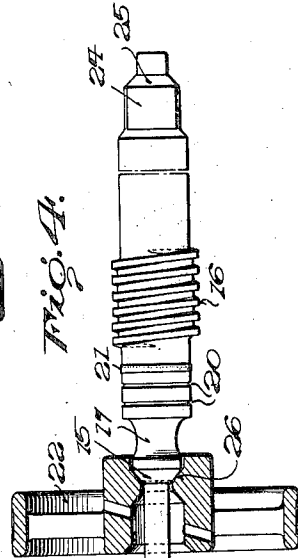
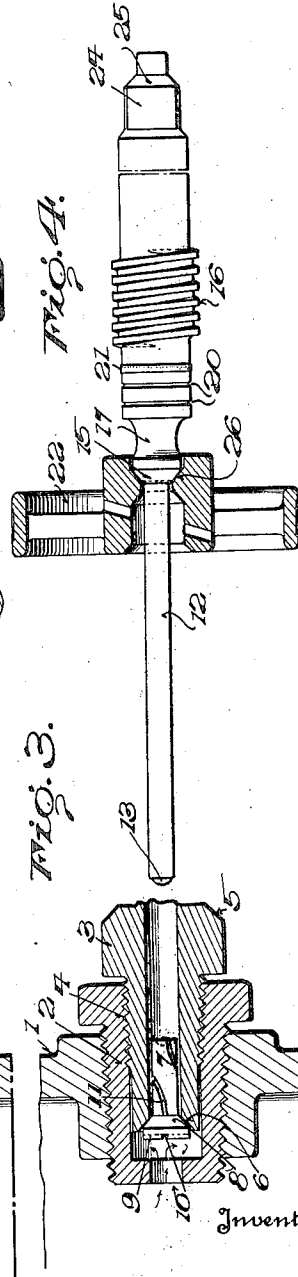
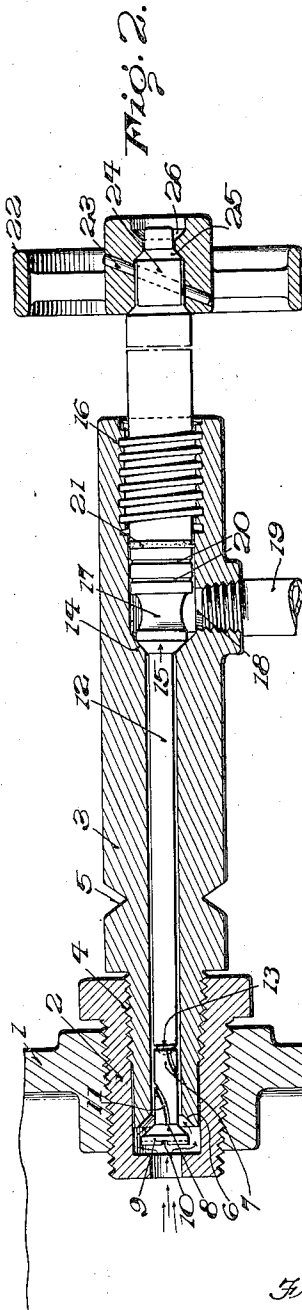
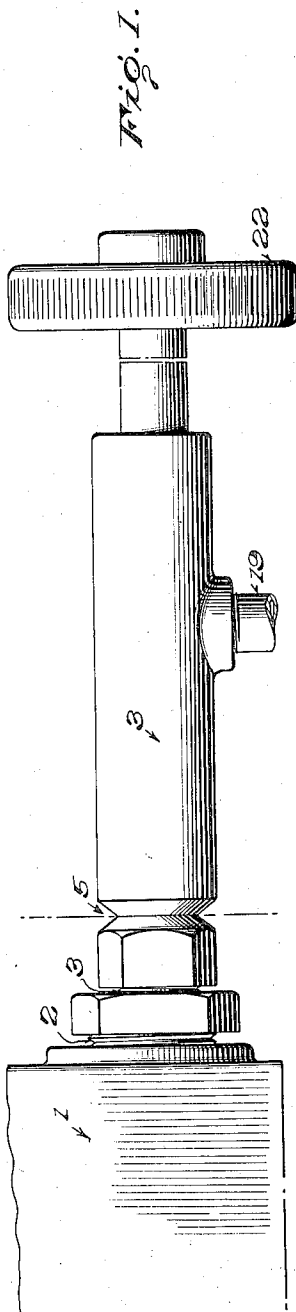
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1,990,601

SAFETY VALVE

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UNITED STATES PATENT OFFICE

1,990,601

SAFETY VALVE

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10 Claims. (Cl. 277—28)

This invention relates to safety valves and more particularly to safety valves of the kind that are to be used in boiler connections and the like to prevent the escape of steam or hot water from the boiler in case the connections are broken.

Fig. 2 is a longitudinal sectional view of the valve shown in Fig. 1;

Fig. 3 is a sectional view of the boiler connection showing the safety valve in closed position; and

Fig. 4 illustrates the grinding of the valve.

Referring now to the drawing, the valve is shown in position on a boiler 1 of any suitable type, as for example, a locomotive boiler. In order that the valve may be removed and the boiler opening tested without breaking the boiler line, that is, without breaking the joint between the valve assembly and the boiler casing, a bushing 2 is threaded in the opening in the casing and the valve casing 3 is in turn threaded at 4 into the bushing 2. The bushing 2 is permanently installed and need not be removed for purposes of inspection or testing, the valve casing being merely unscrewed from the bushing.

Preferably and as shown, the casing 3 of the valve is made in one piece having its inner end threaded at 4 for insertion in the bushing 2 and provided at 5 with a fracture groove or line adjacent the boiler so that in case of accident the casing will tend to break at the groove 5 externally of the connection to the boiler and externally of the safety valve described hereinafter. The casing 3 has a central bore extending from one end to the other and at the inner end of the casing the bore is formed in any suitable way to provide a valve seat 6. Inserted in the inner end of the valve casing is a valve member 7 having a valve surface 8 and a flat head 9 on which are transverse grooves 10. The stem of the valve member is provided with a plurality of spiral grooves 11 so that whenever the valve member 7 is moved into the valve casing 3 by boiler pressure to close the valve 6, 8 (Fig. 3), the steam passing through the grooves 11 will rotate the valve member 7 as it moves to closed position and hence grind the valve seat 6 and valve surface 8 automatically. Preferably the valve member is provided with three grooves, each having one-third turn. A safety valve of this type will operate over long periods without attention, the valve surfaces being automatically kept free of scale or dirt so that a tight closure is always obtained. Preferably the valve member 7 is made of Monel metal or other suitable non-corroding material, while the valve casing 3 may be of bronze or other suitable material.

The valve member 7 is normally maintained in the open position shown in Fig. 2 by means of a valve stem 12 which also operates a manually controlled valve to be described, said stem extend-

Locomotive boilers, for example, are provided with a number of connections to gauges, indicators, blow-offs, and the like and in case breaking of these connections occurs, through wrecking of the locomotive or otherwise, the escaping steam or hot water from the boiler may escape and scald the trainmen. Hence it is desirable to place safety valves in these connections which are automatically closed by boiler pressure in the event of breaking of any connection. Valves of this kind, as well as the boiler outlets to which the valves are connected, must be capable of being inspected and cleaned at frequent intervals according to rigid regulations. The boiler outlets are tested and cleaned by passing a rod or the like through the opening into the boiler and it is preferable that this test be made without breaking the boiler line, that is, without breaking the connection between the valve casing or bushing and the boiler so that this connection is substantially permanent. Moreover, the valve seats often require grinding and it is desirable to be able to grind the valve and its seat under pressure without having to shut down the boiler. In the prior United States patent of French E. Godsey, No. 1,692,296, dated November 20, 1928, there is disclosed a valve which is closed by fluid pressure in the event of breaking of a boiler connection, which is capable of being cleaned and tested without breaking the boiler line, and which is capable of being ground under pressure without shutting down the boiler. The present invention provides a safety valve embodying these features but of improved design and construction which is stronger and safer, of simpler design having fewer parts and hence cheaper to manufacture, and so constructed that it may be assembled or disassembled for purposes of inspection or grinding with a minimum amount of work.

One embodiment of the invention is illustrated in the accompanying drawing, but it is to be expressly understood that said drawing is for purposes of illustration only and is not to be construed as a definition of the limits of the invention, reference being had to the appended claims for this purpose.

In the drawing,

Fig. 1 is a view of a valve embodying the invention which is shown installed on a boiler;

ing from the outer end of the casing 3 into contact with the end of the valve member 7 and being preferably provided with a rounded end 13 engaging in a similarly rounded depression 5 formed in the end of the valve member 7. As will be seen from the drawing, the stem 12 adjacent valve member 7 is smaller than the bore in the valve casing to provide a passage for steam and water passing through the valve 6, 8, and to control the flow the bore of the valve casing is enlarged in diameter at 14 to form a valve seat and the valve stem 12 is enlarged in diameter at 15 to form a cooperating valve surface the valve stem 12 having threaded engagement at 16 with the casing whereby the valve 14, 15 may be opened or closed. In order to provide for the escape of steam or water from the boiler when the valves 6, 8 and 14, 15 are open, the valve stem 12 is reduced in diameter at 17 immediately adjacent the valve surface 15 and a lateral opening 18 is formed in the valve casing in registry with the reduced portion 17. An outlet pipe 19 may be threaded in the opening 18 of the valve casing, the threaded portion of the opening preferably terminating short of the inner surface of the bore in the casing so that the pipe 19 cannot be screwed in until it contacts with the valve stem 12.

Suitable means are provided for preventing the escape of steam and the like past the opening 18 and out of the end of the valve casing 3. To this end the portion of the valve stem 12 on the outer side of the reduced portion 17 preferably has a journal fit in the casing 3 and is also provided with one or more annular sealing grooves 20 which catch any moisture tending to pass between the valve stem and casing. The valve stem may likewise be provided with an additional groove in which suitable packing 21 is placed to pack the joint between the valve stem and casing.

The valve stem 12 may be rotated to open and close the valve 14, 15 by means of a suitable handle 22 which is removably secured to the outer end of the valve stem in any suitable way as by a cotter pin 23, the valve stem being provided with flat sides 24 on which the handle 22 engages.

Means are also provided for grinding the valve surfaces 14 and 15. In the form shown, the valve stem 12 is provided at 25 adjacent its outer end with a grinding surface, and when it is desired to grind the valve seat surface 14, the valve stem 12 is removed from the valve casing, reversed, and again inserted in the valve casing until the grinding surface 25 engages with the surface 14. For grinding the valve surface 15, the handle 22 is provided with a grinding surface 26. The valve stem is removed from the casing and held in any suitable way, as by a vise engaging the flat surfaces 24 while the handle 22 is slipped over the inner end of the valve stem until the surface 26 engages the surface 15 as shown in Fig. 4.

In use, when it is desired to open the valve 14, 15, the valve stem is rotated by means of a handle 22 to withdraw the surface 15 from contact with the surface 14 but not sufficiently to permit the valve 6, 8 to close. Preferably the valve is arranged so that one-quarter turn of the handle 22 will withdraw the shoulder at the outer side of the reduced portion 17 of the valve stem until it is flush with the edge of the outlet opening 18. Steam and water now pass from the boiler past the valve member 7, valve stem 12 and valve 14, 15 and into the outlet pipe 19. Thus the valve may be used as an indicator valve,

gauge cock, or the like. At the same time, in case any of these connections is broken, the boiler pressure is always effective to close the safety valve 6, 8 which as above described is rotated and ground into its seat at every closing operation. It will be noted that in case of accident, the valve casing tends to break at the groove 5, thus leaving the bushing 2 and the inner end of the valve casing intact. Moreover, the provision of the safety valve makes it possible to grind the valve surfaces 14 and 15 under boiler pressure as described above. For purposes of inspection, the valve may be removed from the boiler as a unit by unscrewing the casing 3 from the bushing 2. Any desired test can now be made of the boiler opening without breaking the joint between the bushing 2 and the boiler casing. The transverse grooves 10 on the head of the valve member 7 provide a passage for the escape of steam and water in case the valve member should become jammed or stuck in the inner end of the bushing 2.

It will be understood that the invention is not limited to the form illustrated in the drawing, but is capable of a variety of mechanical expressions, and that various changes may be made in the form, details of construction and arrangement of the several parts without departing from the spirit of the invention. Reference is therefore to be had to the appended claims for a definition of the limits of the invention.

What is claimed is:

1. In a valve of the class described, the combination of a one piece valve casing, a valve member at the inner end of said casing capable of being closed by boiler pressure, a valve stem having threaded engagement in the outer end of said casing and extending into operative engagement with said valve member, a valve seat formed in the casing, and a cooperating valve formed on said valve stem, said casing having a lateral discharge opening on the outer side of said valve and said stem being reduced in diameter adjacent said opening, said reduced portion being positioned and dimensioned so that it registers flush with the outer edge of said opening when said valve is open.

2. In a valve of the class described, the combination of a valve casing, a valve member at the inner end of said casing capable of being closed by boiler pressure, a valve stem extending through said casing and having operative engagement with said valve member to hold the same out of closed position, a valve formed on said stem, and a cooperating valve seat formed in said casing, said casing having a lateral outlet opening on the outer side of said valve and seat, the outer end of said valve stem being formed as a grinding surface for said valve seat.

3. In a valve of the class described, the combination of a one piece valve casing, a valve member at the inner end of said casing capable of being closed by boiler pressure, a valve stem extending through said casing and having operative engagement with said valve member to hold the same out of closed position, a valve formed on said stem, a cooperating valve seat formed in said casing, said casing having a lateral outlet opening on the outer side of said valve and seat, and a handle secured to the outer end of said valve stem, said handle having formed therein a surface for grinding said valve on the valve stem.

4. In a valve of the class described, the combination of a casing having a valve seat therein,

and a valve stem and a valve in said casing and removable therefrom, said valve stem having a valve seat grinding surface on its outer end.

5 5. In a valve of the class described, the combination of a casing having a valve seat therein, a valve stem and valve in said casing and removable therefrom, and a handle on the outer end of said valve stem, said handle having a valve grinding surface formed therein.

10 6. In a valve of the class described, the combination of a casing having a valve seat therein, a valve stem and valve removable from said casing, a handle removably secured to the outer end of said valve stem, said stem having a grinding surface on its outer end for said valve seat and said handle having a grinding surface for said valve.

20 7. In a valve of the class described, the combination of a one piece valve casing, a valve member at the inner end of said casing capable of being closed by boiler pressure, a valve stem extending into said casing and having operative engagement with said valve member, a valve seat in the casing, and a valve formed on said stem, said casing having an outlet opening formed on the outer side of said valve and seat, said valve stem having a portion registering flush with the outer edge of said opening when the valve is open and fitting closely in said casing on the outer side of said opening and provided with an annular sealing groove.

30 8. In a valve of the class described, the combination of a one piece valve casing, a valve member at the inner end of said casing capable of being closed by boiler pressure, a valve stem in said casing having operative engagement with said valve member, a valve seat formed in said casing, and a cooperating valve formed on said stem, said casing having an outlet opening on the outer side of said valve and seat and said valve stem having a portion registering flush with the outer edge of said opening when the valve is open and fitting closely in said casing on the outer side of said opening and provided with a plu-

ality of sealing grooves and a packing groove.

9. In a valve, the combination of a one piece valve casing having an open outer end, a valve member at the inner end of said casing capable of being closed by boiler pressure, a valve stem 5 extending into the open outer end of said casing, said stem having operative engagement at its inner end with said valve member and being threaded in said casing adjacent its open outer end, a valve seat formed in the casing intermediate 10 its ends, a cooperating valve formed on said stem, said casing having a lateral discharge opening on the outer side of said valve and seat and said valve stem being reduced in diameter adjacent 15 said opening, the enlarged portion of the stem outwardly of said reduced portion being adapted to register flush with the outer edge of said opening when the valve is open and fitting closely in said casing, and means for preventing the escape of fluid past said closely fitting portion and 20 out the open end of said casing including an annular sealing groove.

10. In a valve, the combination of a one-piece valve casing having a central bore extending therethrough and open at both ends, a valve 25 member at the inner end of said bore capable of being closed by boiler pressure, an integral stem extending into the open outer end of said bore and having operative engagement at its inner end with said valve member, a valve seat formed in 30 said casing intermediate its ends, a cooperating valve formed on said stem, said casing having a discharge opening on the outer side of said valve seat and said stem having a diameter less than the diameter of the bore adjacent said discharge 35 opening, said stem increasing in diameter outwardly of said discharge opening and fitting closely in said bore to prevent the escape of fluid past said portion of increased diameter and out the open outer end of said bore, the enlarged 40 portion of said stem registering flush with the outer edge of said discharge opening when the valve is open.

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