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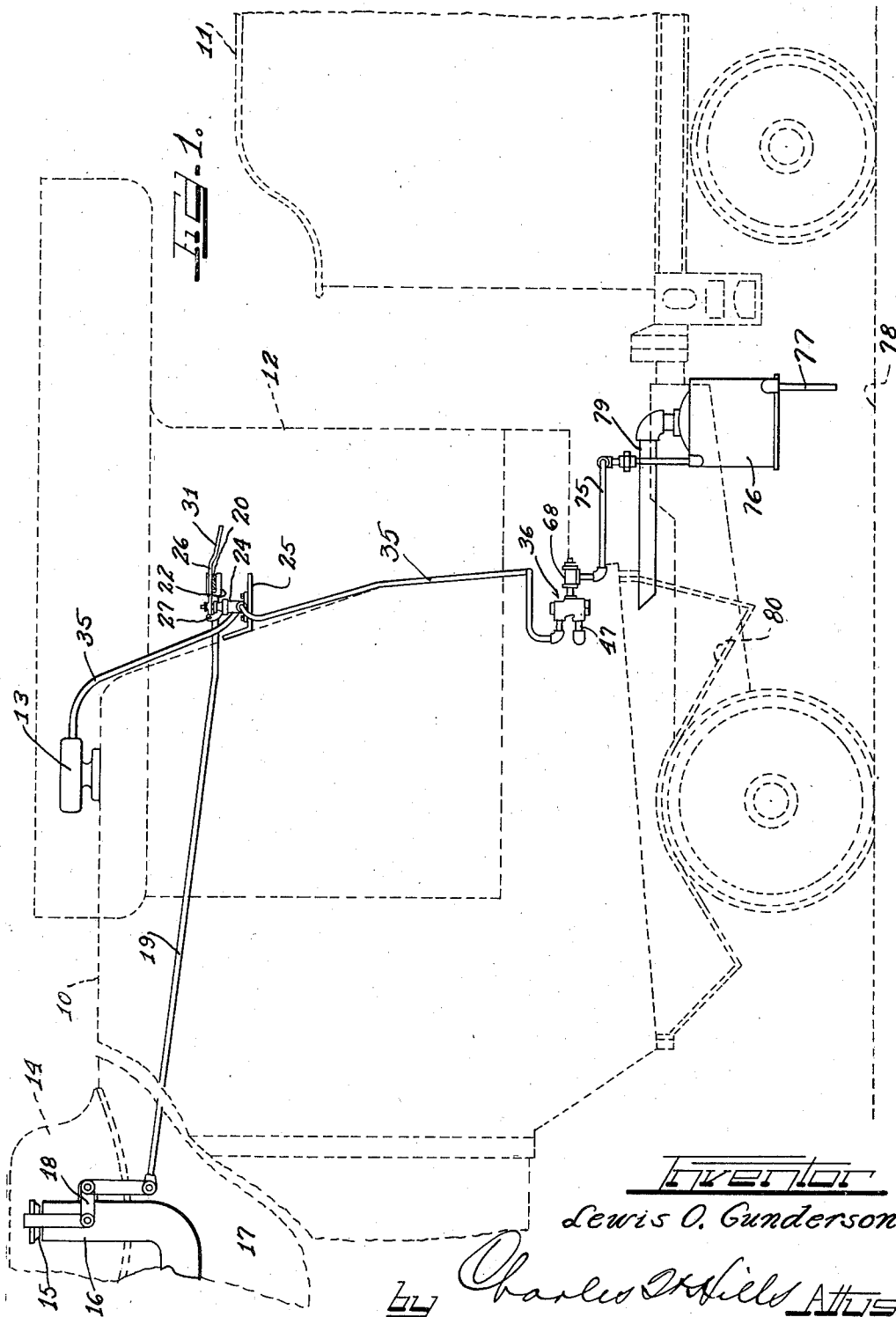
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BLOW-OFF APPARATUS FOR LOCOMOTIVE BOILERS

Filed Dec. 30, 1935

2 Sheets-Sheet 1



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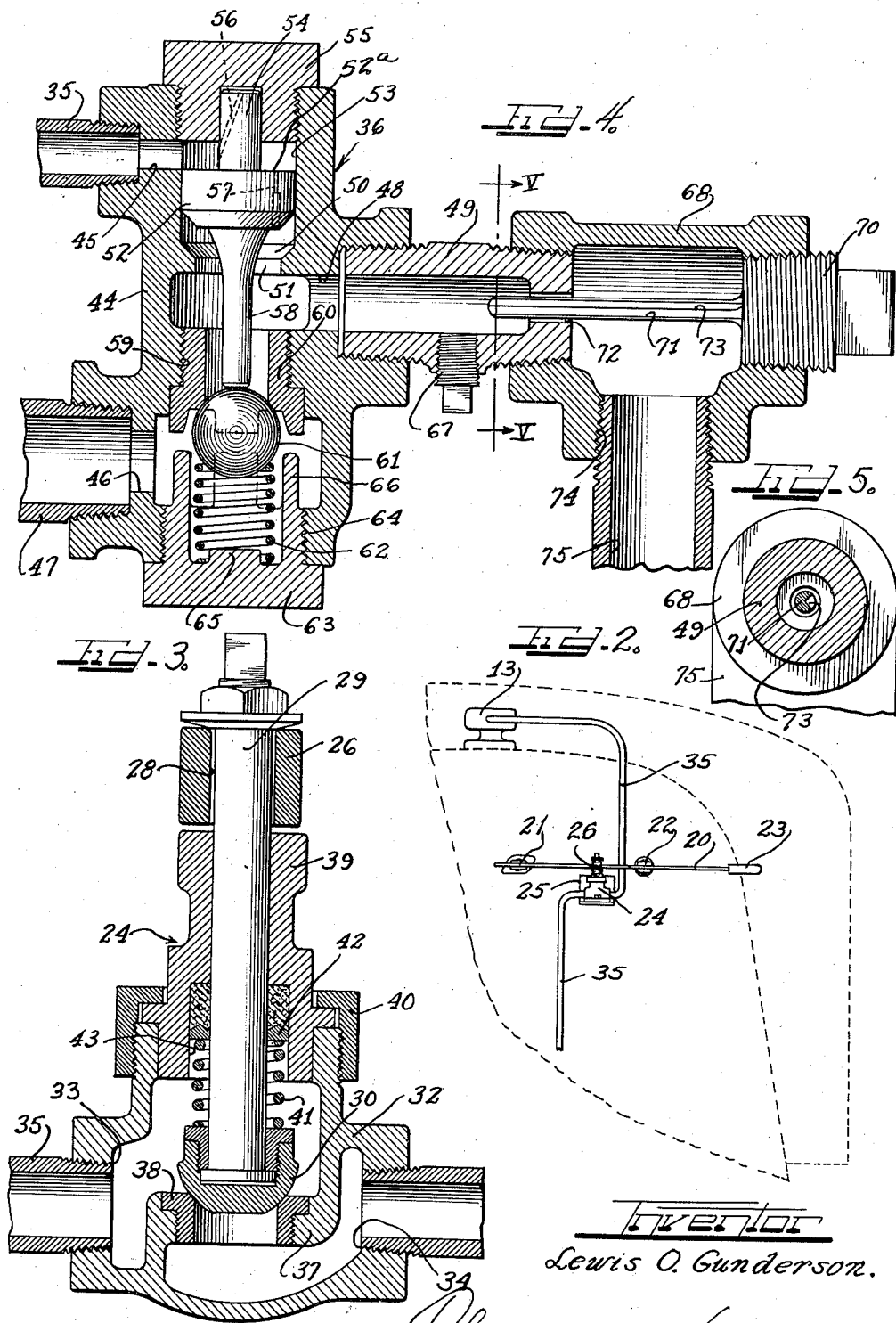
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UNITED STATES PATENT OFFICE

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BLOW-OFF APPARATUS FOR LOCOMOTIVE BOILERS

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2 Claims. (Cl. 122—382)

This invention relates to blow-off apparatus for locomotive boilers and to a method of blowing off such boilers.

Automatic blow-off apparatus for locomotive boilers has heretofore been proposed to effect a simultaneous blowing off of the boiler whenever steam is being delivered from the boiler to the locomotive cylinders. Such an arrangement, however, is wasteful because it causes the boiler to be blown off at the same rate whenever steam is being delivered to the cylinders regardless of the amount of steam being so delivered.

It is therefore an important object of this invention to provide blow-off apparatus for locomotive boilers that will effect a constant blow-off of the boiler whenever but only when steam is being delivered into the cylinders in excess of a predetermined rate, whereby it is possible to open the throttle valve to a "drifting" position without opening the blow-off valve. This is desirable because a relatively small amount of steam is used during such periods as the throttle is in a "drifting" position and for that reason it would not be efficient to continue to blow down the boiler at the same rate as when steam is used for full operation of the locomotive.

It is a further important object of this invention to provide blow-off apparatus for locomotive boilers wherein the blow-off valve is controlled through the operation of a trip valve, which in turn is actuated by the throttle lever whenever and only when the throttle lever is opened a predetermined distance.

It is a further important object of this invention to provide in a blow-off apparatus for locomotive boilers a specially designed trip valve, operated mechanically by the operation of the throttle lever and in accordance with the position of the throttle lever, whereby delayed action in opening the valve is provided so that the valve will be opened only at a predetermined opening of the throttle lever.

Other and further important objects of this invention will be apparent from the disclosures in the specification and the accompanying drawings.

This invention (in a preferred form) is illustrated in the drawings and hereinafter more fully described.

On the drawings:

Figure 1 is a broken side elevational view of an installation of my blow-off apparatus on a locomotive, the latter being shown in dotted outline.

Figure 2 is a fragmentary rear elevational view

showing the trip valve and mechanism connecting the same to the throttle lever.

Figure 3 is an enlarged longitudinal sectional view of the trip valve.

Figure 4 is an enlarged longitudinal sectional view of the blow-off cock and connection.

Figure 5 is a fragmentary sectional view taken substantially on the line V—V of Fig. 4.

As shown on the drawings:

The reference numeral 10 indicates generally a locomotive and the reference numeral 11 a tender drawn thereby. The locomotive 10 comprises the usual cab 12, cab turret 13, and steam dome 14 housing a throttle valve 15 mounted in the steam line 16 leading from the boiler 17 to the cylinders (not shown).

As is customary, the throttle valve 15 is controlled through a bell crank lever 18 and connecting rod 19 by a throttle lever 20. Said throttle lever 20 is pivoted at one end thereof as at 21 (Fig. 2) in a support secured to the rear wall of the boiler and is connected intermediate its ends through a clevis 22 formed on the end of the rod 19 that protrudes into the cab 12. The other end of the throttle lever 20 is provided with a handle 23 that may be moved in and out by the engineer in charge of the locomotive. While the clevis connection 22 has been shown as being spaced considerably from the pivot 21 for purposes of convenience it should be understood that actually these points will be closer together thereby providing a longer lever arm for the lever 20 to permit an easier manual operation of the throttle valve.

A trip valve 24 is mounted upon a bracket 25 secured to the rear face of the boiler. Said trip valve 24 is provided with a handle 26, which is pivoted as at 27 and provided with an aperture 28 (Fig. 3) to receive the stem 29 of the valve proper 30. Said handle 26 is provided with an offset end 31 (Fig. 1) against the lower face of which the throttle lever 20 presses as the throttle lever is pulled out into opened position. As will be readily apparent, since the throttle lever 20 moves in a horizontal plane, the handle 26 will be raised as the offset end 31 rides on the throttle lever 20, thereby lifting the valve stem 29 and opening the valve 30.

Said trip valve 24 comprises a passage body portion 32 having a steam inlet connection 33 and a steam outlet connection 34 for connecting the valve into a steam line 35 leading from the cab turret 13 to a blow-off cock 36. An apertured partition 37 extends between the inlet 33 and outlet 34 and is fitted with a valve seat 38

for receiving the end of the valve 30. Said valve stem 29 extends through a bonnet 39 which is secured to the body portion 32 by means of a flanged nut 40. A spring 41 surrounds the lower end of the stem 29 and is mounted under compression between a washer 42 received within a recess 43 in the bonnet 39 and the valve end 30. Said spring 41 thus normally holds the valve in closed position.

The blow-off cock 36 comprises a passaged body portion 44 having a steam inlet 45 for connection to the pipe 35, a boiler water and sludge inlet 46 for connection with a line 47 leading from the bottom portion of the boiler, and an intermediate boiler water and sludge discharge opening 48 for receiving a discharge connection 49. Said body portion 44 is provided with an internal seat 50 about a port 51 that provides communication between the steam inlet 45 and the discharge 48. A piston 52 is slidably mounted in the cylindrical portion 53 above said port 51 and is adapted to seat against the seat 50 by virtue of the steam pressure on the relatively large area of the top 52a of the piston. Said piston 52 is provided with an upper cylindrical portion 54 that extends into a recessed plug 55 and which is provided with a condensate duct 56 to prevent the condensate from being trapped above the end 54. The body of the piston 52 is also provided with a condensate duct 57 to permit drainage into the discharge side of the cock.

The piston 52 is also provided with an elongated reduced lower end 58 for a purpose that will presently appear. The body portion 44 is provided with a threaded opening 59 between the boiler water inlet and discharge connections for receiving an apertured seat insert 60. A ball 61, preferably of stainless steel, is adapted to be held in seating engagement with said insert 60 by means of a coiled spring 62 mounted in a recessed boss or plug 63. Said plug 63 is threaded into the apertured lower end 64 of the body portion 44 and is provided with a centering boss 65 and upstanding segmental cylindrical lugs 66 that cooperate to center and position the coiled spring 62.

When steam under pressure is admitted to the inlet 45 to the space above the piston 52, the steam pressure thereby exerted against the upper face 52a of the piston causes the piston to be depressed until it seats itself in the seat 50, the elongated end 58 of the piston at the same time pressing against the ball 61 to unseat it and provide a continuous passageway between the boiler water inlet and outlet passages 46 and 48, respectively. With the valve thus opened to blow off boiler water and sludge from the boiler, both the under and upper sides of the piston 52 will be subjected to boiler pressure due to a restricted orifice communicating with the discharge opening 48 as will be hereinafter described. However, owing to the reduced area of the underside of the piston, the total pressure against the upper side 52a of the piston will be greater and thus hold the piston in its lowered, seated position without chattering so long as steam is admitted through the pipe 35 into the chamber above the piston. When the steam pressure above the piston is released, the excessive force of the coil 62 serves to seat the ball 61 and raise the piston from its seat, into the position shown in Fig. 4. The condensate grooves 56 and 57 prevent condensate from being trapped above the body of the piston.

The discharge connection 49 comprises a nipple threaded at both ends and provided with a lower

threaded opening for receiving a drain plug 67. The outer threaded end of said connection 49 receives a T-shaped member 68 having an axially aligned threaded plug 70 that carries a pin 71 adapted to extend freely through an opening 72 in the end of the connection member 49. The pin 71 is provided with a V-shaped groove 73 that extends substantially its full length and serves to prevent clogging of the opening 72. The principle involved is that the pin protruding through the orifice 72 will prevent flat particles of scale from stopping up the orifice completely, inasmuch as any scale entering the orifice nipple will lodge at an angle against the pin and prevent the possibility of complete stoppage of the orifice. Furthermore, by unscrewing the plug 70, the pin will serve as a cleaning instrument for the orifice 72.

The T-shaped member 68 is connected through its lower threaded opening 74 with a boiler water and sludge discharge line 75 of substantially greater diameter than the diameter of the orifice 72. Said line 75 leads to a steam separator 76 of any conventional or common construction such as a centrifugal separator, wherein the steam blown from the boiler with the boiler water and sludge is separated from the boiler water and sludge. The separator 76 may be conveniently mounted on the cab, as from the underside of the floor of the cab, so that the sludge and water draining therefrom through a discharge pipe 77 will flow onto the road bed, indicated generally by the reference numeral 78. The steam is discharged through a pipe 79 leading from the top of the separator 76 into the ashpit 80 and serves to promote combustion in the firebox of the locomotive.

The operation of the blow-off apparatus just described is substantially as follows:

When the steam throttle valve 15 is closed or substantially so, as shown in Fig. 1, the trip valve 24 is also closed, since the horizontal portion of the handle 26 is resting on the throttle lever 20. When, however, the throttle valve 15 is opened up further and the throttle lever 20 has moved along until it strikes the offset end 31 of the handle 26, said handle starts to ride upwardly and lift the trip valve 30 from its seat. The point at which the trip valve 24 is operative will obviously depend upon the relative distance between the offset in the handle 26 and the lever 20 when the latter is in closed position. This distance can be varied as desired by sliding the valve 24 on its support 25 toward and away from the back face of the boiler.

When the movement of the throttle lever 20 has operated to open the trip valve 24, steam is admitted from the cab turret 13, which is in direct communication with the steam space of the boiler, through the line 35 and through the port of the seat insert 38 into the continuation of said steam line 35 leading to the blow-off cock 36. As already explained, the steam pressure thereby created on the top 52a of the piston 52 causes a downward displacement of the piston and an unseating of the ball 61 to open the communication from the lower portion of the boiler 17 through the boiler water discharge line 47, the port provided by the seat insert 60 and the discharge opening 48, through the connection 49 to the discharge orifice 72. The boiler water and sludge then continues through said orifice 72 into the discharge line 75 and then to the separator 76, where steam is separated and discharged into the ashpit 80. The boiler water

and sludge is allowed to drain by gravity through the vertical discharge pipe 77 onto the road bed.

It will thus be apparent that my blow-off apparatus provides for a constant and automatic blowing off of the boiler through a restricted discharge during such periods as the throttle valve is opened beyond a predetermined amount. The operation of the trip valve is preferably delayed to such a point that so long as the steam throttle is in a "drifting" position, the trip valve will not be operated and consequently the blow-off cock will be closed. When, however, the throttle valve is opened to such an extent that steam is being delivered from the boiler to the cylinders of the engine in excess of a predetermined rate, the trip valve will be opened to permit a withdrawal of steam from the steam space of the boiler with consequent building of pressure against the upper surface 52a of the sliding piston 52 to an amount sufficient to open the blow-off valve.

Thus, with this arrangement, the blowing off of the boiler is automatic whenever and only when the steam throttle is opened beyond a predetermined position. Consequently, there is no undesirable blowing off of the boiler when only a relatively small amount of steam is being used, as when the throttle is in a "drifting" position. The amount of the delay in the opening of the trip valve may, as is obvious, be adjusted either by moving the valve itself closer or farther away from the throttle lever in its closed position, or by changing the position of the offset in the trip valve handle or lever.

I am aware that many changes may be made

and numerous details of construction may be varied through a wide range without departing from the principles of this invention, and I, therefore, do not purpose limiting the patent granted hereon otherwise than necessitated by the prior art.

I claim as my invention:

1. In a locomotive having a steam boiler, a throttle for controlling the flow of steam from the boiler and a lever for operating the throttle, a blow-off device communicating with the boiler, pressure operating means for opening the blow-off device, a pipe communicating with the boiler and said pressure operating means, a valve in said pipe, and means so associated with the valve as to be operated by the throttle lever when the latter is beyond a drift speed position for opening the valve to admit boiler pressure through said pipe to the pressure operated means and thereby open the blow-off device.

2. Apparatus for blowing off sludge from a locomotive boiler comprising a steam throttle lever, a blow-off valve communicating with the boiler, pressure operated means in said blow-off valve for opening said valve, a trip valve, a steam line communicating with the steam space of the boiler and connected through said trip valve to said pressure operated means in said blow-off valve, and mechanism so associated with said trip valve and throttle valve as to operate the trip valve to admit to the pressure operated means in the blow-off valve for opening said blow-off valve only when said lever is moved beyond a drift speed position.

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