March 26, 1940. J. G. BROWN 2,194,636

SAFETY DEVICE FOR RAILWAY LOCOMOTIVE BOILERS

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Fig. 1.

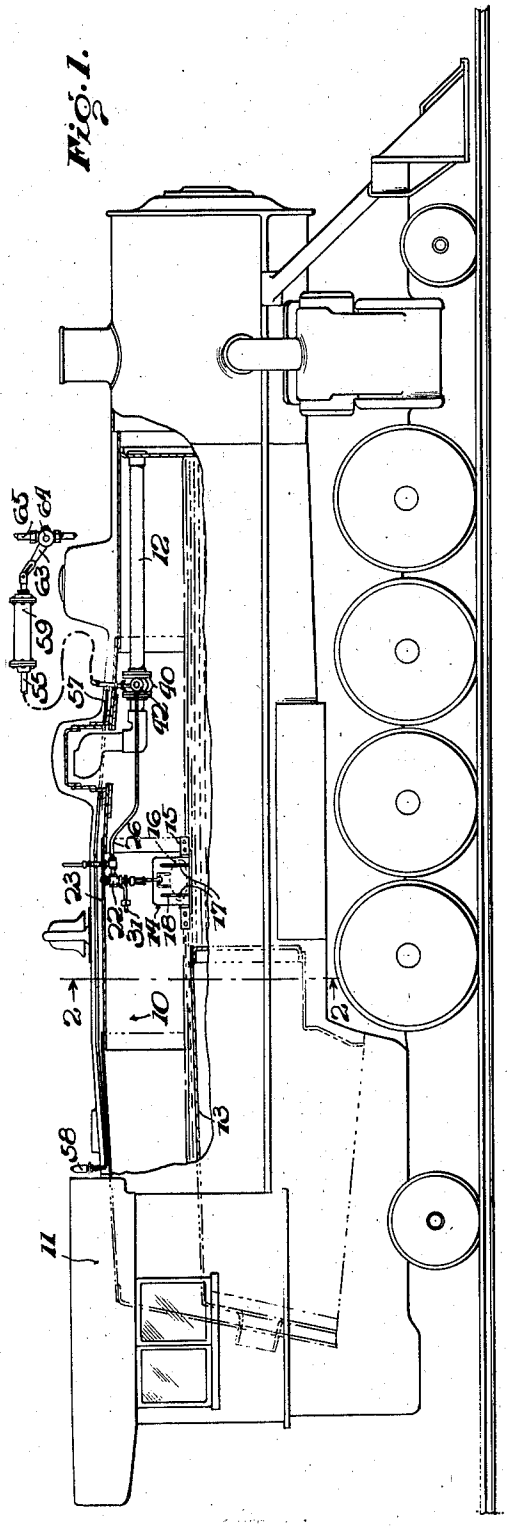


Fig. 3.

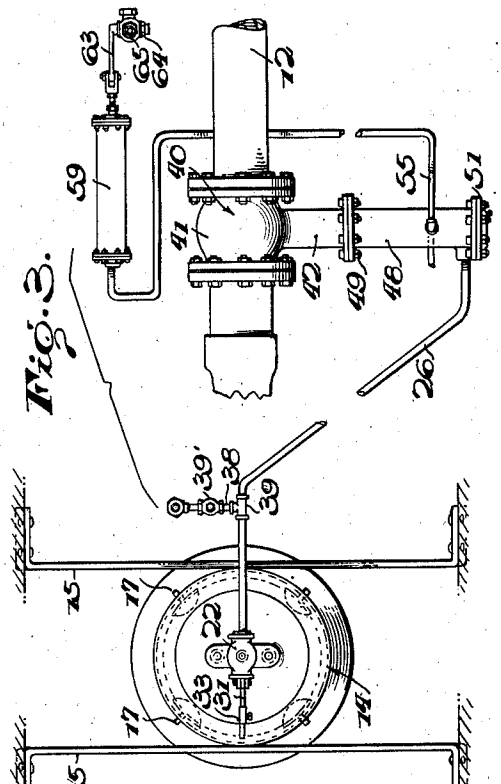
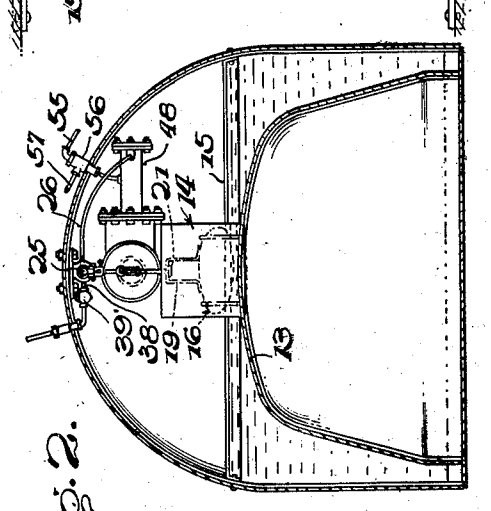


Fig. 2.



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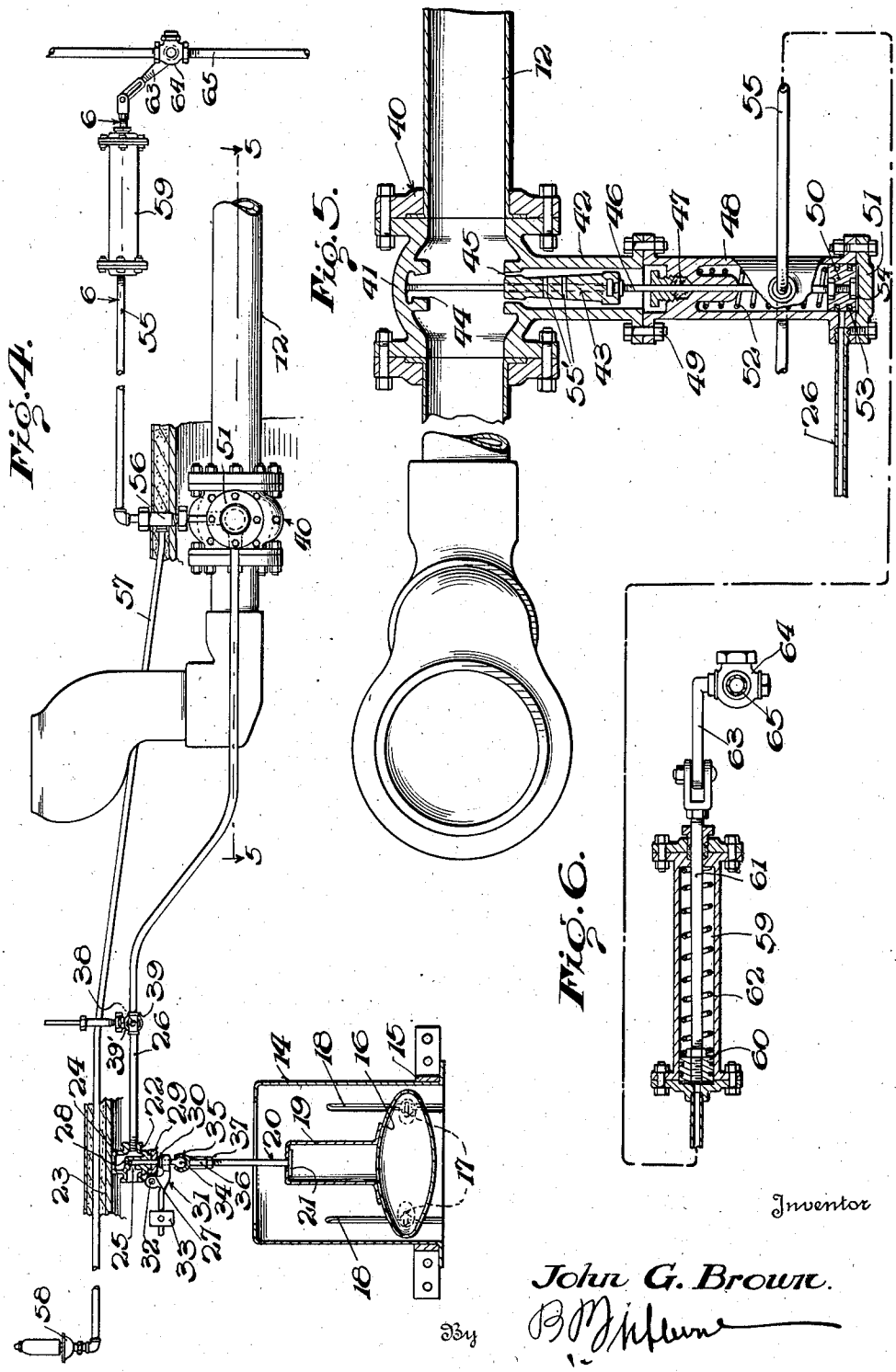


Fig. 4.

Fig. 5.

Fig. 6.

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SAFETY DEVICE FOR RAILWAY LOCOMOTIVE BOILERS

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Application January 3, 1939, Serial No. 249,151

8 Claims. (Cl. 122—504)

My invention relates to a safety device for the boilers of railway locomotives or the like.

An important object of the invention is to provide a device of the above mentioned character, which will prevent a boiler explosion because of low water, and which is automatic in operation and independent of human agency.

A further object of the invention is to provide means for cutting off the passage of steam through the main dry pipe, to any considerable extent thereby checking the draft of the locomotive, reducing the intensity of the heat at the crown sheet, and checking further rapid evaporation of the water.

A further object of the invention is to provide means for applying the air brakes to stop the locomotive or train, when the water level in the boiler is sufficiently lowered.

A further object of the invention is to provide means for producing a signal to indicate the level of the water, and also to provide a vent for indicating if the main valve is leaking, the vent also permitting the return of the valve body of the valve connected in the main dry pipe.

Other objections and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawings, forming a part of this application, and in which like numerals are employed to designate like parts throughout the same,

Figure 1 is a side elevation of a railway locomotive, parts broken away, showing my safety device in side elevation applied thereto,

Figure 2 is a transverse section taken on line 2—2 of Figure 1,

Figure 3 is a plan view of the float and associated elements,

Figure 4 is a central vertical section through the float and main valve, associated elements being shown in elevation,

Figure 5 is a horizontal section taken on line 5—5 of Figure 4, and,

Figure 6 is a horizontal section taken on line 6—6 of Figure 4.

In the drawings, wherein for the purpose of illustration is shown a preferred embodiment of my invention, the numeral 10 designates the boiler of a railway locomotive. The locomotive comprises the usual cab 11 and main dry pipe 12, which supplies steam to the operating cylinders, under the control of the usual throttle valve, not shown.

Arranged within the boiler near and above the firebox crown 13, is a vertical float protection casing 14, open at its top and bottom, and attached to horizontal bars or angle irons 15, in turn secured to the sides of the boiler shell. The protection casing is located in the longitudinal and cross-sectional center of the boiler, to give a true level of water under all conditions, at a specified height above the highest part of the firebox crown sheet. The location also reduces to the minimum the surging action of the water on the float. Mounted within the protection casing 14 is a float 16, preferable of the shape shown, and having pins 17 rigidly secured thereto and operating within vertical elongated slots 18, formed in the protection casing 14. While I have shown four of the vertical slots 18, their number may be varied, if desired. Rigidly attached to the top of the float 16 is a tubular extension 19, having an opening in its top to receive a connecting rod 20, provided at its lower end with a head 21. The connection between the extension 19 and the rod 20 is such that when the extension 19 is lowered it draws the rod 20 down with it, but when the extension 19 is raised, it moves along the rod 20 without moving such rod.

Arranged near and above the protection casing 14 is a main valve 22, rigidly attached to the top 23 of the boiler shell. The valve 22 comprises a casing 24, having an open inlet or mouth 25, in free communication with the interior of the boiler. The valve casing 24 has an outlet connected with a pipe 26, and the passage of steam to the pipe 26 is controlled by a vertically movable valve body 27, arranged to engage or disengage its seat 28. The valve body is in the form of a rod and extends downwardly below the casing and through a stationary supporting element 29, and is provided with a shoulder 30 for engagement with the forked end of a lever 31, pivoted to the supporting element 29, at 32. The lever 31 has a weight 33 adjustably mounted thereon. The lower end of the rod or valve body 27 has a ball 34 formed thereon for engagement within a socket 35 and this socket is carried by a tubular sleeve 36, having screw-threaded engagement with the connecting rod 20, and held against accidental displacement by a lock-nut 37. It is thus seen that the weight 33 and associated elements tend to elevate the valve body 27 and hold it seated, but the downward movement of the float 16 overcomes the action of the weight 33 and unseats the valve body.

A transverse pipe 38, Figures 2 and 4, is connected with the pipe 26 by a T-coupling 39. The transverse pipe 38 leads to the atmosphere exteriorly of the boiler shell and has a reduced bore. A check valve 39' is connected in the branch pipe 38, and closes toward the free end of the branch pipe. The valve body of this check valve is held unseated by a spring or the like, the tension of which may be regulated to permit the valve body to close at a selected pressure. When the valve body 27 is unseated to permit of the flow of the boiler pressure, this pressure closes the check valve, but when the valve body 27 is seated,

the valve 39' is open and then serves as a vent to the atmosphere, having a purpose to be described. Further, if a slight leakage of steam should occur through the valve 22, when the valve body 27 is seated, this leakage of steam would vent to the atmosphere through the pipe 38, indicating such leakage.

Connected in the main dry pipe 12 is a pressure actuated gate valve 40, separate from and independent of the usual throttle valve. This pressure operated valve includes a casing 41 having an extension 42. The passage of steam through the casing 41 may be prevented, by a reciprocatory valve body or gate 43, to engage seats 44 and 45, when closed. This valve body is connected with a rod 46. This rod operates through a stuffing-box 47 carried by a cylinder 48, and the cylinder is bolted or rigidly attached to the extension 42, as shown at 49. Mounted to reciprocate within the cylinder 48 is a plunger 50, rigidly attached to the rod 46, and the plunger is moved toward the outer end or head 51 of the cylinder 48 by a compressible coil spring 52. The spring 52 retains the valve body 43 open when the valve body 27 is seated. The pipe 26 leads into the cylinder 48, near its outer end or head 51, and the steam pressure is conducted by a port 53 into a recess or space 54, behind the plunger 50, to move the plunger inwardly to close or seat the valve body 43. The valve body 43 is provided with reduced opening or openings 55', which permit only sufficient steam to pass to the operating cylinders through the main dry pipe to cushion the pistons therein, while drifting.

Leading into the cylinder 48 inwardly of and spaced from the outer end or head 51 is a pipe 55, which becomes located upon the outer side of the plunger 50 and uncovered by this plunger, when the plunger moves inwardly and the valve body or gate 43 is approaching its closed position. A T-coupling 56 is connected in the pipe 55 and is also attached to the boiler shell. A pipe 57 leads into the coupling 56 as connected with a whistle 58, arranged near the cab 11.

The pipe 55 is connected with a cylinder 59, to be located at any convenient position upon the locomotive, and this cylinder has a plunger 60, mounted to reciprocate therein, and connected with a rod 61. The plunger is returned to the starting position by a spring 62. The plunger rod 61 is connected with the arm 63 of a pressure reducing valve 64 connected in a pipe 65, leading to the air brake line. The valve 64 is adapted to make a sufficient reduction of pressure in the air brake line to apply the brakes. The operation of the apparatus is as follows:

When the level of the water in the boiler is at a proper elevation, the weight 33 maintains the valve body 27 seated. Hence steam is not supplied to the cylinder 48 and the valve body 43 remains open, and the control of the steam to the operating cylinders of the locomotive is regulated by the usual throttle valve. When the level of the water begins to lower in the boiler, the float 16 descends, and when the level reaches the selected or danger elevation, the float 16 unseats the valve body 27 and the steam from the boiler passes through the pipe 26 and into the outer end of the cylinder 48. This steam then shifts the valve body 43 to the closed position, which cuts off the supply of the major portion of the steam through the dry pipe to the operating cylinders. This cuts back the exhaust action in the smoke stack of the locomotive, reducing the intensity of the heat from the fire. A small amount of steam will pass through the reduced openings 55', to afford a cushioning action for the pistons, in drifting. When the plunger 50 moves inwardly it passes over and beyond the intake end of the pipe 55, about or shortly before the time that the valve body 43 is seated, and the steam is therefore free to pass from the cylinder 48 into the pipe 55. This steam will now enter the cylinder 59 and shift the plunger 60, which will operate the pressure reducing valve 64, to apply the brakes. Some of the steam will also pass through the pipe 57 to the whistle 58, to sound the same. When the water level in the boiler is finally raised to the desired elevation, the float 16 rises and valve 27 is again seated. The vent pipe 38 will now have communication with the atmosphere, as its check valve 39 will open, and the cylinder 48 will vent to the atmosphere, and spring 52 will return plunger 50 to the outer position. Spring 62 will also return plunger 60 to its starting position. With the valve body 27 seated, should a leakage of steam occur, this will vent through the pipe 38, indicating the same.

The action of the apparatus may be tested at any time. When the boiler is under steam, the water may be blown down to the level at which the float 16 will unseat the valve body 27, thus closing the valve body 43 of the valve in the dry pipe. When filling the boiler with water after a washout, air pressure will escape through the valve 24 and pipe 38 to the atmosphere, until the float again rises with the level of the water for closing the valve body 27. The vent pipe 38 will indicate if there is any leakage of steam about the valve body 27 when it is seated, as stated. Filling the boiler with air will test the valve 22 for the open position and the pressure devices including the cylinders 48 and 59 for the forward or active positions of their plungers.

It is to be understood that the form of my 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 my invention or the scope of the subjoined claims.

Having thus described my invention, what I claim is:

1. A railway locomotive boiler including a shell, a dry pipe arranged within the shell and having communication with the interior of the shell to supply steam to the cylinders, a valve separate from the throttle valve and arranged within the shell and connected in the dry pipe and having a movable valve body, said valve body when closed serving to cut off the major supply of steam to the cylinders for driving the pistons and permitting of a slight passage of steam to the cylinders to produce a cushioning action for drifting, a pressure operated device arranged within the shell to close the valve body, and float actuated means arranged within the shell and including a float element to contact with the water therein and serving to actuate the pressure operating means.

2. A railway locomotive boiler including a shell, a dry pipe arranged within the shell and having communication with the interior of the shell to supply steam to the cylinders, a valve separate from the throttle valve and arranged within the shell and connected in the dry pipe and including a valve body having restricted opening or openings, a pressure operated device arranged within

the shell and connected with the valve body to move it, a pipe arranged within the shell and connected with the pressure operated device, a control valve arranged within the shell and controlling communication between the pipe and the interior of the shells, a float mounted within the boiler to contact with the water therein, and connecting means between the float and the control valve so that the control valve is opened when the float descends to a selected position.

3. A railway locomotive boiler including a shell, a dry pipe arranged within the shell and having communication with the interior of the shell to supply steam to the cylinders, a valve separate from the throttle valve and arranged within the shell and connected in the dry pipe, a pressure operated device arranged within the shell and connected with the valve to move it, a pipe arranged within the shell and connected with the pressure operated device, a control valve arranged within the shell and connected with the pipe and controlling communication between the pipe and the interior of the boiler, a float mounted within the shell and contacting with the water therein, and connecting means between the float and the control valve to open the control valve when the float descends to a selected elevation.

4. A railway locomotive boiler including a shell, a dry pipe arranged within the shell and having communication with the interior of the shell for supplying steam to the cylinders, a valve arranged within the shell and connected in the dry pipe and embodying a valve body, said valve being separate from the throttle valve, a cylinder arranged within the shell and disposed near the valve, a plunger mounted within the cylinder, a rod connecting the plunger and valve body so that the movement of the plunger in one direction closes the valve body, a spring to move the plunger in an opposite direction to open the valve body, a pipe connected with the cylinder, a control valve connected with the pipe and controlling communication between the pipe and the interior of the shell, a float within the boiler to contact with the water therein, and connecting means between the float and control valve so that the float opens the control valve when the float descends to a selected elevation.

5. A railway locomotive boiler including a shell, a dry pipe arranged within the shell and having communication with the interior thereof for supplying steam to the cylinders, a valve arranged within the shell and connected in the dry pipe and including a valve body, a cylinder arranged within the shell and disposed near the valve, a plunger within the cylinder, a rod connecting the plunger with the valve body so that the movement of the plunger in one direction will close the valve body, a spring to move the plunger in an opposite direction, a pipe connected with the cylinder, and having its intake end adapted for communication with the interior of the shell, means including a float arranged within the shell and actuated by the level of the water in the boiler for controlling the passage of pressure into the pipe, and pressure operated means for applying the air brakes and receiving pressure from the cylinder when the plunger has moved in the cylinder a selected distance for closing the valve body.

6. A railway locomotive boiler including a shell, a dry pipe arranged with the shell and having communication with the interior thereof to supply steam to the cylinders, a valve arranged within the shell and connected in the dry pipe and including a valve body, a cylinder arranged within the shell and mounted upon the valve, a plunger within the cylinder, a rod connecting the plunger and valve body, a pipe arranged within the shell and leading into the cylinder near its outer end to supply fluid pressure into the cylinder for shifting the plunger inwardly to close the valve body, said pipe being adapted to be placed into communication with the interior of the shell, a spring to move the plunger in an opposite direction, a control valve connected with the pipe and controlling communication between the pipe and the interior of the boiler, means including a float arranged within the shell and actuated by the level of the water in the boiler to open the control valve, a pressure operated device for applying the air brakes, and a pipe connected with the pressure operated device and leading into the cylinder at a point inwardly of the plunger when the plunger is in the outer position.

7. A railway locomotive boiler including a shell, a dry pipe arranged within the shell and having communication with the interior of the shell for supplying steam to the cylinders, a valve separate from the throttle valve and arranged within the shell and connected in the dry pipe and including a valve body, said valve body having restricted opening or openings, a cylinder, a plunger within the cylinder, a rod connecting the plunger and valve body, a pipe leading into the cylinder near its outer end to supply fluid pressure into the cylinder for shifting the plunger inwardly to close the valve body, a spring to move the plunger in an opposite direction, a control valve connected with the pipe and controlling communication between the pipe and the interior of the boiler, float controlled means actuated by the level of the water in the boiler to open the control valve, a pressure operated device for applying the air brakes, a pipe connected with the pressure operated device and leading into the cylinder at a point inwardly of the plunger when the plunger is in the outer position, a vent pipe connected with the first named pipe, and a self-opening check valve connected in the vent pipe, the check valve closing toward the outlet end of the vent pipe, the check valve being closed by the boiler pressure passing into the vent pipe, and the check valve opening when the control valve is closed to drain the pressure from the cylinder to the atmosphere.

8. A railway locomotive boiler including a shell, a dry pipe arranged within the shell and having communication with the interior of the shell for supplying steam to the cylinders, an upstanding protection casing arranged within the shell at its longitudinal and transverse centers, said casing being open at the top and bottom and having vertical slots, a float arranged within the protection casing and having pins to engage within the vertical slots for preventing displacement of the float by the surging of the water, a valve connected with the float to be opened by the same, a second valve separate from the throttle valve and arranged within the shell and connected in the dry pipe and including a valve body, a cylinder arranged within the shell near the second valve, a plunger within the cylinder, a rod connecting the plunger and valve body, and a pipe connected with the first valve and with the cylinder.

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