July 17, 1934. L. F. WILSON 1,966,776

LOCOMOTIVE BLOW-OFF APPARATUS

Filed April 10, 1931

Fig. 1.

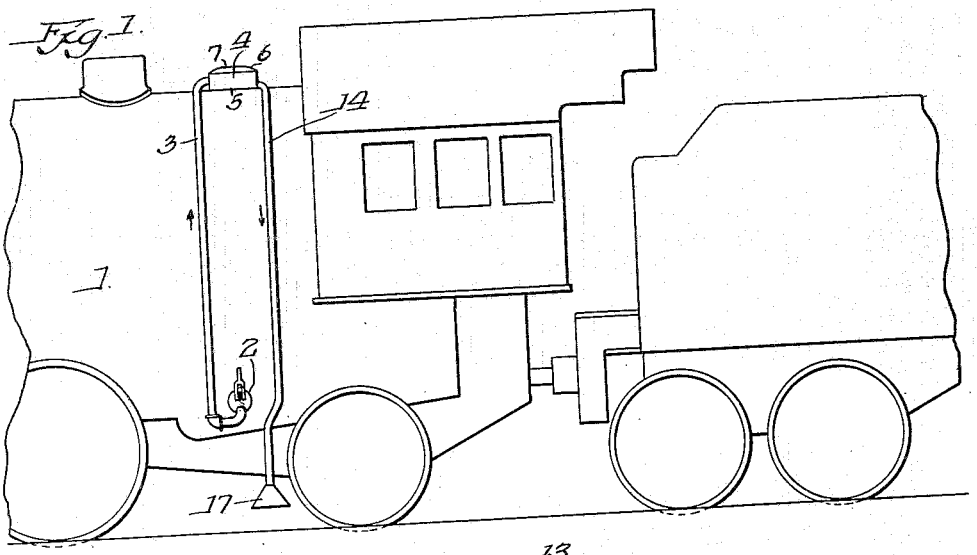


Fig. 2.

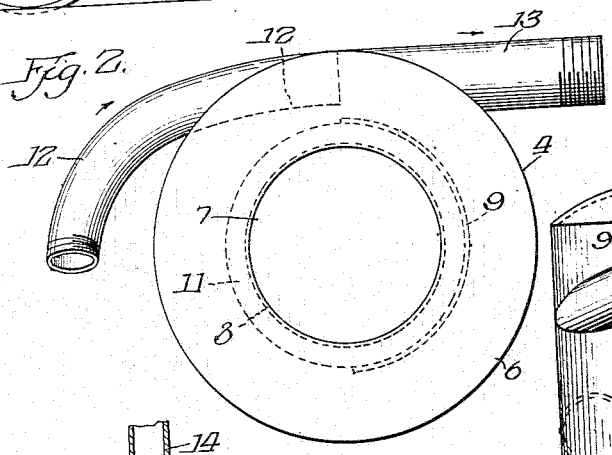


Fig. 3.

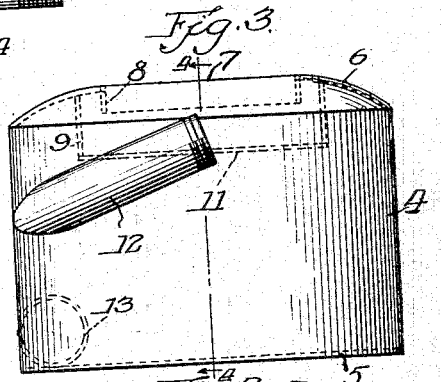


Fig. 5.

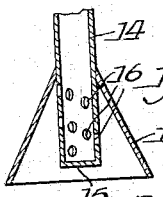


Fig. 6.

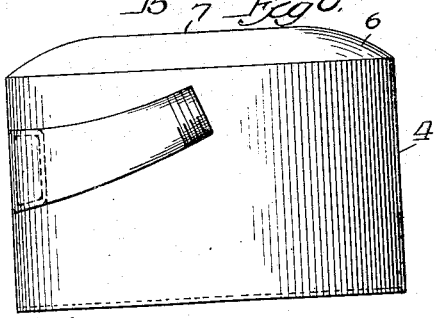
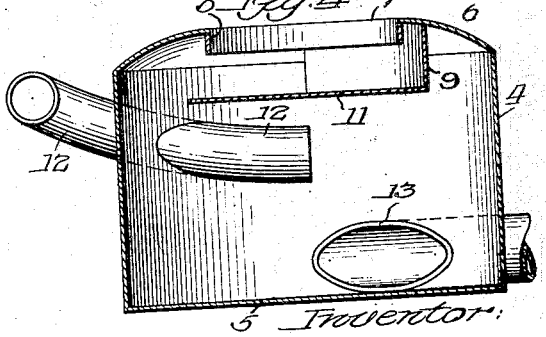


Fig. 4.



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UNITED STATES PATENT OFFICE

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LOCOMOTIVE BLOW-OFF APPARATUS

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Application April 10, 1931, Serial No. 528,999

6 Claims. (Cl. 122—382)

This invention pertains to apparatus to be used for separating water and steam when blowing down a locomotive.

Sludge accumulations in locomotives require that sludge be removed from the boilers at frequent intervals in order that the operating efficiency of the locomotives may not be impaired. In the past, most locomotives have been equipped with blow-off valves located on the sides of the boilers, approximately in the position shown in the attached drawing, through which the water, sludge and steam have been discharged downwardly toward the road bed or outwardly away from the sides of the locomotives. In such cases, it has been the custom to avoid blowing off the locomotives when they were in the terminals or in the yards, because of possible injury to persons and property. As a consequence, locomotives heretofore have been blown down not whenever they needed to be blown down but only when it happened that the need existed at the time when a safe opportunity occurred.

This invention makes it possible, safe and convenient to blow off a locomotive at any time that the sludge accumulation makes the operation advisable and furthermore eliminates any danger of dislodging the ballast or blowing dirt or cinders into the bearings or other operating parts of the locomotive.

Whereas in the past the water, sludge and steam were discharged in a common stream into the atmosphere, by means of this invention the steam is separated from the water and sludge and is discharged upwardly into the atmosphere, while the water and sludge are discharged upon the ground directly or indirectly and in such a way as not to dislodge or injure the track ballast. It is therefore possible to blow down locomotives equipped with this invention at any place in the railroad system, whether in the yards, terminals or elsewhere.

It is accordingly one of the objects of this invention to provide blow-off apparatus for a locomotive constructed to separate the steam from the blow-off products and discharge the separated products separately in a manner which will positively avoid injury to persons or property.

Another object of the invention is to provide blow-off apparatus which will accomplish the foregoing object and be capable of being operated irrespective of the location of the locomotive.

Other objects, advantages and characteristics of the invention should become apparent from a perusal of this specification and drawing:

Fig. 1 is a side elevation of a portion of a locomotive showing this invention installed thereon,

Fig. 2 is a plan view of the separator,

Fig. 3 is a side elevation of the separator,

Fig. 4 is a vertical central sectional view of the separator taken on the line 4—4 of Fig. 3,

Fig. 5 is an enlarged cross sectional view of the dispersing baffle for the discharged blow-off water, and

Fig. 6 is an elevation of a modified form of inlet pipe for the separator.

Referring now to the drawing, the locomotive boiler 1 is provided with a blow-off valve generally indicated as 2, the construction and mode of operation of which is not a part of this invention and hence requires no further description than to say that the valve will ordinarily be manually operated and controlled from the cab of the engine and so located that when it is open the internal boiler pressure will force out through the valve sludge and water at a high temperature, from which steam may be separated.

Connected with the blow-off valve is a pipe 3 which rises and is connected with the separator.

The separator consists of a cylindrical casing 4 which is preferably mounted on top of the boiler, as shown, and secured thereto in any desired manner. The bottom of the casing is closed with a wall 5 and the top of the separator consists of a dome 6 having a circular aperture 7, the edges of which are limited by a collar 8 which extends downwardly therefrom a short distance. Secured to the under-side of the dome is a depending arcuate flange 9 whose form and shape is shown in Figs. 2 and 4. The flange 9, together with a disc 11 which closes the bottom of the semi-cylindrical flange 9 and extends somewhat beyond the flange, as shown in Figs. 2 and 4, assist in preventing water from escaping through the steam outlet 7.

The water, sludge and steam are brought into the separator by means of a curved passage or pipe 12 which is connected to the riser 3. This pipe is curved substantially as shown and its center line lies in a plane disposed substantially at the angle shown in Figs. 3 and 4. The downward inclination of this pipe and its curvature cause the water flowing toward the separator to be thrown by centrifugal force against the outer wall of this curved pipe with the result that the steam immediately begins to separate within this curved pipe, emerging from the water and moving along the inner wall of the curved pipe. Thus a considerable separation occurs within the

curved pipe 12 before the blow-off products enter the separator. Furthermore, the downward inclination of the pipe directs the water into the separator in a stream which is already moving downwardly rather than in some other direction, such as horizontally or upwardly. This downward direction of the water is highly desirable as it assists in preventing the water from creeping up the side of the separator wall and escaping with the steam through the steam outlet 7, and also assists in moving the water toward the water outlet pipe 13. Pipe 12 preferably extends into the separator as shown in Fig. 4 to thus exert a more positive control over the direction of the entering stream of blown off water and sludge.

The water outlet pipe 13 is connected with a water discharge pipe 14 by means of which the water is brought down to a point below the boiler and is then discharged in any desired manner. For example, the water may be discharged into the ashpan or it may be discharged, as shown particularly in Fig. 5, to the closed lower end 15 of the pipe and thence through a plurality of small ports 16 outwardly against the inner wall of the conical baffle 17. The water is thus quite widely dispersed and may fall against the road bed without any harm whatever to the same. The steam having escaped through the port 7, the water emerging from the baffle will be discharged without harmful force.

The centrifugal force imparted to the water as it enters the separator at high velocity will hold the water against the cylindrical wall of the separator and permit the steam to emerge therefrom and flow toward the center of the separator, thence upwardly and out through the steam outlet port 7. In the actual use of this invention, this upward escape of steam is no more dangerous or harmful than the steam which escapes from the pop valve on a locomotive. Consequently the blow-off operation can safely be conducted anywhere along the railroad tracks, whether in the yards or right at the stations. As a direct consequence, the engine crew will be able to blow down their locomotive equipped with this invention whenever the sludge accumulation demands it, without regard to the location of the locomotive at such times.

In Fig. 6 a modified form of inlet pipe for the separator is shown. This pipe is curved between its ends substantially as is the pipe 12 but expands between its ends as shown in the drawing, the cross section being substantially or nearly rectangular at any point between its threaded end and its discharge end. This shape permits expansion of the steam within the inlet pipe to thus assist separation of steam and water and also by reason of its flattened cross section provides a wider separation surface between the steam and water than is possible in a pipe of circular cross section.

It will be noted that the height of this separator is considerably less than its diameter, which is a desirable feature in a device to be mounted on top of a locomotive boiler, and especially on the later type locomotives on top of which there is very little clearance for superposed structures. The ability to use these proportions is aided by the construction of the inlet passage which imparts centrifugal force to the water prior to its entry into the expansion chamber formed by the casing 4. The large diameter of the casing furthermore makes it possible to employ safely a large steam vent 7 through which the steam may escape in a large stream and through which the pressure of the steam may be quickly dissipated. An ensuing advantage resides in the fact that the rapid dissipation of the steam pressure makes it possible for the sludge to be discharged from the separator practically free from steam pressure even though a large amount of sludge and water be discharged through the device per unit of time. The large steam vent furthermore discharges the steam without any objectionable noise. Whereas in the past the steam and water were discharged in a common stream with great force, due to the high steam pressure, and usually with injury to the road bed, through the use of this invention the discharging water is not subject to the internal boiler pressure and therefore does no harm.

In some instances the blow-off valve is used, not primarily for discharging sludge, but for discharging highly concentrated soluble salt solutions from the boiler. But the problem of separating the steam from such solutions will be unchanged. It is apparent that in any case the blow-valve and separator may be operated continuously.

It should be understood that the invention is not limited by the present disclosure but is susceptible of considerable modification without departing, however, from the spirit and scope of the invention as defined in the claims which follow.

Having shown and described my invention, I claim:

1. In combination with a locomotive boiler, a blow-off valve connected for controlling sludge and water discharge from the boiler, and means positioned on top of the boiler connected with said valve for separating the steam from the water and constructed for discharging the steam upwardly above the locomotive into the open atmosphere and the water separately therefrom downwardly at low enough pressure and into the atmosphere in a manner to avoid injury to the train or roadway.

2. In combination with a locomotive boiler and a sludge blow-off valve connected thereto, a centrifugal separator positioned on top of the boiler, a pipe connecting said valve to said separator, a water discharge pipe connected with the separator for discharging separated sludge downwardly below the boiler, and a large steam vent in the top of said separator for discharging steam upwardly and relieving the discharged water from the internal boiler pressure.

3. In combination with a locomotive boiler and a sludge blow-off valve connected thereto, a centrifugal separator mounted on top of the boiler connected with the valve and having a steam vent in the top thereof relatively much larger than the sludge inlet, and means for discharging the sludge from the separator separately from the steam at low enough pressure and into the atmosphere in a manner arranged to avoid injury to the train or roadway.

4. In combination with a locomotive boiler and a blow off valve connected thereto, a centrifugal separator mounted on top of the boiler, having an expansion chamber therein, means connecting said separator with said valve including a curved and downwardly inclined conduit for imparting centrifugal force to the sludge before it enters the expansion chamber and downward flow thereupon, and means for separately discharging the steam upwardly into the atmosphere above the locomotive and the sludge from said chamber downwardly therefrom, the separator and sludge discharge means being constructed to deliver the

sludge to atmosphere at a low enough pressure and in a manner to insure the train and roadbed against injury thereby.

5. In combination with a locomotive boiler, means for conducting boiler blow-off products from the lower portion of the boiler to a point above the boiler, means located on top of the boiler for separating the steam from blow-off products and discharging it upwardly into the atmosphere and discharging the separated water and sludge, means for conducting the sludge downwardly and discharging the same adjacent the roadbed without injury to the roadbed or roadside and a blow-off valve interposed in said first conducting means between the boiler and said separating means.

6. In combination with a locomotive boiler, a blow-off valve located outside said boiler near the bottom thereof, a separator mounted higher than said valve on the upper portion of the boiler, a pipe located outside said boiler and leading from said blow-off valve to said separator through which boiler blow-off products are delivered to the separator, and a pipe leading from the lower portion of said separator to a point below the boiler from which blow-off sludge and water at low pressure may be discharged without injury to the roadbed or roadside, said separator being constructed to separate the blow-off steam from the blow-off sludge and water and having an enlarged vent to direct the separated steam upwardly into the atmosphere above the locomotive at greatly reduced pressure and thus facilitating the discharge of the sludge and water into said discharge pipe at greatly reduced pressure.

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