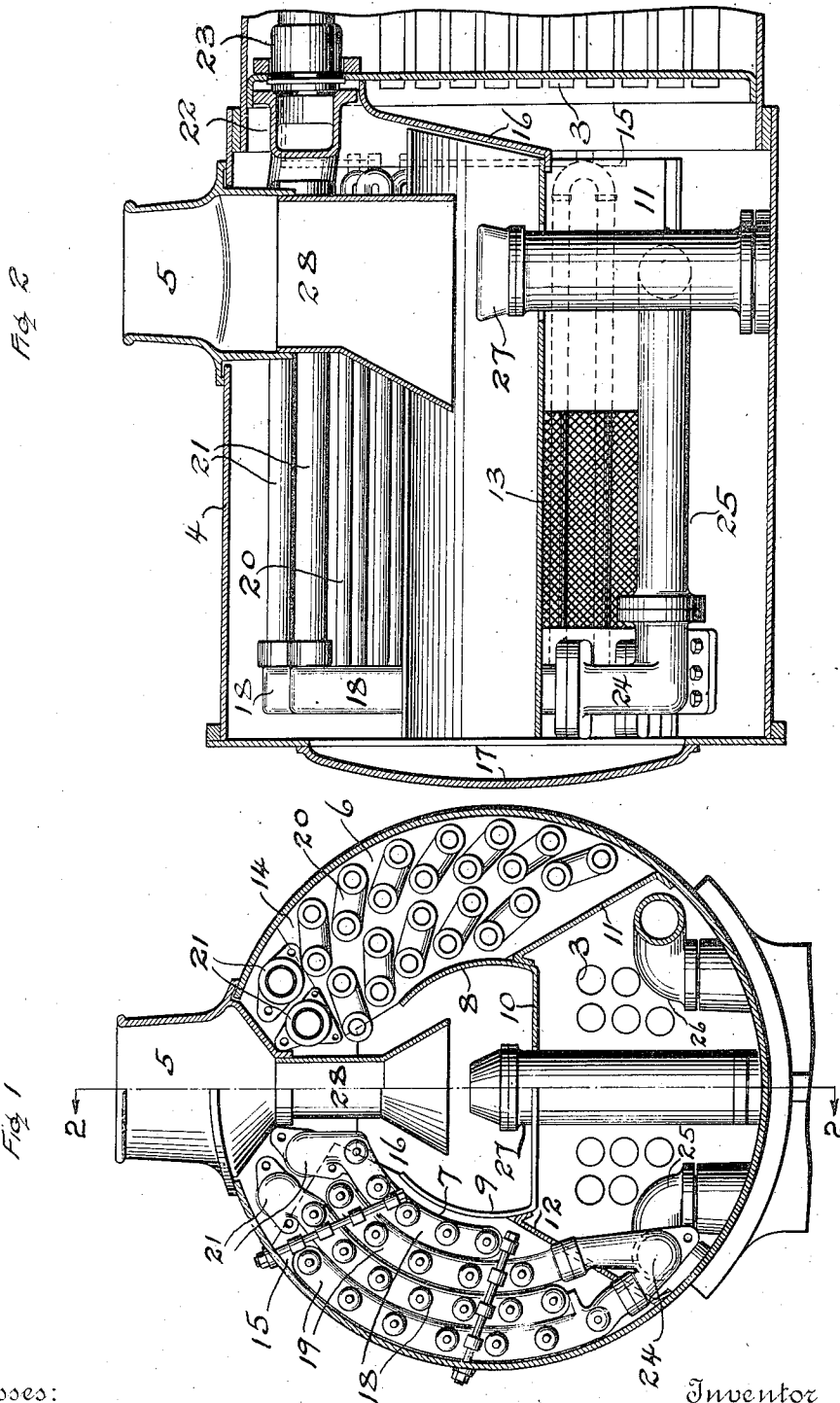


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 STEAM SUPERHEATING APPARATUS FOR LOCOMOTIVE BOILERS.
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UNITED STATES PATENT OFFICE.

JOHN PRIMROSE, OF DANSVILLE, NEW YORK.

STEAM-SUPERHEATING APPARATUS FOR LOCOMOTIVE-BOILERS.

1,060,359.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JOHN PRIMROSE, a subject of the King of Great Britain, residing at Dansville, in the county of Livingston and State of New York, have invented certain new and useful Improvements in Steam-Superheating Apparatus for Locomotive-Boilers, of which the following is a full, clear, and exact description.

This invention relates to steam superheating apparatus for locomotive boilers, and its chief object is to provide an efficient apparatus whereby the otherwise waste heat of the furnace gases can be utilized for superheating purposes, without material, if any, impairment of the draft.

To this and other ends the invention consists in the novel features of construction and combinations of elements hereinafter described.

A convenient and effective embodiment of the invention is illustrated in the annexed drawing, in which—

Figure 1 is a sectional front elevation, showing the superheater located in the smoke-box of the locomotive. Fig. 2 is a longitudinal section on line 2—2.

The hot furnace-gases are discharged from the boiler tubes 3 into the smoke-box 4 and are discharged into the atmosphere through the stack 5. At the sides of the smoke-box, toward the top thereof, are two arc-shaped superheating chambers 6, 7, the outer walls of which are formed by the sides of the smoke-box. The inner side-walls are formed by the cylindrically curved sides 8, 9, of a longitudinally extending trough-shaped member having a bottom 10, and the bottom walls of said superheating chambers are formed by inclined plates 11, 12, extending downwardly and laterally from the lower part of the trough-shaped member to the sides of the smoke-box, as shown. These bottom walls 11, 12, are each provided with a screened opening, as 13, located in front of the smoke-stack 5. At the rear the superheating chambers are closed by plates 14, 15, and the trough-shaped member is closed by a forwardly inclined deflector 16 which serves to deflect downwardly the furnace gases issuing from the upper boiler-tubes.

From the foregoing it will be seen that the gases or products of combustion discharged by the boiler tubes all pass under

the trough-shaped member and between the bottom walls of the superheating chambers. Part of these gases flow to the front of the smoke-box, where the trough-shaped member and the superheating chambers are open, as shown, and thence more or less directly to the stack in the rearward direction. The front wall 17 of the smoke-box, however, is comparatively close to the open front ends of the elements mentioned, thus restricting the path at this point to such an extent that only a part of the furnace gases can, as stated, find their way to the stack in the manner described. The rest of the gases enter the superheating chambers through the screened openings 13, and flow thence through the superheating chambers, which are each open at the top, to the stack 5.

The superheater is composed of two parts, each located in its respective superheating chamber and each having arc-shaped inlet and outlet headers 18, 19, at the front of the chambers and preferably in the same plane, the inlet headers alternating with the outlet headers, as shown. Extending rearwardly from the headers are suitable superheating tubes or elements 20, preferably U-shaped, one leg of each being connected to an inlet header and the other to the adjacent outlet header. Each pair of inlet headers is connected by pipes 21 to the adjacent end of a transverse steam conduit 22, arranged in the rear of the stack and receiving steam through a supply pipe 23 from the steam space of the boilers; while each pair of outlet headers is connected by a V-shaped conduit or connecting member 24 to the respective engine-pipe, 25, or 26, as the case may be, by which the superheated steam is delivered to the engines, not shown.

The exhaust-nozzle 27, connected with the engines by any convenient means not shown, extends up through the bottom-plate 10 into proximity to the open end of the constricted receiver 28, extending downwardly from the stack to a point below the open upper portions of the superheating chambers. This constricted receiver serves to facilitate the ejector action of the exhaust.

The steam entering the transverse conduit 22 divides and flows through the four pipes 21 to the four inlet headers 18 simultaneously; thence through the U-tubes to the four outlet headers 19, and out to the engines through the connecting members 24 and pipes 25, and 26, to the engines. The fur-

nace gases passing under the trough-shaped members, flow in part through the screened openings 13 into the superheater. Passing across and backward over the superheating tubes the gases flow out of the chambers downwardly over the inner chamber-walls 8, 9, and are discharged from the stack into the atmosphere. It will be observed that the ejector action of the exhaust takes place at a point in the course of the gases which is between the superheater and the stack. In other words the gases which enter the superheating chambers cannot reach the stack until the chambers have been completely traversed. The ejector action of the exhaust thus serves to create a positive draft through the two sections of the superheater, so that a most effective utilization of the heat of the gases is assured. The superheating elements themselves are also so arranged as to effectually break up the current of gases and cause a thorough distribution of the same among the said elements. Thus if there is found any tendency of the gases to flow in greater amount through one part of a chamber than another the superheating tubes may be spaced closer together in such part, thereby causing the gases to spread to other parts of the apparatus. This special spacing of the tubes will of course depend upon the conditions of each particular case, which in turn depend upon various factors, such as the absolute and relative dimensions of the various parts, the positions of the superheating chambers, etc.

As previously stated, part of the furnace gases do not flow through the superheating chambers but pass directly to the stack, entering the trough-shaped member at its open forward end. This part of the gases may be made as large or small as desired, relatively to the part flowing through the screened openings 13, by suitably proportioning the space between the front wall of the smoke-box and the front ends of the superheating chambers and the trough-shaped members, thus diminishing or increasing the cross sectional area of the path at that point and compelling more or less of the gases to take the other course, through the openings 13 into the superheating chambers.

As previously stated, the form herein specifically illustrated is the preferred embodiment of the invention. It is to be understood, however, that other forms are permissible without departure from the proper spirit and scope of the invention as defined by the appended claims.

I claim:

1. In a steam superheating apparatus for boilers of the locomotive type, the combination of a smoke box receiving the furnace gases at the rear thereof, of walls within said smoke box forming an upwardly open rearwardly closed trough shaped chamber, a

plurality of chambers concentric with the aforesaid chamber one of which is adapted to receive the furnace gases directly from the flues and the other adapted to receive superheating tubes therein, the walls of said concentric chambers provided with apertures toward the front thereof whereby the gases after passing into the gas chamber are distributed among the superheater elements in the superheater chamber.

2. In a steam superheating apparatus for boilers of the locomotive type, the combination of a smoke box, receiving furnace gases at the rear, of walls within said smoke box forming a chamber with the walls of the said box in the lower portion thereof, said walls also forming an upwardly open rearwardly closed trough shaped chamber in the upper portion of said smoke box and substantially concentric chambers at the sides thereof, said concentric chambers being open at the bottom and closed in the rear, superheating elements, comprising tubes located within said chambers, and means at the rear of said smoke box to cause the hot gases to flow through said chambers.

3. In a steam superheating apparatus for boilers of the locomotive type, the combination of a smoke box having a longitudinal apertured chamber in the lower part thereof adapted to receive the furnace gases as they issue from the boiler tubes, superheater chambers closed at the rear and located at the sides of the smoke box to receive the furnace gases from the gas chamber, and walls in said smoke box forming an upwardly open and rearwardly closed annular chamber, the opening in the upper side thereof adapted to receive the gases from the superheater chambers and the rearwardly closed end adapted to serve as a baffle to deflect the furnace gases downwardly into the gas chamber, and means for discharging the gases from the trough shaped chamber into the atmosphere.

4. In a steam superheating apparatus for boilers of the locomotive type, a smoke box receiving furnace gases at the rear thereof, a smoke stack, superheating elements at the sides of the smoke box, walls within the smoke box forming upper and lower trough shaped chambers and upwardly open concentric superheating chambers between the aforesaid upper chamber and the walls of the smoke box, a baffle adapted to close the rear of the upper trough shaped chamber and deflect the hot gases into the lower trough shaped chamber, the aforesaid walls having apertures for the passage of the hot gases from the aforesaid lower chamber into the superheating chambers and means within the upwardly open trough shaped chamber adapted to draw the gases through the superheating chambers.

5. In a steam superheating apparatus for

boilers of the locomotive type, a smoke box receiving furnace gases at the rear thereof, a smoke stack, superheating elements in substantially concentric chambers at the sides of the smoke box, walls forming with the walls of the concentric chambers an upper and a lower trough shaped chamber, said lower chamber having apertures in the forward end thereof, an exhaust receiver extending downwardly from the smoke stack into the upper trough shaped chamber, a baffle closing the rear of the upper trough shaped chamber and deflecting the gases into the lower trough shaped chamber, said apertures at the forward end of the walls of the lower trough shaped chamber adapted to permit the passage of the hot gases into the superheating chambers, and an exhaust nozzle discharging into the aforesaid receiver whereby the hot gases travel through the superheating chambers and into the stack.

6. In a steam superheating apparatus for boilers of the locomotive type, the combination of a smoke-box, an upwardly open trough-shaped member extending longitudinally in the smoke-box, apertured members extending between the trough-shaped member and the smoke-box walls to form superheating chambers at the sides of the smoke-box, superheating devices in said chambers, a closure for the rear of the upwardly open

trough shaped member, said closure forming a baffle whereby the furnace gases flow under the trough shaped member toward the front of the furnace.

7. In a steam superheating apparatus for boilers of the locomotive type, the combination of a smoke-box having a smoke-stack at its rear, an upwardly open rearwardly closed trough-shaped member extending longitudinally of the smoke box, apertured plates extending between the lower portion of said member and the sides of the smoke-box, transverse plates at the rear of the smoke-box closing the spaces between the trough-shaped member and the sides of the smoke-box, a smoke-stack on the smoke-box at the rear thereof, an exhaust receiver extending downwardly from the smoke-stack into the trough-shaped member, an exhaust nozzle for the engine exhaust discharging into the receiver, and superheating devices in the spaces between the trough-shaped member and the sides of the smoke-box in front of said transverse plates.

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

JOHN PRIMROSE.

Witnesses:

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S. S. DUNHAM.