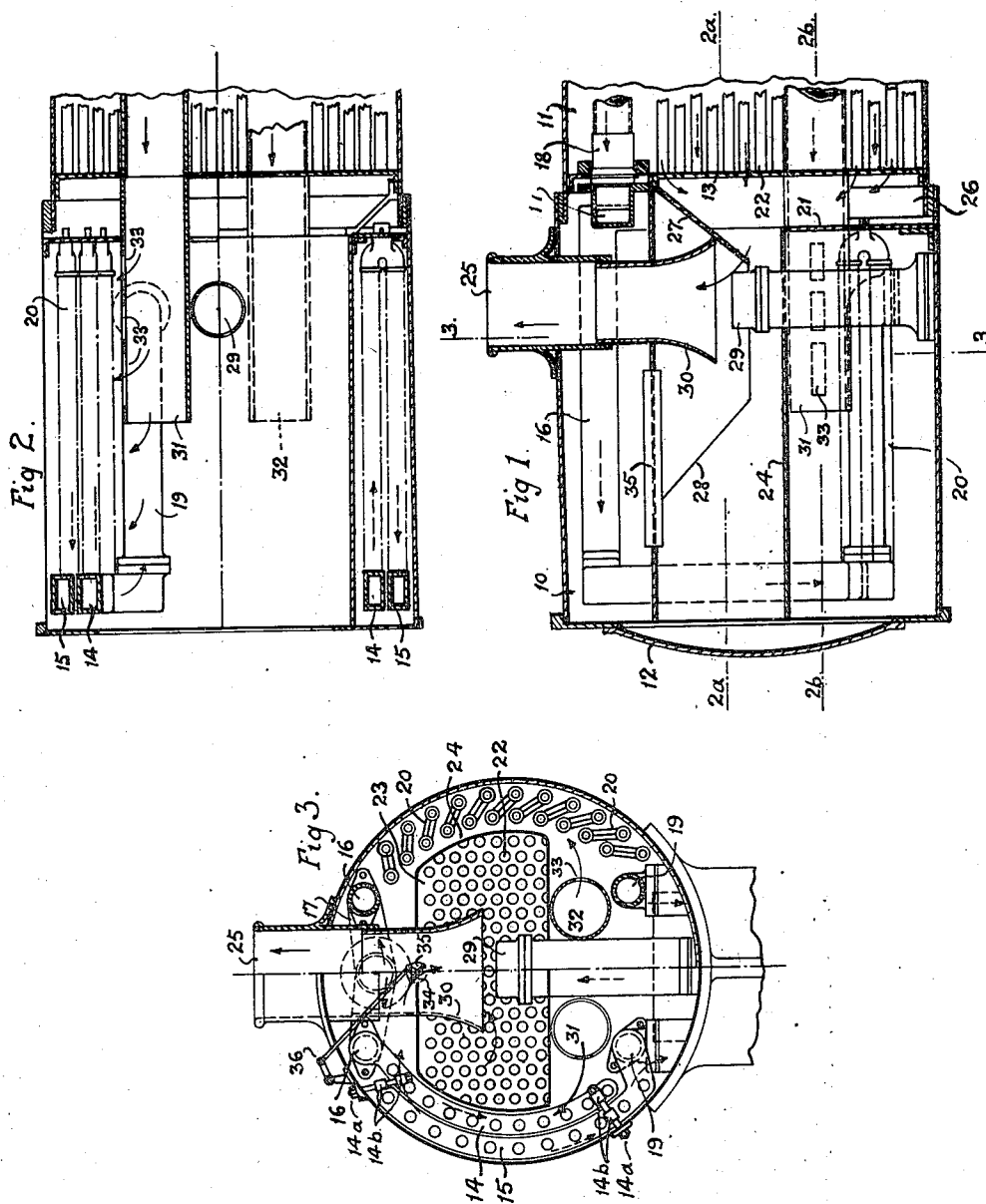


J. PRIMROSE.
 SUPERHEATER FOR LOCOMOTIVE BOILERS.
 APPLICATION FILED MAR. 9, 1911.

1,060,360.

Patented Apr. 29, 1913.



WITNESSES:

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JOHN PRIMROSE, OF NEW YORK, N. Y.

SUPERHEATER FOR LOCOMOTIVE-BOILERS.

1,060,360.

Specification of Letters Patent.

Patented Apr. 29, 1913.

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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 New York, in the county and State of New York, have invented certain new and useful Improvements in Superheaters for Locomotive-Boilers, of which the following is a full, clear, and exact description.

This invention relates to steam superheating apparatus for boilers or generators of the locomotive type, and its chief object is to provide an efficient superheater for the purpose and to so arrange the same in the smoke box of the boiler as to occupy the minimum space, with the least possible interference with the draft.

A further object is to provide effective means for an adequate supply of the furnace gases to the superheater without impairment of the steam-generating capacity of the boiler.

To these and other ends the invention consists in the novel features of construction and combinations of elements herein after described, and more particularly set forth in the appended claims.

The preferred embodiment of the invention is illustrated in the accompanying drawings and will now be described more or less in detail. It should be remembered, however, that the invention is capable of other embodiments without departure from its proper spirit and scope.

In the drawings, Figure 1 is a horizontal and vertical section through the smoke box of a locomotive boiler. Fig. 2 is a sectional plan view, half on line 2^a-2^a and half on line 2^b-2^b of Fig. 1. Fig. 3 is a front view, half with merely the front of the smoke box removed and half substantially on line 3-3 of Fig. 1.

The smoke box 10 is in the usual position at the front end of the boiler, 11, and has a forwardly convex front wall 12, and a rear wall 13 formed by the front tube-sheet of the boiler. At the front of the smoke box, at each side, are two curved headers, 14, 15, the inlet headers 14 being connected at their upper ends by forwardly extending conduits 16 to the ends of a transverse conduit 17 which is connected at its center to a supply pipe 18 leading from a convenient point in the steam space of the boiler. The outlet headers, 15, are connected at their lower ends to rearwardly extending pipes 19, leading to the engines,

not shown. The headers on each side of the smoke box are securely supported by bolts 14^a extending through suitable lugs 14^b on the headers. The inlet headers are connected to the respective outlet headers by rearwardly extending U-shaped superheating tubes 20, the rear ends of which are supported by a transverse plate or partition sheet 21 spaced a short distance in front of the outlets of the fire-tubes or boiler-flues 22. This sheet 21 has an opening 23 inside the headers, and extending forwardly from this opening, into juxtaposition to the bulging front wall of the smoke box is a wide conduit 24. It will therefore be seen that the furnace gases discharged by the boiler-flues can pass directly to the smoke stack 25 by way of the conduit 24 and the space 26 between the sheets 13 and 21. Extending downwardly and forwardly from the top of the opening 23 is a baffle 27, with similar baffles, one of which is shown at 28, (not shown in Figs. 2 and 3), extending downwardly and inwardly from the sides of the conduit 24; the purpose of these baffles being to deflect the furnace gases into proximity to the orifice of the engine-exhaust nozzle 29. The latter extends slightly above the lower edge of the baffles, into proximity to a bell 30 depending from the stack 25. By the arrangement described the draft produced by the ejector action of the exhaust nozzle 29 and the bell 30 is markedly increased.

For the purpose of supplying highly heated gases from the furnace to the superheaters, which latter are inclosed in the chamber formed by the sheet 21, the conduit 24, and the outer, cylindrical wall of the smoke box, two flues, 31, 32, are provided heading directly from the furnace (not shown) to the superheating chamber, below the conduit 24. The gases conveyed by these superheating flues are discharged from the open ends of the flues and also through lateral apertures 33.

In practice the flues 31, 32 terminate preferably at about the center of the smoke box, and it is also preferred to make the forward portions of such flues of cast iron, connecting them to the rearward portions of the flues at the tube-sheet 13. The flues just named are of relatively large diameter, so that their heat-emitting surface in contact with the contents of the boiler will be smaller in proportion to their volume or

capacity than in the case of the boiler-flues or fire-tubes 22. The consequence is that less heat will be lost in transit through the boiler, and hence the furnace gases will arrive at the superheaters with correspondingly higher temperatures.

Discharged from the flues 31, 32, the highly heated furnace gases flow laterally and upwardly among the superheating tubes, a small proportion of the gases finding their way into the conduit 24 through the open forward end thereof while the major portion enters said conduit through an opening 34 in the top, controlled by a damper 35 which may be operated manually from the engine cab (not shown) by any suitable means such as that indicated more or less diagrammatically at 36. From the conduit 24 the superheating gases enter the stack along with the gases from the fire-tubes 22.

From the foregoing it will be seen that the flow of gases from the boiler flues to the stack is in no way interfered with by the pressure of the superheaters, as said gases do not enter the superheating chamber but pass directly to the stack by way of the passage afforded between the sheets 13 and 21 and by the conduit 24. On the other hand, furnace gases at high temperature are supplied to the superheating chamber by the superheating flues 31, 32, and after flowing over the superheating tubes mingle with the gases in the conduit 24 and flow thence to the stack. The net result of these improvements is a marked efficiency of operation, an adequate degree of superheat being obtained without impairing the draft or the steam-generating capacity of the boiler.

As previously stated, the construction herein specifically shown and described is merely the preferred form of the invention, which may be embodied in other forms without departure from its proper spirit and scope.

I claim:

1. In a steam superheater, the combination of a boiler, a smoke box associated therewith having a longitudinal chamber through which the fire tube gases pass directly to the atmosphere, a superheater chamber in said smoke box, the rear wall of which is located forwardly from the rear wall of the smoke box, whereby the longitudinal chamber is enlarged at the rear without enlarging the smoke-box to permit a free flow of gases from the fire tubes to the smoke stack, and means for delivering hot gases directly from the furnace to the superheater chamber.

2. In a steam superheater, the combination of a boiler, a smoke box associated therewith having a longitudinal chamber therein through which the fire tube gases pass directly to the atmosphere, a super-

heater chamber in said smoke box concentric with the aforesaid chamber, the rear wall of which is located forwardly from the rear wall of the smoke box whereby the longitudinal chamber is enlarged at the rear without enlarging the smoke box to permit a free flow of gases directly from the fire tubes to the atmosphere, a superheater in said superheater chamber having the elements longitudinally arranged therein, and means for delivering hot gases directly from the furnace and discharging the same laterally among said superheating elements.

3. In a steam superheater, the combination of a boiler of the locomotive type, a smoke box associated therewith, superheating elements at the sides of the smoke box, and superheating flues extending from the boiler into the smoke box and perforated at the sides thereof and discharging laterally upon the superheating elements.

4. In a steam superheater, the combination of a boiler of the locomotive type, having fire-tubes, a smoke box associated therewith, a longitudinally extending conduit receiving furnace gases from the said fire-tubes, superheating elements at the sides of the smoke box between the walls thereof and the said conduit, means to laterally discharge furnace gases from said conduit upon said superheating elements, and superheating flues extending from the boiler into the space below the said conduit, for supplying highly heated furnace gases to said superheating elements.

5. In a steam superheater, the combination of a boiler of the locomotive type, a smoke box associated therewith, inlet and outlet headers in the front of the smoke box at the sides thereof, a transverse conduit at the rear of the smoke box, longitudinally extending conduits connecting the transverse conduit to the inlet headers, means for conveying steam from the boiler to the transverse conduit, rearwardly extending superheating tubes connecting the inlet headers to the respective outlet headers, and rearwardly extending conduits for conveying superheated steam from the outlet headers.

6. In a steam superheater, the combination of a boiler of the locomotive type, a smoke box associated therewith, a partition sheet extending across the smoke box in the rear portion thereof and having an opening, a conduit for furnace gases extending forwardly from said opening, headers at the front of the smoke box between said conduit and the walls of the smoke box, rearwardly extending superheating tubes connected to the headers and supported at their ends by the partition sheet, and means for discharging superheating gases upon the superheating tubes.

7. In a steam superheater, the combina-

tion of a boiler of the locomotive type having fire-tubes, a smoke box associated with the boiler, a smoke stack, a central longitudinally extending conduit for conveying
5 gases from the fire-tubes to the smoke stack and having an opening in its top, superheaters comprising tubes at the sides of the smoke box between the walls thereof and the said conduit and arranged substantially
10 parallel to said conduit, and a pair of superheating flues of relatively large diameter extending from the boiler into the space below the conduit for laterally discharging highly heated gases upon the longitudinally
15 arranged superheating tubes.

8. In a steam superheater, the combination of a boiler of the locomotive type, a smoke box associated therewith, a longitudinal chamber centrally located in said
20 smoke box whose upper side is apertured and the rear end of which is open to receive the furnace gases directly from the fire tubes, a superheater chamber closed from the fire tubes and from the exterior of the
25 smoke box, means for directly discharging hot furnace gases into said superheater chamber and laterally among said superheater elements, the gases from the said last mentioned chamber adapted to pass there-
30 from into the first mentioned chamber by way of the aperture therein, and means for discharging the fire tube and superheater

gases from the first mentioned chamber into the atmosphere.

9. In a steam superheater, the combination of a boiler of the fire tube type, a smoke box associated therewith having a longitudinal perforated chamber therein through which the fire tube gases pass directly to the atmosphere, a superheater chamber in said
40 smoke box, the rear wall of which is located forwardly from the rear of the smoke box whereby the longitudinal chamber is enlarged at the rear without enlarging the smoke box to permit a free flow of gases
45 from the fire tubes to the smoke stack, means for delivering hot gases from the furnace to the superheater chamber, said furnace gases after traversing said superheater chamber adapted to pass through the per-
50 foration into the longitudinal chamber, an ejector in the longitudinal chamber for discharging the gases from the same into the smoke stack, and means for deflecting the fire tube and superheating gases in proximity to the orifice of the ejector.

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

JOHN PRIMROSE.

Witnesses:

M. LAWSON DYER,
WM. BOHLEBER.