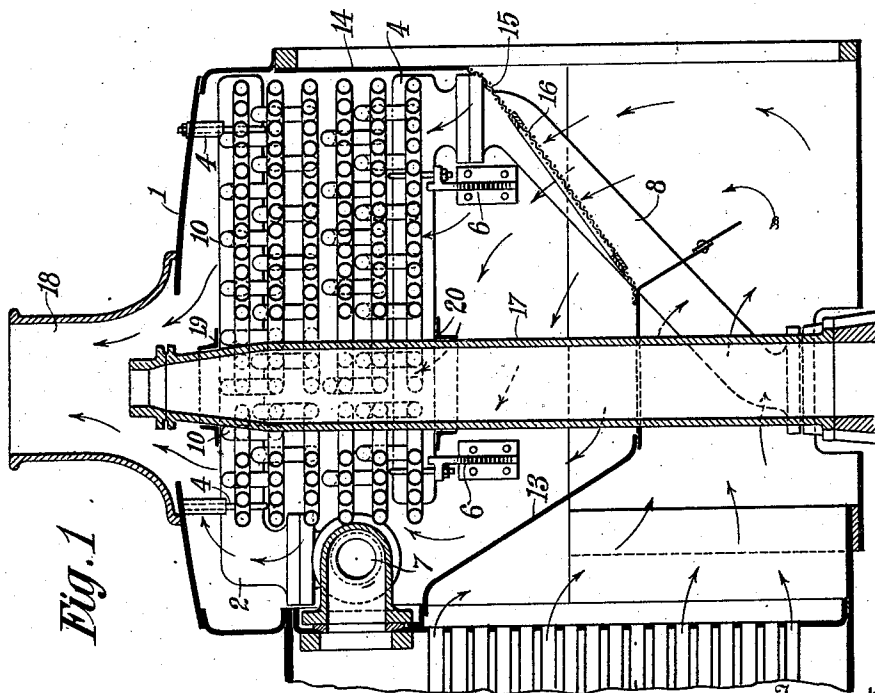
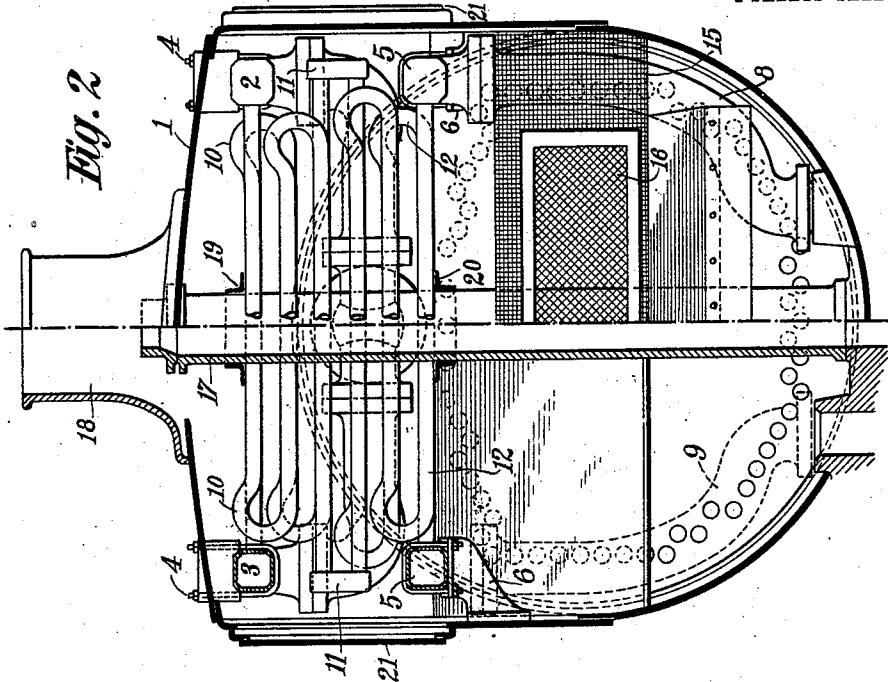


J. PRIMROSE.  
 STEAM SUPERHEATING APPARATUS FOR LOCOMOTIVE BOILERS.  
 APPLICATION FILED AUG. 6, 1908.

1,001,075.

Patented Aug. 22, 1911.

2 SHEETS—SHEET 1.



Witnesses:  
*Raphael Hetter*  
*A. Dunham*

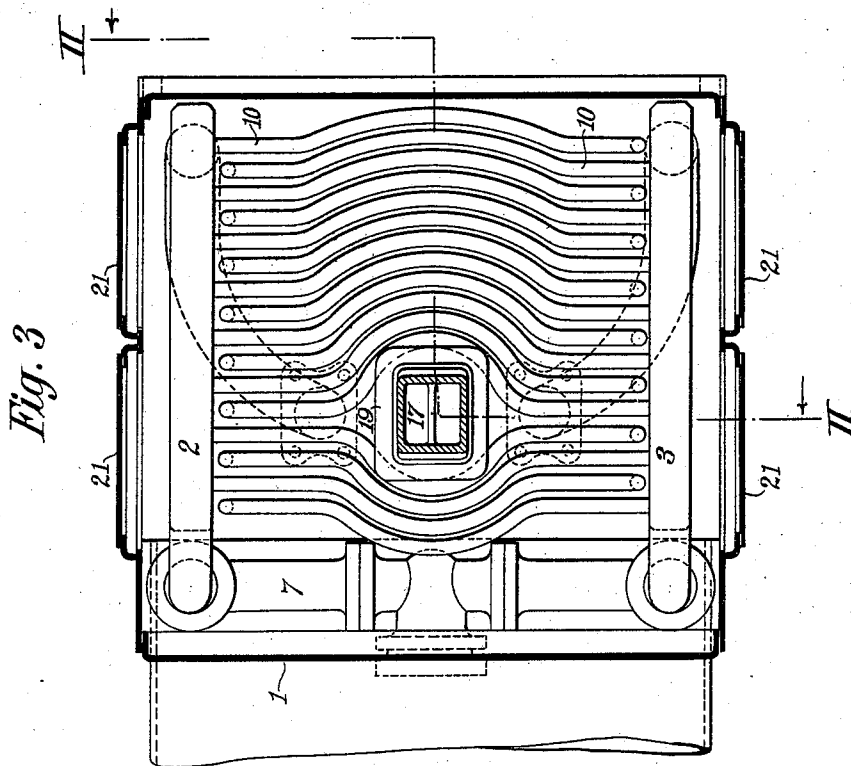
Inventor  
*John Primrose*  
 By his Attorneys  
*Kerr, Page & Cooper*

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# UNITED STATES PATENT OFFICE.

JOHN PRIMROSE, OF NEW YORK, N. Y.

STEAM-SUPERHEATING APPARATUS FOR LOCOMOTIVE-BOILERS.

1,001,075.

Specification of Letters Patent. Patented Aug. 22, 1911.

Application filed August 6, 1908. Serial No. 447,291.

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 of Queens 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 specification, reference being had to the drawings accompanying and forming part of the same.

It has long been felt that the use of superheated steam in locomotive engines would be highly desirable and numerous plans have been proposed for such purpose, but these efforts have not generally been as fruitful of practical results as have been the attempts to provide adequate superheating apparatus for stationary boilers. This is due largely to the fact that whereas, in general, the location of the superheater relative to the furnace, the boiler, and the boiler tubes, is a consideration of the highest importance, and in the case of stationary boilers may be varied almost indefinitely as conditions may demand, in locomotive boilers there are very few places where the superheater can be arranged with anything like satisfactory results. Moreover, the size of the superheater in such boilers is limited by the restricted space available. These and similar considerations have led me to devise my present invention, which has for its chief object to so construct and locate the superheater as to afford an efficient circulation of the furnace-gases among the superheating elements without impairment of the draft.

In carrying out my invention in the preferred way the superheater is located at the forward end of the boiler, in the smoke-box, above the boiler-tubes, while the exhaust-nozzle, through which the exhaust from the engines is discharged, is extended up through the superheater into or close to the smoke stack. The superheater thus being above the boiler tubes and below the stack, the hot gases cannot reach the latter except by first passing among the superheating elements. At the same time the ejector action of the exhaust-nozzle takes place between the stack and the superheater, so that the movement of the gases through the latter is made positive and certain. This result can, by properly spacing the superheater tubes, readily be secured without impairing the draft.

The construction thus briefly outlined is

illustrated in the annexed drawings, in which—

Figure 1 is a vertical longitudinal section through the smoke-box of a locomotive boiler, showing the superheater in position, with the front wall of the smoke-box removed. Fig. 2 is an end view of the smoke-box and superheater, partly in section on the line II—II of Fig. 3. Fig. 3 is a plan view of the superheater in place.

The superheater is located in the smoke-box of the locomotive, above the uppermost boiler tubes, and in order to provide for such location the top of the smoke-box may be enlarged and made rectangular in plan, as shown at 1. The inlet headers of the superheater, designated by 2, 3 are suspended close to the top of the box by U-shaped hangers 4, while the outlet headers 5, 5, are supported on brackets 6 on the sides of the box. The inlet headers are connected by a cross pipe 7 with the steam space of the boiler, as shown in Figs. 1 and 3. The outlet headers, in vertical alinement with the inlet headers, are connected with the engines (not shown) through pipes 8, 9, the latter of these pipes being shown in dotted lines in Fig. 2. All four of these headers are located well above the boiler tubes, as will be seen by reference to Figs. 1 and 2.

Extending inwardly from the inlet headers are superheating tubes 10, looped back and forth to the return boxes 11, from which similar superheating tubes 12, similarly arranged, lead to the outlet headers. The tubes connected to the headers on one side of the smoke-box are staggered or arranged in alternation with those connected to the opposite headers, and the loops of each tube are arranged in vertical alinement, as clearly shown in Figs. 3 and 2 respectively, in which it will also be seen that the upper part of the smoke-box is practically filled with superheating tubes.

For the purpose of delivering the hot gases from the boiler tubes positively into the collection of superheater tubes and to deflect cinders to the bottom of the smoke-box, a baffle or deflector 13 is provided, removably secured in position in any convenient way, extending downwardly and forwardly from the boiler above the outlet ends of the boiler tubes to a point near the front and bottom of the smoke-box. The baffle is preferably made in three parts, detachably secured together in any suitable

manner, whereby they may be disconnected when access to the boiler tubes is desired for purposes of inspection, repair, etc. At the front end of the superheater, extending slightly below the same, is a vertical plate 14, and between this and the baffle or deflecting plate 13 is a cinder screen 15, which may have a central portion 16 of larger mesh to afford freer passage for the gases.

The exhaust nozzle, 17, is arranged to extend vertically through the collection of superheating tubes, close to or into the bottom of the smoke-stack 18. To permit this arrangement the superheating tubes are bent forwardly and rearwardly, as clearly shown in Fig. 3. The outlet of the nozzle being above the superheater the ejector action takes place above the tubes, and none of the hot gases can reach the stack without passing the superheater. In order to prevent the gases from forming a denser current around the exhaust nozzle the latter is provided with lateral deflecting rings or plates 19, 20, above and below the superheater, as shown.

At the sides of the smoke-box, on a level with the superheater, are openings covered with closures 21 removably secured in any convenient manner to afford access to the superheater when desired.

From the foregoing description it will be seen that the position of the superheater is such as to occasion no interference with ready access to the boiler tubes or flues at the front of the boiler. At the same time, the superheating elements are directly in the current of gases on their way from the flues to the stack, and the gases, being directed by the baffle or deflector 13, are drawn positively and effectively through the spaces between the superheating tubes by the ejector action of the exhaust nozzle. The tubes surround the nozzle closely, so that there is no tendency for the gases to form a denser current at the center than at other parts of the superheater.

It is desirable that the hot gases be distributed evenly among the superheating elements, so as to utilize as much as possible of the heat which these gases contain. To this end the superheating tubes may be so spaced as to prevent the gases flowing through one part in preference to others. Thus if in practice it is found that by reason of special or peculiar conditions the gases tend to flow up the front wall of the smoke-box to the top and thence to the stack, the difficulty can be remedied by spacing the tubes of one or more strata in the forward part of the superheater closer together. In such manner, by spacing the tubes closer together or farther apart in one part or another of the apparatus, the current of gases can be effectively divided so as to subject all the elements to substantially the same amount of

heat, thereby giving an efficient utilization not only of the heating surface of the superheater but also of the heat contained in the gases.

The construction herein specifically described typifies the preferred form and arrangement of my superheating apparatus, but its details of construction can be varied and modified in numerous respects without departure from the proper spirit and scope of my invention as defined by the following claims.

What I claim:

1. The combination with a locomotive boiler having a smoke-box and boiler tubes through which hot furnace-gases are delivered to the smoke-box, of a steam superheater arranged in the upper part of the smoke-box comprising inlet headers and outlet headers arranged on either side of the smoke box and superheating tubes connecting the inlet headers with the outlet headers and traversing the smoke box one or more times in the path of the gases, means for delivering steam from the boiler to the superheater, an exhaust-nozzle for the engine exhaust having its outlet or discharge orifice above the superheater whereby the ejector action of the exhaust is availed of to create a positive draft of the furnace gases through the superheater; the elements of the superheater being arranged relatively to each other and the exhaust nozzle to cause a thorough distribution of the furnace-gases among said elements, as set forth.

2. The combination with a locomotive boiler having a smoke-box the dimensions of the latter being substantially the same as the boiler, and boiler-tubes through which hot furnace-gases are delivered to the smoke-box, of an exhaust-nozzle for the engine exhaust extending to the upper part of the smoke-box, a steam superheater arranged in the upper part of the smoke-box around the exhaust-nozzle, below the top thereof and above the boiler-tubes, and composed of inlet and outlet headers connected by superheating tubes, said superheating tubes being arranged to traverse the smoke-box one or more times and in the path of the gases, and also arranged with respect to each other and the exhaust-nozzle to cause a thorough distribution of the furnace gases among the superheating tubes as said gases are drawn through the same by the ejector action of the engine exhaust, and means for delivering steam from the boiler to the superheater, as set forth.

3. The combination with a steam boiler of the superheater type having a smoke-box and boiler tubes discharging thereinto, of a superheater in the upper part of the smoke-box above the boiler tubes, means for delivering steam from the boiler to the superheater, a baffle or deflector extending down-

wardly and forwardly from the boiler above the boiler tubes, and an exhaust nozzle for the engine-exhaust extending upwardly through the baffle or deflector and discharging above the superheater, as set forth.

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4. The combination with a steam boiler of the locomotive type having a smoke-box and boiler tubes discharging hot gases thereinto, of a superheater in the upper part of the smoke-box, an exhaust nozzle for the engine exhaust extending upwardly through the superheater, said superheater having super-

heating tubes surrounding the exhaust nozzle, and deflecting rings or plates on the exhaust nozzle at the top and bottom of the superheater, the superheating tubes being arranged relatively to each other and the exhaust nozzle whereby to cause a thorough distribution of the hot gases among the superheating tubes, as set forth.

JOHN PRIMROSE.

Witnesses:

STURGES S. DUNHAM,  
BERT SANDMAN.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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