

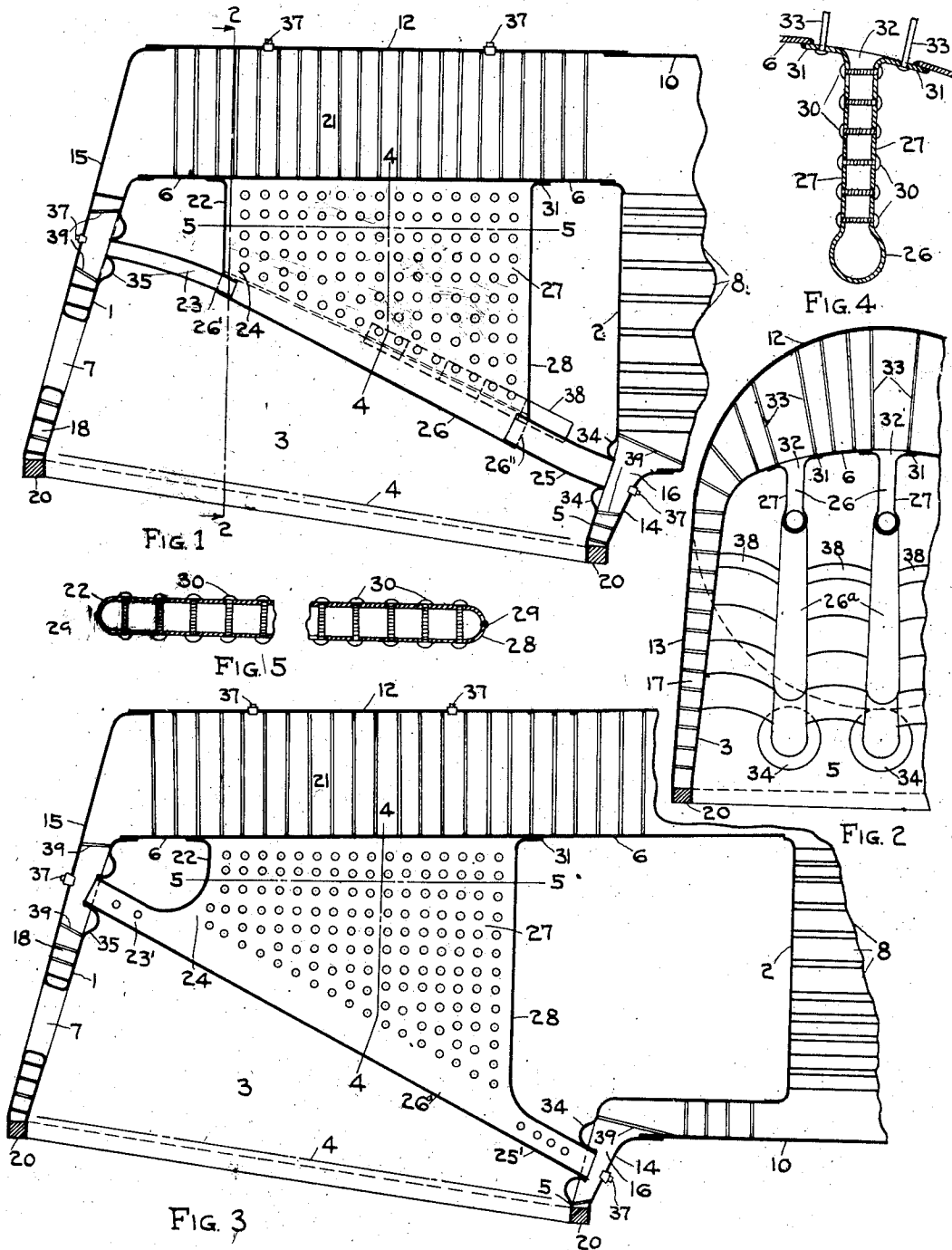
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J. L. NICHOLSON

LOCOMOTIVE BOILER

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INVENTOR

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LOCOMOTIVE BOILER.

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To all whom it may concern:

Be it known that I, JOHN L. NICHOLSON, a citizen of the United States, and a resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Locomotive Boilers, of which the following is a specification.

My invention relates to improvements in locomotive boilers and has particular reference to the fireboxes thereof. The general object of my invention is to obtain a more efficient combustion of the fuel in the firebox; to obtain a more efficient thermic transmission between products of combustion and boiler water, and to improve the circulation of the water within the boiler, so that the capacity, efficiency and durability of both the firebox and boiler shall be increased.

My invention consists generally in the form, construction, arrangement, combination and coaction of parts whereby the above named objects and purposes, together with others that will appear hereinafter, are attainable.

My invention will be more readily understood by reference to the accompanying drawings showing preferred embodiments thereof. In said drawings:

Figure 1 is a vertical longitudinal section of the rear end of a locomotive boiler embodying my invention, showing the internally stayed firebox and the water circulating devices, or thermic siphons, which, combined therewith, constitute my invention; Fig. 2 is a cross section on the line 2—2 of Fig. 1; Fig. 3 is a longitudinal vertical section showing a modification of my invention. Fig. 4 is a vertical cross section on either of the lines 4—4 of Figs. 1 and 3; and Fig. 5 is a horizontal cross section on either of the lines 5—5 of Figs. 1 and 3.

As indicated, my invention is intended for, and is specially applicable to, locomotive boiler fireboxes that have fire chambers which extend from the back sheet, 1, to the flue sheet, 2, and from one side sheet, 3, to the other side sheet, 3; with a grate or bottom, 4, that corresponds to such dimensions, except as modified by differing designs and positions of the throat sheet, 5, with respect to the flue sheet; (compare Figs. 1 and 3). The top of the firebox is formed by the crown sheet, 6. Commonly, such fireboxes have a single door, 7, through which the fuel is introduced. The products of

combustion are withdrawn through the flues, 8, by the action of the exhaust nozzle (not shown) in the front end of the boiler. As usual, the shell of the boiler comprises the barrel, 10, and the firebox wrapper; the latter composed of the top plate, 12, the side plates 13, the outside throat plate, 14, and the back plate, 15. The wrapper and the fire sheets or walls of the firebox, define the several water legs of the boiler, to wit, the front leg or throat, 16, the side legs, 17, 17, and the back water leg, 18, all bottomed by a mud ring, 20. The firebox sheets mentioned, including the crown sheet, 6, are joined to the wrapper and in the instance of a combustion chamber, as in Fig. 3; also to the barrel, 10, by means of the usual closely spaced stay bolts. Certain of these stay bolts will be specially differentiated herein because of their important relations to the water circulating elements about to be described.

In that embodiment of my invention shown in Figs. 1 to 4, inclusive, it will be seen that the firebox contains one or several generally triangular hollow elements which conduct water from the throat or water leg, 16, of the boiler, to the space, 21, above the crown sheet, 6. Two elements are shown in Fig. 2 and three are indicated, but this, it should be understood, is by way of illustration and not by way of limitation. When a plurality of elements are used they are preferably parallel and occupy vertical positions in the firebox extending longitudinally from the low throat sheet, 5, to the crown sheet and along the latter from a point back of the flue sheet to a point near the back sheet, 1.

Unlike the so-called Nicholson thermic siphon disclosed in U. S. Patent No. 1,337,720, the water wall element of this present invention does not present a bottom which sweeps in a single line from the throat sheet to the rear part of the crown sheet. Instead the water wall is of greater depth at the rear end, and ends abruptly. From this end of the element a rear end neck or outlet tube extends to and through the back sheet, 1, of the firebox. This rear end neck is particularly useful in preventing and disposing of any accumulation of solids that might otherwise collect in the upper corner of the element. Like the original thermic siphon this extended siphon, at its lower forward

end, is provided with an intake neck 25 that extends into and takes boiler water from the throat and barrel of the boiler, at a point beneath the main body of flues 8. It suffices to explain that the lower portion 26 of the siphon is preferably of tubular formation while the upper portion comprises a thinner hollow wall of which 27 are the sides. 28 is the forward end or edge and 22 is the rear end or edge of the element or siphon.

By preference the body of the siphon is made from a single sheet of metal of the same kind and thickness as the fire sheets of the firebox, such single sheet being folded over a suitable mandrel to give it the cross sectional form shown in Fig. 4. The horizontal cross sectional appearance of the body of the siphon is well shown in Fig. 5, wherein it appears that the front and back edges of the folded sheet are brought together and united by the autogenous welds 29. Being a flat sided hollow wall subject to boiler pressure, the sides of the siphon are joined by many stay bolts 30, as well shown in Figs. 4 and 5. The upper edges of the body of the siphon are flared outward to provide the flanges 31, which, as will be observed, are thus made to surround the top opening or outlet 32 of the siphon. In practice the flanges 31, of each siphon are accommodated in an opening previously made in the crown sheet and the edges of the siphon flanges are riveted or welded to the crown sheet at the edges of that opening; hence the top flange of the element actually forms a part of the top of the firebox. In one form of my invention the integral top flange of each element is made to receive certain of the crown bolts 33, by which the crown sheet is supported. Obviously the bolts, thus fastened in the flanges of the elements or siphons, serve directly to support the same from the wrapper sheet 12. This construction is well shown in Figs. 2 and 4.

Referring to Figs. 1 and 2, it will be noted that the body of the siphon is composed of a single sheet, which terminates at the ends 26' and 26'' of the bulging bottom of the element. In that case the intake and outlet necks are made from seamless tubing, which is lap-jointed and welded to the body of the element at the ends of the bulging bottom thereof. The intake neck preferably is larger than the discharge connection 23. These connections are fastened in the fire sheets through the medium of the expansion and contraction absorbing diaphragms 34 and 35, respectively. These diaphragms are of the construction and serve the purposes well defined in said Patent 1,337,720, and require no further description here, other than to call attention to the fact that the stay bolts 39, encircling the ends of the neck are fastened in the outer margins of the diaphragms 34, leaving the central portions

of the diaphragms entirely free to move in and out, and up and down, as required to take up the expansion and contraction of the firebox and the associated element.

The water-steaming and circulating element or siphon of Fig. 3 differs from that of Fig. 1, in that in its entirety it is formed from a single sheet of metal. In other words its neck portions 25' and 23' are integral with the body of the siphon. Thus I provide the element with a full length bulging or beam portion 26^a, which extends from the throat sheet 5 to the back sheet 1, to which it is joined by the expansion diaphragm parts 34 and 35. So strong is this construction, considered as a beam or girder, that I find it possible to utilize its top flange 31 as a direct support for the overlapping crown sheet 6 of the firebox; and if desired the associated crown stays may be omitted from those parts of the crown sheet. As will be apparent, the edges of the crown sheet and the edges of the flange 31 are welded or riveted together to provide a steam tight joint.

In all cases the shell of the boiler is provided with a suitable number of clean-out plugs 37, opposite the several intake and discharge openings in the siphon.

The fire bricks 38, which compose the arch of the fire-box, are supported upon the bulging beam portions 26 and 26^a of the water circulating elements, (see Figs. 1 and 2).

The construction herein described has many practical advantages that will be apparent to those skilled in the art.

I call particular attention to the fact that a thermic siphon of the form here described presents a considerable increase of heating surface over an equivalent siphon of the kind depicted in Patent 1,337,720. Further, the continuity of the bottom or bulging portion of the siphon, whereby connection is afforded between the same and the back water leg of the firebox, insures a free and constant discharge of all sediment and scale which might otherwise settle in the bottom of the element. This arrangement operates as a constant automatic blow-off for the siphon, and makes its possible to extend the heating surface, as described; which is equivalent to saying that it makes it possible to pitch the bottom of the siphon at a much lower angle than seems feasible in the case of the persistently triangular siphon shown in the aforesaid Patent 1,337,720, without danger of interrupting the discharge of the solids in the circulating boiler water.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. A locomotive boiler and its internal firebox having a fuel door therein in combination with a vertical longitudinally ex-

tending water steaming and circulating element therein, said element having a bottom which is inclined upwardly and rearwardly, and terminal neck portions, one of which
5 extends into the front water space of the boiler and the other into the back water space above the fuel door, and said element at its top opening through the crown sheet of the firebox.

10 2. A locomotive boiler and its internal firebox having a fuel door therein in combination with a vertical longitudinally extending water steaming and circulating element therein, said element having a bottom
15 which is inclined upwardly and rearwardly, a top which opens through the crown sheet of the firebox, and terminal neck portions which extend into the front and back water spaces, one of said neck portions being in
20 the form of a separate piece of seamless steel tubing jointed to the body portion of the water steaming and circulating element.

25 3. A locomotive boiler and its internal firebox having a fuel door therein in combination with a vertical longitudinally extending water steaming and circulating element therein, said element having a bot-

tom which is inclined upwardly and rearwardly, a top which opens through the crown sheet of the firebox, and terminal neck
30 portions which extend into front and back water spaces, said neck portions being in the form of separate lengths of tubing permanently joined to the end portions of
35 the inclined bottom of the body portion of the water steaming and circulating element.

4. A locomotive boiler and its internal firebox having a fuel door therein in combination with a vertical longitudinally extending water steaming and circulating element
40 therein, said element having a bottom which is inclined upwardly and rearwardly, a top which opens through the crown sheet of the firebox, and terminal neck portions
45 which extend into front and back water spaces, said neck portions being in the form of separate lengths of tubing welded to the end portions of the inclined bottom of the body portion of the water steaming and
50 circulating element.

In testimony whereof, I affix my signature.

JOHN L. NICHOLSON.