W. D. PLUE.

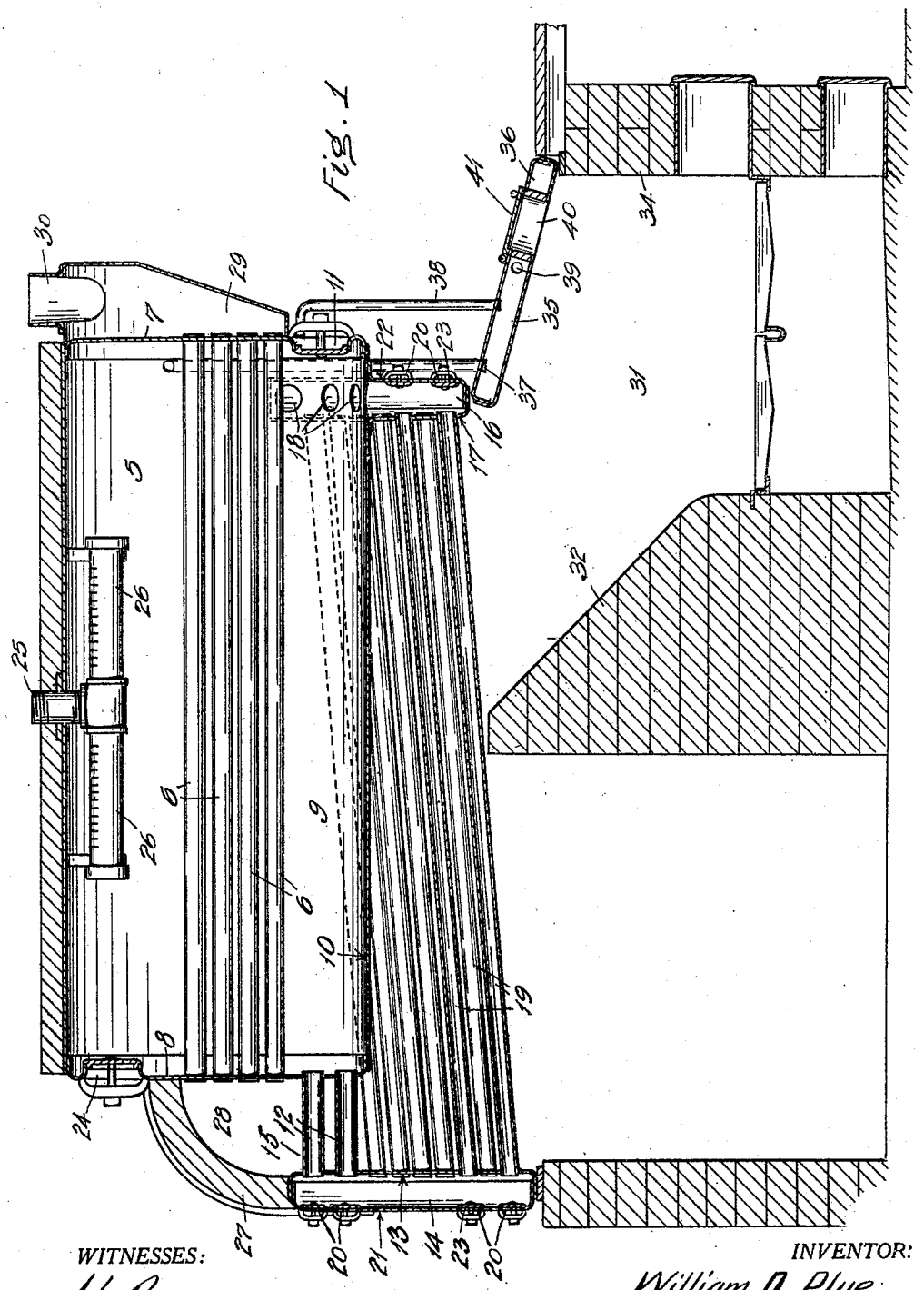
COMBINED STEAM BOILER AND FURNACE.

APPLICATION FILED MAR. 17, 1909.

953,921. Patented Apr. 5, 1910.

2 SHEETS—SHEET 1.

Fig. 1



WITNESSES:

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Fred Schaefer

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2 SHEETS—SHEET 2.

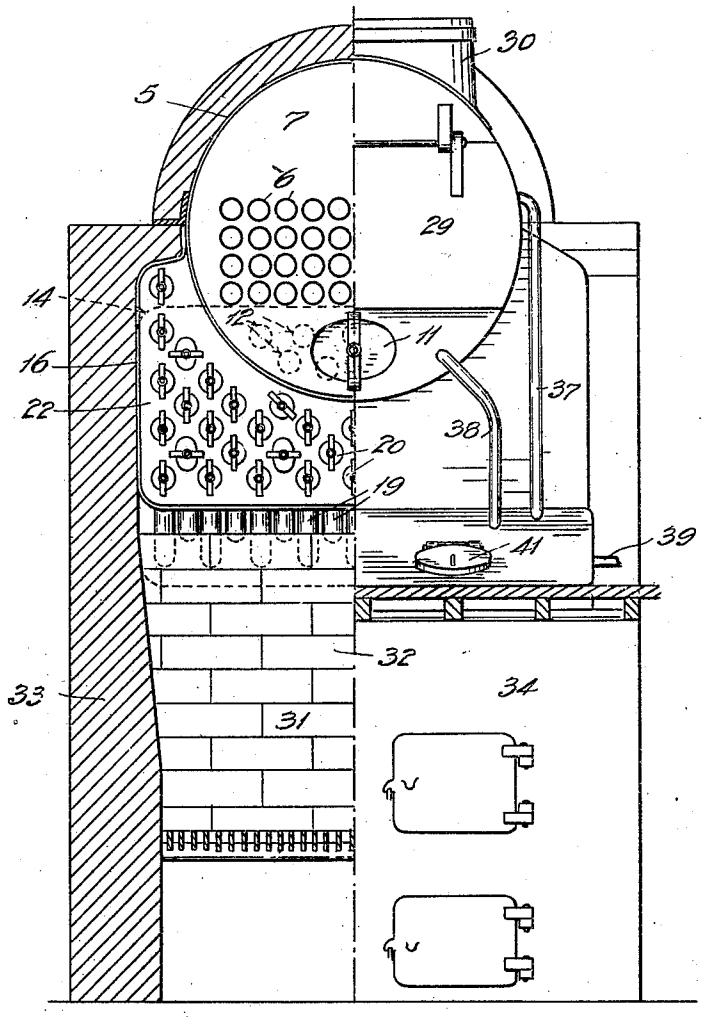

Fig. 2

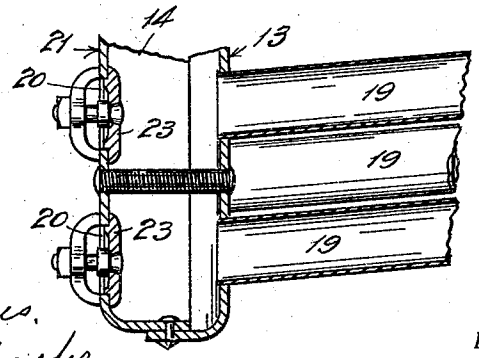

Fig. 3

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UNITED STATES PATENT OFFICE.

WILLIAM D. PLUE, OF RAINIER, OREGON.

COMBINED STEAM-BOILER AND FURNACE.

953,921. Specification of Letters Patent. Patented Apr. 5, 1910.

Application filed March 17, 1909. Serial No. 484,062.

To all whom it may concern:

Be it known that I, WILLIAM D. PLUE, a citizen of the United States, residing at Rainier, in the county of Columbia and State of Oregon, have invented certain new and useful Improvements in Combined Steam-Boilers and Furnaces, of which the following is a specification.

This invention relates to steam generators; and its object is the improvement of such apparatus to render the same efficient in the generation of steam, convenient to operate and maintain in effective condition, and to so combine the several elements that the unequal expansion thereof will not be detrimental to the operativeness of the apparatus.

The invention consists in the novel construction, adaptation and combination of parts, as will be hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a longitudinal vertical section of a steam generator embodying my invention. Fig. 2 is a front elevation of the same with portions of the casing omitted from one side. Fig. 3 is a fragmentary view of the header and associated parts and drawn to a larger scale than the preceding views.

In these drawings the reference numeral 5 designates a cylindrical boiler-shell arranged to be horizontal, or nearly so, and provided with a plurality of longitudinally disposed fire-tubes 6 extending through the front and back heads 7 and 8, respectively. These tubes are positioned so that the lower tier thereof will be at such an elevation with respect to the shell as to afford a space 9 above the crown sheet 10, or that portion of the shell most directly exposed to the fire for conveniently cleaning such sheet without the removal of the tubes. Access is had to the aforesaid space through a manhole 11 in the front head.

Into the back head 8 of the shell and below the fire-tubes 6 are connected the ends of a series of water-tubes 12 which have their opposite ends connected with the tube-sheet 13 of a vessel 14 which will be hereinafter termed the header. This header is spaced from the rear of the said back head to furnish a throat 15 therebetween.

In proximity to the front end of the shell and rigidly secured thereto is a depending water-leg 16 having at its rear side a tube-sheet 17. Communication is established between the interiors of the shell and water-leg by the provision of apertures 18 in the intervening circumferential wall of the shell. The water-leg, as shown in Figs. 1 and 2, is disposed to be at a higher elevation than said header 14. Connecting the header at the rear with the water-leg at the front is a series of water-tubes 19 which are secured in the respective tube-sheets and are inclined downwardly toward the rear. Holes 20 giving access for interiorly cleaning the individual water-tubes are provided in both the header and water-leg walls 21 and 22 which are opposite the respective tube-sheets, and for each such hole there is provided a removable cover-plate 23 which is best shown in Fig. 3.

A manhole 24 may advantageously be provided above the fire-tubes in the shell.

25 represents a steam outflow pipe extending into the shell and terminating therein in oppositely directed branches 26. A wall 27 is employed at the rear of the back head 8 to furnish a passage 28 between the throat 15 and the adjacent ends of the fire-tubes. At the front of the shell is an uptake passage 29 for conducting the smoke from the forward ends of the fire-tubes into the chimney connection 30.

The aforedescribed parts, or the boiler proper, are mounted upon a setting suitable to the employment in which it is to be utilized. At the front and subjacent to the water-tubes 19 is a furnace 31 inclosed by a bridge-wall 32 projecting to within close proximity of the lower row of these water-tubes, side walls 33, a front wall 34 and an inclined top wall 35 which extends forwardly from the water-leg 16 to the top of the front wall 34. These walls, with the exception of 35, are desirably constructed of a refractory material, such as brick.

The wall 35 is formed of metal, such as sheet steel, and is chambered to provide an internal space 36 for the reception of water and constitutes an efficient heater for the boiler-feed water; and to such an end suitably arranged pipe-connections, as 37, and 38, are had between the boiler-shell and the wall, or heater, chamber 36. Also opening into the latter is a supply pipe 39. Extending through the wall 35 is a passage-way 40 having a hinged lid 41.

In operation the flames and other heat products from the fuel consumed in the furnace are directed by the bridge 32 and

top wall 35 to impinge against the water-tubes 19 and thence are directed by the headers 14 to pass through the throat 15, and enveloping the water-tubes 12 in transit to the interior of the fire-tubes 6, wherefrom the combustion gases escape through the uptake passage 29 into the chimney. The flames and other hot gases in thus flowing to the chimney effect the heating of the water contained within the tubes 19, and 12 and also the water within the shell through the medium of the fire-tubes 6 and the portions of the shell which are exposed to the heating agent. The water being thus heated assumes a forward course through the tubes 19 to the water-leg 16, whence it ascends into the shell through the apertures 20, thence rearwardly to pass through the tubes 12 to the header 14 and returning into the tubes 19 to complete a cycle of circulation. In the aforedescribed water course the steam is progressively generated, disassociating from the water in the tubes 19 and ascends through the body of the water contained in the shell to accelerate the generation of the steam in the latter when subjected to heat transmitted through the boiler shell and the fire-tubes therein.

By the peculiar manner of connecting the header by the water-tubes with both the water-leg and the shell, the unequal heating effects of the furnace fire are accommodated to withstand unequal expansion of the parts and thus obviate liability of producing leaky joints between the above cited members. By locating the header at some distance to the rear of the shell, the header serves in effect, as a part of the back wall of the boiler setting and likewise as a baffle to reverberate the impinging hot gases against the back head of the shell and into the fire-tubes, meanwhile absorbing considerable heat to be transposed to the water within the header. By utilizing a chambered metallic top wall for the furnace-structure for and employing water therein its durability as against burning is increased as well as affording an effective heater for the feed-water.

What I claim, is—

In combination, a furnace, a vertically disposed water leg arranged over the fire box of said furnace, a longitudinally extending shell having the forward portion seated in said water leg and the forward end thereof projecting from said water leg, that portion of the bottom of the shell seated in the top of said leg constituting the top wall of said leg, that portion of the bottom of the shell seated in the top of said leg provided with a series of openings for establishing communication between the leg and the shell, a header positioned rearwardly of the back end of the shell and having its upper portion thereof arranged opposite the lower portion of the rear end of the shell, longitudinally extending tubes communicating with the upper portion of the shell, downwardly inclined tubes opening at their forward ends in said leg and at their rear ends in said header below said longitudinally extending tubes, longitudinally extending fire tubes secured to the ends of the shell and extending throughout in a plane above the longitudinally extending tubes which establish communication between the shell and the header whereby an uninterrupted water space will be provided in the shell below the fire tubes, and an arch-shaped wall mounted upon the top of the header and extending to the rear end of the shell at a point above the fire tubes whereby a passage is provided for establishing communication between the rear end of the fire tubes and the furnace.

Signed at Rainier, Oregon, this 1st day of March, 1909.

WILLIAM D. PLUE.

Witnesses:
GEO. H. CURRIER,
N. W. HOWARD.