No. 696,714. Patented Apr. 1, 1902.

F. BURGER & H. M. WILLIAMS.

VERTICAL TUBE STEAM BOILER.

(Application filed Oct. 22, 1900. Renewed Aug. 1, 1901.)

(No Model.) 2 Sheets—Sheet 1.

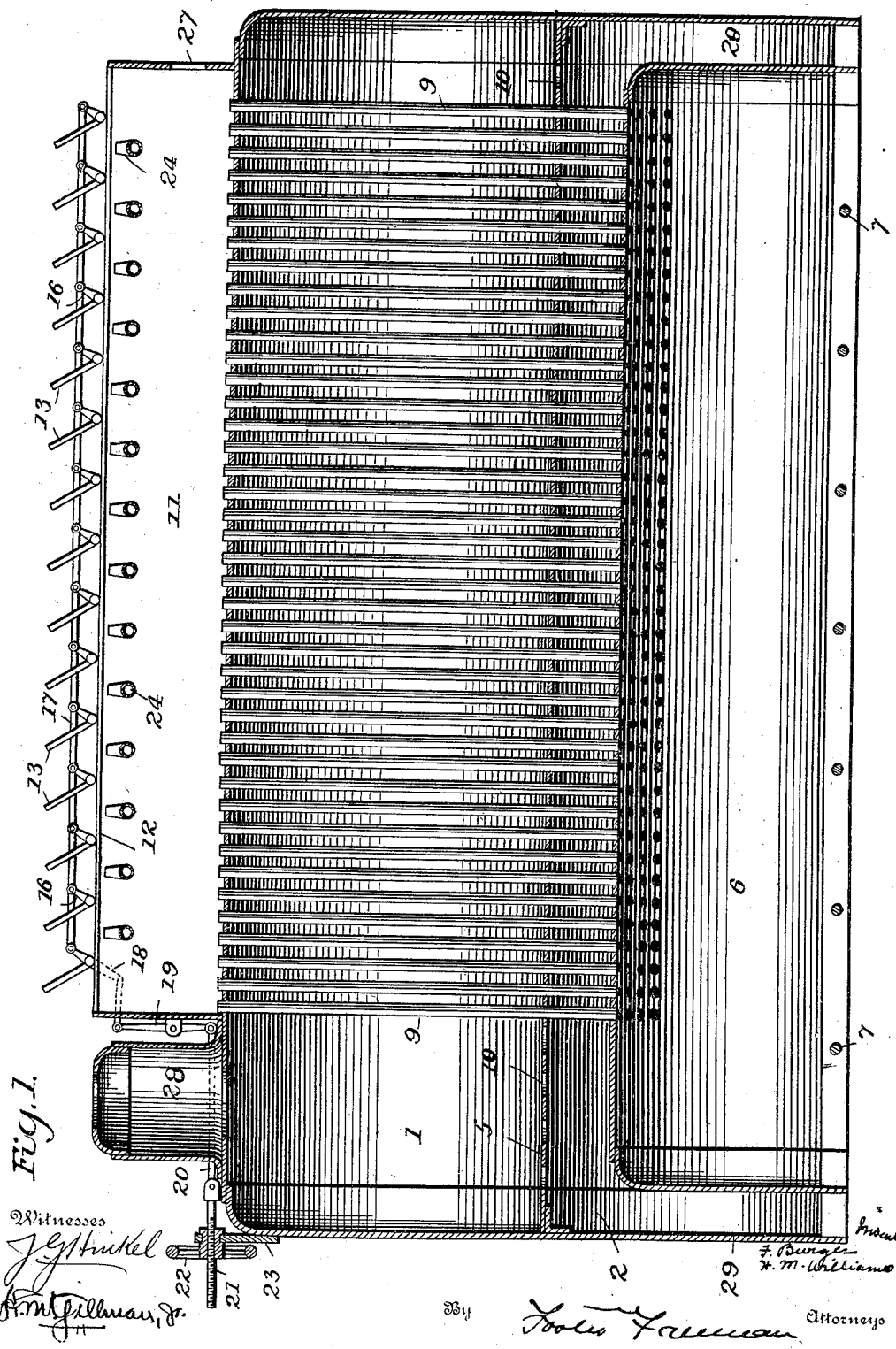


Fig. 1.

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Fig. 2.

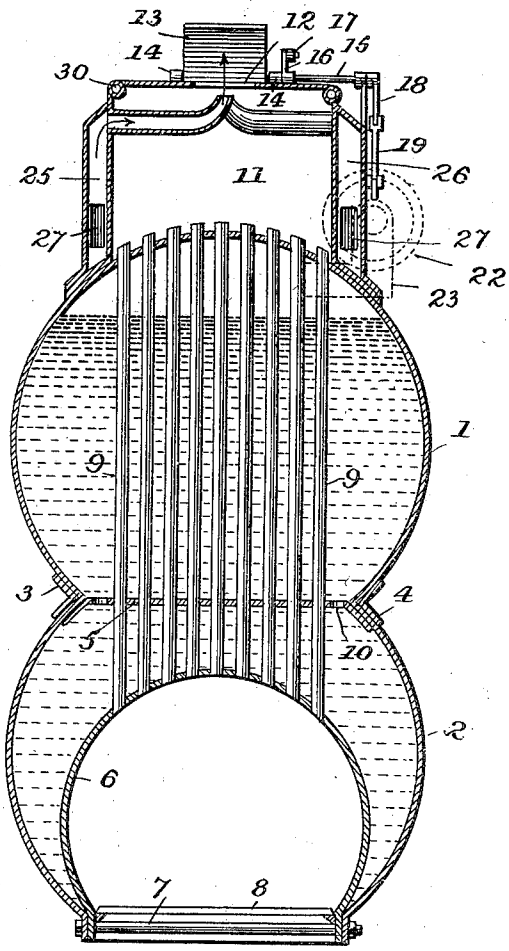
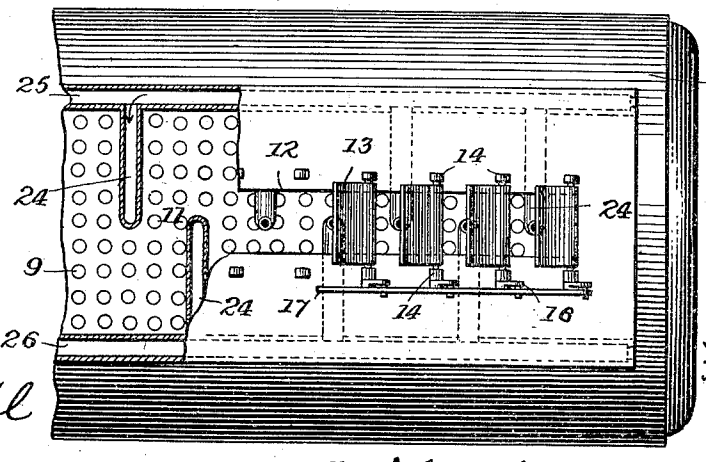


Fig. 3.



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UNITED STATES PATENT OFFICE.

FRANZ BURGER AND HENRY M. WILLIAMS, OF FORT WAYNE, INDIANA; SAID BURGER ASSIGNOR OF ONE-HALF OF HIS RIGHT TO SAID WILLIAMS.

VERTICAL-TUBE STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 696,714, dated April 1, 1902.

Application filed October 22, 1900. Renewed August 1, 1901. Serial No. 70,500. (No model.)

To all whom it may concern:

Be it known that we, FRANZ BURGER and HENRY M. WILLIAMS, citizens of the United States, residing at Fort Wayne, Allen county, State of Indiana, have invented certain new and useful Improvements in Vertical-Tube Steam-Boilers, of which the following is a specification.

This invention relates to vertical-tube steam-boilers, its object being to improve the general construction of such boilers, with the view to increasing the heating-surface and steaming capacity of the boiler, as well as to provide a cheap and efficient construction, avoiding to a great extent the use of stays and providing for a satisfactory draft; and to these and other ends which will appear hereinafter the invention consists in a boiler embodying the features of construction and arrangement of parts having the mode of operation substantially as hereinafter more particularly set forth.

Referring to the accompanying drawings, in which is illustrated a preferred embodiment of the invention, Figure 1 is a longitudinal vertical section of a boiler. Fig. 2 is a transverse vertical section of the same; and Fig. 3 is a partial plan view, partly in section.

According to this invention, generally speaking, the boiler comprises two horizontally-disposed shells substantially cylindrical in shape, the two shells being cut away on their adjacent surfaces and united to form a boiler-space, and one of the shells is shaped so as to provide a longitudinal fire-box within the shell, and above the other shell there is arranged a chamber to receive the products of combustion, which pass through vertical tubes connecting the fire-box with said chamber. Suitable means are provided for controlling the flow of the products of combustion from this chamber and for maintaining a proper draft on the fire within the fire-box.

Referring now to the drawings for a more specific description of the embodiment of the invention illustrated therein, 1 and 2 represent two horizontally-disposed shells, which are substantially cylindrical in shape and one supported above the other. The lower part of the upper shell 1 and the upper part of the lower shell 2 are cut away on adjacent sides, and their edges are secured by any suitable means, so as to make a continuous water-chamber within the boiler. In the present instance these shells are shown as connected by means of angle-pieces 3 4, although any other well-known means may be utilized. In order to furnish additional strength to the boiler, a horizontal plate 5 is secured inside of the shells at or adjacent to the points of union of the two shells. This horizontal plate is perforated so as to allow circulation of water therethrough, there being, preferably, perforations 10 and also perforations larger than the water-tubes which pass through them, as hereinafter described.

The lower shell 2 is provided with a substantially cylindrical inner shell 6, extending longitudinally through it and constituting the fire-box, the lower edges of this inner shell being united to the lower edges of the shell 2 in any suitable way, and in order to give it additional strength and firmness a number of horizontal bolts or rods 7 are extended through the edges of the two shells on opposite sides of the fire-box, and these rods also serve for the support of the grate-bars 8. In this instance the grate-bars 8 are shown conventionally; but in actual practice it is preferable to use an under-feed device which will supply the fuel continuously to the fire-box; but as this forms no part of the present invention such a construction is not shown herein.

The crown of the shell 6 of the fire-box and the crown of the upper shell 1 of the boiler are perforated, and into these perforations are expanded vertical tubes 9, which, as before stated, pass through openings in the plate 5.

Arranged longitudinally on the top of the shell 1 and inclosing the ends of the vertical tubes 9 is a chamber 11, into which the hot gases or products of combustion from the fire-box pass and from which they find their exit through a longitudinal slot or opening 12 in the top of the chamber 11. This slot or opening extends substantially the length of the boiler and is preferably contracted as to its

width, as shown, although it can be of any desired shape or size.

In order to regulate the draft through the slot, suitable means are provided for opening or closing it to a greater or less extent, and while these means may vary there are shown a number of movable plates or wings 13, arranged throughout the length of the slot, and which are journaled in lugs 14, secured to the top of the chamber 11. In the construction shown each wing is provided with a shaft 15, to which is connected an arm 16, and these arms are connected by a rod 17, so that the plates or wings can be moved in unison. Also connected to the shaft of one of the wings is an arm or lever 18, which in turn connects with a rocking lever 19 at its upper end, while its lower end is provided with a connecting-rod 20, which is connected with a regulating-screw 21 by a hinged connection, and there is suitable means, as a hand-wheel 22, journaled on the hanger or support 23 for moving or adjusting the regulating-screw. By this means it will be seen that the positions of the plates or wings can be adjusted so as to readily control the draft through the opening 12.

Sometimes it is desirable to artificially increase the draft through this opening, and in order that this may be done there is arranged, preferably on each side of the chamber 11, chambers 25 26, and connected with these chambers are nozzles 24, which are shown as located between each pair of wings and preferably on alternate sides. The chambers 25 26 are provided with air or steam inlets 27, and in some instances it is desirable to force air or steam into these chambers by some suitable means, and in that case a blower or other similar device may be connected to the inlets to supply air or steam under pressure.

Arranged on one of the shells is a suitable steam-dome 28. Also in the construction shown the lower shell is extended at its ends to form water-legs 29 at the opposite ends of the fire-box, and the form and construction of these legs will vary, depending upon the manner of supplying fuel to the fire-box. In the present instance these legs are shown as completely closing the ends of the fire-box, as it is intended to use an under-feed device to supply the fuel thereto.

This boiler is adapted for various uses and of course can be differently shaped and proportioned to adapt it to the desired use; but in the form shown it is intended more particularly for use with locomotives, and it will be seen that it forms a very compact boiler wherein relatively light material may be used, the substantially cylindrical form of the shells giving them strength and the plate 5 serving also to strengthen the parts. The boiler is relatively high, so that the tubes 9 are long, thus furnishing a large heating-surface in a compact form. Moreover the fire-box is substantially inclosed by the lower shell. By using a suitable under-feed a substantially complete combustion of the fuel may be obtained, so that there is practically no smoke, and the usual smoke-stack is dispensed with. The hot gases or products of combustion which pass through the tubes are collected in the chamber 11 and pass out through the opening 12, and this extending practically the whole length of the boiler furnishes a means of establishing a satisfactory draft in the tubes, and this draft can be regulated by the pivoted wings.

In using the improved boiler its operation will be largely understood, and when fuel is burning in the fire-box the gases will pass up through the tubes 9 into the chamber 11 and out through the slot 12 into the air, and if this boiler is used on a locomotive when the locomotive is running at high speed currents of air are created by the speed of the locomotive, which will impinge against the inclined wings 13, producing upward suction behind the wings, and thereby establishing or aiding in establishing a forced draft, drawing the gases out of the chamber 11, and by regulating the positions of the wings this draft can be controlled. If the boiler is used as a stationary boiler or on a locomotive when standing still and additional draft is required to maintain the fires to the desired extent, air from the chambers 25 26 may be forced through the nozzles 24 to regulate the draft, and, as before stated, the air can be supplied to these chambers through the openings 27 in any suitable way.

Having thus described the specific embodiment of our invention shown in the drawings, its principles will be understood, and the construction and arrangement of parts can be modified to adapt the boiler to the particular purpose desired without departing from the spirit of the invention.

What is claimed is—

1. In a boiler, two horizontally-disposed substantially cylindrical shells supported one above the other, their points of junction being connected by a perforated plate, substantially as described.

2. In a boiler, two horizontally-disposed substantially cylindrical shells supported one above the other, and a fire-box inclosed in one of the shells, substantially as described.

3. In a boiler, two horizontally-disposed substantially cylindrical shells supported one above the other, and a substantially cylindrical fire-box included within the lower shell and connected thereto, substantially as described.

4. In a boiler, two horizontally-disposed substantially cylindrical shells supported one above the other, a fire-box included within the lower shell, and tubes extending from the fire-box to the top of the upper shell, substantially as described.

5. In a boiler, two horizontally-disposed substantially cylindrical shells supported one above the other, a fire-box within one of the

shells, a chamber above the other shell, and vertical tubes extending between the fire-box and chamber, substantially as described.

6. In a boiler, two horizontally-disposed shells supported one above the other, a fire-box connected with one shell, a chamber connected with the other, and vertical tubes extending from the fire-box to said chamber, the chamber being provided with an opening and with means for controlling the opening, substantially as described.

7. In a boiler, two horizontally-disposed shells supported one above the other, a fire-box connected with one shell, a chamber connected with the other, and vertical tubes extending from the fire-box to said chamber, the chamber being provided with an opening, hinged wings, and means for operating them for controlling the opening, substantially as described.

8. In a boiler having tubes extending to the outer surface thereof, a chamber inclosing the ends of said tubes, said chamber being provided with means for regulating the draft through the tubes into the chamber, substantially as described.

9. In a boiler having tubes extending to the outer surface thereof, a chamber inclosing the ends of said tubes, said chamber being provided with an opening and with nozzles connected to air-chambers for controlling the draft through said tubes, substantially as described.

10. In a boiler having tubes extending to the outer surface thereof, a chamber inclosing the ends of said tubes, said chamber being provided with an opening, pivoted wings controlling the opening, and means connected with the wings for adjusting their positions with relation to the opening, substantially as described.

11. In a boiler, two horizontally-disposed substantially cylindrical shells supported one above the other, a plate interposed between their points of junction, a substantially cylindrical fire-box inclosed within one of the shells, a chamber supported upon the other shell, vertical tubes extending from the crown of the fire-box to the crown of the upper shell, and means for regulating the draft through said tubes into said chamber, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

FRANZ BURGER.
HENRY M. WILLIAMS.

Witnesses:
GEO. D. CRANE,
CHAS. A. BEURET.