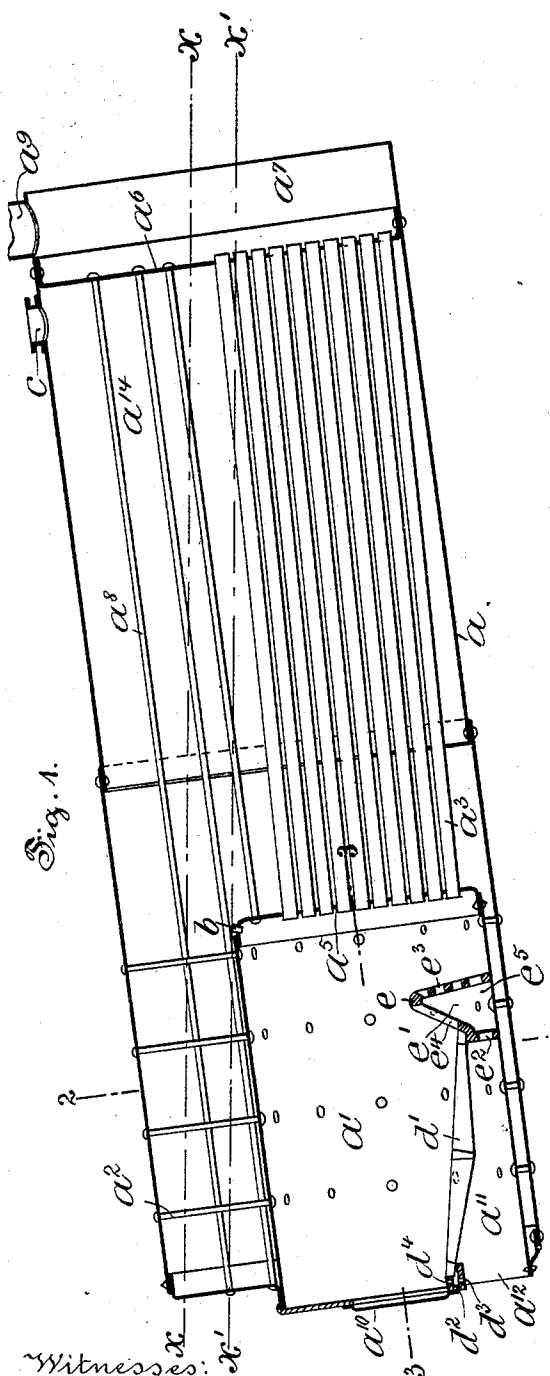


(No Model.)

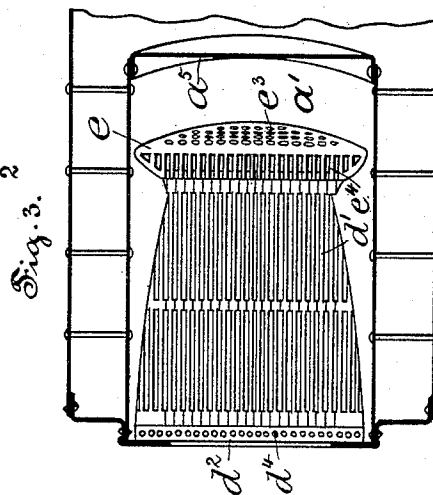
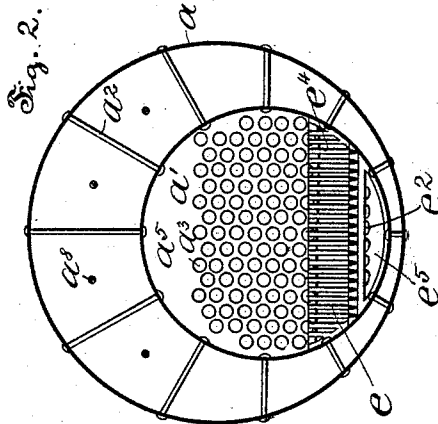
J. J. TONKIN.
STEAM BOILER.

No. 469,287.

Patented Feb. 23, 1892.



Witnesses:
Kernan Borman.
Thomas M. Smith.



Inventor:
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by J. Walter Douglass.
att'y.

UNITED STATES PATENT OFFICE.

JOHN JAY TONKIN, OF PHILADELPHIA, PENNSYLVANIA.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 469,287, dated February 23, 1892.

Application filed October 6, 1891. Serial No. 407,842. (No model.)

To all whom it may concern:

Be it known that I, JOHN JAY TONKIN, a citizen of the United States, residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Steam-Boilers, of which the following is a specification.

The principal objects of my invention are, first, to provide means for introducing a supply of air to the fire-box in such manner that the combustion of fuel and of the resultant gases is greatly promoted and accelerated; second, to increase the grate-supporting surface of the fire-bed and at the same time afford an increased area of surface for the escape of the gases or hot flames, and, third, to construct the fire-bridge piece in such manner that the fire-tubes may be located lower down in the boiler than was heretofore possible, so that an increased area of hot flame or gaseous product surface is afforded.

My improvements are applicable to internally-fired boilers in general. However, the nature and scope of the invention will be more fully understood from the following description, taken in connection with the accompanying drawings, illustrating its application to an inclined internally-fired boiler, and in which—

Figure 1 is a longitudinal central section of an inclined internally-fired boiler, showing a bridge-wall embodying features of my invention in application thereto. Fig. 2 is an end view, partly in section, on the line 2 2 of Fig. 1, showing a front view of the perforated fire-bridge piece or wall; and Fig. 3 is a sectional view on the line 3 3 of Fig. 1, showing the grate-bars and their perforated front support and the hollow perforated and slotted fire-bridge wall.

In the drawings, *a* is the cylindrical shell of the boiler.

a' is a fire-box located within the shell *a* and having its axis parallel to but out of alignment with the axis of the shell, so that a water-space is afforded throughout or around the surface of the fire-box.

a² are slings or stays having their respective extremities connected with the walls of the shell and fire-box in order to brace and support the same.

a³ are fire-tubes supported by the rear plate *a⁵* of the fire-box and by the rear end plate *a⁶* of the boiler and communicating with the fire-box *a'* and with the smoke-chamber *a⁷*.

a⁸ are tie-rods for bracing the end plates of the boiler.

a⁹ is a smoke off-take.

a¹⁰ is a fire-door, and *a¹¹* is an ash-pit provided with an ash-door *a¹²*.

x x represent the normal water-line, and *x'* indicate the low-water line and show that the fusible plug *b* is uncovered, while the crown-sheet is covered with water.

It may be remarked that the steam off-take pipe *c* is located at the rear of the boiler in order to afford a large steam-space *a¹⁴*.

Having thus briefly pointed out the parts of one of the many types of boilers to which my invention is applicable, a description of the invention itself will now be given.

The support *d* for the grate-bars *d'* is formed hollow, as at *d²*, and is perforated, as at *d³* and *d⁴*, so that air entering from the ash-pit *a¹¹* passes through the perforation *d³* into the hollow grate-bar support *d* and finally escapes therefrom through the perforations *d⁴* into close proximity with the front wall of the fire-box, and this draft of air not only equalizes the temperature of the front fire-box wall and cools and prolongs the life of the grate-bar support *d* itself, but also increases the combustion of the fuel on the grate-bars.

The fire-bridge wall *e* is constructed hollow and of substantially triangular shape in cross-section, as shown by the letter *e'*, and extends vertically from the bottom of the sheet of the fire-box. The rear wall of the fire-bridge is provided with perforations *e²*, and the slanting front wall *e⁴* thereof has an offset for supporting the grate-bars *d'*, and is provided with oblong slots or openings disposed above the offset and grate-bars *d'* and with one or more apertures or perforations *e³* disposed beneath the offset and grate-bars.

The object of and advantages incident to providing the front wall of the fire-bridge piece *e* with oblong slots or openings extending through the front wall thereof is to increase the grate-supporting surface of the fire-bed and at the same time afford an increased area of surface for the escape of the gases or hot flames through the front and rear walls

of the bridge-piece e , and, moreover, such arrangement enables the fire-tubes a^3 to be located lower down, and there is also afforded a greater area of hot flame or gaseous product surface. The drafts of air entering from the ash-pit a^{11} traverse the perforations e^2 in the front portion of the fire-bridge wall and the hot gases pass through the oblong slots or openings e^4 in the slanting portion of said bridge-piece e , and thence through the openings e^3 with incoming air from the ash-chamber to the fire-tubes, and thus not only tend to maintain the rear wall a^5 of the fire-box a' at a uniform temperature, but also protects the fire-bridge piece or wall e itself against undue heating. Furthermore, the supply of air which escapes from the perforations e^3 and e^4 is consequently delivered in rear of the fire-bridge piece or wall e , which tends to promote a thorough commingling of the gases and air or products of combustion before entering the fire-tubes, thereby not only increasing the efficiency of the boiler, but also preventing the escape of an undue quantity of smoke and combustible gases. Furthermore, by providing the front portion of the fire-bridge wall e with oblong slots or openings e^4 ash or other extraneous matter is permitted to fall through said openings into the space e^5 between the two walls of said bridge-piece and maintaining thereby a far more uniform and clear

mass. The ash or extraneous matter being discharged through the openings e^2 in the lower portion of the front wall of said bridge-piece e into the ash-chamber can be readily withdrawn therefrom with the least possible labor by a suitable appliance.

Having thus described the nature and objects of my present invention, what I claim as new, and desire to secure by Letters Patent, is—

An internally-fired steam-boiler provided with a hollow perforated and slotted bridge-wall extending from the bottom of the fire-box sheet, as shown, and connected with grate-bars, presenting a large area of grate-surface, and a perforated support in the front of the fire-box, the construction and arrangement being such as to permit of increased drafts of air to protect said parts against overheating and supporting and accelerating combustion throughout the area of the fire-box for increasing the working of the boiler and preventing the formation of clinker.

In witness whereof I have hereunto set my signature in the presence of two subscribing witnesses.

JOHN JAY TONKIN.

Witnesses:

HERMANN BORMANN,
RICHARD C. MAXWELL.