

No. 743,825.

PATENTED NOV. 10, 1903.

F. BURGER & H. M. WILLIAMS,
FIRE TUBE BOILER.

APPLICATION FILED FEB. 20, 1903.

NO MODEL.

3 SHEETS—SHEET 2

Fig. 3.

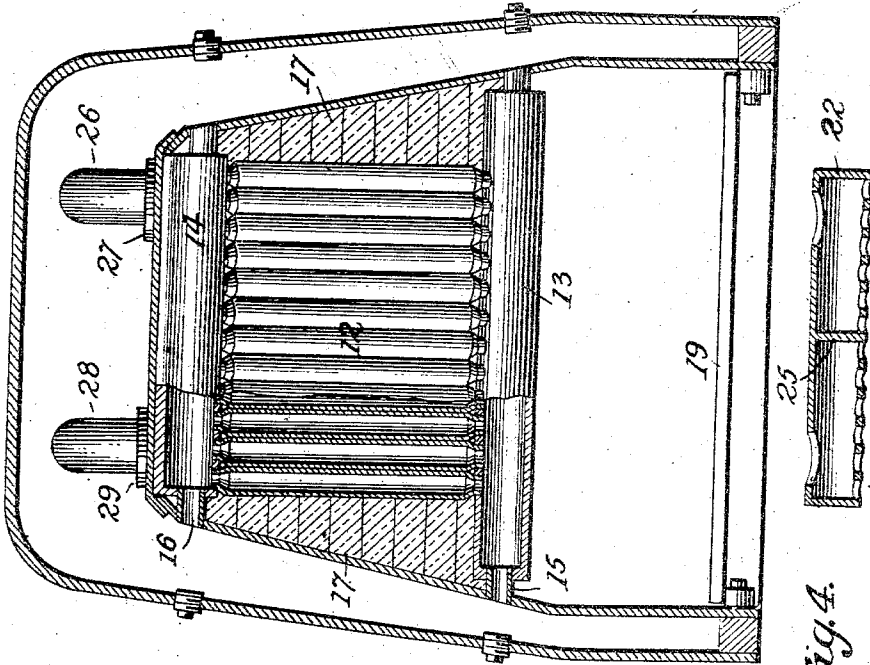
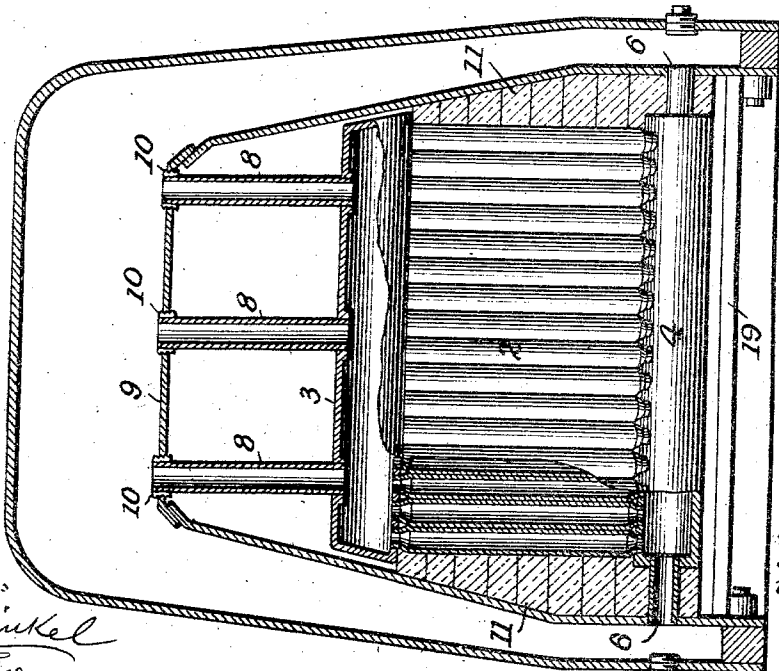


Fig. 4.

Fig. 2.



Witnesses

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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.

FIRE-TUBE BOILER.

SPECIFICATION forming part of Letters Patent No. 743,825, dated November 10, 1903.

Application filed February 20, 1903. Serial No. 144,258. (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 Furnaces for Fire-Tube Boilers, of which the following is a specification.

This invention relates to furnaces for fire-tube boilers, and particularly to such as use a powerful induced draft, as in locomotives. It is well known that when the exhaust-steam is employed to induce a draft through the furnace the suction through the fire-tubes is often sufficient to draw pieces of burning fuel from the furnace through the fire-tubes and discharge them from the stack, and these pieces of burning fuel are frequently the cause of serious fires along the railway. In addition to this objection the gases and other products of combustion are sucked so quickly through the fire-tubes that they do not have sufficient time to impart their heat to the tubes, and there is therefore a great waste of heat.

The object of our present invention is to prevent almost, if not entirely, the discharge of sparks and cinders from the stack and also to utilize to a greater extent the heat of the products of combustion.

The invention will be fully described hereinafter, reference being had to the accompanying drawings, in which—

Figure 1 is a sectional side elevation of a furnace and part of a fire-tube boiler embodying our invention. Fig. 2 is a vertical transverse section with the water-tube bridge partly broken away. Fig. 3 is a similar view with the water-tube apron partly broken away. Fig. 4 is a sectional detail view of a portion of the superheater.

The furnace or fire-box is indicated by 1, and it is provided with grate-bars 5, extending to nearly its inner end, the space between the rear grate-bar and the tube-sheet 20, which forms the rear wall of the furnace, being closed or bridged by a hinged plate 19.

In close proximity to the rear grate-bar is a header 4, which is connected by nipples 6 with the side walls of the furnace, and this

header communicates with the side water-legs of the boiler. Another header 3 is connected to the header 4 by a series of water-tubes 2, and a series of water-circulating pipes 8 lead upward from the header 3 to the crown-sheet 9 of the furnace, to which they are connected by nipples 10, and these pipes 8 communicate with the water-space of the boiler, and the water in the boiler can thus circulate through the headers 4 and 3, tubes 2, and pipes 8.

The header 3 is located in advance of the header 4, so that the tubes 2 incline toward the front of the furnace. In order to bring the tubes 2 close together, their ends are reduced in diameter and fit in openings in the headers 3 and 4. The headers 3 and 4 and tubes 2 form a bridge over which the products of combustion must pass on their way to the fire-tubes, and the space between the top of the bridge and the crown-sheet may be more or less than what is shown as preferred.

Depending from the crown-sheet of the furnace a short distance in advance of the furnace is an apron the lower end of which is about on a level with or slightly below the lower fire-tubes, and the products of combustion which pass over the water-tube bridge must pass down and under the apron before they can enter the fire-tubes.

The apron may be variously constructed; but preferably it consists of lower and upper headers 13 and 14, connected by nipples 15 and 16 with the sides of the furnace and communicating with the water-space of the boiler, and a series of tubes 12 connect the headers, and the water in the boiler can circulate through these headers and tubes. The upper header 14 fits snugly against the crown-sheet.

Immediately back of the water-tube apron and resting against it is a steam-superheater consisting of a series of vertically-disposed tubes 18, connected at their lower ends to a header 21 and at their upper ends to a header 22. This upper header is provided with short tubes 23, each having a flange 24, and these flanges are secured to the crown-sheet 9, openings being formed in the latter which register with the tubes 23, and the latter communicate with the interior of the header 22. This

header is also provided with a partition 25, which divides it into two chambers, and the tubes 23 lead, respectively, from these chambers. A pipe 26 within the boiler is provided with a flange 27, which is secured to the crown-sheet 9 and registers with one of the tubes 23. The other end of the pipe 26 terminates in the steam-space of the boiler. Another pipe 28 is provided with a flange 29 at one end, which is secured to the crown-sheet, so that the pipe 28 registers with the other tube 23, and this pipe 28 will lead to the engine (not shown) and be provided with a suitable valve (not shown) for controlling the flow of steam to the engine.

The spaces between the sides of the furnace and the sides of the water-tube bridge will be filled in by fire-brick, as indicated by 11 in Fig. 2, and the spaces between the sides of the water-tube apron and the sides of the furnace will be filled in by fire-brick 17, as indicated by 17 in Fig. 3.

Such being the preferred construction the operation will be as follows: The products of combustion will pass over the top of the water-tube bridge and be intercepted by the depending water-tube apron, which will deflect them downwardly, and they will pass under the lower end of the apron and into the fire-tubes. Anyinders that may by a strong induced draft be carried from the furnace over the bridge will strike against the apron and drop down onto the hinged plate 19, which can be opened to discharge them whenever necessary. In passing down the apron the products of combustion will impart some of their heat thereto, and thereby greatly aid in heating the water circulating through the apron. They will also impart some of their heat to the steam-superheater.

Without limiting ourselves to the precise construction and arrangement shown and described, we claim—

1. The combination with the furnace of a fire-tube boiler, of a bridge extending transversely of the furnace, said bridge consisting of a lower header supported by the side walls

of the furnace and communicating with the side water-legs of the furnace, an upper header and closely arranged tubes connecting said headers, and separated tubes leading from the upper header and connected to the crown-sheet of the boiler, and communicating with the water-space of the boiler, substantially as set forth.

2. The combination with the furnace of a fire-tube boiler, of a bridge extending transversely of the furnace from the grate-bars upwardly to leave a space between its upper edge and the crown-sheet of the furnace and between it and the fire-tubes, a water-tube apron extending from the crown-sheet downwardly into the space between the bridge and the fire-tubes, said apron comprising upper and lower headers each supported by the side walls of the furnace and communicating with the side water-legs, and a series of closely-arranged tubes connecting said headers, substantially as set forth.

3. The combination with the furnace of a fire-tube boiler, of a bridge extending transversely of the furnace from the grate-bars upwardly to leave a space between its upper edge and the crown-sheet of the furnace and between it and the fire-tubes, a water-tube apron extending from the crown-sheet downwardly into the space between the bridge and the fire-tubes, the lower end of the apron being substantially level with the lower fire-tubes, connections between the water-tube apron and the water-spaces of the boiler, a steam-superheater supported directly in rear of the water-apron, and connections between the superheater and the steam-space of the boiler, substantially as set forth.

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. K. TORRENCE,
GEORGE S. MILLER.