

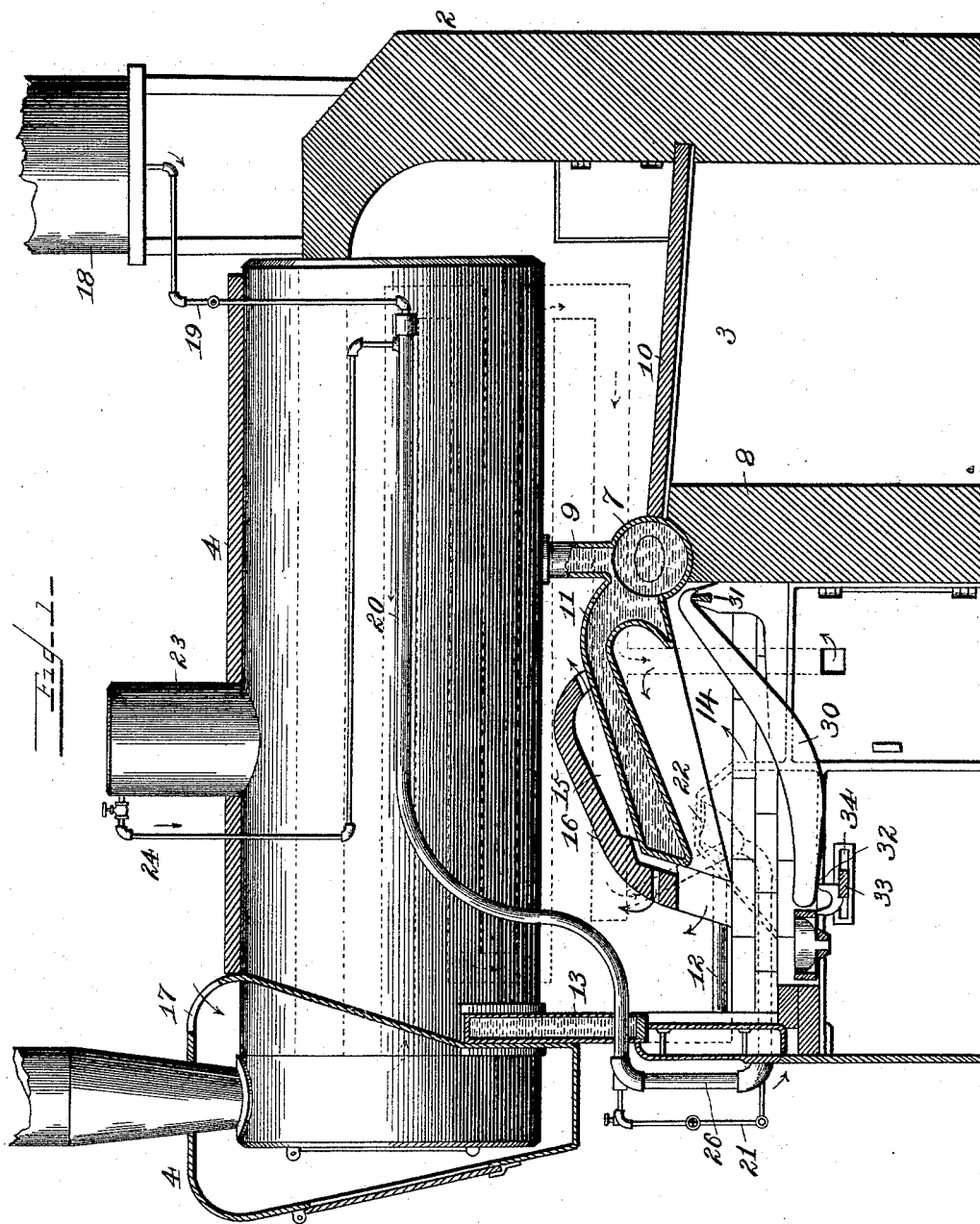
(No Model.)

2 Sheets—Sheet 1.

A. BRYCE.  
FURNACE.

No. 526,612.

Patented Sept. 25, 1894.



Witnesses  
 J. A. Tamborschnitt  
 W. L. Beal

Inventor  
Andrew Bryce,  
by Wm L. Pierce,  
his Attorney

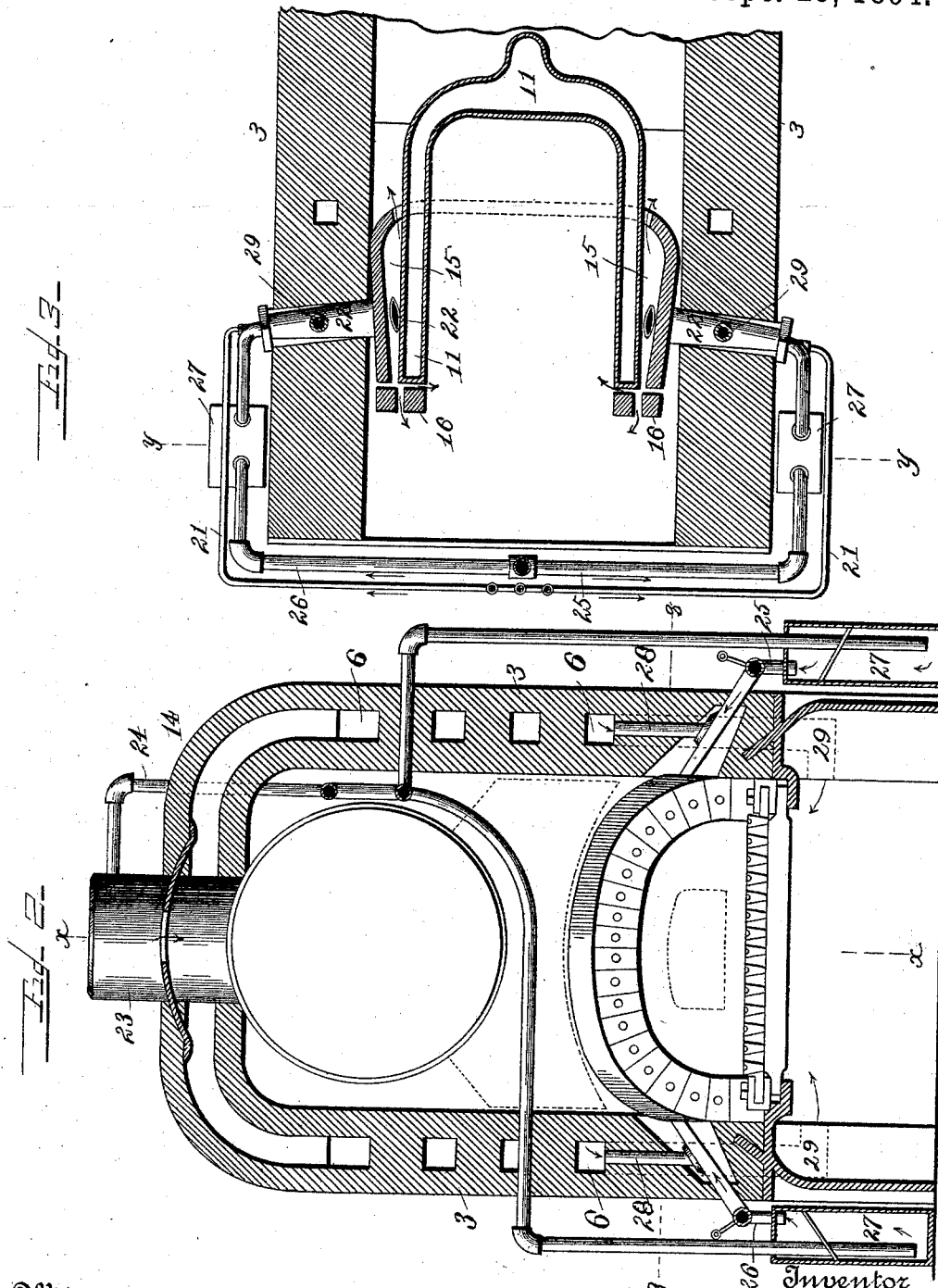
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G. A. Taubenschmidt,  
W. L. Beal.

Inventor  
Andrew Bryce,  
by William L. Pierce,  
his Attorney

# UNITED STATES PATENT OFFICE.

ANDREW BRYCE, OF ALLEGHENY, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO THE BRYCE UNIVERSAL FUEL FIRING APPARATUS COMPANY, OF PITTSBURG, PENNSYLVANIA.

## FURNACE.

SPECIFICATION forming part of Letters Patent No. 526,612, dated September 25, 1894.

Application filed December 23, 1892. Renewed January 29, 1894. Serial No. 498,401. (No model.)

*To all whom it may concern:*

Be it known that I, ANDREW BRYCE, a citizen of the United States, residing at Allegheny, in the county of Allegheny and State of Pennsylvania, have invented or discovered new and useful Improvements in Furnaces, of which the following is a specification.

In the accompanying drawings which make part of this specification, Figure 1, is a vertical longitudinal section partly in elevation of a furnace and boiler provided with my improvements, on line *x—x*, of Fig. 2. Fig. 2, is a vertical cross-section of same on line *y—y*, of Fig. 3; and Fig. 3, is a sectional plan broken off on line *z—z*, of Fig. 2.

My invention generally stated relates to a conduit over the combustion chamber of furnaces wherein gases are intensely heated, and from which they are delivered in finely divided jets to join with the heavier fuel and be consumed. It is also concerned with the peculiar brick which form the roof and forward end of said conduit. The various other features described and shown, I do not herein claim, as they constitute the subject matter of separate applications filed by me June 18, 1892, Serial Nos. 437,230 and 437,231.

I have shown my invention applied to the furnace of an ordinary stationary or marine boiler, but it is clear that it is applicable to all steam or heat generators where the combustion of fuel is the agent for generating heat.

In the accompanying drawings which make part of this invention, 1, is a boiler; 2, the rear brick wall of the furnace, and 3, 3, the side walls. The boiler heats the chamber between itself and the outer shell 4, air being admitted to said chamber at 17. In both sides of the furnace are air conduits 6—6.

7 is a mud drum running transversely of the furnace and supported upon the pier 8. The pipe 9 connects it with the boiler. Back of said drum is the floor 10 of the draft flue. Communicating with said mud drum 7, is the water jacket 11, a longitudinal section thereof being substantially of fish hook shape as seen in Fig. 1. Said water jacket has a number of forward extensions 12—12, connecting with

the front water leg 13, which forms the front wall of the furnace above the line of the grate bars. This water jacket 11, forms the roof of what I call the inner combustion chamber and fuel pocket 14. The bottom of said chamber is formed by the concave grate bars hereinafter described. Over the forward end of the water jacket 11, is what I term an arched spraying conduit 15. This is formed by the arch of curved brick 16—16. These brick have a very large number of perforations extending in various directions.

Returning now to the boiler and the parts immediately adjacent;—17 is the cold air inlet into the chamber between the boiler and outer shell 4.

18 is an elevated tank containing oil. Leading therefrom is pipe 19, which passes through a length of superheated steam pipe 20, where the oil is highly heated and may become converted into an oil vapor. Emerging from said super-heated steam pipe the oil passes by pipes 21, 21, to injectors 22, 22, of any desirable construction which discharge into either side of the spraying conduit 15.

23 is a steam drum from which leads a pipe 24, containing wet steam. This is superheated by passing through the outer combustion chamber of the furnace and connects with pipe 20, described before. The pipe 20 emerges from the front of the furnace and branches right and left in pipes 25, 26 to the injectors 22, 22, passing intermediately through steam separators 27, 27.

28, 28, are hot air connections to the injectors from the conduits 6—6, and 29, 29 from same supplying hot air under the grate bars.

The grate bars which I use are seen in Figs. 1 and 2. The rear grate bars, 30, 30, is a series of parallel concave bars inclined to the front of the furnace and hooked at the rear to the cross piece 31. They rest at the front upon the projection 32, of the bar 33. Sliding grooves 34, 34, and the front grate being unsupported can be easily overturned.

The operation of my devices is now intelligible. Solid fuel is fed upon the grate and steam generated, say to a head of about five

pounds. The wet steam from the steam drum is then turned on, superheated and separated from water and carried to the injectors. Likewise the superheated oil is carried to the injectors. The air having been admitted around the boiler, is heated in the air conduits in the sides of the furnace by the waste heat and a portion of said air delivered to the injectors while another portion is introduced beneath the grate and passing up through the same forces the products of combustion in the inner combustion chamber to the far end thereof where they strike the roof and return to the front and escape by the opening at the front. They then pass over the fire-arch formed by the perforated brick where they are necessarily intercepted by the fine streams of mingled oil vapor, dry steam and hot air coming out of the spraying conduit through the multitude of fine perforations therein. These all join in an intense and smokeless flame, in the outer combustion chamber and finally escape through the various draft flues leading to the stack.

No air is admitted to the grate except such as I bring in through my hot air flues or through some aperture made to the open air and communicating with the grate. In this way I can regulate the amount of draft required for the fire by regulating the amount of hot air admitted.

Having described my invention, I claim—

1. In a furnace designed to burn simultaneously both solid and gaseous fuels, the combination of a combustion chamber for the solid fuels having one opening at its forward end for the entrance and exit of the draft; a second combustion chamber for burning gaseous fuels superposed upon said first chamber and provided with perforations for delivering the flame therefrom into the path of the products of combustion escaping from said first chamber, and means for delivering gas to said second chamber, substantially as set forth.

2. In a furnace designed to burn simultaneously both solid and gaseous fuels, the combination of a combustion chamber for the solid fuels, having one opening at its forward end for the entrance and exit of the draft; a second combustion chamber superposed thereon to burn gaseous fuels, the roof of said second chamber being formed of concaved and perforated firebrick, and means for delivering gas to said second combustion chamber, substantially as set forth.

In testimony whereof I have hereunto set my hand this 22d day of December, A. D. 1892.

ANDREW BRYCE.

Witnesses:

WM. L. PIERCE,  
WILLIAM BEAL.