(No Model.) 2 Sheets—Sheet 1.

P. H. BAGLEY.

BOILER FURNACE.

No. 566,837. Patented Sept. 1, 1896.

Fig. 1.

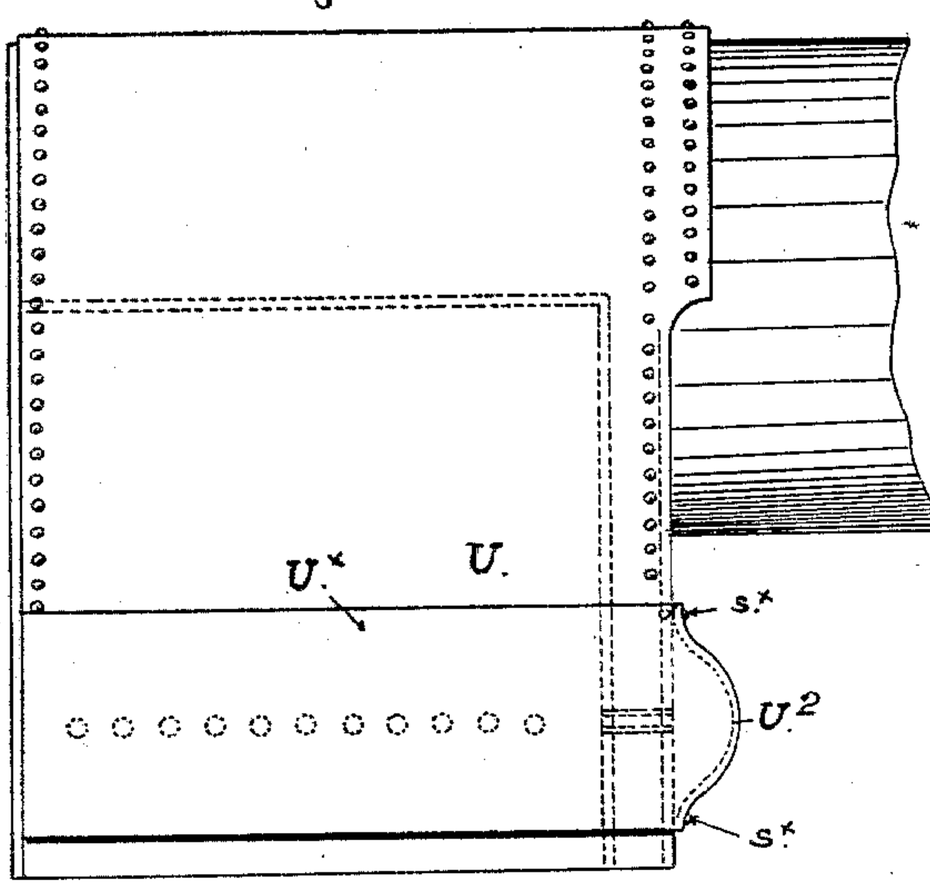


Fig. 2.

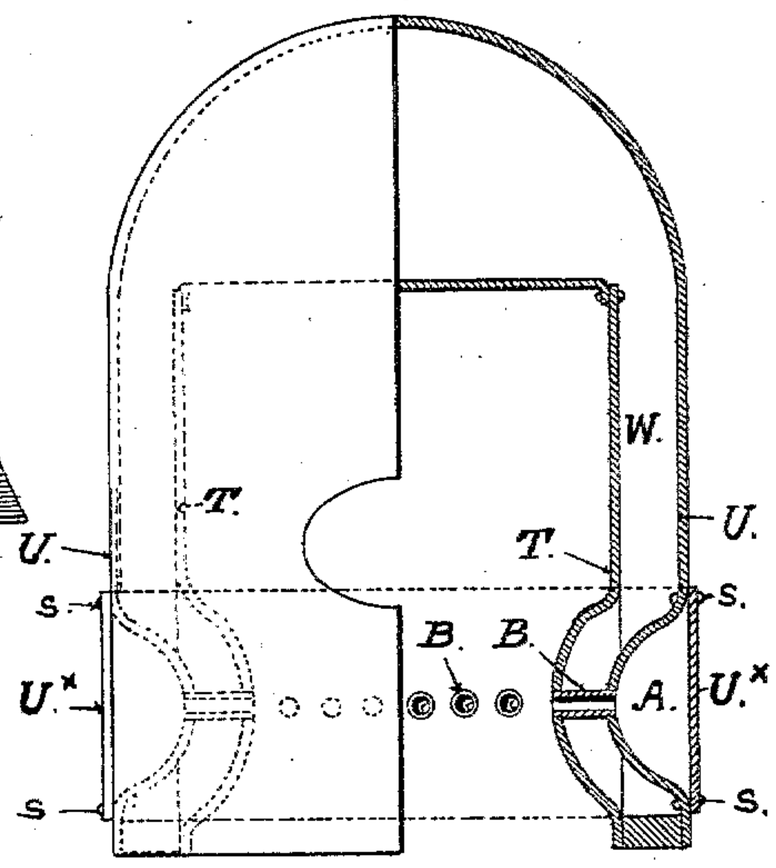


Fig. 3.

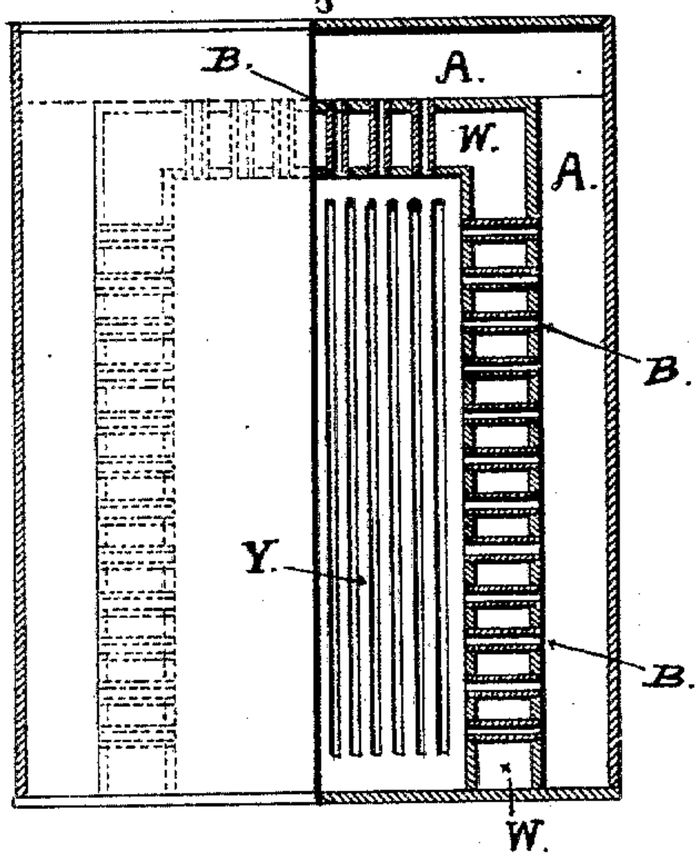


Fig. 4.

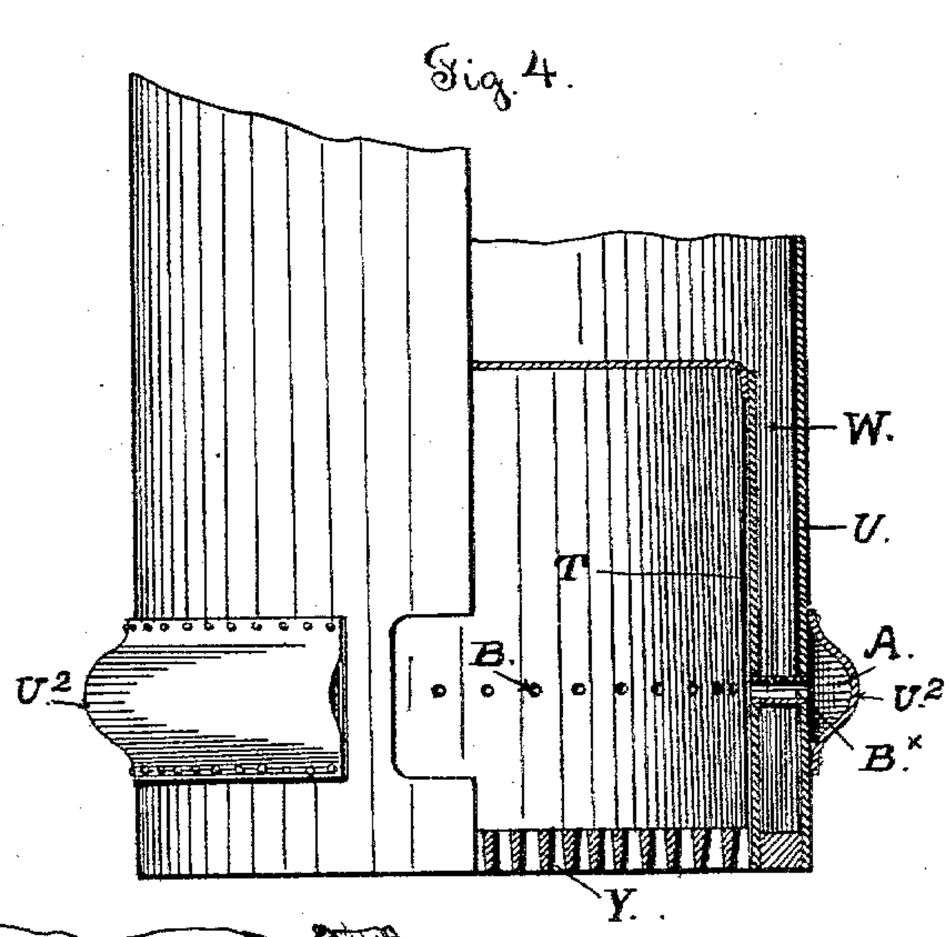
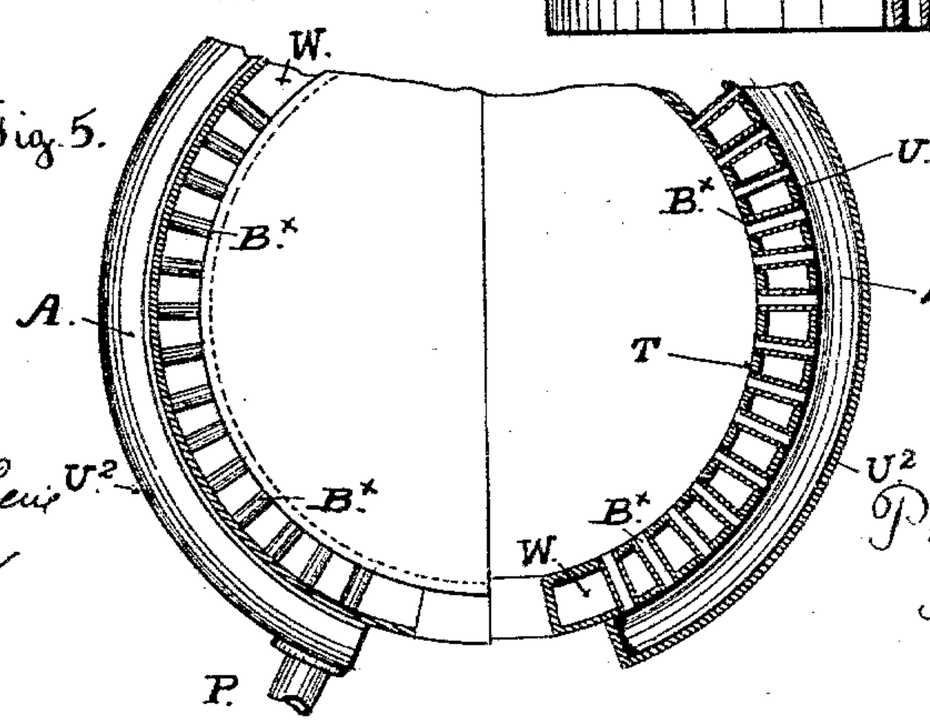


Fig. 5.



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(No Model.) 2 Sheets—Sheet 2

P. H. BAGLEY.

BOILER FURNACE.

No. 566,837. Patented Sept. 1, 1896.

Fig. 6.

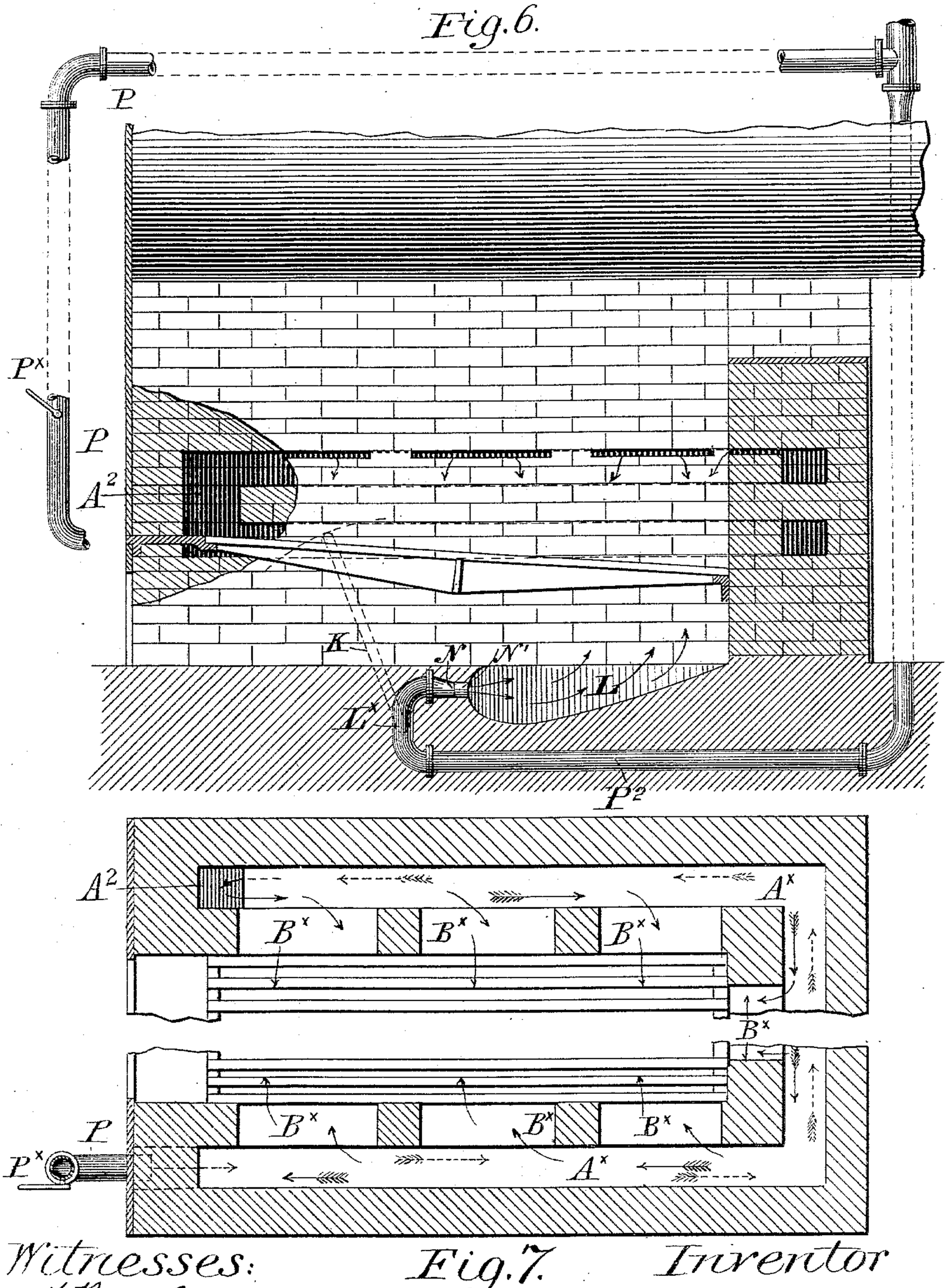

Fig. 7.

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UNITED STATES PATENT OFFICE.

PERKINS H. BAGLEY, OF SAN FRANCISCO, CALIFORNIA.

BOILER-FURNACE.

SPECIFICATION forming part of Letters Patent No. 566,837, dated September 1, 1896.

Application filed May 24, 1895. Serial No. 550,582. (No model.)

To all whom it may concern:

Be it known that I, PERKINS H. BAGLEY, a citizen of the United States, residing in the city and county of San Francisco and State of California, have invented certain new and useful Improvements in Boiler-Furnaces, of which the following is a specification.

My invention relates to improvements made in the fire-boxes or furnaces of steam boilers and generators of the kind or description that are known as smoke-preventing and smoke-consuming furnaces; and consists in the construction of air conducting and heating flues or passages and air-apertures in combination with an air-blower or means for forcing air through said flues and apertures into the furnace, as hereinafter fully explained and set forth, whereby I secure thorough and effective combustion of the gases and products of combustion within the fire-box and prevent the escape of the same in an imperfect or partially-consumed state in the form of smoke.

The following description explains the nature of my said improvements and the manner in which I proceed to construct and apply the same for operation with boilers or generators, both of horizontal and upright types and portable as well as stationary, reference being had therein to the accompanying drawings that form part of this specification.

Figure 1 represents in side elevation the fire-box of a stationary boiler of the horizontal type constructed according to my invention. Fig. 2 is an end view of the fire-box with one-half in cross-section. Fig. 3 is a horizontal section taken above the crown-sheet of the fire-box on one side of the longitudinal center line $x\,x$ and below the sheet on the other side of the same line. Fig. 4 represents these improvements applied to the fire-box of an upright boiler, the fire-box and boiler-sheet being shown in section on one-half of the vertical center line $x\,x$. Fig. 5 is a horizontal section through the line $y\,y$, Fig. 4. Figs. 6 and 7 illustrate the manner of applying these improvements to a stationary boiler in which the sides of the fire-box and the bridge-wall are constructed of brickwork, Fig. 6 being a longitudinal section and Fig. 7 a horizontal section taken at the line $x\,y$, Fig. 6, with the center portion broken out for the purpose of contracting the figure.

In applying and carrying out these improvements in the case of a locomotive-boiler, Figs. 1, 2, and 3, or a portable boiler of the upright type, Figs. 4 and 5, I proceed to form an air-tight flue or passage A around the sides of the fire-box and in the exterior wall thereof, and by short tubes B B, I connect the fire-chamber or interior space of the fire-box above the grate-surface Y directly with the aforesaid flue or passage outside. The tubes B are fixed in the inner sheets or walls T, and in the outer sheets U of the fire-box at regular intervals apart across the water-space W they are placed along the sides and also across the back of the fire-box, and in the case of an upright boiler, Figs. 4 and 5, where the fire-chamber is circular in shape, I carry the circle of tubes $B^{\times}$ around nearly the entire circumference, leaving proper room at the front of the boiler for the door-frames and other openings.

The flue or passage A is formed in one way by bending in the sheets T U on a smooth regular curve, beginning about at the line of the grate-bars and springing inwardly and returning in a regular curve into the straight line of the sheets again, these curved portions of the inner and the outer sheets being substantially parallel and equidistant from each other at all points. The greatest swell of the curve is located at a proper distance above the level of the grate to come above the working surface of the body of fuel. At this point or line of greatest projection of the internal wall into the fire-chamber along the side the tubes B, fixed in the two bent sheets, connect the depression or channel in the exterior sheet with the fire-space within the box, and this channel is converted into a closed passage by a plate or narrow sheet $U^{\times}$, that is lapped on the straight part of the outside sheets above and beneath the curved portion and secured by rows of rivets $s\,s$.

At the back of the fire-box this passage is produced not by bending the sheets of the fire-box, as before described, and using a flat plate for the outside wall of the passage, but by fixing the tubes B in the straight inner and outer sheets T U of the fire-box and then fixing a bent plate or sheet $U^{\times}$ to the straight outer sheet U over the mouths of the tubes by rows of rivets $s^{\times}\,s^{\times}$, the curvature of this plate U^{2} being such that the passage A, inclosed between it and the straight sheet U of the boiler, shall have about the same area as the passage A along the sides.

The construction illustrated in Figs. 1, 2,

and 3 has the advantage over the last-described construction of not increasing the external width of the fire-box; but, on the other hand, it is not applicable to furnaces already constructed, and it also reduces to some extent the breadth of the space over the grate-surface.

The construction illustrated in Figs. 4 and 5 is the simplest and least expensive, and where economy of space around the outside of the furnace is not an object I produce the passage A in that manner.

The ends of the passage A are closed at the front, and into one end is set the end of an air-conducting pipe P, to which is connected an air-blower, (not shown in the drawings,) such as a rotary fan. From this blower air is constantly forced into the passage A around the sides of the fire-box and is constantly discharged through the small tubes B in numerous jets or small streams across the fire-chamber above the fuel both from the rear end forward and from the opposite sides transversely across the space into the flames and gases of the burning fuel.

In the case of a furnace formed by the brickwork-setting of a stationary boiler I build the air-conducting flues or passages $A^{\times}$ directly in the side walls and in the bridge-wall at the back, as I have illustrated in Figs. 6 and 7, and in place of the tubes B, I make slits or narrow apertures through the inner face of the furnace-walls into the flues $A^{\times}$, as shown at $B^{\times}$ $B^{\times}$. On account of the increased thickness of the walls of these air-passages when made of brick instead of iron, I increase the length of travel of the air from the front of the furnace to the points of discharge at the slits $B^{\times}$ by returning the flue once more around the sides and through the bridge-wall, and make the discharge-apertures $B^{\times}$ in the higher one of the two flues, as clearly shown in Figs. 6 and 7.

The end of the supply-pipe P, connected with the air-blower, is set through the front of the furnace into the end of the higher flue at one side of the fire-box, and the two flues are connected by the vertical passage A^2 at the opposite ends, so that the air forced in at one end of the lower flue is carried first around the furnace and into and through the upper flue, from which it is discharged through the outlet-apertures $B^{\times}$ into the flames and gases. These discharge-openings are located in the bridge-walls as well as in the two side walls of the fire-box.

By a valve P′, set in the pipe P, the quantity of air delivered into the furnace is regulated as conditions of perfect or imperfect combustion in the fire-chamber are found to require from time to time.

It will be observed that the jets or streams of air are directed into the flames and gases and are not forced through the body of fuel, so that they are not used to augment the drafts from the ash-pit upward through the grate-bars.

In furnaces of large capacity, however, and in those cases where a forced draft through the fuel is required I carry a branch pipe P^2 from the air-conductor P downward and underneath the furnace to a nozzle N, set below the level of the ash-pit floor in a sunken basin or depression L made in the floor. This depression is the deepest at the front end and the bottom has a regular inclination upward and backward to the face of the bridge-wall, at which point it comes up to the level of the ash-pit floor.

The end of the nozzle N has a broad flat orifice N′, that extends the entire width of the depression L, and this end of the nozzle is so set that its orifice delivers the air in a thin flat stream in a horizontal direction against the inclined bottom of the depression and toward the rear wall of the ash-pit. The effect of this is to deliver and distribute the air in a broad flat stream against the rear wall, where it is deflected and thrown forward and upward against the grate-bars for the full width thereof in the most effective manner. The supply of air to this ash-pit nozzle is controlled and regulated by a valve $L^{\times}$ in the air-pipe P^2, and the valve is worked from above the floor by a lever K on the outside of the boiler-setting. This construction is clearly shown in Figs. 6 and 7^a of the drawings. The construction of such means for increasing the draft through the body of fuel with the forced blast that is applied within the fire-chamber to act on the flames and gases makes a complete and very effective apparatus for furnaces of large capacity where the ordinary draft furnished by the ash-pit openings and the chimney is not sufficient to insure effective ignition and even combustion of the fuel on the grate-surface.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

In a steam-boiler furnace, the combination with the fire-box, of an air flue or passage in the exterior walls thereof extending from the front along both sides and across the rear wall, the tubes or passages leading from said flue through the inner walls of the fire-box and opening into the fire-space thereof above the grate-surface, an air-pipe adapted to connect said flue at the front with an air-blower, the depression in the floor of the ash-pit having an upwardly-inclined bottom, the nozzle sunk in the front of the depression and beneath the floor, and the air-pipe connecting said nozzle with the principal air-supply pipe, and a regulating-valve at said nozzle, constructed for operation as set forth.

In testimony that I claim the foregoing I have hereunto set my hand and seal.

PERKINS H. BAGLEY. [L. S.]

Witnesses:
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