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F. A. JONES.

FURNACE.

No. 540,986. Patented June 11, 1895.

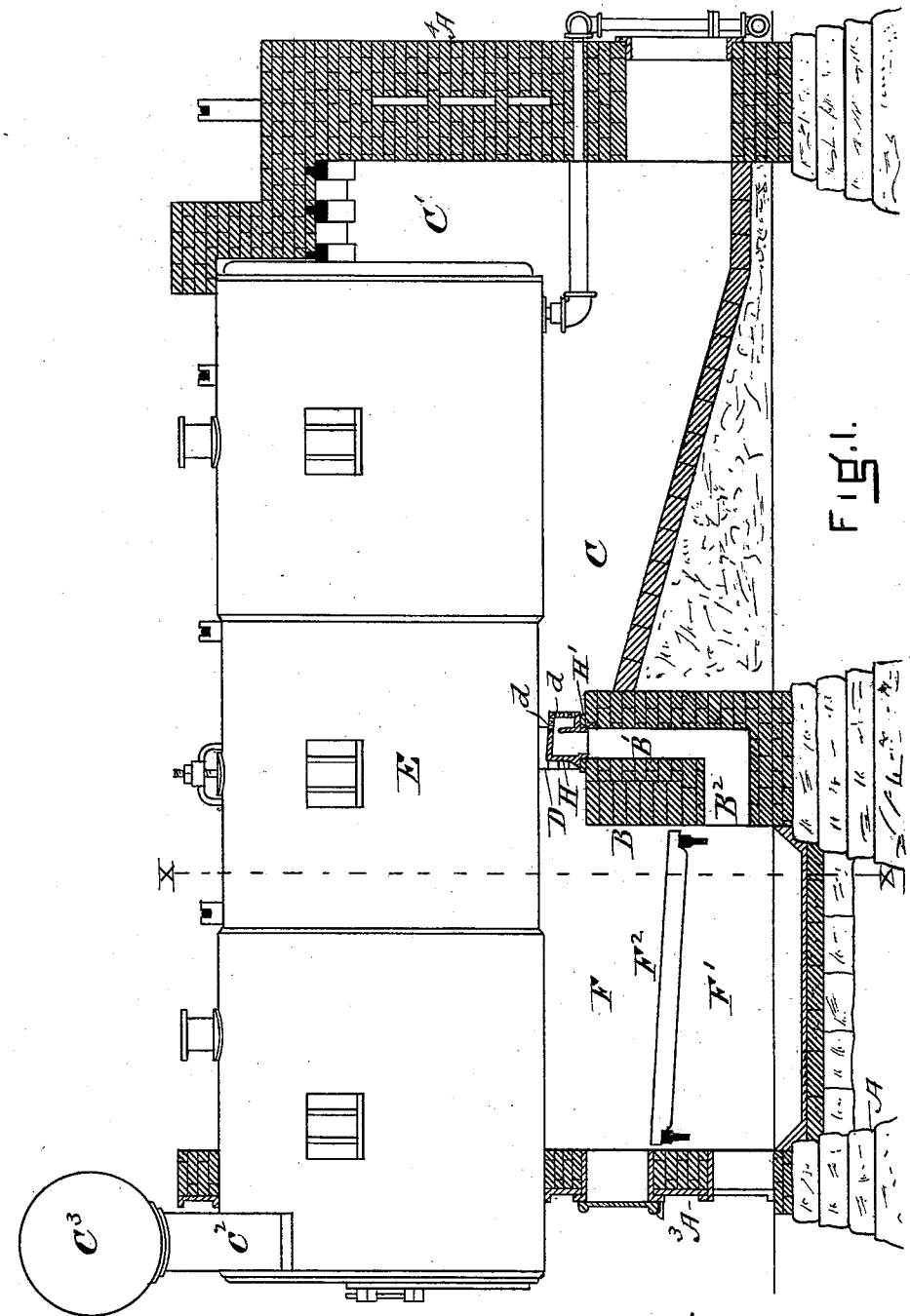

FIG. 1.

WITNESSES

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No. 540,986. Patented June 11, 1895.

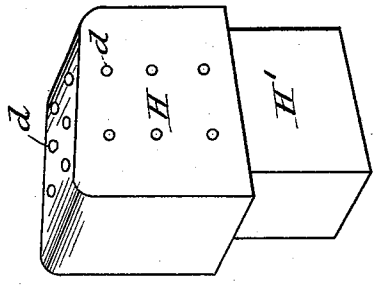

Fig. 3.

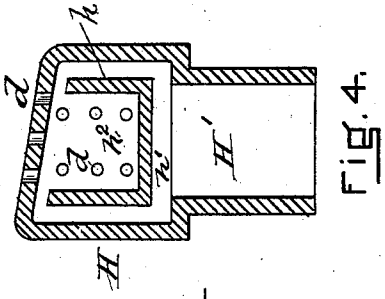

Fig. 4.

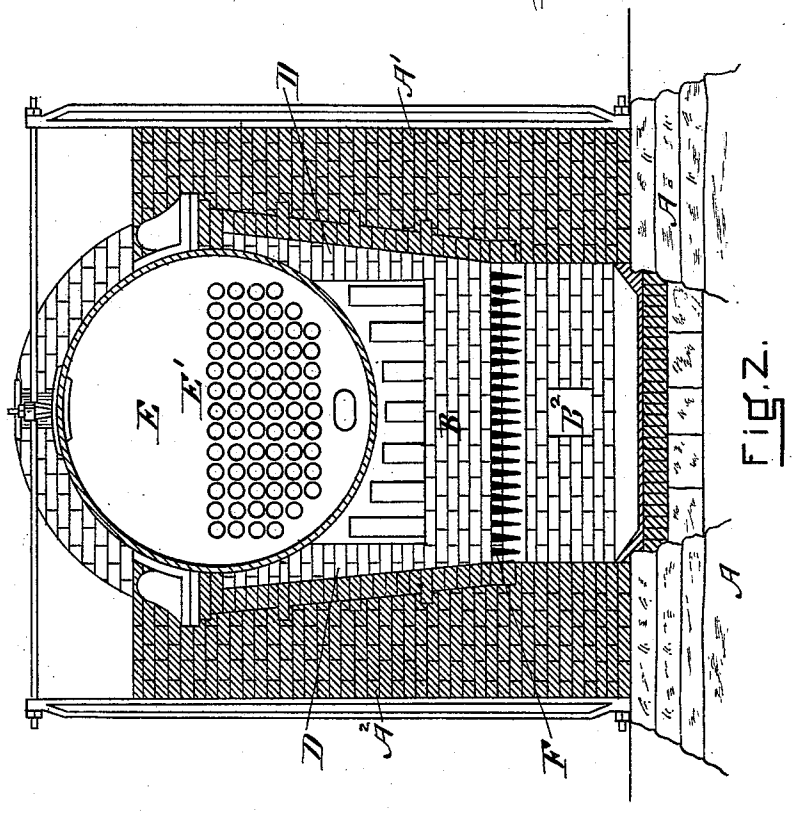

Fig. 2.

WITNESSES

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No. 540,986. Patented June 11, 1895.

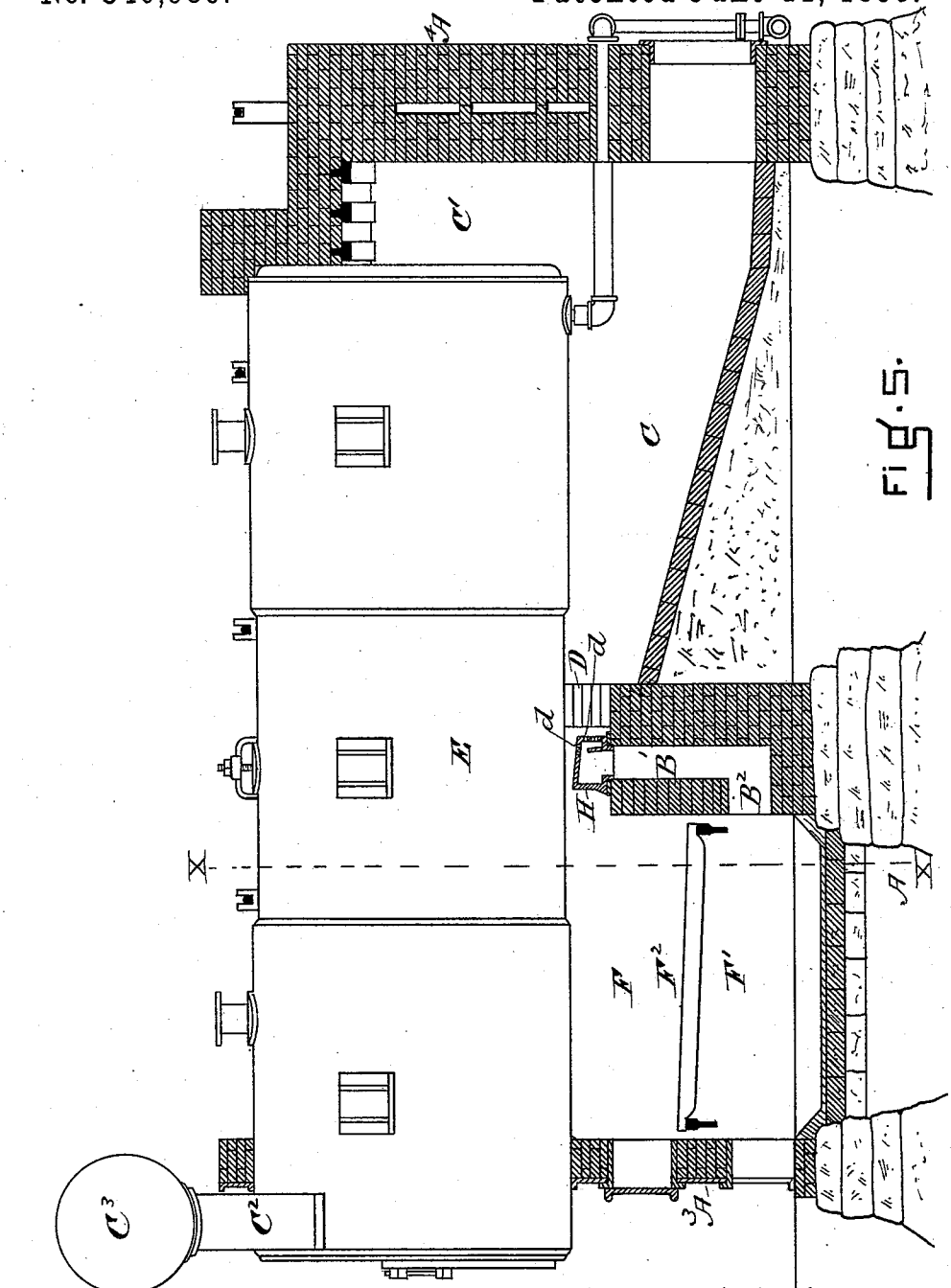

Fig. 5.

WITNESSES.

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(No Model.) 5 Sheets—Sheet 4.

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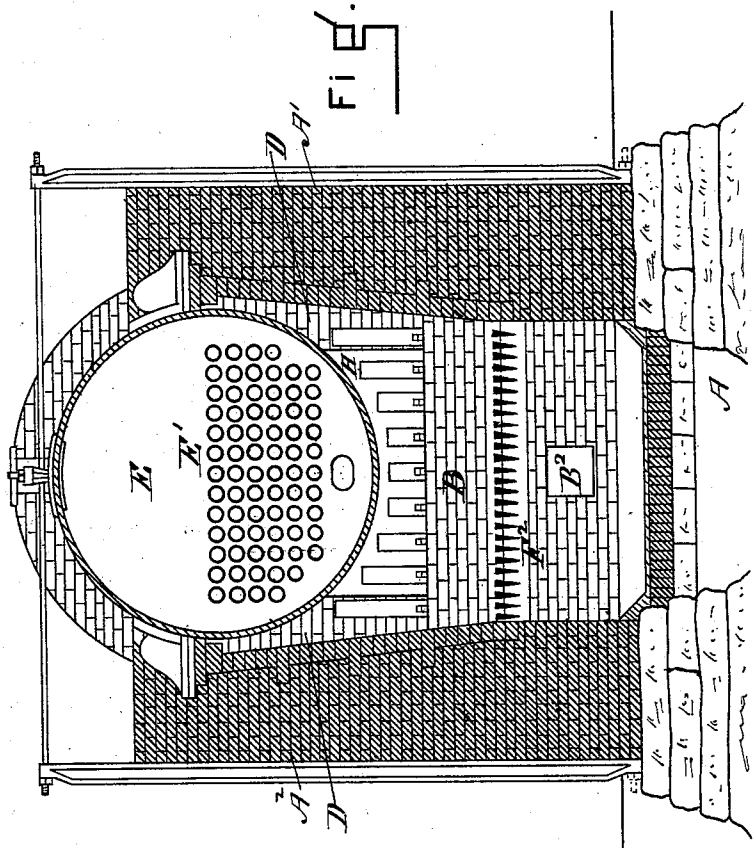
FURNACE.

No. 540,986. Patented June 11, 1895.

Fig. 6.



WITNESSES

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(No Model.) 5 Sheets—Sheet 5.

F. A. JONES.

FURNACE.

No. 540,986. Patented June 11, 1895.

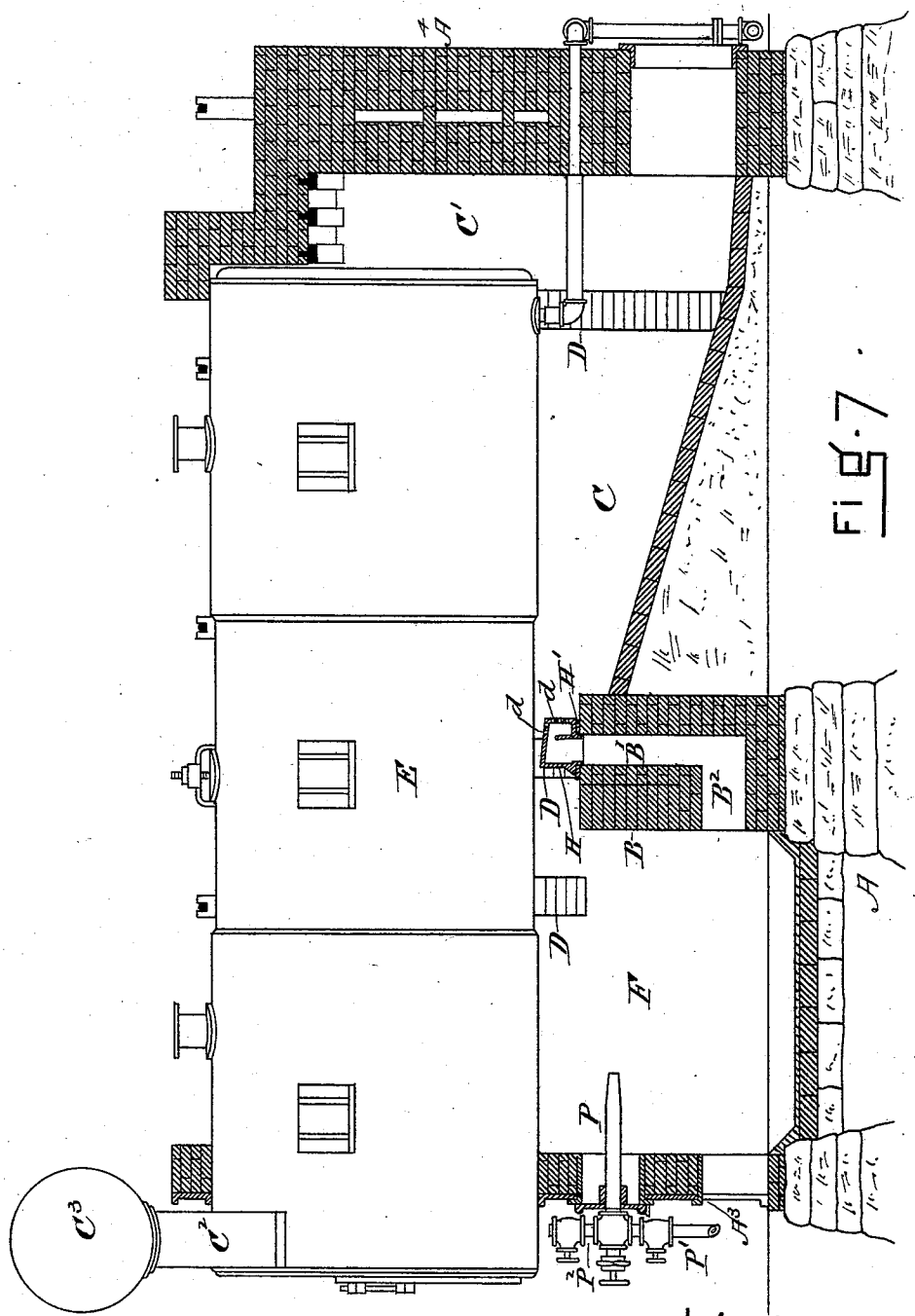

Fig. 7.

WITNESSES

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Florentine A. Jones.

UNITED STATES PATENT OFFICE.

FLORENTINE A. JONES, OF MALDEN, MASSACHUSETTS.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 540,986, dated June 11, 1895.

Application filed January 3, 1889. Serial No. 295,375. (No model.)

To all whom it may concern:

Be it known that I, FLORENTINE A. JONES, of Malden, in the county of Middlesex and State of Massachusetts, have invented a new and useful Improvement in Furnaces, of which the following, taken in connection with the accompanying drawings, is a specification.

The object of my invention is to improve the interior of furnaces by the addition and combination of arrangements of deflecting and contracting walls, with device or devices for supplying air or other combustion supporting mixture or compound for the purpose of maintaining more perfect combustion.

My invention is adapted and designed to improve the combustion of the various substances used as fuel, and is particularly applicable to, and effective in, the burning of gas or gaseous fuel, oil, or other liquid fuels, as well as bituminous coals, which require a large amount of oxygen for their combustion. This object I attain by the construction shown in the accompanying drawings, in which—

Figure 1 is a longitudinal vertical section of my furnace, the boiler being represented in elevation, showing my furnace having deflecting-walls and air-supplying projections situated immediately on the bridge-wall. Fig. 2 is a cross vertical section of the same, taken on line *x x* of Fig. 1, representing air-supplying projections, the heights of which correspond to the curve of the boiler, and located immediately between the inner faces of the directing-walls. Fig. 3 is a perspective view of one of the air-supplying projections. Fig. 4 is a longitudinal vertical section of Fig. 3. Fig. 5 is a longitudinal vertical section of my furnace, the boiler being represented in elevation, with the air-supplying projections situated forward of the directing-walls. Fig. 6 is a cross vertical section of my furnace, taken on line *x x* of Fig. 5, representing the air-supplying projections situated on the bridge-wall and located to the front of a plane parallel with the front face of the directing-walls. Fig. 7 is a longitudinal vertical section of my furnace, the boiler being represented in elevation, showing deflecting-walls situated on the bridge-wall and to the front and rear of the bridge-wall and provided with an appliance for burning oil or gaseous fuel.

My improvements are based principally upon the law that in the mass of flowing matter consisting of vapors, gases, and finely divided solids, due to incipient combustion, a large portion of the more combustible elements are lighter than other portions of the combustible elements, and therefore rise to the highest parts of the combustion chamber.

My design is to cause the flowing combustible volume to be directed into such channels as are hottest and best supplied with air and in the best location for useful effect, and supply the additional quantity of air or other combustion supporting mixture or compound necessary to insure a more perfect combustion of the combustible elements by means of projections extending beyond the surface, and thereby carrying or supplying air or other combustion supporting mixtures or compounds within the outer surface of the flowing volume of combustible matter.

My device for supplying air, or other combustion supporting mixture or compound, to the interior of the flowing volume of combustible matter, and for thoroughly commingling the whole, consists in a series of projections adapted to supply air, or other combustion supporting mixtures or compounds.

In the drawings, I have shown a horizontal tubular boiler E, with its tubes E′, set in masonry A, A′, A^2, A^3, A^4, having a combustion chamber C and flues C′, C^2, C^3, designed to connect with a chimney (not shown), these parts being common and well known.

In Fig. 1, I show a fire-box F, grate F^2, and ash-pit F′. The fire-box F, has at its rear end a hollow bridge wall B, having an opening or air-duct B^2, leading from the ash-pit into the air chamber B′ situated within the bridge wall B, and connecting with the air supplying projections H, situated on the bridge wall B, also provided with deflecting or contracting walls D (more clearly shown in Fig. 2). These walls contract the entrance to the combustion chamber and cause the products of partial combustion that pass from the fire-box F to be deflected under and against the boiler.

By building the directing walls D, D, up between the boiler and the side walls A′ and A^2, I prevent the flow of the currents of combustible matter into this narrow space, where it would become so cooled off as not to burn. As shown in Fig. 1 and various other figures,

there is still room for the flow of currents into the space between the boiler and the side walls, both before and behind the point of contraction.

By building the inner surface of the side walls of the setting inward at the point of entrance to the combustion chamber, I form a throat which brings the field of the greatest heat under the central part of, and in direct contact with the boiler, where it will be the most efficient.

It will be observed that each of the projections H has a shank H′, which is hollow and adapted to fit into the orifice made in the top of the bridge wall B to receive it, or into a plate which may be placed across the top of the bridge wall or chamber B′, and provided with openings for the reception of the shank H′ of these projections H, so that they are readily put in place, and easily removed if occasion requires.

Air from the chamber B′ enters the passage *h′* in the projections H through the hollow shank H′, and passes out into the furnace through the openings *d*, *d*.

While I consider it preferable to construct the air supplying projections separate from the surface they rest upon, yet it is not necessary, and they will function as well if constructed solid with and forming a part of the surface from which they project; and though I prefer to make them of iron, yet they may be made of any other material adapted to the exigencies of their use, and they may be of any desired form. In fact, pipes of any form in their place, carrying and supplying air within the outer surface of the combustible matter, would perform the functions of my air supplying projections. I have shown this particular form and construction of air supplying projection in this application, because it possesses great merit and is more effectual than simple hollow tubes, spheres, or other ordinary forms which would naturally suggest themselves. I have not claimed this particular form of air supplying projection in this application, because it forms the subject-matter of a subsequent application for a patent, filed June 28, 1894, Serial No. 515,973.

For furnaces adapted for burning oil or other liquid or gaseous fuels, I omit the grate and provide oil or gas pipes, one of which is indicated by P, in Fig. 7. These oil pipes, or other appliances for the burning of natural gas or gaseous fuel, or gases obtained from the burning of coals, may have in connection with them steam and air pipes, and be provided with injectors and other usual appliances.

In Fig. 6 it will be observed that the air supplying projection on each end of the series is situated outside of the planes of the inner surfaces of the directing walls, while the rest of the series of projections are situated between the planes of the inner surfaces of the directing walls.

For some purposes it is desirable to place directing walls in front of the bridge wall, also in the rear of the bridge wall; and in Fig. 7 they are placed in the fire-box and at the end of the combustion chamber. These walls can be perforated and supplied with air in any convenient manner.

For the purpose of illustrating and showing forms of construction, I have placed the air supplying projections H, H, on the bridge wall; but it is to be understood that the projections H, H, may be placed in a great variety of positions and still be between the planes of the inner surfaces of the directing walls and functionally identical with those on the bridge wall.

When the projections H, H, are placed on the bridge wall, the flues for the passage of air to them may pass within the bridge wall, and may be formed in it as shown; but in case air supplying projections are applied away from the bridge wall, then air may be supplied through the side walls of the furnace, or flues may be made for the purpose; but this comes within the limits of ordinary skill in construction, and need not be illustrated.

In the specification, I have only shown my device in combination with the ordinary horizontal tubular boiler with a plain setting, but it is evident that my devices are applicable to, and designed to be applied to boilers and furnaces of almost every construction.

It will be seen from the foregoing that the essential features of my invention are as follows:

First, the wing walls which project inwardly from the side walls of the casing and are in contact with the side portions while the sides of the boiler along the fire-box and combustion chamber are fully exposed to the heat as usual, excepting the limited portions covered by said wing walls. The higher spaces or channels at the junction of the side walls of the casing and the sides of the boiler are dammed or obstructed and the products of partial combustion rising from the fire are deflected downwardly and inwardly and are caused to pass along the bottom of the boiler at the point where the air is diffused through them, the said wing walls covering only the sides and not the bottom of the boiler so that their inner faces form the sides of a contracted throat the top of which is the bottom of the boiler.

Secondly, the projections or tongues extending upwardly into the throat and preferably above the vertical center of the throat or into the upper portion thereof and arranged to diffuse a combustion supporting mixture through all parts of the concentrated volume of products of partial combustion flowing through said throat.

It is well known that portions of the products of combustion of coal or any hydrocarbon fuel are heavier and denser than atmospheric air. Hydrogen, however, is much lighter and it happens, therefore, that the volume of products of partial combustion flowing

from the fire box becomes stratified, the hydrogen rising to the highest point where without meeting its equivalent of oxygen it passes away unconsumed with a great loss of useful effect, the combustion of hydrogen giving out several times more heat than that of carbon, and being necessary to insure the perfect combustion of the carbon. The denser stratum under the stratum of hydrogen acts as a barrier, preventing air introduced into the lower portion of the flowing volume from rising and mingling with the hydrogen.

It will be seen that my improvements effectually prevent the escape of the hydrogen unconsumed, by insuring a supply to the hydrogen of its equivalent of oxygen at the upper portion of the contracted throat, and further that by thus insuring the combustion of the hydrogen at the upper part of the throat and in direct contact with the most effective heating surface of the boiler I thoroughly utilize the heat resulting from the combustion of the hydrogen.

I am aware that it has been proposed to form a series of contracted throats below the bottom of a boiler and to diffuse air through the products of partial combustion passing through said throats, but so far as I am aware the throats have been separated from the bottom of the boiler so that the united volume of oxygen and hydrogen does not impinge directly upon the bottom of the boiler, the heat given out by the hydrogen being therefore much less fully utilized.

I desire to lay especial stress on the direct impingement of the united hydrogen and oxygen upon the effective heating surface of the boiler entirely across the throat, and it is this that particularly distinguishes my invention from anything of which I am aware in the prior state of the art.

I am also aware that it has been proposed to admit streams of air into an open space behind the bridge wall, the top of said space being the bottom of the boiler, but without provision for conducting the air into the upper stratum of hydrogen through the underlying barrier of denser gases. Without this provision the hydrogen is not utilized as above stated.

I claim—

1. The combination with a boiler, of a casing or setting having inwardly projecting wing walls which are in contact with the side portions of the boiler but are separated from the bottom portion thereof and cooperate with the said bottom portion in forming a contracted throat arranged to conduct the products of partial combustion along a portion of the bottom of the boiler, and a series of tuyeres or projections which extend above the vertical center of said throat and are arranged to diffuse a combustion supporting mixture through the lighter parts of the volume of products of partial combustion flowing through said throat.

2. The combination with a boiler, of a casing or setting which with the boiler constitutes a fire-box and a combustion chamber, a bridge wall between said fire-box and combustion chamber, inwardly projecting wing walls which are in contact with the side portions of the boiler but are separated from the bottom portion thereof, and cooperate with the bridge wall and the bottom of the boiler in forming a contracted throat through which the products of partial combustion pass from the fire-box into the combustion chamber in contact with the boiler, and a series of tuyeres or projections extending above the vertical center of said throat, and arranged to diffuse a combustion supporting mixture through all parts of the flowing volume of products of partial combustion passing through said throat, including the lighter products in the upper portion of the throat.

3. The combination with a boiler, of a casing or setting having inwardly projecting walls which are in contact with portions of the sides of the boiler but are separated from the bottom portion thereof, and cooperate with the said bottom portion in forming a contracted throat arranged to conduct the products of partial combustion along a portion of the bottom of the boiler and a series of tuyeres or projections situated between the inner surfaces of the inwardly projecting walls and arranged to diffuse a combustion supporting mixture through the volume of products of partial combustion flowing through said throat.

4. The combination with a boiler, of a casing or setting having inwardly projecting walls which are in contact with portions of the sides of the boiler but are separated from the bottom portion thereof, and cooperate with the said bottom portion in forming a contracted throat arranged to conduct the products of partial combustion along a portion of the bottom of the boiler and a series of tuyeres or projections arranged substantially as shown to diffuse a combustion supporting mixture through the volume of products of partial combustion flowing through said throat.

FLORENTINE A. JONES.

Witnesses:
FRANK G. PARKER,
MATTHEW M. BLUNT.