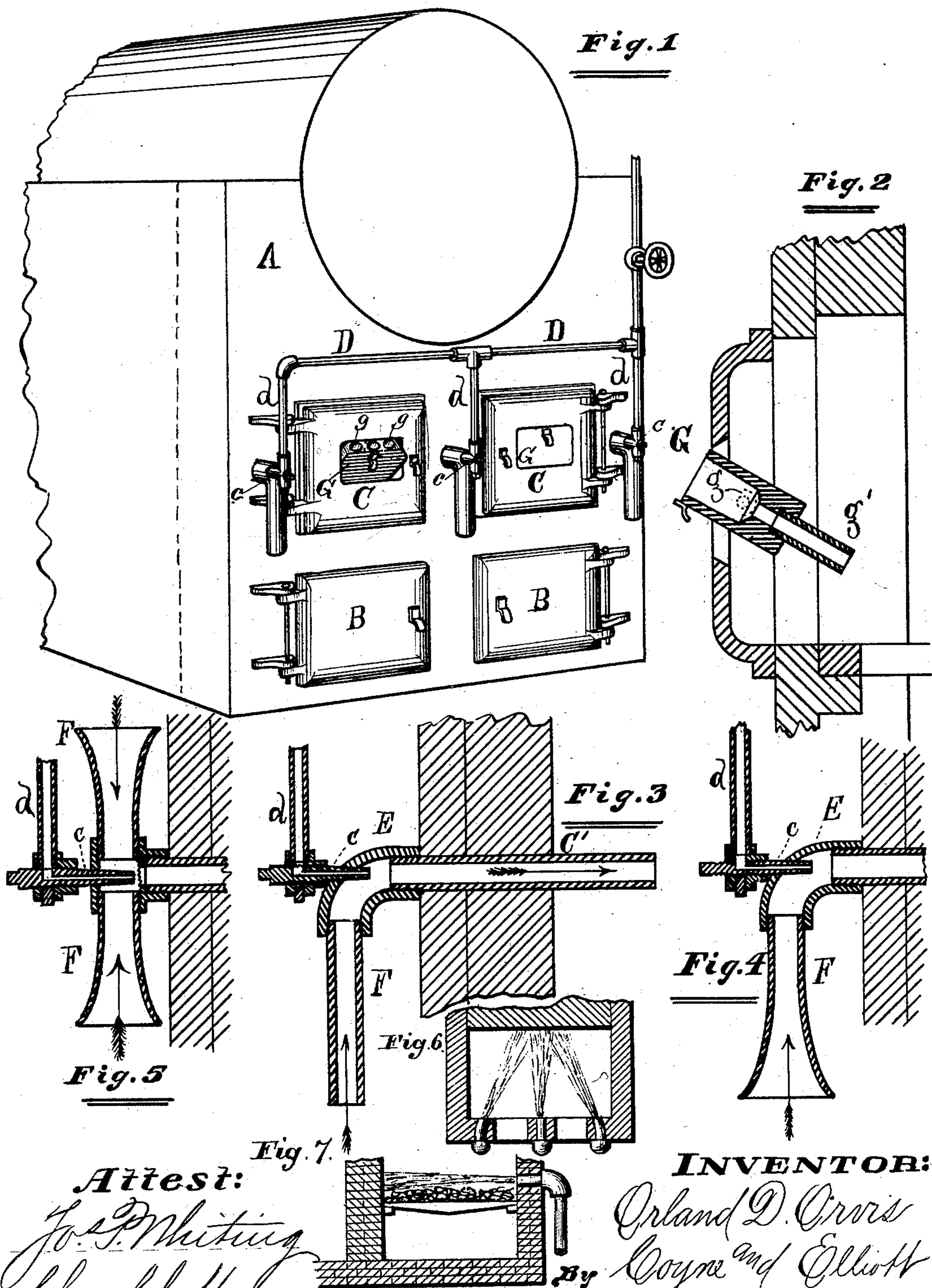


O. D. ORVIS.
Steam-Boiler and other Furnaces.

No. 223,238.

Patented Jan. 6, 1880.



Attest:

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UNITED STATES PATENT OFFICE.

ORLAND D. ORVIS, OF CHICAGO, ILLINOIS.

STEAM-BOILER AND OTHER FURNACES.

SPECIFICATION forming part of Letters Patent No. 223,238, dated January 6, 1880.

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To all whom it may concern :

Be it known that I, ORLAND D. ORVIS, of Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Steam-Boiler and other Furnaces, of which the following is a specification.

This invention relates to devices for supplying steam and air to the fire-chamber of furnaces to assist combustion.

10 The object of this invention is to consume the products of combustion, which would otherwise produce smoke and pass off into the open air, by directing into a furnace jets of oxygen or air intermingled with the hydrogen
15 of steam, together with streams of air alone, in such a manner that all of the products of combustion arising from the burning fuel will be fully and thoroughly ignited, and hence consumed.

20 A further object is to provide a furnace-door with means for introducing streams of air into the furnace at any desired angle to the surface of the burning fuel, or entirely cut off the same from the furnace.

25 In the accompanying drawings, in which similar letters of reference indicate like parts, Figure 1 is a perspective view of a furnace and boiler, showing my attachment; Fig. 2, a vertical section through the same, showing the
30 construction and manner of attachment of the air-draft. Fig. 3 is a vertical section through the same and the steam and air supply pipe and steam-jet; Figs. 4 and 5, modifications of the inlet of the supply-pipe; Fig. 6, a plan
35 view with the boiler removed, showing the direction of the steam and air jets; Fig. 7, a longitudinal vertical section, showing the relative position of the steam and air jets to the top of the bridge-wall.

40 A represents the front and a part of the side walls of a furnace with a boiler mounted thereon.

45 B B are the doors of the ash-pit, and C C the doors of the furnace, of the ordinary construction.

D is a steam-pipe connecting with a pipe having a stop-cock to the upper part of the boiler, and extending across the front of the wall of the furnace, with vertical extensions *d*
50 *d d* reaching downwardly, and having attached, at right angles to their lower ends, by any suit-

able means, injectors *e*, which form continuations of extensions *d*.

C' are outlet-pipes to conduct combined steam and air to a furnace. These outlet-pipes
55 C' are set in the walls of the furnace, on either side of the furnace-doors, in a horizontal plane at a height just above the surface of the fuel upon the grate-bars, and not so high that a line drawn from them would be above the fire-
60 wall. Those next the side walls have a sufficient horizontal curve in the direction of the center of the furnace, as shown in Fig. 6, to direct the steam and air jets toward the center of length of the bridge-wall, where the
65 products of combustion are the thickest and at their highest temperature. The ends of these pipes C' project upon the outside sufficiently beyond the walls to permit of the attachment of an elbow, E. 70

To the lower end of the elbow is attached, in a vertical line, an air-supply pipe, F, of about the same length as the outlet-pipe, which may be straight, as shown in Figs. 1 and 3, or flaring at its mouth, as shown in Fig. 4. 75

A modification of the air-supply pipe is shown in Fig. 5, in which I use a T-joint instead of an elbow, and extend the pipe above the outlet-pipe, so that I am enabled to obtain a current of air from two directions. 80

The steam-pipes are connected to the air and outlet pipes by passing the injector, in a horizontal plane with the outlet-pipe, through a perforation in the elbow or T-joint, as shown in Figs. 1, 3, 4, and 5. By this means I am
85 enabled to conduct a jet of steam and air in a direct line into the furnace, and to have the jet at such a distance from the opening of the air-supply pipe that there will be little or no noise from the rush of the steam and air, and
90 at the same time have a direct current of air in the supply-pipe. In the doors C of the furnace I have a rectangular opening for inserting the drafts G, which, when closed, entirely fill the opening. These drafts have perfora-
95 tions *g* extended through them from edge to edge, and are pivoted to the doors, so that when closed no air will be admitted. The perforations *g* are made quite large at their upper end, but converge toward the center
100 and terminate in a small neck, and are in outline like the bowl and stem of an ordinary

goblet. To the neck of this perforation is attached a removable extension, g' , in such a manner that it will not interfere with the opening and closing of the draft.

5 By the above construction it will be seen that I may not only cut off the current of air through the draft, but may direct it at any desired angle into the furnace, or upon the fuel, and that a supply of air is thus obtained
10 between the currents of air and steam to complete combustion, thereby consuming the smoke, and at the same time economizing the amount of steam otherwise necessary for this purpose.

15 The operation of my device is as follows, viz.: Having fired up until steam has formed in the boiler, I turn the stop-cock and admit the steam to the pipes. As a vacuum is formed by the escape of the steam from the injector
20 through the inlet-pipe into the furnace the air rushes in from the supply-pipe, and is mingled with the steam, thus producing a blast of oxyhydrogen, to assist combustion in the furnace.

25 About the time the steam is turned on I open the air-drafts in the doors, to introduce a current of air between the streams of air and steam. By practical experiment I have found that some of the products of combustion accumulate between the streams of oxyhydrogen,
30 and that by having the intermediate adjustable air-draft, to introduce a current of air between these streams, they are entirely consumed.

35 Having thus described my invention, I wish it to be understood that I do not confine myself to the exact construction set forth, for I

may insert the pipe d through the elbow, instead of attaching it upon the outside to the injector, or I may make my draft with straight
40 perforations instead of converging ones, and I may do away with the extension g' , &c.; but

What I do claim, and desire to secure by Letters Patent, is—

1. In a furnace, a series of steam and air
45 pipes, arranged substantially as described, to inject combined steam and air in a horizontal plane from the front, so as to converge toward the center and back of the furnace, below the fire-wall, and in close proximity to the burning
50 fuel, in combination with the pivotally-adjustable and independently-operating air-draft secured to the door of the furnace and intermediate the points of entrance of the jets, the said draft being an auxiliary to the combined
55 steam and air jets, whereby combustion is facilitated and the smoke entirely consumed.

2. The combination, with a furnace-door, of a pivotally-adjustable air-draft attached to said door, and provided with perforations g ,
60 converging near their bottom, as shown, and removable extensions g' , substantially as and for the purpose described.

3. The combination, with the door of a furnace, of the pivotally-adjustable air-drafts G ,
65 attached to said door, and provided with perforations g , extending from edge to edge, whereby a current of air may be directed into the furnace at any desired angle or be entirely cut off, substantially as described and shown. 70

ORLAND D. ORVIS.

Witnesses:

CHAS. H. SCHOFF,
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