

G. W. CUMMINGS.
Steam-Generating Furnaces.

No. 156,208.

Patented Oct. 27, 1874.

Fig. 1.

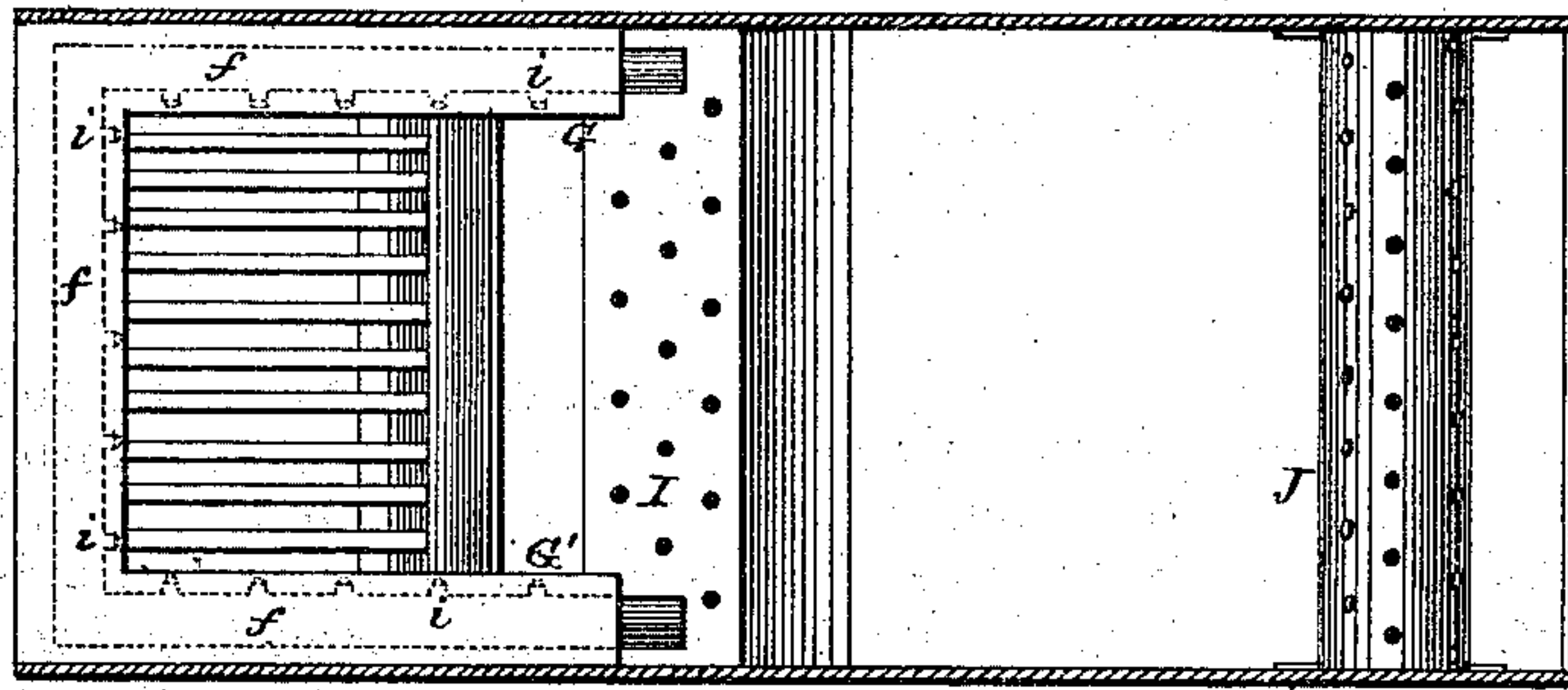


Fig. 2.

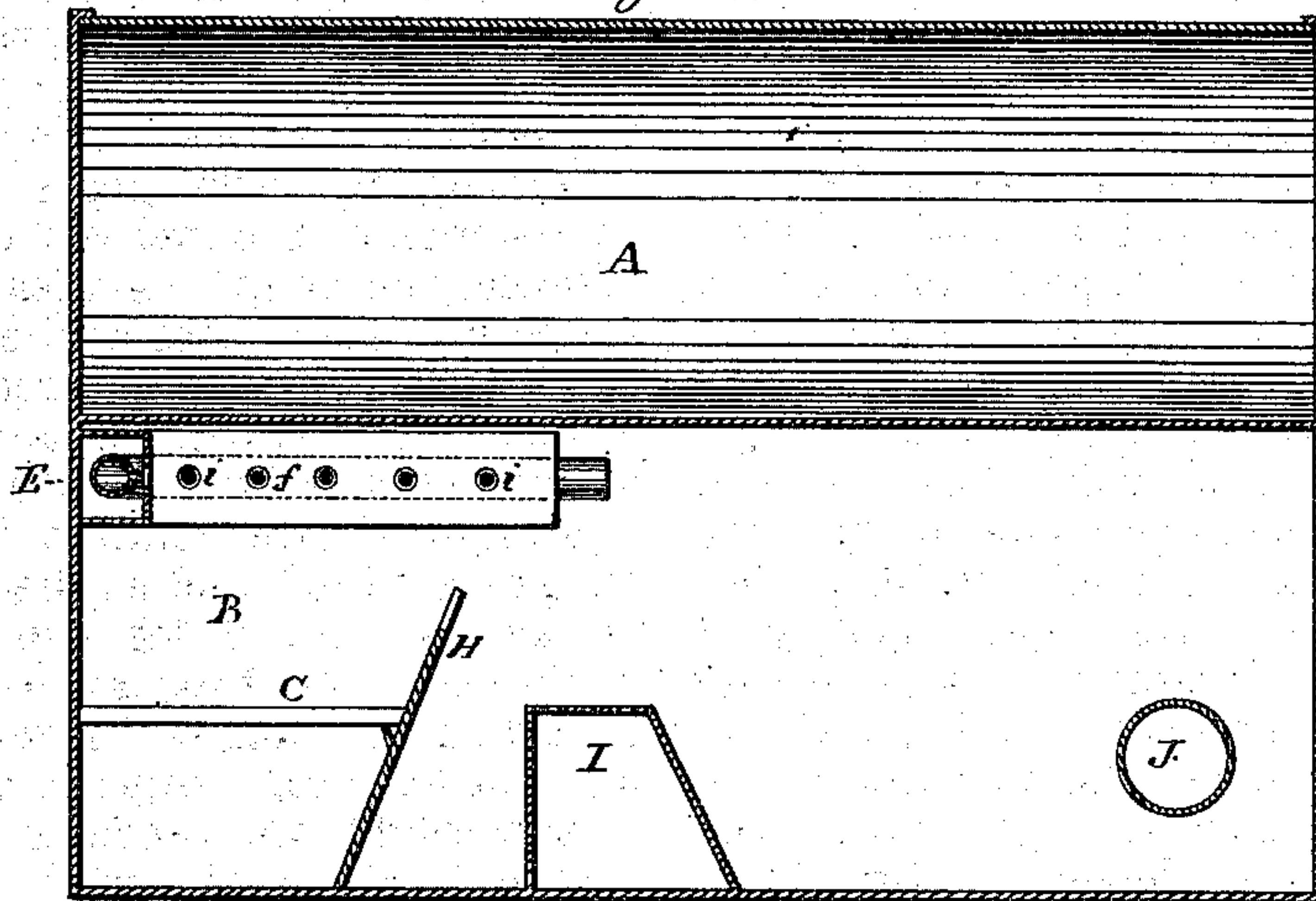
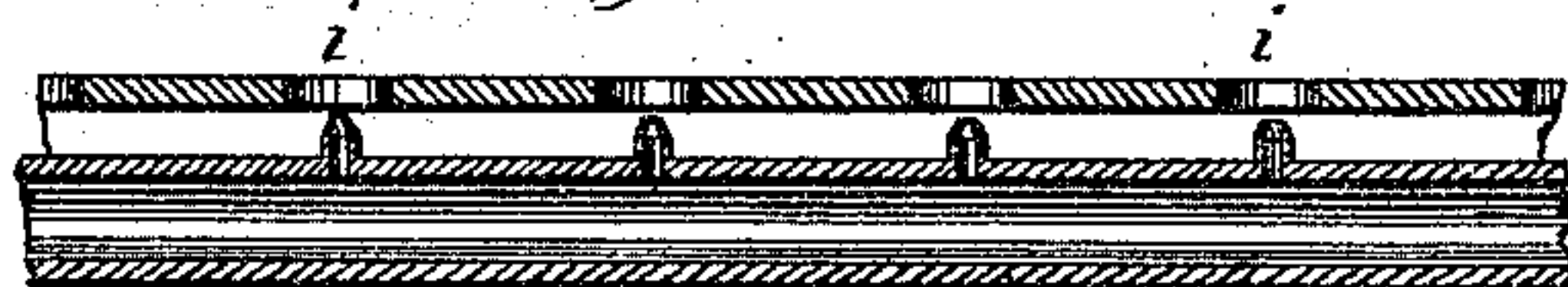


Fig. 3.



WITNESSES:

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UNITED STATES PATENT OFFICE.

GEORGE W. CUMMINGS, OF CLEVELAND, OHIO.

IMPROVEMENT IN STEAM-GENERATING FURNACES.

Specification forming part of Letters Patent No. **156,208**, dated October 27, 1874; application filed September 16, 1874.

To all whom it may concern:

Be it known that I, GEORGE WASHINGTON CUMMINGS, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented Improvements in Steam-Generating Furnaces, of which the following is a specification:

The object of my invention is to provide means for completing or perfecting the combustion of coals or other fuels and their gaseous products in the fire-boxes or furnaces connected with steam-boilers.

The nature of my invention consists in supplying the incandescent coals and the gases arising therefrom with oxygen from air and steam introduced into the fire-box above the furnace-door, and pure air introduced into the lower part of the flame-bed, back of the bridge-wall, and at one or more points between said bridge-wall, and along the flame-bed between the furnace and the rear end of the boiler, in such manner that the large quantity of air introduced and necessary to complete combustion shall not operate as a cooling medium, but shall rather augment the heat, and thereby increase the evaporation going on in the boiler with the same or a lesser quantity of fuel and the suppression of smoke.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

The boiler being constructed in any of the known forms, I introduce a current of air to the fuel and flames in the fire-box or furnace by means of pipes or chambers, placed within the casement-walls of the fire-box or furnace over the fire-doors, or along the sides of the fire-box, furnace, or casement, and fitted with apertures, through which air and steam are forced, as hereinafter described. I also admit pure air unmixed with steam to the flame-bed at a point immediately behind the bridge-wall through a pipe or flue perforated with small holes on the top and one side of said pipe or flue, and said pipe or flue extends laterally across the flame-bed and through both side walls of the casement, so that, the ends being open, the air from the outside of said fire-box or casement may have free access to the gases as they pass the bridge-wall on their way to the flues of the boiler and the chimney. At one or more points between the first-described

perforated tube or flue and the rear end of the boiler I introduce one or more perforated pipes or flues, extending laterally across the flame-bed and through the side walls of the casement, open at each end to admit the air freely from without, as in the case of the first perforated pipe or flue behind or near the bridge-wall. The object of this arrangement of the tubes, or pipes, or flues is, that the first pipe or flue over the furnace-doors or along or within the sides of the casement or fire-box may, by admitting air to the gases arising from the combustion of the fuel within said fire-box or furnace, thoroughly mix said gases, and by supplying said gases at the same time with oxygen from the air so introduced initiate the combustion of said gases, and as the products of said combustion pass over the bridge-wall in a highly-heated state a further supply of oxygen is added, and as the flame progresses toward the rear of the boiler it receives still further supplies of oxygen to support the combustion in like manner through the perforated pipes or flues communicating with the atmosphere without said casement, and thus the combustion is continued until completed.

I perforate the flues or pipes I J on top and one side for the following reason, viz., that when the draft from the chimney, which is always more or less variable, shall cause the currents of air, gas, or vapors from the fire-box to pass over the top of said perforated pipes or flues so rapidly as to overcome the atmospheric pressure from without the casement or fire-box, thereby in effect corking up said top apertures, the side apertures will supply the requisite quantity of air, for the purpose heretofore stated.

Reference being had to the accompanying drawings, it will be seen that Figure 1 is a plan view of my invention applied to an ordinary fire-box or furnace under a steam-boiler, the boiler A being removed, in order that an unobstructed view may be had. C represents the grate-bars; E, perforated pipe or chamber over the fire-doors; f, perforated steam-pipe; G and G', perforated pipes or chambers in the sides of the fire-box or casement; I, pipe or flue behind the bridge-wall, perforated on top and one side, as described; and J, one of the perforated pipes or flues, of which there may

be several, at or near the rear end of the casement, and beneath the boiler.

Fig. 2 is a longitudinal vertical section of the fire-box or furnace and boiler with my apparatus attached, A being the boiler; B, fire-box; C, grate-bars; D, ash-pit; E, perforated pipe or chamber over fire-doors; G G', similar perforated pipes or chambers along the sides of the casement; *f*, perforated steam-pipe within the chamber E and the side chambers G G'; H, bridge-wall; I, perforated pipe or flue behind bridge-wall; J, perforated pipe or flue in rear of casement, and at convenient distances between the bridge-wall and the rear end of the boiler.

I prefer to make the perforations in the air pipes or flues about half an inch in diameter, and to place them about one and one-half inch apart from center to center.

The steam-pipe *f* passes from the boiler through the flue or chamber E, and may also be made to extend down the side flues or chambers G and G'. That part of it inclosed in the flues or chambers E and G and G' is perforated along the inner side, and both ends of the flue or chamber E being open, the steam escaping through the perforations in the steam-pipe *f* into the said air flue or flues, and thence through their perforations into the fire-box, draws in a current of air, which passes into the fire-box with the steam.

In lieu of the perforated pipes or flues I J, and as the equivalent thereof, a similarly perforated horizontal plate may be introduced into the flame bed or chamber back of the bridge-wall, and extending from said bridge-wall back to the rear end of the boiler, and from side to side of the casement, forming a perforated floor under the flame-bed and a little below the bridge-wall, through which air will be introduced to the flame behind the bridge-wall from the chamber below said floor. In such case there must be sufficient openings in the sides of the casement to admit air under said perforated floor; and these openings may be provided with regulating-valves, to control the admission of air.

The perforations in the steam-pipe *f* dis-

charge through small nipples *i*, which coincide with the somewhat larger perforations in the inner wall of the chamber E, as shown on enlarged scale in Fig. 3.

I do not introduce steam into the fire-box under the supposition that the steam actually burns; but I employ the steam-pipe *f* simply as a blower, for forcing air into the fire-box, and disseminating and mixing it with the gaseous products of combustion arising from the burning fuel.

I deem it essential that the air introduced back of the bridge-wall be introduced below the top of said wall, in the lower part of the flame-bed, at a point near said bridge, and also at one or more points between the point last mentioned and the rear end of the boiler.

I am aware that an attempt was long ago made to improve a furnace by introducing superheated steam mixed with hot air into the fire-box, and hot air unmixed with steam into the flame-flue, just back of the bridge-wall, immediately under the boiler, and above the flame-bed, through perforated pipes, and that a patent was granted to one C. Buckhardt, June 5, 1849, on a furnace constructed to effect said object. I do not therefore claim, broadly, introducing air and steam into the fire-box, and pure air into the flame-bed or flue back of the bridge-wall through perforated pipes; but

What I do claim is—

A perforated air-flue above the furnace-grate inclosing a perforated steam-pipe, provided with nipples, as described, for blowing air and steam into the fire-box, in combination with perforated air-flues below the top of the bridge-wall, and between it and the rear end of the boiler, for introducing pure air to the lower portion of the flame-bed, all being constructed, combined, and arranged to operate substantially as described.

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Witnesses:

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