

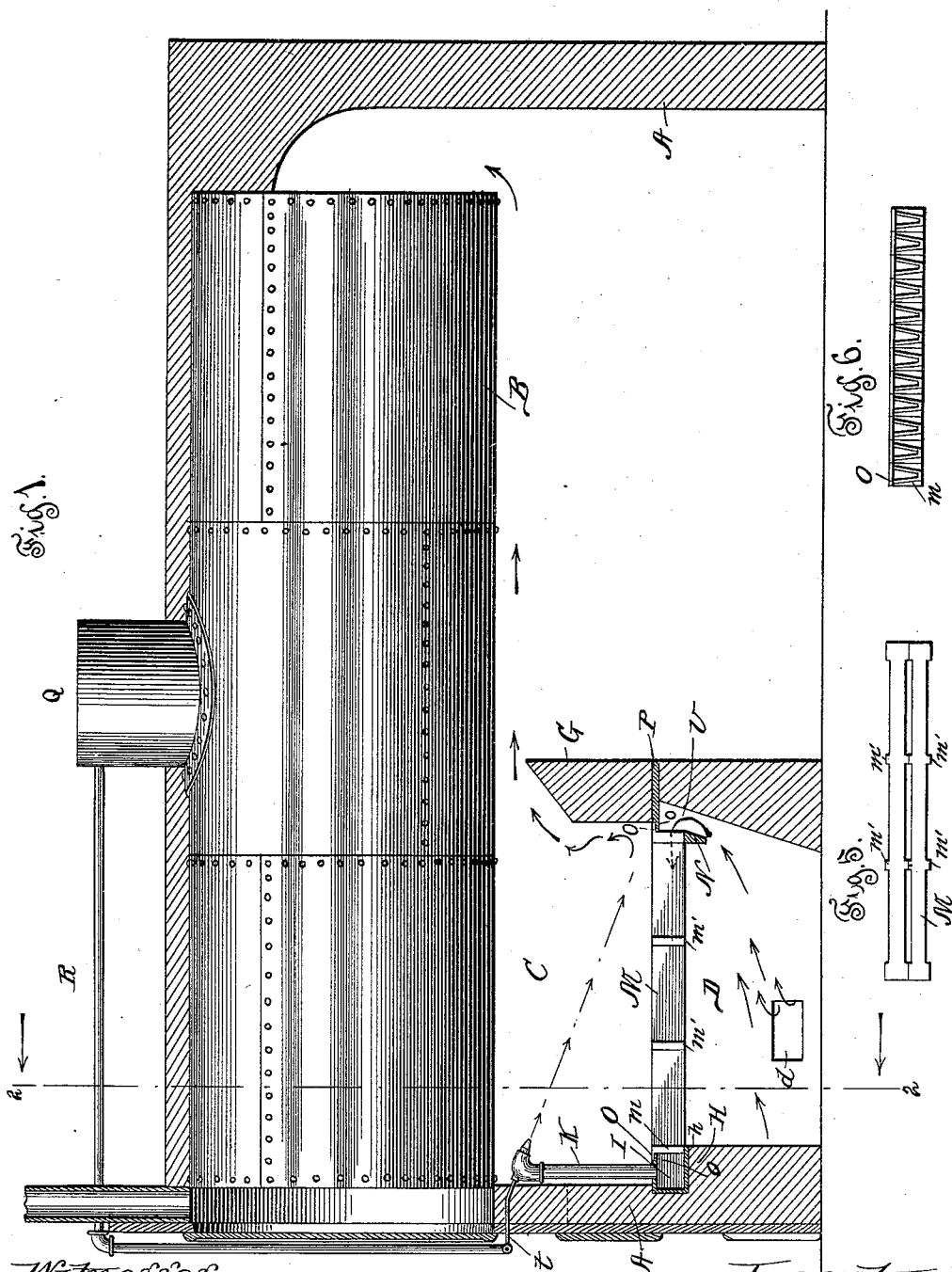
(No Model.)

W. WALTERS.
FURNACE.

2 Sheets—Sheet 1.

No. 479,771.

Patented July 26, 1892.



Witnesses
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(No Model.)

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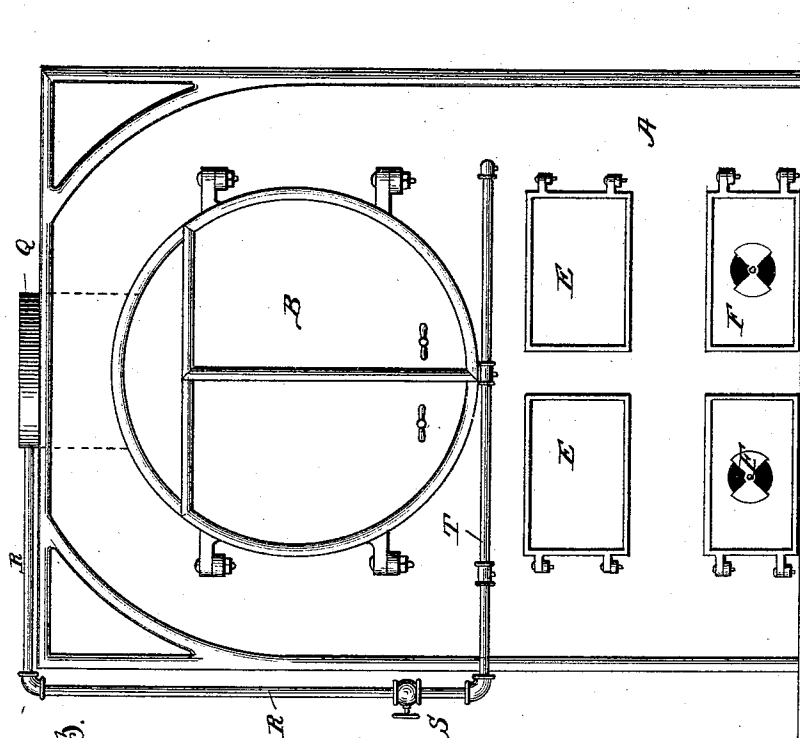


Fig. 3.

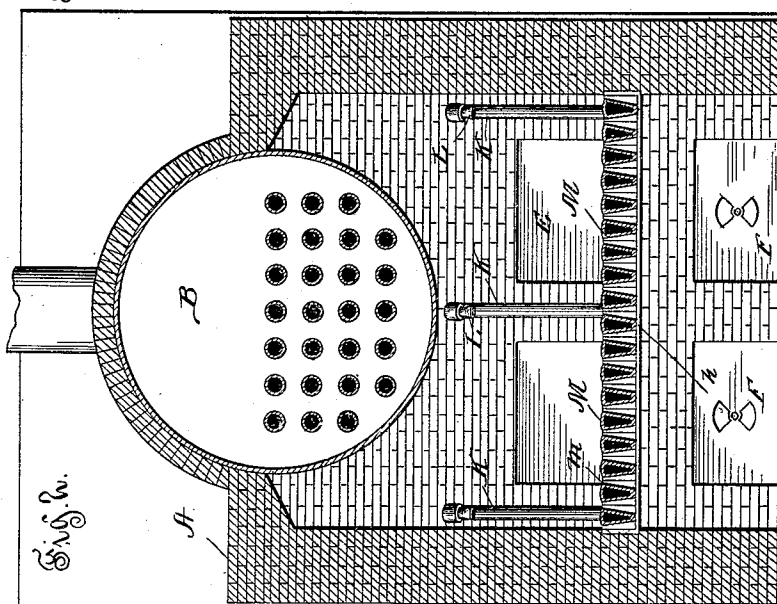
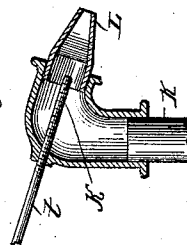


Fig. 4.

Fig. 5.



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UNITED STATES PATENT OFFICE.

WILLIAM WALTERS, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-FOURTH TO
GEORGE D. GARLAND, OF SAME PLACE.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 479,771, dated July 26, 1892.

Application filed October 20, 1891. Serial No. 409,275. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM WALTERS, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Furnaces, of which the following is a specification.

My invention relates to steam-boiler furnaces and the acceleration of combustion therein, and more particularly in that class of steam-boiler furnaces in which jets of combined air and steam are injected into the fire-box for promoting combustion.

The invention has for its primary object to provide improved means for retaining the smoke and other products of combustion not fully consumed within the furnace until perfect combustion has taken place, but without thereby retarding the free draft between the fire-chamber and the uptake, thereby obtaining the maximum degree of heat from a given amount of fuel within a given period of time and preventing the discharge of objectionable products of combustion into the atmosphere.

My invention also has for its object to supply the combustion-chamber or fire-box with highly-combustible gas or vapor composed of heated air and steam to assist in the thorough consumption of the partially-consumed products and to heat the said air by means of the heat of the fire-box without thereby producing a detrimental and wasteful draft through the fuel, and at the same time to utilize such air for cooling the grate-bars, and thus prevent them from burning out.

With these ends in view my invention consists in certain features of novelty by which the said objects and certain other objects of minor importance are accomplished, herein-after fully described, and more particularly pointed out in the claims.

In carrying out my invention I propose to retain the smoke and other partially-consumed products of combustion within the fire-box until perfect combustion has taken place by means of a current or currents of combustible gas, such as that resulting from combining highly-heated air and steam, which currents are directed across the fire-chamber in a downward direction toward the base of

the bridge-wall, so that the ascending products of combustion, instead of being permitted to rise and immediately pass over the bridge-wall and thence into the uptake, are depressed into contact with the incandescent fuel and compelled to traverse the whole extent of the fire-box, during which time the combined heat of the incandescent fuel and the burning stratum of gas thoroughly consumes them. This forced stratum of gas, while it has the effect of retaining the smoke and unconsumed particles within the fire-box, it nevertheless does not retard the draft between the fire-box and the uptake. It only prolongs the course or flight of the products within the fire-box and causes them all to pass to the hottest point in the furnace—that is, immediately in front of the bridge-wall—before they can ascend and pass over the latter; but by the time they reach this point they are fully consumed, and hence the resulting heat only passes over the bridge-wall. In fact this forced stratum of gas, unlike the ordinary “buffer-draft,” has a slight tendency to make the furnace draw more freely, inasmuch as it is projected in the direction of the natural draft, it taking approximately the course indicated by the arrows in Fig. 1—that is, it cuts across the fire-box to a point just in front of the bridge-wall, where its weakened velocity is overcome by the upward draft of the uptake and it is thereby deflected over the bridge-wall. The supply of air necessary for the formation of this gas is drawn through the fire in the fire-box, but out of contact therewith, so as to be highly heated, but without accelerating the draft through the fuel in passing through the latter, and the necessary steam is drawn from the steam-dome of the boiler or other suitable source, and the two are combined and directed across the fire-chamber in the described manner, the dynamic force of the steam being employed for drawing in the air and projecting the resultant gas in the desired direction.

In order that others skilled in the art may be able to make and use my invention, the same will now be more particularly described with reference to the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section

of a steam-boiler furnace provided with my improvements. Fig. 2 is a vertical transverse section taken on the line II II, Fig. 1, looking in the direction of the arrows. Fig. 3 is a rear end elevation thereof. Fig. 4 is an enlarged detail sectional view of one of the injector-nozzles hereinafter described. Fig. 5 is a plan view of two of the grate-bars, and Fig. 6 is an end elevation of the grate-bars hereinafter described.

In the drawings, wherein like signs of reference refer to like parts throughout the several views, A is the furnace wall or setting, B a boiler arranged therein, C the combustion-chamber, D the ash-pit, E F the fire and ash doors, respectively, and G the bridge-wall, all of the usual and well-known construction.

Supported on a flange or ledge H of the wall A is a manifold air-chamber I, which extends athwart the front part of the fire-box and is provided at suitable intervals, preferably at three places, as shown in Fig. 2, with upright or branch pipes K, whose upper extremities are provided with injectors *k*, the nozzle ends L of which are flattened, as shown in Figs. 2 and 4, and aimed downwardly across the fire-chamber toward the base of the bridge-wall, so as to project in such direction a flattened stream or stratum of the fluid passing therethrough. The inner side of the transverse chamber I is preferably left open from end to end and its lower portion or bottom is provided with a slight extension *h*, upon which rest the ends of the grate-bars M. These grate-bars are hollow throughout their extent and are preferably of approximately V shape, as shown in Fig. 2, but having square or rectangular portions *m* at both ends, which rest upon the flange H of the chamber I, and a cross beam or bar N at the inner side of the ash-pit, respectively. For the sake of a more perfect fit, each of the bars M is provided at both ends with a flange or lip O, which flanges rest in rabbeted portions *o* in the top of the chamber I and a supporting-plate P, secured in the inner wall of the ash-pit, respectively, and the ends of the bars are so formed that when they are fitted together, as in Figs. 5 and 6, they will completely fill the open side of the chamber I at their outer ends and form a continuous wall or partition, as shown in Fig. 6, at their inner ends.

The necessary steam to induce the inflow of air and form therewith the combustible gas is drawn from the steam-dome Q or other suitable supply and led *via* the pipe R, having regulating-valve S, to a manifold pipe T, which latter is provided with a number of branch pipes *t*, which lead into the injectors *k* in a downward direction, as shown, and terminate within the nozzles L, so as to produce the requisite suction in the pipes K. The air is preferably drawn from the ash-pit, to which it is supplied through the doors F or other suitable draft-regulating device, and for this

reason the grate-bars are made to fall short of the inner wall of the ash-pit or, in other words, such inner wall is inclined, as shown in Fig. 1, so as to form a chamber U at the rear or inner ends of the grate-bars, whereby the air entering through the ash-doors F will be compelled to traverse the full length of the ash-pit and then enter the grate-bars at their inner ends, and thence traverse such bars and empty into the chamber I, whence it ascends into the pipes K and is discharged through the nozzles L, as described.

By arranging the air-inlets to the injectors within the furnace in this manner I not only obtain highly-heated air, but I prevent the great noise produced by the operation of the injector from being heard, a feature which has been found very objectionable with air-injectors drawing their air immediately through a funnel located in the wall of the furnace. It will now be seen that the strong draft which is induced by the injector does not pass upward through the grate-bars and into the fuel or affect the fire in any manner excepting that which has already been described, but the natural draft rises, as usual, from the ash-pit through the openings between the grate-bars and supports combustion below the stratum of gas projected across the fire-box without interruption.

From the foregoing description it will be seen that the grate-bars are entirely independent of each other and do not require fastening devices for holding them in place, and hence may be readily removed for cleaning the furnace or putting in new bars by pushing the fire or fuel to one side from over the particular bar or bars to be replaced without dumping the fuel or materially affecting the operation of the device. For the sake of greater strength and rigidity, the grate-bars are provided at suitable intervals with vertical ribs *m'*, which come against each other in the manner shown in Fig. 5, and thus prevent lateral as well as downward bending.

The suction in the ash-pit D is so great that the apparatus may be utilized to advantage for ventilating the building in which it is situated; and when it is desired to do this the room or rooms to be ventilated are connected to the ash-pit at the point *d* or other suitable portion by means of any desirable and well-known system of ventilating-flues, the ash-doors in such case of course being kept closed, so as to compel the draft to come through the ventilating-flues.

I prefer to utilize the grate-bars as a means for heating the air, because they are not only especially adapted for this purpose, but the cold air passing through them rapidly conducts away their heat and prevents them from burning out. While I have described steam and air as a preferred form of gas for acting in the described manner to depress the ascending products of combustion into contact with the incandescent fuel, I wish it to be understood that any other combustible gas

might be used to the same end, or either steam or air alone might also be employed with good results.

5 Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a furnace, the combination, with a fire-box and the ash-pit, of the injector-nozzles arranged to direct a stratum of fluid
10 across the fire-box and hollow grate-bars communicating with the ash-pit at one end and with such injector-nozzles at their other ends, substantially as set forth.

2. In a furnace, the combination, with the
15 fire-box and ash-pit, of hollow grate-bars communicating with the ash-pit and an injector arranged within the fire-box and having communication with said grate-bars and having
20 its nozzle so aimed as to direct a current across the fire-box in a downward direction, substantially as set forth.

3. In a furnace, the combination, with the fire-box and ash-pit, of hollow grate-bars communicating with the ash-pit at their inner
25 ends, a manifold chamber with which said bars communicate at their other ends, upright branch pipes leading from said manifold chamber, and injector-nozzles on said

branch pipes aimed across the fire-box, substantially as set forth.

4. In a furnace, the combination, with the fire-box and ash-pit, of hollow grate-bars communicating with the ash-pit at their inner ends, a manifold chamber with which said bars communicate at their other ends, up- 35
right branch pipes leading from said manifold chamber, and injector-nozzles on said branch pipes aimed in a downward direction across the fire-box, so as to project fluid passing therethrough toward the base of the 40
bridge-wall, substantially as set forth.

5. In a furnace, the combination, with the fire-box and ash-pit, of hollow independently-removable grate-bars having communication at their inner ends with said ash-pit, a mani- 45
fold chamber with which said bars communicate at their outer ends, branch pipes projecting upwardly from said manifold chamber, and steam-injectors on the upper ends of said pipes aimed toward the base of the bridge- 50
wall, substantially as set forth.

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Witnesses:

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G. D. GARLAND.