

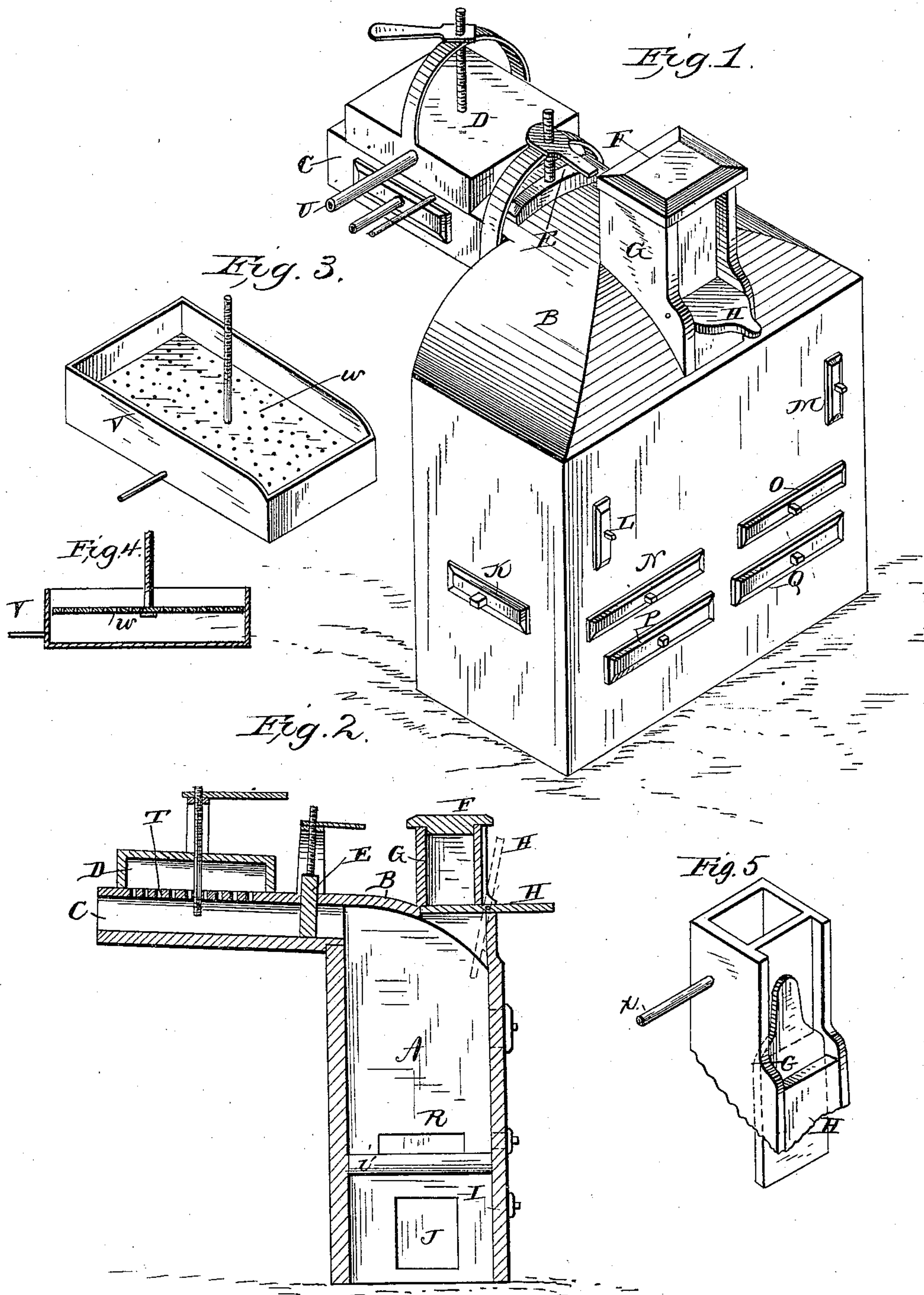
(No Model.)

J. D. PUTNAM.

FURNACE FOR GLASS FACTORIES, &c.

No. 287,470.

Patented Oct. 30, 1883.



WITNESSES

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JACOB DASCAMB PUTNAM, OF LOWELL, MASSACHUSETTS.

FURNACE FOR GLASS-FACTORIES, &c.

SPECIFICATION forming part of Letters Patent No. 287,470, dated October 30, 1883.

Application filed May 26, 1883. (No model.)

To all whom it may concern:

Be it known that I, JACOB DASCAMB PUTNAM, of Lowell, in the county of Middlesex and State of Massachusetts, have invented certain
5 new and useful Improvements in Furnaces for Glass-Factories, Iron and Steel Manufacture, Smelting, and for Locomotive and Stationary Boilers, &c.; and I do hereby declare that the following is a full, clear, and exact descrip-
10 tion of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a
15 part of this specification.

My improvements have for their objects economy of fuel, prevention of smoke, the avoidance of the combustion of gases in the coal or fuel chamber, the sending of all the
20 gases generated up through a throat to be saturated with atmospheric air just at their entrance into the combustion-chamber, and the production of a very intense heat, sufficient for any requirements of the arts.

25 The improvements relate both to the process and to the means employed; and they are adapted alike for glass-furnaces, iron and steel furnaces, smelting-furnaces, locomotive and stationary boilers, &c., and for solid, liquid,
30 or gaseous fuel.

Figure 1 is a perspective, Fig. 2 a vertical section, of an apparatus embodying my invention, and Figs. 3 and 4 details in enlarged view, showing an oil-tank which may be used
35 when desired; Fig. 5, a detail showing how steam may be used to prevent the escape of gas when feeding in the coal.

I will first describe my invention with reference to its use with coal as the fuel.

40 A is the distilling-chamber, in which the coal is placed and in which the fire is kindled; B, a dome over the same; C, a flue or throat leading from this dome to any combustion-chamber, (not needing to be shown,) and in
45 which the gases generated by my apparatus are consumed.

D is a fresh-air chamber directly over this throat, and E is a damper to separate the distilling-chamber A from the combustion-chamber, and it is located near the inlet end of the
50 throat C, and may be raised or lowered by

means of a screw, as shown, or in any convenient manner.

F is a cover for the hopper G, through which the coal is supplied to the chamber A, and H is
55 a damper to the hopper, and which is adapted to partially or entirely close it at will, or to leave it entirely free.

The ash-pit is shown at I, and its door at J.

K L M N O P Q R are stoppers, which, when
60 removed, permit the insertion of iron bars to remove ashes, clinkers, &c. Some of these stoppers are below the grate-bars S and some above.

The chamber A, when the furnace is in op-
65 eration, is closed at all sides by its stoppers, so as to be air-tight, and so that there is no combustion here or outlet for the gases produced, except from the dome through the throat or flue C.

70 Between the air-chamber D and the throat C is a perforated plate, (or plates,) T, and the fresh air enters the chamber D at any appropriate point or points—as, for instance, at U—by means of any suitable pipe or pipes, and
75 the admission of this air can of course be regulated by dampers in the wind-pipes in any well-known manner, and under pressure by means of fans, blowers, or otherwise. The pressure should be equal to that of several at-
80 mospheres.

The operation is as follows: A fire being kindled in the chamber A, the coal is introduced through the hopper G, to a depth of, say, two feet, or more, and then all air is ex-
85 cluded, except sufficient through the ash-pit I and grate-bars *i'* to produce sufficient heat to distill the gases from the coal, and which, with the carbonic-oxide gas which is also produced, pass up through the throat or flue C,
90 under the perforated plate or plates I, at which point they receive the requisite amount of fresh atmospheric air in finely-divided jets or columns, and which is the most favorable way of producing that intimate mixture neces-
95 sary for perfect combustion, it being of course understood that the perforations may be as many, as small, and as close to each other as may be desired. Thence this mixed fuel passes into the combustion-chamber, where it is to be
100 utilized, and in which the entire heat due to the chemical union of the air and gases will

be produced, resulting in great economy of coal, prevention of smoke, because of perfect combustion, and any degree of heat desired.

As before stated, my plan and apparatus are adapted for glass-melting furnaces, iron and steel furnaces, smelting-furnaces, and for locomotive and stationary boilers.

It will be evident that the finely-divided jets or columns of atmospheric air may be produced by means of perforated plates, caps, crowns, covers, or other equivalents at suitable proximity to the point of ignition.

My invention is also applicable and entirely effective and successful when using liquid fuels—for instance, crude petroleum—and with which the operation is as follows: Close the inlet end of the throat or flue C with the damper E, and in this throat, preferably through a door in its side, insert, under the perforated plate or plates T, an iron pan or tank, V, of suitable dimensions. In the bottom of this pan I have a perforated iron plate, *w*, of suitable thickness, (say one inch or more,) filling the whole area of the bottom of the pan, the oil being fed through pipes having suitable regulating-valves into the bottom of such pan, so placed beneath this perforated iron plate, the oil rising in the orifices of this plate to any required height, and evenly dividing and distributing itself to present greater evaporating surface in contact with the jets or columns of air. Then ignite the vapor arising from this petroleum, and at the same time introduce the jets of air through the plate or plates T of the air-chamber D, when the mixture of vapors and air will issue from the throat and pass into the combustion chamber or furnace attached, where perfect combustion will ensue, producing the intensest white heat without smoke, and sufficient for any requirements.

As heretofore stated, the admission of air to the chamber D is to be regulated by any suitable dampers in the wind-pipes.

The prevention of smoke is complete with my invention, whether crude petroleum or bituminous coal or anthracite coal be used.

When the oil-tank is used it must rest on a level seat in the throat, and its perforated plate (shown at *w*) must be arranged to be raised and lowered at will by any appropriate device—such, for instance, as that shown for raising and lowering the damper E—the object of such device being to perfectly regulate the amount of fire, it being understood that the level or depth of oil in the pan is always to remain the same by regulating its feed-pipe. The oil-feed pipe of the tank requires an outlet-pipe, so that the oil may, in case of exigency and as a perfect safety precaution, be instantaneously emptied or withdrawn from the pan to prevent accident or damage. It will of course be understood that the oil must be introduced or fed no faster than is required for combustion.

My arrangements for feeding, vaporizing, and withdrawing oil from the tank render the use of oil safe, neat, and convenient.

It is not intended to use oil and coal in conjunction for producing the requisite intense heat, as this can be accomplished with either of them by my invention, which therefore has a double value and use, being adapted for using either fuel, coal being used when abundant and cheapest, and oil being used when it is abundant and cheap, and the construction is such that this change of fuel can be made at once, and without delay or interruption of the heat. Oil may, however, be used in connection with coal by means of feed-pipes inserted in the dome of the coal-chamber A, where it should issue in jets or spray, and be thus instantly vaporized, and this vapor or gas, mixing with the gases from the coal and then passing through the throat, will there receive its supply of air from chamber D, and pass on to be utilized in the combustion-chamber.

When not using oil—that is, in my coal process—the vapor of water is used under the grates. Suppose the depth of coal upon the grate-bars to be some three feet and in an incandescent state, the carbonic-acid gas—the product of combustion upon the grate-bars—in its passage through the glowing coals is converted into carbonic-oxide gas, and the vapor of the water under the grates, in its passage through the bed of coal, is decomposed into oxygen and hydrogen gases, which, added to the hydrocarbons distilled from the coal, pass together, carrying the heat of the fuel-chamber with them, to the combustion-chamber, where the entire heat, due to the union of these gases with the supply of oxygen from the fresh atmospheric air, is available. There is nothing lost by partial combustion in the fuel-chamber, nor at any point remote from, nor other than just where the heat is desired, the process resulting, therefore, in the greatest possible economy of fuel, and in any degree of temperature desired; and, besides, insuring great cleanliness, for no ashes or cinders go over, but only a pure, clean, gaseous flame, conducive to the best interests and requirements of the arts, depositing no sediment in the flues, and preventing smoke, and therefore peculiarly desirable for locomotive and stationary boilers.

In actual practice upon a glass-melting furnace it is found by actual weight of the coal that a much larger and much improved product is obtained from less than half the amount of coal previously used in the ordinary way.

The objects of the damper H and cover F to the hopper are to prevent the escape of gas when feeding in the coal; but I sometimes use a jet of steam to prevent such escape, and which answers well for this purpose, the steam being turned on when the cover is off and the damper open, and serving to keep the gas down in the coal-chamber—as, for instance, as seen in Fig. 5, in which *x* is a pipe for discharging a jet of steam into the hopper G.

The most essential feature of my invention may be stated to be the introduction of atom-

ized or finely-divided fresh air to saturate the gases at the point of ignition and before entering the combustion-chamber, it being understood that air is excluded from the fuel or coal chamber, (no combustion taking place there,) and that the gases are heated and carried forward to the combustion-chamber before ignition, and the whole heat is applied just when and where it is needed.

10 I claim—

1. The described process for effecting an intimate combination and mixture of atmospheric air with the vapors and gases arising from burning fuel and for their more perfect combustion, consisting in the introduction to said vapors or gases, at a point near that of their ignition, and between the closed distilling chamber and the furnace or combustion-chamber, of atmospheric air in a multitude of fine jets or columns under mechanical pressure, as set forth.

2. The described combination and arrangement of the distilling-chamber A, having a

dome, B, with the outlet throat or flue C, provided with a damper and leading to a combustion-chamber, and with the air-receiving chamber D in such throat, and provided with numerous small perforations, whereby the air may be forced in many finely-divided columns or jets into the gases passing through such throat prior to their entrance into the combustion-chamber.

3. In combination with the distilling-chamber, the flue C, constructed substantially as set forth, and having therein the air-chamber D and its perforated bottom, and a vessel within such flue, adapted for holding, finely dividing, and distributing liquid fuel, this vessel consisting of a pan or tank and an adjustable perforated plate or false bottom therein, the combination being and operating substantially as set forth.

JACOB DASCAMB PUTNAM.

Witnesses:

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AZRE D. CRAM.