

(No Model.)

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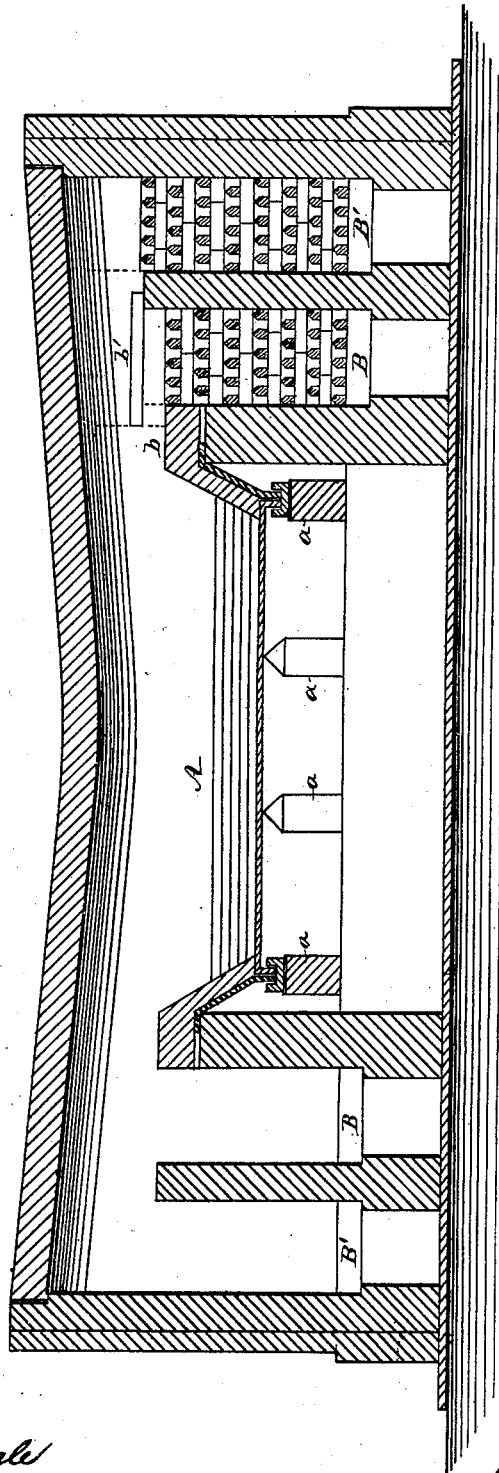
M. V. SMITH.

FURNACE FOR MELTING GLASS, &c.

No. 267,116.

Patented Nov. 7, 1882.

Fig. 1.



WITNESSES

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(No Model.)

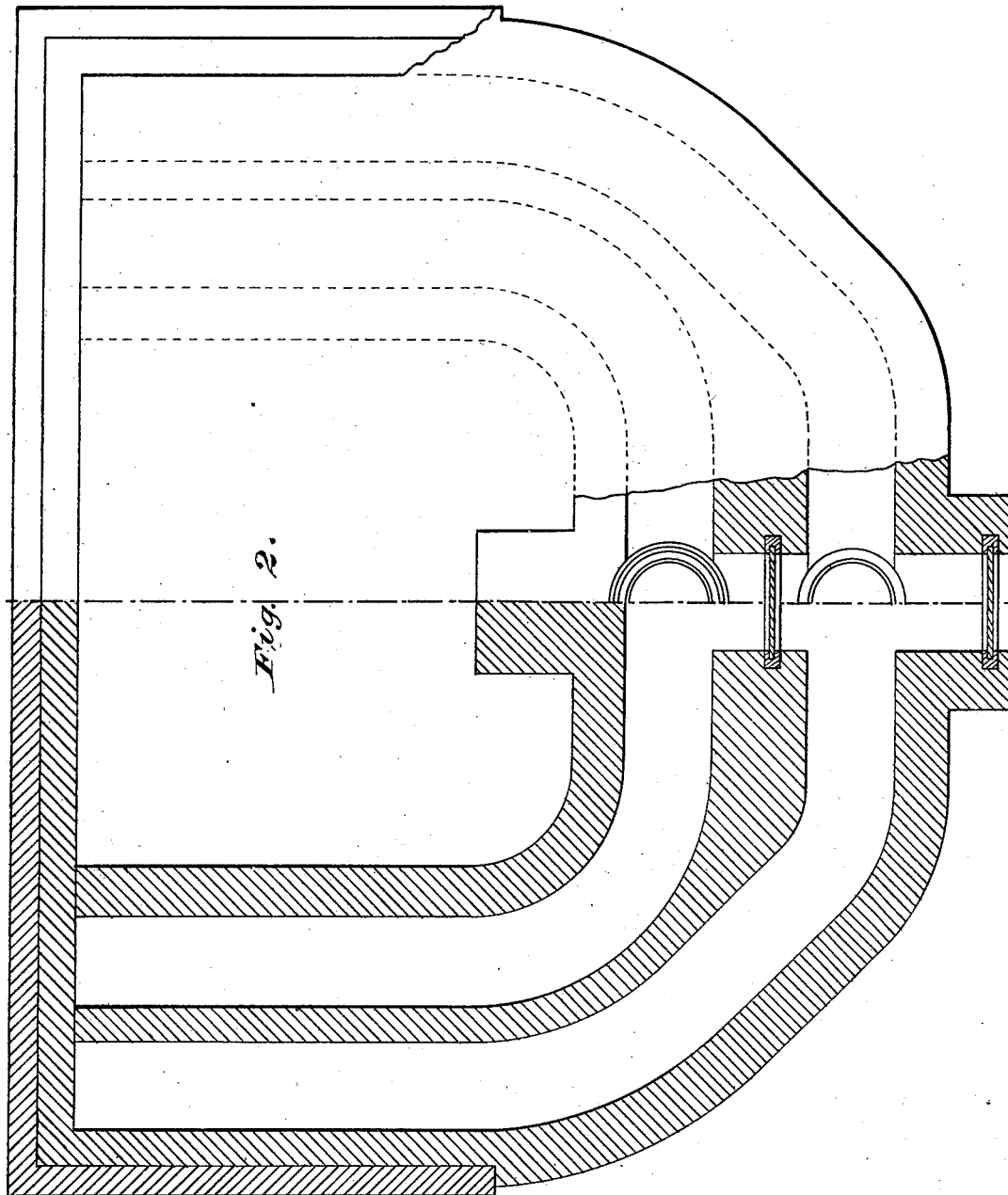
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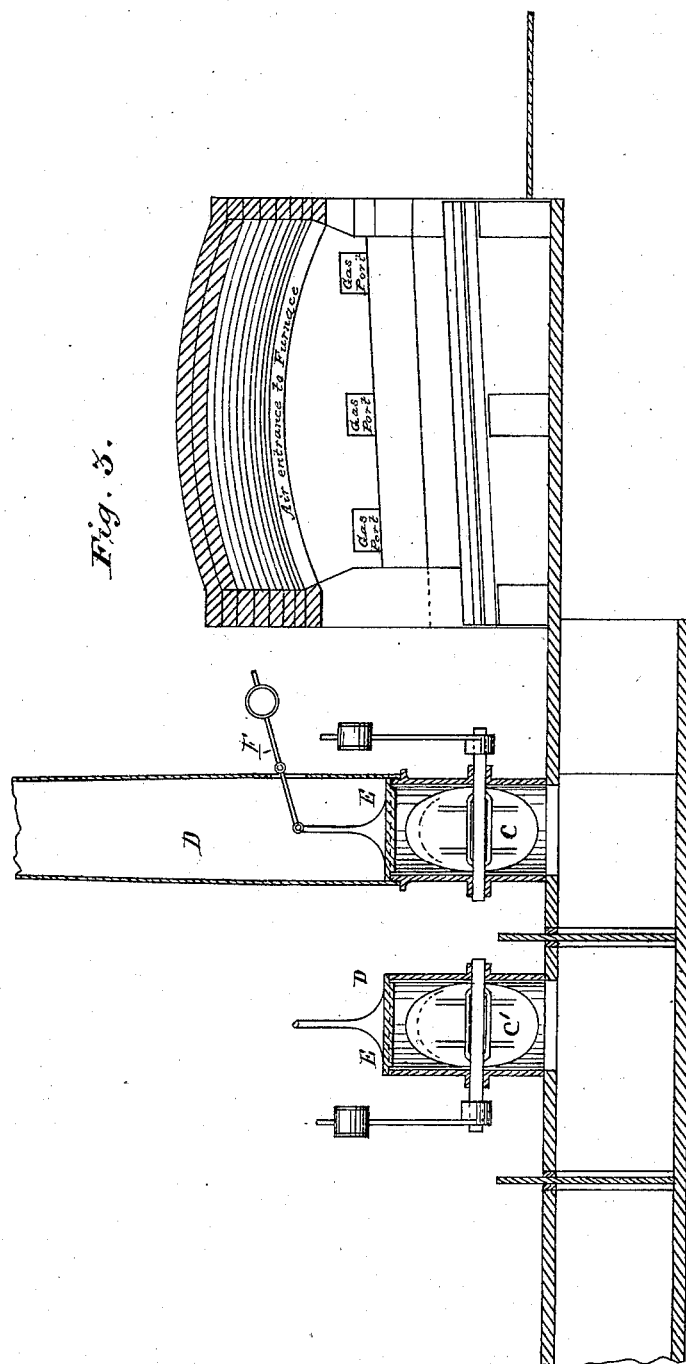
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Patented Nov. 7, 1882.



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MARTIN V. SMITH, OF TYRONE, PENNSYLVANIA.

FURNACE FOR MELTING GLASS, &c.

SPECIFICATION forming part of Letters Patent No. 267,116, dated November 7, 1882.

Application filed September 9, 1882. (No model.)

To all whom it may concern:

Be it known that I, MARTIN V. SMITH, a citizen of the United States, residing at Tyrone, in the county of Blair and State of Pennsylvania, have invented certain new and useful Improvements in Furnaces for Melting Glass and other Purposes; and I do declare the following to be a full, clear, and exact description of the invention, such as 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 the letters and figures of reference marked thereon, which form a part of this specification.

Figure 1 is a vertical longitudinal sectional view. Fig. 2 is a plan view, partly in section, of the gas and air flues. Fig. 3 is a vertical sectional view at right angles to Fig. 1.

My invention relates to improvements in furnaces for melting glass or metal, and for melting or heating other substances requiring an intense heat; and it consists in placing the regenerators above the ground or floor level.

It consists, further, in extending the checker-work of the air-flues up above the point at which the gas enters the melting-tank or combustion-chamber.

My invention consists, further, in the arrangements of the regenerators, so that the roof of the furnace will form the covering for the checker-work, thus dispensing with a separate arch for inclosing the same.

My invention consists, further, in forming the gas-ports by placing tiles over the gas checker-work, the ends of the tiles resting on the side walls of the gas-flue, the inner wall of which is provided with orifices or openings, which enter the melting-tank or combustion-chamber.

It consists, further, in placing the valves which control the gas and air currents on the floor-level and at the opposite side or rear of the furnace to that occupied by the workmen, which will obviate the intense heat to which the workmen are ordinarily exposed when the valves are under the floor.

It consists, also, in having the gas and air supply pipes to enter through the valves to the flues leading to the regenerators in a vertical line.

Referring to the drawings, A indicates the melting-tank, which may be of the ordinary or any other convenient or desirable form, constructed of metal or other suitable supporting-base lined with fire-brick or other refractory material. The melting-tank is supported by any suitable number of piers *a a*, so as to admit of a free circulation of air thereunder to keep it cool and prevent in a measure the rapid disintegration of the same by heat.

The regenerators B B and B' B', of which the former, B B, are for the gas and the latter, B' B', for air, are arranged in pairs at each end of the combustion-chamber, and are located above or on the floor-level and embraced or covered by the same roof or arch which covers the melting-tank or combustion-chamber. The regenerators are composed of the ordinary checker-work of fire-brick, arranged in the ordinary manner, the brick which compose the checker-work being preferably beveled on their upper edges, so as to prevent the lodgment of soot and ashes, and the consequent stopping up or choking of the regenerators. The regenerators may vary in size, the smaller being for the passage of the gas and the larger for that of air, their proportions varying to correspond to the quantity of air and gas required to insure complete combustion in the melting-chamber. The regenerator-walls are or may be made of fire-brick or other refractory material, and are made gas-tight, so that no leakage may take place from one chamber to the other. The checker-work of the air-regenerators extends up to or nearly to the arch of the combustion-chamber, thus greatly increasing the superficial area of the fire-brick composing the checker-work, and consequently increasing the heating capacity, so that when the direction of the gas and air is reversed, as is common in this class of furnaces, the air will be more perfectly heated and a better combustion effected; and, furthermore, by extending the checker-work of the air-flues above the point of entrance of the gas the air is caused to enter the furnace above the gas, and by reason of the superior specific gravity of the air and the inclined construction or arrangement of the arch of the furnace tends to sink or be deflected through the gas, which enters the

melting or combustion chamber in a horizontal direction, so that the air and gases become thoroughly intermixed and complete combustion is effected.

5 As before intimated, the regenerators are placed above ground and on a level with the floor and under cover of the arch or roof of the melting-tank or combustion-chamber. The advantages of this construction are obvious—
10 first, the expense and labor of constructing separate arches for the regenerators are dispensed with; second, the furnace is made more compact, and of course does not occupy so much space; third, the heat from the regenerators is confined within the walls of the melting-furnace or combustion-chamber, and not distributed through the floor of the works to the annoyance and discomfort of the workmen.

20 The inner walls of the gas-generators are provided with openings *b* at their upper ends, and fire-proof tiles *b'* are laid from the division-walls between the gas and air compartments, which form openings in a horizontal plane for the entrance of gas into the melting or combustion chamber, and bring the point of combustion forward and nearer to the material to be acted upon, thereby avoiding any loss of heat.

30 The valves *C* and *C'*, for controlling the admission of gas and air to the furnace, are located at the opposite side or to the rear of the working-face of the furnace, and as they are on a level with the floor of the furnace will prevent the intense heat heretofore referred to from interfering with the operations of the workmen.

35 As heretofore constructed the gas and air ports and valves for controlling the flow of gas and air have been placed below the furnace-level and the supply of gas and air introduced in a horizontal line, while, on the other hand, I introduce the gas and air through vertical pipes *D D*, which obviates the settling of soot and ashes, so as to interfere with the operations
45 of the valves.

The gas and air supply pipes are provided with valves *E E*, operated by weighted levers *F*, which facilitate the operations of supplying the products of combustion to the furnace or
50 combustion-chamber.

The valves *C C'* are of the ordinary construction, and need no further mention in this connection.

55 The operation of my furnace is much the same as others of this class; but for the purpose of making it more clear I will describe the mode of operation.

On first lighting the fires of the furnace the gas passes through the valves and flues into
60 the bottom of the regenerator-chamber *B*, while the air enters through corresponding valves and flues into the chamber *B'*. The currents of gas and air both rise separately through the chamber *B* and *B* and pass up into the melting or combustion chamber, where they meet

and are ignited, producing a moderate heat. The products of combustion pass over through a similar set of flues at the other end of the furnace into the regenerators *B* and *B*, and thence through properly-constructed flues and
70 valves to the chimney-flue, (not shown, but of the ordinary construction.) The waste heat is thus deposited in the upper courses or checkers of open fire-brick, heating them up to about the temperature of the products of combustion. 75
After a suitable interval has elapsed the valves *C* and *C'*, through which the air and gas are admitted to the furnace, are reversed and caused to enter through the regenerators, which have just been heated by the waste products of combustion, and in passing up through the checker-work they become heated, and then, on meeting as they enter into the melting or combustion chamber *A*, they produce a
80 very high degree of heat, and thus an accumulation of heat is obtained step by step by alternately reversing the direction of the gas and air currents until the desired heat is attained, while the heat is thoroughly abstracted from the products of combustion by the regenerators, so that but little or no heat is allowed to go to waste.

In the manufacture of glass the advantages of my furnace are obvious, the principal one being that the glass is pure and free from soot
95 and smoke and a better quality produced.

I do not wish to be understood as limiting myself in the use of my furnace to glass-manufacture alone, as it is obvious that it is well adapted for all metallurgical operations. 100

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

1. In a furnace for melting glass, or for melting or heating other substances, the combination of a melting-tank with the gas and air heating devices, substantially such as described, located above the ground or on the floor-level of the furnace and in juxtaposition to said melting-furnace, as set forth. 105

2. In a furnace for melting glass or metal, the checker-work of the air-heating compartment arranged so as to extend above the point at which the gas enters the combustion or melting chamber, as set forth. 110

3. In a furnace for melting glass or metal, the combination of the melting-tank with regenerators arranged at each end thereof in close proximity thereto, and all inclosed within or under a common roof or arch, whereby
120 the construction of separate arches for the regenerators are dispensed with, as set forth.

4. In a furnace for melting glass or metal, the combination of the openings *b* in the walls of the melting-tank with the slit *b'* for covering the checker-work of the gas-regenerator, whereby the gas is directed into the melting or combustion chamber in a horizontal line and direct from the regenerator, as set forth. 125

5. In a regenerator-furnace for melting glass 130

or metal, the valves for controlling the direction of the air and gas, located within vertical supply-pipes on or above the floor-level and to the rear of the working-face of the furnace, for the purpose set forth.

5 6. In a regenerative furnace for melting glass or metal, the valves for controlling the ingress of air and gas to the regenerators, located within vertical supply-pipes, and provided

with weighted levers to facilitate the operation of said valves, as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

MARTIN V. SMITH.

Witnesses:

WM. KENT,
M. P. CANFIELD.