(No Model.)

H. KNOWLES.

CONSTRUCTION OF KILNS, POTTERY OR COKE OVENS, &c.

No. 318,264. Patented May 19, 1885.

FIG. 1.

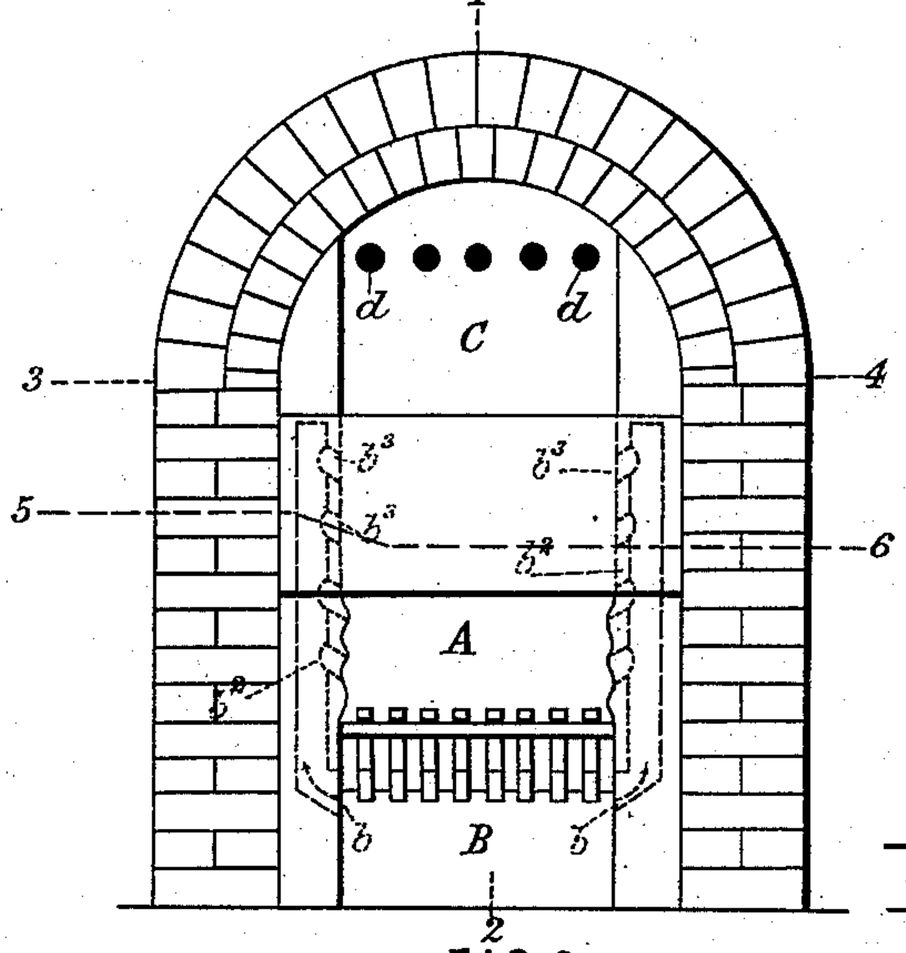


FIG. 3.

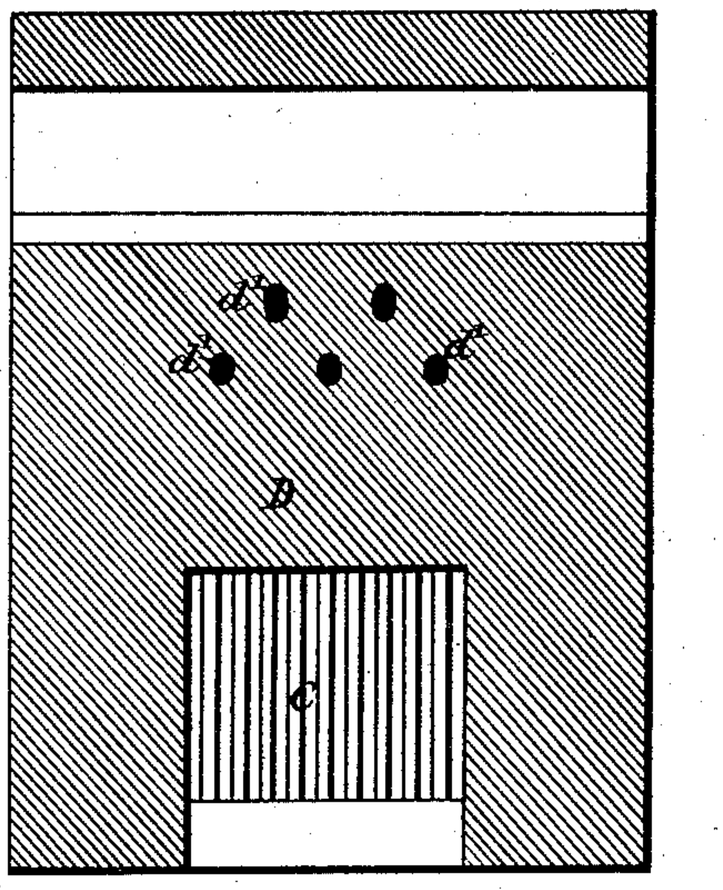


FIG. 2.

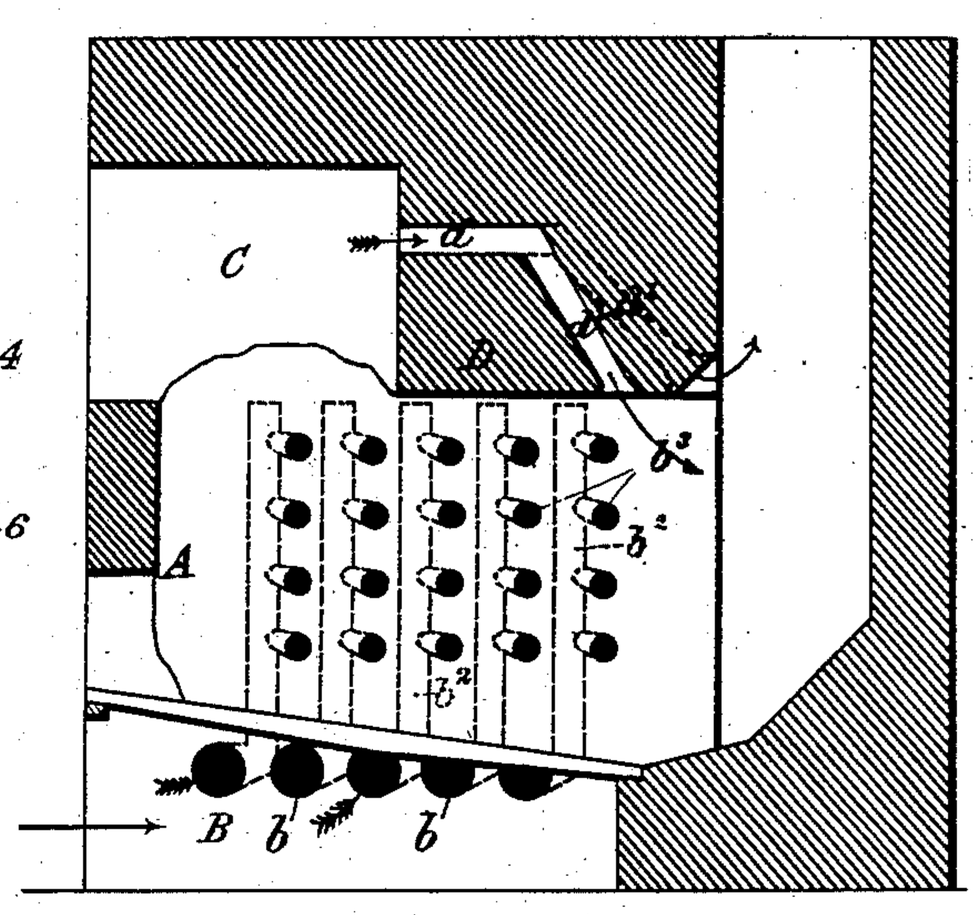
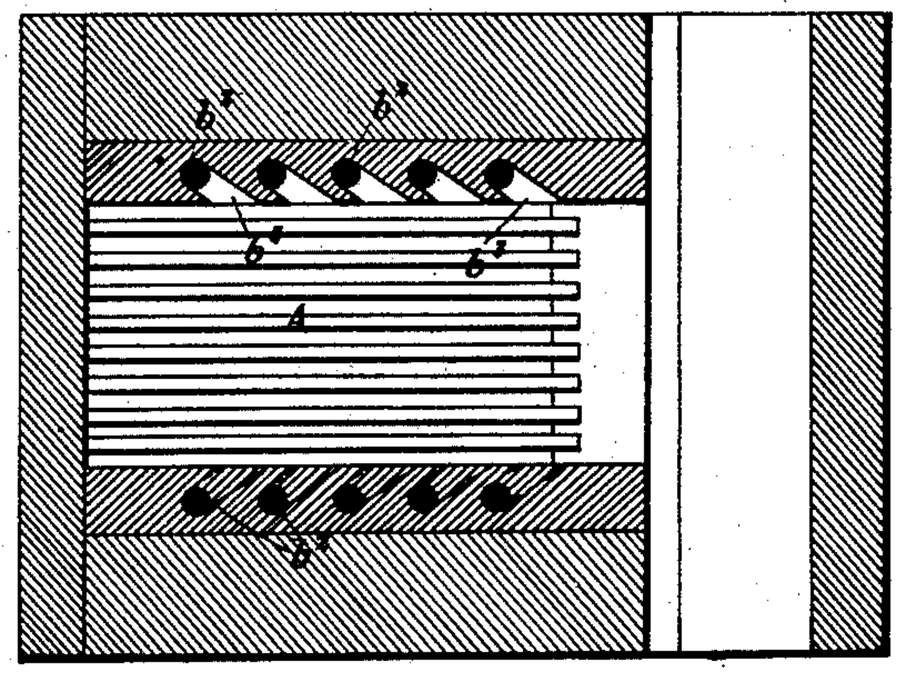


FIG. 4.



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UNITED STATES PATENT OFFICE.

HENRY KNOWLES, OF WOODVILLE, COUNTY OF LEICESTER, ENGLAND.

CONSTRUCTION OF KILNS, POTTERY OR COKE OVENS, &c.

SPECIFICATION forming part of Letters Patent No. 318,264, dated May 19, 1885.

Application filed December 4, 1884. (No model.) Patented in England January 2, 1884, No. 474.

To all whom it may concern:

Be it known that I, HENRY KNOWLES, fire-brick and sanitary-pipe manufacturer, a subject of the Queen of Great Britain and Ireland, and residing at Albion Works, Woodville, in the county of Leicester, England, have invented certain Improvements in the Construction of Kilns, Pottery or Coke Ovens, Glass-Furnaces, or like Structures, (for which I have obtained a patent in Great Britain, No. 474, dated January 2, 1884,) of which the following is a specification.

My invention relates to improvements in the construction of the fire-places in kilns, ovens, and glass and other furnaces for burning bricks, tiles, pipes, terra-cotta, pottery, lime, and other articles and substances, and for other purposes to which such fire-places are applicable. It has for its object the economy of fuel and consumption of smoke, which is secured by a simple arrangement of the parts of the fire-places for effecting complete or practically complete combustion of the fuel and the gases evolved therefrom, by which a common and low-priced fuel may be used, and from which as much effective heat-power may be obtained and maintained as from the more expensive qualities of fuel ordinarily used for such purposes. It can be applied to all kinds of fire-places used for the various purposes enumerated or for other analogous purposes; and it consists of an arrangement for heating to a high degree the air necessary to effect complete combustion, and to supply the same to the solid fuel and gases evolved therefrom in as simple and direct a manner as possible, so that an intense heat is generated at the smallest possible cost, and smoke is consumed and nuisance avoided.

I construct the sides of the fire-places of fire bricks or blocks with openings or inlets for the admission of the air. These openings or inlets I make in each side wall of the fire-place in the lower part or ash-pit, near to the fire, and I make them at an acute angle with the inside or inner walls of the fire-place, the said openings or air-inlets passing in an upward direction for a short distance to ease the draft and to avoid any ledge on which ashes would lodge at the mouth of the inlets, and so avoid choking. I then continue the openings upward in the side walls, either vertically or otherwise, to the upper part level with the top of the fire or thereabout, and out of each I make a series of perforations or outlets through the sides of the fire-place directly to the fire at different levels. These outlets I also preferably make at a slightly acute angle downward, to make them clear of ashes and to make them slanting in the direction the fire is working to ease the draft. I also prefer to make the outlets wider at their mouths for the better distribution of the heated air to the fuel. If there be sufficient space in the side wall to allow of the construction of an air-chamber into which the inlet-flues enter at the bottom and out of the sides of which the outlet-flues can be made, as in the case of the above-described openings, such an air-chamber may be used, if desired. These openings or air-flues in the side walls are for the purpose of supplying the air necessary for combustion in a highly-heated state to the solid fuel, on which it impinges as it issues from the flues, and causes energetic combustion instead of slow combustion, which results from burning against a "dead" wall with insufficient air of low temperature.

The interior of the side walls next the fire may be either plain, corrugated, fluted, grooved, or ribbed. I prefer to make them corrugated, grooved, or ribbed when they are made of sufficiently refractory fire-brick to withstand the intense heat and wear, as the grooves enable the air to spread more freely upon the fuel.

In combination with the above-described improvements I construct in the crown or archway of the fire-place openings or air-flues for the supply of heated air to the gases evolved from the burning fuel, which as they rise are met by the heated air issuing from the said openings in the crown or arch over the fire, and by combining with the said air are consumed and generate intense heat. In carrying this into effect I construct the crown or arch of the fire-place of fire bricks or blocks, and at the top, across the front of the same, I make a series of air-inlets and continue them through the bricks alternately at varying angles downward in the direction the fire is working, so as to open over different portions of the fire, and I make them wider at the outlet for the better diffusion of the heated air

among the gases as they are evolved and pass under the crown or archway, where they mix together and burn with great intensity, and complete combustion is effected and the smoke consumed. If the air be found at any time to be in excess of what is required to effect complete combustion, the supply can be regulated as desired by closing or partially closing as many of the inlets over the fire as may be necessary.

By the above improved arrangement of air-flues, constructed in the form and manner as described and passing through the highly-heated brick-work of the fire-place, the air necessary to effect complete combustion is supplied to the fuel in a highly-heated state and in as direct a manner as possible, so that common low-priced fuel can be utilized and intense heat generated at a comparatively small cost, and the smoke effectually consumed and nuisance avoided.

In order that my said invention may be fully understood, I shall now proceed more particularly to describe the same, and for that purpose shall refer to the several figures of the annexed drawings, the same letters of reference indicating corresponding parts in all the figures.

Figure 1 is a front elevation of a fire-place, the example given being a fire-place such as is generally used in brick and pipe kilns. Fig. 2 is a vertical section of the same, taken on the line 1 2, Fig. 1. Fig. 3 is a horizontal section taken on the line 3 4, Fig. 1; and Fig. 4 is also a horizontal section, but taken on the line 5 6, Fig. 1.

A is the fire-place proper; B, the ash-pit, and C the opening through which the fuel is fed to the fire-place A, and D is the arch or crown of the fire-place.

The sides of the ash-pit B have in them the openings or inlets *b*, which are continued in passages b^2 toward the upper part of the walls of the fire-place A. The branch perforations b^3 lead from these passages b^2 at different levels.

In Fig. 1 I have shown the side walls of the fire-place A next the fire as being fluted, grooved, or ribbed, as hereinbefore mentioned; but they may be plain, if desired.

In the crown or arch D are flues or passages *d*, through which air passes to meet the gases evolved from the fuel in the fire-place A. These passages are made with their inner ends directed downward at varying angles, as shown at *d'*, so as to discharge the air (which has become highly heated in its passages through the flues *d*) over the whole area of the back of the fire-place, or that part past which the gases and smoke escape therefrom.

In working, the fuel is fed at the mouth C of the fire-place, and as the fires are gradually made up the side walls of the said fire-place and the arch D become intensely heated, so that the air in its passage through the air-flues described is highly heated, and on emerging at the outlets in the side walls it impinges on the burning fuel, causing intense combustion, and the gases and smoke evolved are met as they pass under the arch or crown by the hot air issuing from the air-flues *d d'*, which air combines with the said gases and smoke and complete combustion is effected. In case the air passing through the flues in the crown is in excess of what is required to effect complete combustion, it can be readily regulated or checked by the insertion of plugs or stoppers into the inlets of the air-flues.

My invention is applicable to all kinds of fire-places in which the hereinbefore-described air-flues can be constructed, substantially as hereinbefore described, and shown in the drawings.

My improvements are designed more especially for burning the commoner and cheaper qualities of fuel, such as "slack," which, being small, lies too close and dense to admit of the requisite amount of air being supplied in the ordinary way, thereby causing slow combustion and the evolution of dense volumes of smoke, causing great nuisance and much waste of fuel; but these evils are prevented when air is supplied according to my invention.

I claim as my invention—

1. A fire-place for a kiln or oven having in the side walls air-inlets *b* at the ash-pit, vertical passages b^2, leading therefrom, and a series of branch perforations, b^3, from said passages into the fire-place and combustion-chamber, substantially as described.

2. A fire-place for a kiln or oven having its inner walls grooved or corrugated, and having air inlets and passages b b^2, and branch perforations b^3 from said passages into the fire-place at different levels, substantially as set forth.

3. A fire-place for a kiln or oven having in its arch air-flues *d*, with their inner ends, *d'* *d'*, directed downward into the combustion-chamber at different angles, substantially as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HENRY KNOWLES.

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