H. M. SMITH.

Furnace.

No. 164,404. Patented June 15, 1875.

Fig. 1.

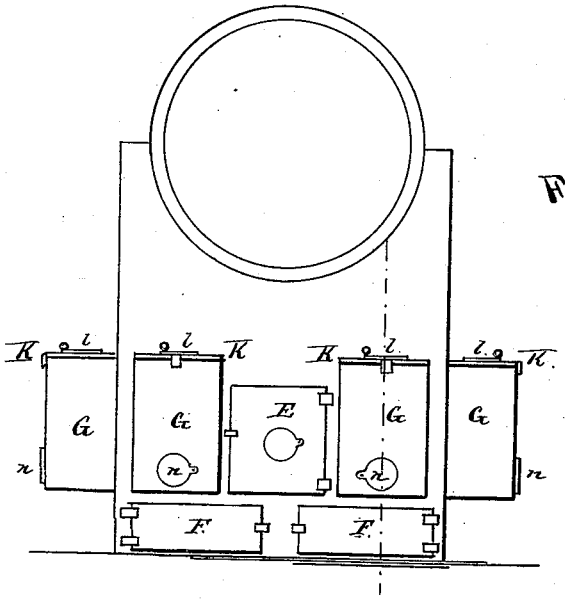
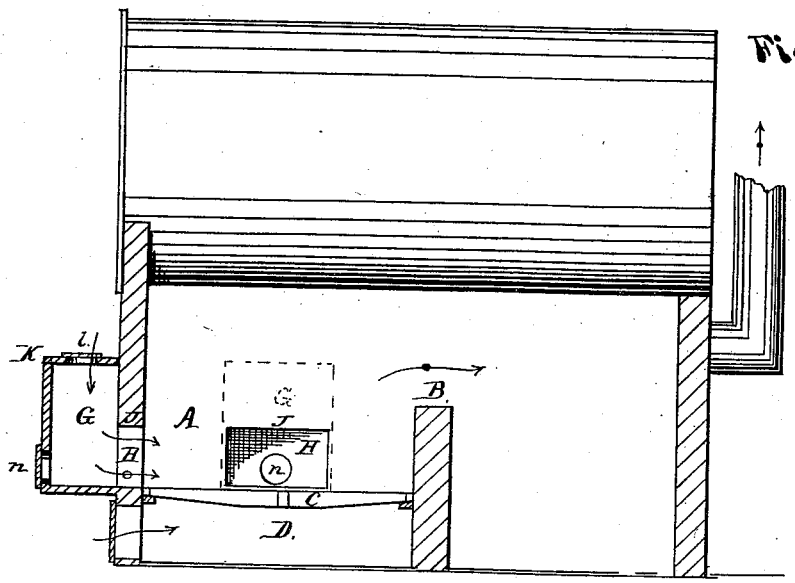


Fig. 2



Witnesses:

A. Kleininger

Henry L. Smith

Inventor:

Horatio M. Smith

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his attys.

UNITED STATES PATENT OFFICE.

HORATIO M. SMITH, OF CHICAGO, ILLINOIS, ASSIGNOR OF TWO-THIRDS HIS RIGHT TO MOSES W. LESTER AND FRANKLIN LESTER, OF SAME PLACE.

IMPROVEMENT IN FURNACES.

Specification forming part of Letters Patent No. **164,404**, dated June 15, 1875; application filed January 18, 1875.

CASE C.

To all whom it may concern:

Be it known that I, HORATIO M. SMITH, of Chicago, in the county of Cook and State of Illinois, have invented an Improvement in Furnaces for the Combustion of Coal, of which the following is a specification:

By experiment I have ascertained that while it is almost impossible to pass a sufficient current of air to produce a perfect combustion upward through a mass of finely-comminuted fuel, such as coal-dust, or mine-slack, or the waste of coal-mines, ignited at the bottom, yet it is not at all difficult to bring a sufficient supply down through the mass. I account for this by the theory that if the air first passes up through the fire it is expanded many volumes by the heat, and thus retards its own passage. On the other hand, if passed down through the mass in a comparatively cool condition, it remains unexpanded until it is among the incandescent mass at the bottom, which, by reason of the burning, has become partially coked and in a measure porous. I have also found that the coking process of coal proceeds uniformly in a direction against the draft of air if air is admitted into a furnace or chamber containing ignited coal and properly arranged. This fact of coal coking against the draft has been heretofore made use of in the arts for coking comminuted coal of a difficult character; and the fact stands thus demonstrated.

Based upon these natural peculiarities of the combustion of the coal is the present invention; and its object is to take advantage of these principles in the construction of furnaces.

In the first place I apply to the combustion-chamber of a furnace (which may be of the ordinary kind, provided with grate and bridge-walls) an external pocket or inverted fire-box, or a series of such, opening into the first-mentioned combustion-chamber, and so constructed, as will presently appear, that said pocket or pockets may be charged with coal, coal-dust, or mine-slack, through which a regulable draft will pass in a downward direction, discharging a compound of air and evolved gases, under an inverted bridge-wall, into the combustion-chamber, producing in the pocket, at will, a combustion more or less complete, and a corresponding coking of its contents, which proceeds upward into the pocket. Said pocket or pockets are fed from above without at all interfering with the operation of the fire, and the coke produced is discharged under the inverted bridge-wall from time to time, as occasion demands, into the combustion-chamber, upon the grates, where it is wholly consumed in the ordinary way, serving to assist in consuming the evolved gases. These pockets are entirely independent of the furnace, so to speak, and may, therefore, be readily applied to any furnace as now constructed, it being simply necessary to cut a hole through the wall of the furnace to form the inverted bridge-wall for the pocket, and to secure the pocket in place upon the outside of the furnace.

It will thus be seen that my invention is one which may be applied to existing furnaces with the greatest ease. This is a great desideratum in inventions of this nature, as it obviates the necessity of reconstructing the furnace.

It is in a great measure immaterial at what part of the fire-box the pocket or pockets are applied. I prefer, however, to employ several of them, and in the present instance, as will be seen by the drawing hereafter alluded to, actually employ four—two in front and one at each side. This forms a very convenient arrangement, possessing peculiar advantages, enabling a thorough and equal distribution of the coke in the fire-box, and not interfering with the ordinary arrangement for fire-doors.

In the accompanying drawing, which forms a part hereof, Figure 1 is a front view of a furnace constructed according to my invention, and Fig. 2 is a longitudinal vertical section of the same upon the line *x x* of Fig. 1.

In said drawing, A represents a common fire-box; B, its bridge-wall; C, its grate-bars; D, its ash-pit; E, its fire or stoking door, and F F its ash-doors. G G G G are the several external fuel-pockets, each opening into the fire-box A by an opening, H, the upper lip of

which, J, forms an inverted bridge-wall. This inverted bridge-wall, in the operation of the furnace, is subjected to an intense heat, and should therefore be made of or incased with a refractory material, or otherwise so constructed that it will resist the destructive action of the heat. These pockets, it will be noticed, are higher than they are wide, so as to conveniently retain a charge of fuel. They are shown to be rectangular in form; but this is entirely unessential, as they may be of any form, but should be deep enough to contain above the lip of the inverted bridge-wall a considerable charge of fuel. Each pocket is shown provided with a lid, K, which may be raised for the admission of fuel. This forms a very convenient method of stoking the furnace, especially where fine comminuted fuel is used, which may be led, if desired, by a chute to a point immediately above the pocket, and discharged therein as wanted. The fact that the fuel is fed into these pockets instead of into the fire-box, and that the draft is through the pockets, obviates the loss of heat which usually occurs in ordinary fire-boxes by reason of the opening of the stoking-door. In this invention it is no matter whether air enters along with the entering fuel or not, as it does not pass above the fuel, but through it. Indeed it is desirable that the air should enter in this way. The lid K is provided with a regulable draft-opening, *l*, through which air is admitted in any desired quantity, to pass through the fuel and mingle with the gases. Each pocket is provided, also, with an opening, *n*, near the base, by which access may be had to the interior of the pocket for pushing the coke from the pocket into the fire-box, and also for regulating the draft.

In the drawing the plain arrows indicate the course of the currents of air, the arrows with open circles upon their shafts the course of the mingled evolved gases and air, and the arrows with black disks upon their shafts the course of the products of combustion.

The operation of my improvement is briefly as follows: A charge of fuel is dumped into the pocket, the kindling placed on top and lighted, and the draft opened to such degree as desired. When the first fire is reduced to an incandescent mass a second charge is dumped in upon it. The fuel in the pocket then immediately commences a rapid coking process, which proceeds from the bottom up toward the draft *l*, a large quantity of gas being evolved, which, mingled with the air passing in through the opening *l*, is drawn into the combustion-chamber A by the draft, and there burns with a hot flame, being further supplied with air through the grate C, if desirable. When the fuel is sufficiently coked it is pushed under the inverted bridge-wall upon the grate C, where it is wholly consumed, the charge in the pocket being renewed; or the combustion of the coke may be allowed to go on to completion in the pockets. Of course, some of the coke, in the latter case, would, of its own accord, fall into the fire-box.

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

1. The external fuel pocket or pockets, constructed to receive fuel from above, provided with a downward draft from the top, and having an imperforate or grateless base, in combination with the independent combustion-chamber A, from which said pocket or pockets are separated by inverted bridge-walls J, as specified, producing separate and distinct coking and combustion chambers and the several results enumerated.

2. The combination of the combustion-chamber A and the four pockets G, arranged as shown, one at each side of the fire-door in front and one at each side at the sides of the furnace, substantially as specified.

HORATIO M. SMITH.

Witnesses:

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EDW. S. EVARTS.