W. D. Bartlett.

Hot-Air Furnace.

No. 110,889. Patented Jan. 10, 1871.

Fig. 1.

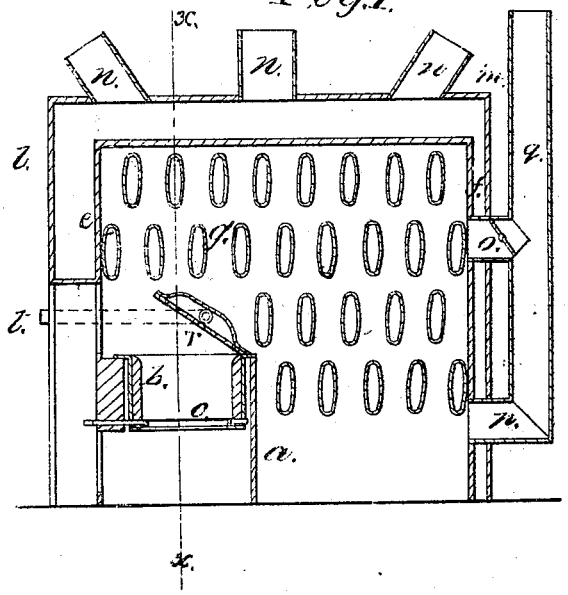


Fig. h.

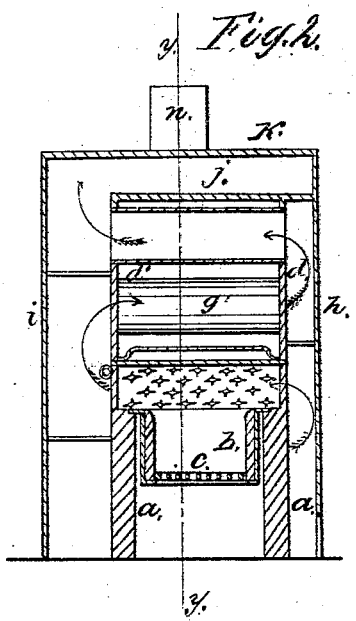


Fig. 3.

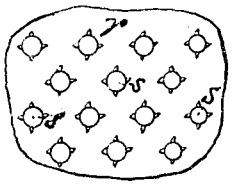
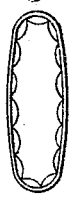


Fig. 4.



Witnesses.

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Letters Patent No. 110,889, dated January 10, 1871.

IMPROVEMENT IN HOT-AIR FURNACES.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, WILLIAM D. BARTLETT, of Amesbury, in the county of Essex and State of Massachusetts, have invented Improvements in Hot-Air Furnaces; and I do hereby declare that the following, taken in connection with the drawing which accompanies and forms part of this specification, is a description of my invention sufficient to enable those skilled in the art to practice it.

This furnace is composed of masonry, in which are set a suitable fire-pot and air-flues of metal, the design being to produce a simple and effective heating-apparatus, which can be made of any size suited to the size of the fire-pot employed, without the need of having expensive patterns and castings for different sizes of furnaces, in which apparatus there are no joints other than such as can be made by any mason with mortar and cement, and no red-hot surfaces of iron to render the heated air unpleasant to the senses.

In this furnace I introduce a means for supplying heated air in fine jets directly over the incandescent fuel, so that it mingles with the smoke and liberated gases, causing their perfect combustion.

The fire-pot is composed of metal, lined with fire-brick, soap-stone, or other suitable refractory material, the whole fire-pot being so mounted in masonry as to leave, between the outside of the pot and the wall which supports and surrounds it, an air-space, from which the air, heated by conduction and radiation from the fire-pot, may pass through the grate and the fuel therein, or into the combustion-chamber and space above the fuel.

The chamber into which the smoke and gases pass is made by walls and a top of masonry, and in two of the opposite walls are set flues of metal, which I prefer to make of an oval form of section, arranged with the long diameter of each in a vertical position.

These flues are open at both ends, and opposite the ends of the flues on one side a wall is built, leaving a space between it and the flue-supporting wall, which is divided by horizontal partitions, beneath the lower one of which cold air is admitted, which becomes heated by passing through the flues. Opposite the other ends of the flues another wall is built, leaving an air-space between it and the flue-supporting wall, this space being also divided by horizontal partitions alternating with those above named, the top of the furnace, and preferably, also, around the ends thereof, so as to prevent waste of heat from the end walls of the combustion-chamber; and from the space over the furnace the hot air is taken for distribution through suitable pipes.

I place at the rear of the fire-pot, inclining upward and toward the fuel-door, a plate of soap-stone, fire-brick, or other suitable refractory material, and, by means of a dishing-plate secured to the back of the soap-stone, I form a chamber into which air is admitted through a pipe. The soap-stone is drilled with numerous holes of about an inch in diameter, and the holes are grooved and then filled with cylindrical plugs of suitable refractory material, thus leaving numerous small air-passages through which the air introduced through the pipe escapes over the fuel, being highly heated on its passage. The fine holes for the passage of air may be otherwise made, but I have described the most practical and convenient method known to me.

From the combustion-chamber, which receives the heat, smoke, and gases generated by the consumption of fuel, two outlet-pipes lead to one funnel, leading to the chimney, one outlet-pipe being near the upper part, and the other being near the lower part of the combustion-chamber, the former giving a direct draught, to be used in starting a fire, and the other an indirect draught, to be used after a fire is established, there being a controlling damper in the direct outlet.

Referring to the drawing for further description—

Figure 1 shows my improved furnace in vertical longitudinal section;

Figure 2 shows the same in cross vertical section, the sectional plans of each figure being denoted by dotted lines on the other figure;

Figure 3 is a detailed view of a portion of the surface of the perforated plate of the gas-burning apparatus; and

Figure 4 shows a diaphragm, which I sometimes introduce into the cold-air ends of some of the lower flues to lessen the amount of flow of air through them.

a is the wall which forms the ash-pit, and which supports the flanged metal of the fire-pot, which is provided with a refractory lining, *b*, and a suitable shaking and dumping-grate, *c*.

Side walls *d d'*, and front and rear walls *e* and *f*, are erected, as shown, the flues *g* being built into the walls *d d'*, and making passage-ways for air to pass from the space formed between the walls *d* and *h*, into the space between the walls *d'* and *i*, and *vice versa*, the cold air first passing through the lower series of tubes, then in the opposite direction through the next higher series, and so on alternately, metal partitions 1 1 1 serving to compel the air to take this winding or circuitous path before reaching the hot-air chamber.

The walls *d d'*, *f*, and *e*, are lower than the walls *h* and *i*, and are covered by a top, *j*, which extends from the wall *d'* to the wall *h*, the walls *f* and *e* also extending to the wall *h*.

A less perfect construction is to dispense with the

outer end air-spaces and walls *l* and *m*, continuing the walls *e* and *f* to the top, *k*, the outlet-distributing pipes *n n n* leading from the space between the tops *j* and *k*.

o is the direct-draught outlet, and

p, the indirect-draught outlet, both communicating with the funnel *q*, there being a damper in *o*, by which the outgoing passage of smoke, &c., is controlled.

An air-chamber which has a front plate, *r*, of soapstone or other suitable refractory material, and a dishing-back, of copper, preferably, rests with its lower edge across the rear of the fire-pot, the plate *r* projecting upward and inclining toward the fuel-door.

This plate is perforated, preferably by boring, then the round holes are grooved, and cylindrical plugs, *s*, are driven into the holes, thus leaving small escape-passages for the air, which, through pipe *t*, enters the chamber formed at the back of plate *r*.

It will be seen that all the products of combustion are thrown off from the fuel directly into the large chamber which is traversed by the flues *g*, that cold air entering the space between *d* and *h*, or between *d'* and *i*, as the case may be, passes through the lower flues, is heated in its winding passage through the other flues, and is distributed from and through pipes *n*.

The flues may be made of cast or wrought metal, or of fire-clay or other refractory material, and of any desired form, and the size of the furnace may be enlarged or diminished at will, by merely increasing or diminishing the walls, and the number of flues and the size of the fire-pot, so that such furnaces may be made in regions remote from foundries and where transportation is expensive.

The gas-burner is located where it will become intensely heated, and where it discharges fine jets of highly-heated air directly upon and into the consumable volatile products escaping from the fuel, resulting in the ignition of said products and their consumption with a brilliant flame, thus utilizing the calorific value of the fuel to the greatest possible extent.

Ashes and other solid matter fall in the flue-chamber below the flues, where the deposit remains until cleaned out, without obstructing the draught or lessening the efficiency of the conducting and radiating surfaces. The flues are shown as horizontal in their location, but they might be inclined upward.

I claim—

1. The furnace as made, with a combustion-chamber located with respect to the fire-pot, as shown and described, when the combustion-chamber is unencumbered with tortuous or contracted passages between the fire-pot and the direct or indirect smoke outlet, and when it is traversed by air-flues which are surrounded by the heated and volatile products of combustion proceeding from the fuel, through the lower series of which flues passes cold air from a cold-air chamber on one side of the furnace, and thence back and forth alternately through each series of flues, to a hot-air chamber located over its top, the air being heated in its passage through the flues, the whole being arranged and combined substantially as described.

2. The plate *r* of the air-heating chamber, in which the air-discharge passages are made by and between perforations through the plate and plugs which are located in such perforations.

WM. D. BARTLETT.

Witnesses:
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