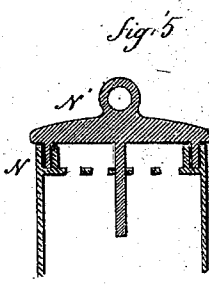
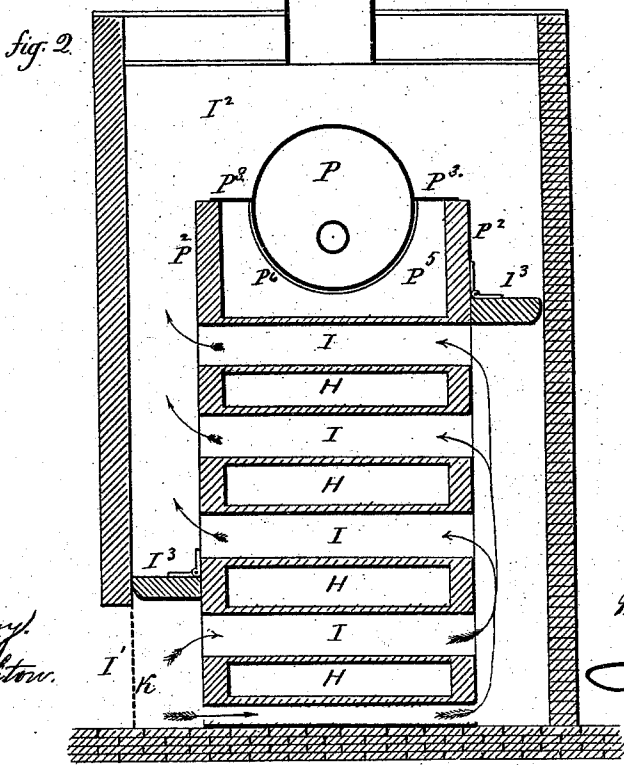
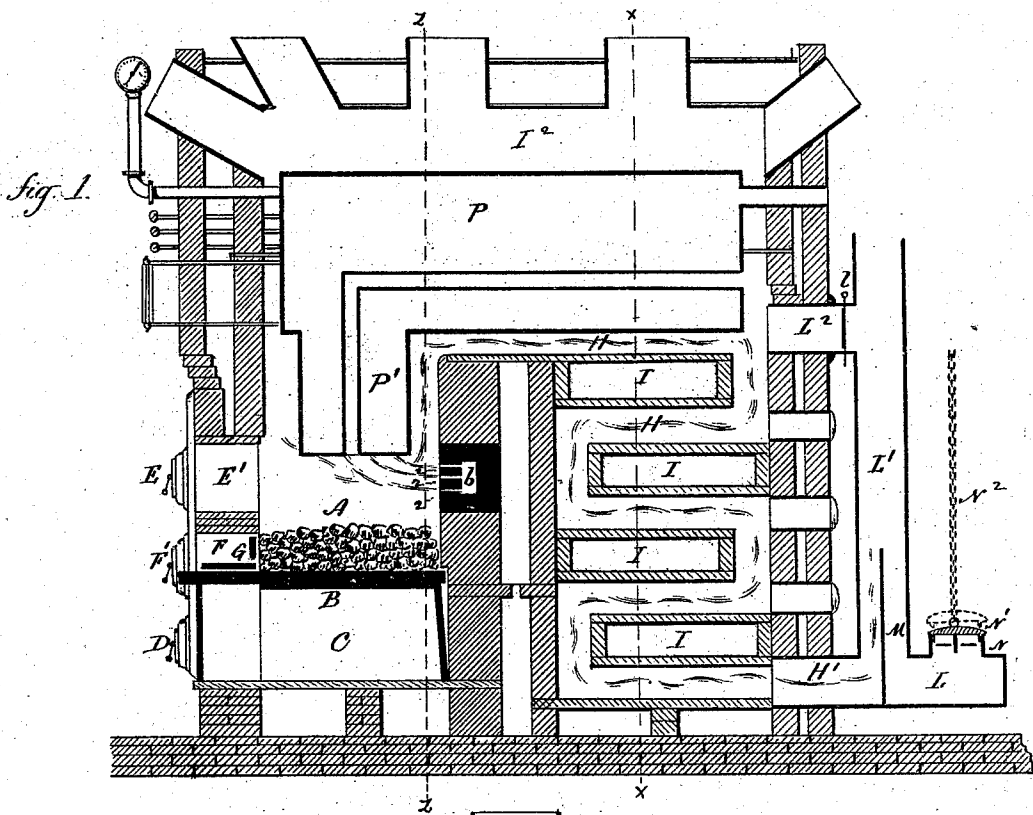


S. SMITH.
HEATING-FURNACE.

No. 172,188.

Patented Jan. 11, 1876.



Witnesses.
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Oliver Doughton.

Sidney Smith,
By Atty. *Inventor.*
John E. Earle

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fig. 3

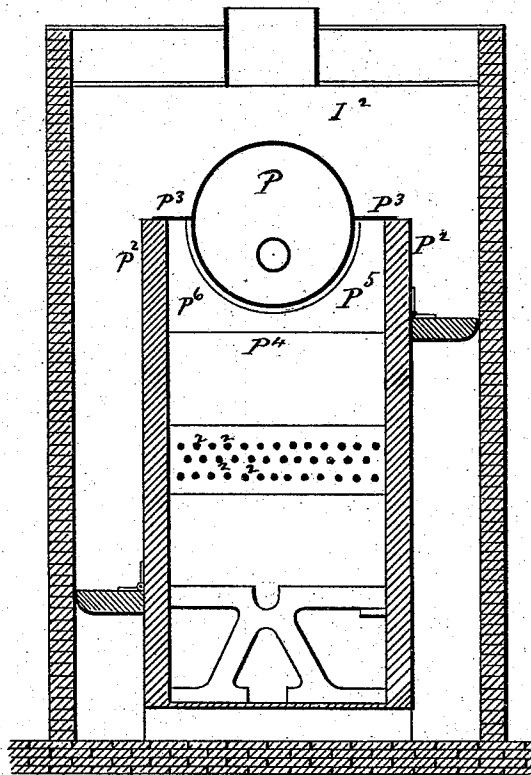
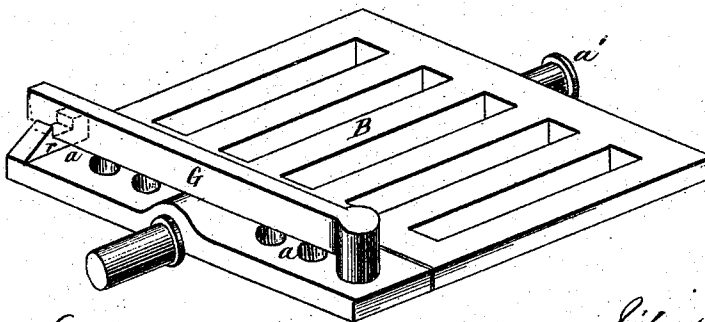


fig. 4



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UNITED STATES PATENT OFFICE.

SIDNEY SMITH, OF WORCESTER, MASSACHUSETTS.

IMPROVEMENT IN HEATING-FURNACES.

Specification forming part of Letters Patent No. 172,188, dated January 11, 1876; application filed May 31, 1875.

To all whom it may concern:

Be it known that I, SIDNEY SMITH, of Worcester, in the county of Worcester and State of Massachusetts, have invented a new Improvement in Furnace; and I do hereby declare the following, when taken in connection with the accompanying drawings and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification, and represent, in—

Figure 1, longitudinal central section; Fig. 2, vertical section on line *xx*; Fig. 3, vertical section on line *zz*; Figs. 4 and 5, detached views.

This invention relates to an improvement in that class of furnaces for heating purposes in which the air is heated by passing back and forth through transverse flues, the said flues heated from the fire, the products of which pass in a longitudinal or descending flue, around the said transverse flues, to the escape, but applicable to other classes of furnaces; and the invention consists in the construction of the various parts, as fully hereinafter described.

A is the fire-box, the fire supported on a grate, B, beneath which is an ash-pit, C, the ash-pit closed by a door, D; E, the door closing the opening E' to the fire-box. Between the ash-pit door and the fire-opening, and on a level with the upper surface of the grate, is a third opening, F, closed by a door, F'. At the inside of the front wall, and in this opening F, is an auxiliary door, G. (Shown in Fig. 4.) Beneath this door is an opening, *a*, flush with the grate, the door held closed by latching into a notch, *b*, at the opposite side to which it is hinged. The object of this door is to afford a convenient means for cleaning the grate, and to avoid the usual necessary shaking of the grate, and it is done by inserting the poker through the opening beneath the door G, and running it over the surface of the grate—that is, between the grate and the coal, which so agitates or disturbs the coal as to cause the ashes to be separated and fall through into the pit below, and if occasion requires the removal of clinkers or other foreign material, the door G may be opened, and such material be removed without necessarily bring-

ing it to the top of the fire, as is necessary in the common construction of furnaces. By this construction the fire is much more perfectly and easily cleared than by any agitation of the grate or "poking" from below. H is the smoke or heating flue, which leads from the top of the fire-box down in a circuitous passage to the exit H'. This circuitous passage is preferably formed from plates of soapstone laid upon a wall of the same material, and transverse openings I formed between the plates, through which the air to be heated passes in contact with the plates, by which contact it is heated.

The furnace is surrounded by a wall, in the usual manner for other furnaces, leaving a space between the wall and the furnace proper as the heating-space.

Air is admitted through a suitable opening, I¹, near the bottom at one side, to pass through the transverse flues I to the opposite side, and return again, and so on back and forth to the desired extent, coming finally to the hot-air chamber I² at the top, from whence it is taken by pipes to the registers in the usual manner.

In order to deflect or turn the inflowing air back and forth through the flues, deflecting-plates I³ are arranged as seen in Fig. 2.

The air which enters the heating-chamber from outside has usually combined with it more or less dust or other foreign matter, which renders such air injurious to health, and the heating of the air in this condition only adds to the difficulty, to avoid which I introduce into the passage for cold air a filter, K, composed of an open fibrous material, presenting a wool or woolly surface, sufficiently open to permit the air to pass freely through, but the woolly fibers retain all the dust or other foreign matter which the air may contain when it comes to the filter, and hence the air which is heated is perfectly pure.

In order to produce perfect combustion, it is essential that more or less atmosphere be directly mingled with the products of combustion above the burning coal. To do this I arrange in the fire-box wall, preferably in the rear, a flue, *b*, into which the external atmosphere is permitted to flow, and from this flue into the fire-box more or less perforations, 2,

are made, through which currents of air will freely flow into the fire-box, as indicated in Fig. 1, there to mingle with the products of, and produce a most perfect, combustion. This flue *b* is made complete from soapstone, one side of which is perforated, and so as to be laid in the wall, as shown in solid black.

To regulate the draft of the fire, a projection or extension, *L*, is formed on the exit-pipe *H'*, and from the pipe *H'* a vertical pipe, *L*¹, extends up and connects with the direct draft *L*², and thence leads to the chimney. The direct draft *L*² is provided with a damper, *l*, by which to turn the draft through the circuitous flue to the exit *H'*. On the extension *L* a circular grooved flange, *N*, is formed, and over this a cover, *N*¹, is set, (see Fig. 5,) the flange of the cover setting into the groove in the ring, and to this a chain or cord, *N*², is attached, by which the cover *N*¹ may be suspended above the ring, as denoted in broken lines. Thus suspended, an opening is formed into the draft-flue, and through this cold air will rush to the flue and check the draft, according to the quantity of air admitted; but when closed, the check ceases, and the draft is unobstructed. The groove in the ring is filled with oil or other suitable liquid, so that when the flange rests therein the opening will be perfectly closed. Between the outlet *H'* and the check a partition, *M*, is arranged, extend-

ing up into the vertical pipe a short distance, so as to form, as it were, two flues, both opening into the main flue, whereby the possibility of the escape of gas from the furnace through the check when opened is prevented.

I do not wish to be understood as claiming any of the elements shown in the accompanying illustration, except as hereinafter specified.

I do not wish to be understood as broadly claiming openings into the fire-box for the admission of air above the fire, as such, I am aware, is not new.

I claim—

1. In combination with the principal door *F'* of the opening *F*, the auxiliary door *G*, constructed to leave a space beneath it, and substantially flush with the surface of the grate, as and for the purpose described.

2. In combination with the exit-flue of a furnace, the grooved ring *N* outside the said flue, and the flange-cover *N*¹, substantially as and for the purpose described.

3. In combination with the exit-flue *H'* of a furnace, and the check, consisting of the ring *N* and cover *N*¹, the intermediate partition *M*, substantially as and for the purpose described.

SIDNEY SMITH.

Witnesses:

JOHN E. EARLE,
CLARA BROUGHTON,