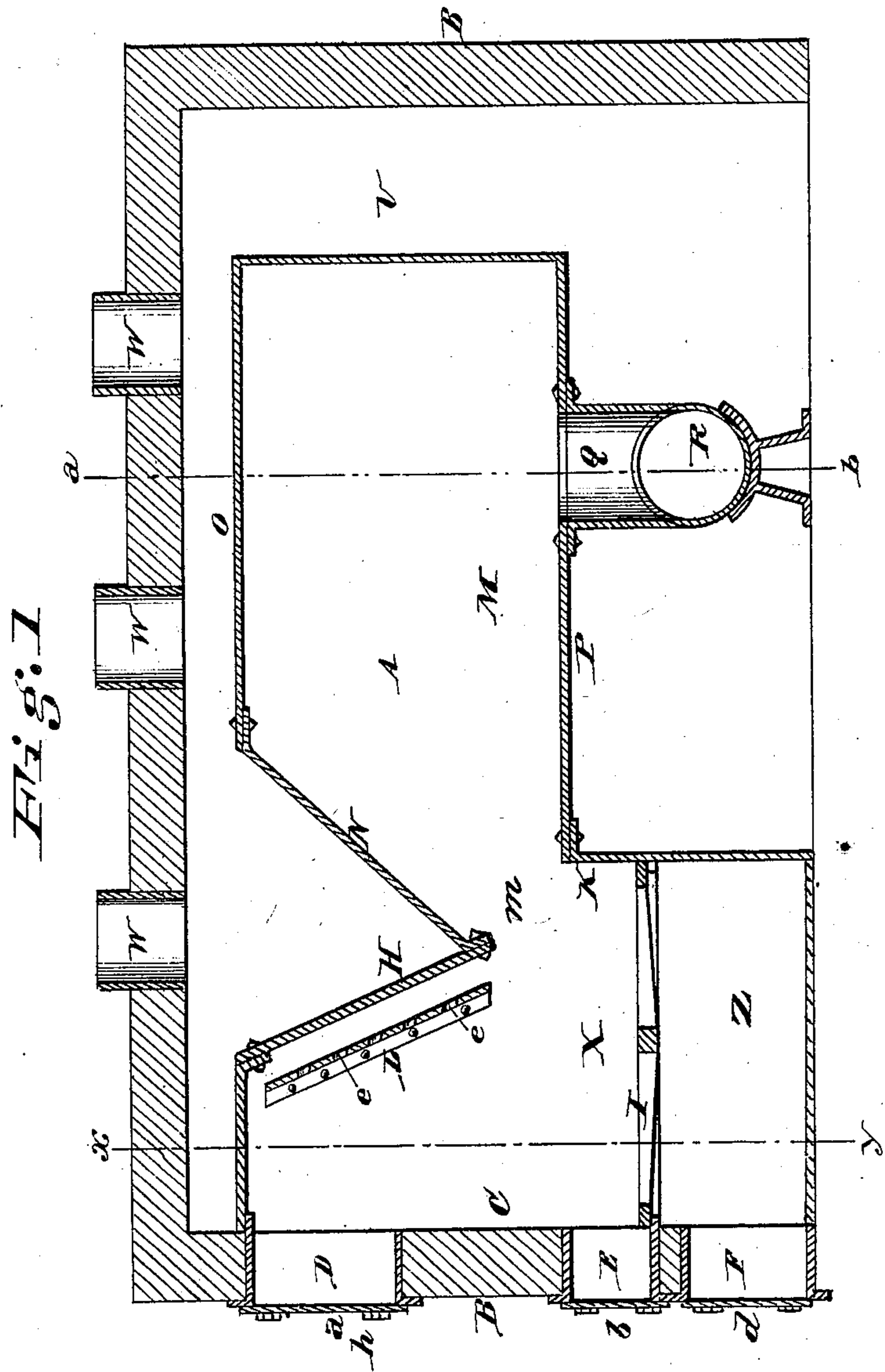


N. TOYE.
Hot Air Furnace.

No. 167,631.

Patented Sept. 14, 1875.



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J. O. Kennedy
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Inventor
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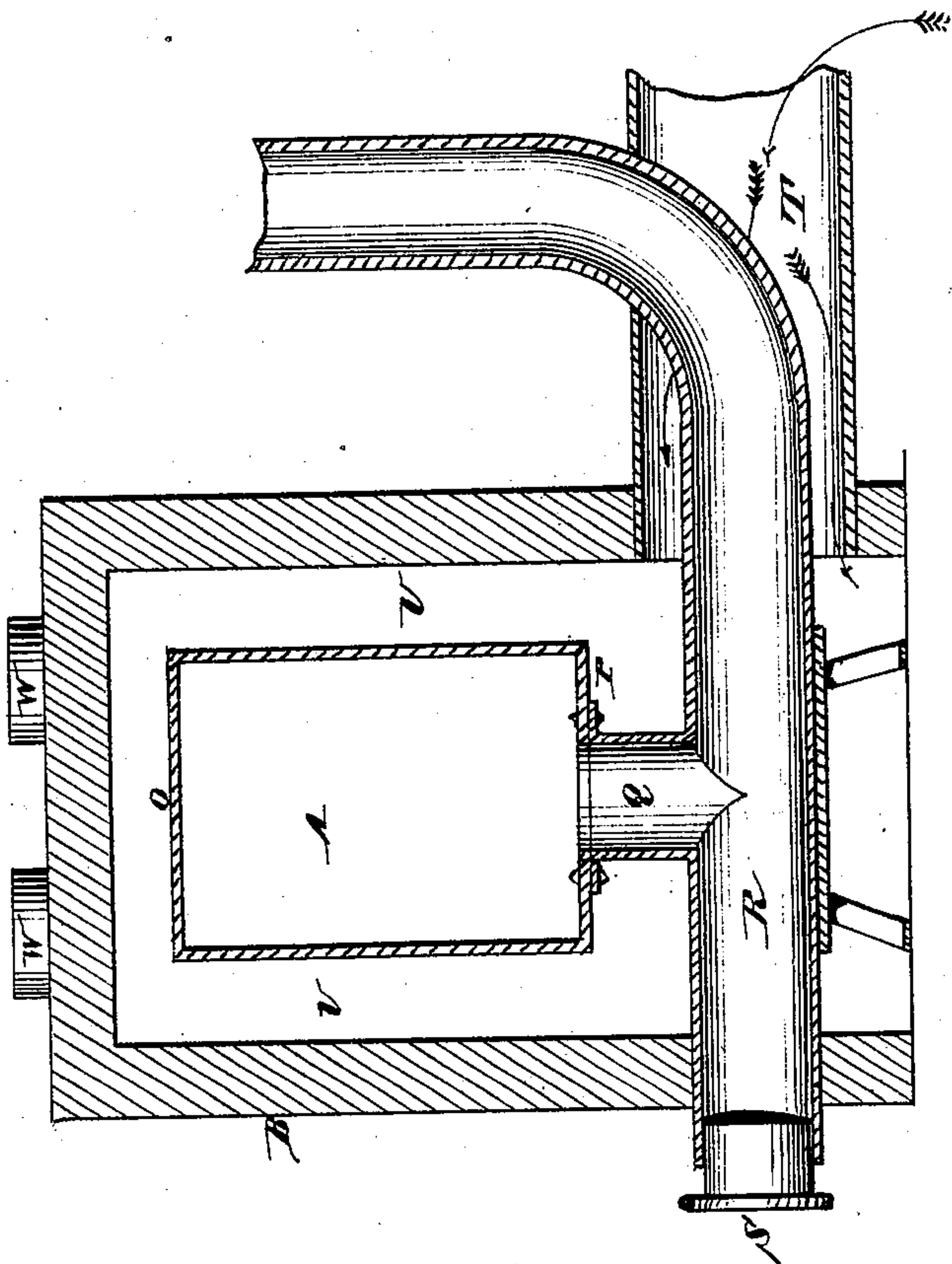


Fig. 3

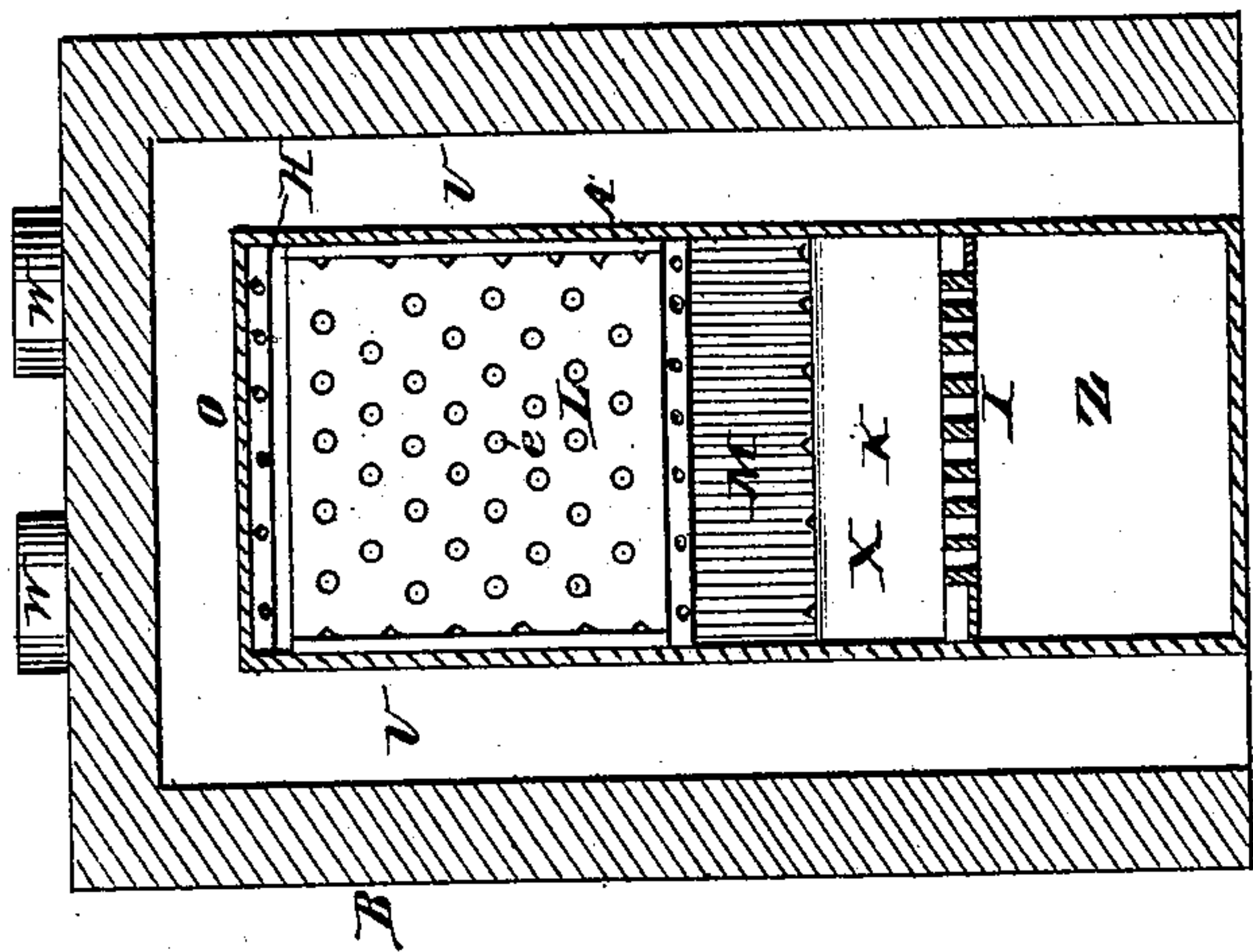


Fig. 2

Attest

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UNITED STATES PATENT OFFICE.

NAPOLEON TOYE, OF COVINGTON, KENTUCKY.

IMPROVEMENT IN HOT-AIR FURNACES.

Specification forming part of Letters Patent No. **167,631**, dated September 14, 1875; application filed April 13, 1875.

To all whom it may concern:

Be it known that I, NAPOLEON TOYE, a resident of the city of Covington, in the State of Kentucky, have invented certain new and useful Improvements in Hot-Air Furnaces, of which the following is a specification:

My invention as a whole consists in combining a new combination of parts for consuming the smoke.

My improvements for the consumption of the smoke—that is, the dark and white vapors generated during combustion—consists in the arrangement of a perforated plate in connection with the bridge-wall of the furnace, in such a manner that air admitted at the front of the furnace shall pass over the fire, and pass partly over and partly through this plate, and pass thence down between said plate and bridge-wall into the bed of the fire, where the oxygen of this now heated air unites with the volatile vapors generated from the fuel, and by the aid of the intense heat thereat they are ignited and consumed.

The second part of my invention consists in making the sides of the furnace incline outward from the highest point at which the fuel is to be placed therein down as far as the grate-bars, so that as the fuel is consumed and settles, a space shall be left between the side of the furnace and the fuel, whereby the side of the furnace is kept free from clinker, and said space forms a burning-surface, air being admitted to said space from a suitable source, preferably the ash-pit.

In the accompanying drawings forming part of this specification, Figure 1, Sheet 1, represents a vertical-central longitudinal section of a furnace, embodying my improvements. Fig. 2, Sheet 2, represents a vertical transverse section of the same furnace, taken at the line X Y, Fig. 1; and Fig. 3, Sheet 2, represents a vertical transverse section of the same furnace, taken at the line *a b*, Fig. 1.

The furnace A is provided with walls B, preferably of brick. There are at the front C of the furnace three openings, D E F, connecting the exterior and interior of the furnace. The top of the uppermost opening D is preferably at the inner roof of the combustion-chamber X, the opening being used for the introduction of fuel and air into the fur-

nace. To carry into effect the latter object the door *a* is provided with perforations or damper *h*. Opening E has a door, *b*, and is on a level with the grate I, and is of use for drawing the grate-bars. Opening F has door *d* giving access to the ash-pit Z. H is the rear wall of combustion-chamber X, and extending backward and downward from the top of the same to a point a little over half the height of the combustion-chamber. From and above the plane of the grate-bars the sides of the combustion-chamber X incline gradually inward to the top of the fire-box. (See Fig. 2, Sheet 2.) The grate-bars I extend to a short distance behind the vertical plane, in which the lowest point of the wall H is situated. Immediately at the rear of the grate-bars rises an abutment or wall, K. In front of the wall H, and parallel thereto, extends the perforated plate L, being sufficiently far removed from the wall to allow air to pass between the two sufficient for the perfect combustion of fuel. A space sufficient for the same purpose is left between the top of the furnace and the plate. The plate is perforated with holes *e*. The receiving-chamber or radiator M, which receives the heated products of combustion, and imparts their heat to the air which is to supply the house, is constructed as follows:

The back N of the wall H, beginning at the bottom of the latter, extends upward and backward at nearly the same angle as the wall H extends forward, and meets the top O of the chamber M. This top is preferably horizontal. The floor P of this chamber begins at the top of abutment K, and extends back horizontally. The mouth of the flue or pipe Q for the exit of the products of combustion, termed in non-smoke-consuming furnaces the smoke-flue, is situated in this floor, preferably at or near the rear thereof, and thence passes vertically down into the horizontal pipe or flue R. The latter pipe extends through both sides of the furnace, and at one end is provided with cap S, and at the other passes out into the smoke-stack. The flue T, which supplies the air, which is to be heated and delivered to the house, incloses the latter portion of the pipe R. A space, U, is left between the radiator and the outer walls of the

furnace, through which the air can pass. W are tubes connecting the air-space U with the flues or register of the building to be heated.

The mode in which my improvements operate is as follows, viz: I make a fire in the combustion-chamber in the usual way with wood and coal, preferring, however, that the sides of the grate-bars shall receive an excess of wood, shavings being placed in the rear. After starting the fire in the rear I commence putting the coal in front till it rolls down and strikes abutment K. As fast as the latter consumes I add more coal until it is coked to within two inches of the top of the throat *m*, the latter being the opening between the combustion-chamber and the radiator M, and lying between walls H and K. Then the combustion-chamber may be filled up to the top of the perforated plate. The combustion of the coal takes place as follows, viz: The burning proceeds inward from the bottom, and then from the rear plate L, and eventually from the sides, finally reaching the center. During this time the ignition and combustion of the smoke commences, and continues until the coal is all carbonized. Cool air passes into the combustion-chamber through the damper *h* in door *a*, and over the top of the fire-bed and the top of the plate L, and thence down between the plate and wall H. All the gases of the burning fuel pass over the top of the plate or through the perforations *e*, and, mixing with the air passing down the space between the wall H and plate L, are carried down to the throat *m*, and there, in consequence of the intense heat, the said products of combustion are by the aid of the said air ignited, and the oxygen of the latter chemically unites with the carbon, &c., of the products. The heat thus generated passes into and fills the radiator M, filling the latter; thence it passes down flue Q into smoke or

eduction pipe R, giving off on its way through the latter much of its heat, the cool air passing from the outer atmosphere through induction-pipe T. Thus much of the heat which would otherwise pass off through pipe T and be wasted is utilized. The location of pipe Q in the bottom of the radiator practically preserves the latter from the action of the fire, and more equally distributes the heat, because the heat has a tendency to ascend, and in order to get out must first fill the entire radiator; whereas, when the smoke-pipe is placed, as is usually the case, in the top or upper part of the radiator, the upper part is overheated, while the lower portion is left comparatively cool. The provision of cap S enables the pipe to be conveniently cleaned of any settlings which may possibly accumulate therein.

While the construction of the combustion-chamber herein shown and described is especially adapted for a hot-air furnace, I do not limit the application of it to that class of furnaces, but claim it as a smoke-consuming furnace for any purpose to which it can be applied. The same is true of the radiator. The furnace, which feeds through *m*, may be of any desired construction, and the advantages resulting from the arrangement of pipes Q, or R, and T.

What I claim as new, and desire to secure by Letters Patent, is—

In a furnace, X, the combination of openings D *a*, plate L, wall H, and throat *m*, plate L being removed sufficiently far from wall H to allow the passage of air between them, as and for the purposes specified.

NAPOLEON TOYE.

In presence of—

D. P. KENNEDY,
A. T. EARLE.