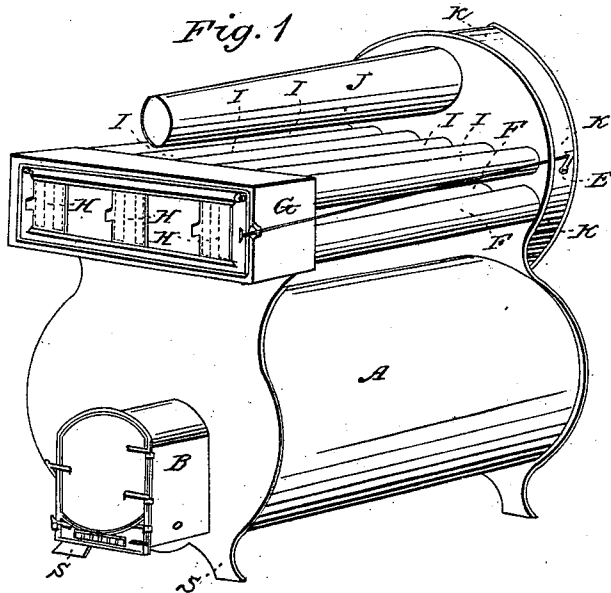
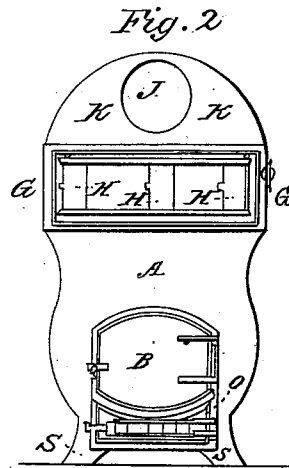
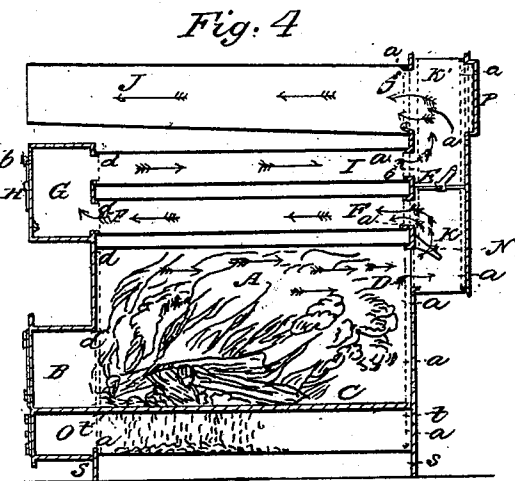
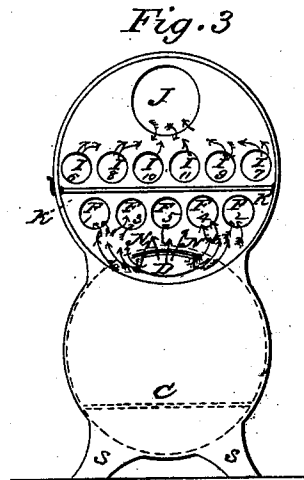


LEE & HARDENBERGH.

Hot Air Furnace.

No. 96,328.

Patented Nov. 2, 1869.



Witnesses:

Wm. H. Gale

Inventors:

*H. H. Lee
Chas. M. Hardenbergh*

United States Patent Office.

WILLIAM H. LEE AND CHARLES M. HARDENBERGH, OF MINNEAPOLIS,
MINNESOTA.

Letters Patent No. 96,328, dated November 2, 1869.

HOT-AIR FURNACE.

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

Be it known that we, WILLIAM H. LEE and CHARLES M. HARDENBERGH, both of Minneapolis, in the county of Hennepin, and State of Minnesota, have invented certain Improvements in the Construction of Furnaces and Flues for Warming Buildings; and we hereby declare the following to be a full and sufficient description thereof, reference being had to the accompanying drawings, making part of the description, of which—

Figure 1 is a perspective view of the furnace, flues, &c.

Figure 2 is a front elevation.

Figure 3 is a rear elevation, with back or cover of chamber K removed, to show the curved diaphragm N.

Figure 4 is a transverse section of furnace and flues, showing a side view of furnace.

A represents cylindrical fire-box.

B is door for firing up.

C is a grate for the furnace.

D is an outlet from fire-box to cylinder K.

E is a damper used for starting fire.

F, lower series of radiating-flues.

G, smoke-box for check-draught.

H, slide-valves for the check-draught.

I, upper series of radiating-flues.

J, converging radiator, receiving smoke from K, and converging to front.

K, cylindrical chamber.

N, diaphragm, to divert flame to the side radiators.

O, ash-door and pit.

P, opening, to reach flue-chamber K, for clearing J, or taking off part of the smoke elsewhere.

a a, flanges on casting, to bring all the wrought-iron parts snugly together.

b, snugs, to secure plates H and their attachments in place.

S, legs or standards for the furnace.

t, lugs, for sustaining grate C.

1, 2, 3, and 4, lateral flues of lower series F.

5 is the middle flue of lower series.

6, 7, 8, and 9, lateral flues of upper series I.

10 and 11, middle upper flues of series I.

Screw-bolts for tightening up, not shown in the drawings.

To enable others skilled in the art to make and use our improvement, we give the following description of it.

The nature of the invention consists in the adaptation of several individual devices for special purposes.

Thus, in using a series of many flues, it is not easy to control and distribute the flame and hot air equally. This we have done by the interposition of a diaphragm, n n, fig. 3, which throws the flame and hot air to the side flues, and equalizes the distribution of the heat, and a check-valve or draught in smoke-box G, which

controls the heat thus distributed, by letting in air through slide-valve H, which slows combustion, and economizes fuel.

Another feature of the invention relates to the construction of the heads or ends of the cylindrical portions, in such manner, in one casting, with uniform flanges, that all the parts come together at once, and make a smoke-tight joint, by screw-bolts and rods.

The general construction of the furnace is of cast and wrought-iron. It consists of a large cylinder, A, containing the fire, and a cylinder, K, of like diameter, but shallow, as indicated in fig. 1, to receive the products of combustion from the lower range of flues F, and deliver the same to upper range of flues I, through smoke-box G, and finally to the converging-flue J, and thence to the chimney.

Operation.

The fire is lighted at B in cylinder A, figs 4 and 3, on C, and when ignited, damper E is closed, and the products of combustion follow the course of the arrows, traversing the length of the furnace four times. The distributor N renders a valuable service, compelling the flame and gases to pass through the lateral flues to a large extent, and thus equalizes the heat throughout the apparatus.

The above-described cylinders, tubes, &c., should be enclosed or encased in brick-work, metal, or other suitable material.

Having stated the nature of the invention, and the mode of using it,

What we claim, and desire to secure by Letters Patent, is—

1. The diaphragm n, in combination with check-valve H in smoke-box G, for distributing, equalizing, and controlling the combustion, according to circumstances, as set forth.

2. In combination with the diaphragm and check-valve, as claimed under the preceding clause, the valve E, horizontal tubes F and I, and smoke-box G, substantially as set forth.

3. In combination with the valves, tubes, and smoke-box claimed in the manner set forth in the preceding clause, the fire-box A and cylinder K, operated as and for the purposes set forth.

4. The construction of the ends of the furnace of cast-iron in a single casting, with flanges a' a' upon each figure, and to receive at once cylinders and flues F I J, the whole drawn together smoke-tight.

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