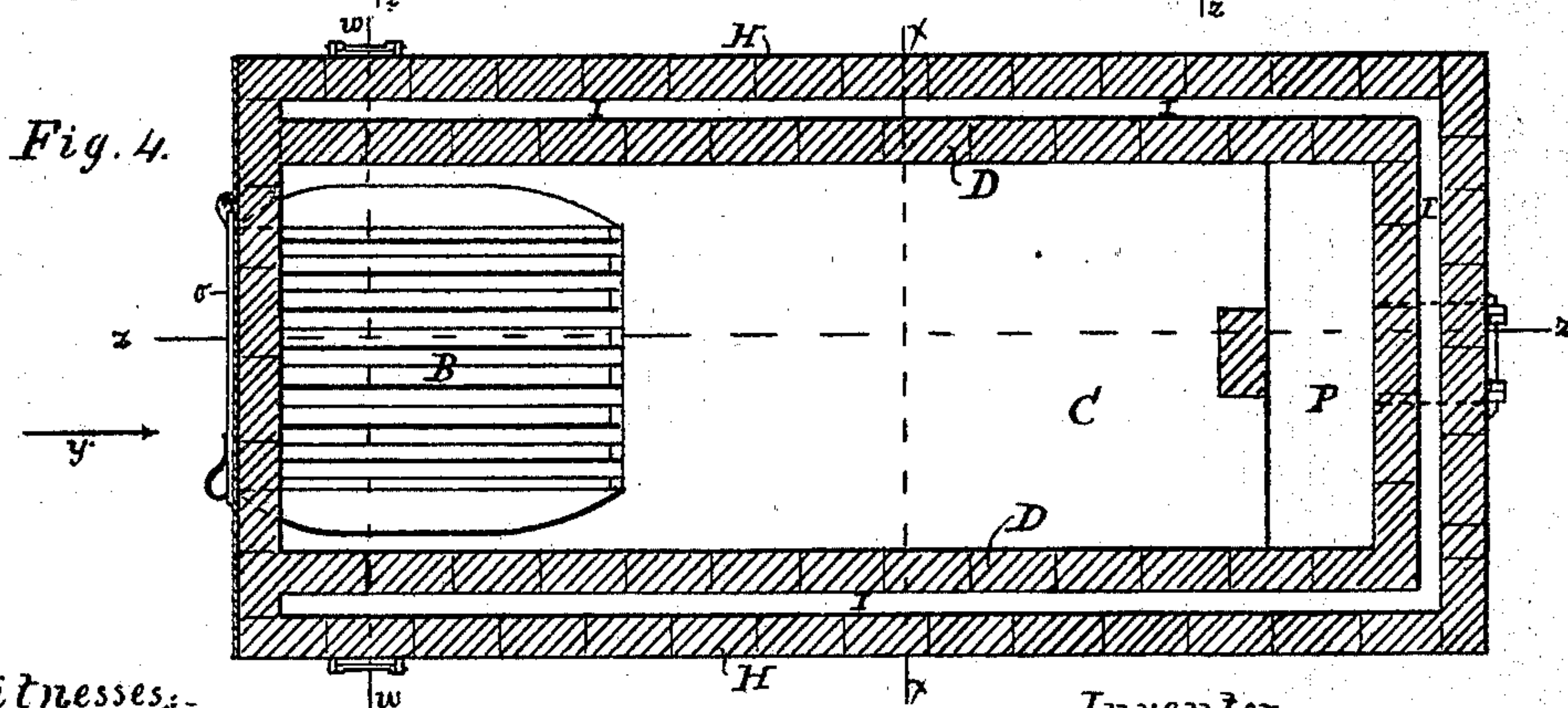
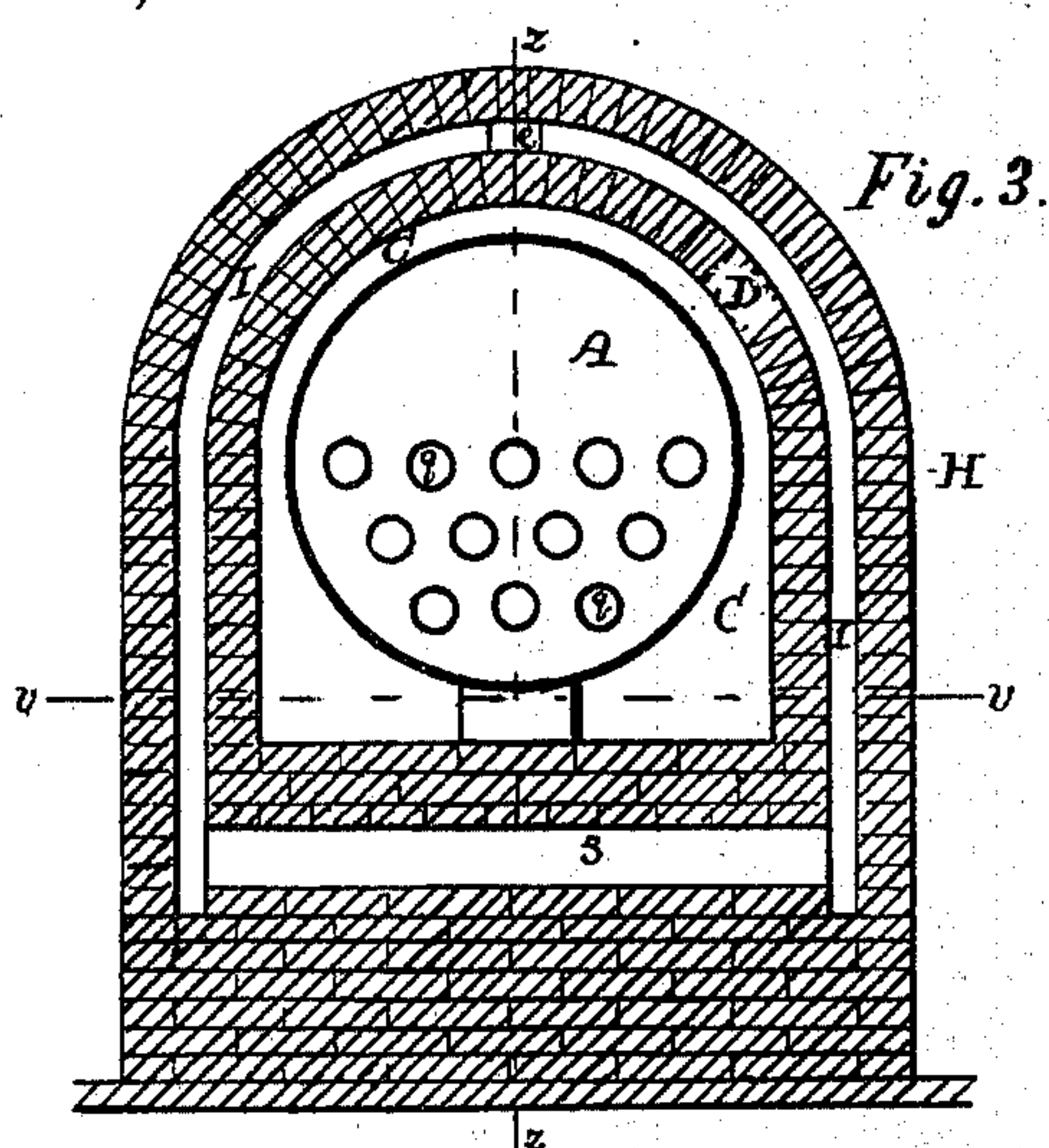
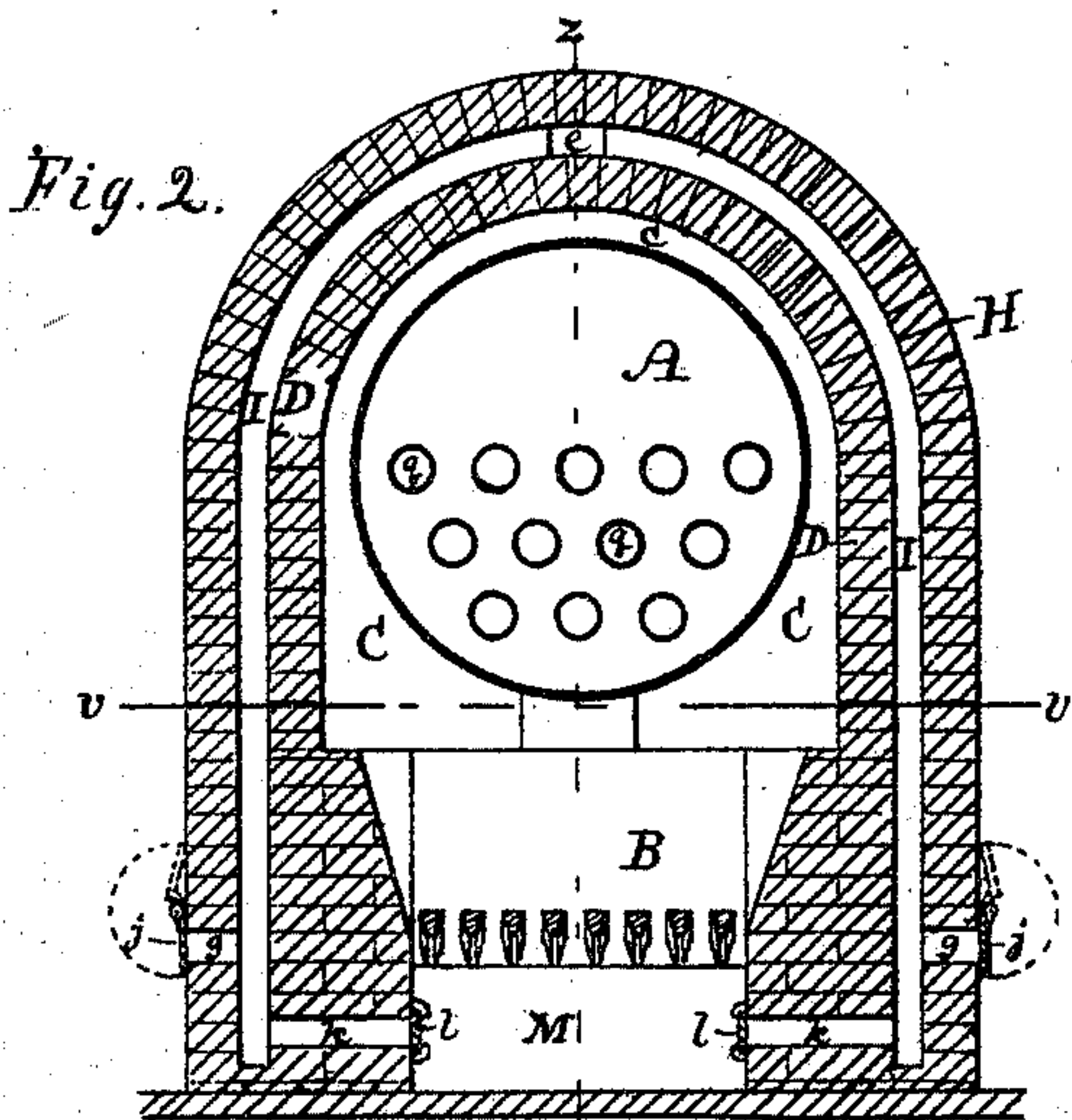
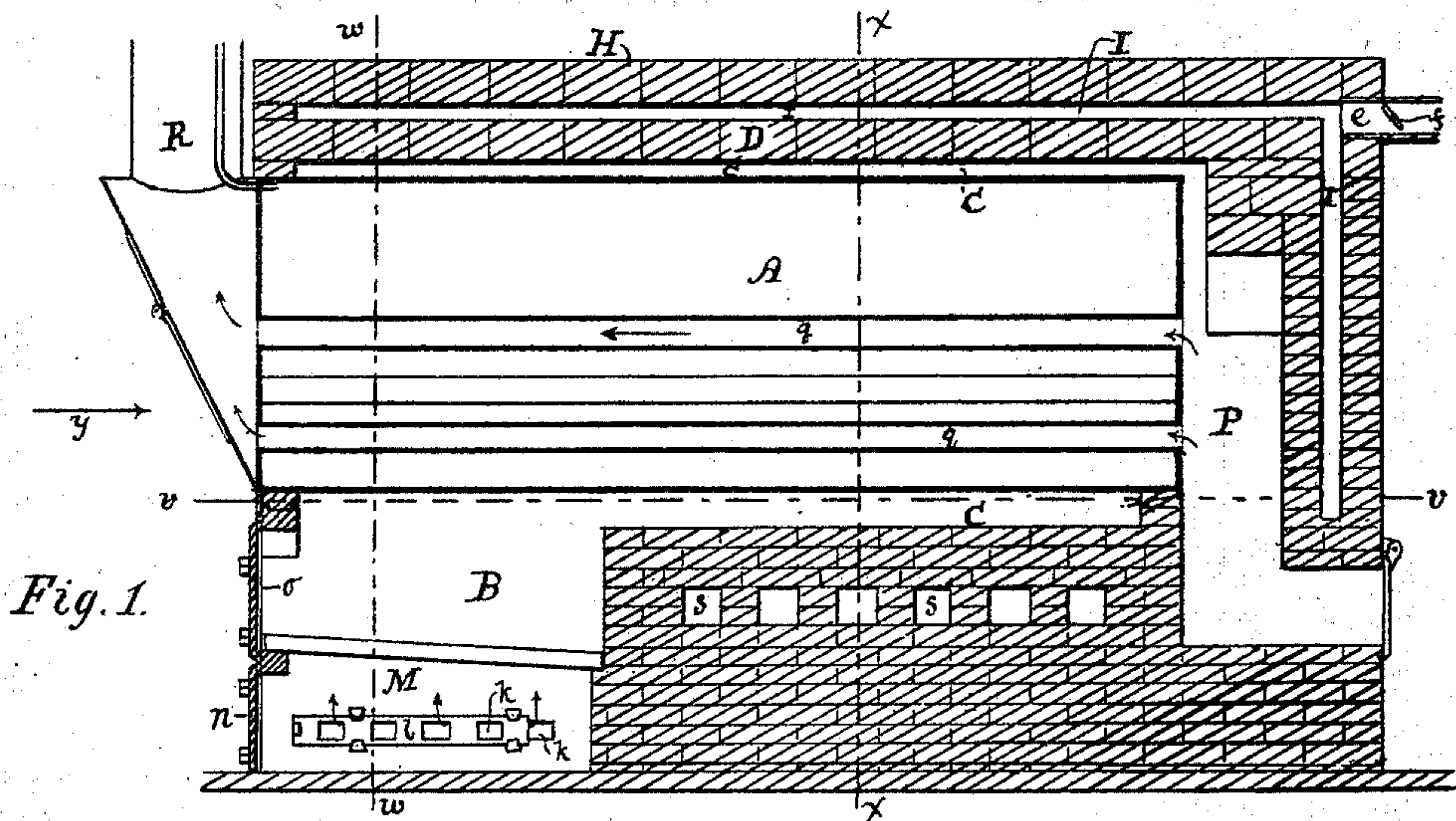


S. KEYES.
Steam-Boiler Furnaces.

No. 144,393.

Patented Nov. 11, 1873.



Witnesses:-

A. B. Gardner
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UNITED STATES PATENT OFFICE.

SAMUEL KEYES, OF BENNINGTON, VERMONT.

IMPROVEMENT IN STEAM-BOILER FURNACES.

Specification forming part of Letters Patent No. **144,393**, dated November 11, 1873; application filed June 7, 1873.

To all whom it may concern:

Be it known that I, SAMUEL KEYES, of Bennington, in the county of Bennington and State of Vermont, have invented certain Improvements in Steam-Boiler Furnaces, of which the following is a specification, reference being had to the accompanying drawing.

This invention consists of the combination of devices, as hereinafter described, for heating a horizontal boiler to generate steam therein, and superheat the steam in the upper part of the boiler, for equalizing the heat of, and lessening the radiation, conduction, and waste of heat from the outer surface of, the furnace around the boiler, and for producing a heated current of atmospheric air, and conducting the same into the draft-chamber under the fuel-grate of the fire-chamber of the furnace.

In the aforesaid drawing, Figure 1 is an elevation of a central vertical section, at the line *z z* in Figs. 2, 3, and 4, of a combined steam-boiler and furnace which embodies my invention. Fig. 2 is an elevation of a section of the same at the line *w w*, and viewed in the direction of the arrow *y* in Figs. 1 and 4. Fig. 3 is an elevation of a section of the same at the line *x x* in Fig. 1, viewed in the direction of the arrow *y*. Fig. 4 is a plan of a horizontal section of the furnace at the line *v v*.

A is a steam-boiler. B is a fire-chamber under the forward portion of the boiler. C is a gas-flue extending from the fire-chamber along the bottom and sides of the boiler, and in a sheet over the top thereof. D is the casing of the gas-flue. I is a sheet-like air-space covering the casing D of the gas-flue. The air-space I has, in its upper part, an external aperture, *e*, with a damper, *f*, therein. In the lower part of the air-space, and near the fire-chamber, are external apertures *g* through the outer casing H, and furnished with doors or dampers *j*. Passages or apertures *k*, having dampers *l*, extend from the lower part of the space I into the ash-pit M, which has a door, *n*, by which the ash-pit can be closed, as represented in Fig. 1. The fire-chamber B has a grate in its bottom over the ash-pit, and has a door, *o*, by which the fire-chamber is closed. The gas-flue C has communication, through the chamber P and boiler-flue *q*, with a draft-pipe or chimney, R. The air-space I may or may

not extend across the end or ends of the furnace, and may or may not have a passage or passages, *s*, under the casing of the gas-flue below the boiler. The extension of the gas-flue C in a sheet over the top of the boiler keeps the steam hot therein, and the air-space I retards the conduction of heat from the flue C to the outer surface of the sides and top of the furnace, whether the apertures *e*, *g*, and *k*, or any of them, are either permanently or temporarily closed or open. When the aperture *e* is open, and the apertures *g* or *k*, or *g* and *k*, are open to the external air, or to the ash-pit M, when the latter is wide open, a current of air will enter the lower part of the space I by the apertures *g* or *k*, or *g* and *k*, and will be warmed or heated in, and will pass upward and rearward through, the sheet-space I, and will pass out through the aperture *e*, so that the heating of the sides and top of the outer casing H of the furnace will thereby be more effectually prevented than when the said aperture or apertures shall be closed, or the space I occupied by confined air, and at the same time the current of warm or heated air issuing from the aperture *e* can be conducted off by a pipe and used to warm a distant apartment, or for other purposes. When the fire-chamber B and ash-pit M are closed, and the apertures *e* and *k* are open, or partly open, as indicated in Fig. 1, and the apertures *g* *g* are closed, or do not exist, the draft through the gas-flue C draws a current of air through the aperture *e* into, and downward through, the space I, wherein the air is warmed or heated, and from the space I through the apertures *k* into the closed ash-pit M, and thence in a heated condition up through the fire-chamber B to support the combustion of fuel therein; and, at the same time, the quantity of the current of air can be regulated and controlled by the damper or dampers *f* or *l*; and the same current of air, in passing down through the space I, effectually prevents the heating of the outer casing H of the furnace. When the aperture *e* is closed, and one of the apertures *g* *g* is open and the other closed, and the passage *k* which is nearest to the open one of the apertures *g* *g* is closed, while the other passage *k* is open, and the doors *n* and *o* of the chambers M and B are closed, in that case the

draft of a fire in the chamber B will draw external air through the open one of the apertures *g g* into the lower part of one leg of the sheet-like space I, and upward therein to and through the upper portion thereof, and thence downward through the other leg of the space I, and through the open one of the passages *k k*, into the chamber M, and thence upward through the burning fuel on the grated bottom of the chamber B. By thus merely having the lower part of one leg of the space I open to the external air by an aperture, *g*, and the lower part of the other leg of the space I in communication with the chamber M by a passage, *k*, the external air is admitted by the aperture *g* into the chamber I, wherein it absorbs the heat given off from the casing D of the flue C over the boiler, and is thence conducted into the chamber M by the passage *k*,

and increases the heat and combustion of fuel on the grate in the chamber B, substantially the same, and about as effectually, as when the external air is admitted into the space I by the aperture *e*, and is conducted therefrom into the chamber M by the passages *k k*.

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

The combination of a horizontal boiler, A, fire-chamber B, fire-flue C, surrounding the boiler, sheet-like space I over the flue C, chamber M under the fire-chamber, and passages *e* and *k k* for directing external air into and through the space I, and thence into the chamber M, substantially as described.

SAMUEL KEYES.

Witnesses:

ABRAHAM B. GARDNER,
THOMAS WHITE.