

No. 679,093.

Patented July 23, 1901.

V. L. SULLIVAN.
HOT AIR FURNACE.

(Application filed Mar. 19, 1901.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.

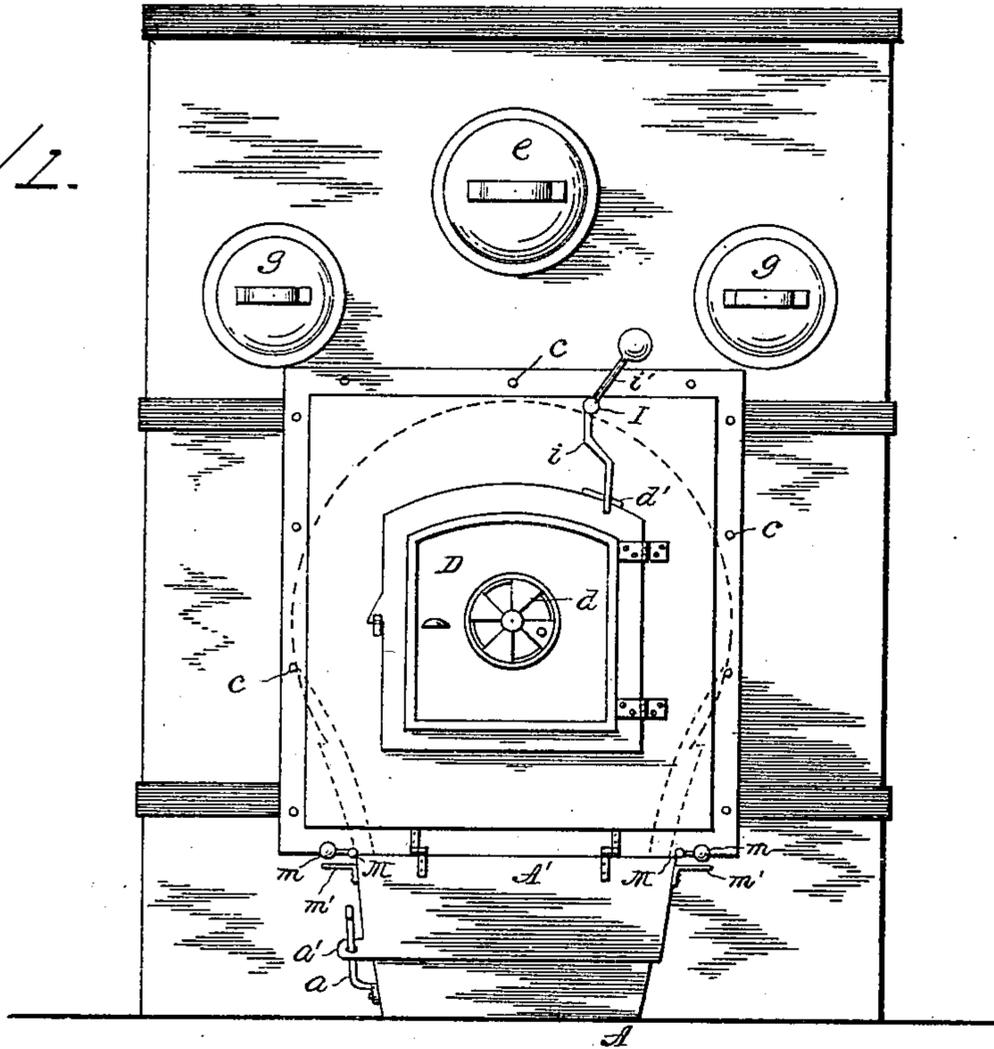
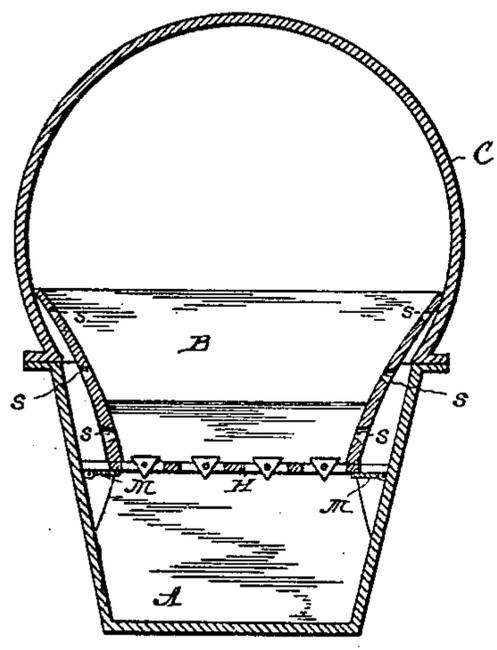


Fig. 2.



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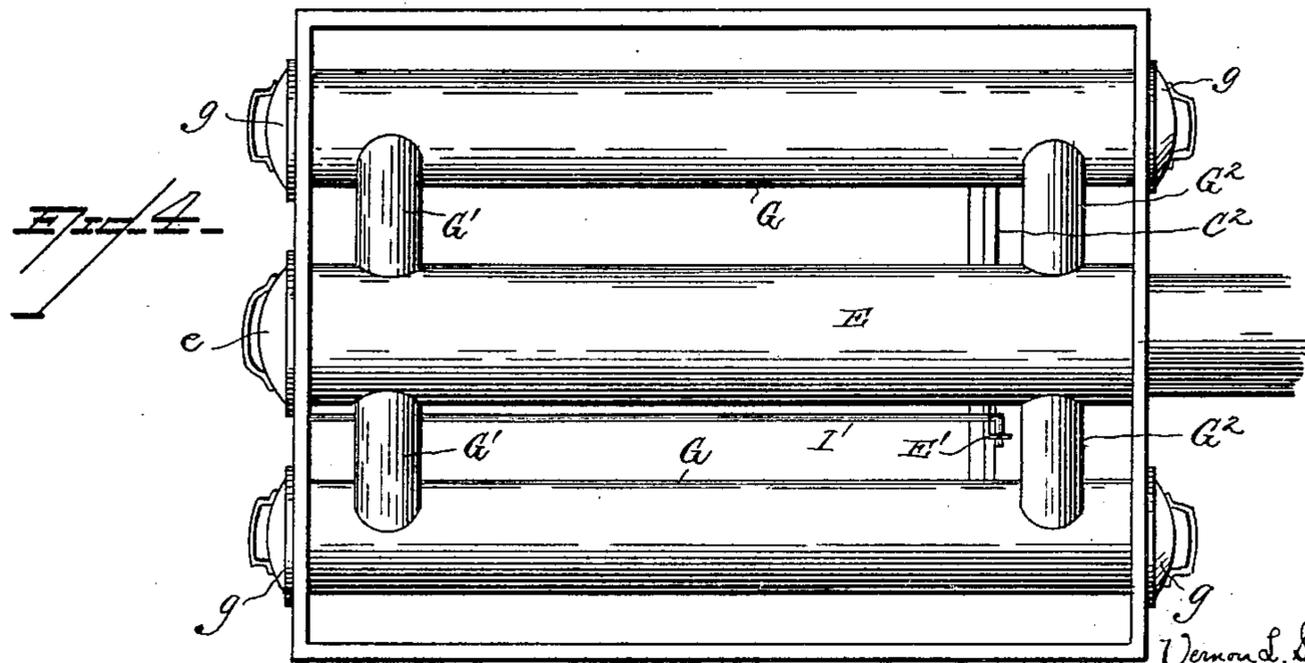
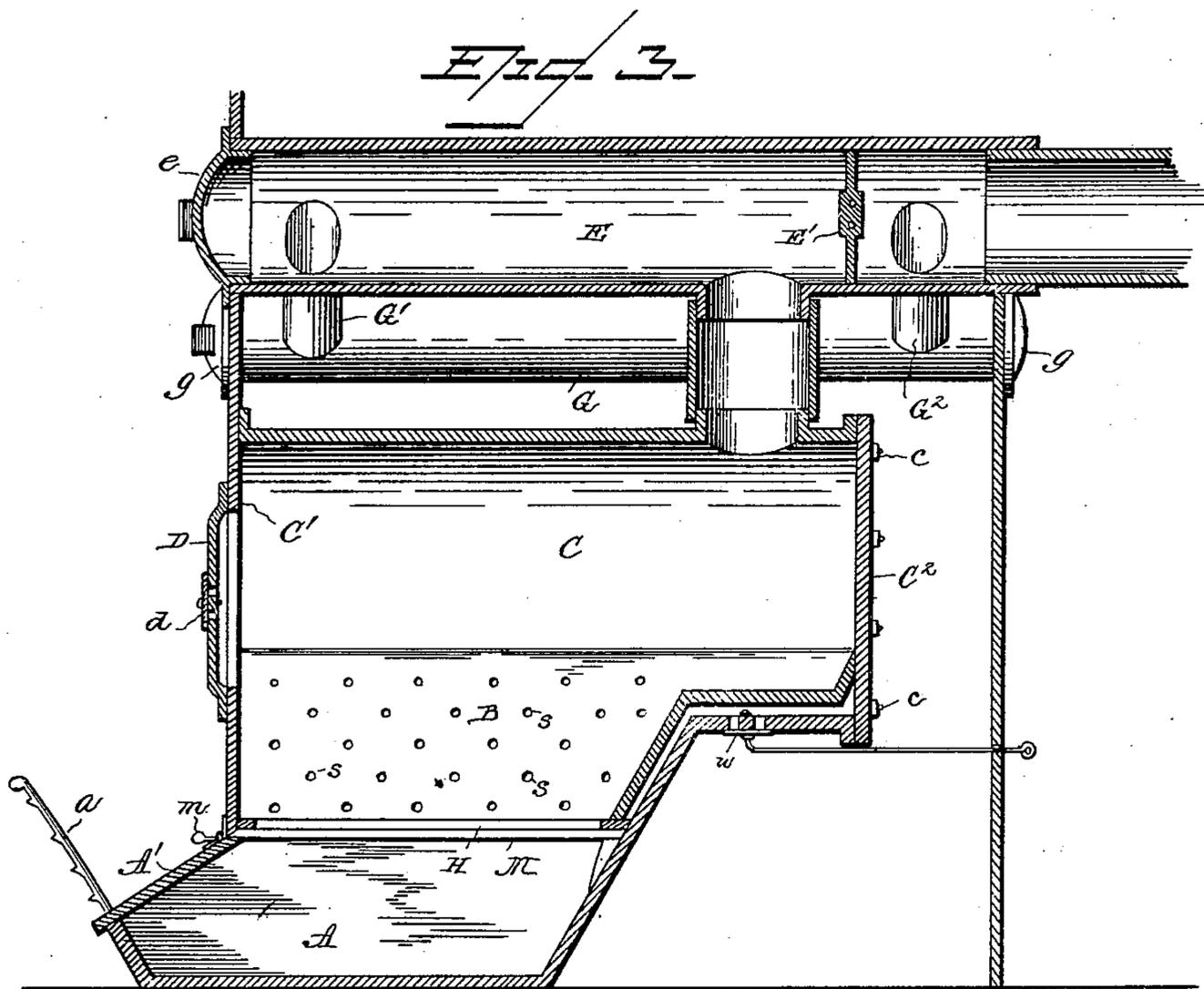
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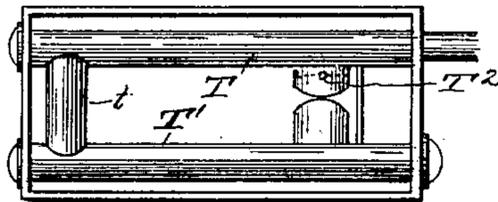
(No Model.)

2 Sheets—Sheet 2.



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Fig. 5



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UNITED STATES PATENT OFFICE.

VERNON L. SULLIVAN, OF GRANDLEDGE, MICHIGAN.

HOT-AIR FURNACE.

SPECIFICATION forming part of Letters Patent No. 679,093, dated July 23, 1901.

Application filed March 19, 1901. Serial No. 51,890. (No model.)

To all whom it may concern:

Be it known that I, VERNON L. SULLIVAN, a citizen of the United States, and a resident of Grandledge, in the county of Eaton and State of Michigan, have invented a Hot-Air Furnace, of which the following is a specification.

This invention is an improvement in hot-air furnaces; and one object of said invention is to provide a furnace of peculiar construction in which the burning of the fuel will be facilitated in a manner to radiate the greatest amount of heat and in which the products of combustion may circulate through a series of smoke-flues disposed in the hot-air chamber or drum to materially assist in the heating of the air on its way to the heat-conducting flues.

A further object of the invention is to provide automatic devices for regulating the dampers.

The following specification enters into a detail description of my invention, reference being had to the accompanying drawings and to letters of reference thereon, and what I claim in the particular construction and arrangement of parts constituting the improved furnace will be more specifically pointed out in the appended claims.

In the accompanying drawings, forming a part of this specification, Figure 1 is a front elevation of a furnace constructed in accordance with my invention. Fig. 2 is a vertical transverse sectional view through the lower part of the furnace. Fig. 3 is a longitudinal sectional view. Fig. 4 is a plan view showing the arrangement of the smoke-flues. Fig. 5 is a view showing a modification of the arrangement of smoke-flues.

Referring to said drawings, A designates the cast-iron ash-pan of the furnace, which rests upon a suitable foundation and upon which is supported the fire-box and superstructure of the furnace proper, the sides of said ash-pan being extended upward, as shown, to receive the fire-box B, hereinafter particularly described. The forward part of the ash-pan or cast-iron bottom of the furnace is extended forwardly at its lower end in order that the opening covered by the door A' will be disposed at an angle to facilitate the removal of ashes, the said door being hinged at its upper end, and as the draft is regulated

by means of this door it is held open to the desired extent by means of the lever *a* engaging lug *a'*. It will also be noted that the upper part of the ash-pan is extended rearward, leaving a space under said extension for the circulation of air.

Bolted to the upper end of the cast-iron ash-pan is a casing C, of boiler-iron or steel, the casing being arched, as shown, and forms the dome of the fire-pot. The front and rear plates C' and C², respectively, of this casing are bolted in place by means of long bolts *c*, extending from one to the other, and the front plate is provided with a feed-opening covered by a door D, having the usual damper-wheel *d*. Disposed centrally above the fire-pot and casing and longitudinally thereof is a smoke-flue E, the rear end of which is adapted for connection to the smoke-pipe, while its forward end is provided with a removable cap *e*. At a short distance from its rear end the smoke-flue E is connected directly to the casing C by a pipe or flue F, and intermediate the flue F and smoke-pipe said flue E contains a damper E'. Extending parallel with and at either side of the flue E are flues G G, of slightly-smaller diameter than said flue E and preferably on a lower plane. The flues G are provided with removable caps *g* at both ends, and at their forward ends are connected directly to the center flue E by short flues G', being also connected to the rear end of said center flue by short flues G², the latter entering in the rear of the damper E'. By this arrangement of smoke-flues, manner of connecting same, and location of the damper E' it will be noted that the products of combustion entering the center flue E may be discharged directly into the smoke-pipe to give a direct draft to the furnace or may be caused to circulate through the several flues before entering said smoke-pipe, according to the position of the damper-blade, for it will be noted that should the damper be opened the products of combustion from the fire-pot will pass directly into the smoke-pipe, and, conversely, the damper being closed the products of combustion would pass forwardly in the center flue and by way of flues G' into the auxiliary flues G, passing rearward therein to the short flues G², which communicate with said center flue in the rear of the damper.

The products of combustion are thereby caused to circulate through the several flues before reaching the smoke-pipe, and the heat will be radiated through said flues directly
5 into the hot-air chamber of the furnace, the hot-air chamber being formed by a jacket of sheet metal or masonry.

In order to provide against the emission of gas and flame through the feed-opening when
10 the door is opened, which would result should the damper E' be closed when said door is opened, the operating-rod I of said damper is extended through the front of the furnace and has a crank-handle *i*, operated by the
15 opening of the feed-door. This is accomplished by having the end of the crank-handle depend in the path of a lug *d'* at the upper edge of the door D and providing said crank-handle with a weighted arm *i'*, which will
20 throw the damper entirely open upon a slight movement of said handle.

The fire-pot of the furnace is provided with flaring sides, and its upper edge is adapted to bear against the cast-iron ash-pan, while the
25 lower end of said fire-pot rests upon a grate H, of any approved pattern. The sides of this fire-pot are flared to a greater extent than the corresponding sides of the ash-pan in order that a space will be left between the same for
30 the circulation of air, which is admitted to the burning fuel through holes *s* in the sides of the fire-pot. These holes are conical, with the larger end at the outer side in order to prevent the accumulation of coal or ashes there-
35 in. Air is admitted through the damper *w* in the rear part of the ash-pan, and the hot air entering at the sides of the burning coal will give the greatest amount of combustion and serve to rapidly consume the gases, producing
40 a flame that will radiate a maximum heat. It will be apparent that by directing jets of hot air into the burning coal the heating capacity of the furnace will be greatly increased, and a more economical burning of the fuel will re-
45 sult. Plates M are located at the lower end of the fire-pot, and the ashes which fall thereon from the holes *s* are deposited in the ash-pan when the door A' is opened, the crank-arm *m* at the outer end of the plate being op-
50 erated by an arm *m'* on the door. When the door A' is opened to give a greater draft, the plates M will also be opened to permit a direct draft to the holes *s*.

In Fig. 5 of the drawings I have illustrated
55 a slight modification in the arrangement of the smoke-flues, in which the center flue is left out and but two parallel flues T and T' provided, both being connected at their rear ends to the dome of the fire-pot and con-
60 nected together at their forward ends by a transverse pipe *t*. The flue T is connected directly to the smoke-pipe, and the short flue which connects said flue to the dome of the fire-pot is provided with a damper T². When
65 this damper is opened, a direct draft is provided, and when it is closed the products of

combustion are caused to pass into the other flue and circulate around the flues before passing into the smoke-pipe. Though this
70 arrangement of flues may be provided, I prefer to employ the arrangement shown in the other views of the drawings, as a greater cir-
75 culation is had thereby and results in the radiation of considerable more heat.

A furnace constructed as herein shown and
80 described will give the greatest amount of heat for the fuel consumed, as there are no corners in which the air may become packed, and after a fire has been well started the
85 products of combustion will serve to heat the air on its way to the conducting-flues. The furnace proper is inclosed by a metal or masonry jacket U, forming the hot-air cham-
90 ber or drum into which air is admitted at the lower end by an air-shaft W, the heated air
95 being conducted from the top of the chamber or drum by conducting-pipes W'.

Having thus described my invention, what I claim as new, and desire to secure by Letters
100 Patent, is—

1. In a furnace, the combination with the ash-pan having a rearward extension at its upper end, of the fire-pot supported in the ash-pan and having a rearward extension
105 overlying the extension of the ash-pan, a space being left between the sides of the ash-pan and fire-pot and the sides of the body por-
110 tion of the fire-pot provided with conical holes; a damper in the ash-pan, and a hinged plate forming the bottom of the space sur-
115 rounding the sides of the fire-pot; together with an arm on the door of the ash-pan adapted to swing the hinged plate, substantially as shown and for the purpose set forth.

2. In a furnace, the combination with the
120 ash-pan, of a fire-pot supported therein and provided with holes in its sides, a casing bolted to the upper end of the ash-pan, a center flue connected to the casing and to the
125 smoke-pipe, a damper located between the aforesaid connection and smoke-pipe, paral-
130 lel flues connected at their ends to the center flue, the connections at the rear end being in the rear of the damper in the center flue, sub-
135 stantially as shown and for the purpose set forth.

3. In a furnace, the combination with the ash-pan, of a fire-pot supported therein, an
140 arched dome forming the top of the fire-pot, plates bolted to the ends of the dome by bolts
145 extending from one to the other, a door covering the feed-opening in the front plate; to-
150 gether with a center flue located above the arched dome, a flue connecting the dome to the center flue near the rear end thereof, a
155 damper in the rear of said connecting-flue, and auxiliary flues located at either side and below the plane of the center flue, said aux-
160 iliary flues being connected by short flues to the opposite ends of said center flue, the con-
165 nections at the rear end being in the rear of the aforesaid damper, and removable caps

fitting into the ends of the flues, substantially as shown and for the purpose set forth.

4. In a furnace, the combination with the fire-pot and dome, of a center flue connected
5 to said dome and to the smoke-pipe, a damper located between said flue connection and smoke-pipe, auxiliary flues located at either side of the center flue and connected thereto at both ends thereof, the connections at the
10 rear end being in the rear of the aforesaid damper, and removable caps closing the ends

of said flues; together with a rod extending from the damper to the front of the furnace, a crank-handle and weighted arm at the forward end of said rod, and a lug on the feed- 15 door of the furnace, substantially as shown and for the purpose set forth.

VERNON L. SULLIVAN.

In presence of—

MAMIE E. VANDERBILT,
CASSIUS ALEXANDER.