

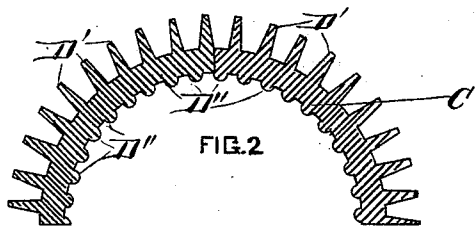
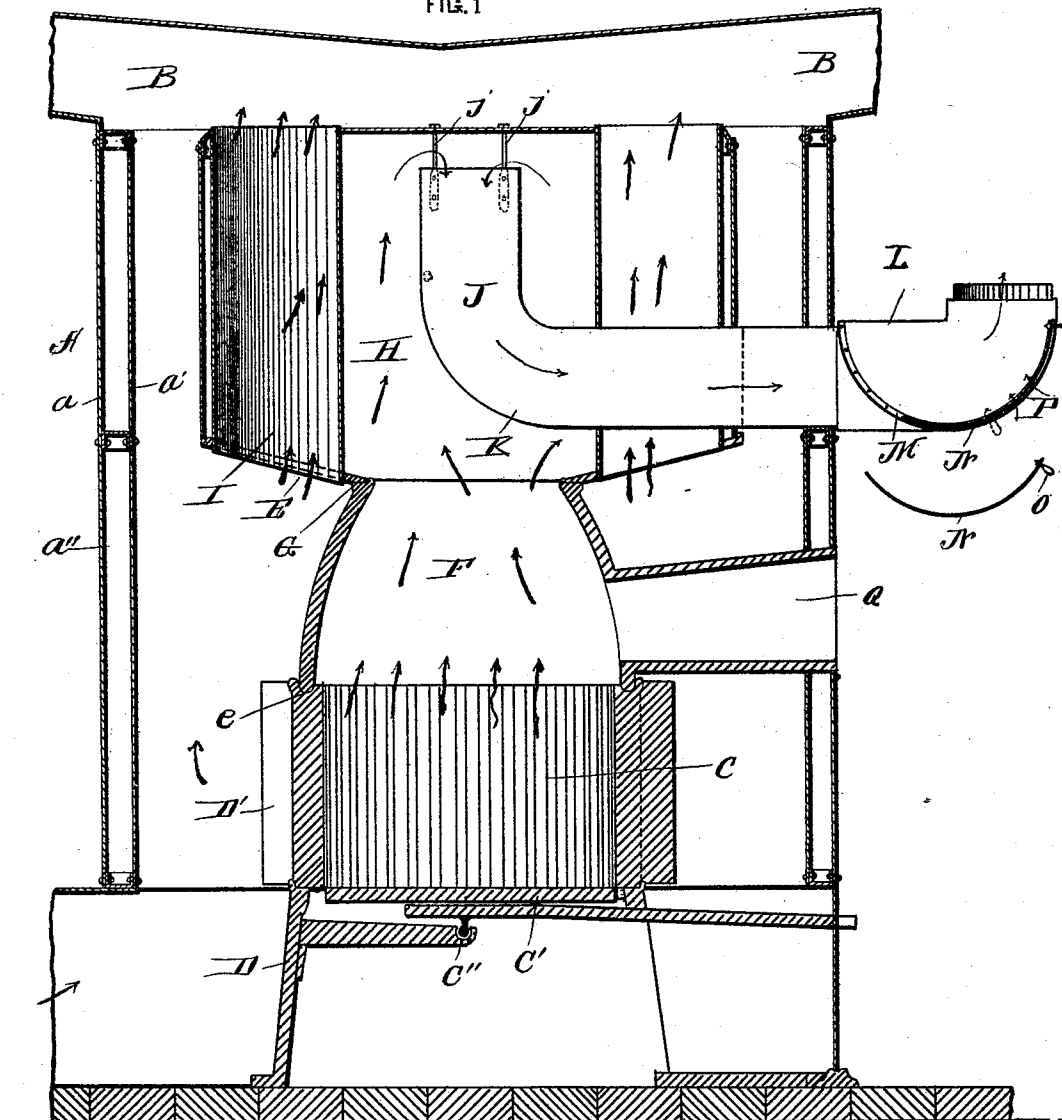
(No Model.)

F. G. WARD.
HOT AIR FURNACE.

No. 498,701.

Patented May 30, 1893.

FIG. 1



WITNESSES:

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UNITED STATES PATENT OFFICE.

FREDERICK G. WARD, OF ALLEGHENY, PENNSYLVANIA.

HOT-AIR FURNACE.

SPECIFICATION forming part of Letters Patent No. 498,701, dated May 30, 1893.

Application filed July 27, 1892. Serial No. 441,413. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK G. WARD, a citizen of the United States, residing at Allegheny, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Hot-Air Furnace, of which the following is a specification.

My invention relates to improvements in hot-air or heating furnaces, and the object of my improvement is to provide a construction and arrangement whereby economy of fuel may be attained by producing the maximum amount of heat from a given quantity of fuel.

A further object of my improvement is to concentrate the heat in the conducting flues, and prevent waste by radiation from the fire-box, drum or smoke-flue.

A further object of my invention is to provide against overheating the several parts of the structure.

Further objects of my invention will appear in the following description and the novel features thereof will be particularly pointed out in the appended claims.

In the drawings, Figure 1 is a vertical axial section of a furnace embodying my improvements. Fig. 2 is a partial horizontal sectional view of the fire-pot, to show the interior ribs and exterior webs with which it is provided.

A represents the shell or casing of the furnace, the walls of which are double; the outer wall *a* and the inner wall *a'* being separated to form an intermediate air-space, *a''* which communicates at its upper end with the interior of the body of the shell or casing to which are connected the heating flues, B B. Within the shell or casing, at or near its bottom, is arranged the fire-pot, C, supported by a suitable frame-work, D, and provided with the ordinary grate, C' and grate-operating devices, C''.

The fire-box which I have shown in connection with my improvement is circular, in plan, and is provided with interior, vertical ribs, D'' D'', and exterior vertical and radially-disposed webs, D' D'. The interior ribs permit a vertical draft through the fire-box, at all times, inasmuch as the fuel is prevented, thereby, from clinging closely to the walls of the box, and the exterior webs are designed, primarily, to increase the radiating surface

of the fire-pot, and secondarily to strengthen the structure, and prevent, by the rapid radiation, the overheating of the same.

The drum, E, is provided at its lower end with a depending, bell-shaped concentrating chamber, F, which is seated at its lower edge in a groove *e* in the upper edge of the fire-box and is tapered toward its upper end to form the reduced throat, G, which is in vertical alignment with the fire-box and is smaller than the latter. The main body of the drum comprises an interior smoke-chamber, H, and a circular series of vertical convection tubes, I, which are open at top and bottom and communicate with the body of the furnace, as shown. The upper end of the concentrating chamber is connected to and communicates, only, with the lower end of the smoke-chamber.

The smoke-flue, J, the heat which is radiated therefrom being the source of much loss and waste as ordinarily applied, communicates with the smoke-chamber at its upper end, or adjacent to the roof of the drum, the end of said flue being turned up and terminating close to the roof of the drum so as to prevent the direct entrance, therinto, of the products of combustion. The smoke-flue is arranged vertically and axially in the smoke-chamber, being supported in such position by hangers, *j j*, and is provided near the bottom of said chamber with an elbow, K, and is thence carried through suitable aligned openings in the side of the drum and in the side of the shell or casing, as shown. Without the shell or casing the smoke-flue is provided with a damper-box, L, which is semi-circular in shape and is provided with a semi-circular guide-groove, M, in which fits and operates the segmental damper-valve, N, provided outside the box with an operating handle, O. When in the position shown in dotted lines in Fig. 1 the flue is closed, and when in the position shown in full lines in said figure the flue is open to allow the passage and escape of the products of combustion.

P designates an opening in the damper-box, which is closed by the damper-valve when the latter is in the position shown in full lines in Fig. 1, (or when the flue is open,) and is uncovered when the flue is closed by the valve.

The advantage of this construction is that when the flue is closed to cut off the draft a free circulation of air, from the outside, is allowed through the portion of the smoke-flue which is without the furnace, to prevent overheating the latter. The closing of the flue and the opening of the relief or inlet opening are simultaneous, as will be seen from the foregoing description.

10 The chute, Q, for the introduction of the fuel into the fire-box is arranged in registering openings in the outer shell or casing and the bell-shaped concentrating chamber.

15 Having now described the construction of my improved furnace, the operation thereof is as follows: The heat and other products of combustion rise vertically from the fire-box, and passing through the concentrating chamber, are introduced into the smoke-chamber 20 from the walls of which the heat is rapidly radiated and carried to the top of the shell or casing by the upward draft through the convection tubes. The products of combustion are then caused to come in contact 25 with the roof of the drum before they can enter the upturned end of the smoke-flue. The smoke flue is carried for a considerable distance through the drum, thus retaining its heat, within the furnace, and enabling its radiated heat to affect the temperature of the air contained in the shell or casing. After leaving the smoke-chamber the flue is carried between adjacent tubes I, thus affording another opportunity for the radiation of the heat, after which it crosses the intervening space between the walls of the drum and the walls of the shell or casing and then passes out through the double walls of the latter. In this way the greater part of 40 the heat of the smoke-flue is given off before it leaves the furnace, and is utilized to heat the current of air which is continually entering the shell or casing at the bottom through the inlet opening, R, and being carried away 45 by the heating flues, thus causing a vertical draft, indicated by the arrows in Fig. 1, through the structure.

The top of the shell or casing is depressed

at its center to distribute the heated air as it rises from the convection tubes and is radiated 50 from the top of the drum, and causes it to enter the heating flues.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In a furnace, the combination of an inclosing shell or casing having double walls, and a deflecting top depressed at its center, a cylindrical smoke-chamber located concentrically in the shell or casing and having a closed 60 upper end, a circular series of convection-tubes surrounding said smoke-chamber and having open lower and upper ends, a cylindrical fire-pot arranged axially below the smoke chamber, a conical concentrating-chamber connecting the fire-pot to the lower open end of the smoke-chamber and having an inlet chute, and a smoke-flue arranged axially in the smoke-chamber with its upper open end located adjacent to the closed upper 70 end of the smoke-chamber, substantially as specified.

2. In a furnace, the combination with the inclosing shell or casing, a drum having a cylindrical smoke chamber surrounded by a circular series of convection tubes in communication with the interior of the shell or casing, and a fire box beneath and in communication with said combustion chamber, of a smoke flue extending within the combustion chamber and having an upturned inclosed elbow, whose open or inlet end is arranged adjacent to the closed upper end of the combustion chamber, and a check valve arranged in the smoke flue outside the shell or casing, said 85 flue being provided with an opening P adapted to be closed by said valve when the flue is open, substantially as specified.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in 90 the presence of two witnesses.

FREDERICK G. WARD.

Witnesses:

A. D. WILSON,
VICTOR W. BROWN.