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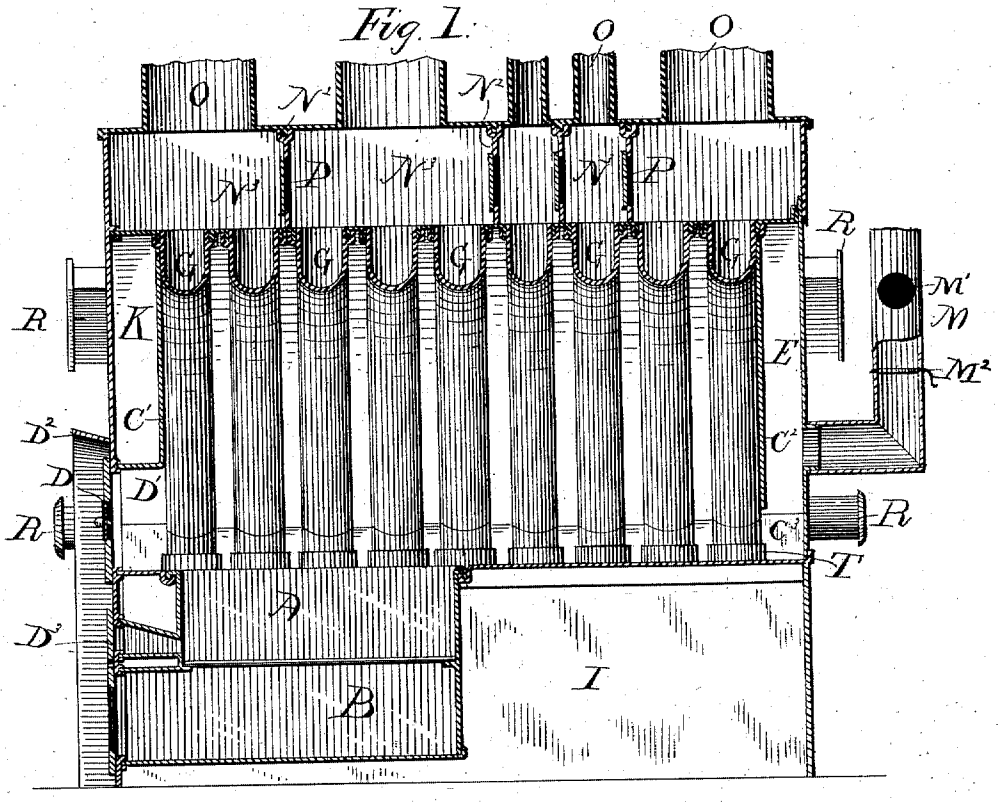
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A. HOPKINS.

FURNACE.

No. 308,073. Patented Nov. 18, 1884.

Fig. 1.



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(No Model.)

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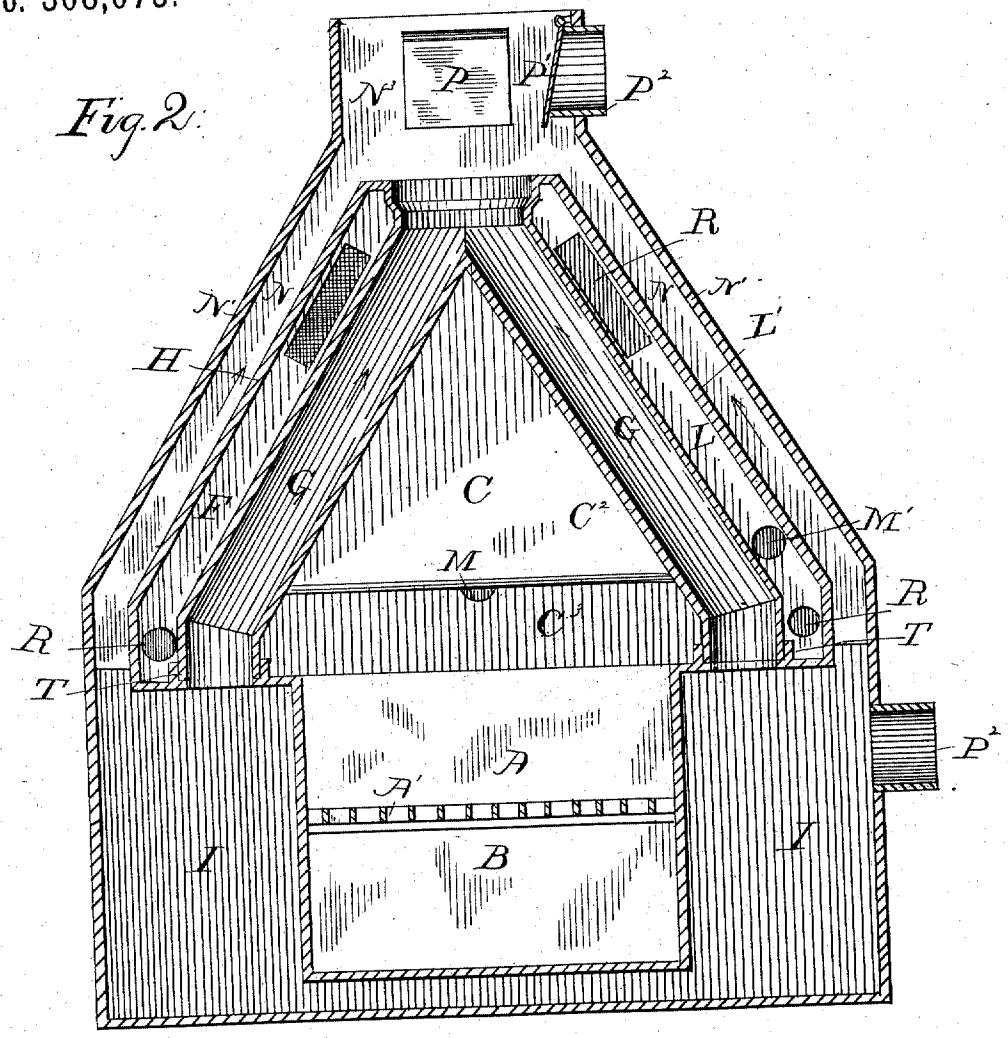
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Fig. 2.



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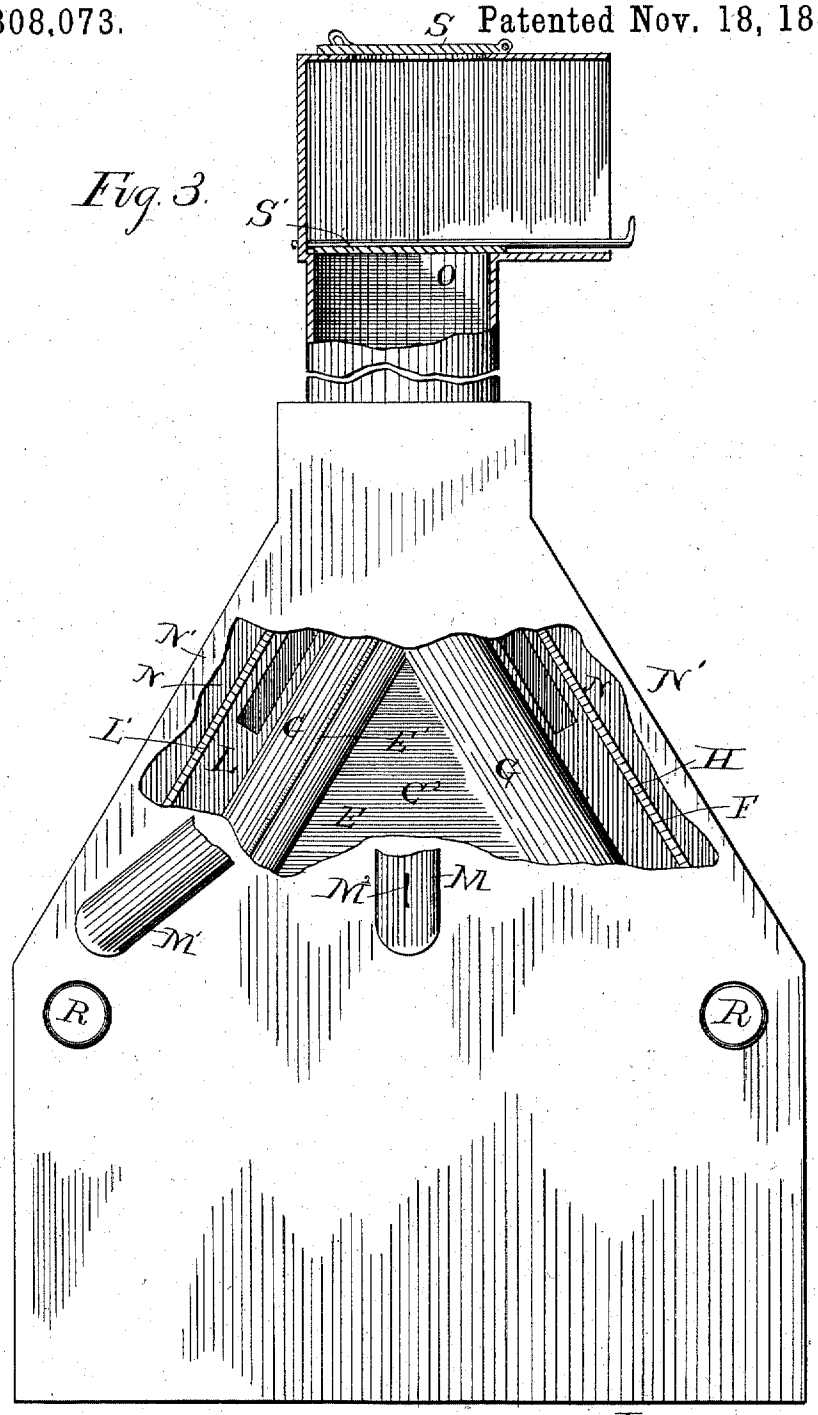
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Fig. 3.



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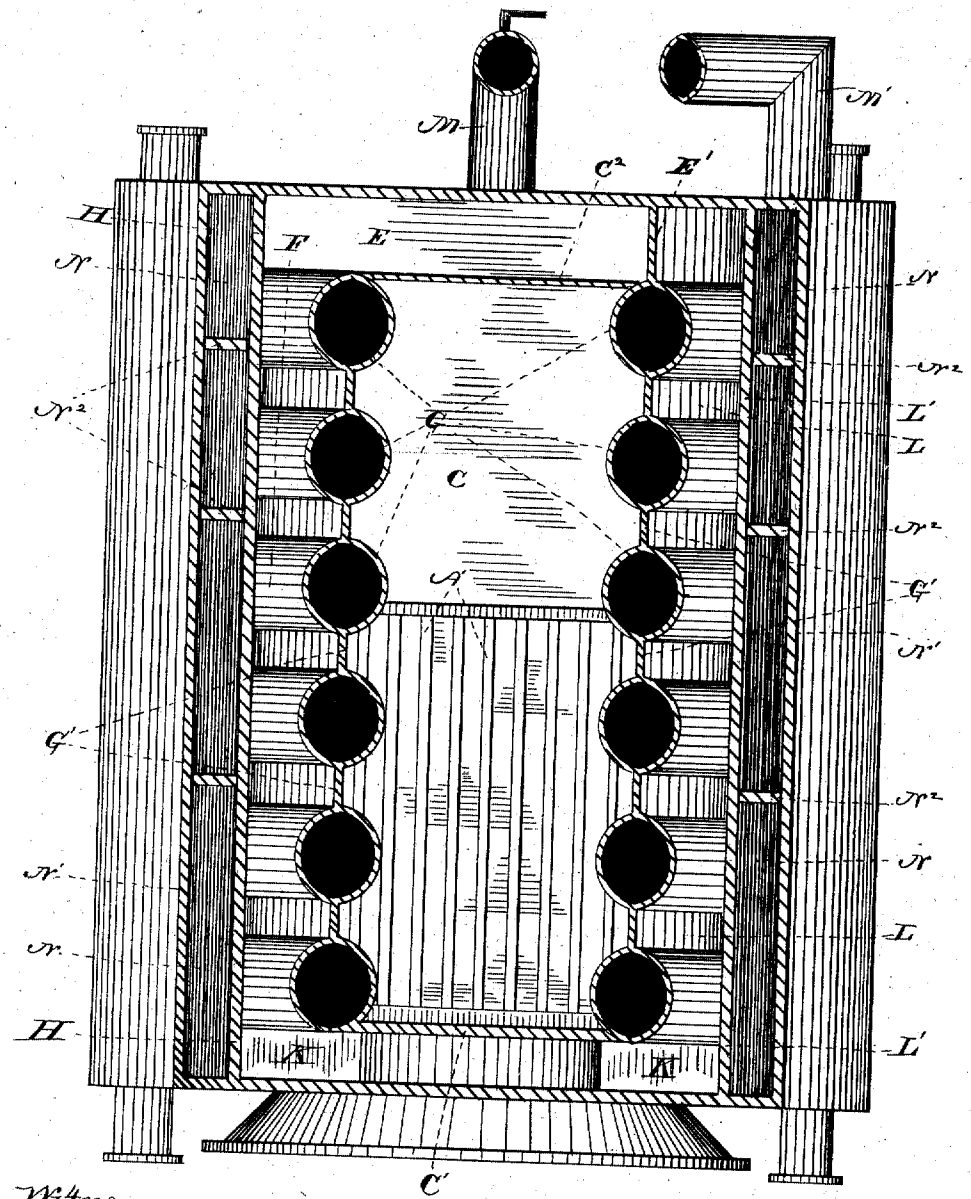
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FURNACE.

No. 308,073. Patented Nov. 18, 1884.

Fig. 4.



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UNITED STATES PATENT OFFICE.

ALFRED HOPKINS, OF BRIDGEPORT, CONNECTICUT.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 308,073, dated November 18, 1884.

Application filed August 13, 1883. (No model.)

To all whom it may concern:

Be it known that I, ALFRED HOPKINS, a citizen of the United States, residing at Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to furnaces, and has for its object to secure greater heating power in proportion to the consumption of coal than has ever heretofore been accomplished, while at the same time my furnace is exceedingly simple in construction, easy to manage, not liable to get out of repair, and economical in cost.

With this object in view my invention consists in the construction and combination of parts, as hereinafter fully described, and then specifically designated by the claims.

For the purpose of enabling those skilled in the art to which my invention relates to construct and use my improved furnace, I will proceed to describe the same, referring by letters to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a central longitudinal section. Fig. 2 is a vertical transverse section on an enlarged scale, looking toward the rear end of the furnace; Fig. 3, a rear end elevation, with a portion of the outer casing broken away, and also showing one of the delivery-pipes; and Fig. 4 is a horizontal section taken on a line just above the door.

Similar letters indicate like parts in all the figures of the drawings.

A represents the fire-box, A′ the grate, and B the ash-pit, which are of ordinary construction.

C is a combustion-chamber, which occupies the entire central portion of the furnace. This chamber is wholly closed at the front end by plate C′ and door D, from which a closed passage, D′, leads to said chamber, through which coal is fed to the fire-box. At the back of the furnace this chamber is closed by a depending wall, C^2, which, however, does not extend to the bottom of the chamber; but an aperture, C^3, is provided, through which the products of combustion pass into a chamber, E, which is closed on one side by wall or plate E′, but the other side is unobstructed, and the products of combustion pass around and enter a heating-chamber, F, which runs the entire length of the furnace, occupying the space between air-flues G and plate or wall H.

It will be seen that the products of combustion enter chamber F at the bottom thereof, thereby exposing the entire surface of the air-flues to intense heat. These air-flues are an important feature of my invention. They are supplied with pure cold air from cold-air boxes I, and extend upward and inward at an angle until they meet at the top. As they are all joined together, as shown at G, they thus form themselves the walls of the combustion-chamber, so that the intense heat of this chamber acts first upon the surfaces of these flues, thereby utilizing the entire walls of the combustion-chamber in heating pure cold air. The function of wall C^2 is to retain the gaseous products of the decomposition of the coal in the combustion-chamber as long as possible, so that combustion may be complete and the intense heat produced may be wholly utilized, while at the same time the smoke may escape into the chamber E. The products of combustion in chamber F pass to the front of the furnace, but in doing so pass over the opposite side of flues G. Thus the whole superficial surface of these flues is continually subjected to an intense heat. From chamber F the products of combustion pass into chamber K, the inner wall of which separates it from the combustion-chamber, so that, instead of being cooled in this chamber, the temperature of its contents is actually raised. Chamber K opens into heating-chamber L, which runs the entire length of the furnace between plate or wall L′ and the air-flues on that side of the furnace. From chamber L the products of combustion pass into the main smoke-pipe M, through pipe M′, and so on into the chimney. The main smoke-pipe M opens directly out of chamber E. This pipe may be wholly closed by damper M^2, and is only used in building the fire or when the fire is very low. At all other times damper M^2 wholly closes this pipe, and the products of combustion, after leaving the combustion-chamber, where the combustion of the gaseous matter mostly takes place, are forced to make the en-

tire circuit of the furnace, as they can only enter the main smoke-pipe from chamber L by means of pipe M′, which enters pipe M above the damper, as shown in Fig. 1.

N represents an additional series of air-flues, which lie between the outer wall or casing, N′, of the furnace, and plates or walls L′ and H, referred to above. These chambers, and also chambers N^3, presently to be described, are separated from each other by plates or walls N^2, for a purpose hereinafter to be explained. Thus it will be seen that the products of combustion are utilized to heat air in the flues, not only in the combustion-chamber but in the additional series of chambers extending entirely around the furnace. The inner set of air-flues is exposed on all sides to the action of the heat, and all the heating power of the products of combustion is utilized by causing them to pass entirely around the furnace in the series of chambers just referred to before escaping into the chimney, and by constructing air-flues on both sides of said series of chambers the two sets of air-flues G and N meet at the arch of the furnace forming chambers N^3, and the heated air is conducted from thence by supply-pipes O directly to the rooms to be heated.

The object of partition-walls N^2 is to provide a separate heating-chamber for each room to be heated, so that, if it is desired to heat all the rooms at the same time, no rooms shall be able to draw heat from the others, but all will receive a quantity of heated air proportionate to the size of the heating-chamber and supply-pipe alloted to it. Dampers P, however, are provided in partition-walls N^2, so that in case heat is not desired in any of the rooms the supply of heated air which would otherwise go to those rooms may be thrown into other heating-chambers, and from thence to rooms where it is needed. Chambers N^3 are also provided with another set of dampers, P′, located in pipes P^2, part only being shown, which lead directly into the cold-air box. The object of these pipes and dampers is to allow the air in chambers N^3 to be instantly cooled should it be at any time desirable. Pipes O, which conduct the heated air directly from chambers N^3 to the rooms, are located in the ventilating-flue. A damper, S, is provided above the register for the purpose of ventilation, and also to permit the whole or part of the heated air to pass into the ventilating-shaft should the temperature be too high.

S′ is a damper used to shut off the heated air from the room. R R are openings provided with caps, for the purpose of giving access to chambers F and L when it is desired to clean them.

This furnace may be properly designated a "horizontal return-draft furnace."

The practical results of the construction I have described are that in a furnace of my improved construction I am able to get a much greater area of heating-surface in a furnace of given dimensions than has ever heretofore been accomplished. The air in flues G is heated to a high temperature, but this temperature is modified in chambers N^3 by the cooler current of air from flues N; or, if necessary, by opening dampers P′ in pipes P^2 and admitting air directly from the cold-air boxes. Chambers N^3 serve as receiving and distributing chambers. In practice, a thermometer is located at each chamber, to regulate the temperature of the air admitted to the rooms, which should not be more than 125° Fahrenheit. The joints throughout the furnace are of the style illustrated at T in Figs. 1 and 2, being originally packed with kaolin or sand, and so constructed as to be continuously self-packing with the waste product of combustion.

It will be observed in Fig. 1 that I have shown the front plate as provided with an outwardly-projecting flange, D^2, and also that openings R are built out from the outer plate or shell of the furnace. This, however, is only necessary when it is intended to brick in the front and rear of the furnace. This construction, however, is not essential, as I propose, when desirable, to use heavier front and rear plates and dispense with the bricking in.

D^3 represents merely the ordinary passage to the grate for use in raking down the fire and taking out clinker.

It will of course be understood that I do not limit myself to the exact construction shown, as the details of construction might be varied without departing from the spirit of my invention. For instance, the furnace might be cylindrical in form, in which construction the products of combustion, after leaving the combustion-chamber, would pass around outside of the inner set of air-flues in a single chamber.

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

1. In a furnace, a combustion-chamber whose side walls are formed of connected air-flues which lead from the cold-air box to the receiving-chambers, and whose rear is closed by a depending wall having an aperture at the bottom, in combination with horizontal chambers for the products of combustion, extending around the furnace outside the connected air-flues, and an outer series of air-flues, also leading from the cold-air box to the receiving-chambers.

2. The combustion-chamber and a series of air-flues joined together, which form the side and top walls thereof, in combination with a depending wall at the rear open only at the bottom, and connected heating-chambers outside of said flues, which surround the furnace, whereby the products of combustion are caused to enter the first chamber at the bottom thereof, and to pass entirely around the furnace outside the series of flues before escaping into the chimney.

3. Air-flues G and N, in combination with the receiving-chambers having dampers P P′, for the purpose set forth, whereby the cham-

bers may be connected or disconnected, and pure cold air admitted thereto, if desired.

4. Chambers N^3, having dampers P and P', in combination with air-flues G and N, and pipes O and P^2.

5. Combustion-chamber C, closed in front by wall C' and door D, and in the rear by wall C^2, having aperture C^3, in combination with air-flues G, which form its walls.

6. In a furnace, combustion-chamber C and wall C^2, having opening C^3 at the bottom thereof, in combination with plate or wall E', chambers E, F, K, and L, and pipe M'.

7. Combustion-chamber C and plate or wall E', in combination with chambers E, F, K, and L, and pipes M and M'.

8. Combustion-chamber C, having aperture C^3 at the bottom thereof, and plate E', in combination with a series of chambers leading around the furnace, through which the products of combustion must pass, and smoke-pipe M'.

In testimony whereof I affix my signature in presence of two witnesses.

ALFRED HOPKINS.

Witnesses:

A. M. WOOSTER,

LOUIS E. SAGE.

Corrections in Letters Patent No. 308,073.

It is hereby certified that in Letters Patent No. 308,073, granted November 18, 1884, upon the application of Alfred Hopkins, of Bridgeport, Connecticut, for an improvement in "Furnaces," errors appear in the printed specification requiring correction, as follows: In line 67, page 1, the reference letter "G" should read G^1; in lines 23-24, page 2, a *period* should be inserted after the word "chambers," and the following word "the" commenced with a capital; and that the Letters Patent should be read with these corrections therein to make it conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 16th day of December, A. D. 1884.

[SEAL.]

M. L. JOSLYN,
Acting Secretary of the Interior.

Countersigned:

BENJ. BUTTERWORTH,
Commissioner of Patents.