



(No Model.)

2. Sheets—Sheet 2.

D. S. RICHARDSON.  
HOT AIR FURNACE.

No. 470,446.

Patented Mar. 8, 1892.

Fig. 3.

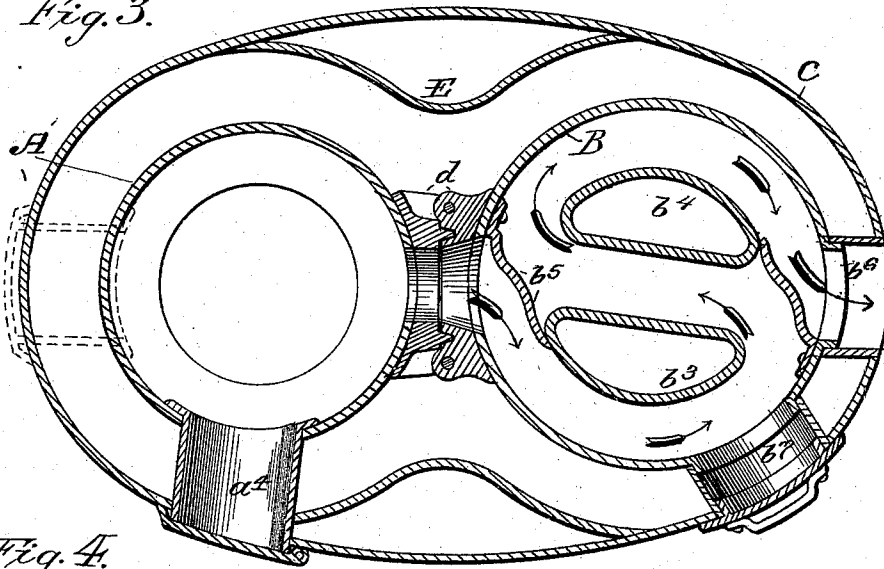


Fig. 4.

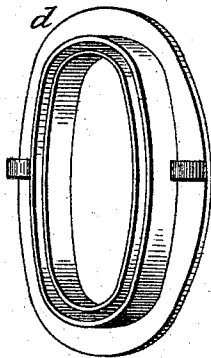
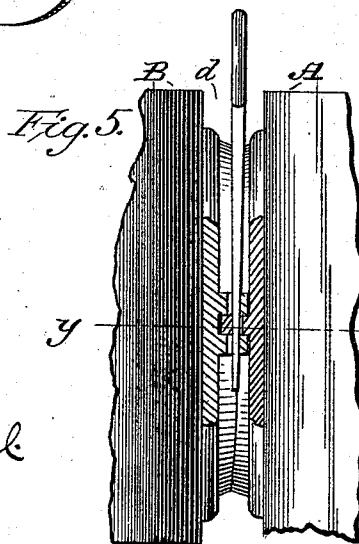
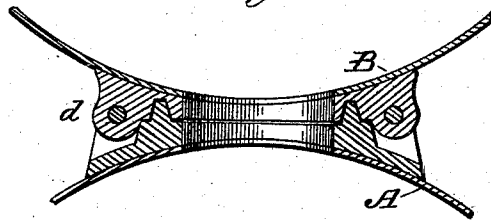


Fig. 6.



Witnesses:

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# UNITED STATES PATENT OFFICE.

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## HOT-AIR FURNACE.

SPECIFICATION forming part of Letters Patent No. 470,446, dated March 8, 1892.

Application filed January 6, 1891. Serial No. 376,877. (No model.)

*To all whom it may concern:*

Be it known that I, DWIGHT S. RICHARDSON, a citizen of the United States, and a resident in the city of Brooklyn, in the county of Kings, in the State of New York, have invented a new and useful Hot-Air Furnace, of which the following is a description.

The object of the invention is to provide a low-down furnace—that is to say, a furnace which is adapted to basements of inconsiderable height—which, while quick and effective in its heating action, shall nevertheless thoroughly utilize the heat derived from the burning fuel.

It is well known that the basement-stories of many houses are so low that if a furnace in which the heating-drum surmounts the combustion-chamber be employed therein the inclination of the hot-air pipes will necessarily be so slight that the movement of air therethrough will be sluggish and the delivery thereof to the apartments will be insufficient and unsatisfactory. To obviate this difficulty, furnaces have in some instances been made in which the heating-drum or radiator has been located behind the furnace proper; but these have not generally been found acceptable, mainly because in most cases the escape of products of combustion through the drum has been slow, and the quantity of heat delivered to the rooms has consequently been inadequate. To remove the objection commonly found to exist in this class of furnaces, I have devised a heating-drum of such construction that, although located in the same horizontal plane as the combustion-chamber, the products of combustion in their passage therethrough shall so act upon the parts as to produce and continuously sustain a rapid movement from the combustion-chamber to their point of discharge from the drum.

The invention consists in the novel combinations of parts involved in the construction thus generally indicated, as will first be particularly described, and then specifically indicated in the concluding paragraphs of this specification.

In the accompanying drawings, which constitute a part of this specific description, Figure 1 represents a vertical longitudinal central section of the furnace, its radiator, air-

casing, and exit-pipe as in the line *ww* in Fig. 2. Fig. 2 is a horizontal plan, the section being in the line *xx* in Fig. 1. Fig. 3 is a horizontal section of a modified construction, the plane being as in Fig. 2. Fig. 4 is a detail perspective elevation showing the smoke-inlet opening of the radiator. Fig. 5 is a detail, partly in elevation and partly in vertical section, showing the means by which the combustion-chamber and the radiator are locked together. Fig. 6 is a detail horizontal section as in the line *yy* in Fig. 5.

In Figs. 1, 2, and 3, A designates the furnace proper, B the heating drum or radiator, and C the air-casing.

For the purposes of this invention the ash-pit *a*, the fire-pot *a'*, and the combustion-chamber *a''* may be of ordinary construction, and a controllable dust-flue *a'''*, leading from the ash-pit to the feed-chute *a''''* or other point in direct communication with the combustion-chamber, may be provided, as is common. Behind or at one side of the fire-pot and its combustion-chamber and above the plane of the ash-pit and supported upon any suitable leg or legs *b''* is the detachable radiator B, which in vertical extent is equal or about equal to that of the fire-pot and the combustion-chamber combined and which is of any suitable diameter. As will be seen, it is composed, essentially, of a circular drum or cylinder *b*, a bottom plate *b'*, and a top plate *b''*. The top and bottom plates have openings, in which are fitted the air-pipes *b'''* and *b''''*, which are seen in plan in Fig. 2. Opposite the inlet-opening from the combustion-chamber and extending across or nearly across the same at a short distance therefrom is the vertical flue-plate, deflector, or diaphragm *b''''''*, which closes the space between the body of the drum and the body of the air-pipe *b'''*. A similar diaphragm *b''''''''*, coincident with the exit or smoke-discharge pipe *b''''''''*, extends across the space between the rear or outer portion of the cylinder and the air-pipe *b''''*.

The casing C, oval in horizontal section, as shown, is provided at its top with the hot-air pipes *c'*, at its sides with air-inlet openings *c*, and at its rear with openings through which project the smoke-discharge pipe *b''''''* and the clean-out pipe *b''''''''*. Within the sides of the casing at a point coincident with the connect-

ing-pipe  $d$ , between the combustion-chamber and the radiator, are deflectors or trench-plates  $E$ , extending from the casing inward toward the connecting-pipe  $d$ , as shown.

5 It will be observed that the currents of air introduced through draft-door  $a^2$  pass upwardly through the grate and the fire-pot into the combustion-chamber  $a^3$ , and thence through the connecting-pipe  $d$  into the radiator or  
10 heating-drum  $B$ , striking first against the diaphragm  $d^5$  and imparting to it and to the air-pipe  $b^3$  a high degree of heat. Deflected by these obstacles the currents pass next to the right and to the rear of the air-pipe  $b^3$ , then  
15 to the front of the drum, where their temperature is increased and their speed accelerated by a second contact with the highly-heated diaphragm  $b^5$ , and thence passing to the left of the air-pipe  $b^4$  to the discharge-pipe  $b^6$ , all  
20 as indicated by the feathered arrows in the drawings.

Currents of air to be warmed introduced through openings  $c$  in the sides and rear of the casing, near the foot thereof, are directed  
25 by the means already described against the most highly-heated portions of the furnace, its radiator, and their connecting-pipe, and, being sufficiently heated, are discharged through the hot-air pipes  $c'$ , which lead to the  
30 various apartments of the building. These currents are designated by unfeathered arrows.

It will be noted that the accelerating plate or diaphragm  $b^5$  is heated not only by direct  
35 contact of the escaping heat-currents, but by its direct exposure to the intense heat of the combustion-chamber and by direct radiation from the opposite wall of such chamber. It will also be observed that under the described  
40 construction, in which the radiator is not extended below the connecting-pipe to a point not easily reached and warmed by the products of combustion, the incoming cool-air  
45 surfaces which are so highly heated that the impact of the cold air thereon produces no

perceptible effect upon the circulation of the smoke-currents within the drum, thus avoiding a defect in construction and in operation which has been common in this class of heaters and has tended to discourage their introduction.

In some basements the relation of the windows to the furnace or other circumstances will make it expedient to employ the construction represented in Fig. 3, in which the feed-chute of the furnace is at a right angle with its smoke-discharge opening.

The invention having been thus described, what is claimed is—

1. A hot-air furnace having, in combination, a casing provided with the usual supply and discharge pipes for air, a fire-pot, and combustion-chamber, and a drum located on substantially the same level as the combustion-chamber and provided with horizontal  
65 flues having between them a partition, through which the heat from one portion of the current of products of combustion may be conducted to a succeeding portion of such currents, substantially as set forth.

2. The described radiator, having the vertically-placed accelerating-diaphragm  $b^5$ , the vertical air-pipes  $b^3$  and  $b^4$ , and the contiguous zigzag flue, in which the escaping products  
75 encircle the air-pipes in succession, in combination with a hot-air furnace the combustion-chamber of which is substantially in horizontal plane with the radiator.

3. The described radiator, having the vertically-placed accelerating-diaphragm  $b^5$ , the vertical air-pipes  $b^3$  and  $b^4$ , and the contiguous zigzag flue, in which the escaping products, moving in a horizontal plane, encircle the air-pipes in succession, in combination with the  
85 furnace  $A$ , having smoke-discharging opening opposite the accelerating-diaphragm, as set forth.

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Witnesses:

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