

June 20, 1933.

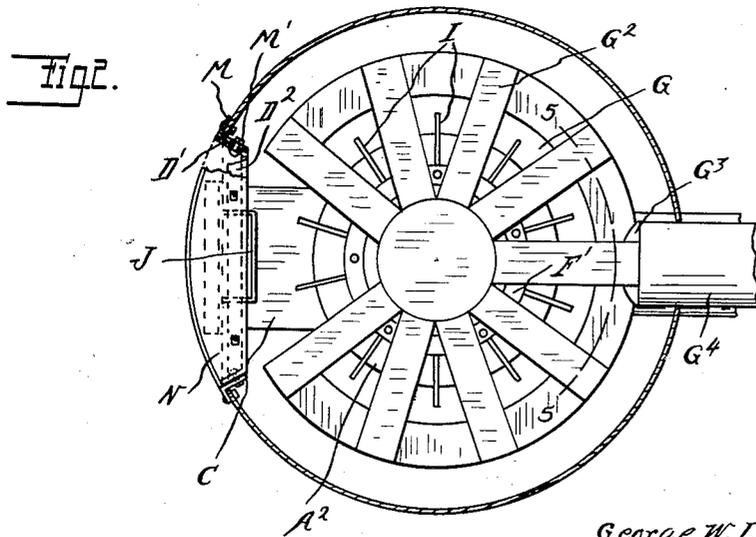
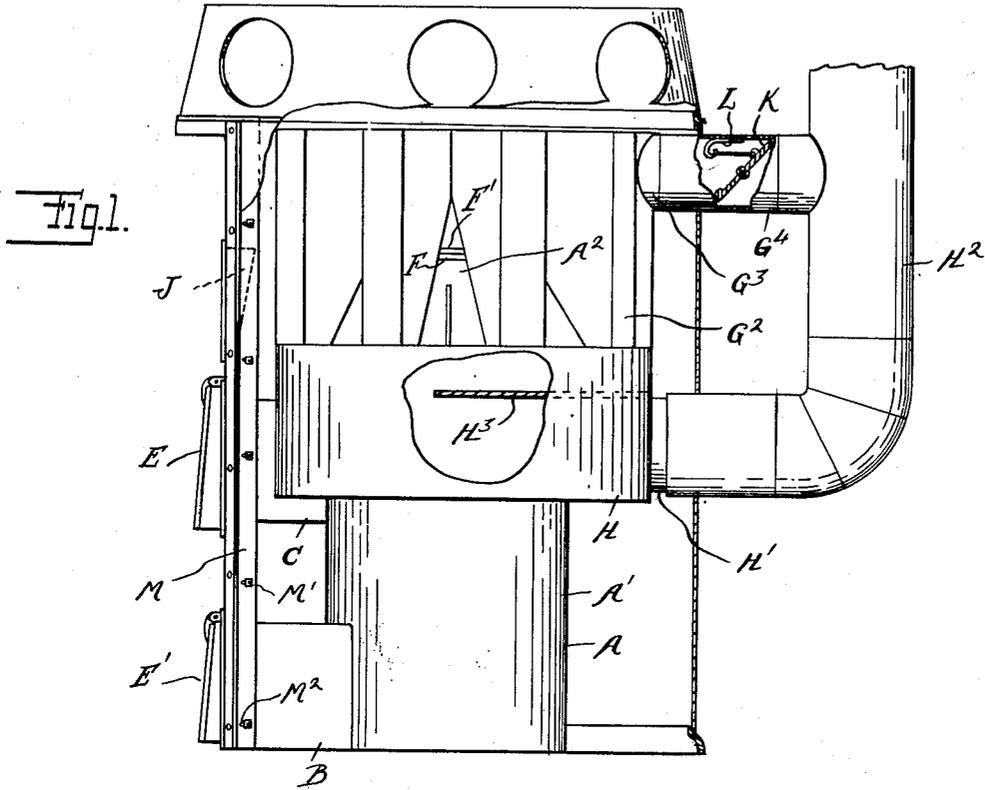
G. W. LANGFORD ET AL

1,915,132

HEATING FURNACE

Filed March 30, 1931

2 Sheets-Sheet 1



INVENTORS

George W. Langford
Alford C. Barrows

BY *Whittmore Hulbert*
Whittmore & Belknap

ATTORNEYS

June 20, 1933.

G. W. LANGFORD ET AL

1,915,132

HEATING FURNACE

Filed March 30, 1931

2 Sheets-Sheet 2

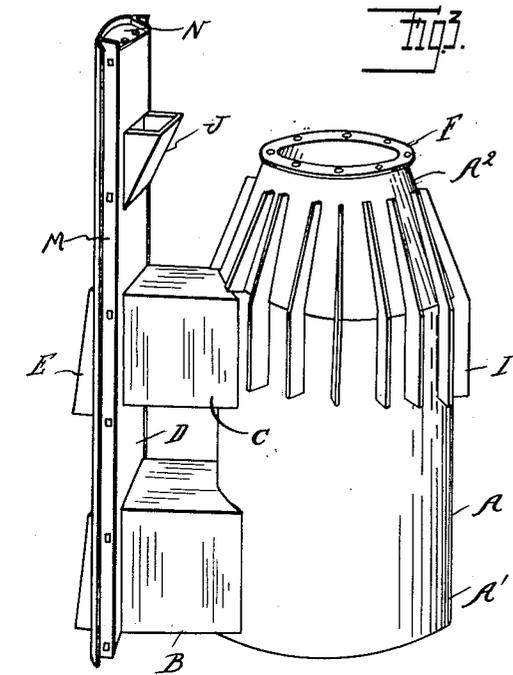


Fig. 1.

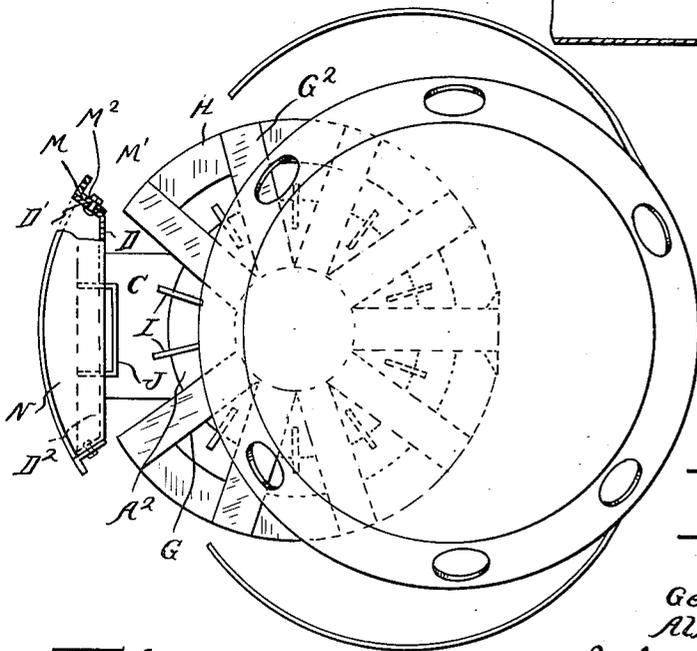
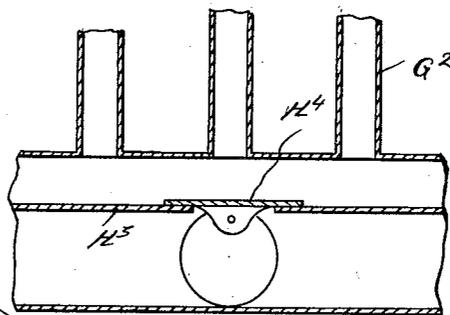
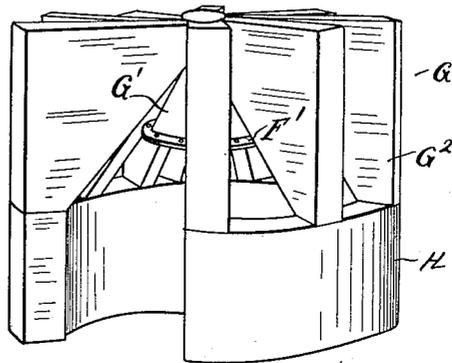


Fig. 4.

Fig. 5.

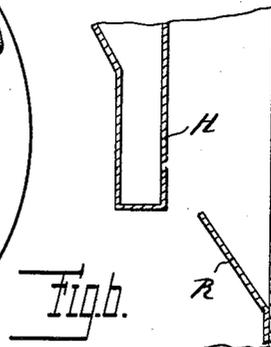


Fig. 6.

BY

INVENTORS
George W. Langford
Alford C. Barrow
Whittemore, Halberd
Whittemore & Belknap

ATTORNEYS

UNITED STATES PATENT OFFICE

GEORGE W. LANGFORD AND ALFORD C. BARROWS, OF ANN ARBOR, MICHIGAN, AS-
SIGNORS TO ECONOMY BALER COMPANY, OF ANN ARBOR, MICHIGAN, A CORPORA-
TION OF MICHIGAN

HEATING FURNACE

Application filed March 30, 1931. Serial No. 526,486.

The invention relates to hot air furnaces and consists in the novel construction as hereinafter set forth.

In the drawings:

5 Figure 1 is a sectional elevation of the furnace with the outer jacket cut away;

Figure 2 is a sectional plan view thereof;

Figure 3 is a perspective view showing the two sections of the furnace detached from
10 each other;

Figure 4 is a diagrammatic plan view showing the manner in which our improved construction can be used as a replacement for another heating unit without detachment of
15 the hot air flues from the jacket.

Figure 5 is a section on line 5—5 of Figure 2.

Figure 6 is a section through a portion of the furnace showing the deflector used in
20 connection with a large jacket.

Among the objects of our invention are, first, to obtain a construction particularly adapted for use with liquid fuel burners which will effectively prevent any mixing of
25 the fuel vapor or products of combustion with the air which is being heated. At the same time it is desirable to have a construction which may be readily handled during installation and which is capable of disas-
30 sembly when necessary for repairs. These results we have obtained by a construction having outer and inner units detachably secured to each other but in such a manner as to pre-
clude any gas leakage through the joints.

35 Another object is to obtain a very high efficiency both by reason of the amount of heating surface that is exposed to the gaseous products of combustion and to the air to be warmed and also by the disposition of this
40 surface to be most effective in the transfer of heat from the one medium to the other. This result is obtained by the specific construction which is as follows:

45 A is the inner unit which has a cylindrical portion A' forming the combustion chamber and extending downward to the supporting base or that which in a solid fuel furnace would constitute the ash pit section. This
50 cylindrical portion is also provided with outwardly extending door opening casings B

and C which extend to a front plate D. A door E connecting with the case C provides access to the interior of said unit A. Above the cylindrical portion A' is an upwardly extending conical portion A² which terminates
55 in an annular flange F for attachment to the outer section. This outer section G has at its upper end a central portion G' resting upon the conical portion A² and provided with a flange F' for clamping the same to
60 the flange F. Extending radially from this central portion G' are flues G² which are substantially rectangular in horizontal section, but which taper outwardly as they extend downward so as to clear the conical portion
65 A². The lower ends of the flues G² are connected to a segmental annular flue H which surrounds the portion A' of the section A and at the center and to the rear has a nipple H' for connecting with the chimney flue. 70
There is also a nipple G³ connecting to the upper end of one of the flues G² for forming a direct draft connection with the chimney flue.

75 Each of the sections A and G is formed with welded joints so as to be gas tight, the only detachable joint being between the flanges F and F' which can be sealed by a gasket. Consequently there is no opportunity
80 for the gaseous fuel or products of combustion to escape from the furnace into the air chamber. To increase the efficiency, fins I extend radially outward from the inner section A and serve also to divide the rising
85 air currents from each other so as to avoid any obstructing eddies. A water tank J is preferably placed in an aperture in the front D above the door E where it will be in contact with the warmer air. This tank may be
90 filled by tilting it outward while resting on the lower edge of the aperture and after filling the weight of the water will hold it in position.

95 The outer jacket may be of the usual construction connected to the hot air flues in the usual way. When, however, our improved construction is used as a replacement, it is not necessary to completely disassemble the outer
100 jacket and its connections but merely to detach it from the furnace front and open it

out sufficiently for removal of the old furnace. The new furnace may then be inserted therein and the jacket closed therearound and attached to the front D.

5 With the construction as described in operation, the cold air entering at the bottom of the jacket will rise vertically through the spaces between the fins I coming in contact with the outer surface of the inner section A and passing between the same and the segmental flue H. This segmental flue constricts the space within the jacket so that a portion of the ascending air passes between the same and the inner section as just described and another portion passes between the outer surface of the segmental flue and jacket. As soon, however, as the air rises above the segmental flue the volume of unobstructed space within the jacket is increased and the rise of the more highly heated air adjacent to the inner section will draw the cold air from adjacent to the outer wall of the jacket radially inward between the radially extending flues G². This will insure a more thorough and uniform heating of the rising air before it is delivered to the hot air flues. Furthermore, the radially extending flues provide a large amount of heating surface, all of which is wiped by the ascending current of air to obtain a high efficiency in heat transfer.

The construction of the section G with its center or hub portion G' and radially extending flues G² is an important feature of the improvement. This permits of forming the outer and inner sections of separate units which may be assembled with each other and when attached will form a rigid structure. At the same time provision is made for expansion and contraction under varying temperatures without any tendency to cause a snapping or other disturbing noise. The joint between the flanges F and F' can be readily made gas tight and as all other joints are welded, there is no danger of escape of gas.

As has been stated, the upper end of one of the flues G² has a nipple G³ which is connected through a horizontal flue G⁴ with the chimney pipe H² leading from the nipple H'. In the flue G⁴ is a damper K which is automatically operated by a thermostatic connection L. The arrangement is such that when the furnace is cold as in starting, the damper K will be opened so as to afford a direct draft without requiring the products of combustion to pass downward through the flues G² and segmental flue H. As soon, however, as the furnace is heated the thermostatic connection L will operate to close the damper K compelling the products to pass by way of the flues G² and H to the furnace pipe H².

The doors E and E' which normally close the door openings B and C rest against inclined sheets and are hinged at the top so as

to remain closed by gravity. If, however, any slight explosion should occur upon the ignition of the fuel within the combustion chamber, the pressure will be relieved by automatically opening the doors E and E' which will again immediately close.

In replacing old furnaces with our improved construction, the old jacket may be utilized as has been previously described. Inasmuch, however, as jackets of different furnaces vary considerably in diameter, we have provided means for adjusting our unit to connect with the same. Thus as shown, the front plate D is provided at its side edges with outwardly extending flanges D' and to these flanges angle bars M are secured by bolts M' passing through slots M². This permits of adjusting the angle bars M radially outward or inward so as to fit the particular diameter of jacket. At the top there is an outwardly extending flange D² to which is secured a segmental angle bar N for completing the attachment to the upper end of the jacket. Where jackets are of different diameters, exchangeable segments are used.

To prevent short circuiting of the gaseous products of combustion so that the greater part will pass downward through the rear flues G² only, we have arranged a baffle H³ within the segmental flue H and at the rear side thereof. This will compel the gases passing downward through the rear flues G² to travel forward above the baffle H³ and then join the gases descending through the forward flues G² to pass under the baffle to the nipple H'.

The furnace may be readily cleaned by the introduction of a brush through the rear nipple H' when the chimney pipe H² is removed. To avoid the obstruction of the baffle H³ an aperture is cut therein adjacent to the nipple H' which is closed by a removable plate H⁴. Thus in cleaning the rear flue G² the plate H is first removed which permits of introduction of the brush through the aperture to find access to said flues.

Where the furnace is used as a replacement in a large size jacket, it is desirable to restrict the area within the jacket and to force the air from the outer wall radially inward. This may be accomplished as shown in Figure 6 in which a segmental inclined deflector R is secured at its lower end to the jacket and directs the ascending air current inward into proximity to the heating surface.

What we claim as our invention is:

1. A hot air heating furnace comprising a central cylindrical section forming the combustion chamber provided with a conical upward extension, a section mounted on said central section having a center or hub portion attached to the upper end of said conical extension, and flues radiating from said hub portion and extending downwardly therefrom, said flues tapering outwardly in a

downward direction, and a segmental flue connected at the lower ends of the radial flues and provided with a chimney connection.

2. A hot air heating furnace formed of a plurality of sections, one of said sections having a cylindrical portion forming the combustion chamber with an upwardly extending conical portion, another of said sections having a central or hub portion attached to the upper end of said conical section, a series of flues extending radially and downwardly from said hub portion, and a segmental flue connected to the lower ends of said downwardly extending flues and surrounding the cylindrical portion of the first section, said segmental flue being provided with a nipple forming a chimney flue connection.

3. A hot air furnace comprising a plurality of sections, the inner section being formed with a cylindrical portion for enclosing the combustion chamber and a conical upward extension thereof terminating in a flange, another section comprising a central or hub portion flanged to be secured to the flange of said conical portion, a series of radially outward and downwardly extending flues connected to said hub section, said flues tapering outwardly to provide clearance between the same and said conical section, and a segmental flue connecting to the lower ends of said radial flues, said inner section being provided with vertically and radially extending fins for the purpose described.

4. A hot air furnace comprising a plurality of sections, the inner section being formed with a cylindrical portion for enclosing the combustion chamber and a conical upward extension thereof, another section comprising a central or hub portion having attachment to the upper end of said conical portion and also having a series of radially outward and downwardly extending flues, and a segmental flue connected to the lower ends of said downwardly extending flues forming an obstruction between the inner section and the outer jacket whereby a portion of the ascending air will pass between said segmental flue and inner section and another portion will pass outside said flue and then radially inward in the pockets between said radially extending flues and in wiping contact with the surfaces thereof.

5. A hot air furnace comprising a plurality of sections, the inner section being formed with a cylindrical portion for enclosing a combustion chamber and conical upward extension, an outer section comprising a central or hub portion connected to the upper end of said conical portion and a series of radially outward and downwardly extending flues connected to said hub section, a segmental flue connected to the lower ends of said downwardly extending flues and extending around the furnace from opposite sides of the front, a chimney pipe connected cen-

trally to said segmental flue and a horizontally extending baffle or partition in said segmental flue for compelling the gaseous products descending through the rear downwardly extending flues to pass forward, said baffle being apertured adjacent to the chimney pipe connection to permit of cleaning the flues and a detachable plate for covering said aperture.

6. In a hot air heating furnace, a heating unit adapted for replacement use, said unit being provided with a front connected thereto and with a door opening casing extending from said front inward to the unit and flanges connected to said front and angle bars radially adjustably secured thereto for attaching the same to jackets of different diameters.

7. In a hot air heating furnace, a heating unit adapted for replacement use, said unit being provided with a front connected thereto and with door opening casings extending from said front inward to the unit, outwardly extending flanges on opposite sides of said front and angle bars secured to said flanges and radially adjustable thereon to be engageable with jackets of different diameters.

8. In a hot air heating furnace, a heating unit adapted for replacement use, said unit being provided with a front connected thereto and with door opening frames extending from said front inward to the unit and an outwardly extending flange at the top of said front and an exchangeable segmental flange for connecting the top flange of said front with the jacket and of a curvature corresponding thereto.

9. A hot air furnace comprising a plurality of sections, the inner section being formed with a cylindrical portion and a conical upward extension thereof, an outer section having a hub portion for connecting with said conical extension and a series of radially outwardly and downwardly extending flues, a segmental flue connected to the lower end of said downwardly extending flues and providing a chimney flue connection, and a series of radial fins connecting to said inner section and extending outward in the space between the same and said segmental flue, said fins dividing the space surrounding the inner section into separate vertically extending air channels for the purpose described.

10. A hot air furnace comprising a plurality of sections, the inner section being formed of a cylindrical portion for enclosing a combustion chamber and a conical upward extension thereof, the outer section comprising a central or hub portion for engaging said conical extension, a series of radially outward and downwardly extending flues and a segmental flue connecting the lower ends of said downwardly extending flues and providing a chimney flue connection, a

by-pass flue between the upper end of one of said radially extending flues and the chimney flue and a thermostatically controlled damper in said by-pass flue adapted to open the same when the furnace is cold and to close when heated.

In testimony whereof we affix our signatures.

GEORGE W. LANGFORD.
ALFORD C. BARROWS.

10

15

20

25

30

35

40

45

50

55

60

65