

May 6, 1941.

N. E. WALKER

2,240,531

FURNACE

Filed March 19, 1938

2 Sheets-Sheet 1

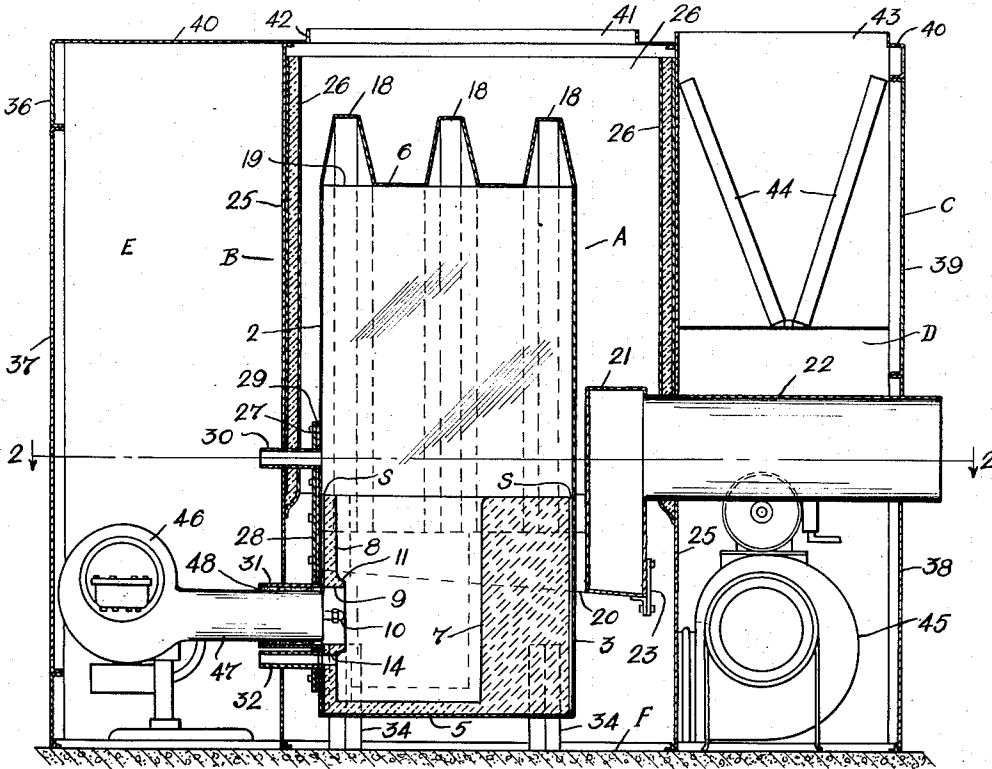


Fig. 1

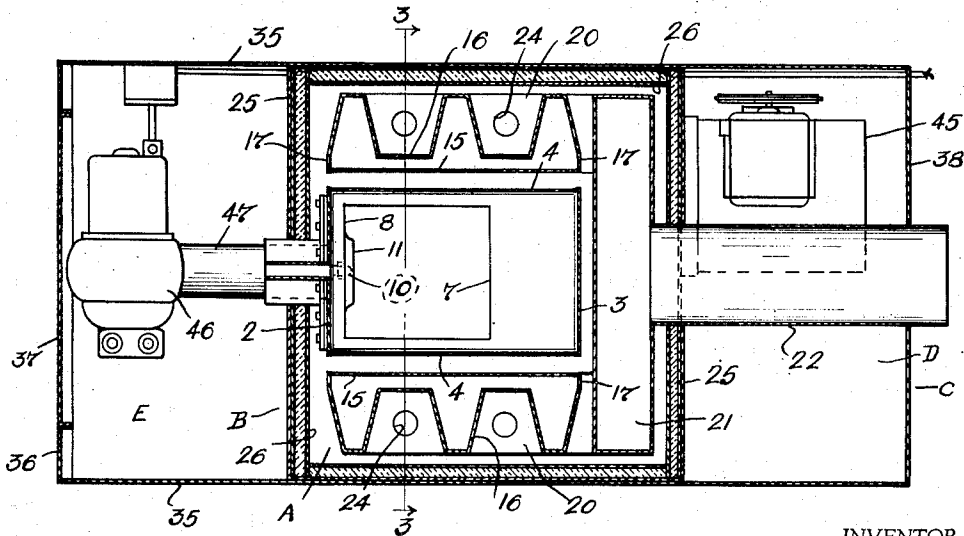


Fig. 2

BY

INVENTOR.

Nathan E. Walker

Pray, Oberlin & Pray
ATTORNEYS,

May 6, 1941.

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2 Sheets-Sheet 2

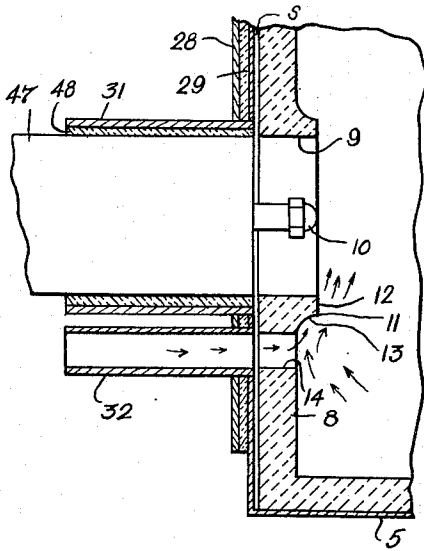


Fig. 5

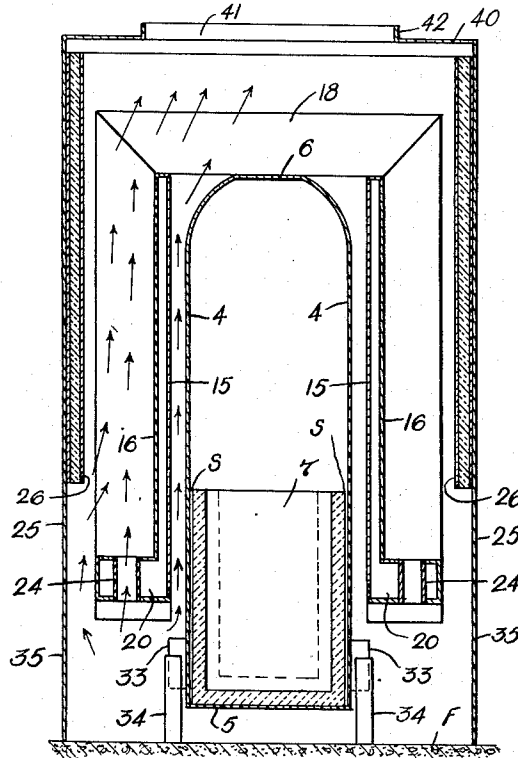


Fig. 3

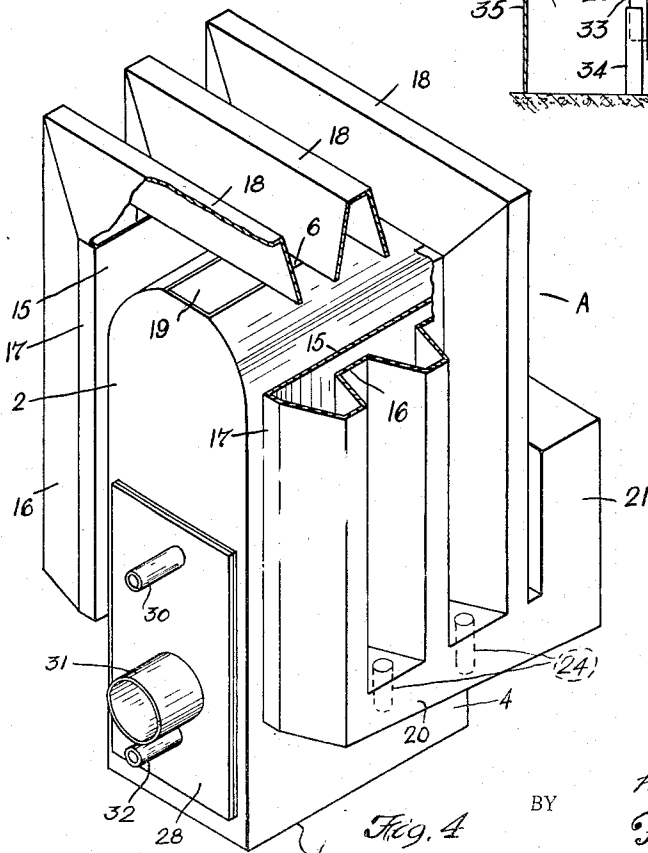


Fig. 4

BY

INVENTOR.
Nathan E. Walker
Ray, Oberlin & Ray
ATTORNEYS.

UNITED STATES PATENT OFFICE

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FURNACE

Nathan E. Walker, Amherst, Ohio, assignor, by
mesne assignments, to Clyde B. Williams and
L. R. Johnson

Application March 19, 1938, Serial No. 196,978

3 Claims. (Cl. 126—116)

This invention relates, as indicated, to furnaces, but has reference more particularly to a hot air furnace of the oil-fired type.

Among other objects of the invention is the provision of a furnace of the character described which is of rugged, durable construction, highly efficient, economical and safe in operation, and attractive in appearance.

Another object of the invention is the provision of a furnace of the character described, which is particularly adapted for air conditioning purposes.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims; the annexed drawings and the following description setting forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but one of various mechanical means in which the principle of the invention may be used.

In said annexed drawings:

Fig. 1 is a vertical longitudinal cross-sectional view of the furnace;

Fig. 2 is a horizontal cross-sectional view of the furnace, taken on the line 2—2 of Fig. 1;

Fig. 3 is a vertical transverse cross-sectional view of the furnace, taken on the line 3—3 of Fig. 2;

Fig. 4 is a perspective view of the furnace proper, with portions thereof broken away to more clearly show the structure thereof; and

Fig. 5 is an enlarged view of a portion of Fig. 1.

Referring more particularly to the drawings, the furnace proper, designated generally by reference character A, is disposed within a casing, designated generally by reference character B. Casing B and other equipment used in connection with the furnace is housed within a housing or casing, designated generally by reference character C.

The furnace A is formed of sheet metal, and comprises a combustion chamber 1 consisting of front and rear walls 2 and 3 respectively, side walls 4, bottom 5 and top 6. The upper ends of the side walls are curved inwardly, as shown in Figs. 3 and 4, for a purpose which will hereinafter appear.

Disposed within the lower portion of the combustion chamber is a one-piece firebox, preferably formed of molded "Firecrete" or similar refractory material, and having a rear wall 7, which is considerably thicker than the front or side walls or the bottom thereof. The front wall 8

of the firebox has an opening 9 therein for the reception of an oil burner nozzle 10. The portion of the front wall 8 immediately surrounding the opening 9 is thickened to provide a flange 11, and it will be noted that the tip of the burner nozzle 10 is substantially flush with the inner face 12 of the flange 11 and that the outer wall 13 of the flange 11 is curved, as clearly shown in Fig. 5. The function of this flange will presently appear. Below the opening is a smaller opening 14, the purpose of which will be later described.

Spaced from the side walls 4 of the combustion chamber are flues formed from sheet metal and consisting of inner walls 15, which are substantially parallel with the major portions of the side walls 4, and outer corrugated walls 16, the corrugations of which extend vertically, as clearly shown in Fig. 4. The flues are substantially co-extensive in length with the combustion chamber of the furnace, and the walls forming the flue are connected at the front and rear by means of end walls 17. The products of combustion are conducted to these flues by means of inverted V-shaped conduits 18 which receive such products of combustion through openings 19 in the top 6 of the combustion chamber and deliver them to the upper ends of the flues. It will be understood, if not apparent from the drawings, that the portions of these conduits 18, extending from the openings 19 to the inner walls 15 of the flues, are closed at the bottom.

The flues communicate at their lower end with exhaust manifolds 20, which are coextensive in width with the flues and extend rearwardly to points spaced from the rear wall 3 of the combustion chamber, where they communicate with a riser 21 from which a smoke pipe or stack 22 extends. It will be noted that the bottoms of the exhaust manifold 20 slope downwardly from front to rear. This facilitates cleaning of these manifolds, access being had thereto for this purpose through openings at the rear of the manifold, which are normally closed by clean-out plates or covers 23, removably secured to the manifolds. Extending through the exhaust manifolds at points intermediate the corrugations of the wall 16 are tubes 24, which serve a purpose to be presently described.

The casing B is of generally rectangular cross-section, and consists of sheet-metal walls 25 lined in their upper portions with panels 26 containing heat-insulating material, such as asbestos.

Removably secured to the front wall 2 of the combustion chamber, as by means of screws 27, is a steel plate 28, a gasket 29 of heat-re-

sistant material being interposed between said plate and wall. A sight tube 30 extends from a point in advance of the front wall of the casing B through the casing, plate 28, gasket 29 and wall 2 of the combustion chamber at a point just above the firebox, and through this tube, the conditions within the combustion chamber may be observed. A second tube 31, of considerably larger diameter than the tube 30 similarly extends through the casing B, plate 28, gasket 29 and wall 2 of the combustion chamber, this tube being in axial alignment with the opening 9 in the firebox. A tube 32, similar to the tube 30, likewise extends through the casing B, plate 28, gasket 29 and wall 2 of the combustion chamber, this tube being in axial alignment with the opening 14 in the firebox. The function of this tube will presently be described.

The furnace proper is provided at the sides with brackets 33, to which are secured angle legs 34, whereby the furnace may be supported in spaced relation to the floor F. The legs 34 are adjustable relatively to the brackets 33, so as to permit variation in the spacing of the furnace from the floor.

The housing C is also of generally rectangular cross-section, and consists of sheet-metal side walls 35, disposed adjacent the side walls of the casing B, a front wall 36, having a door 37 therein, a rear wall 38 having a door 39 therein, and a top 40. The top 40 has an opening 41 therein directly above the furnace A, through which the heated air from the space about the furnace passes into a bonnet (not shown), which may be secured to the flange 42. The top 40 has a second opening 43 therein forming a cold or recirculated air intake, such air passing through air cleaners or filters 44, which are disposed in a chamber D formed by the side walls 35, rear wall 38 and rear wall 25 of the casing B. The air, as thus cleaned, is forced by a motor driven blower 45, disposed within the chamber D, through the rear wall of the casing B, and into the space within the casing. The air, it will be noted, is blown into the lowermost portion of the casing. The smoke pipe 22 passes through the chamber D, and thus preheats the air drawn into the blower.

Disposed within a chamber E, formed by the side walls 35, front wall 36 and front wall of the casing B is an oil burner 46, the outlet conduit 47 of which extends into the tube 31 and to a point adjacent the opening 9 in the firebox. The conduit 47 is slightly smaller in diameter than the tube 31, and the space between the conduit and tube is filled with asbestos cord 48 or the like, thereby providing necessary heat insulation, and avoiding metal to metal contact between the burner and the furnace and furnace casing, thereby insuring against noise due to vibrations set up by the burner equipment.

The operation of the furnace will, it is believed, be understood from the foregoing description, but may be briefly described as follows:

The oil, in an atomized condition, is blown into the firebox, where it is consumed, the products of combustion passing upwardly into the upper portion of the combustion chamber, and thence into the conduits 18, flues, exhaust manifolds 20, riser 21 and pipe 22, whence they pass into the chimney or smokestack. In such passage of the products of combustion, the walls of the combustion chamber, conduits, flues, exhaust manifold and riser are heated. This heat is transferred to the air which is blown into the

space between the furnace and casing B by the blower 45. The passage of the air is generally indicated by the arrows in Fig. 3, and, at this point, it will be noted that by providing conduits 18 of the particular shape shown and corrugating the outer walls of the flues, large areas of heat transfer are formed. The air passing to the outside of the manifolds is literally forced into the spaces between the corrugations by the lower edges of the insulating panels 26 and the tubes 24 are of value in permitting more direct passage of air into these spaces. Due to the spacing of the flues from the combustion chamber, some of the air passes into these spaces and is thus heated by both the combustion chamber and the flues. By curving the upper portions of the side walls of the combustion chamber, the air which thus passes upwardly between the flues and the combustion chamber is heated by the entire outer surface of the conduits 18. Due to the relatively long path which the products of combustion take, maximum heating area is provided and the furnace is thus highly efficient. Due to the provision of seals at all critical points, leakage of the products of combustion into the air space is effectively avoided. Since the furnace proper is elevated above the ground, some of the air is even heated by the bottom 5 of the furnace.

By making the rear wall 7 of the firebox, which receives the impact of the hot gases, of extreme thickness, long life is assured for the furnace. Some of the gases which thus strike the wall 7 are swirled about, as indicated in Fig. 5. Heretofore, in furnaces which were not provided with fireboxes having a flange such as 11, such swirling gases attacked the burner nozzles, with the result that such nozzles were either melted or so severely corroded as to require frequent shut-downs and replacements. By providing the flange 11, and especially by curving the outer wall 13 thereof, as in Fig. 5, such swirling gases are diverted away from the burner nozzle and the life of such nozzle is materially prolonged. The gases which are thus diverted from the nozzle are swept upwardly by air which is drawn by suction into the combustion chamber through the tube 32. This air is relatively cool, and, in effect, cools the tip of the burner nozzle. The provision of the flange 11 and the tube 32 are thus important features.

The firebox is cast in the furnace prior to shipment of the furnace to its point of installation, and in thus casting the firebox, the walls and bottom of the combustion chamber from the outside of the mold. The inside of the mold is formed by a wood form, indicated by the dotted lines in Figs. 1 and 3. The inside of the mold is left in situ and the furnace may be shipped before the material of which the firebox has been made has become completely hardened or seasoned. When the furnace is installed, the inner wood form is burned when the operation of the furnace has been started. As the result of thus burning the form, it has been found that the firebox shrinks away from the walls of the combustion chamber, as indicated by the spaces S. These spaces form air insulating spaces which have been found to materially prolong the life of the furnace.

The furnace, it thus appears, is of rugged, durable construction, highly efficient, economical and safe in operation, and attractive in appearance.

Other modes of applying the principle of my

invention may be employed instead of the one explained, change being made as regards the structure herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:

1. In a furnace of the character described, a combustion chamber, flues spaced from said chamber and communicating with the upper portion of said chamber, said flues having flat inner walls, and outer walls having outwardly extending corrugations, manifolds communicating with the lower ends of said flues and extending from the front to the rear of said flues and having upper walls extending across the spaces between said corrugations and tubular members extending through said manifolds at points intermediate said corrugations, said tubular members communicating the spaces below said flues with the spaces between said corrugations.

2. In a furnace of the character described, a combustion chamber, a flue spaced from said chamber and in communication therewith, said

flue having an inner wall, and an outer wall having outwardly extending corrugations, a manifold coextensive in width with the width of said flue, and having upper walls extending across the spaces between said corrugations, and open-ended air heating conduits extending through said manifold at points intermediate said corrugations and communicating the space below said flue with the spaces between said corrugations.

3. In a furnace of the character described a combustion chamber having a flat top provided with spaced openings, flues spaced laterally from the combustion chamber on opposite sides thereof, and straight horizontally disposed flues extending across the top of the combustion chamber and communicating with the combustion chamber and lateral flues and having flat bottoms lying in the same plane as and directly engaging the flat top of the combustion chamber, said horizontal flues having openings therein registering with the openings in the top of the combustion chamber.

NATHAN E. WALKER.