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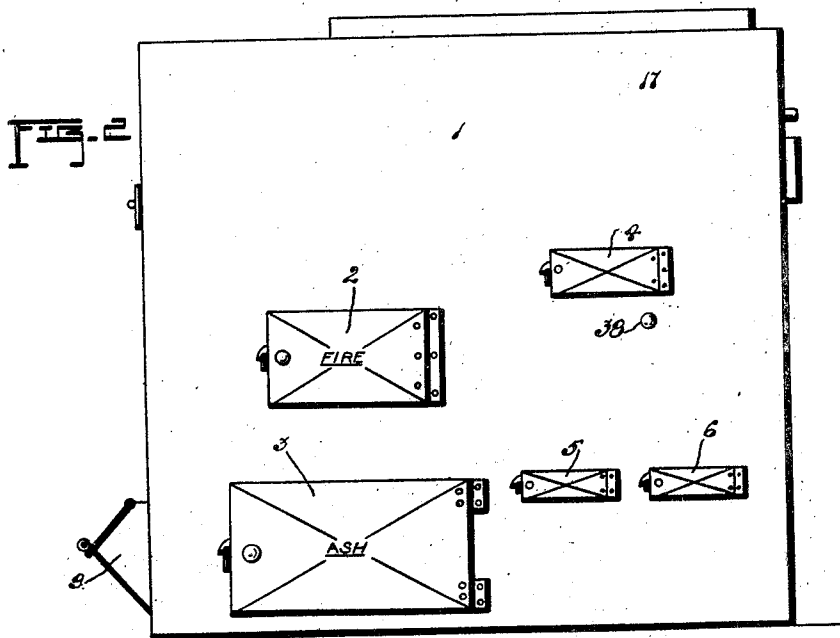
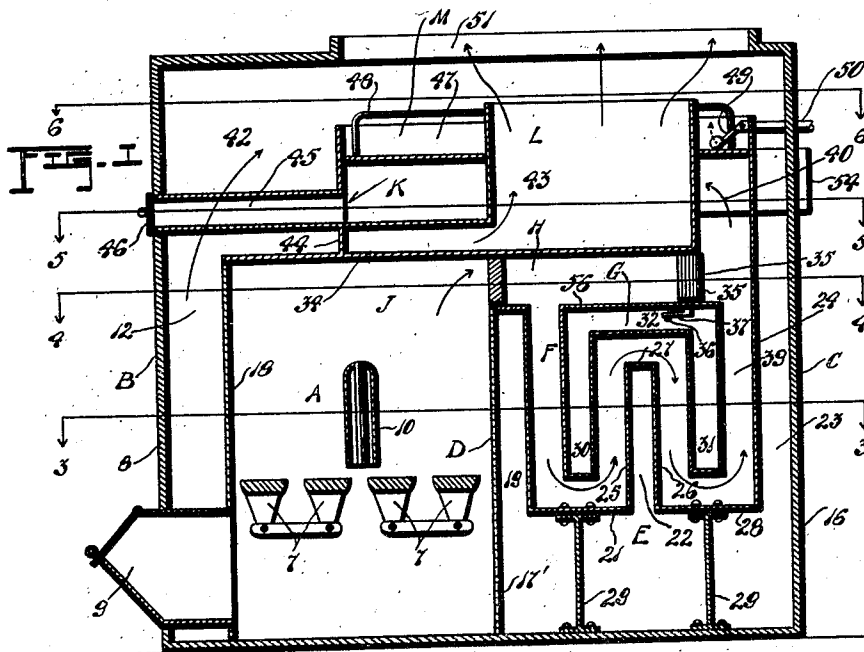
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2,296,545

FURNACE

Filed Oct. 21, 1939

3 Sheets-Sheet 1



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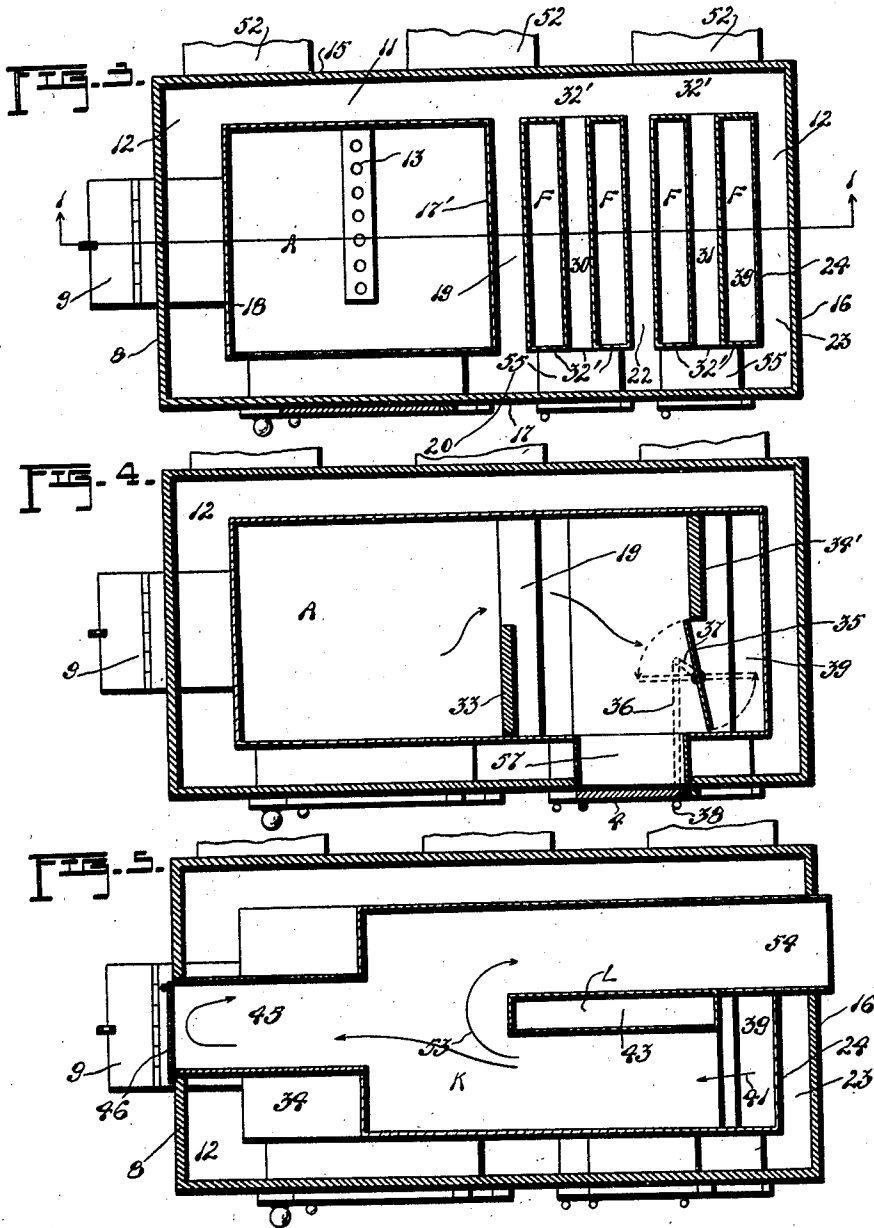
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FURNACE

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3 Sheets-Sheet 2



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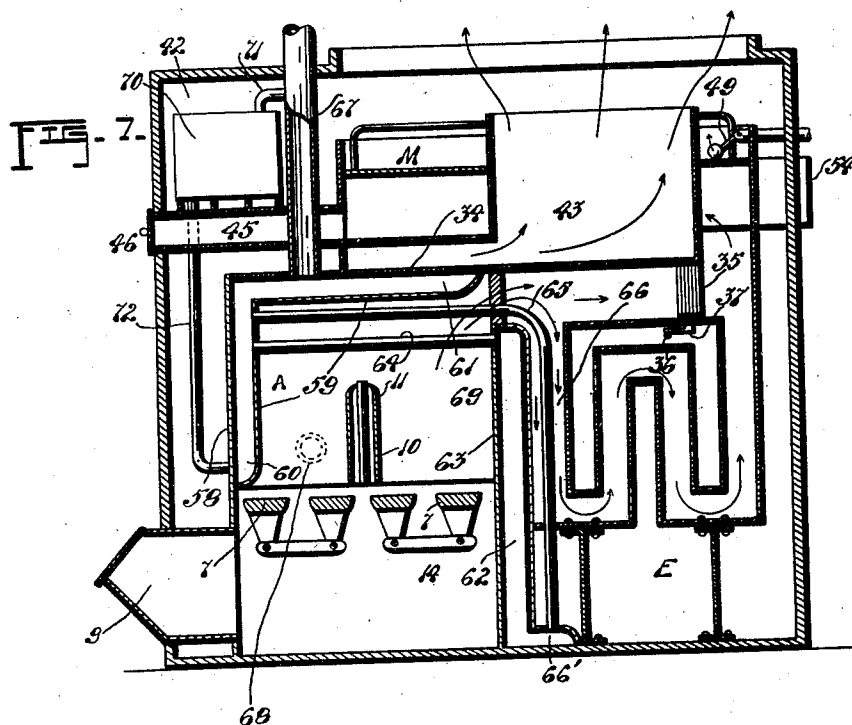
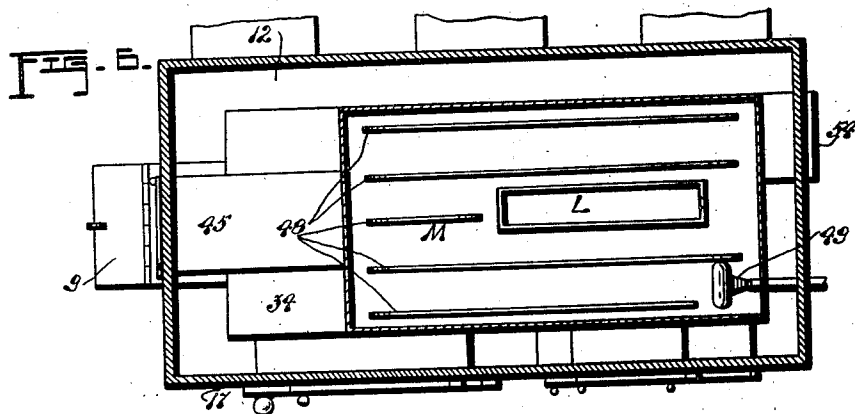
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3 Sheets-Sheet 3



UNITED STATES PATENT OFFICE

2,296,545

FURNACE

George A. Tichbourne, Port Arthur, Ontario,
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Application October 21, 1939, Serial No. 300,625

4 Claims. (Cl. 126—108)

One of the objects of my invention is to provide, in a hot air furnace, efficient means for imparting to a body of heated air the requisite degree of humidity for comfort.

A further object of my invention is to provide a combination hot air and hot water furnace in which a domestic establishment for instance, may be kept warm by hot air in those parts where this can be most efficiently done but at the same time may be kept warm by hot water radiation in those parts which for instance are far removed horizontally from the furnace or in those parts which have a northerly exposure or are in any other way, difficult to heat by hot air.

A further object of my invention is to provide a furnace which is outstandingly economical in fuel consumption and in which a far higher thermal efficiency is possible than with the conventional type of furnace.

A further object of my invention is to provide a furnace which is in all respects practical to manufacture and low in price and which is easy to install.

With the above more important objects in view and such other minor objects as may appear as the specification proceeds, my invention consists essentially in the arrangement and construction of parts all as hereinafter more particularly described, reference being had to the accompanying drawings, in which:

Figure 1 is a section on the line 1—1 of Figure 3.

Figure 2 is a frontal elevation of my furnace.

Figure 3 is a section on the line 3—3 of Figure 1.

Figure 4 is a section on the line 4—4 of Figure 1.

Figure 5 is a section on the line 5—5 of Figure 1.

Figure 6 is a section on the line 6—6 of Figure 1.

Figure 7 is a sectional elevation illustrating my combination hot air and hot water furnace.

In the drawings like characters of reference indicate corresponding parts in the different figures.

In its essentials my invention comprises a rectangular firebox A surrounded by a rectangular wall of sheet metal B, which is spaced therefrom to provide a hot air jacket, the sheet C, however, being spaced from the opposing sheet D of the firebox by a considerably greater distance than the remaining three sheets to provide what I will refer to herein as an adjacent hot air chamber E through which the hot products of com-

bustion from the firebox travel through the W-shaped fire path F formed by the three vertical hollow walls and the downturned U-shaped transverse walled passage G. I also provide a draft passage H and after passing through the W-shaped fire path, the hot products of combustion are turned back into the horizontal and proceed over the crown sheet J through the horizontal reverse angulated fire passage K (Figure 5) which surrounds a vertical open ended hot air duct L (Figures 1 and 5), extending around which is also a rectangular humidifying pan M, this pan being superimposed above the fire passage.

Proceeding now to describe my construction in detail and considering first the hot air embodiment of Figure 1, it will be seen that the frontal surface of my furnace 1 is provided with the usual firebox door 2, ash clean-out 3 and also with three soot clean-outs 4, 5 and 6, to be described in further detail later. Within the firebox are the usual grates 7 and projecting from one side of my firebox and through the wall 8 is a suitable damper 9, for which I claim no novelty.

My firebox A is divided into two compartments by means of the hollow firebox partition 10, which extends at right angles to the plane of the firebox gate 2 or the firebox opening therebehind, this partition being vertical and communicating with the posterior side 11 of the surrounding hot air space 12 (Figure 3) enclosed by the wall or jacket B, a plurality of parallel and vertical open ended tubes 13 extending through this partition, such tubes being provided to take in air from the ash pit 14 through the lower end thereof and discharge it into the firebox above the normal level of the fire bed to increase combustion by this means. It will also be understood that if desired, only one side or the other of the partition may be fired as in mild weather for instance, while if necessary to distribute the fire bed from one side to both sides of the partition, such may easily be accomplished by operation of the grates 7 as described in connection with my United States Patent No. 2,089,450 above referred to.

Extending right around my firebox and spaced therefrom is a rectangular wall of sheet metal, one surface of which I have already designated with the numeral 8, the posterior sheet being enumerated 15, the remaining sheet 16 and the front sheet 17, and it will be noted that the sheet 16 is spaced considerably further from the central wall 17' of my firebox A than is the sheet 8 from the opposing side wall 18 of my firebox

for the purpose of providing the aforementioned adjacent hot air chamber E.

By reference to the accompanying Figure 3 in its relation to Figure 1, it will be seen that the hot air space 12 extends around all four sides of my firebox and that within the adjacent hot air chamber are three vertical transverse hollow walls, an interior, an intermediate, and an anterior one. The interior wall 19 also serves as the central wall 17' of my firebox and communicates with the posterior portion 11 and the frontal portion 20 of my surrounding water space 12.

Spaced from the interior wall 19 and connected thereto by the horizontal transverse plate 21 is an intermediate wall 22, which it will be noted does not extend to the height of the wall 19. This wall also communicates with the portions 11 and 20 of the air space.

The anterior wall 23, also constitutes one of the four sides of my surrounding hot air space 12, the sheets 16 and 24 forming one side of this wall extending vertically to a height in excess of that of the walls 19 and 22.

The panels 25 and 26 of which the wall 22 is formed, are united at the apex thereof by the panel 27, while the panel 26 is united at the base thereof to the sheet 24 by means of the portion 28 and by reference to the accompanying Figure 1 it will be seen that the foregoing walls are supported by means of the pedestals 29.

Extending across the adjacent hot air chamber and communicating at each end with the portions 11 and 20 of my surrounding hot air space, is the transverse inverted U-shaped hot air passage which I have already designated G, the same having sheet metal walls which comprise the vertical legs 30 and 31 and the horizontal communicating passage 32 so that the passage may be described as perimetrically closed yet open sided since it communicates with the surrounding air space 12. The passage G is spaced from the three hollow walls I have referred to, thereby providing what I describe as a serpentine fire path F which actually is W-shaped as may clearly be seen. It will be understood of course, that the ends of the fire path F are closed by the panels 32'.

It will be understood of course, that the products of combustion emerge from my firebox in the direction of the arrow in the accompanying Figure 1 and by reference to this figure and to the accompanying Figure 4, it will be seen that I provide a baffle plate 33 at the apex of the wall 17' extending up to the crown plate 34, so that the products of combustion travel not only in the direction of the arrow to be seen in the accompanying Figure 1 but are also guided in the direction of the arrow to be seen in the accompanying Figure 4.

Above the serpentine fire path referred to, is my draft passage H, the far end of which is spanned by the baffle plate 34' and when necessary by the damper 35 and from the foregoing it will be seen that I have provided a pair of staggered baffle plates, by means of which the products of combustion in emerging from my firebox are compelled to distribute themselves all over the under surface of the crown sheet immediately above the draft passage and thereby assist in heating the superimposed hot air compartment presently to be referred to. My damper 35 is actuated by the push-pull rod 36, which is connected to the link 37 (Figure 4), the rod 36 terminating in a convenient knob 38 project-

ing from the frontal surface of my furnace and it is to be understood that when the draft is in the open position illustrated in chain lines in the accompanying Figure 4, the products of combustion travel through the draft passage while when closed, they travel through the serpentine fire path but also enter the draft passage before being backed-up by the closed damper and baffle 34'.

As the hot gases of combustion reach a height in the leg 39 of my fire path, corresponding approximately to the position of the arrow 40 in the accompanying Figure 1, they are turned back into the horizontal as illustrated in the accompanying Figure 5 by the arrow 41 and into my horizontally reverse angulated fire passage K also clearly illustrated in the accompanying Figure 5. This passage is positioned within what I have termed my superimposed air heating compartment 42 and surrounds a vertical open-ended hot air duct 43, which as clearly illustrated in the accompanying Figure 1, is in communication with my hot air space 12 and of course, the several hollow walls in the adjacent hot air chamber E.

The fire passage K is supported above the crown sheet by suitable supports such as 44 and it will be seen that I provide a suitable clean-out passage 45 terminating upon the side 8 of my furnace in the clean-out gate 46.

The horizontal fire passage is enclosed at the top by a rectangular humidifying pan 47 as most clearly illustrated in the accompanying Figure 1, which surrounds the hot air duct 43, this humidifying pan being provided with a plurality of up-standing angle brackets 48 over which the usual absorbent cloth may be hung and into which water is drawn from the pan by capillary attraction.

I do not of course claim any novelty for the use of absorbent cloth or the means for hanging the same in my humidifying pan nor do I claim any novelty for the float-valve assembly 49, by means of which water is maintained in my humidifying pan at a constant level from the conduit 50. I do claim as novel, however, the construction and location of my humidifying pan and the remaining structure which I have described as being positioned within the superimposed hot air compartment 42.

Finally with reference to the hot air embodiment of my furnace, it will be understood that heated air rises through the enlarged aperture 51 while a plurality of cold air conduits 52 are positioned at any convenient point near the base of my furnace. It is perhaps also unnecessary to point out that the course of hot gases through my fire passage K will be in the direction of the arrow 53 so that they emerge through the passage 54 (Figures 1 and 5) into the usual chimney. It should also be noted of course, that these hot gases are also free to back-up into the clean-out passage 45, from which heat may also be radiated into the surrounding hot air compartment. By reference to the accompanying Figures 1, 2 and 3, it will also be seen that I am able to clean out the surfaces 21 and 28 of my W-shaped fire path by virtue of the short passages 55, which terminate in the gates 5 and 6, while by reference to the accompanying Figures 1, 2 and 4 it will be seen that I am also able to clean out the surface 56 of the draft passage H by virtue of the short transverse passage 57 which terminates in the clean-out gate 4.

The combination hot water and hot air embodi-

ment illustrated sectionally in the accompanying Figure 7, is essentially similar to the embodiment which I have already described and accordingly I consider it only necessary to described the same briefly and in respect of the additional structure by means of which it is enabled to heat a quantity of water.

It will be seen that the side 58 of my firebox and that portion of the crown sheet 34 which covers the same, is water jacketed by means of the right angled hollow wall 59 consisting of a vertical portion 60 and a horizontal portion 61.

In this embodiment the intermediate hollow wall 62 is filled with water and terminates at the corners where the back and front walls of the firebox join the wall 63 to allow for the surrounding hot air space 12.

The hollow walls 59 and 62 are connected by means of any desired number of horizontal water tubes 64 as clearly illustrated in the accompanying Figure 7, and also by the right angled water tubes 65 which it will be seen extend vertically down the leg 66 of my fire path and communicate with the wall 62 via a horizontally extending water jacketed foot 66'.

Hot water rises through the conduits 67 which communicate with the horizontal portion of my wall 59 while cold water returns through the conduit 68 to enter the posterior vertical section 69 of my wall 59.

Since many modifications can be made in the invention herein described and since the accompanying drawings have been prepared only to illustrate the relative arrangement and interaction of parts and not with regard to accuracy of dimensions for manufacturing purposes which in view of this disclosure I consider to entail merely mechanical skill coupled with the skill of the draftsman, and since many apparently widely different embodiments of this invention may be

made within the scope of the accompanying claims without departing from the spirit and scope of the same it is intended that all matter contained in the accompanying specification shall be interpreted as illustrative only and not in a limiting sense.

What I claim as my invention is:

1. Improvements in furnaces comprising in combination, a firebox, a jacket surrounding said firebox, a fire-path at one side of said fire-box of serpentine vertical cross-sectional configuration and a transverse perimetrically enclosed passage of U-shaped cross-section in the plane of, and at one side of said firebox communicating at the sides thereof with air jacket, said passage bounding at least a portion of said fire-path.

2. Improvements in furnaces comprising in combination, a firebox, a jacket surrounding said firebox, a fire path at one side of said firebox of W-shaped vertical cross-section and a transverse perimetrically enclosed hot air passage of U-shaped vertical cross-section extending between said jacket, the walls of said passage constituting one of the boundaries of said W-shaped fire path.

3. The furnace as defined in claim 1 which includes a horizontal draft passage above said W-shaped fire path and staggered baffle plates at the ends of said draft passage.

4. Improvements in furnaces comprising in combination a fire-box, a jacket surrounding said fire-box, a fire path at one side of said fire box of W-shaped vertical cross-section, a transverse baffle of inverted U-shaped vertical cross-section extending between said jacket a draft passage above the horizontal portion of said baffle constituting the lower wall of said passage, said baffle constituting one of the boundaries of said W-shaped fire path.

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