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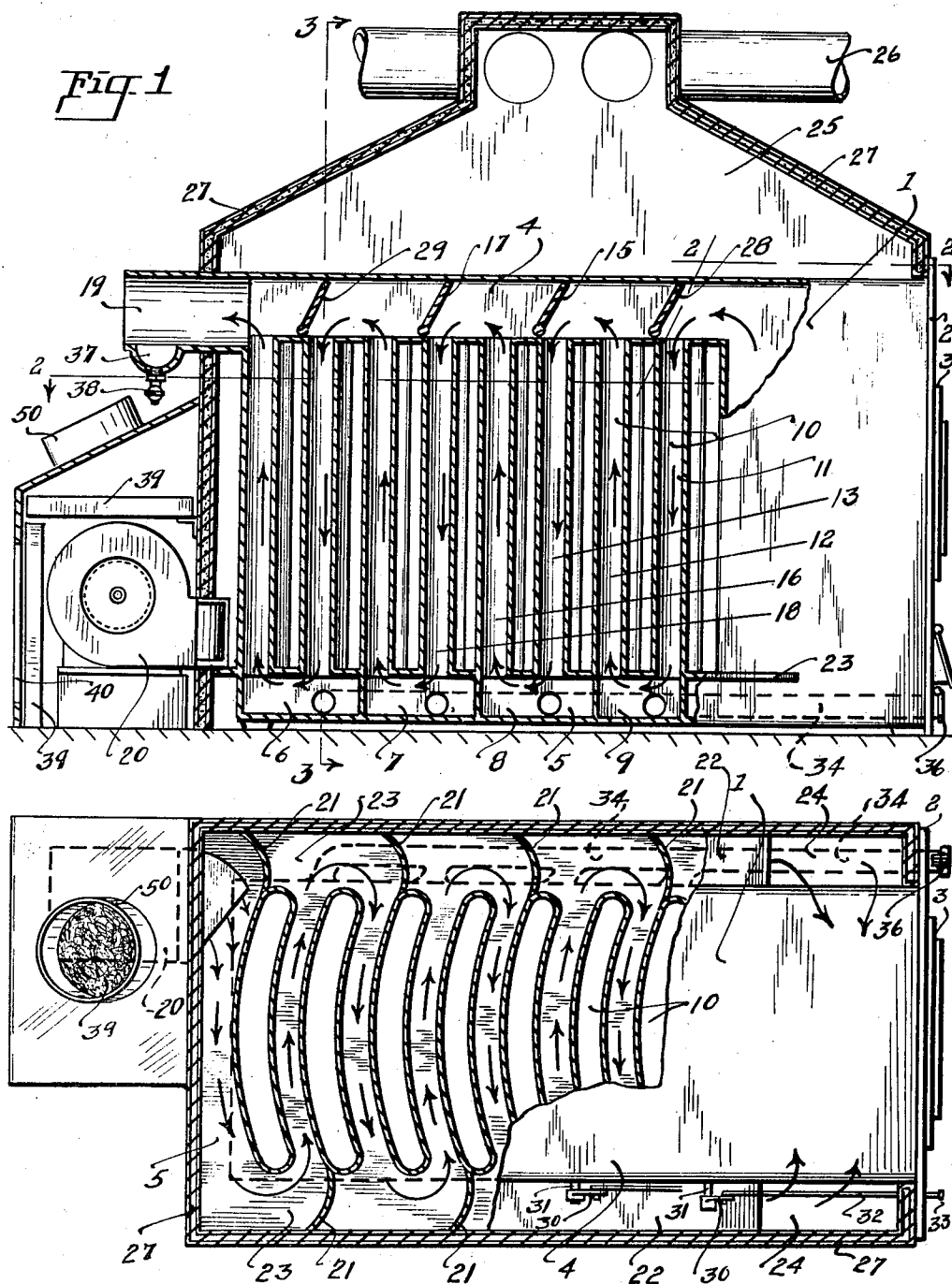
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2,290,255

FURNACE

Filed Feb. 21, 1940

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

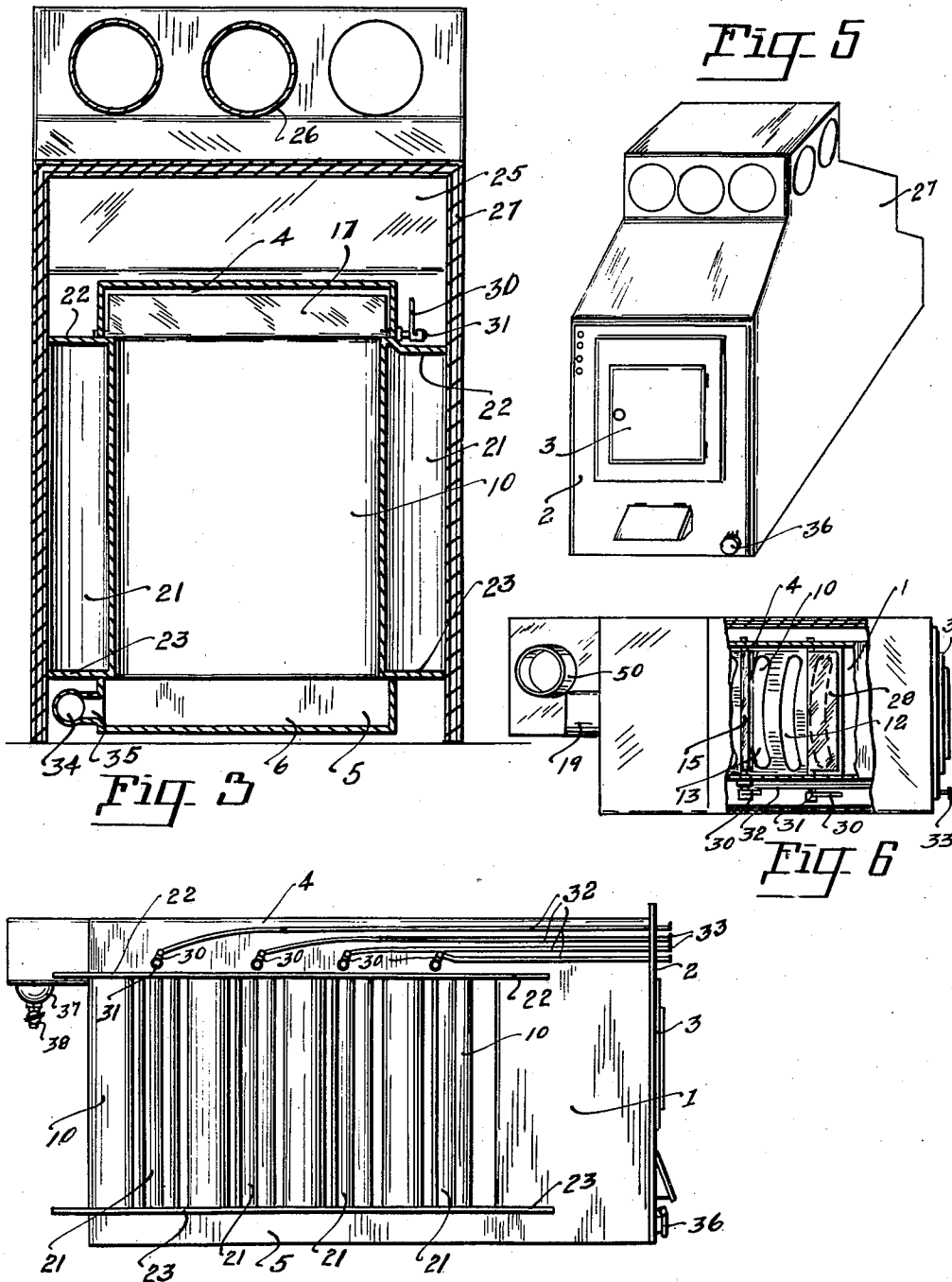


Fig. 4

Fig. 6

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FURNACE

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3 Claims. (Cl. 126—110)

This invention relates to hot air furnaces and the primary object of the invention is to extract the greatest number of heat units possible from the fuel within the combustion chamber of a furnace, transferring these units into the hot air distributing chamber by a series of heat transfer chambers.

Another object of the invention is to construct these heat transfer chambers so that the heat from the combustion chamber will have to travel through the heat transfer chambers in an up and down movement in a general horizontal direction. The heat can be extracted from the heat transfer chambers more efficiently as it travels up and down within these chambers in a general horizontal direction towards the smoke-stack of the furnace. In other words, due to the arrangement of heat chambers in a horizontal line the heat must travel over all of the surfaces of the heat transfer chambers before it reaches the smoke-stack.

Another object of the invention is to provide control dampers within the heat chambers for controlling the flow of heat through the chambers. It has been found in past experience that if a series of heat chambers are used in connection with a fire box, where certain kinds of fuel are used, that creosote will form in the heat chambers farthest away from the fire box. This is caused by the cooling off of the chambers which condenses the heated gases, depositing a film of creosote and the like. The heat chambers nearer the fire box will be clean due to the intense heat at this point, and a fine ash will be formed in these chambers that can be readily removed.

In order to eliminate the difficulty of condensation within these heating chambers, control dampers have been provided that will direct the heat directly from the fire box into any one of these heat transfer chambers converting the creosote into an ash that can be removed easily. This is an important feature of my invention, as it makes it possible to use a series of heat transfer chambers operating without fouling.

A still further object of my invention is to provide a means of cleaning out the heat transfer chambers by a vacuum system connected to the chambers.

These and other incidental objects will be apparent in the drawings, specification and claims to follow.

Referring to the drawings:

Figure 1 is a sectional side elevation of my new and improved hot air furnace, parts broken away to illustrate invention.

Figure 2 is a plan sectional view, taken on line 2—2 of Figure 1, looking in the direction indicated, parts broken away for convenience of illustration.

Figure 3 is an end sectional view, taken on line 3—3 of Figure 1 looking in the direction indicated.

Figure 4 is a side elevation of the fire box and heat transfer chamber as they would appear removed from the hot air jacket.

Figure 5 is a front perspective view of the furnace in one of its preferred forms.

Figure 6 is a plan view of the furnace, parts broken away to illustrate the fire box, heat transfer chambers and their relationship to the control dampers.

In the drawings:

A standard fire box 1, has the usual internal equipment, such as grates and so forth, depending upon the type of fuel to be used. This fire box has a face plate 2 and the usual doors 3. Extending rearward of the fire box is a manifold 4, which is directly in communication with the interior of the fire box. Another manifold 5 extends rearwardly from the furnace and does not intercommunicate therewith. This manifold is divided into a number of chambers 6, 7, 8 and 9. Intercommunicating heat transfer chambers 10 are connected between the manifold 4 and the lower manifold 5, by any suitable means, such as welding and the like.

Referring to Figure 1, the heat and smoke from combustible material within the fire box 1 travels in the direction of the arrows illustrated in Figure 1, down and up through the heat transfer chamber 10 as follows: Down through the chamber 11 into the manifold chamber 9, up through the chamber 12 into the upper manifold and is forced down into the chamber 13 by the damper 15 into the lower manifold chamber 8, up through the chamber 16 into the manifold 4 and directed by the damper 17 into the chamber 18, lower manifold chamber 7 and so forth until it reaches the smoke outlet 19. By the time the heated air from the fire box reaches the outlet 19 practically all of the heat has been extracted therefrom by the heat transfer chambers. To assist natural convection between these chambers a suitable fan 20 is provided, forcing air between the heat transfer chamber 10 in the direction of the arrows, best illustrated in Figure 2. Vertical baffle plates 21 direct the air from the fan between the heat transfer chambers as indicated.

Referring to Figure 3, longitudinal baffle plates 22 and 23 direct the air from the fan along the

heat transfer chambers until the same has reached the fire box end of the furnace. The air is allowed to come up past the fire box at 24 over the fire box and into the hot air chamber 25 of the furnace from where it is delivered by suitable pipes 26 to its destination. The hot air chamber surrounding the furnace is properly insulated by any suitable insulation jacket, as indicated by numeral 27.

The dampers 15, 17, 28 and 29 are controlled by the levers 30 which are secured to the shafts 31 of the dampers. Suitable control rods 32, terminating in control buttons 33 provide for the opening or closing of these dampers, these dampers have a definite purpose and are for assisting in the cleansing of the heat transfer chambers. This is one of the high-lights of this invention.

The farther away from the fire box that the heat transfer chamber is located, the greater will be the amount of deposit that will cling to the inner walls of the chamber, such as creosote and the like. This is because these heat transfer chambers become cooler as they get farther away from the fire box. In order to clean these deposits out of the chambers it becomes necessary to direct the flow of heat created in the fire box through the individual heat transfer chambers in order to clean out these deposits. In order to secure this result, the dampers are opened, except the damper beyond the heat chamber to be cleaned. The productions of combustion are thus sent directly through the heat chamber to be cleaned to utilize such maximum heat for consuming or reducing to a fine dry ash the deposit in that heat chamber. Obviously by the control of the dampers, any particular heat chamber may be subjected to this cleaning operation. By the use of these dampers, for the purpose of cleaning away these deposits, it has been possible to use a number of heat transfer chambers in my new hot air furnace. This has been one of the big difficulties with such an arrangement in the past. By directing intense heat through each chamber the deposits are converted into a fine dry ash that can be readily removed.

A manifold 34, having connections 35 into the chambers 6, 7, 8 and 9 provides a novel means of removing the ash and deposits from within the heat transfer chambers. A vacuum connection is attached to the fitting 36 on the end of the manifold 34 for extracting the ashes and foreign matter from the lower manifold 5. This is another important feature of my new and improved furnace.

By referring to Figure 2, it will be noted that the heat transfer chambers are constructed on a curve or arc, somewhat semicircular in form; this is to prevent them from warping with the heat.

A suitable condensing chamber 37, having drain 38 may be provided in connection with the outlet smoke-stack 19.

The fan 20 receives its air supply through the air cleaners 39 from either the opening 40 or through a pipe system leading to the opening 50.

In operation the combustion products from

the fire box travel in the direction of the arrows indicated in Figure 1, and is discharged through the stack 19. While this process is going on air is delivered by the fan 20 and discharged in the direction of the arrows in Figure 2, surrounding the heat transfer chambers 10 and extracting the heat therefrom, delivering it up through the openings 24 into the hot air chamber 25 and to the distant points through the pipe 26. In traveling up and down through these heat transfer chambers the air is subjected to the heat from the hot gases delivered by the fuel within the combustion chamber that constitutes my invention. It has been found that where the heat from the fuel in the combustion chamber travels up and down through these heat transfer chambers in a general horizontal direction the efficiency of the transfer of heat into the hot air chamber of the furnace will be materially increased.

I do not wish to be limited to the particular form of mechanical construction herein shown, as my invention is adapted to other mechanical embodiments, still coming within the scope of the claims to follow.

What is claimed as new is:

1. In a hot-air furnace, a horizontally arranged furnace body, a furnace proper at one end of the body, a plurality of relatively narrow elongated spaced chambers, of less width and height than the body, arranged in the body in horizontal alignment with the furnace proper, the chambers being open at the upper and lower ends and otherwise closed, the chambers defining collectively a path for the products of combustion from the furnace proper and the spaces between the chambers defining a path for air to be heated, the space in the body above the chambers defining a service manifold open to the products of combustion from the furnace proper, a series of manually controlled dampers in the service manifold to selectively control the path of the products of combustion relative to the chambers, the space below the chambers defining a directing manifold, partitions fixed in said directing manifold to permanently control the flow of the products of combustion relative to the chambers, and means at the end of the body opposite the furnace for directing a current of air successively between the chambers in a predetermined fixed path toward the furnace proper.

2. A construction as defined in claim 1, including a duct extending longitudinally of and open to the full delivery manifold, said opening through the body below the furnace proper, whereby to provide for suction exhaust of refuse accumulating in such manifold.

3. A construction as defined in claim 1, wherein the spaces in the body at the respective sides of the chambers are divided by partitions to define a fixed air path relative to the chambers, and means for directing a current of air through such path, the chambers and partitions being in curved form transversely of the body.

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