Sept. 28, 1926. 1,601,622

C. W. HAMILTON

FURNACE

Filed Jan. 23, 1926

Fig. 1.

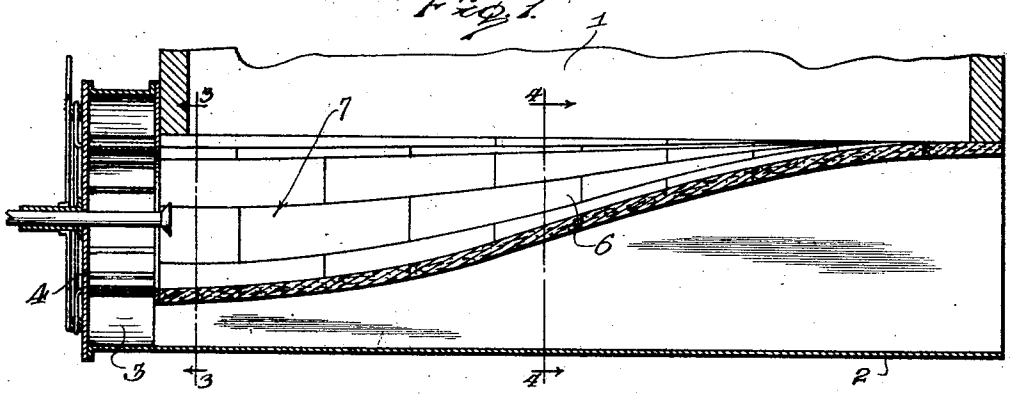


Fig. 2.

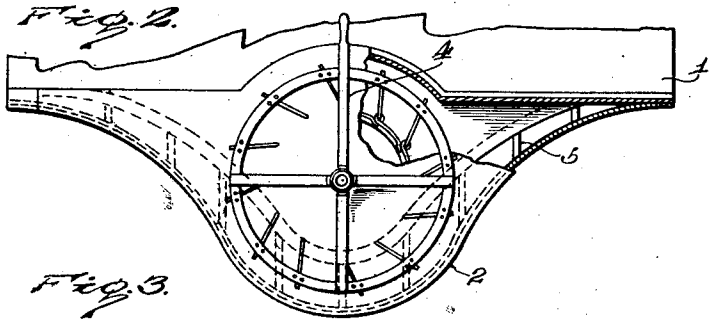


Fig. 3.

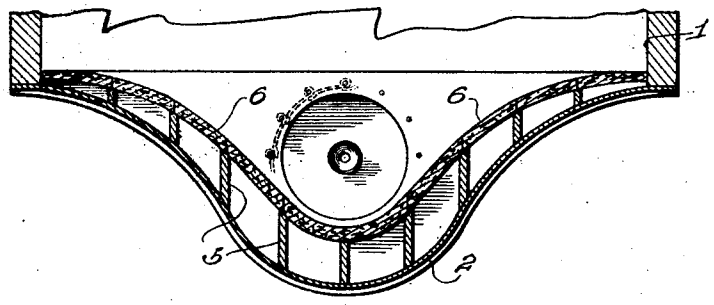
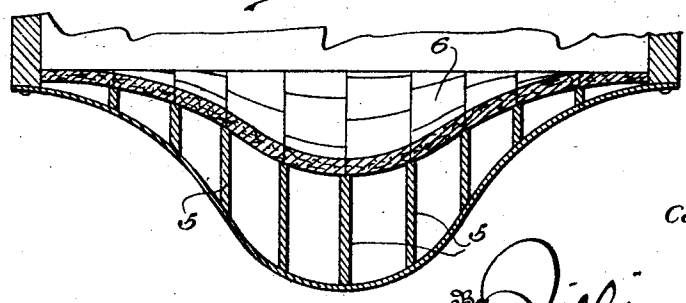


Fig. 4.



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UNITED STATES PATENT OFFICE.

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FURNACE.

Application filed January 23, 1926. Serial No. 83,396.

This invention relates to improvements in furnaces and especially to those of the oil burning type or design such as used in conjunction with locomotives and corresponding apparatus, the invention having for an object to provide an advantageous form of means for preheating the supply of air to the combustion chamber of a furnace, whereby to perfect combustion with the practicing of a material economy in fuel consumption, as well as materially increasing the heating efficiency of an equipped furnace and avoiding any possibility of breakage or premature deterioration of parts housed therewithin or adjacent to and communicating with the combustion chamber or by reason of the direction of chilling drafts of air thereonto.

It is also an equally important object of the invention to provide a device of the character mentioned wherein, without the usage of an auxiliary heating means, that air supplied to the combustion chamber of the furnace will be preheated, such preheating being accomplised by the utilization of energy otherwise wasted from the furnace.

Other objects of the invention will be in part obvious and in part pointed out hereinafter.

In order that the invention and its mode of operation may be readily understood by persons skilled in the art to which it appertains, I have in the accompanying illustrative drawings, and in the detailed following description based thereupon, set out one possible embodiment of the same.

In these drawings:—

Figure 1 is a fragmentary vertical longitudinal section through a furnace constructed in accordance with the invention,

Figure 2 is a front and fragmentary elevation of the same, a portion of which is broken away and shown in section,

Figure 3 is a vertical transverse section taken on the line 3—3 of Figure 1, looking in the direction in which the arrows point, and

Figure 4 is a corresponding section taken on the line 4—4 of Figure 1, looking in the direction in which the arrows point.

Having more particular reference to the drawings, in connection with which like characters of reference will designate corresponding parts throughout, 1 indicates the housing or casing proper of an oil burning furnace, such for example as those types of oil burning furnaces commonly used upon a now prevalent form of locomotives a fire pan 2 being arranged and supported beneath the same in the manner shown in the Figure 1 and having an intermediately arranged longitudinally disposed pocket formed therein and extended throughout its length; the rearward portion of said fire pan opening at one end of the furnace construction while the forward portion thereof is also open flush with the adjacent end of the furnace housing but is adapted to communicate with the closure housing 3 of an air register generally designated by the numeral 4 adapted to control the intake or inflow of air thereby into the combustion chamber of the furnace; a burner pipe or nozzle being extended through the central portion of said register into the combustion chamber of the furnace as illustrated in the Figure 1.

A plurality of relatively spaced longitudinally disposed supporting walls 5 are received upon the fire pan 2 of the furnace and are removably arranged with respect to each other; these walls serving to receive and support upon their upper marginal portions a fire wall 6 constructed of refractory brick or similar material, and as will be noted, being curved upon itself throughout its length, in the manner as indicated in the Figure 1. In this connection, it will be noted that the rearward portion of the refractory wall 6 is transversely curved or bowed upon itself and is also curved longitudinally in an upward direction so that the rearward end thereof is arranged directly adjacent to and in contact with the adjacent rearward portion of the furnace housing 1, while the intermediate portion of said wall is longitudinally curved downwardly upon itself and extends to a point adjacent to the forward end of the fire pan 2 and likewise, the forward end of the housing 1. Likewise, the transverse curvature of the wall increases in its depth as it nears the forward end thereof, so that in effect, said wall is provided with an intermediate longitudinally disposed pocket decreasing in depth towards its rearward end into and throughout which combustion is effected. This lower and forward end of the refractory wall 6, however, is arranged in proximity to the adjacent portion of the fire pan 2, that is, it is so curved downwardly upon itself as to materially restrict the area of the opening at the rearward end thereof

and by consequence, it will be understood that air flowing into the rearward and open end of the fire pan at atmospherical pressure will, in passing through this restricted area between the forward ends of the fire wall 6 and the fire pan 3, have its velocity increased and hence, that the same will be so discharged into the casing 3 for delivery into the combustion chamber 7 of the furnace construction in a manner to thoroughly admix the fuel charge.

Because of the fact that the transverse and longitudinal curvature of the refractory wall 6 is such as to present an impedance to the passage of air through the various ways beneath the wall 6 from the rearward end thereof to its forward end, it will be seen that such air in contacting with the refractory material of such walls will be preheated and in this preheated form will be discharged into the end casing 3 for delivery into the combustion chamber 7 by way of the air register 4; it of course being understood that this preheating of the air in the way below the wall 6 does not occur until said wall 6 has been heated from the flame produced at the discharge end of the burner, aforesaid. Consequently upon this preheating of air prior to its delivery into the combustion chamber 7 of the furnace construction 1, it will be understood that combustion within such chamber will be prefected and likewise, that operation of the furnace may be carried on with a material economy in fuel consumption together with a material increase of the heating efficiency of an equipped furnace. Also, due tothe preheating of air before its discharge into the combustion chamber of an equipped furnace, it will be readily appreciated by workers skilled in the art that the delivery of chilling blasts of air onto those parts housed within or adjacent to and communicating with the combustion chamber will be prevented and therefore, that damaging of the same as by crystallization or by other detrimental processes will be eliminated, also, that carbon formations and deposits within the furnace construction will be avoided, since a perfect combustion of fuel is effected within the chamber 7.

In this connection, it will be noted upon reference to the Figures 2 to 4 inclusive that the fire pan 2 by being formed with a transversely curved and longitudinally disposed intermediate pocket, is permitted to be conveniently installed upon a furnace of the locomotive type and further, that because of the transverse curvature of this pocket, which generally conforms to the transverse curvature of the fire wall 6, an air way or passage as between said pan and said fire wall is effected so that air passing thereinto from the open rearward end of the pan will be positively caused to have contact with the forwardly increasingly hotter surfaces of the exposed surface of said fire wall 6. Consequently upon this, it will be understood that the preheating of such air passing through this way or passage will be most efficiently caused in that such air will be distributed entirely over and in full contact with the heated area of the fire wall 6.

It is also of importance to note that by reason of the forming of the longitudinally disposed intermediate and transversely curved pocket in the fire wall 6, the air preheating surface of said fire wall, that is, that surface of the same exposed to the way between the same and the fire pan 2 will be materially increased and thus, will give greater heat radiating efficiency to the equipped furnace construction, effecting a positive preheating of air taken into the passage or way beneath the fire wall 6 and above the fire pan 2 and discharging the same at a high temperature into the casing 3 at a point beyond said fire wall 6 whereupon the air so preheated is adapted to be delivered in a suitably regulated supply from the register 4 into the combustion chamber 7. Furthermore, attention is invited to the fact that by extending the fire wall 6 throughout the entire length of the furnace housing 1 and the fire pan 2, the air passing through the way or passage aforesaid will be afforded an even greater heating area or surface than were the fire wall 6 formed with a discharge port or way in the forward end thereof inwardly of the housing 1 and directly above the fire pan 2; it being borne in mind herein that through the instrumentalities of my invention, I cause the air in process of preheating to pass over a heating surface extending for the full length of the furnace housing 1 and the fire pan 2, whereupon such preheated air is discharged at a point adjacent and flush with the forward end of the furnace housing 1 and fire pan 2 into the air register casing 3 secured, in a suitable manner, to the forward end of the furnace construction. Also, by eliminating the discharge of preheated air upwardly through a discharge port or way formed in the fire wall into the combustion chamber and instead, discharging the preheated air directly and in a longitudinal direction into the forward end of the combustion chamber 7, it will be appreciated that the velocity of the preheated air will in no way be diminished, except through regulation by the vanes of the air registers 4, and thus, that a perfect admixture of the same with the fuel discharged from the burner into the combustion chamber will be effected.

Manifestly, the construction shown is capable of considerable modification, and such modification as is within the scope of my

claims, I consider within the spirit of my invention.

I claim:—

1. In a furnace of the character described, a fire wall having a longitudinally disposed pocket formed therein throughout the greater portion of its length, the upper side of said pocket forming a combustion chamber and the lower side thereof forming an air heating way open at either end and decreasing in area towards its forward end.

2. In a furnace of the character described, a fire wall having an intermediately arranged longitudinally disposed pocket formed therein throughout the greater portion of its length, the upper side of said pocket forming a combustion chamber and the lower side thereof forming an air heating way open at either end and decreasing in area towards its forward end.

3. In a furnace of the character described, a fire wall having a longitudinally disposed pocket formed therein, said pocket increasing in depth toward and to the forward end of said wall, the upper side of said pocket forming a combustion chamber and the lower side thereof forming an air heating way open at either end and decreasing in area towards its forward end.

4. In a furnace of the character described, a fire wall having a longitudinally disposed pocket formed therein throughout the greater portion of its length, said pocket starting inwardly and extending downwardly at a point slightly beyond the rearward end of the wall and increasing in depth toward and to the forward end of said wall, the upper side of said pocket forming a combustion chamber and the lower side thereof forming an air heating way open at either end and decreasing in area towards its forward end.

5. In a furnace of the character described, a fire wall having an intermediately arranged longitudinally disposed and transversely curved pocket formed therein throughout the greater portion of its length, said pocket starting at a point inwardly or the rearward end of said wall and increasing in depth throughout toward and to the forward end of such wall, the upper side of said pocket forming a combustion chamber and the lower side thereof forming an air heating way open at either end and decreasing in area towards its forward end.

6. In a furnace of the character described, a wall of refractory material supported between the lower portion of the furnace housing and the fire pan thereof, said wall being curved transversely upon itself throughout its length and the rearward end thereof being disposed upwardly whereby to materially increase the space beneath the same and the adjacent portion of the fire pan while the forward end of said wall is arranged to materially reduce such space adjacent the forward end of such fire pan, said forward portion of the space beneath the wall communicating with the combustion chamber of the furnace.

7. In a furnace of the character described, a fire pan having an intermediate longitudinally disposed pocket formed throughout its length, the forward and rearward ends of such pan being open, a fire wall above said pan having a longitudinally disposed pocket formed therein throughout the greater portion of its length, the upper side of said pocket forming a combustion chamber and the lower side thereof forming an air heating way open at either end and decreasing in area towards its forward end, and means adjacent the forward end of said pan and said wall for receiving air passing from between the pan and wall and discharging the same into said combustion chamber.

8. In a furnace of the character described, a fire pan having a longitudinally disposed pocket formed therein throughout its length, the forward and rearward ends of said pan being open, a fire wall arranged above said pan, said fire wall having an intermediately arranged longitudinally disposed pocket formed therein, said pocket starting at a point inwardly of the rearward end of the fire wall and increasing in depth toward and to the forward end of such fire wall, the upper side of said pocket forming a combustion chamber and the lower side thereof forming an air heating way open at either end and decreasing in area towards its forward end, and means for receiving air passing from between said pan and wall and discharging the same into said combustion chamber.

9. In a furnace of the character described, a fire pan having an intermediately arranged longitudinally disposed transversely curved pocket formed therein throughout its length, the forward and rearward ends of said pan being open, a fire wall supported above said pan, said fire wall having an intermediately disposed longitudinally extending transversely curved pocket formed therein throughout the greater portion of its length, the pocket starting at a point inwardly of the rearward end of the fire wall and increasing in depth toward and to the forward end of the fire wall, the upper side of said pocket forming a combustion chamber and the lower side thereof forming an air heating way open at either end and decreasing in area towards its forward end, and means adjacent the forward end of said pan and wall for receiving air passing therebetween and returning the same into said combustion chamber.

10. In a furnace of the character described, a fire wall extending entirely throughout the length of the lower portion

of the furnace housing, said wall having a longitudinally disposed pocket formed therein for a portion of its length, the upper side of said pocket forming a combustion chamber and the lower side thereof forming an air heating way open at either end and decreasing in area towards its forward end, a pan supported below and spaced from said wall having open forward and rearward ends, and means communicating with the forward end of said pan and said wall for receiving air passing between such pan and wall and discharging the same into said combusitnon chamber.

11. In a furnace of the character described, a fire wall having an intermediately arranged longitudinally disposed transversely curved pocket formed therein for a portion of its length, said pocket starting at a point inwardly of the rearward end of the wall and increasing in depth throughout its length toward and to the forward end of said wall, the upper side of said pocket forming a combustion chamber and the lower side thereof forming an air heating way open at either end and decreasing in area towards its forward end, said fire wall extending throughout the entire length of the furnace housing, a fire pan arranged beneath said fire wall and extended throughout the entire length of the same, the opposite ends of said pan being open, and means communicating with the space between the forward ends of said pan and said wall for receiving air passing therefrom and directing the same into said combustion chamber.

In witness whereof I have hereunto set my hand.

CARL W. HAMILTON.