March 16, 1926. 1,576,646

T. FARMER

HOT WATER FURNACE

Filed Feb. 20, 1925 2 Sheets-Sheet 1

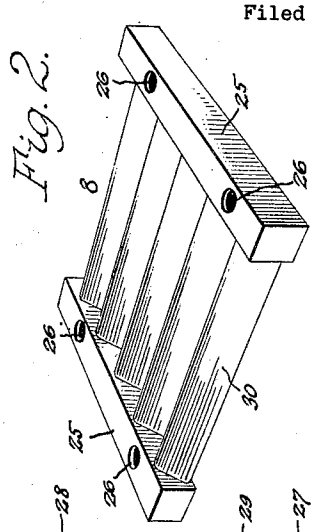


Fig. 2.

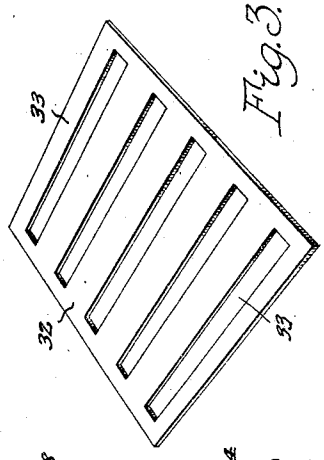


Fig. 3.

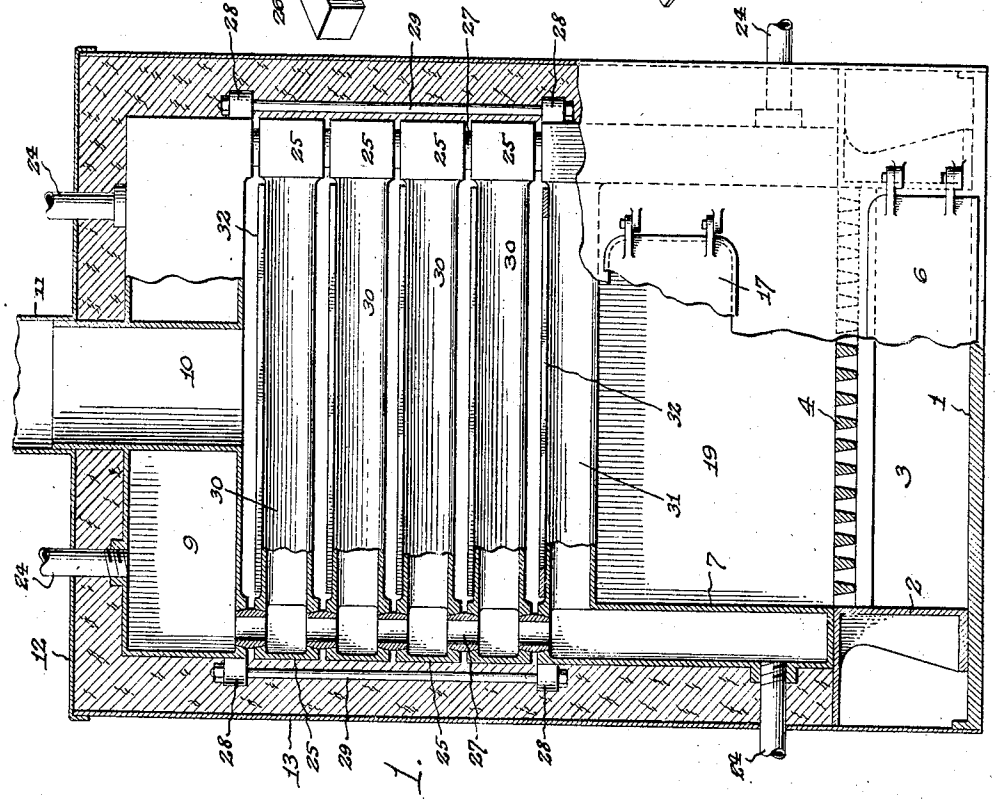


Fig. 1.

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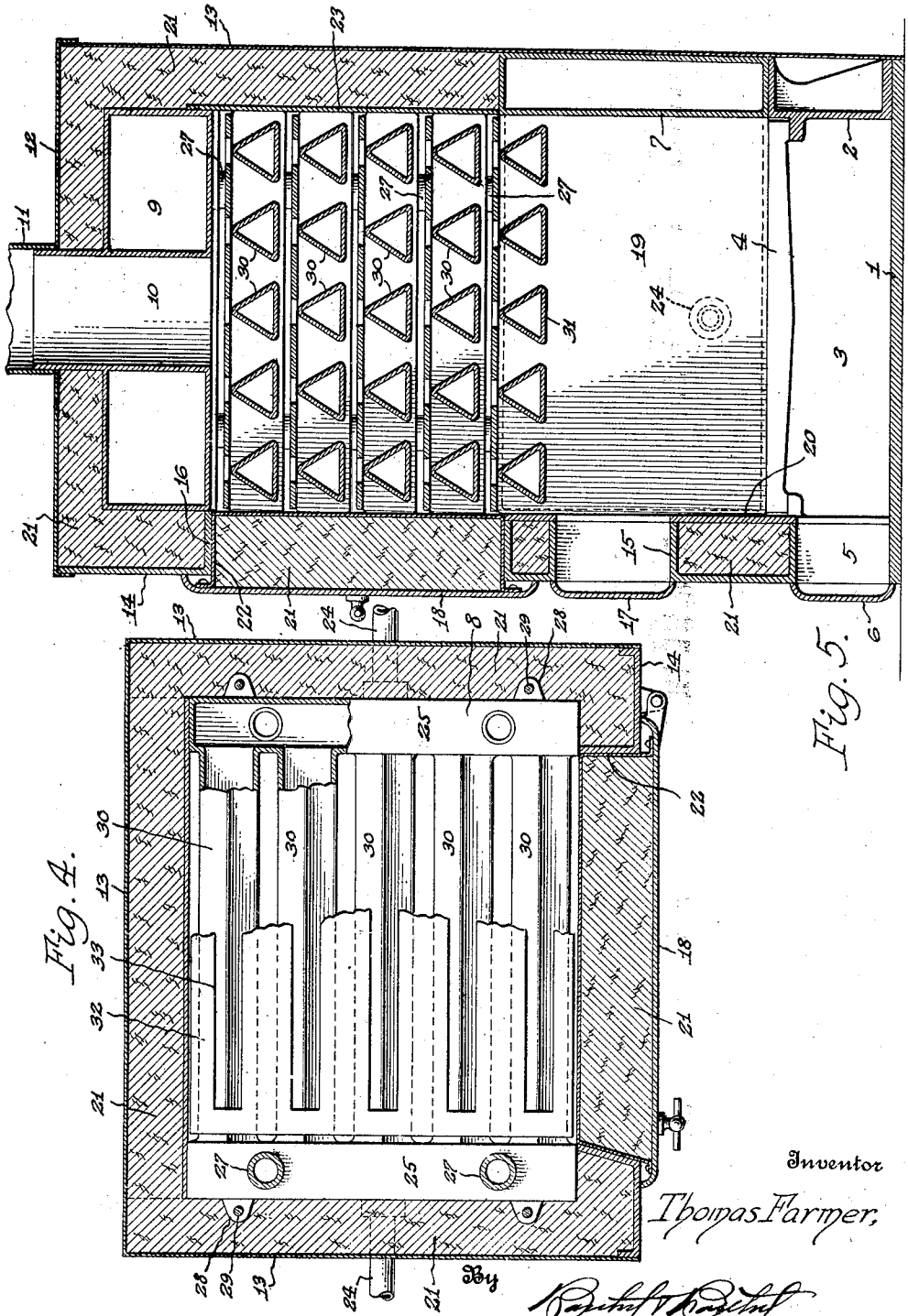


Fig. 5.

Fig. 4.

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UNITED STATES PATENT OFFICE.

THOMAS FARMER, OF BIRMINGHAM, MICHIGAN.

HOT-WATER FURNACE.

Application filed February 20, 1925. Serial No. 10,519.

To all whom it may concern:

Be it known that I, THOMAS FARMER, a citizen of the United States, residing at Birmingham, in the county of Oakland and State of Michigan, have invented certain new and useful Improvements in Hot-Water Furnaces, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to a hot water furnace and has special reference to that type of water heating apparatus adapted to form part of a heating system through which water may be circulated for heating purposes.

The principles involved in this invention may be embodied in a steam generating apparatus and my invention may be characterized in the following particulars.

First, there are superposed water tube units which may be easily and quickly assembled to provide a water heating furnace of desired size, and each unit is a durable structure that can be manufactured at a comparatively small cost and readily handled.

Second, each water tube unit includes tubes of the novel configuration affording a maximum heating area for water in the tubes. The configuration of the tubes is such as to provide soot shedding walls and in consequence of such construction the accumulation of soot on or about the tubes is reduced to a minimum.

Third, the water tube units are arranged so that the tubes thereof will be in horizontal rows in the upper part of a combustion chamber, and between the rows of the tubes are placed removable baffle members which co-operate with the tubes in forming a sinuous or tortuous passage from the lower part of the combustion chamber to the upper part thereof, so that the products of combustion will be more or less retarded before final exhaust and thus permit of the tubes receiving a maximum degree of heat from the fuel used in the furnace structure. With the baffle members removable, the furnace structure can be easily cleaned and since easy access may be had to the baffle members, it is possible to actuate the same to release soot and cause the same to fall into the combustion chambers.

Fourth, there is an insulated casing containing a water jacket, reservoir and water tube units interposed between the jacket and reservoir so that the water circulated through these superposed structures may be economically and expeditiously heated by various fuels burned in the combustion chamber having for some of its walls the water jacket of the furnace structure.

Compared with the present type of water heating furnace or boiler, there are numerous advantages to be gained by my improved structure, and reference will now be had to the drawings, wherein—

Figure 1 is a vertical cross sectional view of the hot water furnace;

Figure 2 is a perspective view of a water tube unit;

Fig. 3 is a similar view of a baffle member;

Fig. 4 is a horizontal sectional view of the furnace; and

Fig. 5 is a vertical longitudinal sectional view of the same.

In the drawings, the reference numeral 1 denotes a base and mounted thereon is a horizontally disposed frame 2 forming a walled ash pit or chamber 3 with a conventional form of grate 4 in the upper part of the ash chamber. The frame 2 provides the usual door-way 5 and said frame supports a suitable door 6 for the door-way. Mounted on the frame 2 is a water jacket 7 and above said water jacket are superposed water tube units 8 supporting a water reservoir 9. The reservoir 9 is substantially rectangular and is provided with an exhaust flue 10 extending into the exhaust conduit 11 carried by the top 12 of a casing 13 forming the rear and side walls of the furnace structure. The casing side walls meet a front wall 14 provided with doorways 15 and 16 normally closed by doors 17 and 18.

The water jacket 7 forms the rear and side walls of a combustion chamber 19 above

the grate 4 and at the front end of a combustion chamber there is an apertured wall 20 co-operating with the front wall 14 for supporting suitable insulation material 21 which is also placed between the casing 13 and the water tube units 8 and the water reservoir 9. The door 18 has a casing 22 containing the insulation material and opposite the door casing 22 is a wall 23 that co-operates with the casing 13 in retaining the insulation material in the rear wall of the furnace structure.

Asbestos is an example of insulation material that may be placed in the walls of the furnace structure to prevent the loss of heat.

Suitably connected to the water jacket and the water reservoir 9 are inlet and outlet pipes 24 which permits of water being circulated through the furnace structure.

Each water tube unit comprises headers 25 provided with top and bottom openings 26 and suitably mounted in these openings are connectors 27 by which communication is established between the superposed units and between said units, the water jacket 7 and the water reservoir 9. To hold these parts in superposed relation the water jacket 7 and the water reservoir 9 have sets of apertured lugs 28 connected by vertically disposed tie rods 29 and it is by virtue of these tie rods that all of the parts may be non-leakably fitted together to insure a safe and rigid structure.

The heads 25 of each water tube unit are connected by parallel tubes 30 triangular in cross section and positioned so as to provide flat bottom walls and inclined soot shedding walls. The tubes of one unit are adapted to vertically align with the tubes of adjacent units and the upper part of the water jacket 7 is formed with similar tubes 31 so that there may be a maximum number of tubes in a minimum space between the lower part of the combustion chamber and the water jacket 9.

The doorway 16 is of such area that access may be had to all of the tubes for cleaning purposes and the same doorway permits of baffle members 32 being placed on the apices of the tubes and solely supported thereby. Each baffle is in the form of a plate having longitudinal slots 33 and when the baffle members are in position the slots 33 are above the apices of the triangular shaped tubes, thus providing sufficient partitions between the water tube units to form a sinuous or tortuous passage from the lower part of the combustion chamber to the upper part thereof, consequently the products of combustion will be retarded and caused to travel in a path which subjects all of the water tubes to heat before final exhaust through the flue 10 and the conduit 11. The products of combustion are directed along the inclined walls of the water tubes to impinge against the bottom walls thereof and be deflected in lateral directions, thus subjecting all of the tube walls to such heat as may be produced in the combustion chamber. The baffle members freely resting on the tube units may be laterally removed from the doorway 16 and cleaned or the door 18 may be opened and the baffle member actuated sufficiently to cause any soot or foreign matter adhering thereto to be dislodged and deposited in the combustion chamber 19. It is by virtue of the side doorway 16 that the tube units can be easily cleaned and this with the maximum heating area of the water tubes is adapted to provide a highly efficient furnace structure.

By placing horizontally disposed tube units upon one another, the weight of said units contributes to secure connections therebetween and this is in contradistinction to tube units vertically disposed side by side where expansion and contraction is liable to loosen connections and cause trouble. It is an easy matter to increase the number of tube units to a furnace of the desired capacity and it is only necessary to provide casings of different sizes to take care of any increase in the water heating area of the furnace proper.

It is to be noted that in my furnace there is practically no floor surface, that is, an upper section of any tube or like member exposed to the products of combustion, such floor surface being considered of no material value for heating purposes. In my furnace construction the configuration of the water tubes and the arrangement of the baffles is such as to expose practically all surfaces to the products of combustion without retarding the same to such an extent as to dampen or decrease the efficiency of the furnace as a heating apparatus.

One embodiment of my invention has been illustrated but it is to be understood that the structural elements are susceptible to such variations and modifications as fall within the scope of the appended claims.

What I claim is:—

1. In a hot water furnace, a casing having a combustion chamber therein, a set of superposed headers in said casing adapted to have water circulated therethrough, tubes connecting the headers of one set to the headers of the other set, said tubes being triangular in cross section and disposed with upwardly presented apices to provide soot shedding walls, and baffle members on said tubes provided with openings at the apices of said tubes cooperating therewith in providing sinuous passages from the top of said combustion chamber to the upper portion of said casing.

2. A water heating apparatus comprising a combustion chamber, tubes in the upper part of said combustion chamber and

through which water may be circulated, said tubes being triangular in cross section and disposed with upwardly presented apices, and baffle members on said tubes, each baffle member having a series of slots directly over the apices of adjacent tubes cooperating with spaces between said tubes and the flat bottom walls of other adjacent tubes in providing a sinuous passage in the upper part of said combustion chamber for products of combustion.

In testimony whereof I affix my signature.

THOMAS FARMER.