Jan. 9, 1940. G. FAULDS 2,186,373

BAFFLE AND HEAT RETAINING MEANS FOR FURNACES

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FIG. I.

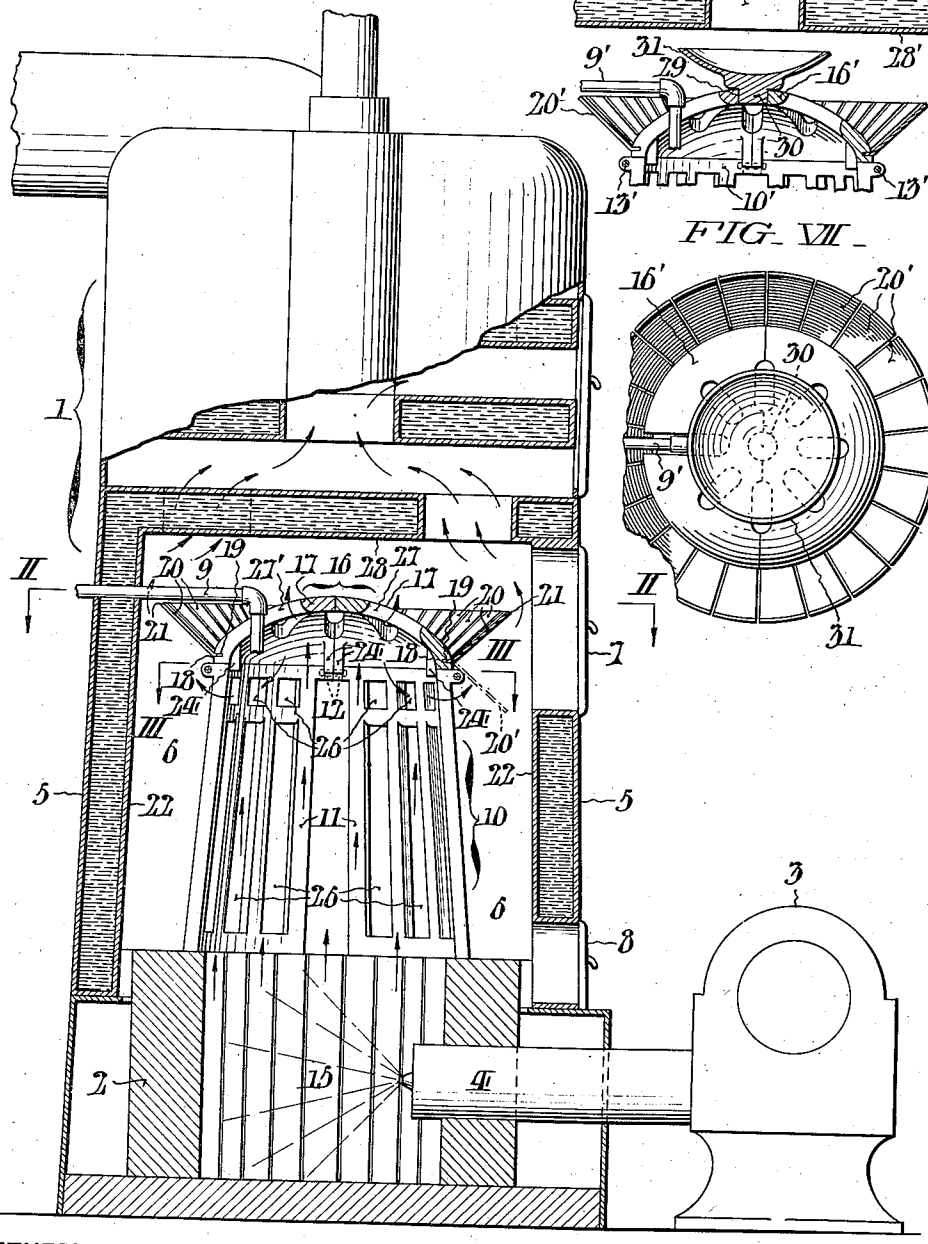

FIG. VI.

FIG. VII.

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FIG. II.

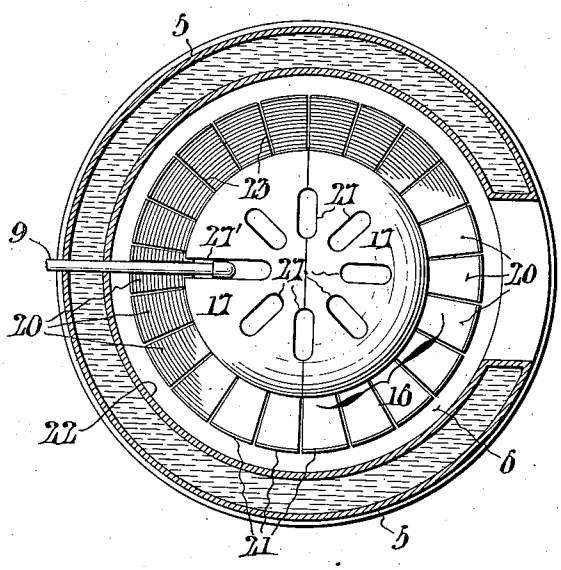


FIG. III.

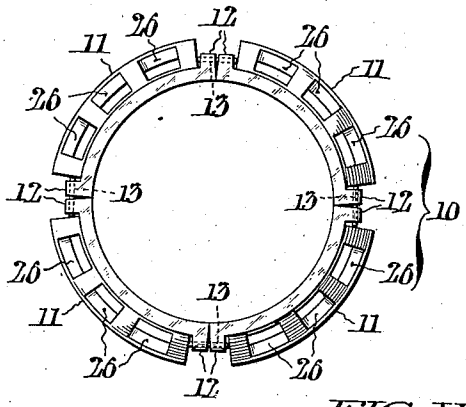


FIG. IV.

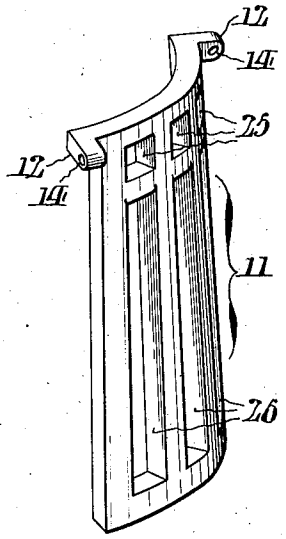
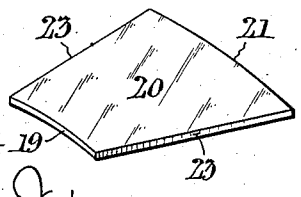


FIG. V.



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UNITED STATES PATENT OFFICE

2,186,373

BAFFLE AND HEAT RETAINING MEANS FOR FURNACES

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Application August 9, 1938, Serial No. 223,781

4 Claims. (Cl. 110—97)

This invention relates to baffle and heat retaining means for automatically controlled intermittently fired furnaces including not only hot air furnaces, but also hot water and steam boilers. More particularly, the present improvements are directed to domestic heating-furnaces using hydrocarbons such as crude or standard fuel oils.

The primary object had in view in the provision of a novel baffle and heat retaining means of massive construction and bulk which is adapted for ready assembly in the heat transfer chamber of conventional furnaces, said means incidental to placement forming a rigid unit, whereby a more efficient and economic consumption of the fuel results, and whereby a great quantity of heat is absorbed and made available for use during the off periods of the furnace.

Another object is to provide a novel means of the type indicated in the preceding paragraph whereby the heating flame is effectively diffused and caused to impinge upon the whole of the interior surface of the jacketed combustion chamber of the furnace before discharging into the flue.

Further objects and ancillary advantages of this invention will appear from the following disclosure of a preferred embodiment, when considered in conjunction with the accompanying drawings; while it is to be understood that the concluding claims are to be accorded a range of equivalents consistent with the state of the prior art.

In the drawings:

Fig. I is a view partly in elevation and mainly in vertical section illustrating the adaptation of the novel baffle and heat retaining device, of this invention, to a conventional liquid fuel burning hot water furnace.

Fig. II is a sectional plan view, taken approximately in the plane designated II—II in the preceding illustration.

Fig. III is a plan view of the assembled main structure or grill portion of the combined baffle and heat retaining device.

Fig. IV is a perspective view of one of the individual grill sections.

Fig. V is a similar view of one of the baffles hereinafter fully explained.

Figs. VI and VII are, respectively, a fragmentary section and top plan view of a modified form of crown-piece, hereinafter more fully described.

Referring more in detail to the drawings, the hot water furnace is comprehensively designated as 1, said boiler embodying the customary refractory lined fire pot 2, adapted for using liquid fuel supplied by a gun type oil burner 3 having a discharge 4 projecting inwardly of said fire pot. Surmounting the fire pot 2 is a water jacket 5 defining the heat transfer or combustion chamber 6 and having upper and lower access doors 7, 8, while a broken portion of a domestic wash water heating pipe or coil is indicated at 9. All of the foregoing parts are merely referred to by way of forming a background in describing the following subject matter.

The improved baffle and heat retaining means of this invention is in the form of a cage and comprises an apertured framework or truncate shell 10 of a height and diameter somewhat less than those of the combustion chamber 6, with provision of clearance above and around it as shown in Fig. I. The shell 10 includes complemental sections 11 of suitable dimensions for passage through the boiler upper door 7, each such section being of arcual cross-section and provided at the upper edge with apertured lugs 12. In the embodiment of the invention illustrated, it will be seen the shell 10 is composed of four-quarters or grill-sections 11 and, when assembled, the several lugs 12 coincide for free insertion of pins 13 in the registering apertures 14 thereof. Thus it will be apparent that when the several grill-sections 11 are assembled the structure or shell 10 can be readily centered on top of the fire pot 2 over the combustion chamber 15 therein.

A concavo-convex or inverted dished crown-piece 16 composed of complemental apertured-halves 17, for example, is now placed on top of the shell 10, it being remarked that said halves are of a size for easy passage through the boiler door 7; and it will be understood the crown-piece 16 may be composed of more than two parts. Each of the crown-piece apertured-halves 17 is provided near its exterior basal edge or lip with a suitable groove 18 which, when said halves are assembled provide a continuous circumferential seat for the rigid fixture therein of the inner arcual edges 19 of segmental blades or baffle elements 20. These baffle elements 20 are preferably made of light flexible sheet metal so they can easily be bent up, or down as typically indicated by dotted lines 20' at the right-hand of the shell 10 in Fig. I, to provide a predetermined marginal clearance between the blade outer arcual edges 21 and the inner wall 22 of the water jack 5, as well as intervening clearances defined by the blade radial edges 23 as readily understood from Figs. I and II. Besides direct-

ing the flame from the combustion chamber 15 and surmounted truncate shell 10 under the crown-piece 16, as desired, the baffle elements 20 permit adjustment of the device to various sizes of boilers, differing draft conditions, or other interfering conditions caused by internal piping and similar efficiency-obstructing obstructions. Obviously, the baffle elements 20 may be suitably deflected or adjusted prior to introduction of the complemental halves 17 into the heat transfer chamber 6, or after assembly of the shell 10 and crown-piece 16 therein.

In order to concentrically seat the crown-piece 16 on top of the shell 10, the sections 17 of the former are preferably provided with spaced projections 24, Fig. I, which, when the respective sections are seated, engage within the upper inner marginal edge of the assembled shell and thereby assure proper assembly relation of the respective parts while accommodating expansion and contraction of the several parts as an interconnected whole.

The shell 10, as well as the crown-piece 16, are preferably both made of heavy cast iron and of substantial proportions to provide bulk for heat storage and to ensure rigidity when assembled, while each section 17 is formed with spaced and aligned upper and lower longitudinal openings 25, 26 which together form vertical slots extending substantially from top to bottom of the device to ensure efficient radial diffusion of the flame and impingement thereof upon the inner wall 22 of the heat transfer or combustion chamber 6 below the baffle elements 20. The respective crown-piece halves 17 are formed with radial elongate openings 27 for adequate access of the flame upwardly to the roof 28, Fig. I, of the chamber 6 in an obvious mannner; one of said openings 27' being extended to the circumference of the crown-piece 16 for passage of the domestic coil pipe 9.

The baffle elements 20 are preferably made of thin steel or other suitably durable sheet material; whereas heavy refractory baked clay or ceramic material may be used instead of cast iron for the shell 10 and crown-piece 16.

In operation when the oil burner 3, 4 starts, the ascending flame from the combustion chamber 15 will heat-up the entire shell 10 and crown-piece 16 to a high degree of incandescence in a very short period of time; after which the flame will be attracted by the hot metal and directed through the openings 25, 26 outwardly and evenly against the inner wall 22 of the water back 5, and thus form a complete annular wall of flame within the heat transfer or combustion chamber 6. At the upper region of the shell 10, the column of flame therewithin will be divided by the elongate openings 27 for diffusion below the chamber roof 28, while a circular flow of the flame outside the shell 10 will be deflected by the baffle elements 20 annularly and inwardly against the roof 28 for commingling augmentation of the flame discharged upwardly through the elongate openings 27 with resultant quicker heating of the greater volume of water above the device. The differential movements set up by the combined shell 10 and crown-piece 16 thus create a torch-like action of the flame which is directed against the entire surface of the inner wall of the heat transfer chamber 6 above the fire pot 2. Any unburnt gases passing around the shell 10 or under the crown-piece 16 are promptly ignited by the incandescent material of which said parts are made. In addition, it is to be particularly noted the column of flame within the shell 10 will in part be downwardly deflected by the blank portion of the crown-piece 16 for discharge through the upper openings 26 in the shell 10 and thereby set up a circulatory action resulting in a more complete combustion of any unburnt fuel contained in the column of flame.

From the foregoing it will be clearly apparent that the combined baffle and heat retaining device of this invention positively ensures complete combustion of the fuel with resultant greater heating efficiency. In this connection it is to be remarked that without the means of this invention above the fire pot 2, when the burner 3, 4 is shut-off, there will result a quick chilling action in the heat transfer chamber 6 with rapid cooling of the water in the jacket 5. Such action is effectively avoided by use of the present invention due to the volume of heat retained by and in the shell structure 10 and its crown-piece 16 as, obviously, this retained heat will diffuse for a considerable time after the burner 3, 4 is shut-off, or function as a "booster" similar in effect to a banked coal fire. This advantage of radiated heat in addition to complete combustion of the fuel inhering to the structure of this invention ensures considerable economy in oil consumption, inasmuch as the "off" periods of the burner 3, 4, are considerably increased with the "on" periods correspondingly decreased. Another advantage noted in connection with use of the present invention is that the customary noise associated with fuel oil burners is substantially reduced because the heated materal of which the parts 10 and 16 are formed attracts the flame and reduces the free roaring action customary in a large open transfer chamber.

In the modified form of the invention shown in Figs. VI and VII, the crown-piece 16' is provided centrally with an aperture 29 for reception of the shank 30 of a dished-spreader 31. This form of the invention is designed for use in heater furnaces having a central draft 32 through upper portion of the water jacket 5'. In all other respects the shell 10' and crown-piece 16' conform with the preceding description; accordingly, like reference characters are applied with an added prime for purposes of ready differentiation and avoidance of repetitive description.

While the embodiment of the invention has been shown and described in connection with a circular boiler, it will be self-evident that by minor changes in design said invention can be readily adapted for use in boilers and heaters of other cross-section without departure from the spirit and scope of the present improvements. Accordingly the right is hereby reserved to make such changes and variations in the invention as differing service conditions may require, and as may be reasonably included within the terms of the following claims.

Having thus described my invention, I claim:

1. The combination with an intermittently fired furnace having a fire box with a burner at the bottom of its combustion chamber, of a metallic flame diffusing and heat retaining device positioned axially over and of greater overall diameter than the fire box, said device having the form of a massive open bottomed cage somewhat smaller in height and girth than the combustion chamber, and provided circumferentially of its top with a series of flat, laterally-projecting closely spaced baffle vanes with flat sides uppermost, which, during the active periods of the burner, retard escape of the hot products of com-

bustion from the annular space between the cage and the furnace wall and diffuse them to facilitate heat absorption by said cage, and which, during the off periods of the burner, operate to conserve the heat previously stored in the cage.

2. The combination according to claim 1, in which the cage body is composed of circumferential sections, and in which the cage top is composed of segments, said sections and segments being proportioned for ready introduction through the furnace fire door opening.

3. The combination according to claim 1, wherein the top of the cage is provided with openings which permit restricted upward flow of hot combustion gases through it from within the cage.

4. The combination according to claim 1, wherein the top of the cage is provided with an annular series of openings permitting restricted upward flow of hot combustion gases through it from within the cage; and wherein there is an axially arranged baffle above the cage which overhangs the openings in the cage top and laterally distributes the gases issuing upwardly from said openings.

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