April 16, 1940. G. FAULDS 2,197,495

BAFFLE AND HEAT DISTRIBUTOR MEANS

Filed June 6, 1939 3 Sheets-Sheet 1

FIG. I.

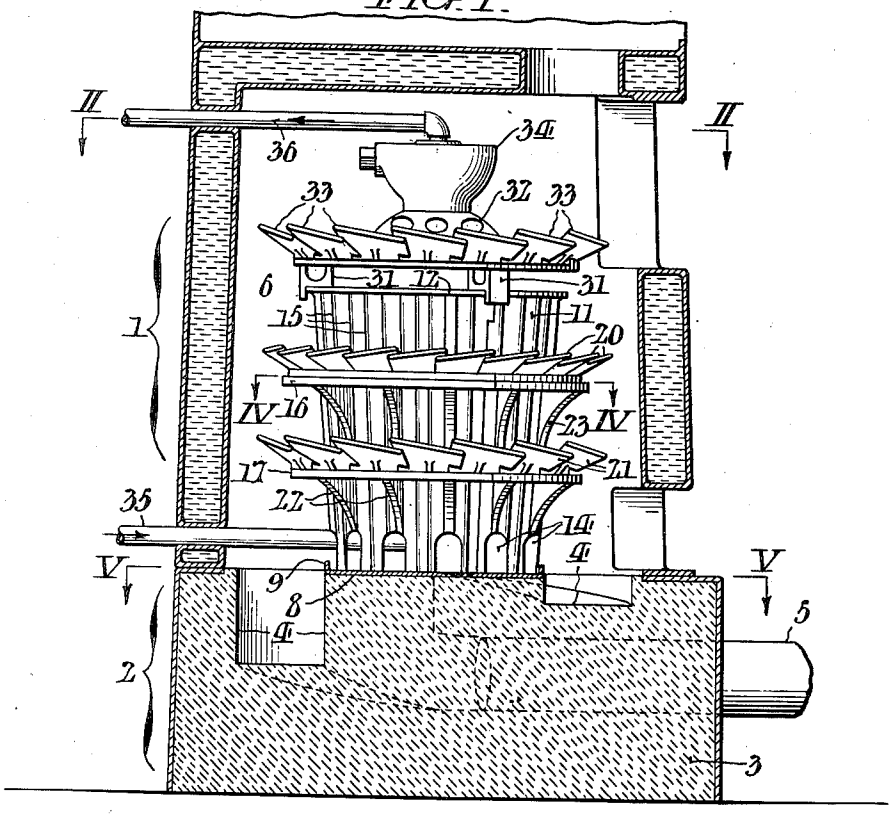
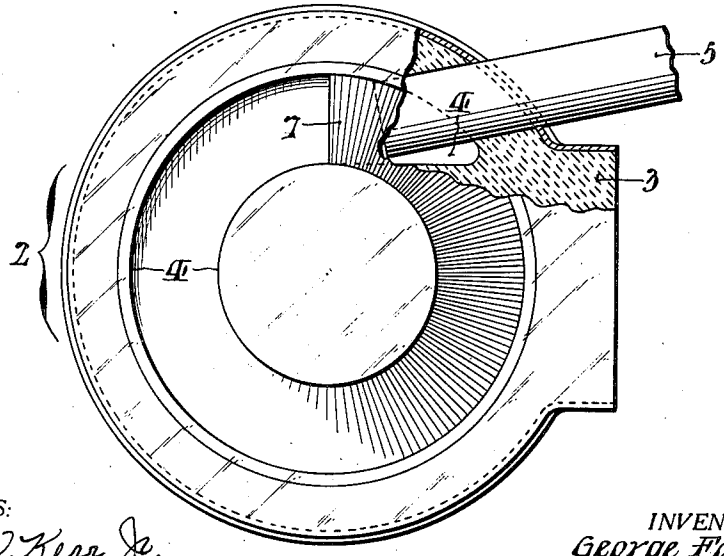


FIG. V.



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FIG. II.

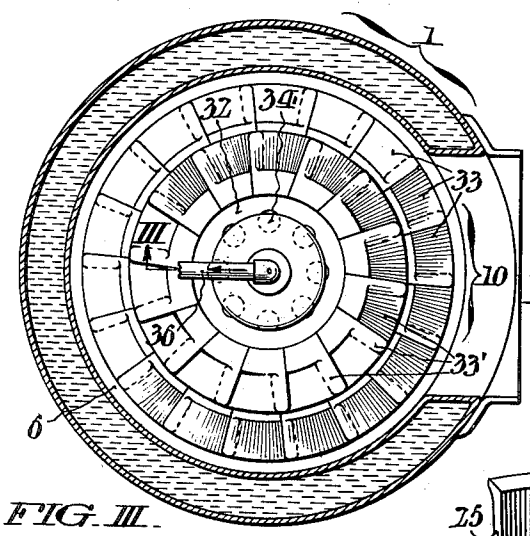


FIG. IV.

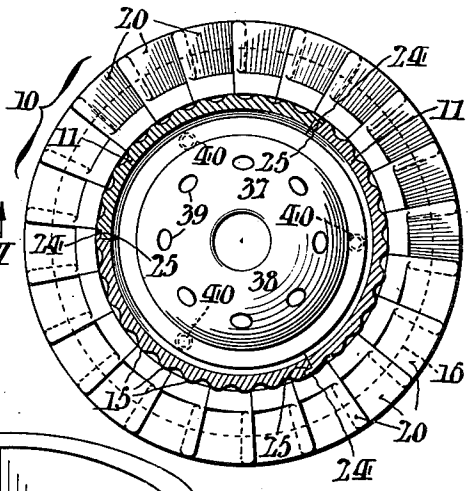
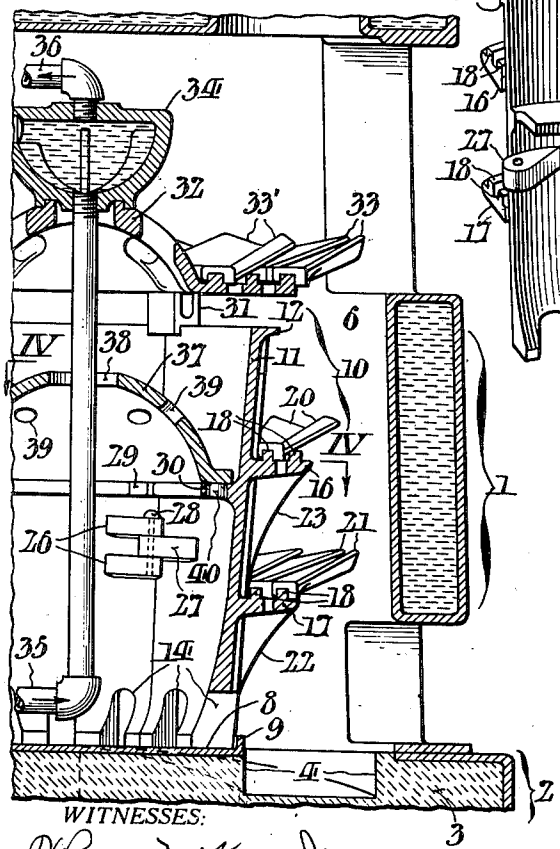


FIG. III.



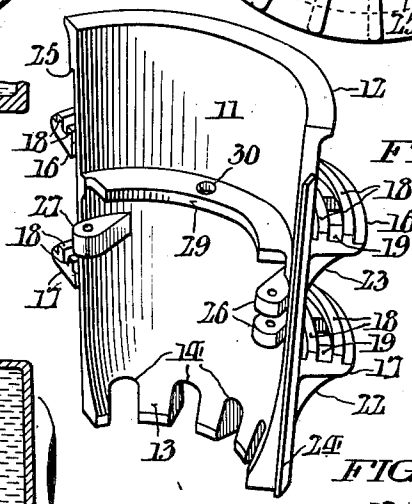
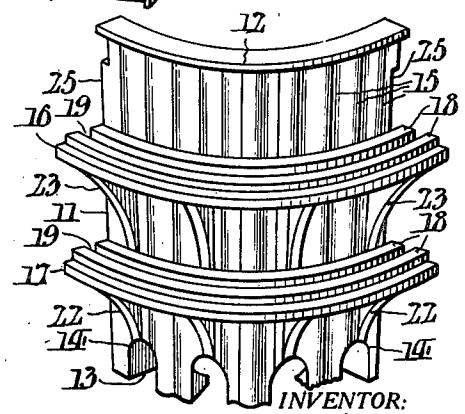


FIG. VI.

FIG. VII.



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BAFFLE AND HEAT DISTRIBUTOR MEANS

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FIG. VIII.

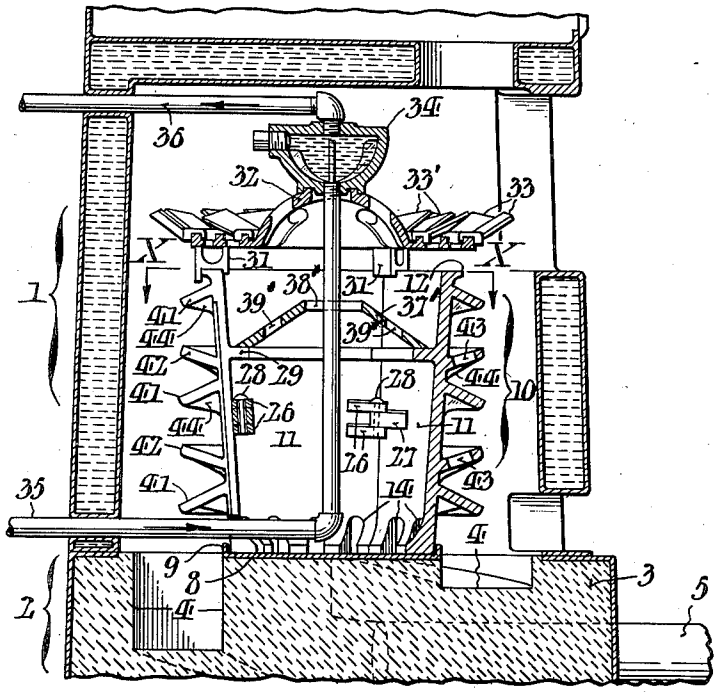


FIG. IX.

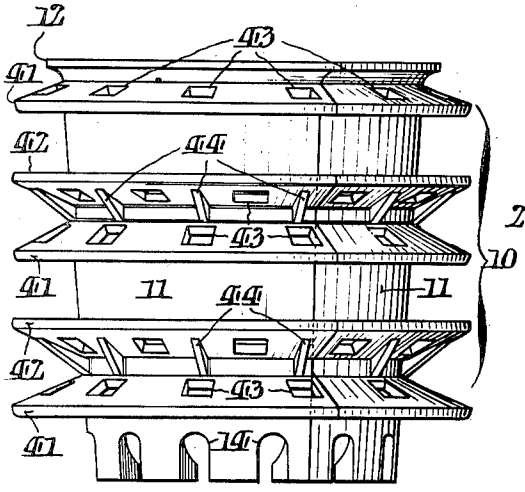
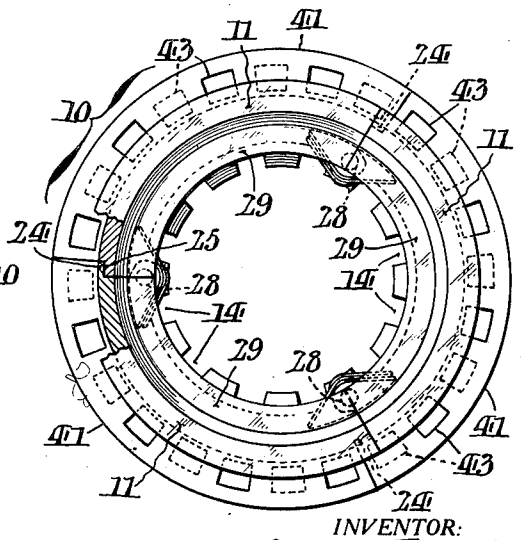


FIG. X.



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Patented Apr. 16, 1940 2,197,495

UNITED STATES PATENT OFFICE

2,197,495

BAFFLE AND HEAT DISTRIBUTOR MEANS

George Faulds, Philadelphia, Pa.

Application June 6, 1939, Serial No. 277,589

6 Claims. (Cl. 110—97)

This invention has reference to baffle and heat distributor means for intermittently fired furnaces and, more particularly, to structures for insertion in the combustion chambers of oil-fired heaters.

The primary object of this invention is the provision of a baffle and heat distributing structure of corresponding components which can be easily passed through a standard fire-box door, assembled in the combustion chamber, and held together with capacity for expansion and contraction.

Another object is to provide a structure of the specified character having a novel arrangement of relatively-adjustable baffle blades whereby the thermogenic medium or combustion gases are differentially-directed in adjoining zones to the inner wall of the heater chamber and more efficiently distributed and concentrated for purposes of heat transmission than heretofore possible with analogous means.

A further object is the provision of a structure of the typified character embodying means effective to induce a flow of the combustion gases inwardly thereof, with a device for choking and constraining the same to follow definite annular directions, said device also serving to hold the structure in assembly while accommodating expansion and contraction thereof.

An auxiliary objective is to improve the base support for the combined baffle and heat distributor by furnishing therefor a substructure embodying a spiral channel which serves to set-up initial whorling of the products of combustion, discharged by the burner, so that the burner flame is prevented from destructive concentration at maximum temperature.

With the above objects in view, as well as ancillary advantages, this invention consists in the constructive features, combinations and arrangements of parts, hereinafter fully disclosed, typically shown by the accompanying sheets of drawings, and more particularly defined in the concluding claims.

In the drawings:

Fig. I is a broken vertical section through an oil-fired heater having a typical arrangement of this invention included therein.

Fig. II is a horizontal section, taken approximately as indicated by the arrows II—II in Fig. I.

Fig. III is a broken vertical section on the plane III—III in Fig. II, as viewed in the direction of the associated arrows, but drawn to an increased scale to better illustrate minor details.

Fig. IV is a horizontal section, through the combined baffle and heat distributor means, taken on the plane IV—IV in Figs. I and III.

Fig. V is a plan view, taken as indicated by the arrows V—V in Fig. I, or with the superstructure removed and a portion of the base broken out in order to clarify a detail later on further explained.

Fig. VI is a perspective view of one of the distributor components, and looking inwardly thereof.

Fig. VII is a similar view looking at the outside of the distributor component.

Fig. VIII is a broken vertical section illustrating a modified form of the invention.

Fig. IX is an elevation of the insert baffle and distributor structure of Fig. VIII; and,

Fig. X is a plan view, taken approximately as indicated by the arrows X—X in Fig. VIII.

Referring more in detail to the drawings, a conventional form of heater is comprehensively designated by the reference 1, the same having a bottom section 2 filled with a substantial refractory material base 3, moulded or otherwise set-up, to define a spiralized flame-conducting channel 4, leading from the nozzle 5, of a standard type oil-burner, not shown, to a diametrically opposed point where it merges into the floor of the combustion chamber 6. The channel 4, as best appreciated from Figs. I and V, embodies one convolution with the deeper portion in the region of entrance for the nozzle 5, or in what may be termed a flue 7, into which said nozzle is passed but does not project therefrom, so that the flame emitted is directed from a low level and constrained to follow the channel over an annular course before fully expanding into the combustion chamber with a "whorling" flow.

Suitably secured centrally of the base 3 is a metal plate 8, having a circumferential lip 9, affording a seat for the combined baffle and heat distributor device 10, of this invention. This device 10 is of tubular character and comprises arcual units 11, Figs. VI and VII, which, when assembled, preferably form a frusto-conical structure. Each unit 11, is of curved transverse and upwardly flaring section, having a surrounding rim 12 at the top with the lower portion inwardly-thickened at 13, for strengthening purpose, said inwardly-thickened portion being apertured at spaced intervals by arched radial openings 14, to induce a central draft upwardly through the device 10, as well as for the admission of highly heated combustion gases thereinto, for a purpose later on clarified. In addition, the outer surface of each unit 11 is preferably formed with verti-

cal corrugations 15, best shown in Figs. I, IV and VII, effective to not only increase the area of radiation but to set-up local eddying in the flow for planar direction against the surrounding combustion chamber wall; as well as spaced lateral-flanges 16, 17, said flanges being provided with concentric arcual ribs and slots 18, 19, respectively, for reception and lateral adjustment of edge-overlapping differentially-pitched baffle devices 20, 21, conveniently of the types disclosed and claimed in my co-pending application for a patent, filed April 29, 1939, under Serial No. 270,756. In other words, the lower flange 17, for example, may have all of its baffle devices 21 angularly pitched to direct the spiralized upward flow of heated air and flame, in part downwardly into the circumambient lower region of the combustion chamber 6 under eddying-action; whereas the series of baffle devices 20 on the flange 18 are preferably reversely-pitched for local concentration of a further portion of the heated air and flame intermediate the zone of the combustion chamber defined by the lateral flanges 16, 17 for eddying direction against the surroundingly confronting wall of the combustion chamber 6. In addition to the foregoing it is to be observed that centrally above each of the radial arched openings 14 there is provided a vertical buttressing web 22 below the flange 17, with similarly aligned webs 23 below the flange 16, said webs 22, 23 defining annularly surrounding pockets which coact with the vertical corrugations 15 to substantially increase the eddying flow of the contained heated air and flame, and prevent too rapid rise thereof, intermediate the immediately superjacent edge-overlapping baffle devices 20 or 21 as well as circumferentially therearound.

Each unit 11 is also provided along one vertical edge with a longitudinal tongue 24 and a complemental groove 25 in the opposing edge so that, when the units 11 are assembled, the tongues 24 engage in the confronting grooves 25 and thereby interengage said units. In addition, each unit 11 is provided with apertured lugs 26 at one side with a correspondingly pierced tongue 27, at the opposing side for interengagement, with the confronting corresponding parts of the adjoining units, and for securement together by loosely fitting drop pins 28, in an obvious manner. Still further, each unit 11 is formed with an arcual flange 29 having a central hole 30 therein, for a purpose later on set forth.

Fitting on top of the device 10 with interposition of spacer block 31 is a suitable crown 32 having reversely pitched annular series of baffle devices 33 in Fig. I, with respect to the intermediate series 20, all in accordance with the hereinbefore referred to prior patent application, said crown being surmounted by a suitable water-back 34 having inlet and outlet service connections 35, 36, in accordance with previous practice adopted by me, and being merely referred to by way of completing the correlated subject-matter of this case. As shown in Figs. III and VIII, the crown 32 may be provided with an additional inner series of baffle devices 33′ pitched reversely to the outer series 33; or having the same effective direction for whorling the heated air and flame as the intermediate series of such devices 20. Otherwise expressed the series of baffle devices 33 direct the rising heated air and flame angularly outwards and upwards, whereas the inner series 33′ function to deflect the air and flame reversely for effective service around the water back 34 and top of the crown 32.

In order to check the draft through the structure 10, a concavo-convex or tapering choke device 37 having an axial opening 38, with a series of flow distributing apertures 39 is seated on the arcual flanges 29; and preferably said device is provided with dependent studs 40 of less diameter than the flange central holes 30, and thereby serves as an assembly retainer means for the structure 10, without using the drop pins 28; or dispensing with the apertured lugs and tongues 26, 27, respectively. In Fig. VIII, the choke device reference numerals have a prime applied thereto for contrasting purposes with respect to the concavo-convex device 37 of Fig. III.

Referring now to Figs. VIII–X, inclusive, which show a modified form of the invention, all parts having equivalents in the preceding description are correspondingly designated and only the features of differentiation will now be described, to avoid unnecessary repetitive matter. It will be remarked the several units 11 of the structure 10 are provided with downwardly and upwardly inclined flares 41, 42, respectively, which, when the units are assembled define parallel surrounding series of coactive angularly-related flanges, all of which have relatively-staggering alternatingly-located suitable apertures 43 therethrough with intervening strengthening struts or fillets 44; the fillets in each flare 41, 42 breaking joint with or diverting the upward flow of hot air and flame passing through the apertures 43 to the right and left-hand, so as to efficiently maintain superposed zones of laterally-agitated spirally-ascending character, whereby the products of combustion are dispersed all around the interior surface of the heater chamber 6, from its floor to the level of the dome baffle devices 33, or 33, 33′, in a manner closely resembling the result effected by the disclosure of Figs. I–VII.

In operation the structure 10, of this invention, the spirally-rising heated air and flame from the channel 4, at maximum temperature, is annularly subdivided between the exterior and interior of the device 10 incident to its spiralized flow upwards with concurrent induced flow into the interior of said device by way of the arched openings 14. As before explained, the upward flow of the heated air and flame exteriorly of the device 10 will be zonally eddied and locally concentrated with reversed general flow in the adjoining zones. In other words, the up-flow is constrained to lateral strata-simulating flows in reverse directions around the entire inner vertical surface of the combustion chamber 6 from its bottom upwards, whereby the operating efficiency of a heater equipped with this invention is considerably improved.

From the foregoing it will be clearly apparent that while specific embodiments of the invention have been disclosed with particularity, the same is susceptible of detail variation in adapting said invention to different types of heaters as well as for kindred application.

Having thus described my invention, I claim:

1. A baffle and heat distributor for combustion chambers comprising a tubular structure, spaced flanges about the tubular structure defining differential flow-strata of the combustion gases within the combustion chamber, webs at intervals around the flanges effective to eddy and constrain the respective flow strata to direct local action on the combustion chamber surrounding wall, and means diverting a partial flow of the combustion gases through the tubular structure, in combination with a base support for the struc-

ture, said base having an annular inclined groove effective to sustain a definite spiral flow of the combustion gases adjoining the combustion chamber inner wall.

2. A baffle and heat distributor for combustion chambers comprising a tubular structure of interconnectable components, vertically-spaced apertured-flanges around the tubular structure defining differential flow strata of the combustion gases within the combustion chamber, radially-projecting vertical webs around the several flanges effective to eddy and constrain the respective flow strata directly against the paralleling portion of the combustion chamber surrounding wall, and radial apertures through the lower part of the tubular structure with means to effect choked flow therethrough of part of the medium aforesaid, in combination with a refractory material base support for the structure, and a spiral groove in the base with an entrant flue for the burner, said groove serving to constrain the heated air and flame to an upward whorling flow adjoining the combustion chamber wall.

3. A baffle and heat distributor as defined in claim 2, wherein the device comprises complemental units, and said units when assembled, form an inverted frusto-conical structure including an upper circumferential rim and an inwardly thickened bottom portion.

4. A baffle and heat distributor as defined in claim 2, wherein the vertically-spaced apertured-flanges are alternately angled upwards and downwards, and the tubular structure radially directed openings in the basal portion are of arched formation.

5. A baffle and heat distributor as defined in claim 2, wherein the tubular structure is formed with a vertically corrugated outer surface, and the lateral flanges have arcual ribs with intervening slots.

6. A baffle and heat distributor as defined in claim 2, wherein the tubular structure components have an inner arcual coplanarly related flange, each said flange having a central hole, and an apertured choke device seated on the flanges with integral dependent studs freely engaging in the holes aforesaid to hold the structure in assembly with capacity for expansion and contraction.

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