

Oct. 13, 1936.

S. J. LONERGAN

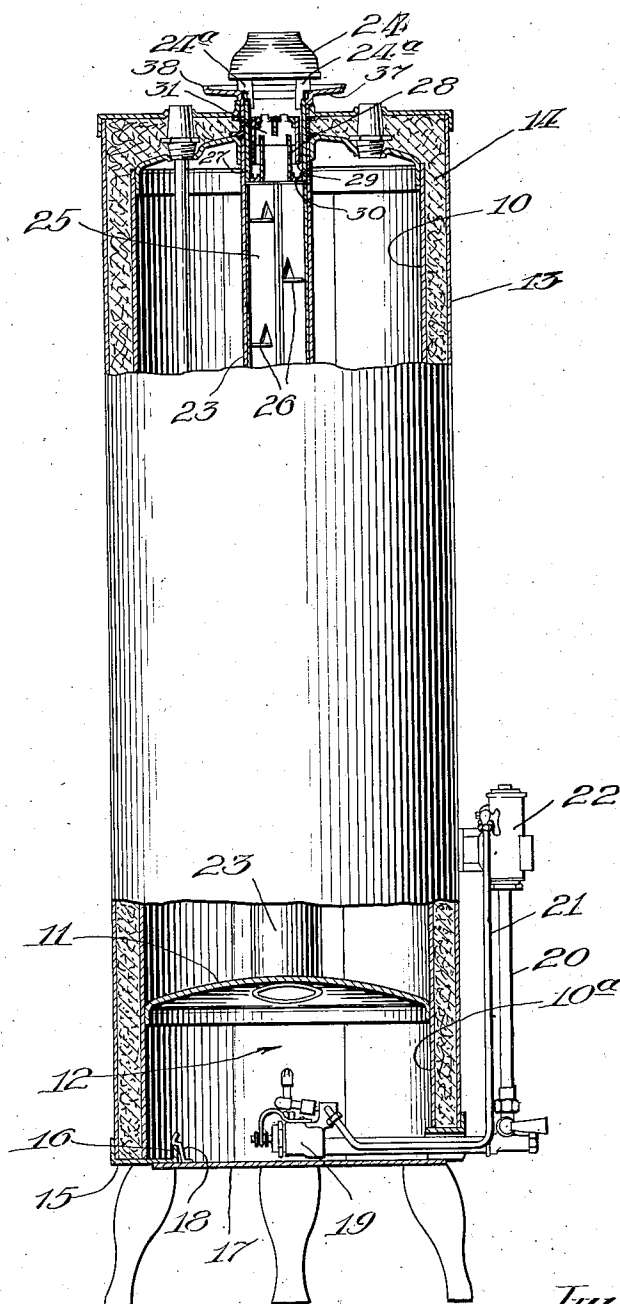
2,057,154

FLUE STRUCTURE

Filed Feb. 4, 1932

3 Sheets-Sheet 1

Fig. 1.



Inventor
Simon J. Lonergan

By Rector, Hibben, Davis & Macauley
Attys.

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S. J. LONERGAN

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Fig. 2.

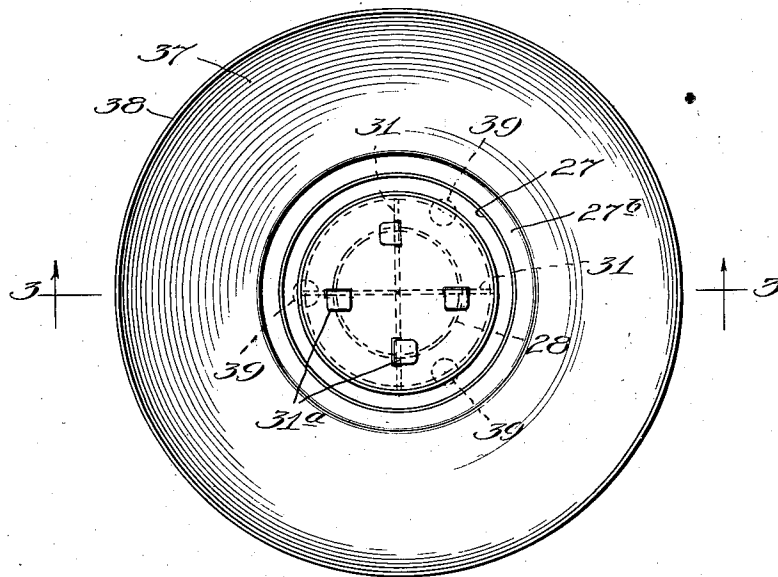


Fig. 3

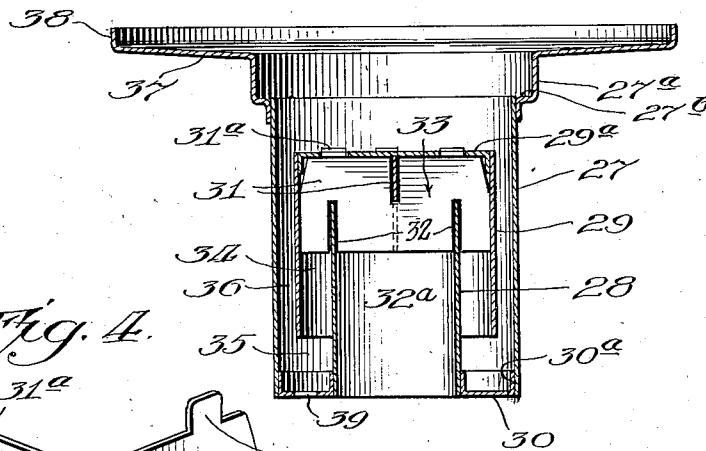
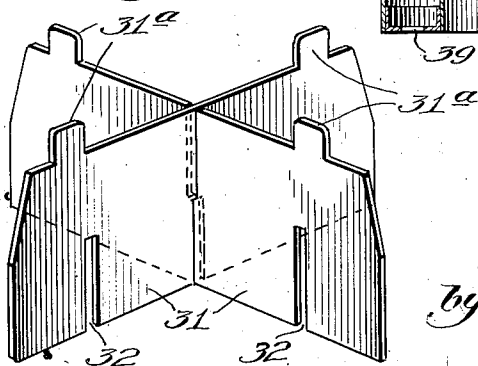


Fig. 4.



Inventor:
Simon J. Lonergan
By Rector, Hibben, Davis & Macaulay
Attys.

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3 Sheets-Sheet 3

Fig. 5.

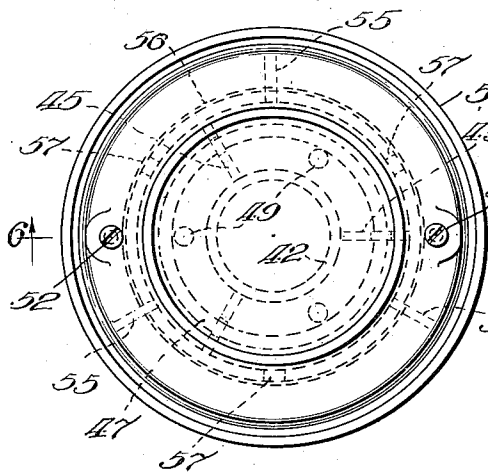


Fig. 7.

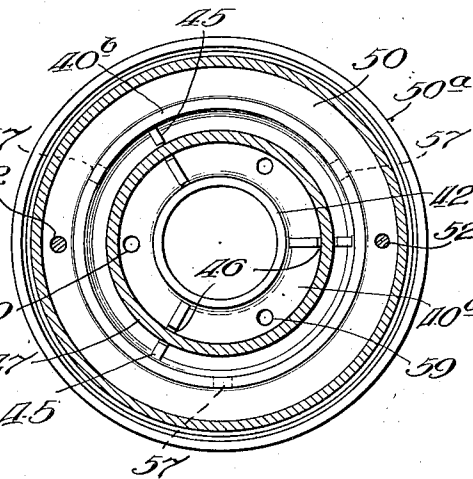


Fig. 6.

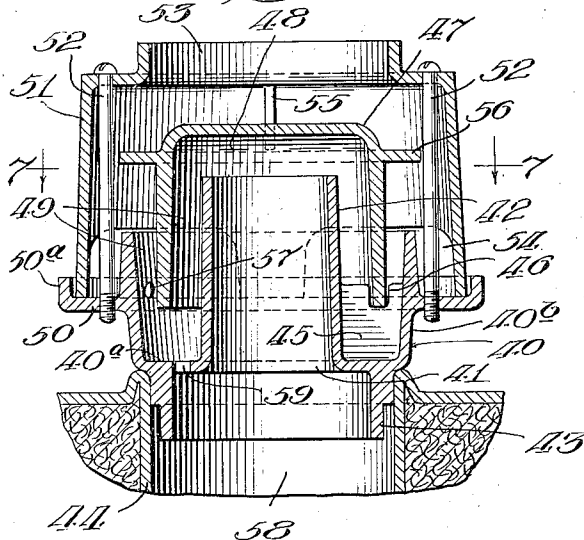
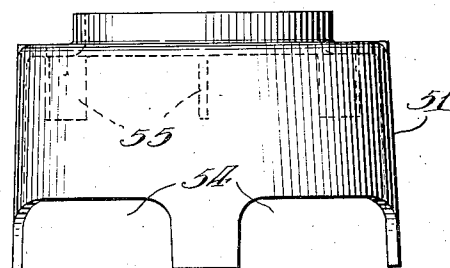


Fig. 8.



Inventor:
Simon J. Lonergan

by Rector, Hibben, Davis & Macaulay
Attorneys

UNITED STATES PATENT OFFICE

2,057,154

FLUE STRUCTURE

Simon J. Lonergan, La Porte, Ind., assignor to
Bastian-Morley Company, La Porte, Ind., a
corporation of Indiana

Application February 4, 1932, Serial No. 590,838

18 Claims. (Cl. 126—307)

My invention relates to flue structure and has particular utility in structures of this character adapted for use in environments where it is desired to obtain maximum heating efficiency from the flue gases as, for example, without limitation of the generality, in gas-fired water heater installations in which the flue leading from the combustion chamber passes through the water in the storage tank.

To facilitate explanation of my invention, I will refer to the same in its application to a water heater of the character above mentioned. It is a necessary requirement that sufficient flue area be provided to properly carry away the products of combustion. Consequently, these requirements, in structures heretofore provided have brought forth flue structure so designed as to provide a predetermined flue area for carrying away gases of combustion based on the use of a fixed rate burner. In some instances velocity-retarding means, such as baffles and the like, have been employed for restricting the flow of gas through the flue and for also breaking up or agitating the same for the purpose of eliminating cool insulating films in attempts to cause the passage of a maximum amount of heat through the flue wall; all tending to increase operating efficiency and reduce waste and cost of operation. However, continued effort has been made to meet the above stated requirement with the result that each heating structure (including flue) has been adapted to only one consumption rate. In other words, prior structures have been so designed that they will not operate efficiently on any rating except that for which they were normally intended. For example, suppose that the heating structure were designed for use of a gas burner having a high consumption rating with a proportionately large-sized flue,—it would not be suitable for use of a low consumption burner because there would not be enough restriction offered to the small volume of gas passing through the relatively large flue to effect pick-up of the rated amount of heat. In other words, the efficiency would be quite low, and below standard for that particularly-rated burner, since the velocity of the gas through the flue would be so great without additional restriction that there would be only a very minimum of heat transfer through the flue wall. The only solution of this problem, so far as prior designs are concerned, would be to substitute properly rated flue structure as the consumption rate (burner size, capacity, etc.) is varied which would be impractical from cost, etc., standpoints.

Practical experience has clearly shown that it is highly desirable from the standpoints of production and standardization to have a heater structure which will give substantially equal efficiency when employing either a high or low consumption burner. In that case, a heater employing a high consumption burner and already installed and operating in the field might readily be converted to a low consumption heater by the substitution of a low consumption burner, wherefore the maximum amount of gas consumption could be guaranteed to the consumer so that the same might be operated on the flat rate basis. In other words, if such convertibility were provided for, any particular rate heater could be changed to suit the requirements of the consumer so that as his needs increase or decrease the gas consumption capacity could readily be increased or decreased for most economic operation. Convertibility would also lighten production burdens. The amount of stock which has to be carried in order to meet the requirements of varied customers would be materially reduced since a general design of heater could be made and then adapted to the particular conditions of use without material cost.

So far as I have been able to discover a structure suitable for conversion to meet the foregoing requirements has not heretofore been devised; and it is the principal object of my invention to provide such a structure. More particularly, my invention provides a simple and inexpensive means for adapting and converting heating structure, either in the factory or in the field, from a high consumption structure to a low consumption one and vice versa.

A further object is to provide a novel trap means which is adapted to be readily and easily inserted in the flue for controlling the flue gases in such a way as to compensate for variation in consumption rating of burners permitting the heating structure, merely by substitution of burners, to be converted from high to low consumption, or vice versa.

A further object is to provide means for conversion of pre-rated heating structure from high to low consumption and vice versa, with maximum efficiency in heat transfer, and whereby the flow of air through the flue is so restricted during inoperative periods that heat loss from this cause is reduced to a minimum.

Other objects and advantages will become apparent as this description progresses and by reference to the drawings, wherein,—

Figure 1 is an elevational view, partly in sec-

tion, of one form of water heater employing one form of heating structure embodying my invention;

Fig. 2 is an enlarged, separated top plan view of the form of the flue trap structure shown in Fig. 1;

Fig. 3 is a section taken substantially on line 3—3 of Fig. 2;

Fig. 4 is an enlarged perspective view of the means shown in Fig. 3 for supporting the trap cup;

Fig. 5 is a top plan view of another form of flue trap structure embodying my invention;

Fig. 6 is a section taken substantially on line 6—6 of Fig. 5;

Fig. 7 is a section taken substantially on line 7—7 of Fig. 6; and

Fig. 8 is a separated elevational view of the draft hood shown in Figs. 5 to 8, inclusive.

Although I have chosen to explain my invention as used in one particular form of water heater, I do not wish to be particularly limited to that use since it is obvious that it has utility in other instances where similar flue control benefits are desired.

Referring to Figs. 1 to 4, inclusive, of the drawings, the water heater structure shown comprises a storage tank having its side wall 10 extended downwardly as at 10^a beneath its bottom 11 providing a combustion chamber 12. The storage tank and combustion chamber are surrounded by a spaced outer shell 13 insulated by any suitable material indicated at 14. The bottom of the combustion chamber is closed by a drip pan 15 having a central opening defined by an upstanding annular flange 16, its central opening being, in turn, closed by an auxiliary pan or cover 17 which is held in place by an annular series of spring clips 18 which are provided at their upper ends with V-shaped projections adapted to snap over the upper edge of the flange 16, as best shown in Fig. 1. A burner 19 of any desired form is mounted in the combustion chamber 12 being connected to the gas supply by a main-flow pipe 20 (and pilot pipe 21) through a thermostat mechanism 22 of any preferred form. This thermostat, controls the flow of gas under and in accordance with the temperature of the water in the storage tank, in a manner well known.

For the purpose of this description, a gas burner 19 of a low consumption type is employed, although, according to my invention, as will be readily appreciated hereinafter, a higher consumption burner may readily be substituted for the burner 19 in conversion of the structure for the purpose hereinabove stated. The burner 19, which will not be described in detail is, preferably of the type disclosed in United States Letters Patent No. 1,753,962, granted April 8, 1930, for Gas burner, such burner employing for low consumption purposes, only one tip.

A circular flue shell 23 leads from the combustion chamber upwardly through the water in the tank where it is connected to suitable discharge means by a draft diverter device 24. The particular flue structure illustrated is of that type disclosed in my copending application, Serial No. 400,201, filed October 17, 1929, for Water heater flue, taking the form, preferably, of a plurality of tubular inserts 25 metal-bonded to the flue shell 23 and having a plurality of variously-directed projections 26 extending into the path of the flue gases to set up a certain turbulent condition therein to avoid the formation of insulating gas

films along the flue wall and to effect a maximum transfer of heat from the flue gases through the flue shell 23 to heat the water in the tank.

For sake of explanation, it will be assumed that the foregoing flue structure is normally designed for use with a burner of predetermined high consumption rating, and that the low consumption burner 19 is not suitable for use with the same per se. It will, therefore, be obvious, that unless otherwise provided for, the use of the low consumption burner 19 with this structure would not produce the desired heating effect and would result only in waste, loss and quite low efficiency. According to my invention, I convert this structure, easily and cheaply, to one suited for the low consumption burner 19 (or any other burner of lower consumption rating than that for which the flue structure is normally intended) by the utilization of trap means arranged to reduce the velocity of the flue gases to that necessary for maximum efficiency rating.

Specifically, I mount a trap unit (Figs. 3 and 6) in the flue shell 23 adjacent its discharge end. The form of unit shown in Figs. 2, 3 and 4 is formed, preferably, from sheet metal and it is of multitubular form comprising an outer cylindrical shell 27, a spaced inner cylindrical shell 28 and an intermediate cylindrical shell 29 disposed between the inner and outer shells with its upper end extending above the upper end of the inner shell and its lower end terminating short of the lower end of the inner shell. The space between the bottom of the inner shell 28 and the outer shell 27 is bridged by a bottom plate 30 having a flange 30^a for securement to the shells in any desired manner. The top of the intermediate shell is covered by a plate 29^a to which is connected by tangs 31^a a pair of crossed plates 31. These plates, at each end thereof, are provided with bottom slots 32 which receive the upper edge of the inner shell 28 to support the intermediate shell in the position illustrated (Fig. 3) with its top 29^a axially-spaced from the upper or outlet end of the inner shell. The foregoing provides a trap constituting a reduced passage 32^a directly communicating with the main flueway and discharging into a trap chamber 33 which in turn discharges through annular passage 34 downwardly of the outlet of passage 32^a into a chamber 35 communicating with the outside of the structure through passage 36.

The outer portion 27^a of the shell 27 is enlarged providing a shoulder 27^b which cooperates with the casing 13 to limit the extent of insertion of the trap unit into the flue shell. This shoulder also provides, in conjunction with the upper part of shell 27, a seat for the legs 24^a of the draft diverter 24. The upper edge of the shell 27 is flared horizontally and shaped to provide a drip pan having an inwardly and downwardly tapering bottom 37 with an upstanding peripheral flange 38. Any condensate that may form on the draft diverter will be caught by this drip pan from whence it drains to the bottom of the chamber 35 and is discharged through openings 39 in the bottom plate 30 with the main flue where it is evaporated.

The trap structure just described sets up a restriction to the flow of flue gases, reducing the velocity of the gas to such an extent that the flue is adapted for use with the low consumption burner such as shown at 19. The restriction offered by the trap structure can be varied by adjusting the depth of insertion of the intermediate shell or trap cup 29 within the member 27 or

by varying the distance of the top 29^a of this trap cup with respect to the outlet end of the shell passage 32^a. In other words, assuming that the minimum gas consumption condition is shown in Figs. 1 and 3 and it is desired to increase the capacity of the burner, and to likewise change the flue structure to accommodate the same,—in that case it is only necessary to raise the shell 29 slightly to space its top 29^a further from the end of the passage 32^a to reduce the restriction offered thereby. This adjustment of the shell 29 may be effected in various ways. For example, the slots 32 may be of sufficient size to tightly engage the wall of the shell 28 so as to frictionally hold the shell 29 in any number of positions thereon; or, if desired, various sized shells 29 may be substituted one for another, or the depth of the crossed plates 31 may be varied to get this same effect. This variation may take place from a low consumption point until the high consumption rate for which the flue is normally intended is reached, at which time the flue trap structure may be dispensed with. Of course, the opposite effect (high consumption to low) may be produced by adjusting the shell 29 lower with respect to the shell 28 as the consumption rating of the burner is lowered.

In Figs. 5 to 8, inclusive, I show another form of trap which is preferably formed of cast iron, and which is adapted to eliminate the use of a separate draft diverter device such as the device 24 of Fig. 1. Specifically, this form comprises a cast, cup-shaped body 40 having an opening 41 in its bottom 40^a surrounded by an upstanding, cylindrical flange or tubular member 42. The bottom of the body 40 is provided around its outer edge, with a depending annular flange 43 adapted to fit within the discharge end of the flue 44 with the body bottom 40^a seated over the outer end of the former. The cup side wall 40^b and the spaced flange 42 define an annular cup space, the bottom of which is bridged by integral, vertical ribs 45 which are notched at 46 to receive and retain (against lateral displacement) the bottom edge of an inverted trap cup 47. The relationship between the flange 42, cup 47 and outer body wall 40^a defines a trap space 48 connected to the flue discharge by a reverse flow passage 49 as in the form of Fig. 3, the entire continuous passage being of inverted N-shape.

The body wall 40^b, near its central portion, is provided with an exterior and annular ledge 50 having its outer edge upturned at 50^a. This ledge supports and retains the lower edge of a bell-shaped hood member 51 which is mounted over and encloses the trap structure. This member 51 is rigidly secured upon the body by oppositely-located screw bolts 52 which pass through the top of member 51 and engage threaded openings in the body ledge 50. The top of the member 51 is provided with a flanged opening 53 which is adapted to be connected to the usual flue discharge pipe; and the side wall of this member 51, at its bottom edge, is provided with a plurality of relatively large openings 54 for down draft diversion purposes.

The hood member 51, near its top, is provided with a plurality (preferably, but not necessarily, three) of ribs 55 which extend radially inward to a point above and in close proximity to the top of an integral, annular ledge 56 around the top (inverted bottom) of the trap cup 47; thereby preventing vertical displacement of such cup. This trap cup ledge is disposed over the dis-

charge end of the trap passage 49 and serves as a down draft diverter throwing the draft out against the wall of the hood member 51 and out through the draft diversion openings 54 in the bottom of such member. The body wall 40^b near its bottom is provided with a plurality of openings 57 through which any condensate which may collect between the body wall 40^b and the hood wall will drain into the bottom of the cup 40. Condensate collecting in the bottom of cup 40 is drained into the flue-way 58 through a plurality of openings 59 located, preferably, one between each set of adjacent ribs 45. Further construction and operation of this form of trap is substantially the same as that of the form of Fig. 3.

The foregoing provides an arrangement by which the heating apparatus is made exceedingly flexible, the same being adapted to a wide range of burners. The heating apparatus may be changed from a high consumption structure to a low consumption one, and vice versa, without impairment of operating efficiency. It insures regulation of gas burning capacity to that required to meet the particular requirements of the consumer. It insures maximum economic efficiency. Waste is eliminated, and cost of operation is materially reduced. It provides an arrangement whereby should a low consumption heater be first installed and, after installation the hot water demand on the heater is increased beyond its ability to recover, it may readily be converted to a higher consumption one without impairment of efficiency. Or, if after installation as a high consumption heater, the consumer should complain of high cost of operation (which might even result from the consumer's careless consumption of hot water or other medium to be heated), the structure can be readily converted to a lower consumption heater and the gas cost predetermined and guaranteed to him at the gas-supply source. The effectiveness of my invention is insured by the construction which permits of restriction in approximately direct proportion to the input of the gas. The cheapness and simplicity of the trap structure places it within the reach of practically every consumer, all to the end that he may receive maximum efficiency under the supervision of gas supply companies, at a minimum cost. It further facilitates production and standardization as well as handling and stocking to meet a varied number of different needs.

While I have shown and described only one form of structure embodying my invention, and only one adaptation of the same, it will be readily appreciated that other changes in details and arrangements of parts may be made without departing from the spirit and scope of my invention as defined by the claims which follow.

I claim:

1. In structure of the character described, means forming a main flue way comprising a tubular shell having an inlet and outlet, a multi-tubular trap unit mounted in the discharge end of said shell and including one open-ended tubular member of lesser width dimension than said shell and directly communicating with said main flue way, another tubular member having one end closed and of larger width dimension than said first tubular member and telescoping the latter with its closed end disposed over the discharge end of said first tubular member in spaced relation, and a third tubular member surrounding the second tubular member in spaced

relation thereto, a bottom wall bridging said first and third members, said bottom wall having one or more openings therein for draining condensate from between said tubular members into said flue way and into the path of gas being delivered to said unit.

2. In structure of the character described, a tubular shell providing a main flue way having an inlet and an outlet, and trap means mounted in said flue way adjacent its outlet comprising a cup-shaped body member mounted in the outlet end of said shell and having an opening in the central portion of its bottom surrounded by an upstanding cylindrical flange defining a relatively smaller passage way communicating with said main flue way, and an inverted cup-shaped member mounted over said flange with its bottom spaced from the outlet end of said flange-defined passage and with its side wall spaced from both said flange and first member to define a more restricted passage leading from said relatively smaller passage downward toward the flue way and then reversely upward, said cup-shaped body member having openings therein communicating said more restricted passage with said flue way for draining of condensate into the path of gases delivered to said trap means.

3. In structure of the character described, a tubular shell providing a main flue way having an inlet and an outlet, and trap means mounted in said flue way adjacent its outlet comprising a member mounted in said shell, and shaped to define a closed-bottom annular space adjacent the wall of said shell with a separate central passage communicating directly with said flue way, an inverted trap-cup member supported with its bottom disposed over the outlet of said central passage in spaced relation with respect thereto and with its side wall extending downwardly into said annular space in spaced relation with respect to all of the surfaces defining said space, and means supporting said trap cup member comprising a pair of plate members crossed in edgewise relation and secured to said trap-cup member, the bottom portion of each said plate member being slotted at its ends for adjustable reception of a wall surface of said first-mentioned member.

4. In structure of the character described, the combination with means forming a flue way, of a cup-shaped body having an end part adapted to be removably inserted in the discharge end of said flue way and having an opening in its bottom surrounded by an upstanding tubular element, the outer wall of said body and said tubular element forming an annular space substantially in alignment with said flue way, an inverted cup-shaped member telescoping said upstanding element in spaced relation thereto and to the side and bottom walls of said body, a substantially horizontal ledge extending from the outer wall of said body, and a hood member seated upon said ledge and enclosing the open end of said body and said cup-shaped member, said hood having an opening in its top adapted to communicate with a flue discharge conduit, the bottom of said body having a comparatively small opening therein communicating said annular space with said flue way for the flow of condensate from said body to said flue way.

5. In structure of the character described, the combination with means forming a flue way, of a body adapted to be mounted at the discharge end of said flue way and having spaced outer and inner walls defining a relatively smaller passage

communicating with said flue way and an annular passage therearound, spaced rib members bridging said annular space and having notches in their upper edge, an inverted cup-shaped member mounted over said inner wall in spaced relation thereto with its free rim seated in said notches, and a hood member supported by and surrounding said body outer wall and said cup-shaped member.

6. Trap structure of the character described comprising a body having spaced walls defining a central passage surrounded by an annular space, an inverted cup-shaped member mounted over said central passage in spaced relation to the wall defining the same and forming with said passage, a continuous discharge way extending outwardly, then downwardly and finally outwardly, said cup-shaped member adjacent its top part having a horizontal ledge projecting over the discharge end of said discharge way in spaced relation thereto to direct down drafts therefrom, and a hood member surrounding the outer of said body walls and said cup-shaped member and having means communicating with a flue discharge point, said hood having a plurality of openings leading to atmosphere and in deflection alignment with said ledge.

7. Trap structure of the character described comprising wall structure including an inverted cup-shaped member, means preventing lateral displacement of said member, a hood having means communicating with a discharge point and surrounding said cup-shaped member, said wall structure forming a tortuous passage comprised of an upwardly extending intake portion, a downwardly extending intermediate portion, and an upwardly extending discharge portion, said member having a ledge disposed in the discharge portion of said passage, ribs carried by said hood member and extending over the top of said member preventing vertical displacement of the latter, said hood having a discharge opening located below the discharge portion of said passage in down draft deflection alignment with said ledge.

8. In structure of the character described comprising at least three cast parts, the first of which comprises a cup-shaped body having a central opening surrounded by an upstanding tubular wall spaced from the body of said wall, said two walls being bridged by spaced ribs notched in their upper edge, and said body wall having an outwardly extending substantially horizontal ledge; the second of which comprises an inverted cup-shaped member, the rim of which is adapted to seat in said notches, and said member having an outwardly extending ledge adjacent its top; and the third of which comprises a hood member having its bottom edge adapted to seat upon said body ledge and surrounding said body wall and cup-shaped member, said hood having an opening in its top adapted to communicate with a discharge point and an opening in the bottom portion of its side wall adapted to communicate with the atmosphere, said hood also having rib members adapted to extend over said cup-shaped member ledge.

9. In structure of the character described, wall structure forming a central flue-communicating passage, an annular space therearound and a second annular space around the first annular space, an inverted cup-shaped member having its skirt supported in said first annular space in spaced relation to the wall structure forming such space, and a hood member having its skirt

mounted in said second annular space and having an opening in its top, and means for securing all the aforementioned parts in rigid assembled relation.

10. In structure of the character described, wall structure forming a central flue-communicating passage, an annular space therearound and a second annular space around the first annular space, an inverted cup-shaped member having its skirt supported in said first annular space in spaced relation to the wall structure forming such space, and a hood member having its skirt mounted in said second annular space and having an opening in its top, means for securing all the aforementioned parts in rigid assembled relation and one or more openings in the wall structure between said first and second annular spaces, and one or more openings in the wall structure forming the bottom of said first annular space.

11. In structure of the class described, the combination with a member forming a flue way, of a trap unit comprising a body part having one end thereof freely and slidably insertable in and removable from the discharge end of said flue way, said body part having an outer wall as a continuation of said body end and a spaced inner wall, the latter defining a relatively smaller passage communicating with said flue way, a bottom wall bridging said inner and outer walls at the lower end of said inner wall, an inverted cup-shaped trap member mounted over said inner wall in endwise and laterally spaced relation thereto with its bottom edge spaced from said bottom wall and disposed between said inner and outer walls comparatively close to said bottom wall, a bell-shaped hood member closing the outer end of said body and enclosing said trap member in spaced relation thereto, said bottom wall having one or more drain openings therein leading directly into said flue way, and means separate from said trap member for supporting the latter.

12. In structure of the character described, an elongated tubular shell providing a main flue way having an inlet and an outlet, and trap means mounted in said flue way adjacent its outlet comprising a member freely insertable in and removable from the discharge end of said shell and shaped to define a closed-bottom annular space adjacent the wall of said shell with a separate central passage communicating directly with said flue way and forming a direct-flow continuation of the latter, and an inverted, trap-cup member supported with its bottom disposed over the outlet of said central passage in spaced relation with respect thereto and with its side wall extending downwardly into said space in spaced relation with respect to all of the surfaces defining said space, and forming a reverse flow, unobstructed passage leading from said central passage, and means separate from said trap cup member for supporting the latter in spaced relation to the bottom of said annular space, said closed-bottom of said first member being disposed in alignment with said flue way and having openings therein for the flow of condensate directly from said annular space to said flue way.

13. In structure of the class described, means forming a flue way, a trap unit comprising an outer shell having an end part adapted to be inserted within the discharge end of a flue way for free removal therefrom, a spaced inner shell adapted to communicate directly with the flue way and providing a passageway of reduced cross-sectional area serving as an extension of the flue

way and through which substantially all of the gases from the flue way must flow, a wall bridging the bottoms of said inner and outer shells, an inverted cup-shaped and intermediate shell mounted over said inner shell with its bottom walls spaced from said inner shell and with its side walls located between and spaced from both said shells and said bridging wall, said cup-shaped shell forming with said inner and outer shells, said bridging wall and said first passage-way a continuous unobstructed passage, whereby the flue gases in discharging from the flue way through the trap unit flow upward, then downward and finally upward, said bridging wall being located in alignment with the flue way and being provided with means for draining condensate from the trap unit into the flue way.

14. In structure of the class described, the combination of means forming a combustion chamber, a burner mounted in said combustion chamber, means forming a flue way leading from said combustion chamber and adapted for the transfer of heat therethrough to a medium to be heated, and means for retarding the flow of hot gases from said burner through said flue way for increased transfer of heat from said gases through said flue way forming means to said medium including a trap unit having a tubular body, one end of which is constructed and arranged for mounting within and removal from the discharge end of said flue way by merely sliding the same therinto and therefrom, means in said body forming a restricted discharge passage extending directly upward from the discharge end of said flue way and receiving all of the gases from said flue way, means baffling the discharge end of said restricted discharge passage and forming with said body a more restricted passage of substantially uniform cross-sectional area leading from said restricted passage backwardly along the latter and then reversely upward to a substantially unrestricted outlet in said body, said body having one or more openings therein leading from said more restricted passage and communicating with said flue way for draining condensate from the trap unit into said flue way.

15. In structure of the class described, the combination of means forming a combustion chamber, a burner having a predetermined consumptive capacity mounted in said combustion chamber, means forming an elongated flue way leading from said combustion chamber and adapted for the transfer of heat therethrough to a medium to be heated and having normally a discharge capacity exceeding that required for the capacity of said burner, and means for retarding the flow of gases from said burner through said flue way to insure an increased transfer of heat from said gases through said flue way-forming means to said medium which comprises a trap unit including a body having a tubular outer wall slip-fitted and freely insertable in and removable from the discharge end of said flue way forming means, said body also having an inner spaced tubular wall joined to said outer wall by a bridge wall and forming a restricted discharge passage through which only and all of the gases flow from said flue way, said bridge wall being in alignment with said flue way and having one or more openings therein for draining condensate from the space between said inner and outer walls into said flue way, and an inverted cup-shaped trap member supported over said inner body wall with its bottom wall over the end of said restricted discharge passage in spaced relation

thereto and its side wall extending between said inner and outer body walls in spaced relation to said latter walls and said bridge walls and forming a more restricted passageway leading from said discharge end of said restricted discharge passage backwardly along the latter and then outwardly, said body having a discharge outlet substantially unrestricted and with which said more restricted passage communicates.

16. In structure of the character described, the combination with means providing a combustion chamber, of a tubular member connected with said combustion chamber and providing a flue way, and trap means removably positioned within the discharge end of said flue way for restricting the flow of gases through said flue way, said trap means being formed as a self-contained unit and having means for slide-engagement with said tubular member and said trap also having means for draining condensate therefrom directly into said flue way.

17. The combination in a structure of the character described, of means forming a combustion chamber, a gas burner device located in said chamber, means providing a continuous flue way of substantially uniform size leading from said combustion chamber, and means supported directly at the discharge end of said flue way for directly retarding the velocity of gas through said flue way according to the rated input of said burner, said means including a tubular member directly receiving gases of combustion from said flue way, a cup-shape member telescopically mounted over said tubular member providing a reversed direction passageway, means for sup-

porting said cup-shape member for axial adjustment toward and from said tubular member to restrict more or less said passageway, and means for draining condensate from said reversed direction passageway into said flue way.

18. In structure of the class described, means forming a flue way through which gases of combustion are passed for discharge, and trap structure which comprises a plurality of parts assembled in unitary fashion for ready application to and removal from said flue way as a unit by merely sliding the unit into and out of said discharge end of the flue way, said parts including a body part having one end formed to the shape and size of the discharge end of the flue way for free slide insertion into and out of said discharge end, an internal tubular part carried by said body part in laterally spaced relation with respect to the latter and forming a reduced and direct flue way extension and adapted for receiving only and all of the gases of combustion passing through said flue way, another and inverted cup-shaped part mounted over said internal part with its walls spaced laterally and endwise from said body part and said internal part and forming an unobstructed reverse flow passageway communicating with said flue way, and a wall bridging the space between said body part and internal part below the lower edge of said inverted cup-shaped part and having one or more comparatively small openings therein for draining condensate directly from the trap structure into the flue way and into the path of gases flowing to said trap structure.

SIMON J. LONERGAN.