June 3, 1941. M. A. POWERS 2,244,314

FLUID FUEL BURNING APPARATUS

Filed July 15, 1937

Fig. 1

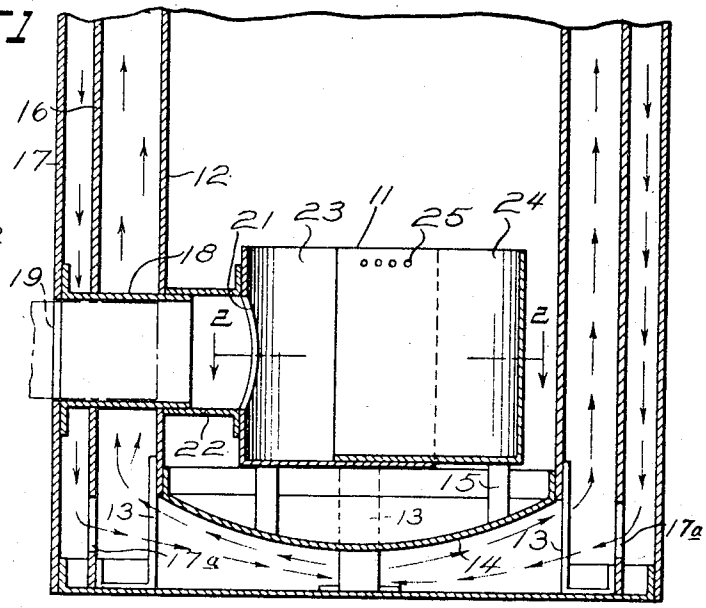


Fig. 5

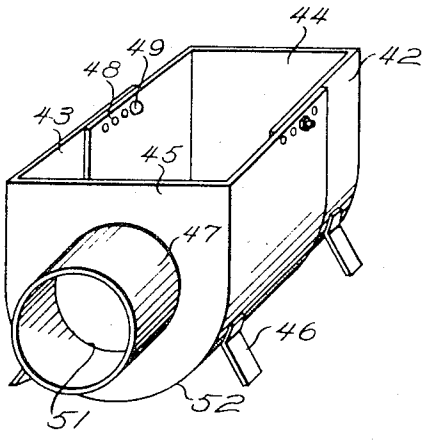
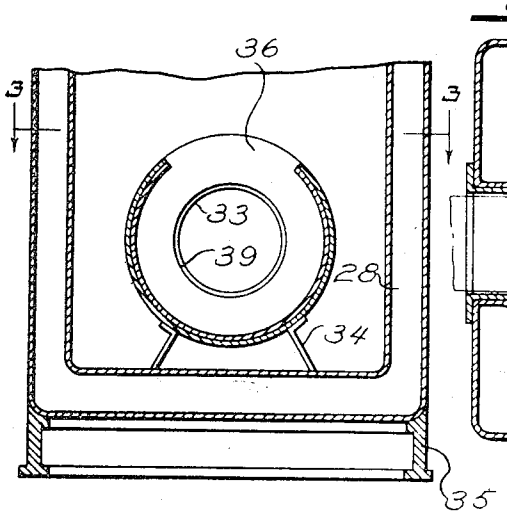


Fig. 3



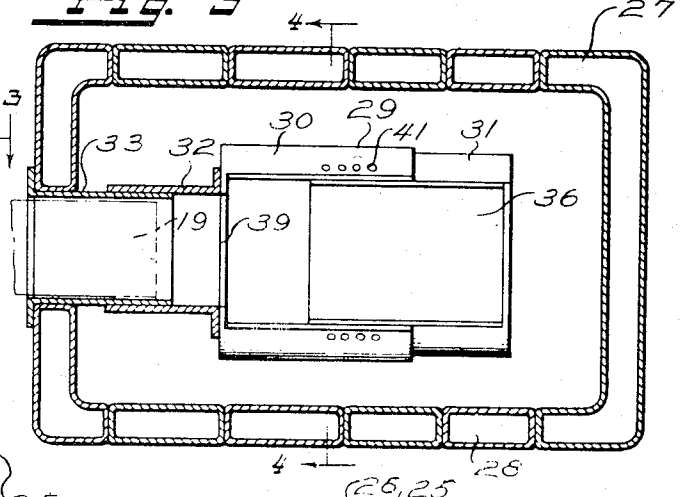


Fig. 4

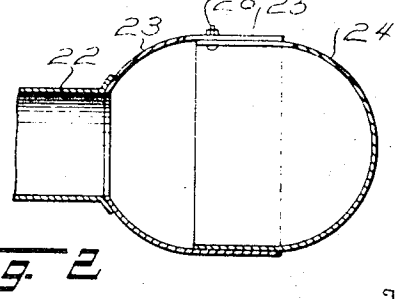


Fig. 2

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FLUID FUEL BURNING APPARATUS

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Application July 15, 1937, Serial No. 153,821

5 Claims. (Cl. 158—4)

This invention relates to fluid fuel burning apparatus and more particularly to combustion chambers which can be easily and quickly installed in such apparatus.

This invention is concerned chiefly with liquid fuel burning apparatus of the so-called gun burner type in which liquid fuel is mechanically atomized and projected into the furnace together with the proper quantity of air to support combustion.

At the present time, especially because of their ease of operation, reliability and cleanliness, oil burner installations are rapidly increasing in number. Some of these installations comprise replacement of the formerly used heating units while some, especially in smaller buildings and private homes, involve conversion of already installed existing solid fuel burning furnaces into liquid fuel burning furnaces.

The gun burner is used in a great many of these conversion installations with the combustion chamber located inside the furnace. The combustion chamber is usually made of ceramic material and is usually built to suit the contour of that portion of the furnace in which it is placed, but the building of such ceramic combustion chambers involves a great deal of time and is expensive as well as unsatisfactory in other ways. The refractory clay combustion chambers are quite heavy and consequently are slow to heat up and equally slow to cool down. The slow heating of such chambers results in poor combustion for a considerable period of time upon starting cold. After the chambers are thoroughly heated a considerable period of time is required to allow them to cool down. The heat released during the cooling period frequently serves to overheat the living quarters. Furthermore, in cold weather when the burner is shut off momentarily by operation of the high temperature limit control in the furnace proper, upon restarting there is possibility of explosion if there is any delay whatever in ignition.

It has been found cheaper and more satisfactory to provide thin metallic combustion chambers which are factory made and ready for installation, and I have shown chambers of this character in my copending application, Serial No. 72,214, filed April 1, 1936, now Patent No. 2,149,182 dated February 28, 1939. The chambers there disclosed are constructed in any desired fixed shape and are made of heat resistant metal.

However the various and unpredictable shapes and sizes of furnaces which may confront the person who is engaged in converting a solid fuel burner into a fluid fuel burner have caused some difficulty in installing these ready-made chambers and it is chiefly with the solution of this problem that the present invention is concerned.

It is accordingly a major object of my invention to provide in a fluid fuel burner apparatus, a novel combustion chamber which can be adapted to efficiently operate in different sizes of furnaces and to also suit various types of combustion conditions.

It is a further object of my invention to provide, in a fluid fuel burning apparatus, a novel combustion chamber which is adjustable to be fitted into different sizes of furnaces and in which provision is made for locking the chamber parts in adjusted position.

A further object of the invention is to provide, in a fluid fuel burning apparatus, a novel combustion chamber having relatively adjustable walls so that its external dimensions may be altered to suit existing furnace sizes or shapes, and which due to its construction may be inserted through the available furnace opening and thereafter assembled and adjusted in position.

It is an important object of my invention to provide a novel attachment support for a combustion chamber in a fluid fuel burner apparatus which enables accurate and speedy mounting of the chamber in the apparatus.

A further object of my invention is to provide novel cooperating support and fastening members on a combustion chamber and the floor of a fluid fuel burner apparatus respectively for quick and efficient assembly of the chamber in the apparatus.

It is a further object of my invention to provide a novel combustion chamber having a readily demountable and detachable top section so that a high walled combustion chamber may be utilized in a fluid fuel burner apparatus whose door opening is too small to allow insertion of an integral chamber of the same height.

A further object of my invention is to provide a novel combustion chamber open at both top and bottom for gaining wide distribution of the products of combustion.

Further objects of the invention will become apparent as the specification proceeds in connection with the accompanying drawing, and from the appended claims.

Referring to the drawing:

Figure 1 is a vertical sectional view of one form of adjustable combustion chamber embodying the invention and installed in a hot air furnace.

Figure 2 is a section taken substantially along line 2—2 of Figure 1 and illustrates further the shape of that form of combustion chamber.

Figure 3 is a plan view partly in section and taken along line 3—3 of Figure 4 illustrating another form of adjustable combustion chamber according to the invention as installed in a furnace having a hot water or steam boiler.

Figure 4 is an end view partly in section taken along line 4—4 of Figure 3 and illustrates the water passage below the combustion chamber.

Figure 5 is a perspective view of a further form of an adjustable combustion chamber according to the invention.

With reference to Figure 1, a combustion chamber generally indicated at 11 is shown installed in a hot air furnace. Surrounding combustion chamber 11 and supported upon a suitable base by spaced legs 13 is a metal shell 12 of suitable shape, here shown by way of illustration as generally cylindrical, defining the combustion gas compartment proper. The lower end of shell 12 is shown closed by a head 14 which also may serve as a support for legs 15 of the combustion chamber. A similar head (not shown) closes the upper end of shell 12, but is provided with a suitable flue gas outlet. Spaced outwardly from and coaxial with shell 12 are metal shells 16 and 17. Air which contacts the outer surfaces of shell 12 and head 14 is heated and rises in the space between shells 12 and 16 toward a suitable number of hot air outlets or exhausts (not shown). Shell 17 provides a cold air return for the cooled air from the room. The cool air enters suitable ducts at the top of the furnace and is introduced between shells 16 and 17, where it flows downwardly and enters suitable ports 17*a* in shell 16 and then is caused to flow along the outer surfaces of members 12 and 14 to be again heated and passed through another cycle.

Secured about the periphery of a circular aperture in shell 17 and extending inwardly through similar apertures in shells 16 and 12 respectively is a cylindrical tube 18. The connections between tube 18 and shells 16 and 12 are made air and gas tight by a suitable operation such as welding. Tube 18 serves to receive the discharge tube 19 of a conventional gun burner (not shown).

Combustion chamber 11 is provided with an aperture 21 with which a tube 22 registers and projects outwardly therefrom. Tube 22 preferably slidingly and telescopically engages the inner open end of tube 18. By this construction combustion chamber 11 is aligned with the gun burner discharge tube and, due to the telescoping engagement of tubes 18 and 22, may be accurately positioned in the shell 12. It will be noted here that tubes 18 and 22 may, if desired, be so interconnected that the weight of chamber 11 is wholly or partly carried by tube 18 instead of using the legs 15 for supporting the chamber from below.

For the best efficiency it is desirable to locate the combustion chamber with its walls spaced a predetermined distance from the inner surface of shell 12. In order to provide a combustion chamber which is sufficiently flexible to be used in any one of several sizes and shapes of shells 12 I preferably make my combustion chamber of a plurality of sections which are adjustably connected. A preferred form is illustrated in Figures 1 and 2 where combustion chamber 11 is composed of two relatively adjustable sections 23 and 24 each constituting an end portion of the chamber and having overlapping telescoping side walls. Each chamber section is provided preferably with a plurality of alignable apertures 25 adapted to receive suitable locking means such as pins, bolts or the like designated at 26. Obviously any other suitable means for locking the chamber sections in adjusted position can be used without departing from the spirit of the invention.

Each of the sections of combustion chamber 11 is preferably made of the heat resistant metal described for use in such chambers in my above mentioned copending application. In Figure 1, the chamber illustrated has a flat closed bottom, generally cylindrical side walls and is open at the top. The ignited fuel charge is projected through aperture 21 into the interior of chamber 11 where it is thoroughly mixed and combusted and the combusted gases escape with a high degree of turbulence through the open top of the chamber into the shell 12 thereby heating the same.

Another preferred embodiment of the invention will now be described in which an adjustable combustion chamber is used in a furnace having a water or steam boiler. Figures 3 and 4 illustrate this form of the invention wherein a combustion chamber generally designated at 29 is composed of two telescoping sections 30 and 31. Chamber 29 is in the form of a flat ended hollow cylinder having a portion of its cylindrical surface removed to provide an opening generally designated by 36 for the escape of the combusted mixture from the combustion chamber.

Surrounding chamber 29 and spaced a predetermined distance therefrom is a multiple section hot water or steam boiler which is subjected to heating from the products of combustion escaping from the combustion chamber. Boiler sections 27 and 28 extend from one wall of the combustion gas compartment proper to the other beneath the combustion chamber. The boiler is seated upon a suitable base 35 as shown in Figure 4. In this way a large amount of heating surface is provided and heat radiated downwardly from the combustion chamber is efficiently utilized.

Extending through an aperture in the front part of the boiler and preferably forming a tight connection therewith is a hollow tube 33 corresponding to tube 18 of Figure 1 and which is adapted to receive the discharge tube 19 of a conventional gun burner (not shown). Tube 33 telescopically engages a tubular extension 32 which is secured as by welding about an aperture 39 in the front end wall of combustion chamber 29. A series of apertures 41 in sections 30 and 31 are provided for the reception of bolts, pins or the like for locking the sections in adjusted position in the manner described above in connection with apertures 25 in Figure 1. Chamber 29 may be supported wholly by legs 34, partly by 34 and tube 33 or wholly by tube 33 as desired.

Figure 5 illustrates a further preferred form of adjustable combustion chamber which is of generally rectangular shape and open at the top with flat end walls 44 and 45 and a rounded bottom 52 to provide a substantially trough-shaped chamber. One flat end wall 45 is apertured as at 51 and provided with a tubular extension 47 corresponding to tube 22 of Figure 1. Telescoping sections 42 and 43 are provided with suitable locking means for overlapping walls here shown as cooperating aperture and bolt members 48 and 49 respectively although any suitable locking means may be used without departing from the spirit of the invention. Legs 46 may be pro-

vided depending from the rounded bottom to serve as chamber supports if desired.

Several different forms of combustion chamber are above disclosed for purposes of illustrating the invention but it will be obvious that the invention is not limited to such and embraces all forms of combustion chambers especially those having adjustable sections. Although the chambers are preferably made of a light, thin, heat resistant metal any suitable material having the same properties with respect to heat may be used. Any of the combustion chamber forms shown in Figures 2, 4 and 5 may be provided with openings at the bottom as well.

It will be further obvious that any form of combustion chamber may be used in any type of furnace, whether it be hot air, steam or hot water. Selection of a particular form of combustion chamber is a matter of choice to suit existing conditions depending upon the various factors involved.

A major feature of the invention, it will be realized, resides in the flexibility provided by adjustable combustion chambers. When converting a solid fuel burner into a liquid fuel burner it is preferable to provide a combustion chamber which will fit into the existing furnace installation without tearing down the major portion of that furnace because such procedure is wasteful of both time and money. In one type of conversion installation all of the refractory material which lines the usual fire pit is removed except that at the bottom leaving the metal side walls of the fire pit exposed. The adjustable combustion chamber is inserted, adjusted to proper volumetric capacity and to provide proper spacing from the fire pit side walls. The combustion chamber is thus supported upon a layer of refractory material and the metal fire pit side walls act as shell 12 in Figure 1. It is obvious that an adjustable combustion chamber as provided by my invention removes many installation difficulties of this kind.

The provision of adjustable combustion chamber units is also advantageous in that it cuts down the number of such units which need be carried in stock in the factory or in the contractor's shop because instead of a whole series of different sizes only a few adjustable units in each shape need be carried. Since all of the parts of the adjustable units are of uniform size the manufacturing costs of such will be proportionately smaller than for a whole series of different sizes of chambers.

Another advantage resulting from the use of adjustable combustion chambers lies in the fact that the chambers may be adjusted to attain the best mixing and combustion conditions for different chamber shapes and different kinds of mixtures projected into the chamber. It will be seen that adjustment of a chamber will change its volumetric capacity as well as the paths of flow of the mixture inside the chamber.

The above recited advantages are available whether the combustion chamber is inserted in a new installation assembled in the factory or in an existing installation in a private home. Once the desired adjustment is made it is locked and need never again be disturbed during the life of the furnace.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. A combustion chamber for use in liquid fuel burning installations comprising a pair of relatively adjustable sections having substantially U-shaped overlapping bottom and side walls and each section having an outer end wall so that the chamber when assembled is in the form of a trough having a rounded bottom and a substantially rectangular opening at the top through which products of combustion escape, one of said end walls being apertured to admit charges of fuel mixtures.

2. The combustion chamber recited in claim 1, wherein the walls of the chamber are all composed of thin heat resistant metal.

3. In a liquid fuel burning apparatus, a combustion chamber having an inlet through which ignited fuel mixtures are passed into the interior of the combustion chamber and an outlet distinct from said inlet through which products of combustion are permitted to escape, said chamber comprising a plurality of sections of thin heat-resisting metal arranged with adjacent walls overlapping each other to permit relative adjustment thereof, said chamber being in the form of a trough having an upwardly facing outlet, and means for locking the overlapped sections in adjusted position.

4. In a liquid fuel burning apparatus, a combustion chamber having an inlet opening through which ignited fuel mixtures are passed into the interior of the chamber and an outlet opening distinct from said inlet opening through which products of combustion are permitted to escape, said combustion chamber comprising a plurality of thin heat-resisting metal sections arranged with their adjacent walls in overlapping relation, so as to permit relative adjustment thereof to selectively vary the volumetric capacity of the chamber; and means for locking the overlapped sections in adjusted position, with their overlapped portions in frictional engagement, said chamber being of substantially cylindrical form.

5. In a liquid fuel burning apparatus, a combustion chamber having an inlet opening through which ignited fuel mixtures are passed into the interior of the chamber and an outlet opening distinct from said inlet opening through which products of combustion are permitted to escape, said combustion chamber comprising a plurality of thin heat-resisting metal sections arranged with their adjacent walls in overlapping relation, so as to permit relative adjustment thereof to selectively vary the volumetric capacity of the chamber, and means for locking the overlapped sections in adjusted position, with their overlapped portions in frictional engagement, said chamber having oppositely curved end walls.

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