Nov. 7, 1939. J. L. BREESE 2,179,142

HYDROCARBON BURNER

Filed Oct. 20, 1937

Fig. 1.

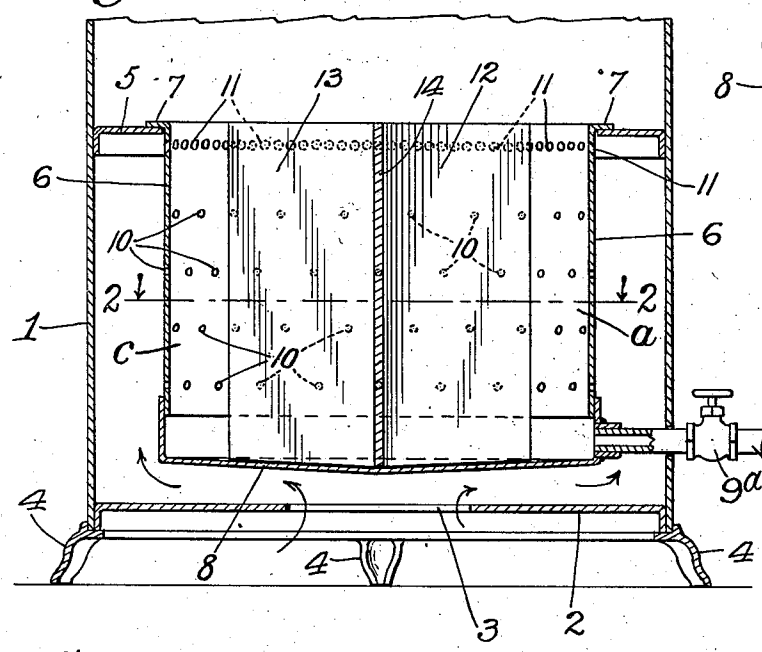


Fig. 4.

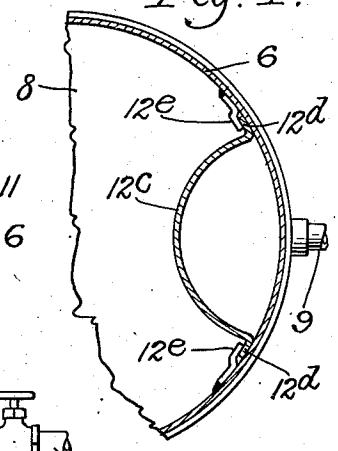


Fig. 2.

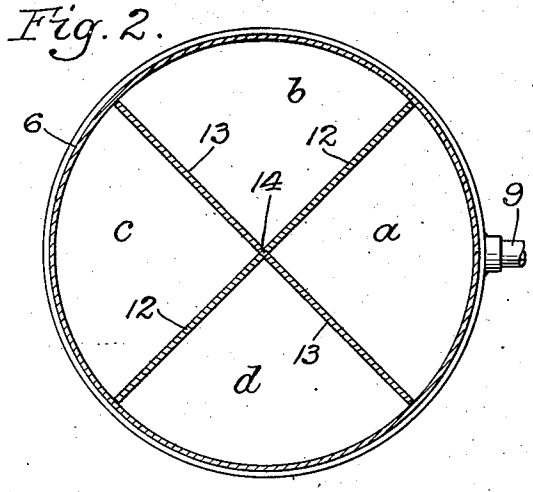
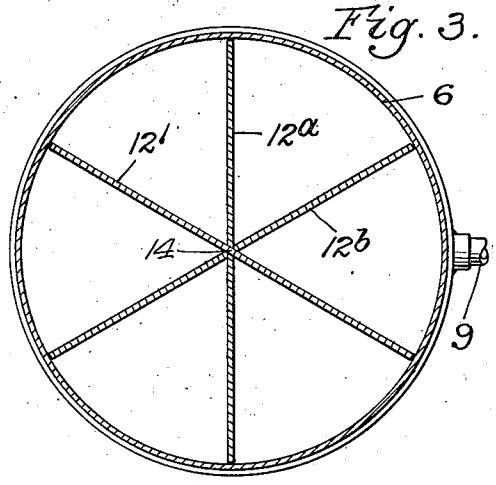


Fig. 3.



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HYDROCARBON BURNER

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Application October 20, 1937, Serial No. 169,960

7 Claims. (Cl. 158—91)

My invention relates to an improvement in hydrocarbon burners and has for one purpose the provision of an improved burner with a maximum turn-down, whereby such a burner may operate at a minimum oil consumption during periods when a heating result is not desired, but when a "pilot" flame is necessary to prevent the necessity of relighting.

Another purpose is the provision of means for preventing down drafts or eddy currents in the so-called "pot" type of hydrocarbon burner in which a mixing zone is defined by a wall or walls provided with primary and secondary air inlet apertures located at different levels.

Another purpose is the provision of an improved multi-stage burner in which the same burner may be readily burned at varying heating effects.

Other purposes will appear from time to time in the course of the specification and claims.

I illustrate my invention more or less diagrammatically in the accompanying drawing wherein:

Figure 1 is a vertical axial section through a burner;

Figure 2 is a section through the line 2—2 of Figure 1;

Figure 3 is a similar section through a variant form of my device; and

Figure 4 is a similar section through a still further variation of my device.

Like parts are indicated by like symbols throughout the specification and drawing.

Referring to the drawing, 1 generally indicates an outer member or drum provided with a bottom 2 having a central air inlet aperture 3. The outer drum or member of the stove may be supported for example by means of a plurality of legs 4. 5 indicates a circumferential inwardly extending flange adapted to receive the mixing chamber proper. I illustrate the mixing chamber as including a generally cylindrical wall member 6 having an upper flange 7 whereby it may be supported upon the flange 5. 8 indicates a downwardly convex bottom member in communication with a fuel inlet pipe 9 through which any suitable liquid hydrocarbon may be admitted to the bottom 8.

The member 6 is provided with a plurality of primary air apertures 10 herein shown as arranged at four levels and scattered generally uniformly throughout the major portion of the height of the member 6. It will be understood that the lowest of these apertures is above the maximum level of the fuel admitted through the pipe 9. 11 indicates a row of secondary air inlet apertures herein shown as upwardly and inwardly inclined whereby a plurality of jets of secondary air are admitted into the space immediately above the mixing zone defined by the lower portion of the member 6. The location and arrangement of the primary and secondary air apertures may be widely varied.

12, 13 indicates a pair of intersecting vertical partition members which intersect along the central vertical axis 14 of the member 6 in the form of the device herein shown. Whereas the size and proportion of the parts may be greatly varied, what I illustrate is a burner divided into a plurality of separate spaces or segments *a*, *b*, *c*, *d*, each of said segments being bounded in part by the circumferential wall 6 with its primary and secondary air inlet apertures. It will be understood that the members 12, 13 are sufficiently loosely fitted into the member 6 so that the liquid hydrocarbon fuel may flow below the lower edges of the members 12 and 13 and thus pass from segment to segment. I illustrate the pipe 9 communicating with the segment *a* as shown in Figure 2.

It will be realized that whereas I have herewith shown and described a practical and operative device, nevertheless many changes might be made in the size, shape, number and disposition of parts without departing from the spirit of the invention and I wish, therefore, that my showing be taken as in a broad sense diagrammatic.

Whereas I have described and shown herein burners of the "hydroxilation" type in which primary and secondary air apertures occur in the walls, it will be understood that I do not wish to be limited thereto. A segregation of primary and secondary apertures may not be necessary or a secondary air supply may be admitted at a level altogether above the top of the mixing chamber. Also, my method of graduated heating may be applied to burners other than the hydroxilation type.

The use and operation of my invention are as follows:

One purpose for employing a plurality of spaces bounded by partitions instead of a single open interior is that by employing smaller spaces the cross sectional area of each such space is so small that an up current is maintained, due to the chimney effect, which keeps eddy currents of air from descending toward the bottom of the space. It is highly desirable to prevent downdrafts or down eddies which break up the char-

acteristic mode of two-stage combustion obtained by burners of the type herein shown.

When downdrafts are prevented, the air penetrating through the primary apertures 10 mixes with the hydrocarbon vaporized by the heat of combustion to form a primary mixture. This primary mixture in turn receives its final air supply through the secondary air apertures 11, and burns with a clear flame and without the deposit of free carbon. If downdrafts or back eddies from above carry air down into the space within the member 6, the normal process of combustion is disturbed and a loss of efficiency and the deposit of carbon and smoking follows.

In effect, in the device above described, each sector or space becomes a separate mixing zone and, being relatively narrow with respect to its height, substantially is free from eddy currents from above, due to the chimney effect caused by its relatively small cross-sectional area. Many variations in detail may be made. As shown in Figure 4, I may employ simply a small space around the oil entrance as in the space defined by the member 12c and the wall 6. I can maintain a flame without sooting or carbon deposit by burning a very small amount of fuel.

If I divide the entire space into four, as shown in Figure 2, I can maintain a pilot flame in one section with a very small fuel consumption. Broadly, if a given size of burner burns a minimum of say four gallons in twenty-four hours, one sector is able to burn a minimum of one gallon in twenty-four hours.

In practice, a very small flow of the liquid fuel is delivered to the particular space opposite the oil entrance, in the case of Figure 2 the space *a*. Combustion having been initiated, an up-draft is established due to the relatively narrow cross section of the space *c*. If only a small volume of fuel is delivered, it is evaporated before it can flow into the adjacent spaces *a*, *b*, or *d*.

On the other hand, as soon as more oil than the first space *c* can evaporate is admitted, the oil will seep into the adjacent spaces *a*, *b* and *d*. As soon as this happens, combustion takes place either around the edge where the members 12, 13 contact the side wall 6, or over the top of the walls 12, 13, and the so-called process of hydroxilation then takes place in all of the spaces, with the primary air apertures 10 supplying the primary air for the final combustion, which takes place at or above the secondary air apertures 11. Each of the spaces is free from down drafts or down eddies, because of the above mentioned chimney effect.

If the user wishes to turn down the flame and reduce the heating effect, and maintain a mere pilot flame, he simply reduces the fuel flow through the line 9 by operating any suitable valve 9*a*. Combustion then ceases shortly in the spaces *a*, *b* and *d* but continues in the space *c*. Owing to the above mentioned long, thin form of the space *c*, the fuel flow can be reduced to a vary small minimum, without causing down drafts or eddies.

In the form of Figure 3, instead of dividing the space within the burner into four segments I divide it into six. The operation, however, is the same, namely the unitary delivery of the oil through the passage 9 to one of the spaces within the burner, with the oil flowing therethrough into other spaces beneath the lower edges of the intervening vertical walls or baffles.

Figure 4 simply divides the housing into two spaces, the small one being defined between the member 12c and the adjacent portion of the wall and serving as the pilot light when a small flow of oil is maintained.

All the forms herein shown have this in common, that the oil is delivered at some common point and passes through an initial chamber before it can reach a second chamber or additional chambers for combustion. When a small flow of oil is maintained, the oil is all burned in the first chamber. This in effect provides a pilot light for the rest of the device. As soon as more oil is being supplied to the initial chamber than can be vaporized and burned therein, the additional unvaporized oil flows through into the additional compartments and is vaporized and burned there. On a maximum flow of oil there is full combustion in all of the various compartments.

I claim:

1. In a hydrocarbon burner, a mixing chamber including a circumferential side wall having formed therein primary and secondary air apertures, a bottom for said mixing chamber, generally vertical partition means dividing the interior of said chamber into a plurality of separate spaces, each of said spaces having a horizontal cross sectional area sufficiently small in relation to the height of such space substantially to prevent down drafts or eddies during combustion, and means for directing a hydrocarbon into one of said spaces, said partition means being adapted to permit excess hydrocarbon to flow into the other spaces.

2. In a hydrocarbon burner, a mixing chamber, partition means for dividing said mixing chamber into a plurality of separate generally vertically walled mixing spaces, portions of the walls of each such space being provided with primary and secondary air inlet means, means for directing a hydrocarbon into one of said spaces, the horizontal cross sectional area of each space being sufficiently small in relation to the height of such space substantially to prevent down drafts or eddies during combustion, said partition means being adapted to permit excess hydrocarbon to flow into the other mixing spaces, when the flow of hydrocarbon to the first mentioned space exceeds the vaporization rate in said space.

3. In a hydrocarbon burner, a mixing chamber including a side wall having air apertures, a bottom for said mixing chamber, generally vertical partition means dividing the interior of the chamber into a plurality of separate spaces, each of said spaces having a horizontal cross sectional area sufficiently small in relation to the height of such space substantially to prevent down drafts or eddies during combustion, means for directing a hydrocarbon into one of said spaces and means effective to permit excess hydrocarbon to flow from one of said spaces into an adjacent space or spaces.

4. In a hydrocarbon burner, a mixing chamber including a plurality of adjacent chambers, perforate walls for such chambers, each such chamber having a horizontal cross section sufficiently small in relation to the height of its space substantially to prevent down drafts or eddies during combustion, means for feeding a liquid fuel to one of said chambers, and means for permitting fuel in excess of that consumed in said chamber to flow to one or more of the other chambers.

5. In a hydrocarbon burner, a mixing chamber including a generally cylindrical exterior wall having a plurality of air apertures therein, and a

plurality of additional imperforate walls adapted to divide the interior of the chamber into a plurality of separate compartments, each such compartment having a horizontal cross section sufficiently small in relation to its height substantially to prevent down drafts or eddies during combustion, means for feeding a liquid fuel to one of said compartments, and means for permitting the fuel in excess of that consumed in said compartment to flow to one or more of the other compartments.

6. In a hydrocarbon burner, a mixing chamber including a generally cylindrical exterior wall having a plurality of air apertures therein, and a plurality of additional imperforate walls adapted to divide the interior of the chamber into a plurality of separate compartments, each such compartment having a horizontal cross section sufficiently small in relation to its height substantially to prevent down drafts or eddies during combustion, means for feeding a liquid fuel to one of said compartments, and means for permitting the fuel in excess of that consumed in said compartment to flow to one or more of the other compartments, said imperforate walls converging adjacent the axis of the cylinder formed by said exterior wall.

7. In a hydrocarbon burner a mixing chamber having a bottom and a circumferential outer wall, said outer wall being provided with a plurality of apertures located at various levels, said apertures being adapted to admit primary air into said mixing chamber, means for delivering a liquid fuel to the bottom of said mixing chamber at a predetermined point, and intermediate upwardly extending wall means, located within said circumferential wall and dividing said mixing chamber into a plurality of separate compartments, including wall means surrounding a space in communication with said means for delivering liquid fuel, whereby said compartment is positioned initially to receive all of the oil delivered to said chamber, and means for permitting oil unvaporized in said initial compartment to flow into an adjacent compartment or compartments when an excess supply of oil is delivered to said initial compartment.

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