Aug. 7, 1945. D. C. BREAULT 2,381,803

OIL BURNER

Filed May 8, 1942

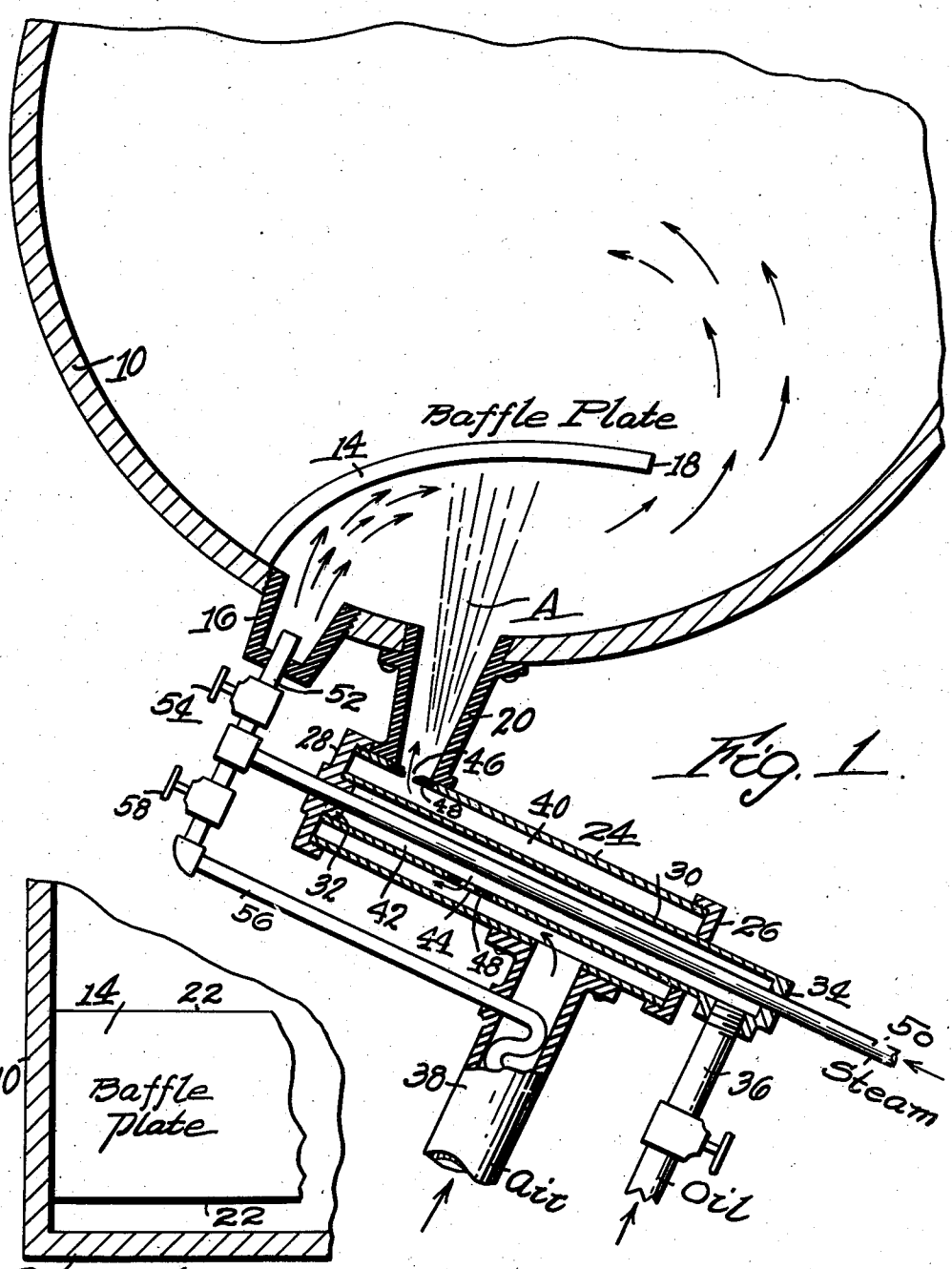


Fig. 1.

Fig. 2.

Inventor
Delphis C. Breault
By attorney
Charles R. Fay

Patented Aug. 7, 1945 2,381,803

UNITED STATES PATENT OFFICE

2,381,803

OIL BURNER

Delphis C. Breault, Boston, Mass., assignor to American Heat Corporation, Lowell, Mass., a corporation of Massachusetts

Application May 8, 1942, Serial No. 442,184

5 Claims. (Cl. 158—74)

This invention relates to oil burners and its objects include the provision of means and methods for the more economical combustion of oils of all grades in a single unitary burner of high efficiency and relatively low cost; the provision of an oil burning apparatus adapted for complete atomization of the oil with corresponding high efficiency and lack of soot formation in the firebox; the provision of an oil burner adapted for use in space heating, metal treating, melting, power plants, industrial uses, etc., wherein the oil may be pre-heated and is thoroughly mixed with air prior to atomization and wherein a secondary air or steam blast is utilized inside the firebox for achieving an efficiency superior to that of the prior art, said secondary air and steam blast being directed at an angle to the atomized oil stream to swirl the latter completely throughout the firebox for quick heat and total burning of the oil.

Further objects of the invention include the provision of a unitary oil atomizing apparatus having a secondary air or steam pipe associated therewith but introduced into the firebox independently for increasing the oil movement therein to produce a swirling or blast of the burning oil stream throughout the entire volume of the firebox, the latter being provided with means such as a baffle plate for angularly changing the direction of flow of the oil stream under influence of the secondary air or steam blast, the latter also having the effect of relatively cooling the baffle for longer life thereof.

A still further object of the invention resides in the provision of a mechanically simplified oil burner unit which is inexpensive to manufacture and yet is capable of efficiently burning all ordinary grades of fuel oil for any heating purpose, this unit being easily taken apart for repair or cleaning and having no moving parts which may get out of order.

Other objects and advantages of the invention will appear hereinafter.

Reference is to be had to the accompanying drawing, in which

Fig. 1 is a sectional view through the apparatus, parts of the firebox being broken away; and

Fig. 2 is a sectional view through the firebox showing the baffle plate.

It is to be understood at the outset that the firebox illustrated in this application may be made for any heating use desired, and may be a domestic space heater, a metal furnace, any type of industrial heater, power plant, or the like. In the drawing the firebox is shown as simply as possible, and for purposes of illustration it includes a refractory wall 10 and bottom 12, there being of course a top of similar material not shown, closing the chamber. The wall or top may be provided with a chimney, grate, boiler, charge or discharge orifices, etc., but these elements do not form any part of the present invention except insofar as they may be used in conjunction with the invention.

A baffle plate 14 also of refractory or similar material, is mounted at one end on a portion of the wall 10 in close proximity to a sleeve 16, this sleeve extending outwardly of the firebox wall for a purpose to be described. The baffle plate may take many convenient forms and shapes but it is preferred that it is free at its end 18 at a point extending well past the axis of a second outwardly extending sleeve 20, the axes of both sleeves intersecting the baffle approximately midway of its height. The baffle is curved as shown in Fig. 1, or may be placed at an angle to substantially correspond with its general disposition relative to the two sleeves, and at top and bottom the baffle is free of the firebox, as shown at 22 in Fig. 2 to provide substantial gas flow spaces thereunder and over.

Sleeve 20 is adapted to mount an elongated hollow element 24 which contains most of the oil feeding apparatus. End caps 26, 28, or similar means threaded onto the hollow element 24 may be utilized to close the element to form a chamber which is easily opened, and these caps may also be made to support a smaller elongated hollow element 30 by means of an interior lug or nut 32 on cap 28 and a central aperture in cap 26, so that the element 30 may extend axially of the element 24 and exteriorly thereof in a direction away from the sleeve 20. Hollow element 30 is provided with closed ends as by the lug or nut 32 and end closure 34, and adjacent the latter but exterior of the element 24 there is provided an oil inlet pipe or the like 36, while element 24 is provided with an air inlet 38 communicating therewith. The effect of the above described construction is to provide a continuous air chamber 40 surrounding an axially disposed interior oil chamber 42. The oil inlet pipe may be provided with a convenient pump and control apparatus and the air inlet pipe may be provided with a controlled fan or the like to feed the oil and air at the quantities and pressures desired, but these feed means and controls form no part of the present invention except insofar as they are used with the present apparatus, and therefore they have not been illustrated.

Element 30 is provided with an oil escape orifice 44 leading into the air chamber at a point spaced longitudinally and angularly from an orifice 46 in the element 24 leading directly into sleeve 20, and the result is that the oil flows from pipe 36 into oil chamber 42 whence it is sprayed through orifice 44 into the air chamber. In the air chamber, the air will mix with

the oil, separating it into globules and turbulating it therein for a period of time for thorough mixing, and then the air and oil mixture is atomized by orifice **46** and blown into sleeve **20** where it is ignited. Jewel or other inserts **48** may be used to form the orifices to prevent distortion of the sizes of the orifices under heat in order to provide against unwanted variations in flow.

End closure **34**, the lug or nut **32**, and cap **28** are all centrally bored to mount a through pipe **50** which carries steam or hot air or a mixture of the two directly centrally through the oil chamber to preheat the oil as it enters the oil chamber. By this co-axial arrangement of pipes the preheating of the oil is made very efficient because the air chamber itself acts as an insulator and the oil and air mixture therein is also heated by the contents of pipe **50**, so that the oil cannot cool in the air chamber. The source of the steam or hot air in pipe **50** is immaterial to the invention but may be derived from the furnace. As shown, pipe **50** extends axially through the oil and air chambers and through cap **28** until it reaches the vicinity of sleeve **16** where it is turned to enter the same as by pipe **52** in the direction shown. A pet-cock **54** or the like valve is interposed between the sleeve and the pipe **50**, and is located in pipe **52** for the purpose of shutting off and controlling the steam or air under certain conditions to be described. The term secondary air in this case means the steam, air, or combination in pipe **50**, and in many cases may be superheated in the furnace in the baffle plate area.

A release pipe **56** for undesired steam may be attached to pipe **52** and a control valve **58** is located in this pipe also to close off the escape therein of the steam if all of the latter available is to be passed into the firebox. Pipe **56** may be continued into the air inlet pipe **38** as shown, to preheat the air if desired.

When the furnace is to be started up, the valve **54** will usually be closed so that no steam, or secondary air as differentiated from the primary oil mixing air in chamber **40**, will impinge the baffle plate, although the burner is perfectly capable of starting under any conditions. First, however, it is important to heat the baffle and firebox bricks, and this is best done without the secondary air in some installations. In this case, the steam may be passed entirely into the air inlet pipe **38** to preheat the primary air (and oil) to as high a degree as possible. When the firebox is heated by the ignited oil at A, Fig. 1, the valve **54** may be opened to direct a blast of steam against the baffle, which in turn directs it against the atomized, burning oil, and this action blows the flame and burning oil out past the end of the baffle as indicated by the arrows in Fig. 1, to swirl under force completely throughout the firebox and back to and under and over the baffle, resulting in complete combustion of the oil. The steam also cools the baffle and prevents it from burning, as of course it becomes extremely hot from the direct blast of burning oil.

It has been found that the combination of the two streams, burning oil from sleeve **20**, and secondary air from sleeve **16** together produce such a complete combustion when united to swirl through the firebox, that No. 6 oil is efficiently burned without the formation of soot or ash, and this result depends on the two streams above stated, the baffle, and the air and oil mixture made possible in the air chamber **40**. In cases where No. 2 oil is to be used, complete combustion without soot is obtained without the use of the steam, so that the present invention provides an extremely efficient burner for wide differences in oil.

The furnace is brought up to heat in a fraction of the time necessary heretofore, and a great saving in the amount of oil used is effected by reason of the complete combustion. Furthermore metals can be melted directly in the firebox without oxidization, and a smaller furnace or power plant may be used for obtaining the same heat as in larger prior installations. Also, the secondary air, or steam not only swirls and turbulates the atomized oil stream but further breaks it down by force of the pressure, and expands the gases, for more complete combustion.

Having thus described my invention and the advantages thereof, I do not wish to be limited to the details herein disclosed, otherwise than as set forth in the claims, but what I claim is:

1. In combination with a furnace, an oil burner comprising a central pipe, means forming an oil chamber, a portion of the length of said pipe being surrounded by said means, an air chamber surrounding said oil chamber, a wall of the oil chamber being provided with an orifice for admission of oil into the air chamber, a wall of the air chamber being provided with an orifice in communication with the furnace, said pipe entering said furnace closely adjacent to said air chamber orifice but spaced therefrom, said pipe being adapted to conduct steam through the oil chamber into said furnace in the region of the oil and air mixture issuing into the furnace through the last named orifice to mix therewith in a single stream.

2. An oil burner comprising a steam pipe, an oil chamber surrounding a portion of said pipe, an air chamber surrounding a portion of the oil chamber, said steam pipe being completely blocked off from said chambers, a furnace, said air chamber having communication with said furnace, a wall between the oil and air chambers provided with an orifice, said steam pipe entering said furnace at a point closely spaced from the point of communication between the air chamber and the furnace and means in the furnace located in a position to be effective to cause the steam and oil and air mixture to merge into a single stream.

3. An oil burner as recited in claim 1 including means providing for escape of the pipe contents prior to entry into the furnace.

4. An oil burner as recited in claim 1 including an additional pipe leading from said first named pipe just before its entry into the furnace, said additional pipe being mounted in cooperation with said air chamber to heat the same.

5. An oil burner as recited in claim 2 wherein said last named means comprises a baffle on which the steam and oil and air mixture entering the furnace impinge to merge to form a single stream.

DELPHIS C. BREAULT.