Aug. 3, 1926. 1,594,686

F. F. PEASE

FUEL OIL BURNING APPARATUS

Filed March 31, 1922 2 Sheets-Sheet 1

Fig. 1

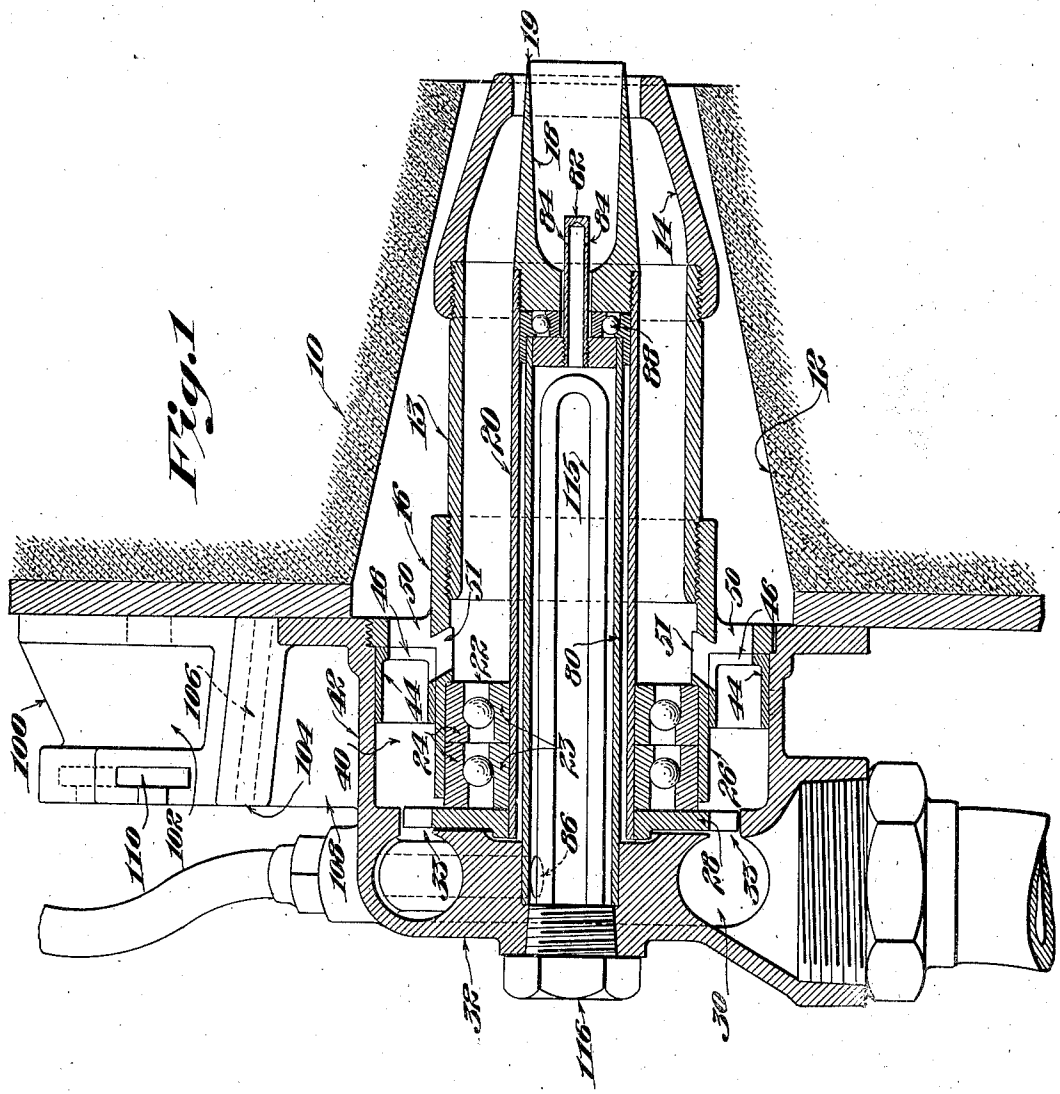

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Fig. 2

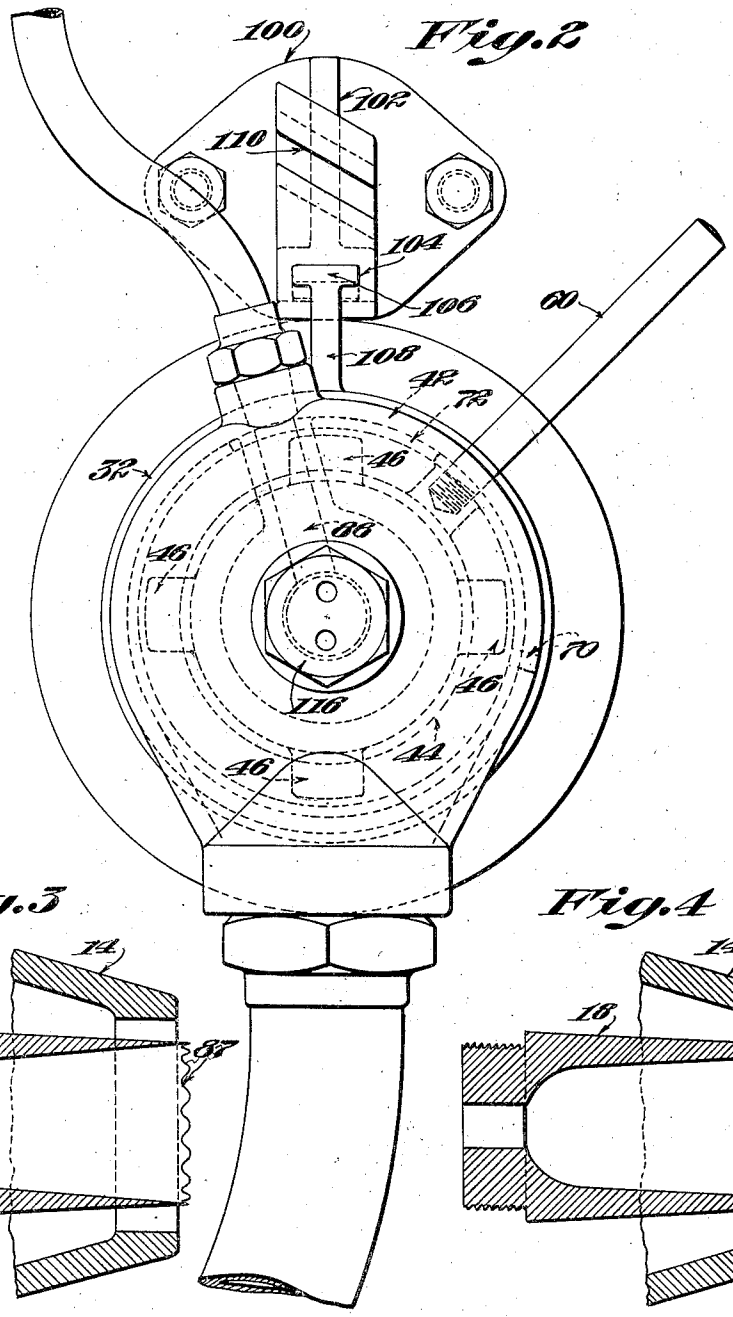

Fig. 3

Fig. 4

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UNITED STATES PATENT OFFICE.

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FUEL-OIL-BURNING APPARATUS.

Application filed March 31, 1922. Serial No. 548,469.

The present invention relates to oil burning equipment and more particularly to equipment of this type adapted for burning fuel oil at relatively low pressures.

One object of the present invention is to improve and reorganize apparatus of this type in such a manner that the efficiency and control of the fuel oil burner is markedly increased.

A further object of the invention is to simplify and improve the construction of these burners in order to facilitate assembling and disassembling of the apparatus and at the same time insure stability of operation throughout long periods of use.

With these objects in view one feature of the invention contemplates the provision of a rotary atomizing cup driven at a substantially constant speed by an air motor to which is delivered a constant volume of air. Air for combustion purposes is supplied through an annular passage surrounding the atomizing cup and the supply of air through this passage is controlled in accordance with the degree of combustion which is desired. By virtue of this feature a constant volume of air is supplied to the driving motor with sufficient impelling power to insure rotation of the atomizing cup under all conditions of operation and thereafter this air, which constitutes the impelling power for the cup, is supplied in variable quantities to the combustion chamber. A further feature of the present invention consists in a construction by virtue of which that portion of the burner apparatus which projects through the wall of the combustion chamber is protected against heat given off from the hot walls by a moving curtain of cool air which serves as part of the supply for combustion purposes.

Still further features of the present invention consist in certain novel features of construction, combinations and arrangements of parts hereinafter described and claimed, the advantages of which will be obvious to those skilled in the art from the following description.

In the accompanying drawings illustrating the preferred form of the invention Fig. 1 is a longitudinal section in elevation of the burner apparatus; Fig. 2 is an end elevation of the apparatus looking toward the right in Fig. 1; and Figs. 3 and 4 are details showing modified forms of atomizers.

The illustrated embodiment of the present invention is primarily designed for burning fuel oil under relatively low pressures and is particularly adapted to installations where it is necessary to secure maximum combustion efficiency under widely varying conditions of operation. Furthermore the present construction of the apparatus facilitates removal from the combustion chamber and disassembling for the purpose of cleaning.

Referring to the accompanying drawings, the wall of the combustion space is indicated at 10 and is provided with the usual opening 12 for the reception of the burner. Projecting through the opening is a tubular nozzle portion 13 having a mouth portion 14 threaded upon the outer end. The inner end of the tubular nozzle portion is threaded within the annular flange of a supporting head 16.

An atomizing cup 18 is rotatably supported within the tubular nozzle portion 13, this atomizing cup serving to mechanically break up and discharge the oil in the form of a thin slightly conical film, this film leaving the outer edge 19 of the cup and meeting the air current in a manner to be presently described. The atomizing cup is provided with a slightly flaring conical surface and threadedly engages with the outer end of a supporting tube 20. This tube is journaled for rotation at its opposite end in anti-friction ball bearings indicated generally at 22, the inner race 23 of the bearing being secured to the tube and the outer race 24 engaging with a flange 26 formed upon the supporting head 16, as shown clearly in Fig. 1. The atomizing cup is rotated during the operation of the burner by an air turbine, indicated at 28 as secured to the inner end of the tube 20.

It is highly desirable that the atomizing cup shall be rotated at a constant speed independently of the volume of fuel oil and air passing through the burner and that the impelling force for this cup shall be sufficient to insure rotation independently of the viscosity of the oil passing therethrough. To this end the turbine 28 is supplied with a sufficient volume of air under pressure to insure rotation of the atomizing cup under any and all conditions of operation. This air is conveniently supplied to the turbine blades from an annular chamber 30 formed in a casting 32 and having a delivery orifice or orifices, indicated at 33, adjacent the

peripheral portion of the turbine. It is possible with such a construction to insure sufficient impelling power for rotation of the atomizing cup under all conditions.

In addition to employing air as the impelling force for the rotary atomizer, it is desirable to employ this same air under pressure for combustion purposes but it is necessary to control the supply of air to the combustion chamber in conformity with the degree of combustion desired. In order to control and regulate the volume of air supplied to the combustion chamber without affecting the volume of air supplied to the turbine, the air is caused to pass through a controlling device subsequent to its passage through the turbine and by suitable manipulation of the controlling device the amount of air delivered to the combustion chamber may be regulated as desired. To this end an annular space 40 is provided between the annular flange 26 and an annular flange 42 of larger diameter formed upon the casting 32. After its passage through the turbine, the air under pressure passes into the annular space 40, in which is located an air control 44. This air control preferably consists of an annular member substantially U-shaped in cross section and rotatably supported by the opposing surfaces of the flanges 26 and 42. This valve controls the delivery of air into the combustion chamber through the provision of openings 46 which register with cooperating openings 50 and 51 formed in the head 16. The openings 51 supply air to the annular space formed by the tubular nozzle portion 13 and the rotary atomizing mechanism 20 and the openings 50 supply air to an annular passage surrounding the outer periphery of the tubular nozzle 13 and separating this periphery from the walls of the opening 12. It will be obvious to those skilled in the art that by a suitable rotation of the controlling valve the amount of air supplied to the respective air passages may be regulated as desired. The manipulation of the control valve may be conveniently accomplished by a control handle 60 threaded into the valve at its inner end and extending outwardly through an opening formed in the casting 32, as indicated in Fig. 2. As a constant volume of air is passing through the turbine, it is necessary to bypass or dispose of the surplus volume of air when the supply of air to the combustion chamber is cut down or diminished. To this end the wall of the casting 32 may be provided with one or more discharge openings 70 which register to a greater or less degree with a similar opening or openings 72 formed in the peripheral wall of the valve. The construction is so designed that as the valve is rotated to decrease the size of the air passages leading to the combustion chamber the discharge passage leading outwardly is correspondingly increased and vice versa. By virtue of such a construction, a sufficient volume of air may be delivered to the impelling turbine to insure a constant speed of rotation under all conditions of operation and at the same time this air under pressure may be employed for combustion purposes without interfering with or impairing the desired regulation of the combustion air. It will be furthermore obvious from an inspection of the drawings that the turbine, supporting bearings and movable valve are all received within the head casting 32 outside of the opening leading to the combustion chamber and in a position where they are not subjected to intense heat. In addition to mounting this portion of the burner outside of the wall of the combustion chamber, the nozzle is maintained comparatively cool through the provision of the air curtain surrounding the outside of the nozzle and passing inwardly to the combustion chamber from the openings 50. By supplying the air in this manner in part through the inner passage separating the tubular nozzle from the rotating portion of the burner and in part through the outer passage separating the burner from the walls of the combustion chamber, the metal portions of the burner are maintained within the desired limits of temperature without interfering with the combustion process.

From an inspection of Fig. 1 it will be evident that the head 16 is threadedly connected with the casting 32 and upon disengaging and removing the head 16 from the casting all of the moving parts, that is to say the turbine, valve, etc., are removed therewith. In order to facilitate this disassembling of the burner, the complementary threaded portions of the head 16 and the casting are interrupted in a manner which will be obvious to those skilled in the art to complete the disengagement of the two members by a partial rotation of the head 16.

The fuel oil may be supplied to this type of burner under little or no pressure, the rotary atomizing cup serving to pick up and mechanically atomize the globules of oil, delivering the oil to the combustion chamber in the form of a continuous film. This oil is conveniently delivered to the rotary atomizer through a passage formed by a tube 80 received within the rotary tube 20 and having a tubular end 82 of reduced diameter which extends outwardly through the hub of the atomizing cup into the space surrounded by the walls of the cup. The fuel oil is delivered from the tube 82 through openings 84 which cause the globules or drops of oil to be deposited on the flaring surface of the rapidly rotating cup. The fuel oil is conveniently delivered to the interior of the feed

tube 80 by an oil passage 86 extended transversely into the inner end of the tube through the casting 32, as indicated clearly in Figs. 1 and 2.

In order to support the outer end of the rotating atomizer and eliminate any possible vibration of this member, an anti-friction bearing, indicated at 88, is conveniently interposed between the oil tube 80 and the atomizer cup 20, as shown in Fig. 1, this bearing serving to augment the support afforded by the bearing at the opposite end of the atomizer assembly.

The apparatus is supported in such a manner that when in operation it is securely held in the proper operative position with respect to the combustion chamber and when not in use may be quickly and easily removed from the combustion chamber and supported upon the outside. To this end a supporting bracket 100 is secured to the outside of the combustion chamber above the opening 12 in any suitable manner. This supporting bracket is provided with a rib 102 having inclined dovetailed ways 104 formed upon the under portion, which receive a correspondingly shaped tongue 106 formed upon a rib 108 projecting upwardly from the casting 32. This bracket with a cooperating tongue and groove connection form the sole support for the burner assembly. Upon referring to Fig. 1 it will be evident that by moving the assembly inwardly until the face of the flange 106 contacts with the wall of the combustion chamber the burner is rigidly held in the proper relation to the combustion chamber and opening 12. When it is desired to move the burner from the combustion chamber this may be accomplished by merely withdrawing it sufficiently to disengage the tongue and groove connections. Thereafter the burner assembly may be supported upon the outside of the furnace by engaging the tongue 106 with a second groove 110 formed on the rib 100, as indicated clearly in Fig. 2. These connections are preferably in the form of flexible tubing which permit withdrawal of the burner assembly from the combustion chamber without being disconnected.

If desired, the fuel oil may be initially heated upon starting the fire through an electrical heating unit 115 received within the oil tube 80 and connected with any suitable source of electrical energy, not shown. This electrical heating unit may conveniently take the form of a U-shaped tubular member mounted upon a plug 116 which is threaded in a tapped opening formed in the casting 32, as indicated.

It may be desirable to modify the atomizing cup in order to insure a film of coil of such a character that it shall be completely intermixed with air for combustion purposes. To this end two slightly modified forms of atomizing cup are indicated in Figs. 3 and 4. As shown in Fig. 4, the atomizing cup is provided with an annular groove 85 just back of the edge to which oil is fed through openings indicated at 86. This form of cup delivers the oil in two separate sheets or films and under certain conditions insures a better intermixture of the oil and air than the cup illustrated in Fig. 1. Another form of cup which may be employed to secure improved results is indicated in Fig. 3, this cup being provided with a scalloped edge 87, as indicated, which apparently improves atomization of the oil. The purpose of both of these modified forms is to insure that the film of oil shall be thrown off from the cup in such a manner that all of the oil will be picked up and combined with the air current.

The term "turbine" as employed in the claims is intended to include any type of fluid operated rotor which will drive the atomizing cup at the desired rate of speed.

While it is preferred to employ the specific construction and arrangement of parts shown and described it will be understood that this construction and arrangement is not essential except so far as specified in the claims and may be changed or modified without departing from the broader features of the invention.

The invention having been described, what is claimed is:

1. Oil burning apparatus comprising a mechanical oil atomizer, means for supplying air around the atomizer, a turbine for rotating the atomizer located at a point relatively remote from the atomizer, means for supplying air to the turbine, and means remote from the combustion chamber for delivering the air in regulated volume after its passage through the turbine to a point adjacent the atomizer.

2. Oil burning apparatus comprising an atomizing cup, an air nozzle associated with the cup, a turbine operatively connected with the cup, means for supplying air to the turbine in sufficient volume to rotate the cup at the desired speed, means for conducting the air after its passage through the turbine to the air nozzle, and means located in the path of the air for directly controlling the volume of air delivered to the nozzle.

3. Oil burning apparatus comprising a tubular air nozzle, a rotary atomizer assembly received within the tubular nozzle, a turbine connected to the atomizer assembly at a point removed from the combustion chamber, means for supplying air to the turbine, and a valve for directly controlling the delivery of air from the turbine to the air nozzle.

4. Oil burning apparatus comprising an elongated tubular atomizer assembly, a tubular air nozzle surrounding the atomizer

assembly, means for rotatively supporting the assembly with relation to the nozzle, a main supporting head, and a single connection for securing the nozzle and atomizer assembly to the head designed to permit the nozzle and atomizer assembly to be readily disconnected from the head in its entirety.

5. Oil burning apparatus comprising a hollow head casting, a supporting member connected to the casting and having a tubular flange portion of smaller diameter than the interior of the casting, an atomizer assembly rotatively supported by the tubular portion, an air nozzle connected to the tubular portion and providing an annular passage surrounding the atomizer assembly, and a sleeve valve rotating upon the tubular flange portion and serving to control the volume of air delivered to the annular passage.

6. Oil burning apparatus comprising a head casting having an intercommunicating air passage and hollow chamber, an atomizer assembly received within the hollow chamber and designed to provide an annular chamber surrounding the assembly, an air turbine connected to the atomizer assembly and arranged to be impelled by air delivered from the air passage, and a valve located in the chamber surrounding the atomizer assembly and designed to control the passage of air from the turbine to the combustion chamber.

7. Oil burning apparatus comprising a head, an oil atomizing assembly and air control mounted on the head and projecting into the combustion chamber, a supporting bracket connected to the outside of the combustion chamber, and sliding tongue and groove connections between the head and bracket designed to automatically center the atomizing assembly and air control with relation to the passage leading into the combustion chamber.

8. Oil burning apparatus comprising a head, an oil atomizing assembly and air control mounted on the head and projecting into the combustion chamber, a supporting bracket connected to the outside of the combustion chamber, sliding tongue and groove connections between the head and bracket designed to automatically center the atomizing assembly and air control with relation to the passage leading into the combustion chamber, and supplementary connections for supporting the head and atomizer assembly outside of the combustion chamber when desired.

9. Oil burning apparatus comprising a head, an oil atomizing assembly and air control mounted on the head and projecting into the combustion chamber, a supporting bracket connected to the outside of the combustion chamber, sliding tongue and groove connections between the head and bracket designed to automatically center the atomizing assembly and air control with relation to the passage leading into the combustion chamber, and flexible connections for conducting fuel oil and air to the head.

10. Oil burning apparatus comprising a supporting head having a tubular flange and a radial web extending therefrom, the tubular flange being provided with an opening therethrough, a tubular atomizing assembly journaled within the flange, a tubular air nozzle surrounding the atomizing assembly and connected to the flange, a hollow head casting adapted to enclose and receive a portion of the atomizing assembly together with the supporting head, threaded connection between the head casting and radial web, and a rotary sleeve valve journaled upon the tubular flange and serving to control the passage of air through the opening in the flange.

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