Feb. 20, 1923. 1,445,828

M. A. FESLER

BURNER

Filed Mar. 24, 1920 2 sheets-sheet 1

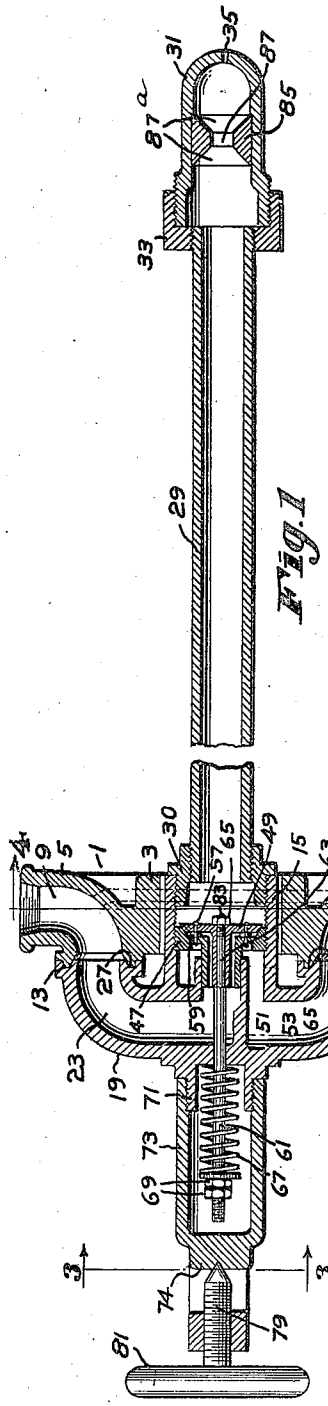


Fig. 1

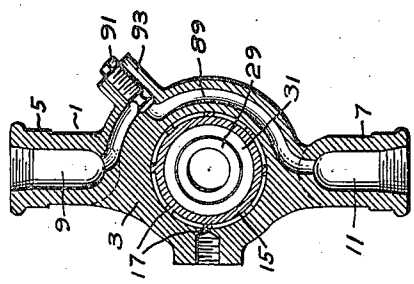


Fig. 4

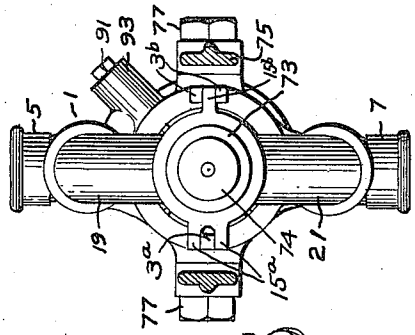


Fig. 3

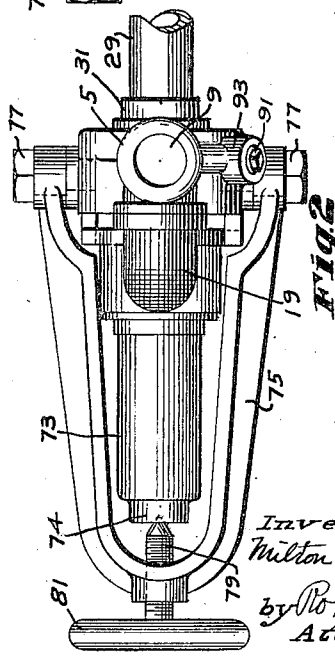


Fig. 2

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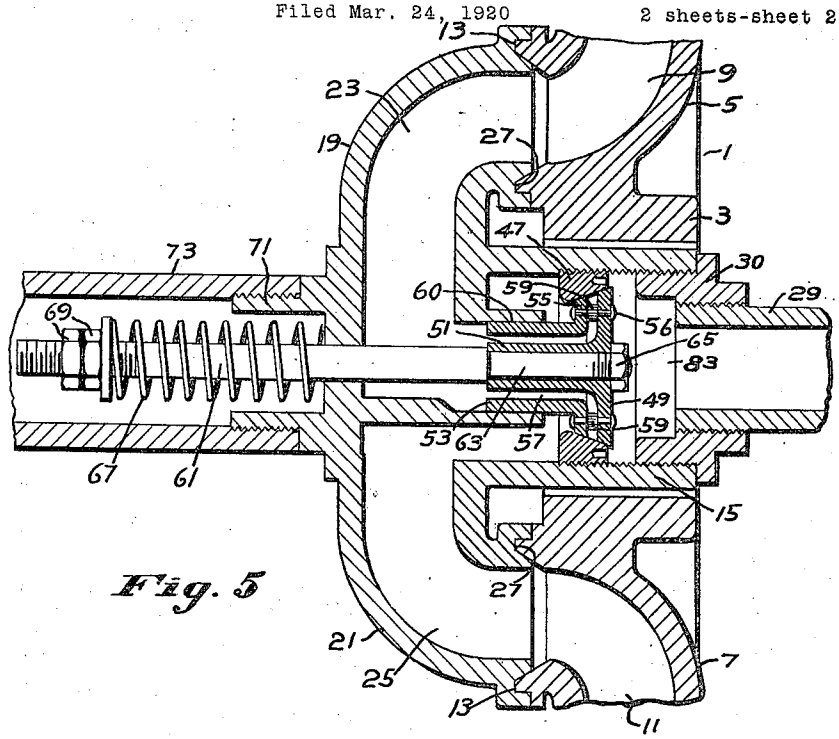


Fig. 5

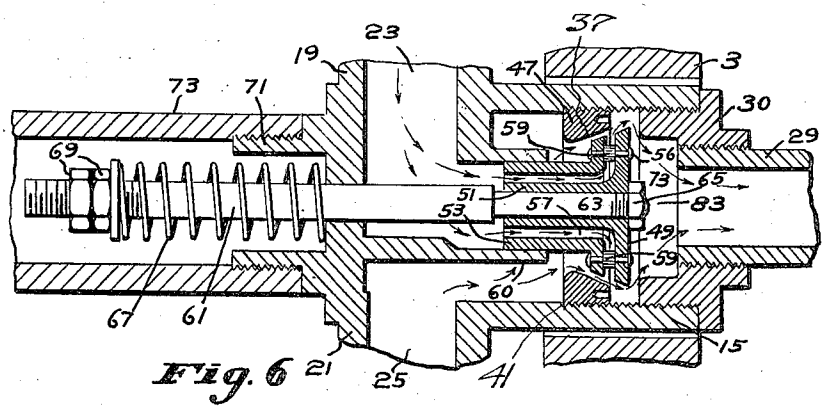


Fig. 6

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UNITED STATES PATENT OFFICE.

MILTON A. FESLER, OF OAKLAND, CALIFORNIA, ASSIGNOR TO PETROLEUM HEAT AND POWER COMPANY, A CORPORATION OF DELAWARE.

BURNER.

Application filed March 24, 1920. Serial No. 368,275.

To all whom it may concern:

Be it known that I, MILTON A. FESLER, a citizen of the United States, residing at Oakland, in the county of Alameda and State of California, have invented an Improvement in Burners, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

The invention to be hereinafter described relates to burners, and more particularly to burners using liquid fuel, such, for example, as crude oil.

Burners of this type usually comprise a liquid fuel conduit and a steam or compressed air conduit leading to a mixing chamber, in which the air or steam meets the liquid fuel and breaks up and atomizes the latter.

Heretofore, the mixing of the compressed air or steam has occurred adjacent to the nozzle or delivery end of the burner, and an excessive amount of air or steam has been necessary in order properly to atomize and break up the liquid fuel for efficient combustion effect. As a consequence, an excess amount of air or steam has been introduced into the combustion chamber of the furnace. Also, where steam is employed for atomizing the fuel, the excess amount of steam required for proper atomization of the fuel objectionably increases the steam consumption, and it follows that if the steam consumption is increased, the fuel consumption necessarily is increased.

One of the purposes of the present invention, therefore, is to provide a simple and efficient burner in which the amount of steam required for proper atomization of the liquid fuel is materially reduced with resultant important economies in steam and fuel consumption.

In carrying the invention into practical effect, the burner is so constructed that the oil or liquid fuel and the steam may meet at a point remote from the nozzle or delivery end of the burner, and therefore, the mixture of the two and atomization of the oil by the steam may occur while they are moving through the burner toward the delivery end thereof. This allows the steam time efficiently to atomize and break up the oil with a material reduction in the amount of steam required.

Another purpose of the invention is to provide a simple and efficient valve which may be located remotely from the delivery end of the burner to regulate the feed of the oil thereto. In the present instance of the invention, the construction is such that the valve is automatically moved from its seat by the pressure of the steam passing through the burner against a yielding or spring pressure, and the degree of opening of the valve will depend upon the volume of the steam passing the valve, so that a desirable automatic proportioning of the oil and steam may be obtained.

Another purpose of the invention is to provide a simple and efficient mounting for the burner, and oil and steam passages for the burner and mounting which may be readily connected on introduction of the burner to the mounting, and separated on removal of the burner from its mounting.

Another purpose of the invention is to provide means remote from the nozzle of the burner for producing a primary atomization of the liquid fuel, and means adjacent the nozzle for producing a secondary or further atomization of the fuel.

Another purpose of the invention is to provide simple and efficient means whereby on shutting down the burner prior to removal from its mounting, any residual oil in the oil passages of the burner may be blown therefrom by the steam.

With the aforesaid and other purposes in view, the character of the invention may be best understood by reference to the following description of one good form thereof shown in the accompanying drawings, wherein:

Fig. 1 is a longitudinal section through a burner shown herein as embodying the invention;

Fig. 2 is a plan of a portion of the construction shown in Fig. 1;

Fig. 3 is a vertical section taken on line 3—3 of Fig. 1;

Fig. 4 is a vertical section taken on line 4—4 of Fig. 1;

Fig. 5 on an enlarged scale is a sectional view of the valve construction showing the valve in closed position; and

Fig. 6 is a view similar to Fig. 5 showing the valve in its open position.

Referring to the drawings, the burner may be provided with a mounting of suit-

able construction, in the present instance, in the form of a union 1 having a sleeve 3 and arms 5 and 7 projecting diametrically oppositely therefrom and provided respectively with an oil conducting passage 9 and a compressed air or steam conducting passage 11. The outer ends of these arms are adapted to be connected with the pipe for conducting the oil or liquid fuel from its source of supply, and for conducting the compressed air or steam from its source of supply to the burner. These passages are curved rearward and provided with tapered rims 13 for a purpose to be described.

The burner, in the present instance of the invention, comprises a cylinder 15 adapted to fit into the mounting sleeve 3 referred to, and provided with longitudinal ribs 17 to facilitate ready insertion of the cylinder into and out of said sleeve. Projecting outwardly from the cylinder 15 are the arms 19 and 21 containing respectively an oil conducting passage 23 and a steam conducting passage 25. These passages are curved forwardly, and provided with grooves 27 adapted to receive the tapered rims 13 at the rear ends of the oil conducting passage 9 and the steam conducting passage 11. Suitable packing material may be introduced into said grooves to insure tight connection of the passages when the burner is secured to its mounting by means to be described.

Projecting forwardly from the cylinder 15 of the burner, a tube, gun or body 29 may be provided of substantial length, and conveniently secured to said sleeve by a collar 30 threaded to said tube and sleeve. The outer delivery end of the tube 29 may be provided with a nozzle 31 conveniently connected to the tube by a flanged collar 33 threaded to said nozzle and tube. At the outer end of the nozzle is an orifice 35 for delivering the oil and steam mixture from the burner, as more fully hereinafter described.

As stated, one of the purposes of the invention is to provide simple and efficient valve means located remotely from the delivery end of the burner for controlling the delivery of the fuel to the burner. This valve means, in the present instance of the invention, comprises a seat 37, preferably tapered, on a ring 47 which may be threaded to the inner surface of the cylinder 15. Before the collar 30 is screwed into the sleeve, the valve seat ring may be screwed therein until limited by its engagement with a shoulder 41 in said sleeve.

Co-operating with the valve seat is a valve, in the present instance, comprising a disk 49 having a hollow stem 51 projecting therefrom, the periphery of said disk being tapered to conform to the taper of the valve seat. Encircling the hollow stem 51 is an outer hollow stem 53 having a flange 55 projecting outwardly therefrom, and provided with a tapered periphery also for engagement with said seat. The flange 55 may be connected to the valve disk 49 by pins or rivets 56, said flange and disk being separated by spacing washers 59 on said pins or rivets. The construction is such that an annular oil conducting passage 57 is provided between the outer and inner stems, and between the flange and disk.

The oil conducting passage 23 may communicate with a neck 60 which may project somewhat into the cylinder 15. The outer stem 53 of the valve may fit into this neck so as to guide the valve in its movements to and from its seat, and to prevent entrance of steam into the oil conducting passage 23, as more fully hereinafter described.

Suitable means may be provided to urge the valve toward its seat. In the present instance of the invention, this means comprises a rod 61 having a reduced end 63 projecting through the inner hollow stem 51 and provided with a nut 65. When this nut is tightened, it will securely connect the valve to the rod. The latter may project rearwardly beyond the arms 19 and 21 to receive a coil spring 67 which may be confined between adjusting and securing nuts 69 on said rod, and the base of a socket 71 projecting rearwardly from said arms. The construction is such that the spring will tend to urge the valve to its seat.

The spring may be protected by a housing 73 having a closed end 74, and its opposite end threaded to the socket 71, the construction being such that the housing may be readily removed to permit access to the nuts 69 to effect variation of the tension of the spring as desired.

Suitable means may be provided to secure the burner to its mounting. To accomplish this, in the present instance, a yoke 75 may be pivotally mounted on screw bolts 77 threaded to opposite sides of projections on the mounting sleeve 3. A screw 79 may be threaded into the rear end of the yoke, and be adapted to engage the closed end 74 of the housing, said screw being provided with a hand wheel 81 to enable ready adjustment thereof. To facilitate presentation of the burner to the proper position on its mounting, the cylinder 15 may have a fork 15^a and a lug 15^b thereon adapted respectively to engage a lug 3^a and a fork 3^b projecting from the sleeve 3. The construction is such that when it is desired to introduce the burner into its mounting, the arms 19 and 21 may be grasped and presented to the arms 5 and 7 and the fork 15^a and lug 15^b of the cylinder may respectively engage the lug 3^a and fork 3^b of the sleeve. The forks and lugs will insure positioning of the burner

so that the oil and steam passages of the burner will register respectively with the oil and steam passages of the mounting. Then the yoke may be rocked to its position shown in Fig. 2, and the hand screw 79 may be adjusted inward against the housing end 74. As a result, the burner arms 19 and 21 will be pressed against the burner arms 5 and 7 respectively, and the tapered rims 13 will be pressed into the grooves 27 so as to prevent any possibility of leakage between them. Thus, the burner will be securely locked in its mounting in readiness for use. When it is desired to remove the burner from its mounting, it is merely necessary to release the hand screw 79, swing the yoke 75 to one side, and then the housing 73 may be grasped, and the burner may be pulled rearward out of its mounting.

When the burner is placed in its mounting in firing position, the usual valves are opened in the oil and steam supply pipes connected to the mounting arms 5 and 7 respectively. The steam will flow through the passages 11 and 25 and press against the rear face of the valve flange 55, thereby moving the valve from its seat against the opposition of the spring 67. The oil will flow from the passages 9 and 23 through the annular passage 57 in the valve, and outwardly in the path of the steam. The two will meet in the mixing chamber 83 directly in front of the valve, the construction being such that the oil and the steam will be effectively atomized by the latter. The atomization of the oil by the steam will progress and increase in the transit of the mixture through the tube 29 toward the nozzle.

Suitable means may be provided further to atomize the oil prior to its delivery from the nozzle. This means, in the present instance, is in the form of a ring 85 fitted into and secured to the nozzle 31, and having an orifice 87 substantially smaller than the internal diameter of the nozzle. The ring may have counterbores 87ª tapered toward the orifice 87. The construction is such that the mixture on reaching the ring will be deflected inward through the orifice, thereby causing the steam more thoroughly to commingle with the oil and effect further atomization thereof. The mixture after passing through the orifice 87 flows through the delivery orifice 35 into the combustion chamber of the furnace.

The construction of the valve means is such that it tends to produce efficient commingling and atomization of the oil by the steam, and since the valve means is located remotely from the delivery end of the burner, and the mixture has substantial length of travel in passing from the valve means to the delivery end of the burner, the steam has sufficient time thoroughly to break up and atomize the oil, and the primary atomization thus effected may be increased by the secondary atomization produced by the orifice ring 85 as the mixture passes therethrough. The thorough atomization of the oil thus obtained prior to the delivery of the mixture from the nozzle, enables substantial reduction in the amount of steam required to effect the proper atomization. Thus, an important economy in steam consumption is obtained, and an important economy in the amount of fuel required in producing the steam.

Suitable means may be provided to drive out residual oil from the oil conducting passages 13, 23, and from the tube 29 and nozzle preparatory to shutting down the burner. To accomplish this, in the present instance, the mounting may be provided with a by-pass passage 89 (Fig. 4) leading from the steam passage 11 to the oil passage 9. A valve 91 may be tapped in a boss 93 on said sleeve, and serve to open or close the by-pass passage 89 as desired. When it is desired to shut off the burner, the usual valve in the pipe leading to the oil conducting passage 9 is closed, and the by-pass valve 91 is opened, thereby allowing steam to flow from the passage 11 around through the by-pass 89 into the oil passage 9, and drive any residual oil from the passages 9, 23, the tube 29 and the nozzle 31.

Since the valve for controlling the supply of oil is located in the burner at a point remote from the nozzle, it does not experience the high temperature of the furnace, and the liability of clogging the valve and other parts by carbonization of the oil is reduced to a minimum. Also, the parts of the valve will not be alternately subjected to high and low temperatures on firing and ceasing firing, and therefore, said parts will not experience expansion and contraction from heating and cooling such as would be liable to deform or injure the same and prevent proper operation thereof.

The annular passage in the valve is such that the oil is delivered outwardly throughout the periphery of the valve, and is thereby desirably distributed into the steam which flows between the valve and its seat throughout the periphery thereof. The area of the valve subjected to the steam pressure is ample, and therefore, the steam may readily unseat the valve without requiring pressure as high as has heretofore been necessary. It will be noted that the tube 29 extending from the valve to the nozzle is contracted or is smaller in diameter than the mixing chamber 83. This will tend to deflect the oil and steam mixture inward from the periphery of the valve, and contribute to the thorough mixing of the two and atomization of the oil, and will also add to

the velocity of the mixture in its transit through the tube to the nozzle.

When the volume of the steam passing the valve is increased, the valve will open wider and the volume of the oil passing the valve will be increased, and when the steam volume is reduced, the yileding or spring pressure on the valve will reduce the valve opening and the volume of oil will be decreased, but the velocity of the steam passing the valve will remain substantially constant within the limits of normal variations in the steam volume passing the valve for working conditions. As a consequence, the atomizing effect of the steam on the oil may be maintained substantially constant within the variations in volume of oil and steam delivered under normal working conditions.

The construction enables ready access to the valve and the seat for the purpose of adjustment, repair or replacement thereof. To accomplish this it is merely necessary to unscrew the collar 30 from the tube 29 and sleeve 15, thereby exposing the valve and seat within the latter.

Since less steam pressure is required thoroughly to atomize the oil than heretofore has been necessary, there will be no danger of projecting the flame of the burner so far in the combustion chamber as to throw unatomized particles of the oil on the water tubes of the boiler. It is well known that if such particles are thrown onto the water tube, they are liable to create conditions which utlimately will result in forming a burn, blister or bag on the water tube.

It will be understood that the invention is not limited to the specific embodiment shown, and that various deviations may be made therefrom without departing from the spirit and scope of the appended claims.

What is claimed is:—

1. In a fuel oil burner, the combination of a casing provided with a delivery orifice, a mixing chamber located remotely from said orifice, a long conduit extending from said chamber to said orifice, and oil and steam passages leading to said mixing chamber; a valve seat adjacent the delivery ends of the oil and steam passages, and a spring-pressed valve for closing both said passages opened by pressure of the steam to admit oil and steam from said passages to said mixing chamber.

2. In a fuel oil burner, the combination of a casing provided with a delivery orifice, a mixing chamber located remotely from said orifice and oil and steam passages leading to said mixing chamber; a seat adjacent said mixing chamber, a valve having a hollow stem slidably mounted in said oil passage, spring means tending to seat said valve, the latter being opened by pressure of steam in said steam passage, and a conduit for conducting the intermingled oil and steam from the mixing chamber to the delivery orifice.

3. In a fuel oil burner, the combination of a gun, a sleeve detachably secured to said gun and having separate oil and atomizing fluid passages therein, a valve seat removably mounted in said sleeve, valve means cooperating with said seat for controlling the delivery of oil and atomizing fluid to the gun from said passages, and means for subjecting said valve means to the pressure of the atomizing fluid to open said valve means.

4. In a fuel oil burner, the combination of a gun having a delivery opening, means to conduct oil and steam to said gun, valve means within the path of travel of the steam and adapted to open in response to the pressure of steam thereagainst and deliver oil and steam to said gun, and means automatically to vary the opening of the valve means and maintain the velocity of the steam passing the same substantially constant under normal working conditions.

5. In a burner, the combination of a casing having oil and steam conducting passages, a valve seat adjacent the delivery ends of said passages, a valve having a port therein for conducting the oil from the oil passage toward said seat, and spring means tending to close said valve, the latter being positioned to be acted upon by the steam and adapted to open in response to steam pressure thereon to allow delivery of the oil from the valve port and the delivery of steam from the steam passage past said valve seat.

6. In a burner, the combination of a casing having oil and steam conducting passages, a valve seat adjacent the delivery end of said passage, a valve for controlling the flow of oil and steam guided by the oil conducting passage and having a port therein for conducting the oil from said passage, and spring means tending to close said valve, the latter being adapted to open and regulate the delivery of oil and steam from said passages in accordance with variations in the pressure of the steam on said valve.

7. In a burner, the combination of a mounting having oil and atomizing fluid conducting passages and a gun, a casing removably connected as a unit to said mounting, said casing having oil and atomizing fluid conducting passages adapted to register respectively with the oil and atomizing fluid conducting passages of said mounting, a valve seat mounted in said casing adjacent the delivery ends of the oil and atomizing fluid conducting passages in said casing, and a valve co-operating with said seat to control the delivery of oil and steam through the opening between the valve and seat.

8. In a burner, the combination of a gun having oil and atomizing fluid conducting passages, a valve seat mounted in the atomizing fluid conducting passage, and a valve

co-operating with said seat having provision for conducting the oil from the oil conducting passage to the opening between the valve and its seat, said valve when closed being adapted to shut off the supply of oil and atomizing fluid to the delivery end of the burner.

9. In a burner, the combination of a casing having oil and atomizing fluid conducting passages therein, a valve seat mounted in the atomizing fluid conducting passage, and a valve having a port therein disposed to conduct the oil from the oil conducting passage outward toward said seat in the path of the atomizing fluid passing between said valve and seat.

10. In a burner, the combination of a casing having oil and atomizing fluid conducting passages therein, a valve seat mounted in the atomizing fluid conducting passage, a valve having a port therein disposed to conduct the oil from the oil conducting passage outward toward said seat in the path of the atomizing fluid passing between said valve and seat, and spring means tending to close the valve toward its seat and yieldable to allow opening of the valve in response to pressure of the atomizing fluid thereon.

11. In a burner, the combination of a casing having oil and atomizing fluid conducting passages having delivery portions, one of the latter encircling the other, a valve seat, a valve co-operating with said seat having a part guided by one of said passage portions and having a port for conducting the oil toward the periphery of the valve, and spring means tending to move the valve toward its seat.

12. In a burner, the combination of a casing having an oil conducting passage and a steam conducting passage having a portion encircling the delivery end of the oil conducting passage, a valve seat mounted in the steam conducting passage adjacent the delivery end of the oil conducting passage, and a valve co-operating with said seat having an annular port for conducting the oil outwardly through the valve into the path of the steam delivered through the opening between the valve and its seat.

13. In a burner, the combination of a casing having oil and steam conducting passages, and a delivery orifice, valve means mounted in said casing remotely from said orifice for controlling the oil and steam, and an orifice member located intermediate said delivery orifice and valve means for promoting mixture of the oil and steam.

14. In a burner, the combination of a gun having a delivery orifice, a casing having oil and steam conducting passages therein, means detachably to secure said casing to the rear end of the gun, a valve seat in said casing adjacent the rear end of said gun, a valve co-operating with said seat for controlling the delivery of oil and steam from said casing into said gun, and spring means tending to move said valve toward its seat.

15. In a burner, the combination of a gun having a delivery end and a rear end, a casing having oil and steam conducting passages therein, valve means mounted in said casing for controlling the delivery of oil and steam from said passages into said gun, and means detachably to secure said casing to said gun.

16. In a burner, the combination of a casing having oil and steam conducting passages therein, a mixing chamber, a valve seat in said casing adjacent said chamber, and an oil and steam supply control valve co-operating with said seat having provision for conducting the oil from said oil passage to the steam delivered between said valve and seat.

17. In a burner, the combination of a gun, a casing secured to said gun having oil and steam conducting passages therein leading to said gun, valve means for controlling the delivery of oil and steam from said passages into said gun, and means to by-pass the steam from the steam passage through the oil passage to drive residual oil from the latter.

18. In a fuel oil burner, the combination of a casing provided with a delivery orifice, a mixing chamber located remotely from said orifice, a long conduit extending from said chamber to the orifice, conduits for conducting fuel and fluid to the mixing chamber, a valve for closing both conduits and movable to open position by the pressure of the fluid in its conduit against the valve, and spring means tending constantly to close the valve but yieldable in response to the pressure of the fluid to open and allow discharge of the fuel and fluid to the mixing chamber.

In testimony whereof, I have signed my name to this specification.

MILTON A. FESLER.