Feb. 9, 1926. 1,572,470

C. A. DIEHL

OIL BURNER

Filed May 5, 1925

Fig. 1.

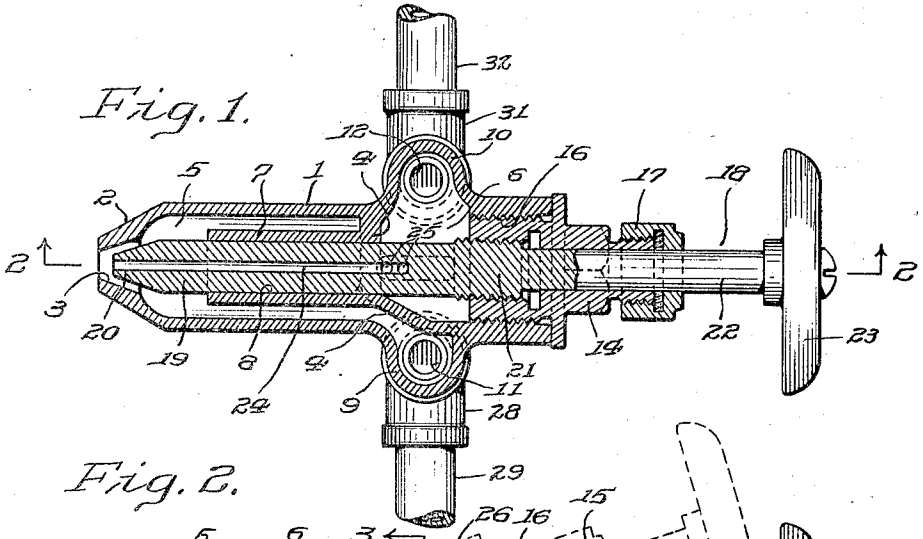


Fig. 2.

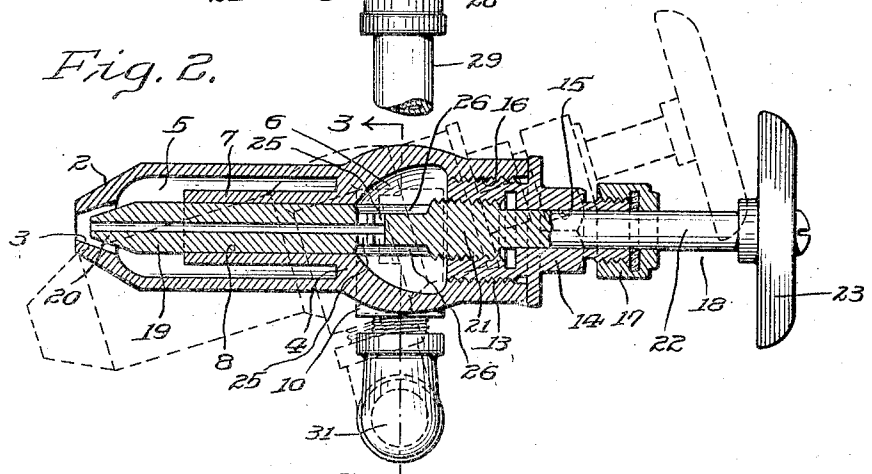
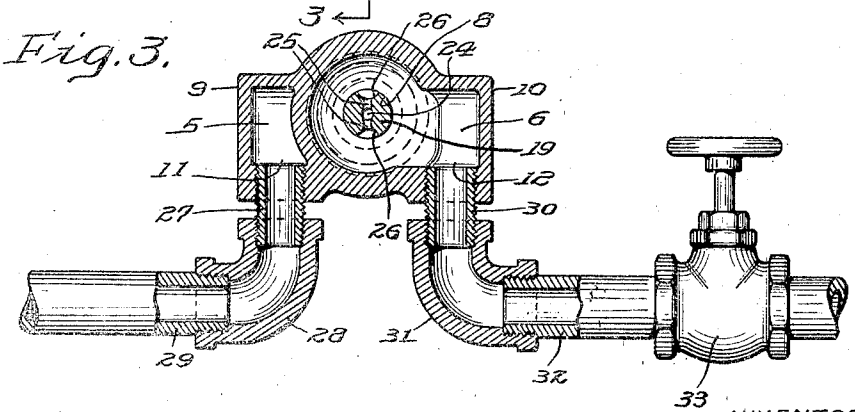


Fig. 3.



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UNITED STATES PATENT OFFICE.

CHRISTIAN A. DIEHL, OF CAMDEN, NEW JERSEY.

OIL BURNER.

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To all whom it may concern:

Be it known that I, CHRISTIAN A. DIEHL, a citizen of the United States, and a resident of the city of Camden, in the county of Camden and State of New Jersey, have invented certain new and useful Improvements in Oil Burners, of which the following is a specification.

My invention relates to oil burners and particularly such burners as are generally used for burning brick, firing boilers and for heating metallurgical furnaces, wherein the service should be uninterrupted so far as possible, and has for its objects the provision of means whereby the direction of the flame may be changed in order to apply it to a particular point or spot. This feature is of particular use in brick kilns in the burning of brick, because if heat be not applied at a certain place or point in the kiln some of the resulting bricks will not be properly colored.

A further object of my invention is to provide an oil burner which is simple in construction and inexpensive to make, which may be readily adjusted or controlled while operating, and in which the adjustments and controls are remote from the hot end.

Further objects of my invention will appear in the specification and claims below.

In the drawings forming a part of this specification and in which the same reference characters are employed throughout the various views to designate the same parts,

Fig. 1 is a horizontal sectional view through the center of the burner.

Fig. 2 is a vertical sectional view on the line 2—2 of Fig. 1, showing in dotted lines, the way in which the burner may be adjusted to different positions; and

Fig. 3 is a vertical sectional view on the line 3—3 of Fig. 2.

My improved valve comprises an outer casing 1 which in general is cylindrical in shape, the forward end 2 whereof is tapering and is provided with a tapering passage 3 forming the nozzle through which the atomized mixture of oil and steam or air are discharged and also forming a valve seat to cooperate with the valve stem, hereinafter described, for regulating the amount of steam or air to be discharged therethrough.

The casing 1 is provided with a transverse wall or partition 4 dividing the interior of the casing 1 into a forward chamber or compartment 5 and a rear chamber or compartment 6.

I preferably provide the wall or partition 4 with a sleeve 7 having a cylindrical bore 8 therethrough in alinement with the axis of the nozzle 3, said sleeve 7 extending from said wall or partition 4 forwardly toward the nozzle 3 longitudinally in the forward chamber 5 for a considerable distance. On diametrically opposite sides of the casing 1 I provide hollow projections 9 and 10, the projection 9 forming an enlargement of the chamber 5 and the projection 10 forming an enlargement of the liquid fuel chamber 6. The projection 9 is provided on the underside thereof with a screwthreaded inlet opening 11 for the admission of compressed air or steam to the chamber 5 and the projection 10 is similarly provided with a screwthreaded inlet opening 12 for the admission of the liquid fuel to the chamber 6. The axes of the inlets 11 and 12 are preferably in a plane normal to the axis of the casing 1.

The rear end of the cylindrical casing 1 is preferably provided with screwthreads 13 into which may be threaded a cap or closure 14 which is provided with an axial cylindrical bore 15 therethrough in alinement with the axis of the nozzle 3. The inner end of the bore 15 communicates in the screwthreaded recess 16 coaxial therewith and is preferably of larger diameter than the bore 15. The outer or rear end of said cap or closure 14 is provided with a stuffing box or gland 17.

Mounted within said casing 1 and cap 14 is the valve stem 18. The forward portion 19 of said valve stem 18 is cylindrical and smoothly fits within the cylindrical bore 8 through the sleeve 7 and the forward extremity 20 of said valve stem 18 is preferably tapered or conical to fit against the tapering valve seat 3 forming the nozzle of the casing 1.

Said valve stem 18 is also preferably provided with a screwthreaded portion 21 adapted to fit into the screwthreads in the recess 16 of the cap or closure 14. The portion 22 of the valve stem 18 to the rear of the screwthreaded portion 21 is cylindrical and fits the bore 15 and the stuffing box 17. A handwheel 23 is preferably secured to the rear end of the valve stem.

The forward cylindrical portion 19 of the valve stem 18 is provided with an axial bore 24 extending from the forward end thereof rearwardly to a point adjacent the screw-

threaded portion 21 and the rear end of said bore 24 communicates through one or more transverse passages 25 through the valve stem with the oil chamber 6. Preferably the valve stem is provided with longitudinal grooves 26 in registration with the ends of the transverse holes 25 through the valve stem.

Into the inlet opening 11 is fitted a piece of piping 27 the lower end of which is connected by an elbow 28 with an air or steam supply pipe 29 preferably disposed in a plane at right angles to the axis of the casing 1 and similarly into the screwthreaded opening 12 is threaded a pipe 30, the lower end of which is connected by an elbow 31 with an oil supply pipe 32, the axis of which is preferably in alinement with the axis of the pipe 29.

The cylindrical portion 19 of the valve stem 18 does not tightly fit in the long sleeve but is free to be rotated and to be moved longitudinally therein. Said sleeve provides a smooth firm support for the valve stem 17 to maintain it in alinement with the nozzle 3. It fits closely enough to prevent any substantial flow of the thick fuel oil from the chamber 6 into the chamber 5 between the outer surface of the cylindrical portion 19 and the inner surface of the bore 8.

I preferably provide the oil supply pipe 32 with a valve 33 to control the supply of oil to the burner and to cut it off from the burner when necessary. The oil in the pipe 32 may be and preferably is under a pressure sufficient to force it in a stream through the bore 24 of the stem 18.

Assuming the nozzle 3 to be closed by the tapering end 20 of the valve stem 18 and the oil supply valve 33 to be closed, in order to start the burner, the oil supply valve 33 is first opened and then the handwheel 23 is turned to draw the tapered end 20 of the valve stem 18 away from the conical tapering seat or passage 3 whereupon air or steam under pressure from the pipe 29 will flow through the air inlet passage 11 into the forward chamber or compartment 5 and then forwardly around the tapering end 20 and out of the nozzle 3, drawing with it and atomizing the oil supplied from the oil supply pipe 30 through the rear chamber 6, through the passages 25, through the bore 24 of the valve stem. Air and liquid fuel or steam and liquid fuel will be discharged from the nozzle 3 in a thoroughly mixed condition so that the mixture may be ignited and will thereafter continue to burn freely so long as the oil and air or steam are supplied to the burner. The amount of air permitted to flow through the nozzle 3 can be carefully and accurately adjusted after the burner has been put into operation, because the control and adjustment of the nozzle is in the rear of the valve remote from the heated end.

In order to tilt the burner to direct the flame to the proper point in the kiln or furnace, it is only necessary to turn the casing about the alined axes of the pipes 29 and 32. The elbows 28 and 31 will turn on their screwthreaded connections with the said pipes 29 and 32 sufficiently to permit any reasonable adjustment or tilt of the burners and the friction of the threaded connection between said elbows and pipe is sufficient to maintain the burner in any position to which it may be adjusted.

It is to be noted that the adjusting portions of my improved burner (the screwthreaded portion 21 of the stem and the threaded recess 16 of the cap) are remote from the hot end of the burner where they may be maintained at a substantially constant low temperature during the operation of the burner. These adjusting portions of the valve are kept at a low temperature by the cool incoming fuel and air, when air is used as the atomizing fluid, and they are maintained at a temperature substantially lower than that of steam, when steam is used, because the cold incoming oil fuel constantly surrounds the stem adjacent the screwthreads and contacts with the inner end of the screwthreaded cap or closure 14. This feature permits the operator to effect a very careful and accurate adjustment of the stem 18 with respect to the nozzle 3 and obviates, to a great extent, that frequent readjustment of the stem, required in the operation of those fuel burners wherein the adjusting threads are adjacent the heated end of the burner and are subjected to the intense heat and more variable temperatures of the furnace, kiln or firebox. After the burner has once been well started the adjusting portions of the burner are maintained at a substantially even and relatively low temperature, and seldom require a resetting or readjustment.

As above referred to the diameter of that portion of the stem passing through the cylindrical bore 8 of the sleeve 7 is slightly smaller than the diameter of the bore but the space is so narrow as to prevent the flow of oil between the stem and the bore by reason of the friction of the heavy oil with the sleeve and stem and also the pressure of the air or steam in the chamber 5. The volume of oil between the sleeve and stem 6 forms a substantial packing around the stem and obviates the necessity of the use of a stuffing box or gland between the stem and the sleeve and the long bearing between the stem and the sleeve and performs all the functions of a stuffing box and maintains the stem in axial alinement with the nozzle opening 4. The grooves or recesses 26 in the stem are operative to prevent the

closure of the holes or transverse passages 25 between the bore 24 and the fuel chamber 6 when the valve 20 is on the seat 3 and holes 25 are within or partly within the sleeve 7.

Having thus described my invention, what I claim and desire to protect by Letters Patent of the United States is:

1. In a liquid fuel burner, the combination of a casing, a partition therein dividing said casing into a forward fluid pressure chamber and a rear liquid fuel chamber, said chambers being provided with inlet openings disposed symmetrically on opposite sides of the axis of said casing, said fluid pressure chamber being provided at its forward end with a nozzle opening forming a valve seat, a sleeve in said casing integral with said partition extending forwardly toward said nozzle opening through said fluid pressure chamber and having a smooth cylindrical bore in alinement with said nozzle opening, a cap or closure closing the rear end of said casing, a valve stem extending through said chambers and through said cap and through said cylindrical bore, its forward end forming a valve member to cooperate with said valve seat and having an axial bore extending from the forward end thereof to said fuel chamber, a screw-threaded connection between said stem and said cap, a handwheel secured to the rear end of said stem, a fluid supply pipe and a fuel supply pipe disposed in alinement with each other and respectively communicating with the nozzles in said chambers and on which pipes said casing is mounted to be turned as on a friction pivot.

2. In a liquid fuel burner, the combination of a casing, a partition therein dividing said casing into a forward fluid pressure chamber and a rear liquid fuel chamber, said chambers being provided with inlet openings disposed symmetrically on opposite sides of the axis of said casing, said fluid pressure chamber being provided at its forward end with a nozzle opening forming a valve seat, a sleeve in said casing integral with said partition extending forwardly toward said nozzle opening through said fluid pressure chamber and having a smooth cylindrical bore in alinement with said nozzle opening, a cap or closure closing the rear end of said casing, a valve stem extending through said chambers and through said cap and through said cylindrical bore, its forward end forming a valve member to cooperate with said valve seat and having an axial bore extending from the forward end thereof to said fuel chamber, a screw-threaded connection between said stem and said cap, a handwheel secured to the rear end of said stem, a fluid supply pipe and a fuel supply pipe disposed horizontally in alinement with each other and respectively communicating with the nozzles in said chambers and on which pipes said casing is mounted to be turned as on a friction pivot in a vertical plane.

3. In a liquid fuel burner, the combination of a casing, a partition therein dividing the interior of said casing into a forward fluid pressure chamber and a rear liquid fuel chamber, said fluid pressure chamber being provided at its forward end with a coaxially disposed nozzle opening forming a valve seat, a sleeve in said casing integral with said partition and extending forwardly through said fluid pressure chamber to a point near said nozzle and having a smooth cylindrical bore in alinement with said nozzle opening, a cap or closure closing the rear end of said casing, a valve stem extending through said chambers and through said cap and through said bore in said sleeve and having its forward end forming a valve member to cooperate with said valve and having an axial bore extending from the forward end thereof rearwardly and communicating with said fuel chamber, a screw-threaded connection between said stem and said cap, and a handwheel on the rear end of said stem, the diameter of said stem passing through said bore in said sleeve being slightly smaller than the diameter of said bore whereby a film of oil from said oil chamber fills the space between said stem and said bore but does not substantially flow through said space into said fluid pressure chamber.

4. In a liquid fuel burner, the combination of a casing, a partition therein dividing the interior of said casing into a forward fluid pressure chamber and a rear liquid fuel chamber, said fluid pressure chamber being provided at its forward end with a coaxially disposed nozzle opening forming a valve seat, a sleeve in said casing integral with said partition and extending forwardly through said fluid pressure chamber to a point near said nozzle and having a smooth cylindrical bore in alinement with said nozzle opening, a cap or closure closing the rear end of said casing, a valve stem extending through said chambers and through said cap and through said bore in said sleeve and having its forward end forming a valve member to cooperate with said valve and having an axial bore extending from the forward end thereof rearwardly and communicating with said fuel chamber, a screwthreaded connection between said stem and said cap, and a handwheel on the rear end of said stem, the diameter of said stem passing through said bore in said sleeve being slightly smaller than the diameter of said bore whereby said stem in firmly supported and guided by said sleeve and whereby the oil between said stem and said sleeve forms a

packing to prevent the flow of oil through said space into said fluid pressure chamber.

5. In a liquid fuel burner, the combination of a casing, a partition therein dividing the interior of said casing into a forward fluid pressure chamber and a rear liquid fuel chamber, said fluid pressure chamber being provided at its forward end with a coaxially disposed nozzle opening forming a valve seat, a sleeve in said casing integral with said partition and extending forwardly through said fluid pressure chamber to a point near said nozzle and having a smooth cylindrical bore in alinement with said nozzle opening, a cap or closure closing the rear end of said casing, a valve stem extending through said chambers and through said cap and through said bore in said sleeve and having its forward end forming a valve member to cooperate with said valve and having an axial bore extending from the forward end thereof rearwardly and communicating with said fuel chamber, a screwthreaded connection between said stem and said cap, and a handwheel on the rear end of said stem, the difference between the diameters of said bore and of the portion of the stem fitting therein being such as to permit oil from said fuel chamber to fill the space between them but small enough to prevent the flow of oil through said space into said fluid pressure chamber.

In witness whereof, I have hereunto set my hand this fourth day of May, 1925.

CHRISTIAN A. DIEHL.