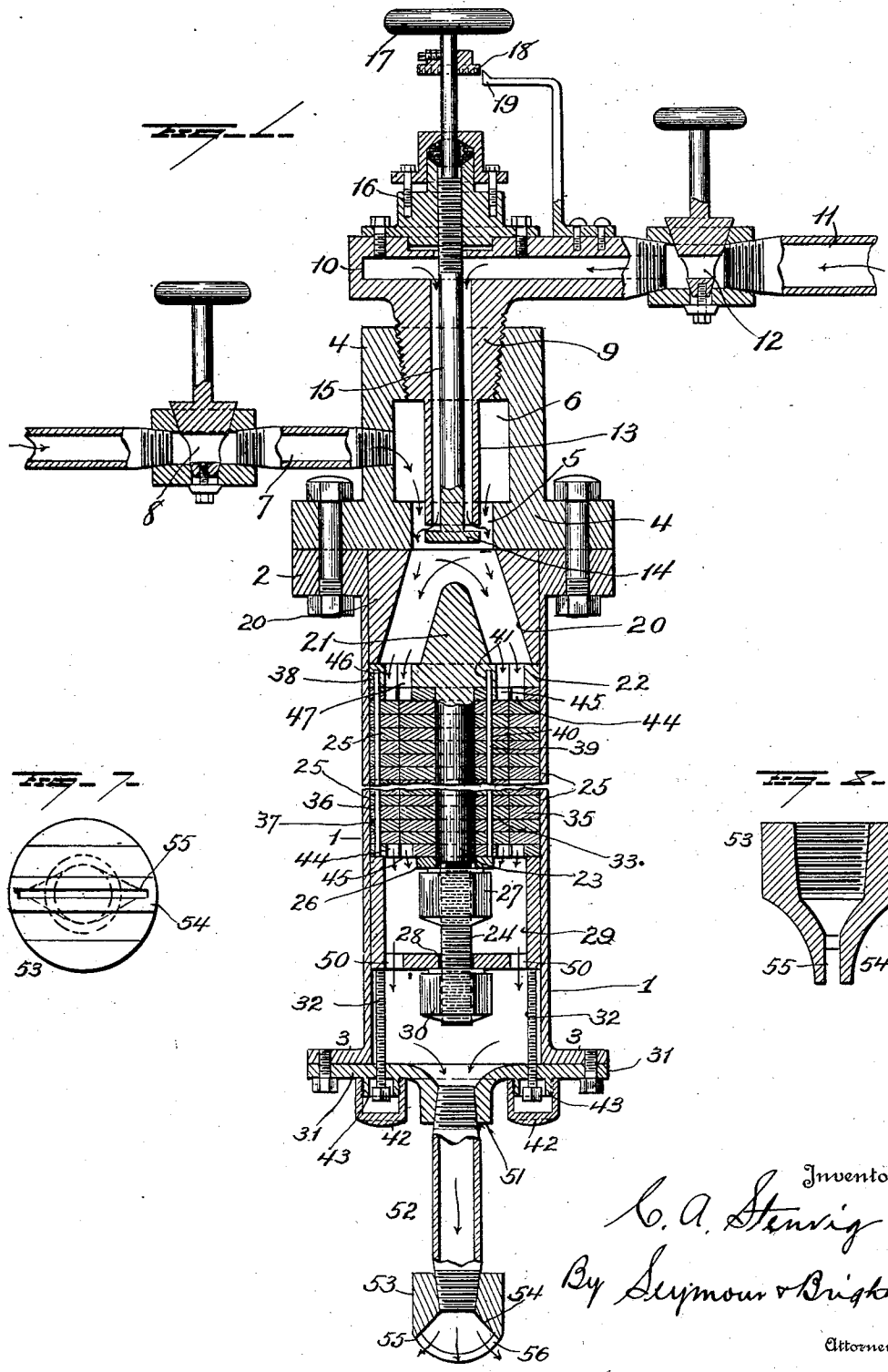
Jan. 7, 1930. C. A. STENVIG 1,742,732

OIL BURNER

Filed June 4, 1926 2 Sheets-Sheet 1



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Fig. 2.

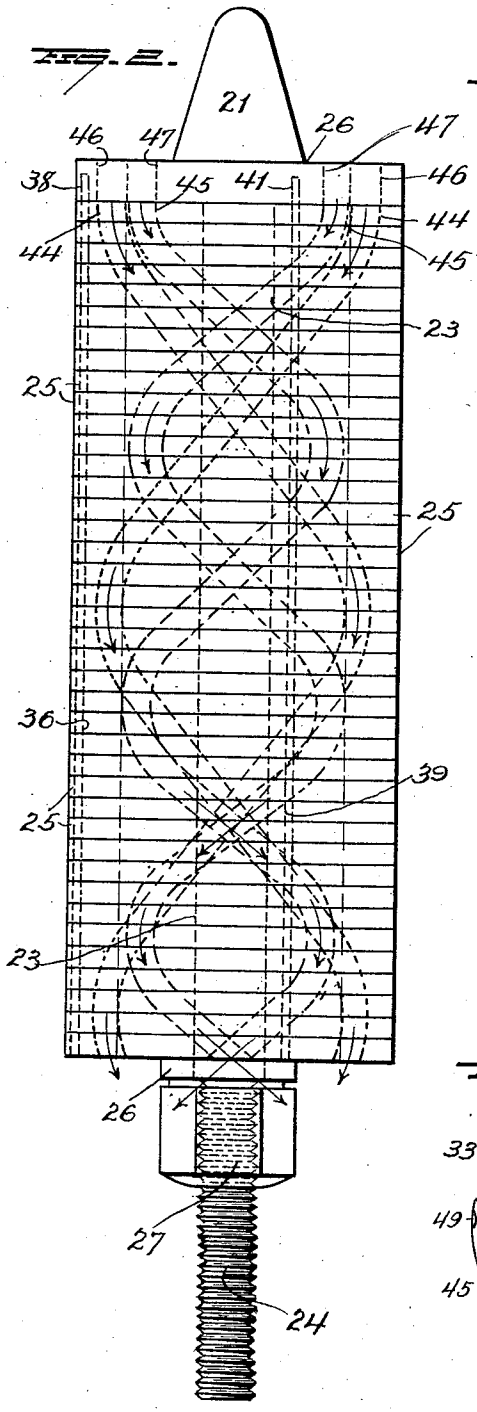


Fig. 3.

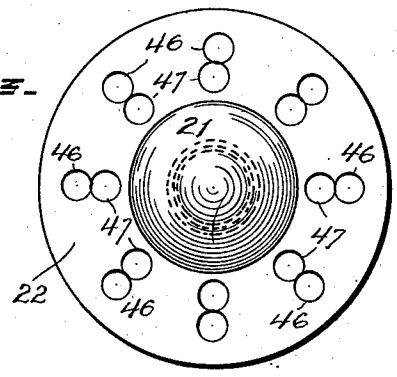


Fig. 4.

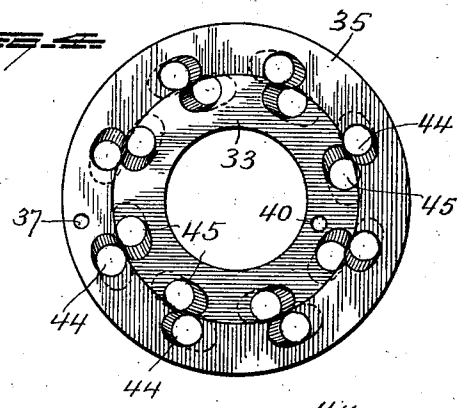


Fig. 5.

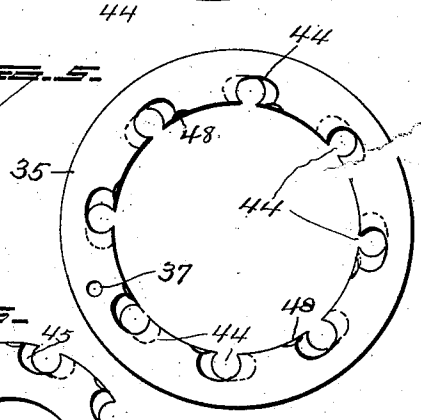
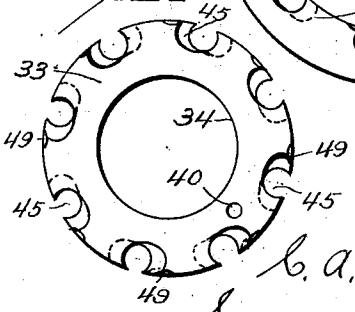


Fig. 6.



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UNITED STATES PATENT OFFICE

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OIL BURNER

Application filed June 4, 1926. Serial No. 113,645.

This invention relates to means for utilizing crude oil as fuel in heating apparatus and has special reference to the means for atomizing the fuel as it flows to the point of ignition. The object of the invention is to provide a novel construction and arrangement whereby the oil and an atomizing agent will be caused to flow in opposed spiral paths to emerge in a fine vapor which readily ignites and will burn without forming smoke and depositing soot or carbon. The invention also seeks to provide a burner which will be compact and in which the parts may be easily assembled or disassembled. The invention is illustrated in the accompanying drawing and will be hereinafter fully described, the novel features being particularly defined in the appended claims.

In the drawings, Figure 1 is a longitudinal section of an apparatus embodying the invention;

Figure 2 is an elevation of the structure whereby the spiral paths are formed;

Figure 3 is a detached view of the spreader end plate;

Figure 4 is a view of one of the path-forming plates;

Figures 5 and 6 are views showing the plate rings separated, and

Figures 7 and 8 are views of the nozzle.

The main body of the device is a cylinder 1 provided with annular flanges 2, 3, at its ends. To the flange 2 is bolted a head 4, as shown, said head having an opening 5 in its inner end establishing communication between the interior of the cylinder and a chamber 6 in the head. In one side of the head is secured an end of a pipe 7 which is equipped with a cut-off and regulating valve 8 and delivers an atomizing agent or pressure fluid, as steam or compressed air, to the chamber 6. In the outer end of the head is secured the lateral nipple or branch 9 of an elbow or coupling 10 through which fuel under pressure is delivered to the cylinder 1 from a fuel supply pipe 11, a cut-off valve 12 being provided in said pipe, as will be understood. The branch 9 is provided with a reduced extension 13 which extends through the chamber 6 and terminates within the outlet opening 5 of the head, as shown. Over the terminal of the extension 13 is arranged a disk valve 14 and the stem 15 of this valve extends through the extension 13, the branch 9, the outer side of the coupling 10, and a stuffing box 16 on the outer side of the coupling the stem having threaded engagement with the bore of the stuffing box and being equipped with a handle 17 on its outer end whereby it may be rotated. Obviously, when the stem is rotated, its threaded mounting will cause it to move longitudinally and thereby set the valve 14 closer to or farther from the end of the fuel inlet extension 13 to control the volume of oil passing to the cylinder, it being noted that the diameter of the valve is substantially equal to the external diameter of the fuel inlet 13 so that the fuel is discharged radially and the steam or air, flowing along the inlet will meet the oil at a right angle to break it up and blow it into the cylinder. The fuel will emerge from between the disk valve 14 and the end of the inlet 13 in a thin stream so that it may be readily atomized, and, that the adjustment of the valve may be known, a graduated collar 18 is secured upon the stem in position to cooperate with a pointer 19 secured to and projecting from the coupling 10 or other convenient fixed support.

In the end of the cylinder 1 presented to the head 4 is a ring 20 having its bore flared inwardly and alined axially with the opening 5, and arranged concentric with the ring is a tapered spreader or deflector 21 which projects centrally from a plate 22 which fits snugly within the cylinder against the inner edge of the ring 20. Extending centrally from the inner side of the plate 22 is a rod 23 which constitutes a support for the path-forming plates and has its free end 24 reduced and externally threaded. The path-forming plates 25 may be provided in any desired number and are held upon the rod and clamped against the plate 22 by a washer 26 and a nut 27 mounted on the rod, as shown. Beyond the nut 27, the threaded end of the rod passes through a central smooth-bored opening 28 in a head 29 and a nut 30 is mounted on the rod to be turned home against said head which is in the form of a large thimble

or circular shell bearing at its open end against the end plate 25 so that when the nut 30 is turned home, the head will be driven against the plates which will then be clamped between the head and the plate 22. A cap plate 31 is bolted to the flange 3 and extends over the end of the cylinder. Long cap bolts 32 are mounted in the cap plate 31 and bear against the head 29 so as to secure the latter in the cylinder and maintain the plates 25 and 22 firmly clamped against the ring 20 and said ring against the head 4.

Each path-forming plate consists of an inner thin flat disk 33 having a central opening 34 whereby it may be fitted on the rod 23, and an outer flat-sided ring 35 fitting snugly around the disk and within the cylinder. The plates, each consisting of an inner disk and an outer ring are arranged side by side upon the rod 23 and in contact so that leakage between them will be avoided, and they are kept in axial alinement by a rod 36 inserted through openings 37 in the rings 35 into a socket 38 in the plate 22, and by a similar rod 39 inserted through openings 40 in the disks 34 into a socket 41 in the plate 22. It will be noted that the washer 26 projects over the end of the rod 39 and the edge of the head 29 covers the end of the rod 36 so that accidental release of the rods cannot occur. To protect the bolts 32 from accidental displacement, cap nuts 42 are fitted to bosses 43 on the plate 31 and cover the heads of said bolts. The plates have openings 44 and 45 formed therethrough and so disposed that when the plates are assembled spiral passages will be formed extending from the plate 22 to the head 29. All the spiral passages open at one end into the interior of the head 29 and at the opposite end register with the openings 46, 47 in the plate 22. The openings 44 are formed in the inner peripheral edge of the ring 35 by boring, the bit being so disposed that the bore will be formed diagonally with respect to the faces of the ring, but at a right angle to the radius, and will break through the inner periphery of the ring. The openings 45 are formed through the edge of the disk 33 in the same manner but with their axes at a right angle to the axes of the respectively adjacent openings 44. The edges of the collars and disks are filed out, as indicated at 48 and 49, so that the openings will have a true circular outline in cross section. The openings 44 and 45 may be provided in any desired number but, of course, the number must be the same in all plates and the openings 46, 47 must be provided in the same number and arrangement.

The head 29 is provided with openings 50 to permit the fuel to pass to the discharge outlet.

The plate 31 is formed with a central boss or nipple 51 in which is secured one end of a discharge pipe or burner tube 52, and on the opposite end of said tube is secured the burner tip or discharge nozzle 53. The said nozzle is a substantially cylindrical body externally tapered to form a flat tip 54 having a diametrical slot 55 therein, the bore of the tip flaring toward the ends of the slot, as shown at 56.

The oil is supplied through the pipe 11 and coupling 10 under pressure, and the escape from the inlet is easily and nicely regulated by setting the valve 14. The atomizing agent meets the escaping oil at the valve 14 at a right angle and immediately effects an initial atomization, blowing the fuel through the opening 5 and mixing therewith. The fluid is deflected by the cone or spreader 21 to the openings 46, 47 and passes through the same to enter the spiral passages. The pressure of the atomizing agent will cause the mixed fuel and agent to flow at a high speed through the spiral passages and the centrifugal action will force the heavier particles of the fuel to the sides of the spirals so that there is a constant atomizing action. It will be noted that the inner and outer spirals intersect or overlap at intervals and the intermingling which occurs at the crossing points causes the overlapping streams to effectually break up the particles of the fuel so that the fluid entering the head 29 will be thoroughly atomized. From the head 29 the mixture flows through the tube 52 to the tip or nozzle 53 where it is ignited.

Because of the slight overlapping or intersecting of the inner and outer spiral passages, the fuel and atomizing agent in the outer passages is revolved at high speed by the force of the mixed fuel and atomizing agent in the inner passages. The mixed fuel and agent in the inner passages is likewise revolved at high speed and the force of the mixed fuel and agent in the outer passages. In other words, the contact of the portions of the two streams at high speed tends to maintain the speed and rotating travel of both. It is obvious that some of the mixture in the outer passages will, at every point of contact with the mixture in the inner passages, be transferred to the inner passages, and vice versa, which means that there is a sudden and violent change of direction of the particles of fuel—an important factor in atomization.

It will be seen from the foregoing description, taken in connection with the accompanying drawing, that I have provided a compact and simple device which may be easily set up and will very effectually atomize crude oil so that it will burn without smoke and without depositing soot. The opposed edges of the ring 35 and disk 33 are machine finished and form a ground joint when fitted together. Inasmuch as the oblique openings may be more easily and accurately formed through the edge of a ring or disk then through the body portion of a plate, the cost

of production is minimized and efficiency in the product is attained, loss due to spoilt material being practically eliminated. It will be noted that spiral mixing paths of any desired length may be provided by simply using a greater or less number of the plates and the sectional construction of the plates facilitates cleaning should such attention be necessary.

Having fully described my invention what I claim as new and desire to secure by Letters-Patent, is:—

1. In an atomizer, a cylindrical casing, and a series of plates secured snugly in the casing with their sides in contact, the plates each having a plurality of obliquely disposed openings therethrough and the openings in the series of assembled plates defining a plurality of spiral passages.

2. In an atomizer, a cylindrical casing, and a plurality of plates secured snugly in the casing with their sides in contact, each plate having reversely arranged oblique openings therethrough and the openings in the series of assembled plates defining a plurality of oppositely disposed spiral passages.

3. In an atomizer, a cylindrical casing, and a series of plates secured snugly in the casing with their sides in contact, each plate having reversed oblique openings therethrough and the openings in the series of assembled plates defining a plurality of spiral passages which intersect at intervals.

4. In an atomizer, a cylindrical casing, a plurality of plates secured snugly in the casing with their adjacent sides in contact, each plate having obliquely disposed openings therethrough and the openings in the series of assembled plates defining a plurality of spiral passages, and means for maintaining the plates in axial alinement and the openings through adjacent plates in register.

5. In an atomizer, a cylindrical casing, a plurality of plates secured snugly in the casing with their adjacent sides in contact, each plate having obliquely disposed openings therethrough and the openings in the series of assembled plates defining a plurality of spiral passages, and means to prevent relative turning movement of the plates.

6. In an atomizer, a cylindrical casing, a plurality of plates secured snugly in the casing with their adjacent sides in contact, each plate having obliquely disposed openings therethrough and the openings through the series of assembled plates defining a plurality of spiral passages, means to maintain axial alinement of the plates, and means to prevent relative turning movement of the plates.

7. In an atomizer, a cylindrical casing, a plurality of plates secured snugly in the casing with their opposed sides in contact, each plate having obliquely disposed openings therethrough and the openings in the series of assembled plates defining a plurality of spiral passages, and retaining rods extending longitudinally through all the plates.

8. In an atomizer, a cylindrical casing, and a plurality of plates secured snugly in the casing with their adjacent sides in contact, each plate consisting of a thin flat disk and a thin flat-sided ring having its inner periphery fitting snugly to the outer periphery of the disk, the disk having oblique openings therethrough at its periphery and the ring having similar openings therethrough at its inner periphery, the openings in the ring being at an angle to the openings in the disk, and the openings in the series of assembled plates defining a plurality of spiral passages.

9. In an atomizer, a cylindrical casing, a plate secured in one end of the cylinder and having openings therethrough, means for admitting oil and an atomizing agent to said end of the casing, a supporting arm extending from the plate axially in the casing, and a plurality of plates fitted on said arm and fitting snugly in the casing, each plate having openings therethrough and the openings in the series of assembled plates defining a plurality of spiral passages leading from the openings in the end plate.

10. In an atomizer, a cylindrical casing, a plate secured in one end of the casing and having openings therethrough, means for admitting oil and an atomizing agent to said end of the casing, a supporting arm extending from the plate axially in the casing, a plurality of plates fitted on said arm and fitting snugly in the casing, each plate having openings therethrough and the openings in the series of assembled plates defining a plurality of spiral passages leading from the openings in the end plate, the end plate having sockets in its inner side and the other plates having longitudinally disposed openings therethrough alined with said socket, aligning rods inserted through the longitudinal opening into the sockets, and means to prevent withdrawal of said rods.

11. In an atomizer, a cylindrical casing, a head closing one end of the casing, means carried by said head to admit oil and an atomizing agent to the casing, a ring in the ends of the casing abutting the head and having an inwardly flared bore, a conical deflector in the casing extending concentrically into the ring in the path of the entering fluid, a mixer body in the casing at the back of said deflector having a plurality of spiral passages therethrough, and means at the opposite end of the casing to secure said body.

In testimony whereof, I have signed this specification.

CARL A. STENVIG.