A. D. LEE.

OIL BURNER.

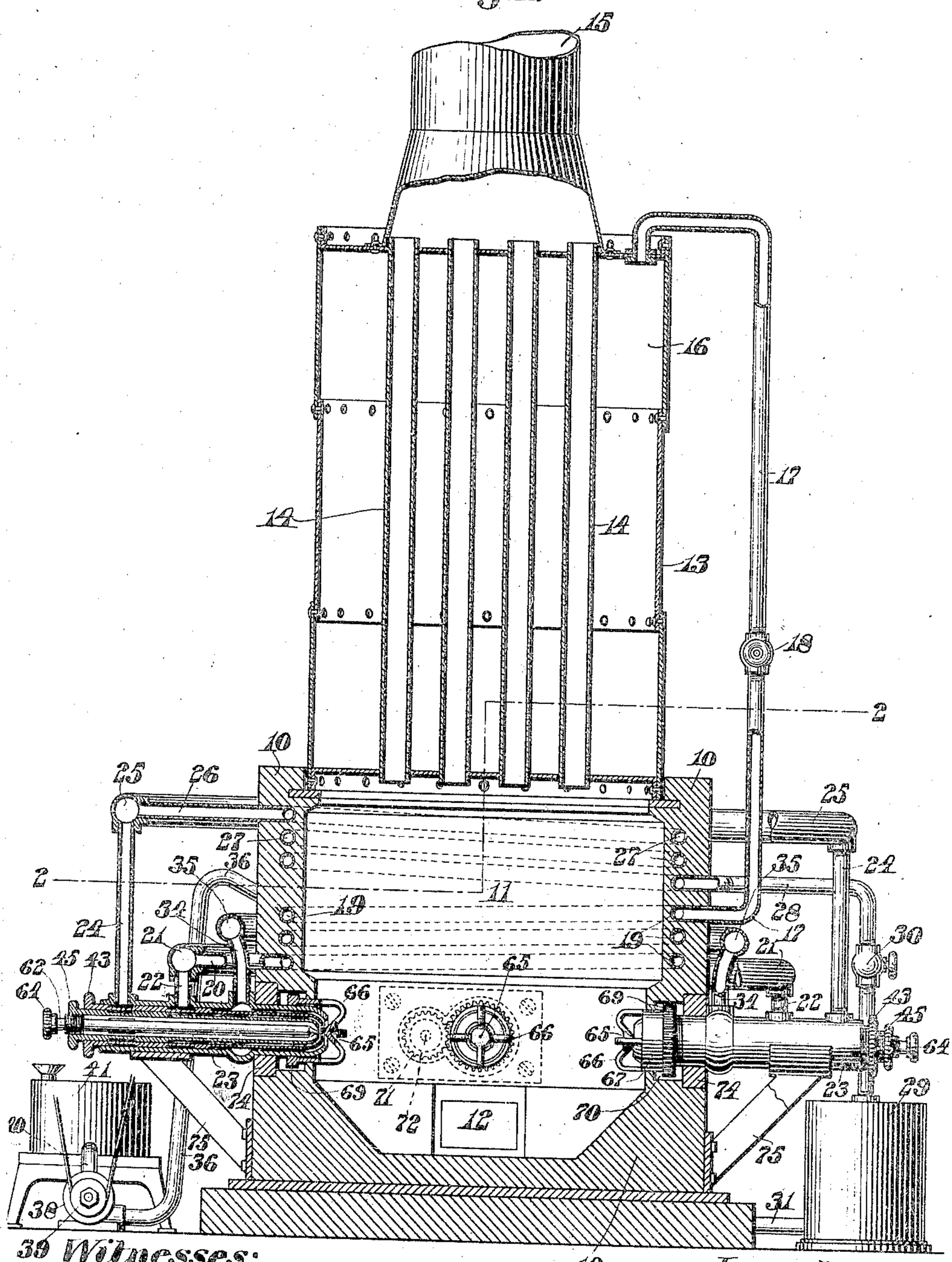
APPLICATION FILED JAN. 16, 1907.

903,735.

Patented Nov. 10, 1908.

3 SHEETS—SHEET 1.

Fig. 1.



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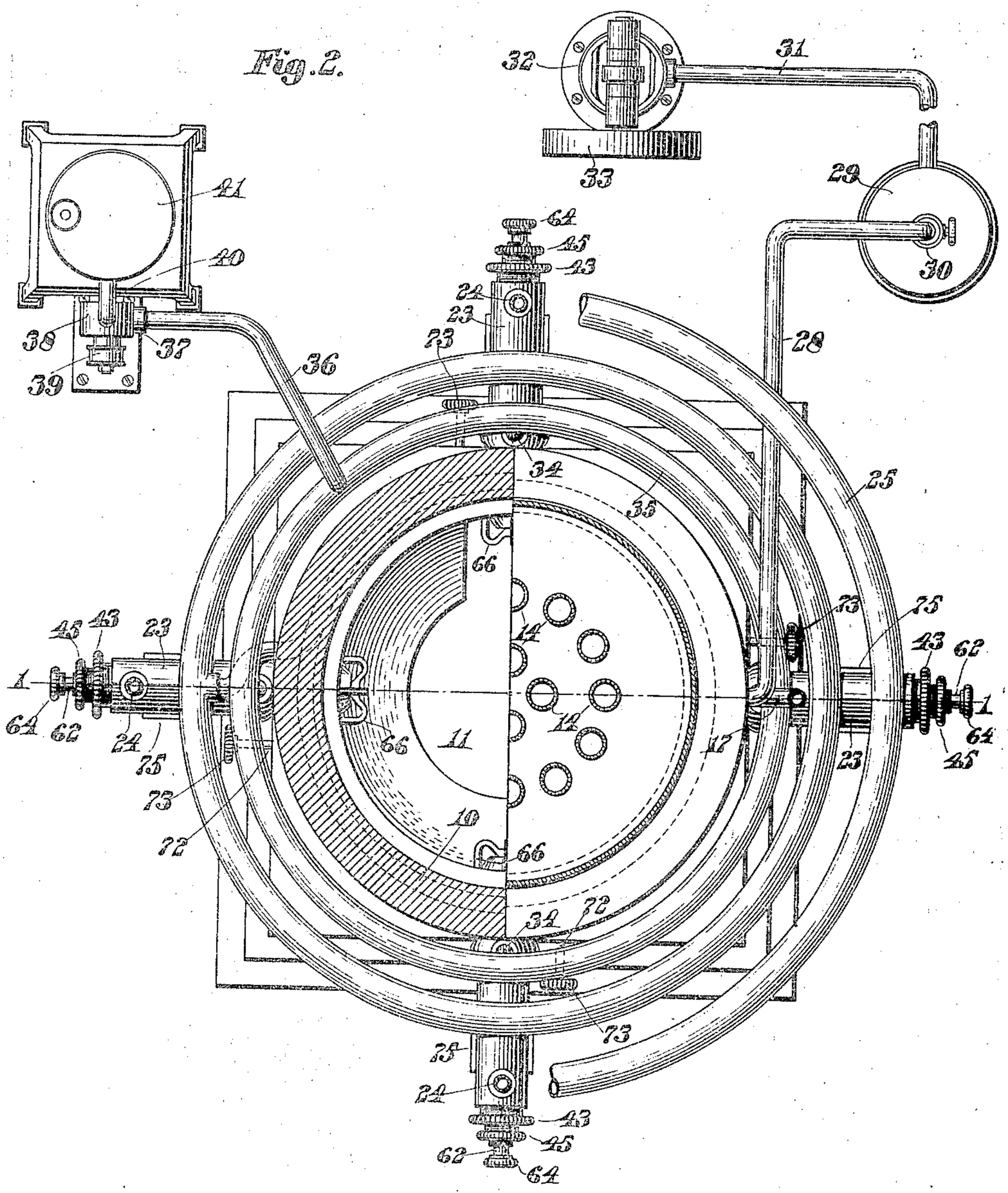
3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 3.

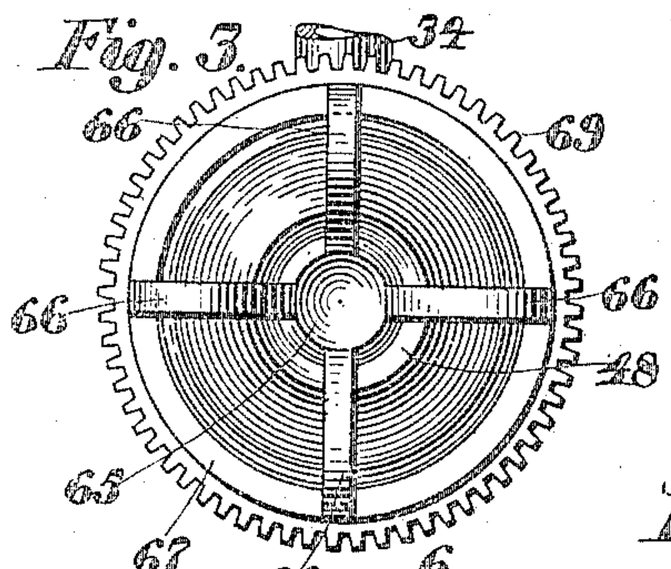


Fig. 4.

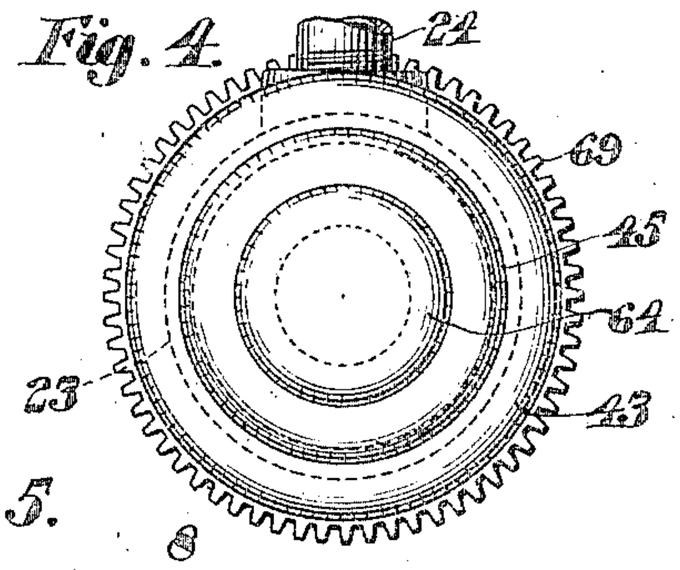


Fig. 5.

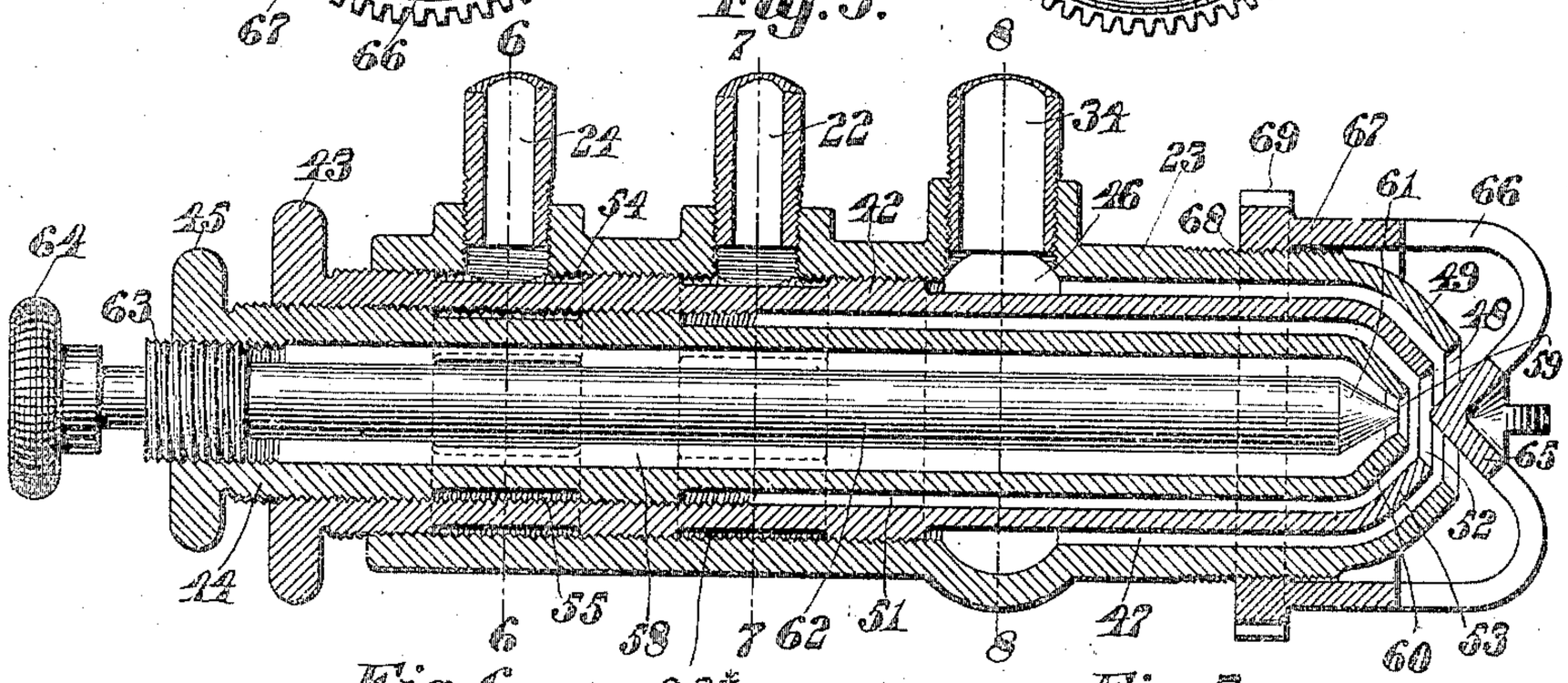


Fig. 6.

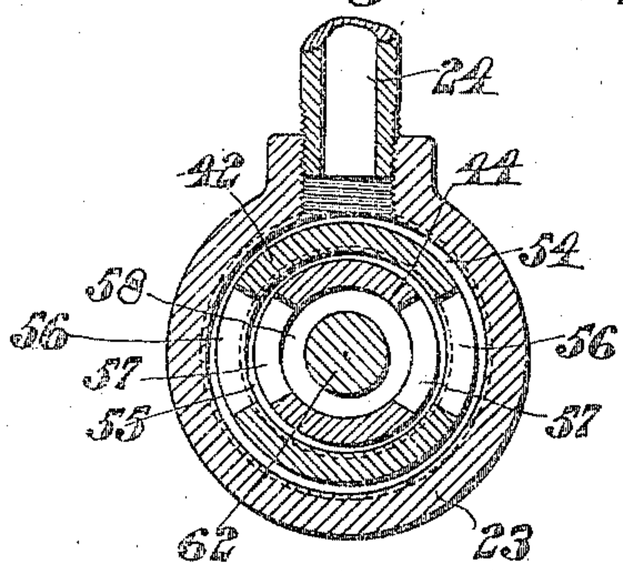


Fig. 7.

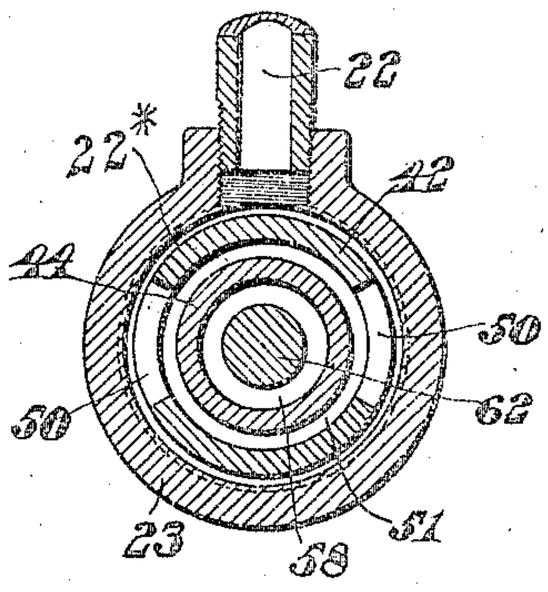
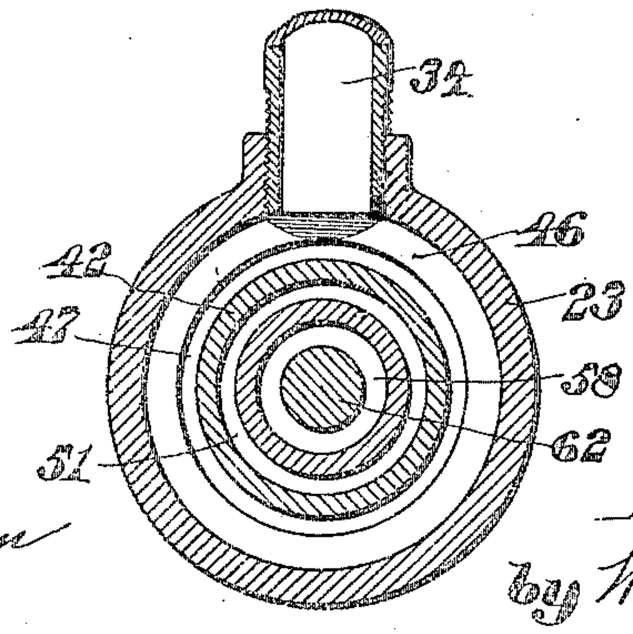


Fig. 8.



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UNITED STATES PATENT OFFICE.

ALVA D. LEE, OF BROOKLINE, MASSACHUSETTS, ASSIGNOR OF ONE-HALF TO ROBERT A. HAMMOND, OF EAST SANDWICH, MASSACHUSETTS.

OIL-BURNER.

No. 903,735. Specification of Letters Patent. Patented Nov. 10, 1908.

Application filed January 16, 1907. Serial No. 352,531.

To all whom it may concern:

Be it known that I, ALVA D. LEE, a citizen of the United States of America, and a resident of Brookline, in the county of Norfolk and State of Massachusetts, have invented certain new and useful Improvements in Oil-Burners, of which the following is a specification.

This invention relates to apparatus for burning oil and has for its object the production of a device in which oil under pressure may be used as a combustible and in which superheated compressed air and superheated steam may be mixed with the oil at its point of ignition.

It has for a further object the production of a device whereby the oil, superheated compressed air, and superheated steam may be mixed in any desired quantities.

The invention consists in certain novel features of construction and arrangement of parts which will be readily understood by reference to the description of the drawings and to the claims hereinafter given.

Of the drawings: Figure 1 represents a vertical section of an apparatus embodying the features of this invention. Fig. 2 represents a horizontal section of the same on line 2—2 on Fig. 1. Figs. 3 and 4 represent end views of a burner utilized in the apparatus. Fig. 5 represents a longitudinal vertical section of the same, and Figs. 6, 7, and 8 represent transverse sections of the same on lines 6—6, 7—7, and 8—8, respectively.

Similar characters designate like parts throughout the several figures of the drawings.

In the drawings, 10 represents a suitable wall of fire brick or similar material the interior chamber of which forms a suitable fire-pot 11 provided with the usual door 12 communicating therewith. Above the fire-pot 11 is a boiler 13 provided with a plurality of pipes 14 for the passage of heat therethrough to the stack 15. From the steam chamber 16 of the boiler 13 extends a pipe 17 provided with a suitable valve 18 which communicates with a coil 19 surrounding the fire-pot 11 and embedded in the material of the wall 10. This coil is situated sufficiently near to the interior of the walls 10 to cause the steam passing through said coil to be subjected to the heat contained within the fire-pot while said coiled pipe 19 is protected from direct contact with the flame.

The opposite end of the coil 19 communicates, by means of a pipe 20, with the annular passage 21 surrounding the exterior of the wall 10. Vertical pipes 22 form a means of communication between said pipes 21 and the interior of a casing 23 extending radially through the wall 10 into the interior of the fire-pot 11. From each of the casings 23 extends a pipe 24 communicating with the interior of an annular pipe 25 surrounding the exterior wall 10 of the fire-pot 11 and communicating by means of the pipe 26 with the coil 27 embedded in the material of said wall 10 in a similar manner to the coil 19 so that the material passing through the coil will be subjected to the heat in the fire-pot but the pipe itself will not come into direct contact with the flame. The opposite end of the coil 27 communicates by means of a pipe 28 with a tank of compressed air 29, said pipe being provided with a suitable valve 30. The tank 29 is connected by means of a pipe 31 with a suitable air compressor 32 which may be of any well-known construction. When this air compressor is operated by means of the pulley 33 air will be compressed and forced through the pipe 31 into the tank 29 from which it may be drawn through the pipe 28 into the coil 27 where it becomes superheated and passes therefrom through the pipe 26 into the annular passage 25 communicating by a plurality of downwardly extending pipes 24 with each of the casings 23. Each of the casings 23 is also connected by a pipe 34 with an annular pipe 35 surrounding the fire-pot 11, said pipe 35 communicating by means of the pipe 36 with the discharge outlet 37 of a suitable pump 38 driven by the pulley 39 and connected by means of the pipe 40 with an oil tank 41. When the pump 38 is operated by means of the pulley 39 oil is forced under pressure through the pump 38 and through the pipe 36, annular pipe 35, and downwardly extending pipes 34 into the interior of the casing members 23.

The interior of the casing 23 has threaded thereto a tubular member 42 adjustable end-

wise therein by means of the milled head 43 and threaded to the interior of the member 42 is another tubular member 44 adjustable therein by means of the milled head 45.

The exteriorly threaded portion of the member 42 co-acting with the threads in the interior of the casing 23 extends between the inlet pipe 34 and the outer end of the casing member and thereby prevents any oil which enters the chamber 46 in the casing 23 from passing outwardly and insuring its passing through the annular passage 47 to the outlet aperture 48 in its tapered inner end 49. The threaded portion of the member 42 is cut away in the plane of the inlet pipe 22 thereby forming a shallow circumferential groove 22*: communicating with said inlet pipe 22, and through the ports 50 with the interior of said pipe 42. In a similar manner the exteriorly threaded portion of the tubular member 44 co-acting with the interiorly threaded portion of the tubuluar member 42 extends from the pipe 22 to the outer end of said member thereby preventing the steam which enters through the inlet pipe 22 into the interior of the casing 23 and through the ports 50 in the tubular member 42 from passing outwardly either between the casing member and the tubular member 42 or outwardly between the two tubular members 42 and 44 and oblige it to pass through the annular passage 51 to the outlet aperture 52 in the tapered end 53 thereof. In like manner a portion of the exterior threads on the tubular member 42 and the exterior threads on the interior tubular member 44 are cut away in the plane of the air inlet pipe 24 thereby providing an exterior annular passage in each of these tubular members the passage 54 of which communicates through ports 56 cut through the exterior tubular member 42 with the interior annular passage 55 which in turn communicates through ports 57 cut through the inner tubular member 44 with the interior chamber 58 of said inner tubular member 44.

The superheated compressed air entering through the pipe 24 will pass through the annular passages 54, ports 56, annular passage 55, and ports 57 into the interior chamber 58 of the inner tubular member 44 and pass along said interior chamber 58 to the outlet aperture 59 in the tapered end 60 thereof.

The walls of the tapered ends 49, 53, and 60 are all parallel with one another and it is obvious that any longitudinal adjustment of the tubular members will narrow or widen the annular passage between said walls to regulate the outlet of the oil through the passage 47 or steam through the passage 51. In a similar manner the discharge of superheated compressed air may be regulated by means of the tapered end 61 of a valve 62 threaded at 63 to the interior tubular member 44 and operated by means of the milled head 64 to regulate the discharge of superheated air through the outlet aperture 59.

The apertures 48, 52, and 59 are all in axial alinement and the outer walls thereof are flaring being substantially parallel with the inner walls of a conical member 65 supported by the spider arms 66 forming a part of the annular ring 67 threaded at 68 to the exterior of the casing 23 and provided with gear teeth 69. The conical end 65 is so situated relative to the annular discharge passage between the tapered ends of the various adjustable tubular members that the oil, steam, and air being discharged therefrom will impinge upon the surface of said conical member and be deflected to form what is known as a balloon flame.

It is obvious that by a movement of the conical member further into or further away from the outlet apertures the size and intensity of the flame may be regulated to a nicety. In order to accomplish this result the annular ring 67 is mounted in a chamber within the wall 10 so that the gear teeth and the threads upon the exterior of the casing member 23 will not be subjected to the intense heat within the fire-pot. Within this chamber 70 the gear 69 is provided with a driving pinion 71 mounted upon a shaft 72 extending through the wall 10 and provided on its outer end with a handle 73 by which the gear 69 may be turned to adjust the conical end 65 into any desired position.

The casings 23 are supported by means of the members 74 secured to the outer face of the wall 10 in connection with the braces 75 also secured to the outer face of the wall 10 and supporting the outer ends of said casing. As many of the casings 23 may be utilized in a fire-pot as is desired and it is obvious that by means of adjusting the members provided for each of these devices any one of these devices may be placed out of commission or any mixture of oil, steam, and air may be provided as desired.

By providing a device of this kind in which the oil is discharged into the fire-pot through an annular passage within the confines of which superheated steam and superheated compressed air are mixed with said oil the oil is more thoroughly atomized and a greatly increased benefit is derived. By providing superheated compressed air and superheated steam in a dry state to be mixed with the oil at its point of ignition this oil being also under pressure an intense heat is provided which is itself utilized to effect the superheating of the steam and compressed air which is being used.

By adjusting the various tubular mem-

bers relative to one another and thereby decreasing the area of the outlet apertures the amount of material which may pass through said outlets is reduced and the material which does pass through is caused to pass therethrough at an increased pressure, thus insuring a greatly improved result.

It is believed that the operation of the invention will be fully understood from the foregoing description.

Having thus described my invention, I claim:

1. In an oil burner, the combination of a casing adapted to receive oil through a suitable inlet and discharge it through a suitable outlet at one end; a plurality of tubular receptacles within said casing provided with discharge outlets in alinement with said oil discharge, each inner discharge outlet being to the rear of the outlet of its surrounding member; means for supplying steam and air to said receptacle; and a member adjustably secured directly to the end of said casing and provided with a conical point which is adapted to extend into a plurality of said discharge outlets and regulate the discharge therefrom.

2. In an oil burner, the combination with a furnace, of a casing extending through the wall thereof and provided with a nozzle adapted to direct the flames into the interior thereof; a plurality of tubular members contained within said casing; means for adjusting each of said members longitudinally of the others; a plurality of inlet pipes communicating with the interior of said casing; means within said casing and forming a part of said tubular members for preventing the mixture of the various elements admitted through said inlets until discharged from the burner; and a needle valve contained within the interior tubular member adapted to regulate the size of the discharge through its outlet.

3. In an oil burner, the combination with a furnace, of a casing extending through the wall thereof and provided with a nozzle adapted to direct the flames into the interior thereof; a plurality of tubular members contained within said casing; means for adjusting each of said members longitudinally of the others; a needle valve contained within the interior tubular member adapted to regulate the size of the discharge through its outlet; means for adjusting the needle valve; and means secured to said casing for admitting different materials to the interior of each of said tubular members.

4. In an oil burner, the combination of a casing provided with a plurality of radial inlets and an axial outlet; a plurality of tubular receptacles within said casing provided with peripheral inlets and discharge outlets in axial line with said casing outlet, said tubular members and casing forming annular chambers and having at their outlets ends which combine to form an annular conical chamber in which the discharge of all the chambers are adapted to be concentrated at a predetermined point; an adjustable abutment on said casing extending into said conical chamber; and a needle valve adapted to regulate the discharge from the inner chamber and direct it against said abutment.

5. In an oil burner, the combination with a furnace and a plurality of radial oil burners adapted to direct the flames into said furnace; of a plurality of annular passages surrounding said furnace at a different level from said burners, means for supplying a different material to each annular passage; and connecting pipes between each of said passages and each of said burners.

6. In an oil burner, the combination with a furnace; of a casing extending through the wall thereof and provided with a nozzle adapted to direct the flames into the interior thereof; a plurality of tubular members contained within said casing the discharge orifices of which combine to form a conical chamber; means for adjusting said tubular members; a needle valve within the inner tubular member; and a conical member adjustable on said casing fitting said conical chamber and extending therein.

7. In an oil burner, the combination with a furnace; of a casing extending through the wall thereof and provided with a nozzle adapted to direct the flames into the interior thereof; a plurality of tubular members contained within said casing the discharge orifices of which combine to form a conical chamber; means for adjusting said tubular members; a needle valve within the inner tubular member; a conical member fitting said conical chamber and extending therein; and means upon said casing for adjusting said conical member in said conical chamber.

8. In an oil burner, the combination with a furnace provided with a fire-pot; of a plurality of casings extending radially through the wall thereof each of said casings being provided with a nozzle adapted to direct the flames into the interior of the fire-pot and with a plurality of inlets to the interior of the casing; a plurality of tubular members contained within and adjustable lengthwise of said casing and each other; means within the casing and forming a part of said tubular members for preventing the mixture of various elements admitted through said inlets until discharged from the nozzle thereof; a needle valve contained within the interior tubular member adapted to regulate the size of the discharge through the outlet nozzles; a steam pipe surrounding the fire-pot and subjected to the heat thereof; an an-

nular pipe communicating therewith surrounding the furnace; a pipe connecting said steam annular pipe with one of the inlets to each casing; an air pipe coiled about said fire-pot and subjected to the heat therein; an annular pipe communicating therewith surrounding the furnace; a pipe connecting said air annular pipe with another of said inlets to each casing; an oil pipe surrounding said furnace; and a pipe connecting said oil pipe with another of the inlets of each casing.

Signed by me at Boston, Mass., this 10th day of January, 1907.

ALVA D. LEE.

Witnesses:

WALTER E. LOMBARD,

EDNA C. CLEVELAND.