

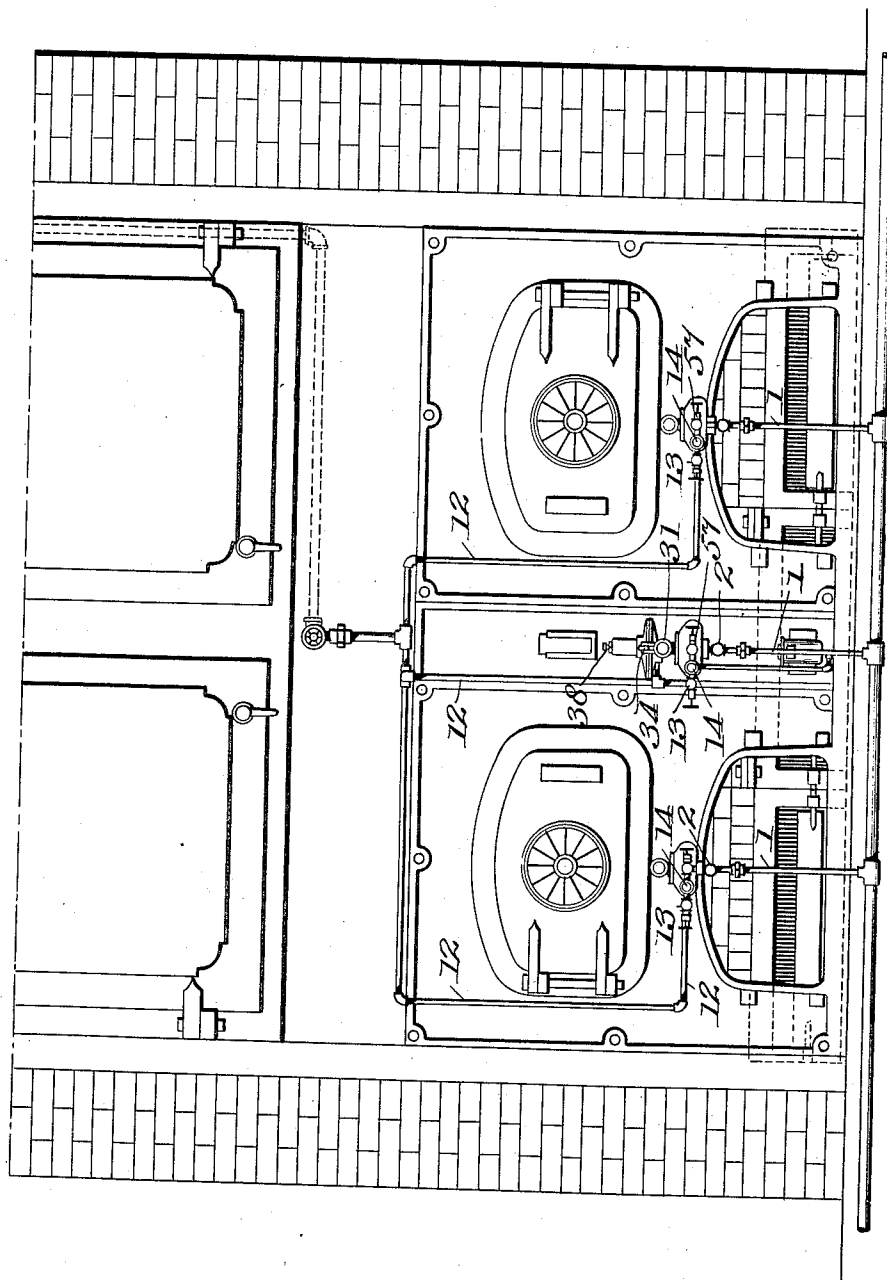
A. H. LIGHT.
OIL BURNER.
APPLICATION FILED FEB. 10, 1909.

959,363.

Patented May 24, 1910.

4 SHEETS—SHEET 1.

Fig. 1.



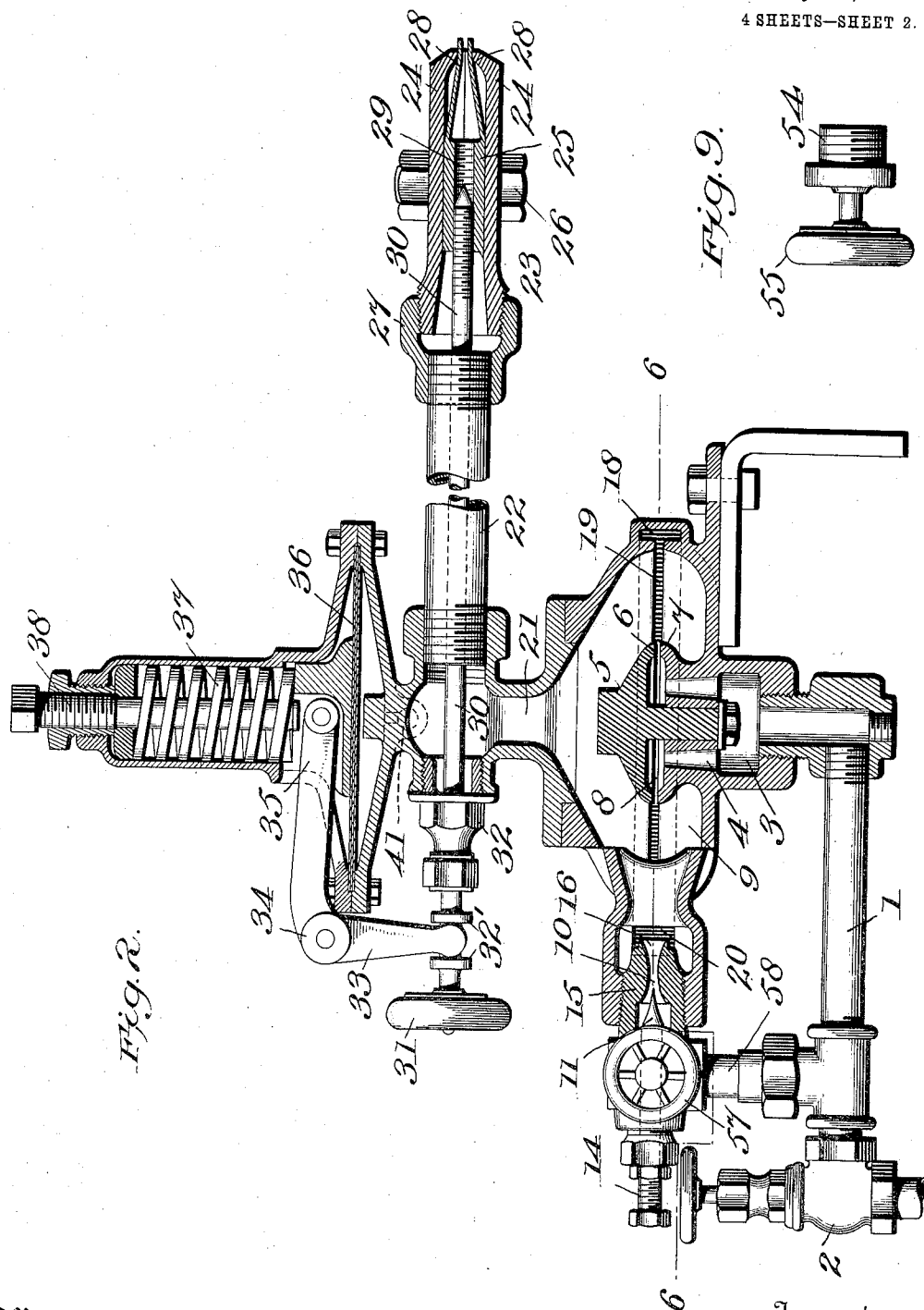
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OIL BURNER.

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4 SHEETS—SHEET 3.

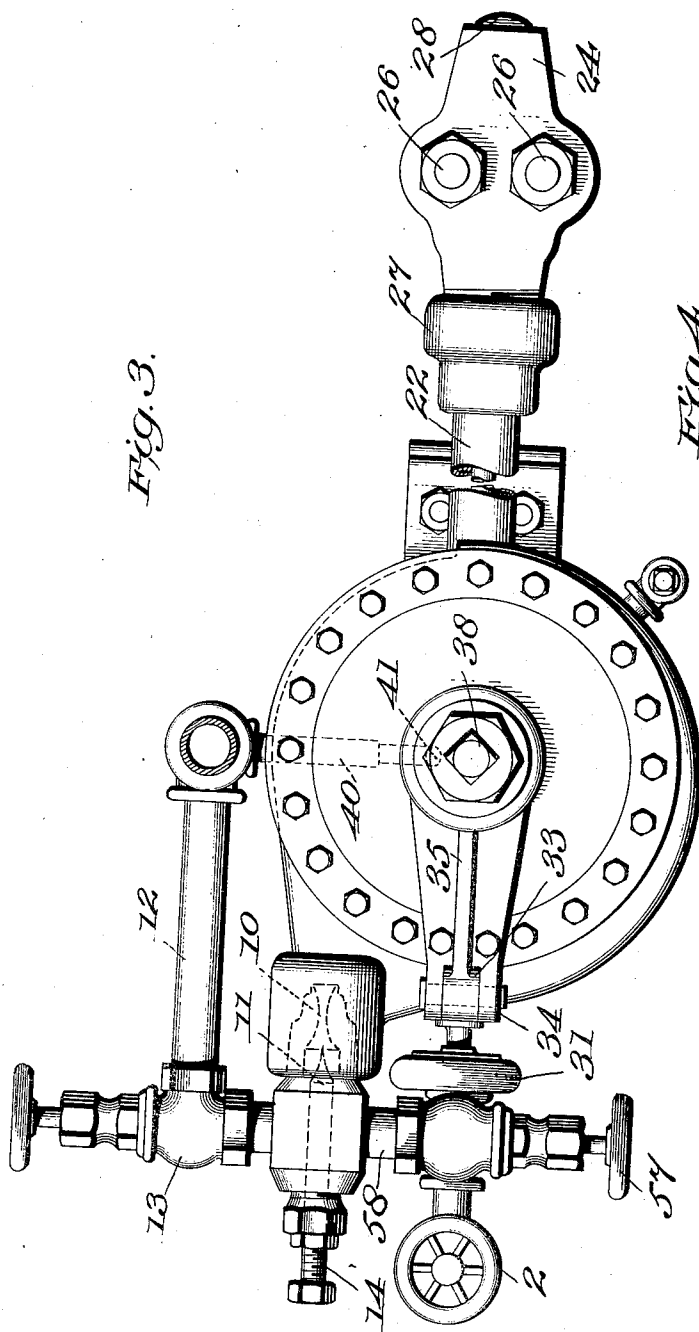


Fig. 3.

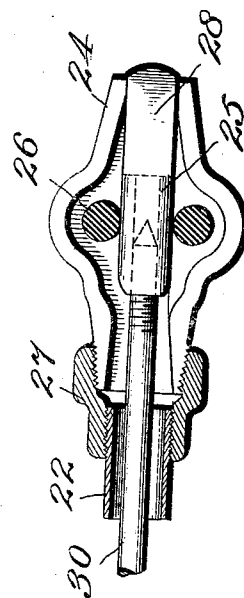


Fig. 4.

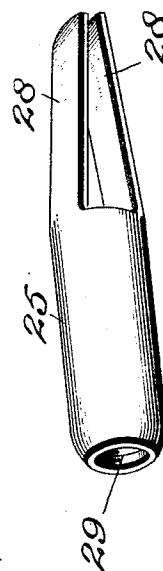


Fig. 5.

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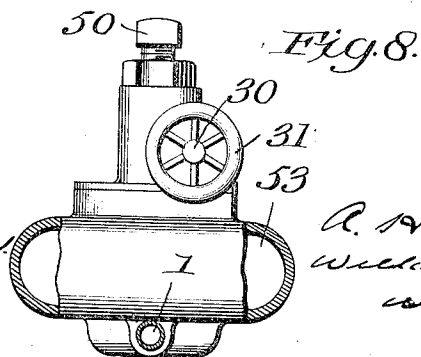
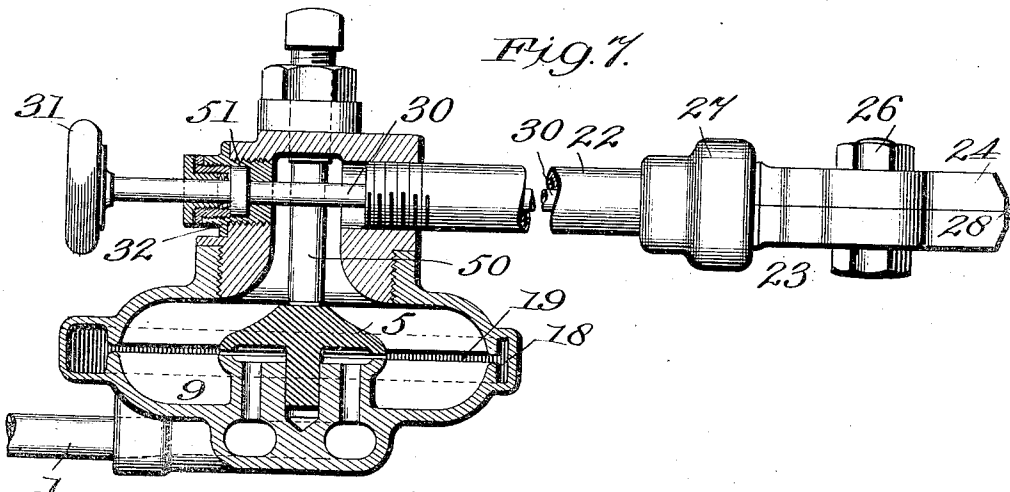
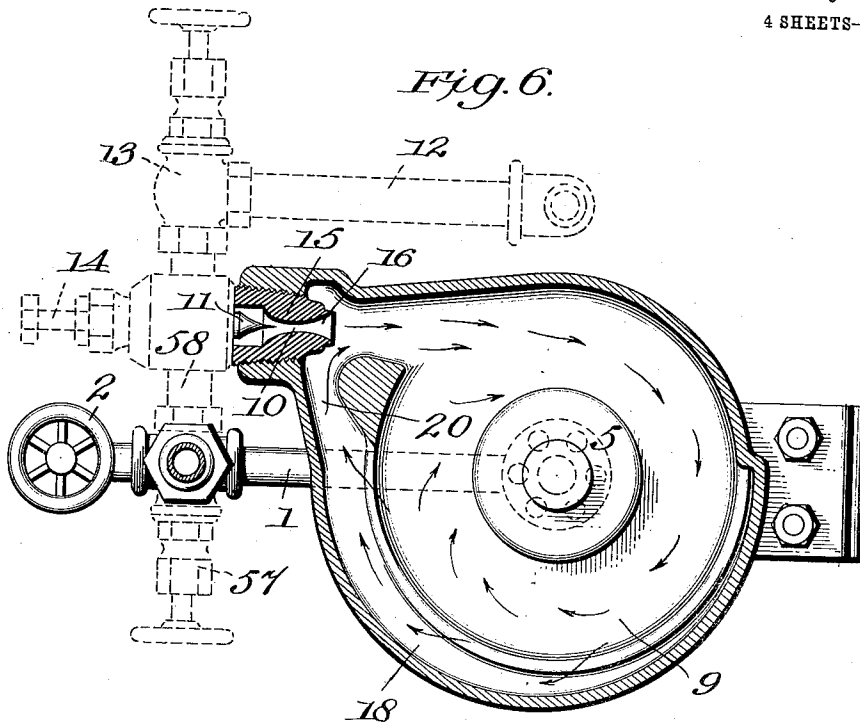
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UNITED STATES PATENT OFFICE.

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OIL-BURNER.

959,363.

Specification of Letters Patent.

Patented May 24, 1910.

Application filed February 10, 1909. Serial No. 477,200.

To all whom it may concern:

Be it known that I, ARTHUR H. LIGHT, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented certain new and useful Improvements in Oil-Burners; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to oil burners, and has among its objects the production of a burner that will cause a more perfect atomization of the oil than heretofore; one that will use a minimum of steam or other expansible fluid in accomplishing this result and will permit of using all the available energy in said fluid while expanding from a higher to a lower pressure; to provide a burner that may be more readily controlled; and to provide an improved tip or nozzle which may be readily freed from obstructions.

With these and other objects in view my invention consists in the novel combination of parts and in the details of construction more fully hereinafter disclosed and particularly pointed out in the claims.

Referring to the accompanying drawings forming a part of this specification in which like numerals refer to like parts in all the views:—Figure 1, is an elevational view of a portion of a furnace with two forms of my invention applied thereto; Fig. 2, is a sectional view of an automatic form of my burner; Fig. 3, a plan view of the same; Figs. 4 and 5, details of the nozzle of my burner; Fig. 6, a sectional view taken on the line 6—6 of Fig. 2; Fig. 7, a partly sectional view of a hand operated form of my burner; Fig. 8, a partly sectional view of a modified form of the mixing chamber; and Fig. 9, a view of a plug used when cleaning the parts.

1 indicates an oil supply controlled by the valve 2, and leading to the space 3, connected with the ports 4 of the check valve 5, having a rim 6 and a seat 7. The space 8 between the said rim and seat leads into the mixing chamber 9, which I term a cyclone mixing chamber, owing to the cyclonic action that takes place in the same, as will appear below.

Owing to the pressure that exists in the chamber 9, when the burner is in action, as

will be more fully explained below, the valve 5 is pressed downwardly toward its seat 7, and the oil under pressure in pipe 1, escapes upwardly through the space 8 in a thin film; and should the space 8 become choked, the pressure of said oil will accumulate and raise the valve 5 higher, so as to cause said space to be cleared. If, however, for any reason the valve should not thus automatically clear itself, steam may be admitted through pipe 1, and clear the valve, as will appear more fully hereinafter.

Steam flows through the pipe 12, Fig. 3, controlled by the valve 13, through the passage 10, controlled by the needle valve 11, and into the mixing chamber 9. The needle valve is adjusted by its screw threaded stem 14, and the tips 15 containing the passage 10 are readily renewable. After entering the mixing chamber 9, the steam which before it enters is preferably kept at full boiler pressure, circulates around said chamber, as best indicated by the arrows in Fig. 6, and the exit end 16 of the tip 15 is so designed as to permit the steam or other fluid to attain its highest velocity in the mixing chamber, in order that the mixture of oil and steam may have imparted to it a very high rotation in said chamber. The higher the speed of rotation the more perfect will be the atomization of the oil.

In order to insure a perfect atomization of the oil in the chamber, I provide the following means for causing any unatomized oil to be subjected to one or more additional subdividing actions. That is to say, I preferably provide the mixing chamber with an additional outer annular chamber or passage 18, connected by the restricted annular passage 19 with the said mixing chamber 9. As best seen in Fig. 6, the chamber 18 preferably circumferentially tapers, does not extend all the way around the chamber 9, and at or near the tip 15, it merges into the passage 20. It results from this construction that as the mixture of oil and steam circulates around the cyclone mixing chamber 9, any unatomized particles, which of course are heavier than the others, will be thrown out to the rim of said chamber by centrifugal action. They will be likewise forced through the passage 19 into the chamber 18, where they will be caught and carried back through the passage 20 to the tip 15 and there again subjected to the rotary cy-

clonic action of the jet issuing from said tip. It is evident that unatomized particles will be thus automatically subjected to additional atomizing actions as long as they exist as such; and since the only escape from chamber 9 is upwardly through the restricted centrally located passage 21, which said unatomized particles cannot reach owing to the centrifugal force which keeps them near the outer rim of the chamber 9, it is evident that said unatomized particles will in time all be automatically subdivided before they leave the mixing chamber. It is also obvious that by simply increasing the pressure of the steam, and decreasing the thickness of the film of oil delivered through the space 8, that any degree of subdivision desired can be attained, even up to reaching a point where the oil is practically all in a state of vapor.

The steam and atomized oil in an extremely finely divided state passes up through the passage 21, along the pipe 22 to the nozzle 23, and of course the mixture exerts pressure to seat the valve 5, and to thereby keep the oil entering the chamber under pressure in a very thin film.

The nozzle or tip 23 is preferably located just inside the front wall of the furnace, and consists of the two halves 24, and the block 25. The halves 24 are secured together steam tight by suitable fastenings 26, and are suitably joined to the pipe 22, as by the coupling 27.

The block or plug 25, is provided with the resilient tongues or lips 28, and is screw threaded at 29. The screw threaded rod 30 fits the screw threads 29, is provided with the hand wheel 31, and passes through the stuffing box 32. It is evident that any movement of the hand wheel 31 will cause the inclined resilient tongues 28 to be adjusted toward or from each other, and therefore will close or open the orifice through which the atomized oil and steam escapes from the nozzle 23. These tongues are made to fit the inner surfaces of the halves 24, as shown, and their own resiliency at all times insures a tight joint with said surfaces. The longitudinally sliding rod 30 is also provided with a pair of collars 32', between which fits one end 33 of a bell crank lever 34, the other end 35 of which is secured to a diaphragm 36, controlled by a rod 38 and a spring 37, the tension of which is capable of adjustment through the screw threaded sleeve 38' operating a disk 38". Steam from the boiler is admitted to the underside of the diaphragm through the pipe 40, Fig. 3, and port 41.

The operation of the automatic form of my burner is as follows:—Suppose the boiler pressure is 140 pounds and the safety valves are so set that they will open at 145 pounds; the tension on the spring 37 will

be so adjusted that the diaphragm 36 will rise when, say 142 pounds is reached. And suppose that the discharge opening between the lips 28 of the nozzle or tip 23 has been so adjusted by the rod 30, that 55 pounds is maintained in the cyclone mixing chamber 9. If the valve 13 be left open and the passage 10 be controlled by the needle valve, steam will expand in said chamber 9 from 140 pounds, its boiler pressure to 55 pounds, the mixing chamber pressure; and this will cause a rotation of the mixture in said chamber of several hundred revolutions per second. Now suppose the pressure maintained on the oil supply is 65 pounds, upon opening the cock 2 slightly the oil will lift the valve 5, and flow into the chamber, owing to its excess of pressure over that in said chamber. The entering oil in a very thin film is caught by the rapidly rotating steam entering the chamber in a tangential direction, and it is thoroughly atomized. The heavier particles by centrifugal action are forced out through the passage 19 into the passage or chamber 18 and immediately returned to the steam jet for a complete atomization. The more finely divided particles, having less weight, will have a tendency to rise, and when their subdivision is sufficient to so lessen their weights as to permit their rising, they will pass upward out of the chamber 9 through the passage 21 and pipe 22 to the tip 23 and into the furnace.

It is evident that any initial diminution of the area of the discharge opening of the tip 23, will bring about an increase of pressure in the chamber 9, and therefore a thinner oil film and a more finely divided state of the oil; and if said diminution is continued the said pressure in the chamber 9 may equal that on the oil supply, when the oil film will be stopped altogether. This, however, would cause the steam pressure to fall, the spring 37 to force the diaphragm down, and the bell crank 34 to move the rod 30 to open the discharge orifice of the tip 23; thereby lowering the pressure in chamber 9 and restoring the oil supply. Likewise any initial increase in the area of the discharge opening in the tip 23 will decrease the pressure in the chamber 9, and will cause the oil film to become thicker, thereby causing more unatomized particles to be thrown into the chamber 18 and re-subjected to the atomizing action. An increased area will also cause the fire to receive more fuel, the steam pressure to rise and the diaphragm 36 to so actuate the rod 30, as to close the discharge orifice in the tip, and therefore the oil supply to be again diminished through the increased pressure in the chamber 9, as above stated.

The initial changes in the opening of the tip 23, above described, could be made by

moving the hand wheel 31, as well as by the automatic action of the diaphragm 36; and it is therefore evident that this automatic form of my burner can be used as well wherever hand operated burners are used.

In Fig. 7 I have illustrated a hand operated form of my burner, in which the parts pertaining to the automatic form are correspondingly numbered and operate in the manner above described. In this hand operated form the valve 5 is controlled by the adjustable rod 50, so that the thickness of the oil film may be adjusted from the outside independently of the pressure. Likewise the rod 30 has a collar 51, so that it cannot slide in the stuffing box 32, as is the case with the automatic form. In this hand operated form, too, the rod 30 is located to one side of the center of the chamber 9, as best illustrated in Fig. 8, in order to make room for the rod 50 to pass down through the center of said chamber. In operation, turning the hand wheel 31 adjusts the discharge orifice of the tip 23, as above described, and the same operations as those stated take place in the chamber 9, except as they may be modified by the particular limitations of the movements of the valve 5 imposed by the rod 50. Of course, it is evident that if desired the rod 50 may be attached to the automatic form also, in which case the operations in the chamber 9 will be the same in the two forms.

In Fig. 8, the mixing chamber 53 is not provided with the annular chamber 18, nor the passage 19, and this particular form of chamber is found useful under certain conditions, but, of course, the atomization of the oil is not so complete as in the other forms.

In all the forms, when used singly, it is usually desirable to provide some means, as for example stops on the rod 30, to gage the increase or decrease of the discharge opening of the tip 23, in order that the fire may not be entirely extinguished unless it is desired to do so; although it is generally only desirable to be able to reduce the fire to a minimum.

When both forms are used together, as illustrated in Fig. 1, which shows one automatic burner, with a hand operated burner on each side of the same, it is best to have the automatic burner so adjusted as to enable it to extinguish the fire entirely, while the hand operated burners are so adjusted as not to permit the fire to be extinguished unless the attendant desires it.

When the rod 30 is to be withdrawn in any of the forms to clean any of the parts, a plug 54 provided with a wheel 55 may be screwed into the orifice occupied by the stuffing box 32 in order to close said orifice; and when this is done, the valve 57 may be

opened which will permit steam to blow through the cross pipe 58 into the oil pipe 1 and through the oil valve ports 4, thereby giving the oil passages as well as all the other passages of the burner a good cleaning.

It will be observed that a large percent. of the total energy in the steam employed to subdivide the oil is utilized in its expansion in the chamber 9, and that therefore my burner is exceedingly economical in this respect.

In my copending application, Serial No. 478,844, filed February 19, 1909, allowed April 24, 1909, of even date herewith, I have described and claimed a mechanism for automatically regulating the steam pressure in the boiler and the supply of air to the furnace.

It is evident that various changes in the details of construction and in the arrangement of parts can be made by those skilled in the art without departing from the spirit of my invention, and therefore I do not wish to be limited to the exact disclosure except as is required by the claims.

What I claim is:—

1. In a fuel burner, the combination of a fuel supply; a supply for fluid under pressure; a valve controlling said fuel supply adapted to be lifted by said fuel and to be seated by the pressure of said fuel and fluid; a chamber provided with a tangential entrance for said fluid supply, adapted to cause said fluid to rotate; said chamber also provided with upwardly inclined walls and with an escape passage for said fluid located above said entrance; substantially as described.

2. In a fuel burner, the combination of a fuel supply; a supply for fluid under pressure; a chamber provided with a tangential entrance for said fluid adapted to cause the same to rapidly rotate while expanding; a valve in said chamber controlling the entrance of fuel therein; said valve adapted to be opened by the pressure of said fuel and closed by the pressure of said fuel and fluid; said chamber also provided with an upwardly inclined wall and with an escape passage for the mixed fuel and fluid located above said valve and fluid entrance; and a suitable tip for the burner; substantially as described.

3. In a fuel burner, the combination of a fuel supply; a supply for fluid under pressure; a chamber provided with a tangential entrance adapted to cause said fluid to rapidly rotate, and with an escape passage located above said entrance; and means for collecting unatomized particles of fuel and preventing them from passing through said escape passage, substantially as described.

4. In a fuel burner, the combination of a fuel supply; a supply for fluid under pressure; a chamber provided with a tangential

entrance for said fluid supply and adapted to cause said fluid to rapidly rotate therein, and with an escape passage located above said entrance; and a passage outside of said chamber adapted to receive any unatomized particles of fuel and to conduct the same back into said chamber, substantially as described.

5. In an oil burner, the combination of a mixing chamber for oil and steam; a supply adapted to deliver a film of oil in said chamber; a steam supply; means to cause said steam to rotate in said chamber and to atomize said oil; a passage outside of said chamber adapted to receive any unatomized particles of oil and to cause the same to be resubjected to the atomizing action, substantially as described.

6. A mixing chamber for oil and steam provided with an annular passage outside the same; a second passage connecting said annular passage and said chamber; and said chamber also provided with entrances for oil and steam, substantially as described.

7. A mixing chamber for oil and steam provided with a tapered annular passage partially surrounding, located outside of, and connected with said chamber; an entrance for oil; and provided with an entrance for steam located near one end of said annular passage, substantially as described.

8. In an oil burner, the combination of a mixing chamber provided with an annular passage outside of, and connected with the same; a valve in said chamber adapted to deliver oil in a film; a tip provided with a passage located tangentially of said chamber adapted to deliver steam under pressure therein to atomize said oil; an escape passage for the mixed oil and steam; an adjustable tip and a passage connecting said escape passage and said tip, substantially as described.

9. In an oil burner, the combination of an oil supply; a mixing chamber; a valve located in said chamber adapted to deliver oil in small quantities therein; means to adjust said valve to control the quantity of oil passing the same; means for delivering steam in a tangential direction into said chamber to rotate and atomize the oil; a tip adapted to deliver the mixed oil and steam into the furnace; and a connection between said tip and said chamber, substantially as described.

10. In an oil burner, the combination of a mixing chamber; steam and oil supplies therefor; a tip adapted to deliver the mixed oil and steam to the furnace comprising a plug provided with resilient tongues; and

means to control the space between said tongues connected to said plug, substantially as described.

11. In an oil burner, the combination of a mixing chamber; a valved steam supply entering the same; a valved oil supply also entering said chamber; a tip adapted to deliver mixed oil and steam to a furnace; a removable rod controlling said tip; and connections between the steam and oil supplies by which steam may be blown through the oil supply into said chamber and out of said tip to clean the burner, substantially as described.

12. In an oil burner, the combination of a mixing chamber; a check valve therein controlling the admission of oil thereto; and an adjustable rod extending outside of said chamber controlling said check valve, substantially as described.

13. In an oil burner, the combination of a mixing chamber; a check valve therein controlling the admission of oil thereto; an adjustable rod extending outside of said chamber controlling said check valve; a tip; connections between said chamber and tip; and a rod controlling the escape of mixed oil and steam through said tip, substantially as described.

14. In an oil burner, the combination of a mixing chamber; a check valve therein controlling the admission of oil thereto; an adjustable rod extending outside of said chamber controlling said check valve; a tip comprising a plug; passages connecting said chamber and tip; a rod located to one side of said adjustable rod connected to said plug and adapted to control the escape of oil and steam from said tip, substantially as described.

15. In an oil burner, the combination of means for atomizing the oil; an adjustable tip comprising two portions, and a plug provided with resilient tongues located in said portions; and means for adjusting said tongues longitudinally of said portions, substantially as described.

16. A tip for oil burners comprising a plug having resilient tongues; two portions, provided with an orifice through which said tongues project; and means for securing the parts together; substantially as described.

In testimony whereof, I affix my signature, in presence of two witnesses.

ARTHUR H. LIGHT.

Witnesses:

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CHAS. F. BLACKSTOCK.