No. 872,023. PATENTED NOV. 26, 1907.

I. E. SMITH.

OIL BURNING SYSTEM.

APPLICATION FILED JULY 30, 1906.

Fig. 1

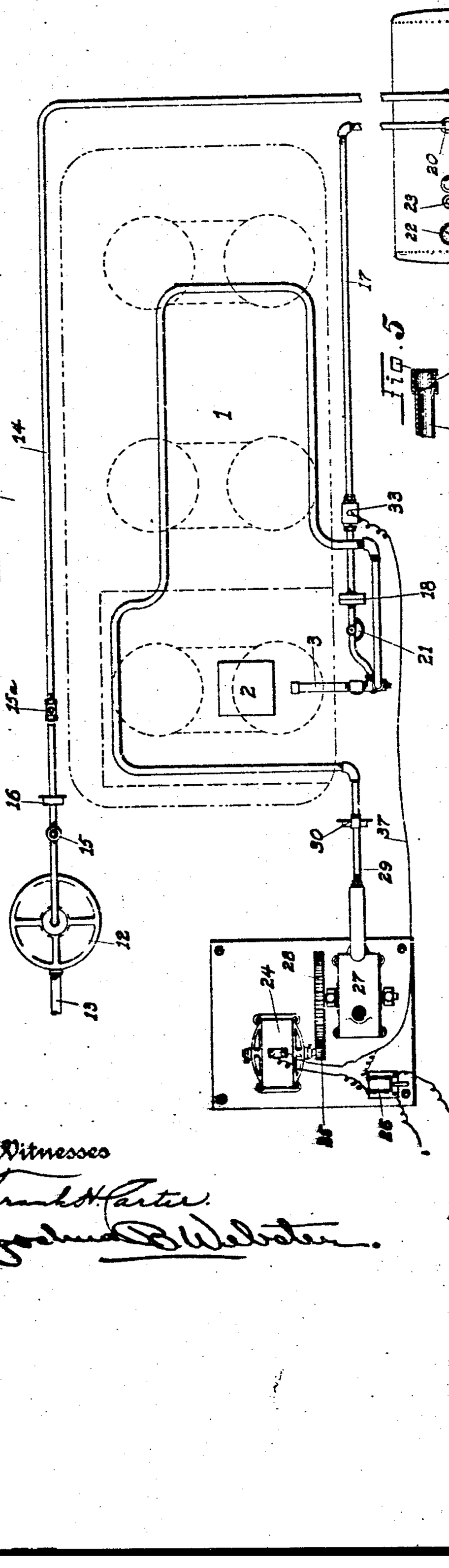


Fig. 5




Fig. 3




Fig. 6

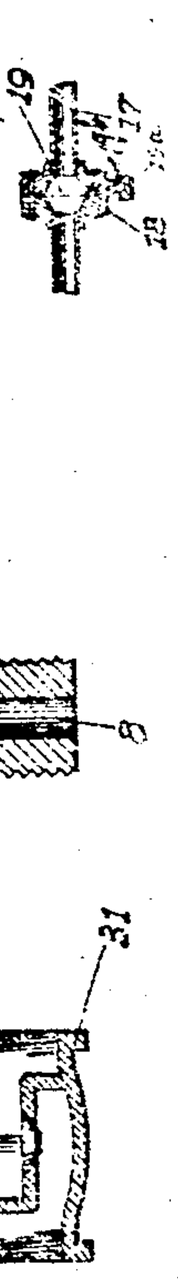


Fig. 4




Witnesses

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# UNITED STATES PATENT OFFICE.

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## OIL-BURNING SYSTEM.

No. 872,023. Specification of Letters Patent. Patented Nov. 26, 1907.

Application filed July 30, 1906. Serial No. 328,307.

*To all whom it may concern:*

Be it known that I, IRA EDWARD SMITH, a citizen of the United States, and a resident of Stockton, in the county of San Joaquin and State of California, have invented certain new and useful Improvements in Oil-Burning Systems; and I do declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and the characters of reference marked thereon, which form a part of this specification.

My invention relates to improvements in oil burning systems, such as are used in connection with cooking stoves, furnaces, and heating contrivances, and particularly to those used in restaurants, hotels and similar localities, and I produce a perfect and steady combustion without causing smoke, soot, smell or an unsteady flame.

The object of my invention is to produce an oil burning system in which oil and air are automatically commingled and fed in the proper proportions for atomizing the oil at the burner, and permitting a low or a high flame, as described and without causing smoke or unsteadiness of the flame.

The particular features of my improved system are the means whereby I produce a perfect air supply, and also the control I am enabled to exercise over the whole system. I am aware that attempts have been made to atomize oil with air, but so far as I am aware, such attempts have generally been accompanied by certain objections which I aim to overcome in my improved oil burning system, as will appear by a perusal of the following specification and claims.

In the drawings similar characters of reference indicate corresponding parts in the several views.

Figure 1 is a top plan view of my improved apparatus. Fig. 2 is a sectional view enlarged of the oil tank and its fittings employed in connection with the improved apparatus. Fig. 3 is a sectional view of a mixing nipple employed in the apparatus. Fig. 4 is a sectional view of the automatic shut-off valve. Fig. 5 is a sectional view of the burner pipe employed in the improved apparatus. Fig. 6 is a sectional view of the strainer employed in the improved apparatus.

For the purpose of more clearly specifying the details of the construction of the improved apparatus, I will, in this specification, deal with my improved system in its three distinct features separately, viz: the burner proper; the oil supply; and the air supply.

*Burner proper:* In the center of the fire box of the range indicated by dotted lines at 1 is located a metal plate 2. 3 is the burner pipe provided with a round orifice 4 arranged to throw the flame against the plate 2. At the outer end of the pipe 3 is a nipple 5 preferably of brass and provided with a main orifice 6 opening into the pipe 3 at the inner end, and provided with an oil inlet 8 entering the orifice 6 from the bottom, and an air inlet 9 entering said orifice 6 from above and rearwardly of said orifice or inlet 8. The nipple 5 is constructed in the usual manner by boring the main orifice 6 through the body of the nipple, and likewise having the branch orifices 8 and 9 transversely of the nipple and intersecting the main orifice 6, and with the outer end of the main orifice closed by a screw plug 7 in the usual manner.

*Oil supply* 10—designates an oil tank, preferably buried or otherwise disposed in a convenient place in the usual manner and at a safe distance from the burner and provided with an oil supply pipe 11.

12 is an automatic water pressure air pump connected to a source of water supply 13. Leading from said air pump 12 is a pipe 14 which is connected into the top of the said oil tank 10. Located in the said pipe 14 is an air pressure regulator 15, the pipe 14 being also provided with a gage 16 and a check valve $15^a$.

17 is an oil supply pipe leading from near the bottom of the tank 10 and being connected to the inlet orifice 8 of the nipple 5 and also provided with a strainer 18, the latter provided with a foraminous diaphragm 19 and a draw off $19^a$ having a closure $19^b$. Said pipe 17 is also provided with a valve 20, located at the tank and a valve 21 at the burner to control the flow.

22 is a tank indicator of suitable construction located on the tank 10 for the purpose of gaging the amount of oil therein, and 23 is a pop valve adapted to relieve all surplus pressure in said tank when the tank is being filled through pipe 11 while the burner is in operation.

The regulator 15 permits of a uniform pressure on the oil tank, and the check valve $15^a$ keeps the air from rushing back into the

pipe 14 and pump 12 when the pump ceases to operate, which would cause the pressure to leave the oil and the fire would go out.

*Air supply:* 24 is a suitable electric motor provided with a small pinion 25, said motor being supplied with electric power controlled by a switch 26.

27 is an air pump preferably of the positive pressure rotary construction and provided with a pinion or gear 28 intermeshing with the pinion 25 whereby the pump 27 is operated from the motor 24.

29 is a pipe leading from the air pump 27 into the range indicated at 1 and carried around therein and thence to the inlet 9.

30 is a pressure gage connected into said pipe 29 to indicate the air pressure therein.

Located in the pipe 17 is a valve 31, and held upward therefrom by a small frame 33 is a small solenoid 32 connected in series by wires 37 to the switch 26 and to the motor 24.

34 is the stem of the valve 31, at the top of which is a cross piece 35, and connected between the piece 35 and the valve 31 is a spring 36, operating to hold the valve normally closed when the magnet 32 is deënergized.

In using the apparatus the tank 10 is filled with oil and the valve 21 is opened so as to permit the desired maximum amount of oil to flow to the burner proper. The air pump 12 is then supplied with a suitable amount of water pressure to operate it which causes the pressure on the oil in the tank 10 to force oil to the burner 3. Power is supplied to the motor 24 which causes the pump 27 to operate which forces air through the pipe 29 to the inlet 9 from whence it passes out through the round orifice 4 and atomizing the oil which enters through the inlet 8, which atomized oil is ignited at the round orifice 4 and the flame strikes the plate 2 heating it red hot, so that if the fire is accidentally blown out or otherwise extinguished, it will immediately be lighted again from said plate.

The positive pressure rotary air pump described is a distinctive feature of my improved oil burning system, as here set forth, as I have found from experience in the actual operation of oil burners, for the purposes set forth, that it is the most economical and practical air pump to use for properly supplying air for atomizing the oil.

The positive pressure rotary air pump employed in the apparatus should receive and deliver forty cubic inches of air at each revolution, without pulsation and at a pressure from ten to twelve pounds per square inch; the pressure being regulated by the size of the round orifice 4 at the end or tip of the burner. The smaller the orifice the greater the pressure, and correspondingly the larger the orifice the lower the pressure. I have found from experience that from one to two pounds pressure at the burner tip or orifice 4 gives the best results. I have also found that it requires forty cubic feet of air at two pounds pressure, which will be indicated by the gage 30, to properly atomize one gallon of crude oil, and to obtain the proper amount of air to atomize sufficient oil to give the desired heat, I can regulate the speed of the rotary air pump by changing the size of the pinion 25 on the electric motor, the gear 28 remaining the same size. If I desire a small amount of air I put on a small pinion 25. If I require a greater amount of air I substitute a larger pinion. If the air pump be constructed to deliver forty cubic inches of air at a revolution and the amount of air it takes to atomize a given quantity of oil is known, it is an easy matter to calculate the required speed of the rotary air pump. The motor employed is preferably of the constant speed construction. The air is delivered from the rotary pump to the orifice 4 at the burner tip without any interference in the way of a regulating valve on the air pipe 29. The rotary air pump is geared when it is installed to give a maximum amount of air to atomize a maximum amount of oil which is admitted through the valve 20 on pipe 17.

From the fact that the air pressure is at no time over two pounds to the square inch, it is not sufficient to blow out the fire if the attendant reduces the pressure of oil, (and consequently reduces the fire or heat) from the maximum to the minimum amount by means of the regulating valve 21. By this means the regulating valve 21 is the only valve the attendant has to operate; the other valves being all set at the time the oil burner is installed and seldom need adjusting.

When the electric current is operating the motor 24 it passes through the wires 37 to the solenoid magnet and constantly energizes the same.

In working the apparatus the operator opens the valve 31 by pulling upward upon the cross piece 35 until the cross piece is brought within the influence of the solenoid, which is strong enough to hold the valve open against the action of the spring 36. When the current is shut off from the motor by the action of the switch 26 the solenoid is deënergized, releasing the valve 34 which is immediately closed automatically by the action of the spring 36, thus shutting off the oil supply as soon as the air pressure is shut off, and thus preventing the over-flow of the oil, as will be obvious.

The strainer 18—19 prevents any extraneous matter from entering the burner proper, while the draw off $19^a$ is used to draw off the residuum which accumulates in said strainer.

The improved device is readily adaptable to any ordinary fire chamber without mate-

rially altering the same, and all the portions of the device being arranged within the fire pot are below the top of the range or stove do not interfere with the ordinary griddles, and being relatively small in area do not interfere with the employment of the fire pot as an ordinary coal or wood heater, if from any cause the oil heating features are disabled or rendered inoperative. This is a decided advantage in the improved apparatus herein described. Another important feature of the apparatus is that the removable portions of the top of the stove, range or furnace may be removed while the burner is in operation without affecting its burning in any way, as I do not depend on the draft through the top of the stove to operate the burner, consequently when a cook or attendant desires to remove the lids to place a vessel next to the flame, the fire does not go out or smother for the want of draft.

I have now entered into a detailed description of the present and preferred embodiment of my invention. I do not desire however to confine myself to such specific detail as many small changes may be resorted to without departing from the spirit of my invention.

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

1. In an oil burning apparatus, a fire chamber, a burner associated with said fire chamber, a fuel supply pipe connected to said burner, an air supply pipe leading through said fire chamber and connected at one end to said burner, means connected to the other end of said latter pipe for supplying air under pressure thereto, an electric motor, connecting means between said motor and the air supplying means, a valve in said fuel supply pipe and provided with a projecting stem, an electro magnet adapted when energized to influence said stem and maintain said valve open, a spring operating to close said valve when the electro magnet is de-energized, and electric conductors between said magnet and motor.

2. In an oil burning apparatus, a fire chamber, a burner associated with said fire chamber, a fuel supply pipe connected to said burner, an air supply pipe leading through said fire chamber and connected at one end to said burner, a positive pressure rotary air pump connected to the other end of said air pipe, an electric motor, connecting means between said motor and the air pump, a valve in the fuel supply pipe and provided with a projecting stem, an electro magnet adapted when energized to influence said stem and maintain said valve open, a spring operating to close said valve when the electro magnet is deënergized, and electric conductors between said magnet and motor.

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

IRA EDWARD SMITH.

Witnesses:
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JOSHUA B. WEBSTER.