

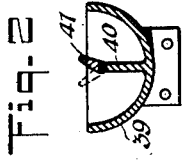
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OIL BURNING SYSTEM

Original Filed June 27, 1924 3 Sheets-Sheet 1



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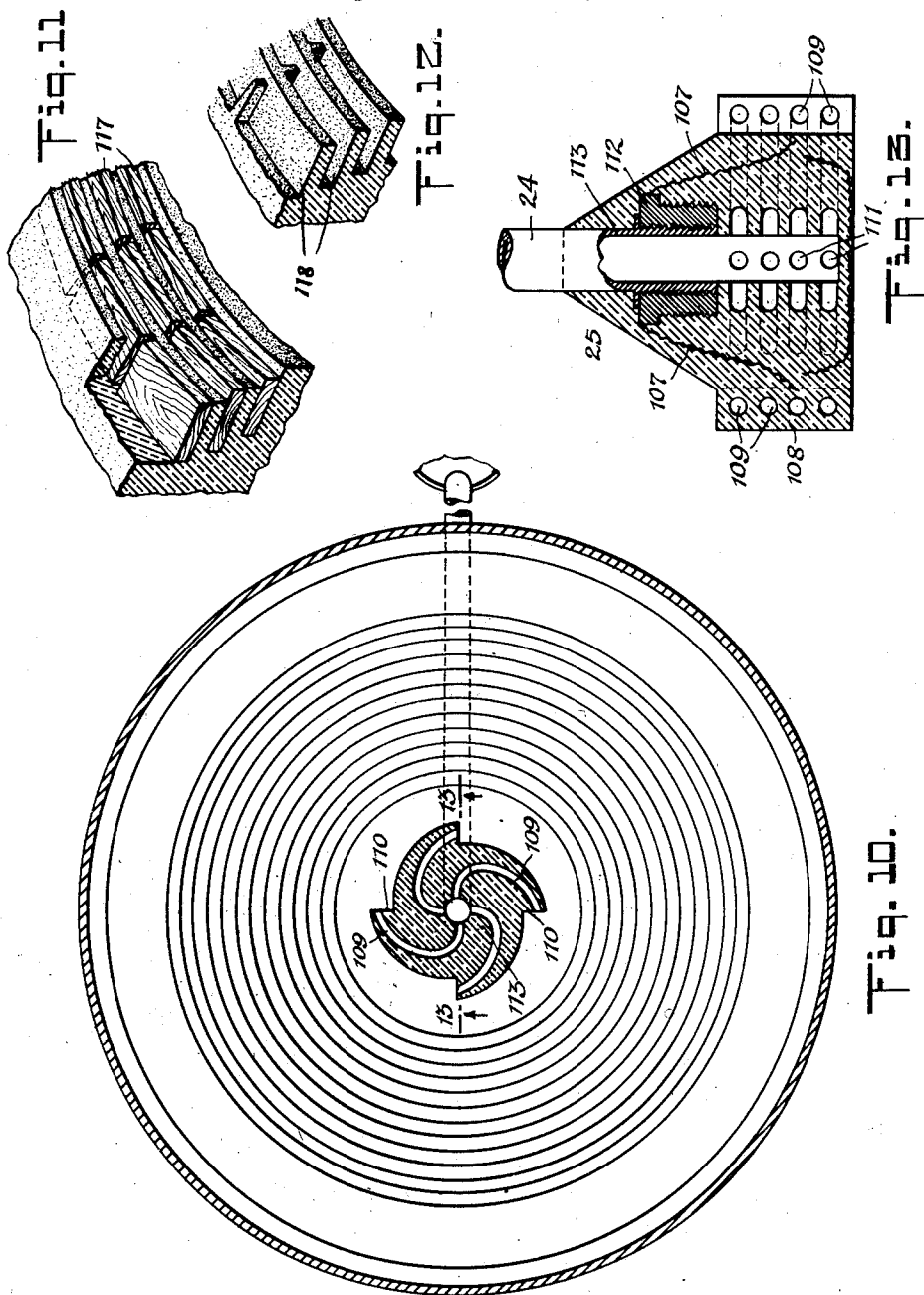
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3 Sheets-Sheet 3



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OIL-BURNING SYSTEM.

Application filed June 27, 1924, Serial No. 722,768. Renewed July 5, 1928.

My invention relates to oil burning systems for heating, cooking, boiling or any other purpose for which an oil burner is adapted, and more especially to that class of oil burning systems in which a thermostatic device in a selected place automatically starts the flow of oil and air to the burner and automatically ignites the oil and air jet when the temperature falls to a predetermined point, automatically cuts out the ignition when the main jet is lighted and automatically shuts off the oil and air supply and extinguishes the flame when the temperature in the selected place rises to the predetermined point.

My invention comprises among other new and useful features an improved form of oil and air burner, and an improved combustion chamber for perfecting the combustion; an improved form of igniter and igniter feed insuring the positive ignition of the main jet; improved means whereby the oil is supplied to the main burner in exactly the right proportion to the supply of air to produce the most perfect combustion and the greatest heat with all grades of oil; improved means for automatically cutting out the igniter and its feed when the main oil and air jet is ignited, and improved means for automatically shutting off the main oil and air supply when the temperature in the selected place reaches the predetermined point, all substantially as hereafter described and claimed.

In order that my invention may be fully understood, I shall first describe in detail the mode in which I at present prefer to carry the invention into effect and then point out in the claims the various features of the invention.

Reference is to be had to the accompanying drawings forming part of this application in which the same parts are designated by like numbers in all the figures.

Figure 1 is a view partly in side elevation, partly in section and partly diagrammatic, showing an oil burning system embodying the principal features of my invention;

Figure 2 is an enlarged sectional view of the oil supply basin of the same;

Figure 3 is an enlarged sectional view of the igniter of the same;

Figure 4 is an enlarged sectional view of

one of the electrode guides of the same; 55

Figure 5 illustrates a modified form of igniter;

Figures 6, 7, 8 and 9 illustrate in different positions the thermostatic switch for controlling automatically the main oil and air supply, the igniter and its feed; 60

Figure 10 is an enlarged sectional plan view of the burner and combustion chamber;

Figures 11 and 12 are detail sectional views showing my preferred method of constructing the combustion chamber. 65

Figure 13 is a sectional side elevation illustrating the construction of my improved burner.

Referring to all the figures, except Figure 5 showing the modified igniter, 15 designates the oil reservoir, 16 the air blower, for which I prefer to use a type of blower which supplies air in measured volume and pressure proportionate to its speed of rotation, 17 the electric-motor which drives the blower, 18 the thermostatic switch, and 19, 20 and 21 the electric wires leading from the thermostatic switch 18 through certain controls hereinafter described, to the motor 17 so that when the temperature in the place of the thermostat 18 falls to a predetermined point the electric circuit 19, 20, 21 will be closed and the motor 17 and blower 16 started, and per contra when the said thermostatic temperature rises to a predetermined point, the electric motor 17 and blower 16, will be stopped automatically all as has been heretofore proposed. 80

From the measuring blower 16 the air under pressure is led through a pipe 22, through a pressure electrode regulator 23 hereinafter described, to a pipe 24, and then to the main burner 25, in the combustion chamber 26 of the furnace 27 which may be the furnace of an ordinary coil boiler as shown or any other heater or means for utilizing the heat of the oil burner. 85

From the main air supply pipe 22, before it reaches the electrode control 23, leads a branch air pipe 28 into a junction 29 with a branch oil pipe 30, which air and oil pipes 28 and 30 respectively feed with a mixture of air and oil an igniter 31 whose flame tube 32 leads into the combustion chamber 26 and is directed at the burner 25, so when the igniter flame issues from the tube 32, it will light the mixed oil and air jets issuing from 100 105

the burner 25 as hereinafter more fully set forth.

To supply oil from the reservoir 15 to the main burner 25 and also to the igniter 31 in measured proportions with respect to the air supply so as to produce the most effective mixture of air and oil and to avoid the usually interdicted pressure from a pump or from gravity, I prefer to use the following means:

From the bottom of the oil reservoir 15, I lead an oil supply pipe 33 into the bottom of an oil well 34, which is closed on all sides but is open at the top above the top of the reservoir, and is therefore continually filled with oil at the same level as in the reservoir 15.

Directly above the oil well 34 is mounted a vertically revoluble sprocket wheel 35, which is driven by any suitable connecting means in synchronism with the air blower 16.

Over the sprocket wheel 35 runs an endless sprocket chain 36 carrying little oil buckets 37 on each side of each link, and said bucket chain runs downward to and around a sprocket wheel 38 suspended loosely thereby in the bottom of the oil well 34, so that as the sprocket wheel 35 is revolved, oil is carried upward by the bucket chain 36 in quantity proportionate to the air supplied to the burner 25.

Directly beneath the sprocket wheel 35 is fixed an oil basin 39, divided transversely by a partition 40 having a hinged upper section or wing 41, so that as the bucket chain 36 travels over the sprocket wheel 35, the buckets 37 will be tilted in succession and discharge their contents into the oil basin 39 on both sides of the partition 40. By adjusting the partition wing 41 on its hinge the proportion of oil falling into each compartment of the basin 39 can be regulated.

Below the basin 39, the rising bucket chain is guided between an embracing pair of tilting wheels 42, loosely mounted on a pivoted lever 43, which lever can be itself tilted and held in its adjustment by a chain 44 engageable at any link by a fixed hook 45. By this means the buckets can be adjusted before they reach the basin to discharge such part of their contents as may be necessary to deliver exactly the right proportions of oil into the supply basin 39.

From one compartment of the oil basin 39, is led an oil pipe 46 into a junction 47 with the main burner air supply pipe 24, so that the mixture of air and oil from the basin inhaled therewith, supplied to the burner 25 consists of exactly the right proportions to produce the most perfect combustion and the greatest heat.

It might be explained that the air forced by the blower 16 through the air supply pipes 24 and 28 by the oil inlets 30 and 46 acts as an injector to draw or inhale

with it the oil from the oil inlets 30 and 46 and basin 39, to supply the igniter and burner respectively.

From the other compartment of the oil basin 39 is led the branch oil pipe 30 previously described as leading into the junction 29, with the branch air pipe 28, to feed the igniter 31 with a mixture of air and oil from the basin inhaled therewith, so that the igniter fed mixture also consists of exactly the right proportions to produce the most effective flame as hereinafter set forth.

In the main oil supply pipe 46 and in the branch oil pipe 30 are fitted shut off valves 48 and 49 respectively, whose handles are preferably placed in line vertically and connected by a common chain 50 to a drip bucket 51 into which leads a pipe 52 draining from the bottom of the combustion chamber 26, so that if any excess oil collects in the bottom of the furnace, it will fill the bucket 51 and thereby automatically close both the oil supply valves 48 and 49, and extinguish the flames at the burner 25 and at the igniter 31.

From the branch oil pipe 30 is led a vent pipe 53, whose mouth 54 is normally closed by a valve 55, carried by a double armature 56 held in a double solenoid 57.

The solenoid is electrically connected at one terminal by a wire 58 with one terminal of the electric motor 17, and a wire circuit 59 leads from the other terminal of the solenoid through the electrodes of the electric igniter 31, and then through a wire 60, to one contact 61 of a thermostatic switch 62. The electric contact 61 is normally projected from its casing by a spring 63 but can be retracted against said spring by a medial contact 64 electrically connected with the wire 19 previously mentioned as leading from the primary thermostat 18.

The contact 64 is fixed upon but insulated from a thermostatic lever 65 pivoted to a bracket 66 fixed to the wall of the furnace 27, and the lever 65 is pressed toward the furnace by a spring 67, but can be pressed outward against said spring 67, by the engaging end of a thermostatic rod 68 expanding and contracting lengthwise in a tube 69 projecting through the wall of the furnace over the combustion chamber.

The opposite side of the medial lever contact 64, is arranged to engage another contact 70, which is normally projected by a spring, but can be retracted against said spring by the lever contact 64, and is electrically connected with the wire 20 previously described as leading to the terminal of the motor 17.

The arrangement and adjustment of the furnace thermostatic switch 62 and its connections are such that when the furnace is cold the lever contact 64 retracts the contact 61 and closes the circuit from the pri-

mary thermostatic switch 18, through the wires 19 and 60, the electric igniter 31, the wire 59, the solenoid 57, the wire 58, the motor 17, the wire 21, and the primary ther-

mostatic switch 18.

Then when the primary thermostatic switch 18 is closed by the fall in temperature the motor air blower, and main and igniter oil feeding devices are set in action, the igniter air vent 54 is closed by the active solenoid 57, the electric igniter 31 is vitalized, the oil and air jet at the main burner 25 is lighted, and the furnace 27 is in action.

As soon as the furnace is hot its thermostatic rod 68 expands, the medial contact 64, while followed by and remaining in touch with the spring pressed contact 61, touches also the opposite contact 70, so as to close also the shunt circuit through the wire 20 to the motor.

Then as the thermostatic rod 68 continues to expand, the lever contact 64 leaves the contact 61 and continues the circuit through the wiring 19 and 20, the motor 17, the wire 21 to the primary thermostat 18, thus keeping active the motor, the main oil and air supply to the burner 25, and the furnace, while at the same time breaking the circuit through the wire 60, the electric igniter 31, the wire 59, the solenoid 57, and the wire 58, to the motor.

The electric igniter 31 is thus devitalized, and the solenoid 57 being rendered also inert, drops the vent valve 55, opens the igniter oil vent 54, and thus prevents any further supply of oil passing from the vented compartment of the basin 39 through the pipe 30 to the igniter 31.

If the flame at the main burner 25 should be extinguished through any cause, the thermostatic rod 68 would of course contract, closing the main circuit again through the contacts 64 and 61, restarting the igniter and its oil and gas supply, again lighting the burner 25, and then again cutting off the igniter and its supply of air and oil as before.

When the primary thermostatic switch 18 is opened by the desired rise in temperature, of course both the main and shunt circuits described are broken and the whole system rendered inactive.

The electric igniter 31, I prefer to construct and arrange as follows, referring first particularly to Figures 1, 3 and 4.

An upright igniter casing 71, of suitable refractory material, through which the igniter tube 32 is extended also lined with refractory material, is fixed in a box 72 outside the furnace.

In a vertical guide tube 73 in said casing leading into the igniter tube 32, is mounted a vertically movable carbon electrode 75, and in downwardly converging guide tubes 76 and 77 in said casing also leading into the

igniter tube 32 on opposite sides of the vertical electrode 75 are mounted movable carbon electrodes 78 and 79 the lower ends of which are arranged when vitalized to form an electric arc with the medial electrode 75.

The outer ends of the converging electrodes 78 and 79 are additionally supported and guided in metallic channel guides 80 and 81 supported in refractory brackets 82 and 83 fixed to the box 72.

The wire 59 from the double solenoid 57 is electrically connected to the electrodes 78 and 79 through their respective metallic guides 80 and 81, so that the circuit to energize the electric arc light thus formed is from the primary thermostat 18 through the vertical electrode 75 to the converging electrodes 78 and 79 and then through the wire 59 to the solenoid 57.

To compensate for the consumption of the vertical carbon electrode 75, while the converging electrodes 78 and 79 compensate for their consumption by falling by gravity in their respective guides 80 and 81, I may use the ordinary or any suitable electrode compensating device, but I now prefer to use the device best shown in Figure 3. This comprises a vertical air cylinder 85 fixed on an insulated base 86 above the igniter box 72, and containing a vertically movable piston 87, below which into the cylinder leads the main air supply pipe 22 and above which out of the cylinder leads the air supply pipe 24 to the junction or mixer 47 and to the burner 25.

The piston 87, is limited in its vertical play by adjustable stops 88 and 89 (shown in Figure 1) mounted in the cylinder respectively below and above the piston.

Above the lower position of the piston 87 the bore of the cylinder, in the lower part of which the piston fits closely but loosely the bore of the cylinder, increases by a flare 90, so that as the piston reaches the flare 90, the air supply entering by the lower pipe 22, will escape past the piston and out of the cylinder through the upper air supply pipe 24.

Centrally fixed in the piston 87 and vertically adjustable therein by a sleeve 91 attached to the piston and set screw 92, is a vertical carbon tube 93 insulated from the cylinder, like the pipes 22 and 24, in which the vertical carbon 75 is held and guided, and which tube 93 itself plays vertically with its attached piston in insulating guides 94 and 95 fixed respectively in the upper and lower heads 96 and 97 respectively of the cylinder 85. To the lower end of the movable piston tube 93 is fixed a bracket 98, carrying an insulated depending pin 99 to which is pivoted a binding arm 100 resting on a support 101 on the top of the igniter casing 71, and embracing loosely the electrode 75. The insulated pin 99 is electri-

cally connected by a wire 102 with the contact 61 of the furnace thermostatic switch 62.

The construction, arrangement and adjustment of the related parts is such that when the primary thermostat 18 starts the air and gas supply to the burner 25 and its igniter 31 and energizes the igniter circuit as before described, the electric current passes through the meeting points of the carbons 75, 78 and 79, and the air supply at the same time passes through the cylinder 85, raising the piston 87, and tube 93, and, through the carbon clamp 100, raising the vertical carbon 75, thus separating the point thereof from the points of the inclined carbons 78 and 79, and forming an electric arc in the refractory casing section of the igniter tube 32. The mixed air and oil jet simultaneously forced through the igniter tube is immediately ignited by the intense heat of the electric arc, and the flame thereby produced directed at the burner 25 as before described, instantly igniting the air and oil mixture issuing from said burner.

As soon as the heated furnace thermostat 62 breaks the circuit through the arc igniter 31 the arc light is extinguished and the mixed oil and air fuel supply to the igniter is cut off as before described.

When the primary thermostat 18 breaks the main circuit and cuts off the burner fuel supply as before described, the piston 87 falls owing to the cessation of air pressure in the cylinder 85, and releases the vertical electrode 75 restoring contact with the other electrodes 78 and 79.

In lieu of the straight inclined integral carbons 78 and 79 shown in Figures 3 and 4, I may use the sectional electrodes 103 and 104, shown in Figure 5 consisting of strings of carbon blocks falling by gravity in curved inclined guides 105 and 106, beneath the point of the vertical carbon 75 in the igniter tube 32.

The main fuel burner 25 in the furnace 27 may be of any suitable form or type, but I at present prefer to construct the same as shown sectionally in Figures 10 and 13, of refractory cement moulded around metal reinforcing screening 107, and combustible cores of any suitable material, such as vegetable fibre saturated with saltpeter, which is then burned out so as to form a lower refractory cylindrical portion 108, having a vertical series of evolute, or it may be spiral, fuel ducts 109, opening at radial faces 110. The ducts 109 lead from corresponding openings 111 in the vertical fuel supply tube 24, the tube 24 being threaded into a bushing 112, fixed in the upper portion 113 of the refractory block which tapers upwardly to the tube 24.

With this construction of burner, the fuel jets issuing from the mouths of the ducts

109 in the radial faces 110, and ignited as previously described make flames of a circular rapidly swirling form as indicated in Figure 10, which secure instant ignition and produce the most perfect combustion of the fuel and the greatest obtainable degree of heat, with almost any grade of fuel.

To coact with this novel form of burner, I may use any suitable construction of furnace, but I at present prefer to use the form constructed as shown in Figures 1, 10, 11 and 12.

I make this special form of furnace by moulding a body 114 of refractory cement in the bottom of the furnace with an upwardly conical or flaring stepped side wall 115, and a flat refractory base 116, the wall 115 being preferably moulded around spaced combustible blocks 117 of for example wood, arranged in circular series, and stepped vertically as best shown in Figures 11 and 12, so that when the combustible blocks are burned out, there are formed in the flaring wall 115 of the combustion chamber a number of vertically stepped circular series of mixing and baffling cells 118, which coact with special effectiveness with the special circular swirl producing burner 25 to make the most perfect combustion and the most intense heat, even with inferior grades of oil.

This special form of swirl burner and cellular wall furnace are especially effective with the special igniter shown in producing instant ignition thereby.

I wish to make it clear that I do not limit myself to the special form of burner or of furnace or of igniter or of oil measuring and feeding devices or any other of the special features herein shown and described, as the same may be widely varied or substituted by ordinary or equivalent devices for the respective purposes without departing from the boundaries of my invention as defined by the following claims.

The invention embodied in the furnace burner and igniter illustrated herein and originally claimed in this application is claimed by me in a divisional application for an oil burning furnace, Serial No. 62,259, filed by me October 13, 1925.

I claim as my invention:

1. An oil burning system comprising an air and oil burner, an air and oil igniter therefor, air supply pipes leading to the burner and its igniter respectively, an oil measuring and delivering device including a basin, a transverse partition having a hinged upper wing, dividing the basin into two compartments into both of which the oil is delivered, and oil supply pipes leading from said respective compartments to the burner and igniter.

2. An oil burning system comprising an air and oil burner, an air and oil igniter, air supply pipes leading to the burner and ig-

5 niter, an oil measuring and delivering device, a partitioned receptacle into both compartments of which the oil is delivered, a pipe leading from one compartment to the burner, a pipe leading from the other compartment to the igniter, a vent in said igniter pipe, a valve to open and close said vent and common electric means for operating said vent valve and the igniter.

10 3. In an oil burning system, the combination with an oil chain pump, a partitioned receptacle into which the oil falls therefrom, a burner, an igniter and their supply pipes leading from opposite sides of said partition, of a hinged wing or section on said partition to deflect the oil falling therein.

15 4. An oil burning system comprising a burner, an igniter therefor having an air and oil burner tube and an electric arc light therein, an air pressure device for controlling the electrodes of the arc, oil supply devices for the burner and for the igniter, air supply devices for the burner and igniter including an air pipe leading from the air supply to the air pressure arc controller and therefrom to the burner, and common electric means for shutting off the air supply to the air pressure arc controller and the electric current to the arc electrodes.

20 5. An oil burning system comprising a burner, an igniter therefor having an air and oil burner tube and an electric arc light therein, an air pressure device for controlling the electrodes of the arc, oil supply devices for the burner and igniter, air supply devices for the burner and igniter including an air pipe leading through the air pressure arc controller to the burner, and common electric means for starting and shutting off the air and oil supply to the burner and igniter, and the current to the arc electrodes.

25 6. In an oil burning system of the character described, the combination with a burner, an igniter therefor having a burner tube, and arc electrodes meeting at the burner tube, of an air pressure cylinder, a piston therein in operative connection with one arc electrode, an air supply pipe leading into and out of said cylinder to the burner, and means whereby when the air enters the cylinder it moves the piston and its electrode, and passes from the cylinder to the burner.

30 7. In an oil burning system of the character described, the combination with the burner, an igniter therefor having a burner tube and arc electrodes meeting at the burner tube, of an air pressure cylinder having a flare in its bore, a piston in the cylinder in operative connection with one electrode, and an air supply pipe leading into said cylinder on one side of said piston and flare and from said cylinder on the other side of said piston and flare to the burner.

35 8. In an oil burning system of the character described, the combination with the

burner, an igniter therefor having a burner tube and arc electrodes meeting at the burner tube, of an air pressure escape cylinder, a piston therein carrying a tube loosely embracing one electrode, an electrode clamp connected to said piston tube and an air supply pipe leading into and out of said cylinder on opposite sides of the piston to the burner.

9. In an oil burning system, the combination with a furnace, an air and oil burner, an electric air and oil igniter and electrically operated air and oil supply devices for the burner and igniter, of a thermostat at the furnace and a thermostatic switch having a contact in operative connection with the furnace thermostat, an elastic contact on each side thereof, an electric circuit including the medial contact, one side contact and the igniter and the air and oil supply devices for both the burner and igniter, and another electric circuit including the medial contact, the other side contact, and the burner air and oil supply devices.

10. An oil burning system comprising a burner, an igniter therefor, air supply pipes leading to the burner, and to the igniter, and an air supply pump, an oil well, an oil basin, an endless chain carrying oil buckets from the oil well in which the buckets are filled, to the oil basin into which the buckets empty, means for operating the air pump and oil bucket chain in unison, and oil supply pipes leading from the oil basin into the air supply pipes for the burner and the igniter, whereby the air draws with it into both the burner and the igniter the oil thus measured and delivered into the basin in definite proportion to the air supplied by the air pump.

11. An oil burning system comprising a burner, an air supply pipe and pump therefor, an oil well, an oil basin, oil carrying buckets, an endless chain carrying the buckets through and from the oil well to and over the basin into which the buckets empty, an oil supply pipe leading from the oil basin into the air supply pipe for the burner, means for tilting the bucket-carrying chain and thereby varying the discharge from the buckets, and means whereby the bucket-carrying chain and air pump are operated in unison, the capacity of the buckets and their rate of movement with respect to the air pump being so proportioned that the oil will be measured and delivered into the basin and aspirated therefrom into the air supply pipe and burner, in a predetermined ratio to the amount of air delivered to the burner.

12. An oil burning system according to claim 11, in which the bucket-chain tilting and adjusting means comprises a pivotal lever having guide wheels thereon loosely embracing the bucket carrying chain and means for adjusting the pivotal position of the same.

In testimony whereof I affix my signature.

ALDEN AARON STEWARD.