Jan. 24, 1928.

1,657,436

H. MUNRO

OIL BURNER

Original Filed Aug. 7. 1924 2 Sheets-Sheet 1

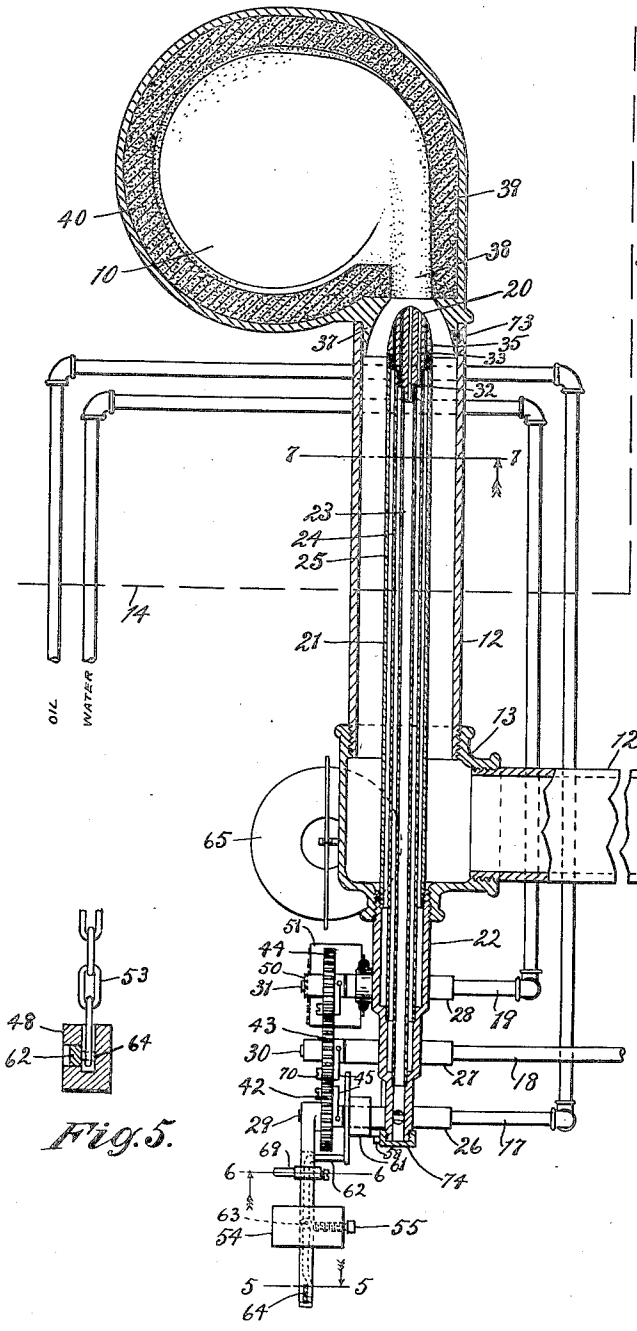


Fig. 1.

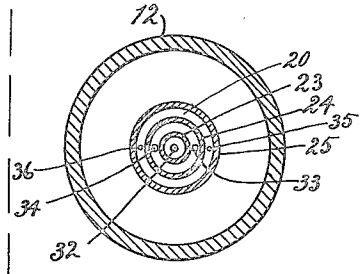


Fig. 1.

Fig. 5.

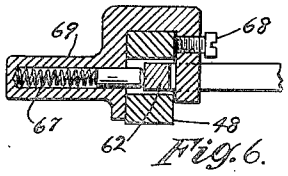


Fig. 6.

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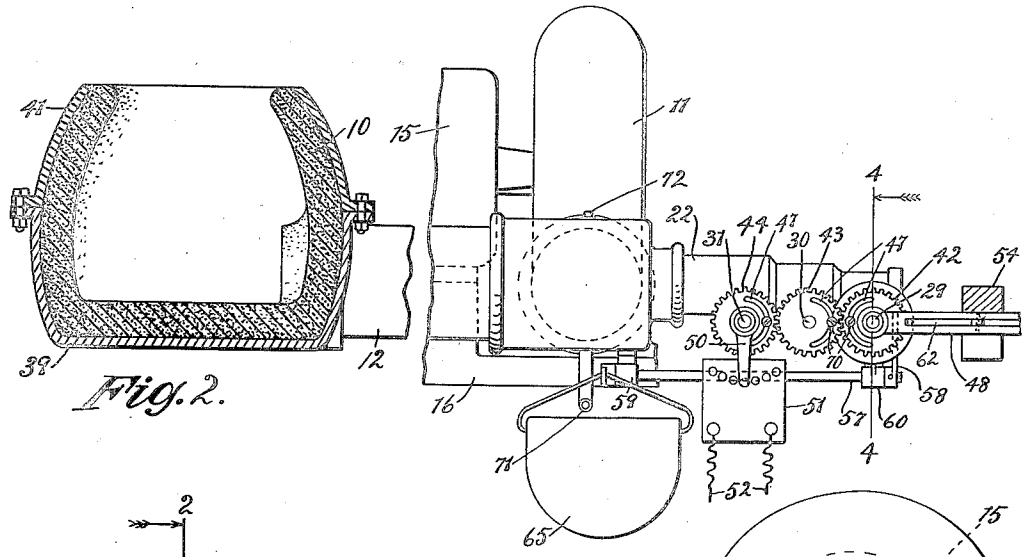


Fig. 2.

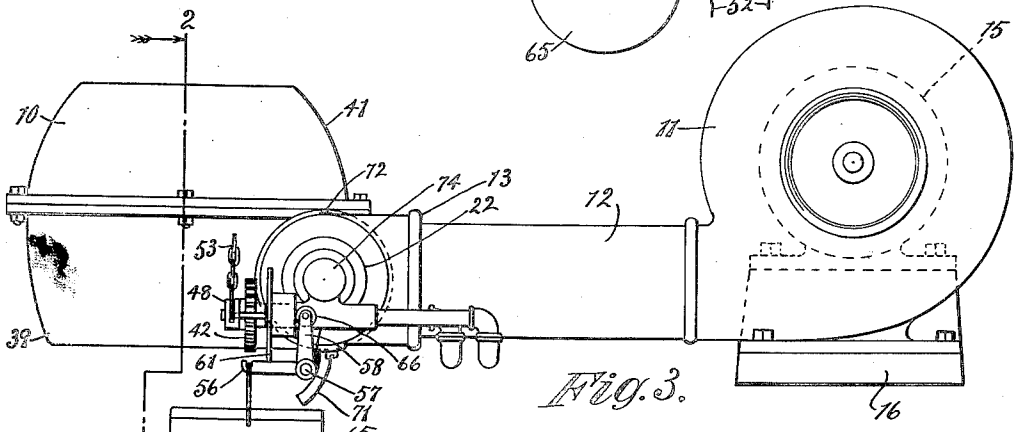


Fig. 3.

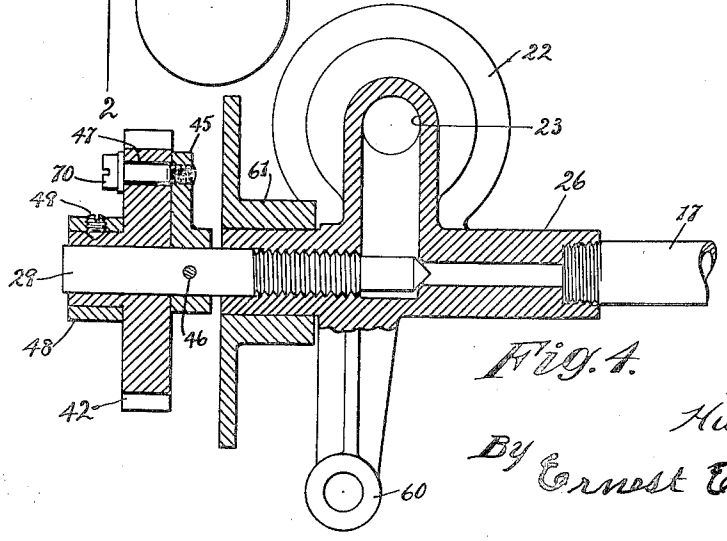


Fig. 4.

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UNITED STATES PATENT OFFICE.

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OIL BURNER.

Refiled for abandoned application Serial No. 730,558, filed August 7, 1924. This application filed October 29, 1926. Serial No. 145,082.

The invention relates to improvements in oil burners and more particularly to burners which utilize water as a material of combustion by mixing it with oil and air.

One of the objects of the invention is to provide a burner which automatically operates to thoroughly mix the oil, air and water comprising the materials of combustion before ignition occurs.

Another object is to provide a burner in which the materials of combustion are thoroughly gasified, mixed and ignited before they escape from the burner.

Still another object is to provide a burner having means whereby the relative proportions of oil, air and water can be regulated to produce a maximum of efficiency in combustion.

A further object is to provide a burner having novel means for automatically controlling the amount of the mixture which is fed into the combustion chamber in accordance with the varying fuel requirements of the plant.

Another object is to provide improved means in a burner whereby the flow of fuel to the burner is automatically stopped in the event that combustion accidentally ceases.

Sitll another object is to provide a burner having improved means for automatically regulating the flow of fuel to a pilot jet whereby a pilot flame is provided when the supply of fuel to the burner is accidentally or intentionally shut off.

A still further object is to provide a burner which minimizes the roaring noises usually incident to combustion in oil burners.

Another object is to provide a burner which is economical to manufacture, simple to construct, and easy to install and operate.

Another object is to generally improve oil burners.

Other further and more specific objects will become apparent as the specification proceeds.

I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a horizontal section and plan view of the device;

Figure 2 is a view along the line 2—2 of Fig. 3;

Figure 3 is an elevational view;

Figure 4 is a sectional view along the line 4—4 of Fig. 2; and

Figures 5, 6 and 7 are sectional views on a larger scale taken along the lines 5—5, 6—6, and 7—7, respectively of Fig. 1.

Similar numerals refer to similar parts throughout the several views.

In its preferred form the burner includes a firepot 10, which is connected with a blower 11, by means of a conduit 12. This conduit may be of any desired length and cross section and extended in any direction suitable to the particular installation. In the embodiment shown the conduit makes a right turn through the medium of a T 13, and extends through the wall of a furnace or a firebox, which is represented diagrammatically by the dotted line 14. The conduit terminates on the inside of the furnace with an opening into the firepot 10 and at the other end by an operative connection with the blower 11. The blower is illustrated as being of the well known snail type. A motor 15 actuates the blower 11 and operates to drive air through the conduit and out through the firepot 10. The motor and the blower are mounted upon a block 16, which is adapted to be supported upon the floor or any convenient pedestal structure. The firepot and adjacent portions of the conduit are supported by the wall 14 of the furnace.

A nozzle 20 is positioned in the conduit where it will emit and deliver into the firepot a jet or spray of the materials of combustion. Pipes 17, 18, 19 supply the nozzle 20 with oil, gas and water respectively, the nozzle being connected with the pipes by a distributor tube 21. This tube is mounted in the T 13, through which it projects and terminates in a generally cylindrical shaped member 22. The interior diameter of the member 22 is substantially less at its midportion than at the innner end and still smaller at the outer end than at the midportion, the change in the diameter being abrupt and providing shoulders with which telescoping pipes 23, 24 and 25, forming part of the distributor tube, are connected. These pipes have exterior diameters corresponding to the various interior diameters of the member 22, and are connected thereto by threading, driving or swaging to a tight

fit. The opposite ends of the pipes 23, 24 and 25, have their interior diameters corresponding in size to and connected with shoulders on the nozzle 20 around which the pipes are threaded or otherwise connected to form a close fitting joint.

The pipes 17, 18 and 19 are connected to the member 22 through the elements 26, 27 and 28 respectively. These elements are shown as integrally formed with the member 22 and each has an extension on one side which provides an inlet opening for the corresponding one of the pipes 17, 18 and 19, and an extension on the other side which forms a mounting for needle valves 29, 30 and 31, operating to control the flow from the pipes 17, 18, and 19 respectively. It is obvious that the outlet from the oil pipe 17 is through the central pipe 23, and the central port 32 of the nozzle 20, that the flow from the gas pipe 18 is confined to the annular shaped conduit between the pipes 23 and 24 and out through the nozzle ports 33 and 34, while flow from the water pipe 19 is through the annular shaped conduit lying between the pipes 24 and 25 and thence through the ports 35 and 36 in the nozzle.

The conduit 12 is connected with the firepot 10 by an annular shaped lug 37. The interior of the lug provides a converging outlet from the conduit to the firepot 10 through a port 38 in the lower wall section 39 of the firepot. The nozzle 20 is positioned in the converging outlet in alignment with the port 38. Operation of the blower 11 drives air through the conduit 12 and out around the nozzle 20 and through the converging outlet into the firepot. The convergence of the outlet causes an acceleration of the air as it passes the nozzle. The speed and acceleration of the air as it passes the nozzle at the tip of the nozzle creates a suction tending to draw the fluids from the nozzle with a force and velocity that disintegrates and thoroughly mixes them together and with the air that carries the entire mass into the firepot.

The firepot is constructed to permit of complete combustion of the mixture while passing therethrough. This result is accomplished by reason of the circular cross section and upward convergence of the lining 40. The mixture enters and strikes the lining tangentially thereby causing it to whirl around the firepot in close proximity to the lining while ignition occurs, the convergence operating to retard escape of the gases until they are thoroughly mixed and ignited. In practice it is found that no carbon is deposited on the lining as is the case of burners where the impact of the fuel against the lining is direct. It is also found that this thorough mixture of the water and oil with the air before combustion occurs, and the retarding of the gases to prevent their escape from the firepot until combustion is substantially complete, minimizes the disturbing noises usually incident to burners of this type. Renewal of the lining 40 is accomplished by providing an upper wall section 41 of the firepot, which is bolted to the lower section 39, so as to be easily removed. Removal of the section 41 facilitates the removal, replacement or repair of the lining 40. The tangential impact of the mixture with the lining also lengthens the life of the lining as the disintegrating effect is much less than in burners where the impact is direct.

The gas is intended as a supply for a pilot flame which remains when the fuel is shut off. The valve 30, controlling the gas supply, operates to open when the valves 29 and 31 are being closed. This is accomplished by mounting gears 42, 43 and 44 upon the stems of the valves 29, 30 and 31 respectively, as is shown in Figure 4, for the valve 29. These gears are in mesh and are mounted to permit limited rotation about their respective stems. Since the gear 43 of the valve 30, which controls the gas, is positioned between and in mesh with both of the gears 42 and 44, it always rotates in a direction opposite to their rotation. Each of the valves has a crank 45, fixedly mounted on its stem by a pin 46, as is best shown in Figure 4. The crank is fastened to the corresponding gear by a bolt 70, extending through a slot 47 in the gear. The slots provide for adjustment of the valves by permitting a limited rotation of the gears without corresponding rotation of the valve stem. The valve stems are similarly threaded, as indicated in Figure 4, so that rotation of the stems in a clockwise direction, as viewed in Figure 2, tends to close the valves and rotation in the opposite direction tends to open them.

A thermostat lever 48 is fixedly fastened to the gear 42 by a set screw 49 and an arm 50 is fastened similarly to the gear 44. The arm 50 connects the gear 44 with a rheostat 51, which is connected with the motor 15 by conductors 52. The thermostat lever 48 is supported at its outer end by a chain 53, which is suspended from and actuated by a thermostat (not shown). The lever 48 is pivotally mounted on the gear 42, as above described, so that movement of the chain up and down by the thermostat operates the system of gears. A counterweight 54 is slidably mounted on the lever 48, and is provided with a set-screw 55 for fastening in any position necessary to proper adjustment.

Complete release of the lever 48 from the chain 53 is accomplished by means of a trip valve apparatus comprising a drip bucket 65, suspended beneath the T 13, from a horizontally extending lever 56. The lever 56 is fixedly fastened to one end of a shaft 57.

This shaft extends underneath and along the member 22 and is supported by standards 59 and 60, which extend downwardly from the T 13 and the member 22 respectively. A vertical arm 58 is fixedly fastened to the shaft 57 adjacent to the element 26. The arm 58 has a ring 66 pivotally mounted on its upper end and arranged to press against a flanged collar 61, which is slidably mounted upon the element 26 adjacent to the gear 42. The lever 48 is hollowed out to receive a rod 62, which is pivotally mounted therein on a pin 63, the rod having a projecting portion connected with the collar 61, so that movement of the collar back and forth causes the rod 62 to oscillate about the pin 63 as a pivot. The outer end of the rod 62 is provided with a pin 64, which engages a link of the chain 53, as shown in Figs. 5 and 6. Movement of the collar to the left by the weight of the drip bucket, acting through the lever 56, shaft 57 and arm 58, releases the pin 64 from engagement with the chain and permits the lever 48 to move downwardly about the gear 42 as a pivot. A spring 67 yieldingly holds the rod 62 against the pressure from the collar 61, and prevents movement of the collar until the weight of the drip bucket 65 exceeds a predetermined amount. The spring 67 is positioned in an element 69, which is slidably mounted upon the lever 48. The resistance of the spring 67 to movement of the rod 62 is adjusted as desired by moving the element 69 along the lever 48 and fastening it in position by means of the set screw 68.

A drain tube 71 is mounted in the T 13, over the bucket 65. The conduit is preferably given a slight slope downwards from the firepot 10 to the T in order that any drip from the nozzle 20 may run back and through the tube 71 into the bucket 65. A hole in the top of the T 13, opposite the tube 71, is filled with a plug 72. In case installation opposite from that shown is desired, the conduit 12 can be turned over and the tube 71 and plug 72 interchanged. The fastening of the firepot 10 to the conduit 12, by means of a set screw 73, permits the firepot to be set with its open end up when the conduit is turned over.

The oil pipe 17 and the water pipe 19 are carried through the furnace wall 14 and out again for the purpose of heating the fuel before it enters the distributing tube 21. A cap 74 on the end of the member 22 is provided for easy removal to facilitate the cleaning of the inner pipe 23 which carries oil to the nozzle 20. The member 22 is shown as threaded through the end of the T 13, thereby making it possible to remove the distributor tube 21 without dismantling the device.

The burner is shown in Figs. 2 and 4 as adjusted so that when the gears are positioned with the bolts 70 in the middle of the slots 47, the valves are partially open. In this position the rheostat arm 50 occupies a middle position and the thermostat lever 48 is substantially horizontal.

The lever 48 and the arm 50, being fixedly fastened to the gears 42 and 44 respectively, it is obvious that elevation of the free end of the thermostat lever 48 rotates the gears 42 and 44 and the arm 50 in anti-clockwise direction as viewed in Fig. 2, and that lowering of the lever 48 causes rotation of these elements in the opposite direction. The bolts 70 are shown in the middle of the slots and by loosening the same, limited movement of the gears can occur in either direction without corresponding rotation of the valves, thereby making it possible to adjust the valves relatively to each other as well as to the lever 48 and the arm 50, and since the valves are partially open for the position of the gears and thermostat arm shown in Fig. 2, rotation in the same direction after the bolts 70 have contacted with the adjacent ends of the respective slots will operate to open or close the valves.

The thermostat arm is arranged to permit the lever 48 to move downwardly as the temperature rises thereby checking the valves 29 and 31, which control the supply of oil and water respectively, and to close the valves when a predetermined temperature is reached. Movement of the lever 48 in this direction opens the valve 30 to provide gas for a pilot jet at the portal 38, in the nozzle 20, and also moves the rheostat arm 50 to slow down the motor 15, as the valves 29 and 31 are closing and to stop the motor when the valves are closed. Movement of the lever 48 in the opposite direction is occasioned by a drop in temperature, thereby causing the valves 29 and 31 to open after the temperature drops a predetermined amount. This reverse movement of the lever 48 also moves the arm 50 to start the motor and to accelerate it as the valves are opened and to shut off the pilot jet by closing the valve 30. The speed of the motor and the volume of the air which is driven into the firepot by the blower are thereby adjusted and proportioned to the amount of oil and water delivered through the valves 29 and 31. The device is adjusted so that the thermostat movement is sufficient in a given range of temperature to actuate the gears to completely open and close the valves and to operate the motor through all intermediate speeds up to the maximum in accordance with the fuel requirements.

In case the motor is stopped accidentally with the valves 29 and 31 open, the valves 29 and 31 will be automatically closed and the valve 30 likewise opened. This action occurs because there is no air current in the conduit to carry the oil and water from the

nozzle 20 into the firepot. The oil and water drips from the nozzle and runs back through the conduit and into the drip bucket 65. The weight of the bucket and its contents soon becomes sufficiently heavy to force the collar 61 and the rod 62 against the resistance of the spring 67, thereby moving the rod to release the chain 53 from engagement with the pin 64. This permits the lever 48 to drop under its own weight and turn the gears to actuate and close the valves 29 and 31, thereby shutting off the supply of oil and water as well as moving the rheostat arm to the shut-off position.

Thus it will be seen that the invention provides not only novel means of mixing and conveying oil and water to a burner by an induced current of air, but provides novel mechanism automatically operable to shut off the flow of oil and water in the event of accidental stoppage of the induced air currents, and further provides for a mixture of oil, air and water in proper proportions for efficient combustion before the mixture enters the combustion chamber and also for the retention of the mixture in the combustion chamber until complete ignition occurs.

I claim:

1. In a device of the class described, a nozzle, a pipe connecting the nozzle with a supply of liquid, a valve controlling the flow of liquid to the nozzle, suitable means for creating air currents of sufficient velocity around the nozzle to carry away the liquid flowing from the nozzle, mechanism adapted to close the nozzle upon failure of the air currents to carry away the liquid, said mechanism comprising a lever suitably fastened to the valve whereby the weight of the lever tends to close the valve, a chain from which the lever is suspended, means for engaging the lever with the chain comprising a rod pivotally mounted on the lever, a pin on the rod engaging a link of the chain, resilient means yieldingly holding the rod in appropriate position for engagement of the pin with the chain and an instrumentality adapted to move the rod to disengage the pin from the chain comprising the bucket into which drip from the nozzle flows, a collar slidably mounted for movement to engage said rod and actuate it in opposition to said resilient means, a bell crank lever having a horizontal arm from which said bucket is suspended, and a second arm engaging said collar, said bell crank lever being suitably mounted whereby the weight of said bucket and contents tends to move said second arm to slide said collar and rotate said rod against the opposition of said resilient means.

2. In a device of the class described, a firepot, a conduit having an opening into the firepot, a nozzle positioned in the conduit, a pipe connecting the nozzle with a supply of liquid, a valve operable to control the flow of liquid to the nozzle, a propeller operable to create a current of air suitably enveloping the nozzle whereby material emitted by the nozzle is carried by said current into the firepot, and an instrumentality adapted to cause closure of the valve when said current of air stops, said instrumentality comprising a drain pipe leading from the conduit, a drip bucket into which the drain pipe flows, a lever appropriately connected at one end to the valve for rotation therewith, an element adapted to support the other end of the lever, means for engaging the lever with said element, mechanism operable by said drip bucket to release the lever from engagement with said supporting element when the weight of the bucket and contents exceeds a predetermined amount, said lever engaging means comprising a rod pivotally mounted on the lever and having a pin on one end adapted for normal engagement with an aperture in said supporting element, a finger on the other end, and resilient means holding the rod with the pin in said aperture, and said mechanism comprising a bell crank lever having a horizontal arm from which the drip bucket is suspended, and a vertical arm bearing against a collar slidably mounted for engagement with said finger in opposition to said resilient means.

3. In a device of the class described, a conduit, a propeller operable to drive air through the conduit, a nozzle adapted to deliver a spray of fluid into said conduit, a plurality of pipes connecting the nozzle with separate supplies of fluid, each of said pipes having a valve operable to control the flow of fluid to the nozzle, said valves each having a gear wheel mounted on its stem in mesh with the wheels of adjacent valves, a rheostat operatively connected with said propeller, an arm mounted on one of said wheels and rotatable therewith to control the rheostat, and a thermostatically actuated lever connected with one of said wheels whereby said arm, valves, and wheels are rotated back and forth as the temperature rises and falls.

4. In a device of the class described, an air conduit, a propeller operable to drive air through the conduit, a nozzle adapted to deliver a spray into the conduit, a plurality of pipes connecting the nozzle with separate supplies of fluid fuel, each of said pipes having a valve operable to control the flow of fuel to the nozzle, said valves each having a gear wheel mounted on its stem in mesh with the wheels of adjacent valves whereby rotation of said wheels in one direction operates to open alternate valves and to close the remaining valves, a rheostat operatively connected with said propeller, an arm mounted on one of said wheels and rotatable therewith to actuate said rheostat to start and to increase the speed of the propel-

ler as said first mentioned alternate valves are opened and to diminish the speed and to stop the propeller when said first mentioned alternate valves are being actuated to a closed position.

5. In a device of the class described, an air conduit, a propeller operable to drive air through the conduit, a nozzle adapted to deliver a spray of fluid fuel into the air conduit, pipes adapted to separately connect the nozzle with a supply of oil, gas and water, respectively, each of said pipes having a valve controlling the flow to the nozzle, said valves each having a gear wheel mounted on its stem with the wheel on the gas valve meshing with each of the wheels on the oil and water valves, whereby the gas valve closes as the oil and water valves open and vice versa, a thermostatically mounted lever suitably connected with one of said wheels to rotate the wheels to close the oil and water valves as the temperature rises and to open said oil and water valves as the temperature falls, a rheostat operatively connected with said propeller and having a controller arm suitably connected with one of said wheels to actuate said rheostat to start the propeller when the oil and water valves are initially opened and to regulate the speed of the propeller proportionately to the opening of the oil and water valves.

6. In a device of the class described, a nozzle, pipes connecting the nozzle with a supply of oil, gas and water respectively, each of said pipes having a valve controlling the flow to the nozzle and each of said valves having a gear wheel mounted on its stem with the gas control valve in mesh with both the oil and water control valves, whereby rotation of the wheels causes the gas control valve to close as the oil and water control valves open and vice versa.

7. In a device of the class described, a nozzle, pipes connecting the nozzle with a supply of oil, gas and water respectively, each of said pipes having a valve controlling the flow to the nozzle and each of said valves having a gear wheel mounted on its stem with gas control valve in mesh with both the oil and water control valves, whereby rotation of the wheels causes the gas control valve to close as the oil and water control valves open and vice versa, and a thermostatically controlled lever suitably connected to one of said wheels to rotate the wheels back and forth as the temperature rises and falls respectively.

8. In a device of the class described, a nozzle, pipes connecting the nozzle with a supply of oil, gas and water respectively, each of said pipes having a valve controlling the flow to the nozzle and each of said valves having a gear wheel mounted on its stem with the gas control valve in mesh with both the oil and water control valves, whereby rotation of the wheels causes the gas control valve to close as the oil and water control valves open and vice versa, and a thermostatically controlled lever suitably connected to one of said wheels to actuate the oil and water control valves towards closing as the temperature rises and towards opening as the temperature falls.

9. In a device of the class described, a nozzle, pipes connecting the nozzle with a supply of oil, gas and water respectively, each of said pipes having a valve controlling the flow to the nozzle, and each of said valves having a gear wheel fixedly mounted on its stem with the gas control valve in mesh with both the oil and water control valves, whereby rotation of the wheels causes the gas control valve to close as the oil and water control valves open and vice versa, and means for shifting the position of the gears relative to their respective stems whereby the relative amount of opening of the valves for a predetermined position of the gears can be varied.

In testimony whereof I affix my signature.

HUGH MUNRO.