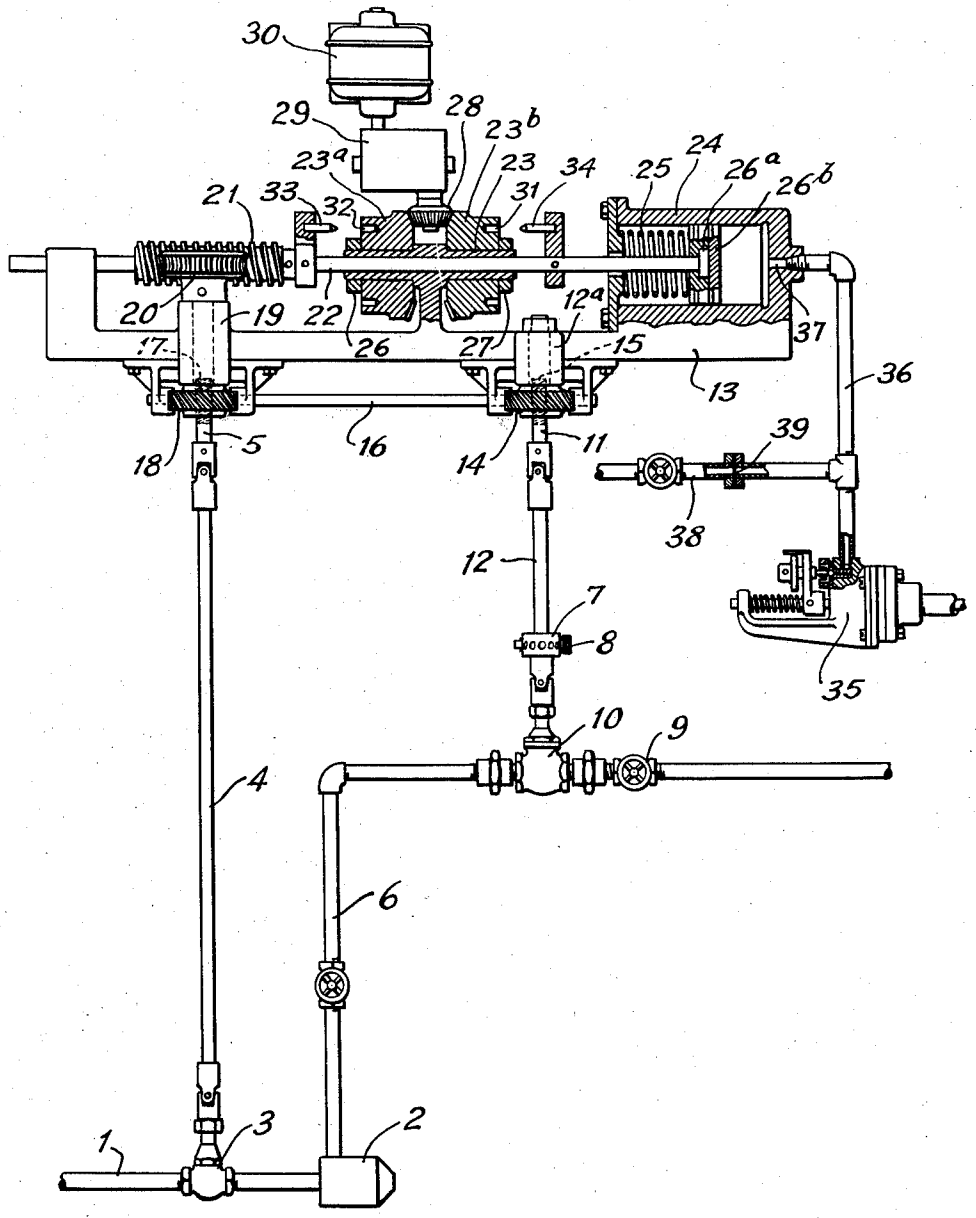
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AUTOMATIC TEMPERATURE CONTROL

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AUTOMATIC TEMPERATURE CONTROL

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This invention relates to an automatic control for fuel burners, and consists broadly of a control for air and/or fuel supply, in which control may be rapidly regulated over one range and then slowly operated over a further range until the direction of the regulation or operation is changed in response to temperature conditions.

An object of the invention is the provision of novel and efficient means acting in series upon a control valve to cause first a rapid opening or closing movement of the valve followed by a gradual further movement thereof.

A further object of the invention is to provide new and improved means of varying, in response to heat conditions, the amount of air and fuel supplied to a burner while maintaining equal the proportions of the two.

The drawing is a diagrammatic representation of the invention as applied to an oil burner showing certain parts thereof in section.

An oil pipe line 1 connects a burner 2 with a source of oil supply under constant pressure (not shown). In the oil pipe line 1 is a needle valve 3 connected by a universal connection 4 with a rod 5, the operation of which will be hereinafter described. An air pipe 6 connects the burner 2 with a source of air under pressure, (not shown). In the pipe line 6 is a maximum air control valve 9 and a needle valve 10. The needle valve 10 is connected to a rod 11 by a universal connection 12. The needle valve 10 is adapted to vary the amount of air passing to the burner 2. Two portions of the universal connection 12 are adjustably connected by means of a rotatable joint 7 which is held in a predetermined position by a pin 8. When the pin 8 is removed, the valve 10 may be manually turned up or down, and thus any selected proportionate relationship between the supply of oil and air may be obtained. After suitably setting the valve 10, the pin may be reinserted to make the valve 10 responsive to the automatic control.

The rod 11 is mounted in a bearing 12*a* in a frame 13. Fixedly mounted on the rod 11 is a skew gear 14 which is actuated by the movement of a skew gear 15. The gear 15 is fixedly connected to a shaft 16, the other end of which carries a skew gear 17 which meshes with a skew gear 18 fixedly mounted on the rod 5. Upon the rotation of the rod 5 in a manner hereinafter described, rotative movement is imparted to the rod 11 as well as to the rod 5, and thus, depending upon the direction of the motion, imparts an opening or closing movement to the needle valves 3 and 10, and synchronously controls the supply of oil and air admitted to the burner 2.

Preferably the valves 3 and 10 and gears 14, 15, 17, and 18 are so selected that the selected proportions of fuel and air are maintained throughout the range of control of the valves.

The rod 5 is mounted in a bearing 19 in the frame 13 and carries on one end thereof a worm wheel 20 which is adapted to mesh with a worm 21. The worm 21 is fixedly mounted near one end of a piston rod 22, which is partially supported by a sleeve 23 formed on an extension of the frame 13, and which is adapted to rotate in a recess 26*a* in a piston 26*b* in an air cylinder 24. Within the cylinder 24 is a spring 25 which is adapted to force the piston 26*b* toward the right end of the cylinder 24, when insufficient pressure exists in the cylinder to counteract the effect thereof. Upon the admission and exhaust of air to and from the cylinder in a manner hereinafter to be described, and by the action of the spring 25, the worm 21 rotates the worm wheel 20 by a "rack" movement, and thus through the linkage before described, partially closes or opens the valves 3 and 10.

Rotatably mounted on the sleeve 23 are bevel gears 23*a* and 23*b* held in place respectively by collars 26 and 27. Mounted in connection therewith is a bevel gear 28 which is connected by a reduction gear 29 to a unidirectional motor 30, which moves continuously, thus imparting a continuous motion in opposite directions to the two gears 23*a* and 23*b*. These two gears contain a plurality of pin holes 31 and 32, which are adapted to receive pins 33 and 34 which are fixedly connected to the piston rod 22. Upon the com-

pletion of movement of the piston rod 22 in either one direction or another, and hence the completion of the "rack" movement imparted to the worm 21, these pins will mesh with the pin holes and a rotative movement will be imparted to the worm 21, thus to the worm wheel 20, and through the previously described linkage to the valves 3 and 10.

The admission of air to the cylinder 24 is determined by the action of a thermally operated valve 35, which in itself forms no part of this invention and may be of any known suitable type. A suitable device is described in great detail both as to its construction and operation in the application for United States Letters Patent of Vergil Mulholland and myself, Ser. No. 199,823, filed June 18, 1927. Such a valve, in response to heat conditions, builds up or decreases air pressure in the pipe line 36 which connects the valve to a port 37 of the cylinder 24. Between the valve 35 and the port 37, a pipe 38 connects the two to a source of air under constant pressure (not shown). In the pipe line 38 is an orifice 39, preferably of the size made by a No. 60 drill, which serves to help restrict the flow of air pressure in the pipe line 38 between the source of supply and the thermally operated valve, thus enabling the valve 35, which controls the exhaust of pressure from the pipes 38 and 36 to the right of the orifice 39 in pipe 38, as seen in the drawing, to control the pressure in this portion of the pipe 38 and in pipe 36 and hence that within the cylinder 24 and thereby to control the valves 3 and 10.

In operation, assuming a condition of insufficient temperature, the thermally operated bleed valve 35 has closed and thereby built up air pressure in the pipe 36 and the cylinder 24, projected the piston rod 22, and imparted a "rack" movement to the worm wheel 20, and thus rapidly opened the valves 3 and 10. In this extended position, the pin 34 meshes with a pin hole 31 and the rotative movement of the motor 30 is imparted to the piston rod 22, and the worm 21 is caused to rotate and thus slowly rotates the worm wheel 20 and, through the connections, the valves 3 and 10, thus gradually opening them more widely.

When sufficient heat has been generated, the thermally operated valve 35 acts in an opposite sense and bleeds air from the pipe 36 and the cylinder 24. The spring 25 then forces the pin 34 out of engagement with the pin hole 31; a "rack" movement in the opposite direction is imparted by the worm 21 to the worm wheel 20, and the valves 3 and 10 are rapidly partially closed. As the spring continues to force the piston 26*b* against the gradually lessening air pressure, the pin 33 is forced into engagement with a pin hole 32 and a rotative movement in the opposite direction from that previously imparted is given to the worm 21, and thus through the connections to the valves 3 and 10, thus gradually closing them.

While the control mechanism herein described is specifically shown as applied to a burner system employing both air and oil it is obvious that it may readily be adapted for use in connection with other systems. For example, it is obvious that the control mechanism for the air valve 10 may be eliminated and the balance of the mechanism readily applied to a gas burner system. Similarly the mechanism may be applied to control electric current, as for example by turning up and down a suitable rheostat in an electric circuit. Other such uses within the spirit of my invention will suggest themselves.

It is likewise obvious that for any particular use, either that described or another, the size and character of the valves, or equivalent apparatus, must be properly selected as must be the character and size of the gears, in order that the valves may be opened and closed at the proper speeds and to the desired extents both in response to the "rack" motion and the rotary movement of the part 21.

While I have shown and described the initiation of both the "rack" and rotary movements of the part 21 as from a single source and by a single means, it is obvious that a plurality of means accomplishing the same ends may readily be substituted.

While I have shown pneumatic means controlled by a thermodynamic valve for imparting both motions to the gear 21, it is obvious that I might substitute other means, as for example, one or more solenoids operated by a simple thermostat.

There are also several ways in which the desired character of rotary movement may be obtained, for example by suitably selecting the pitch of the worm wheel and worm 20 and 21 and by suitably regulating the speed of the motor 30.

The embodiment of my invention herein shown and described is merely by way of illustration, and obviously numerous changes may be made in the structural details and arrangement of parts without departing from the spirit and scope of my invention as set forth in the following claims:

1. An automatic temperature control device comprising a fuel burner, means for supplying fuel to said burner, means for varying the said supply of fuel, comprising a valve in the fuel supply line, means for opening and closing said valve comprising a unidirectional motor and a thermostatically operated combined clutch and air cylinder adapted to first impose a movement on said valve and then operatively connect said unidirectional motor with said valve to impart a further movement thereto.

2. An automatic temperature control device comprising a fuel burner, means for controlling the supply of fuel to said burner comprising a valve in a fuel supply line, a worm and worm wheel, linkage between the valve and the worm and worm wheel, means for imposing a relatively rapid longitudinal action of the worm upon the worm wheel, whereby the worm wheel is rapidly rotated, and means to impart a relatively slower rotative movement to the worm upon the completion of the longitudinal action, whereby the worm wheel is further rotated but more slowly.

3. An automatic temperature control device comprising a valve in a fuel supply line, a worm wheel and worm associated therewith, linkage between the worm wheel and the valve, means to impart an axial movement to the worm whereby the worm wheel is rotated, and means, effective upon the completion of such axial movement, to impart a further rotary movement to said worm.

4. Automatic control mechanism for fuel or power lines and the like, comprising a rotatable element in the line to regulate the flow therethrough, and means for rotating the element including a pair of cooperating gears, means for moving one gear tangentially of the other to rapidly rotate the element, and means for rotating said one gear to more slowly rotate the element.

Signed at Hartford, Connecticut, this 26th day of November, 1929.

WILLIAM T. HONISS.