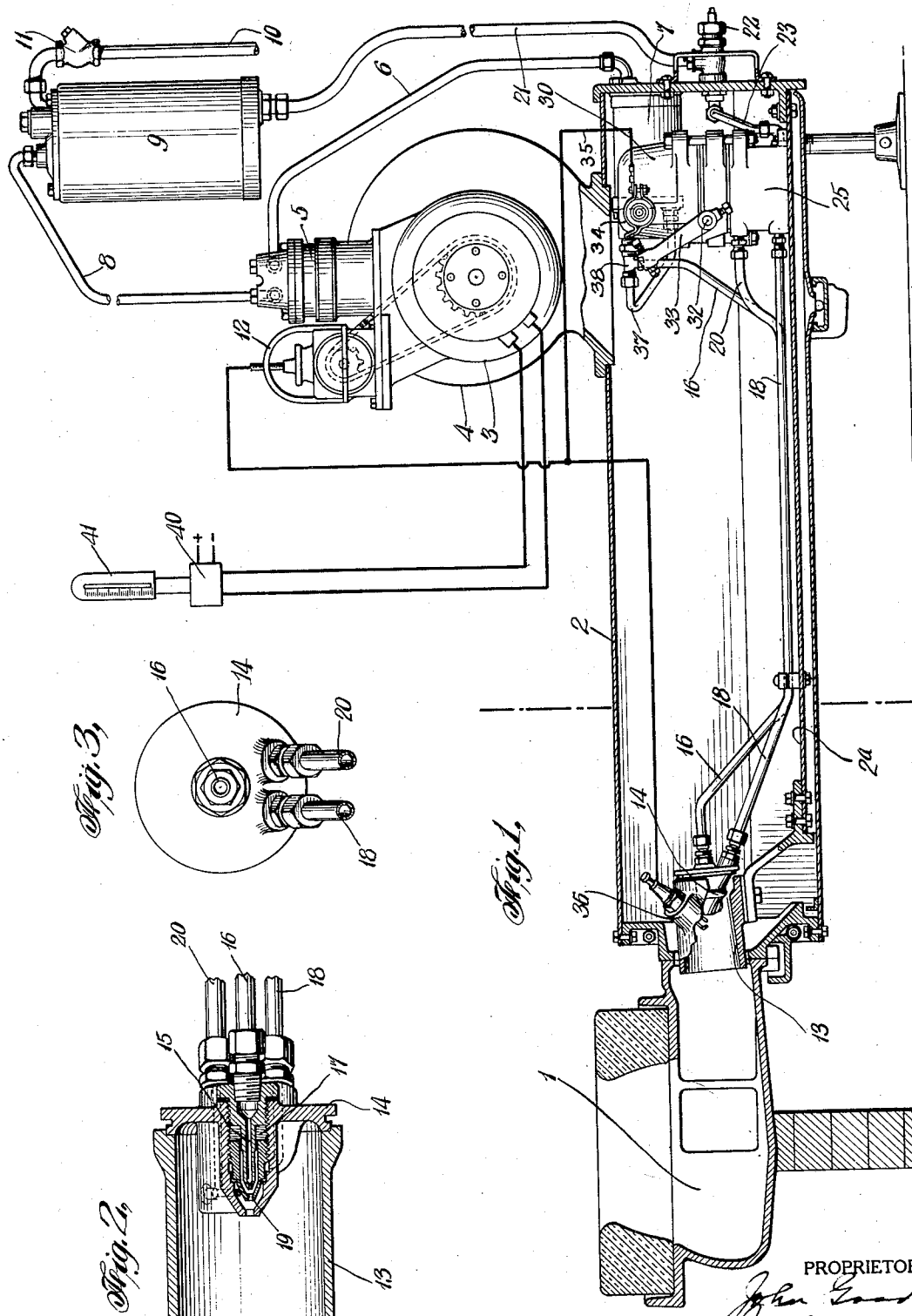
Jan 6, 1931. J. GOOD 1,787,743

OIL BURNER

Filed Aug. 12, 1926 2 Sheets-Sheet 1



PROPRIETOR

John Good

By Jefferys Campbell Egg & Co

Their ATTORNEYS

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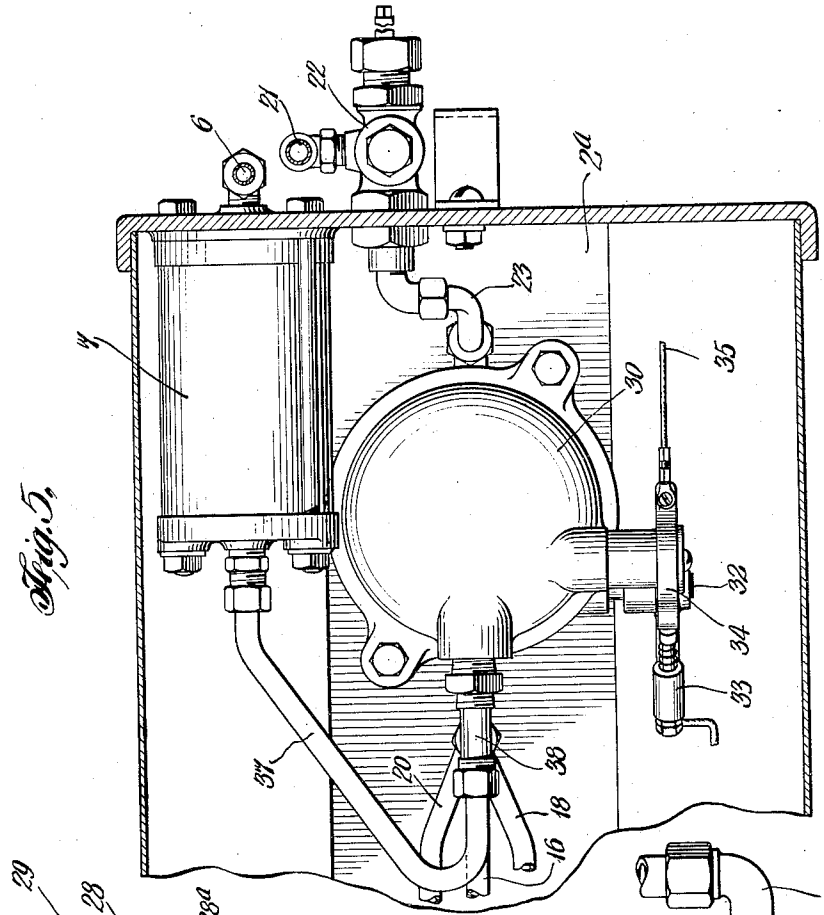


Fig. 3.

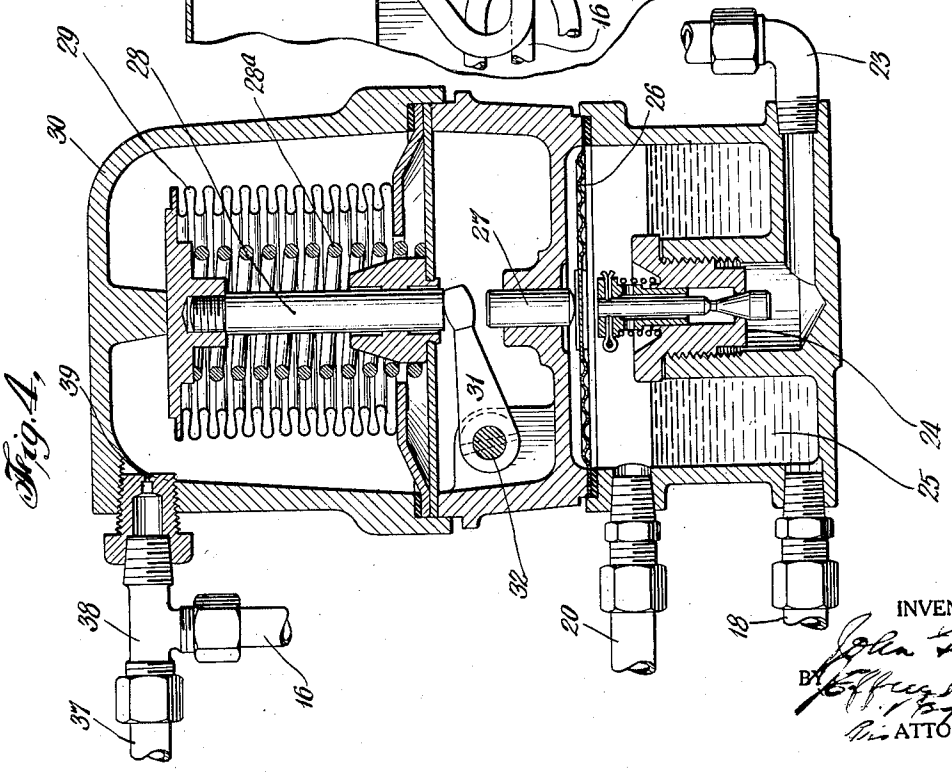


Fig. 4.

INVENTOR
John Good
BY
ATTORNEY

Patented Jan. 6, 1931

1,787,743

UNITED STATES PATENT OFFICE

JOHN GOOD, OF GARDEN CITY, NEW YORK, ASSIGNOR TO GOOD INVENTIONS CO., OF NEW YORK, N. Y., A CORPORATION OF NEW YORK

OIL BURNER

Application filed August 12, 1926. Serial No. 128,756.

The invention has reference to oil burners, more particularly, of the type commonly used in house heating furnaces, although useful elsewhere, and its object is to improve and simplify the means for controlling the introduction of fuel into the combustion chamber to the end of avoiding explosive conditions therein. The invention relates generally to the type of burner disclosed in a previous application, now Patent No. 1,723,031, patented Aug. 6, 1929, and includes certain improvements in the fuel supply arrangements shown in that patent and also contemplates the employment of pneumatic means for establishing the desired sequence and control of the fuel-feeding and ignition periods, such means being particularly suited for use in conjunction with the said fuel supply arrangements although not essential thereto.

In the accompanying drawing,

Fig. 1 is a longitudinal vertical section of a burner structure constructed generally along conventional lines but having the present invention incorporated in it, parts of the mechanism being shown in elevation.

Figs. 2 and 3 are larger scale details of the two-rate spray mechanism;

Fig. 4 an enlarged section of the pneumatic control mechanism, and

Fig. 5 is a plan of the same.

The burner comprises a fire pot 1 supported inside the combustion space of a house heating furnace, or otherwise related to the thing to be heated, and connected with an air conduit 2, extending outside the furnace and containing or supporting the control and operating mechanism. The latter includes an electric motor 3 driving a blower 4, which delivers air through an opening in the top of the air casing 2 and thence to the fire pot and furnace. The motor also drives a small air pump 5, the function of which is to deliver air at a higher pressure through the pipe 6 to the air receiver 7, and thence by the mechanism presently to be described to the sprayer mechanism. The suction side of the air pump 5 is connected by a pipe 8 to a so-called vacuum feed tank 9, which is a local gravity supply for liquid fuel, and draws fuel into it from a remote tank, not shown, through a pipe 10 provided with a check valve 11. The electric motor 3, in the present case, also drives a small electric generator 12, which furnishes the current for igniting the fuel in the burner, but this generator may be omitted and other means of ignition used in its place.

The control of the fuel supply to the burner proper or fuel spray device, and of the ignition current, is accomplished by a pneumatic timing chamber 30 mounted inside of the air conduit 2 and preferably on a tray 2^a therein which can be withdrawn from the end of the conduit, like a drawer, for inspection. The tray also carries the spray head 13 mounted thereon in a position to discharge through an appropriate opening into the fire pot 1. The spray nozzle 14 is a two-rate fuel discharger and, in the present case, is operated by the high pressure air from the air pump 5 delivering the fuel on the injector principle but only as permitted by the pneumatic device referred to. It comprises an air jet 15, supplied with air from pipe 16, an oil jet 17 supplied with oil from pipe 18 and a larger oil jet 19 supplied with oil from pipe 20. Both oil ducts are in aspirating relation to the air jet; the smaller one, 18, represents the low rate of fuel supply and both acting together furnish the full or normal fuel supply, representing maximum combustion of which the apparatus is capable.

Fuel is delivered from the local tank 9 through pipe 21, shut-off valve 22, and oil pipe 23, to a fuel entrance valve 24 contained in the lower part of the oil reservoir 25 of the pneumatic timing device. The construction of this valve will be clear from Fig. 4 without description; it opens downwardly against a spring, and when open allows the oil to flow upwardly through the convolutions of the spring into the reservoir 25. The valve is opened by pressure exerted on it through a flexible diaphragm 26, which latter is arranged to be bulged downwardly by a push rod 27 actuated by the plunger 28 of a motor device or metallic bellows 29, the latter being essentially a piston member mounted in an air chamber 30 and subject to air pressure on its exterior which collapses it against

the pressure of spring 28a and thereby opens the oil valve. The crank arm 31 which intervenes between the pneumatic plunger 28 and the push rod 27 is mounted on a rock shaft 32, extending outside the casing, where it carries an electric grounding arm 33 (Fig. 1). The pneumatic operation of plunger 28 rocks this arm into contact with the insulated terminal 34 (Fig. 5) of a branch 35 of the ignition circuit, which latter extends from the generator to the ignition device or spark plug 36 of the spray mechanism, thereby grounding the plug and rendering it inactive for so long as the pneumatic plunger 28 is depressed. The end of the grounding arm 33 is provided with a spring yielding contact element so that it does not interfere with the movement of the pneumatic plunger.

When the electric motor 3 is set in action after a period of rest, high pressure air from the pipe 6 and air receiver 7 is transmitted through pipe 37 and T-fitting 38 through a restricted orifice 39 (Fig. 4) into the air chamber 30, where it gradually builds up an air pressure sufficient to cause the plunger 28 to operate the grounding arm and then open the fuel entrance valve 24. This may require a minute or more according to the size of restriction 39. The high pressure air passes at the same time, from the T through pipe 16 to the air jet 15 of the sprayer mechanism above described. On the starting of the apparatus, the oil level in reservoir 25 is about as indicated in Fig. 4, below the level of pipe 20, so that the air jet 15 discharges oil only through the low rate pipe 18 and oil jet 19. The resulting small spray is ignited by the spark plug 36, producing a relatively small flame in the fire pot. This flame however is supplied with the normal or full volume of air from the air blower 4, and this is much in excess of its combustion requirements but is desirable for the purposes of safety inasmuch as it thereby becomes impossible for an explosive mixture to be produced, which, if ignited, might do injury.

While this small, or low rate flame is burning in the fire pot, air pressure is building up in the slow-filling timing chamber 30, gradually depressing the pneumatic plunger 28, rocking the grounding arm 33 and depressing the push rod 27, and in the course of a few moments, the grounding arm 33 reaches its contact terminal and thereby deenergizes the igniter. Shortly thereafter the push rod 27 opens the fuel valve 24, whereupon the reservoir 25 fills with fuel up to or above the level of the connection of the larger fuel pipe 20 and the high rate fuel delivery thereupon begins. That is to say, fuel is now delivered to the spray mechanism through both pipes 18 and 20 and the resulting flame is at once enlarged to its normal proportions, the igniter being no longer active, and having been discontinued before the full fuel rate came on. This full rate supply obviously obtains for as long as the air pressure is maintained on the pneumatic diaphragm, to hold the oil valve open, which is to say, as long as the electric motor 3 is supplied with current. Ordinarily such motor is connected to the house electrical circuit through a relay and control box indicated diagrammatically at 40, and governed by a room thermostat 41 or the like. When the room thermostat reaches the temperature for which it has been set it causes the motor circuit to be broken, the air pressure dies off in the chamber 30, and the fuel entrance valve 24 closes, the grounding arm 33 returning to its open or inactive position, ready for the next starting.

On each shut-down a residual portion of fuel is left in the reservoir 25, as above pointed out, to serve as the supply for the initial low rate burning on the next operation. This supply is large enough to accommodate the lag period produced by the restricted admission of air to the pneumatic chamber 30, and the lag period is long enough to insure a proper temperature in the fire pot for the starting of the normal combustion when the fuel valve 24 is opened. Inasmuch as the igniter is always cut out before the full rate burning occurs and cannot be made active while the full rate is in action, the danger of ignition of any substantial volume of explosive mixture in the fire pot is reduced to a minimum.

Having now described my invention, I claim:

1. In an oil burner, the combination of a combustion chamber having an igniter, motor operated means for effecting a preliminary fuel delivery for ignition purposes, and a subsequent main delivery to said chamber including a fuel valve and a slow-filling air chamber for controlling the main delivery, means directly responsive to the pressure in said chamber and operating to open said valve on the attainment of a predetermined pressure, and means for rendering the igniter inactive prior to said subsequent main delivery.

2. In an oil burner, the combination of a combustion chamber having an igniter, motor-operated means for effecting a preliminary fuel delivery for ignition purposes and a subsequent main delivery to said chamber, said means including a pneumatic piston member, a diaphragm operated by said piston member and a fuel valve for said main delivery controlled by said diaphragm, and means responsive to the operation of said piston member for rendering the igniter inactive.

3. In an oil burner, the combination of a combustion chamber having an igniter, a motor-operated means for furnishing air and fuel to said chamber, said means in-

cluding a fuel valve and a pneumatically operated piston member which successively de-energizes said igniter and opens said valve.

4. In an oil burner, a motor, means operated thereby for furnishing fuel and air to the combustion space, said means comprising a reservoir having outlets at different levels, spray mechanism connected to both outlets, and pneumatic timing means for controlling the oil level in said reservoir and the delivery of fuel through one of said outlets.

5. In an oil burner, a motor, means operated thereby for furnishing fuel and air to the combustion space, said means comprising a reservoir having outlets at different levels, fuel discharge mechanism connected to both outlets, and pneumatic means controlling the time of delivery of fuel into said reservoir.

6. In an oil burner, the combination of a combustion chamber having an igniter, and a two-rate fuel discharging mechanism, a motor, and means operated thereby for furnishing air and fuel to said chamber, said means including a pneumatic piston member which successively de-energizes the igniter and starts the full rate fuel discharge.

7. In an oil burner, an igniter, a motor, air supply means operated thereby for effecting a preliminary fuel delivery to a place of combustion for ignition, a main fuel supply means and a pneumatic timing device operated by said air supply means for controlling the main fuel supply and the igniter.

8. In an oil burner, air delivery means, means for effecting a preliminary fuel delivery to a place of combustion for ignition purposes and a subsequent main delivery, including pneumatic means operated by said air delivery means and adapted to interpose a delay between the initiations of the two deliveries, an igniter and means for rendering the same inactive coincidently with the initiation of said main delivery.

9. Oil burning apparatus comprising means for supplying a constant air flow suited for normal combustion, a two-rate spray nozzle adapted to deliver fuel into said air flow and pneumatic means for causing said sprayer to deliver fuel for a predetermined period at a rate below that required to produce an explosive mixture in the place of combustion and subsequently at a higher rate substantially in accordance with combustion requirements.

10. Oil burning apparatus comprising means for supplying a constant air flow suited for normal combustion, a two-rate spray nozzle adapted to deliver fuel into said air flow, and means for causing said sprayer to deliver fuel initially at a rate below that required to produce an explosive mixture in the place of combustion and subsequently at a higher rate substantially in accordance with combustion requirements.

11. In an oil burner, the combination of a combustion chamber and an igniter, oil delivery means including two supply passages together supplying sufficient oil for the normal requirements of the burner, means whereby one of said passages is rendered active to supply oil when the operation of the apparatus is initiated and means for subsequently rendering the igniter inactive and said other passage active.

12. In an oil burner the combination set forth in the preceding claim including a valve controlling the oil flow through said other passage, valve opening means and means for delaying the activity of the latter.

13. Oil burning apparatus comprising means for continuously delivering oil to a place of combustion, means for delivering thereto a quantity of air sufficiently in excess of the combustion requirements of said oil to produce a non-explosive mixture, means for effecting the delivery of additional oil to conform the mixture proportions to normal combustion requirements, means for delaying the operation of the latter, an igniter and means for rendering the igniter inactive prior to said additional oil delivery.

In testimony whereof, I have signed this specification.

JOHN GOOD.