June 17, 1930. H. S. ROGERS ET AL 1,764,984

OIL BURNING APPARATUS

Filed Nov. 22, 1924 2 Sheets-Sheet 1

Fig. 1.

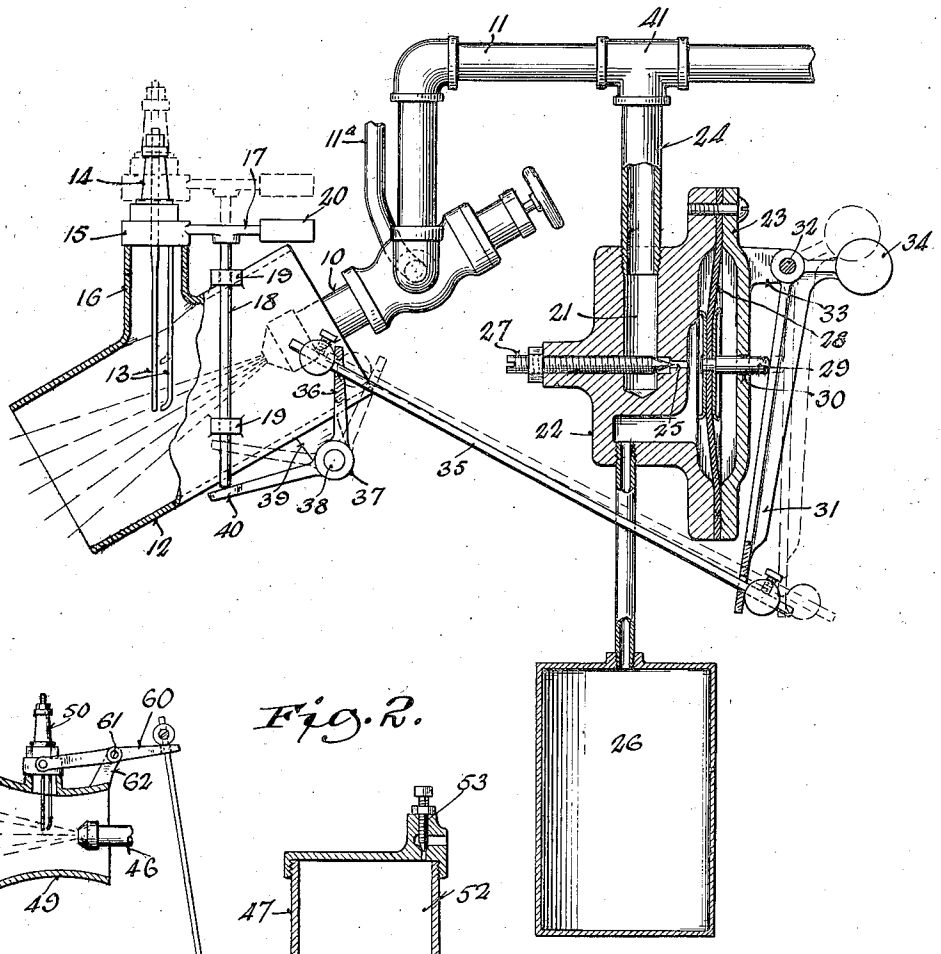
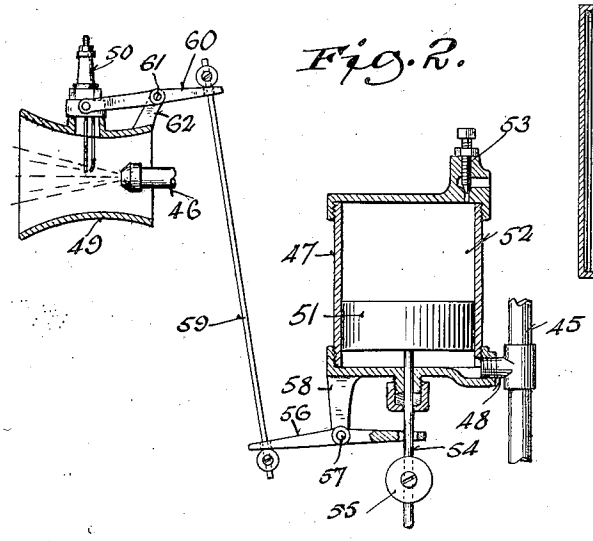


Fig. 2.



INVENTORS:
HOMER S. ROGERS
RICHARD RADDATZ

BY Bottum, Hudnall, Secher & McNamara

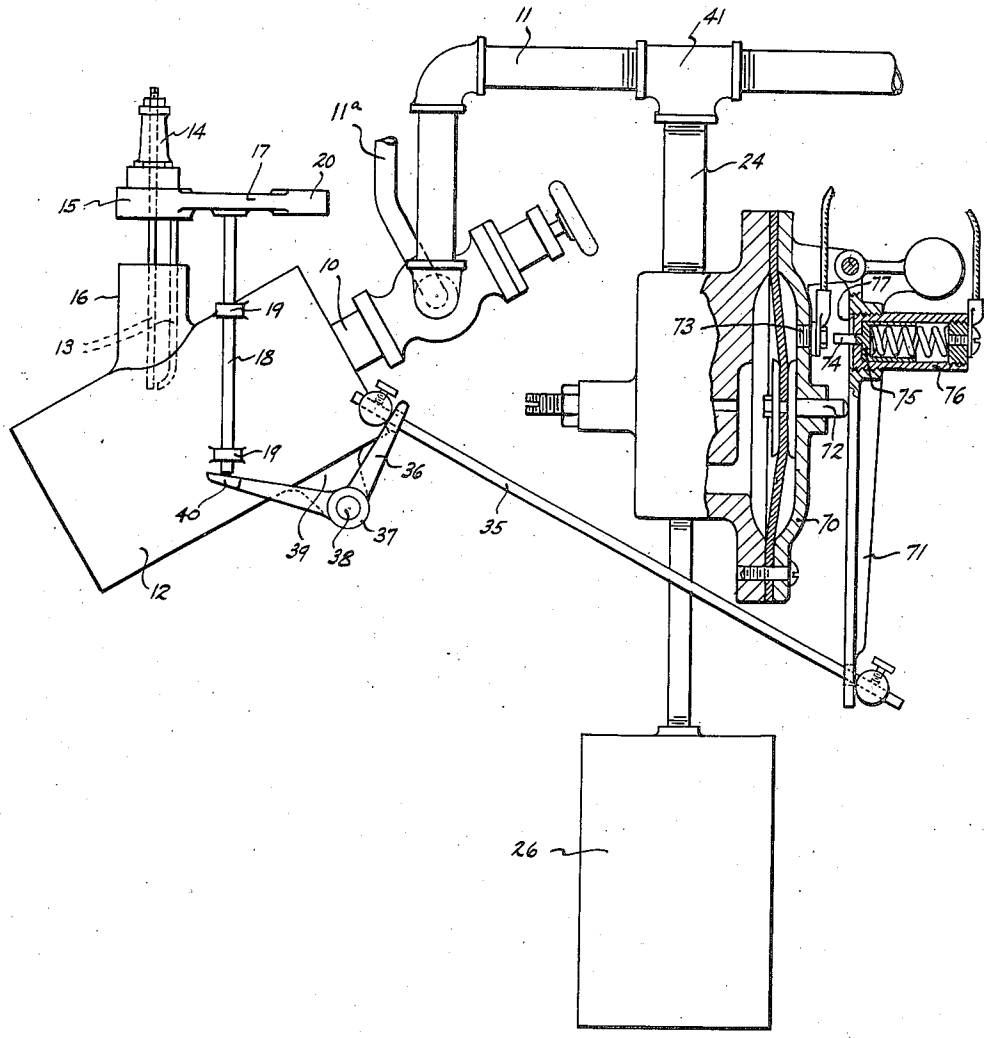
ATTORNEYS.

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Fig. 3.



INVENTORS
HOMER S. ROGERS
RICHARD RADDATZ

BY Bottum, Hudnall, Lecher & McNamara
ATTORNEYS

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UNITED STATES PATENT OFFICE

HOMER S. ROGERS AND RICHARD RADDATZ, OF MILWAUKEE, WISCONSIN, ASSIGNORS TO COMBUSTION FUEL OIL BURNER COMPANY, OF MILWAUKEE, WISCONSIN, A CORPORATION OF WISCONSIN

OIL-BURNING APPARATUS

Application filed November 22, 1924. Serial No. 751,455.

This invention relates to improvements in oil burning apparatus and more particularly to apparatus of this character wherein ignition of the electric, pilot light, or other types is employed.

It has become quite common to ignite the oil in apparatus of this class by means of a spark plug, the electrodes of which project into the path of the fuel or oil spray. In burning heavy oil, short circuiting of the plug through carbonization of the electrodes thereof frequently results, giving rise to serious trouble as is well known to those skilled in the art; also with ignition of the pilot light type many disadvantages are encountered as a result of the pilot remaining in the flame of the burner.

One object of the present invention is to provide means in apparatus of the class described for automatically removing the electrodes or other form of igniting means from the fuel or oil spray after the latter has been ignited, thus eliminating the disadvantages above pointed out.

Other objects and advantages of the invention will be apparent from a reading of the following specification taken in connection with the accompanying drawings wherein several forms of the invention are illustrated.

In the drawings:—

Fig. 1 illustrates one embodiment of the present invention operatively associated with an oil burner, certain of the parts being shown in elevation, while others are shown in section;

Fig. 2 is a somewhat diagrammatic view of another embodiment; and

Figure 3 is a view similar to Figure 1, showing ignition circuit controlling mechanism combined with, and controlled by, the fluid pressure motor.

Referring more in detail to the drawings, 10 designates the spray nozzle of the oil burning apparatus and is supplied with oil through pipe 11^a and air under pressure through a suitable pipe line 11 in the usual manner. The end of the spray nozzle 10 is inclosed within a confined casing or sleeve 12 open at its opposite ends. The electrodes 13 of spark plug 14 project laterally through one wall of the casing or sleeve 12 and into the path of the fuel or oil spray issuing from the nozzle 10. The spark plug is provided with an enlarged portion 15 at its lower end which seats loosely upon upstanding neck 16 of sleeve 12 surrounding the opening through which the electrodes project and this enlarged portion 15 of the spark plug is provided with a laterally extending arm 17 engaged intermediate its ends by a downwardly extending push rod 18 reciprocally mounted through apertured ears or guides 19 carried by the sleeve 12. The outer end of the arm 17 is provided with a counter-balancing weight 20 serving to locate the center of gravity of the combined spark plug and arm in substantial alignment with the upward thrust of push rod 18 so as to facilitate the elevation of the spark plug and the withdrawal of the electrodes from the spray in the manner to be hereinafter described.

According to the present invention a portion of the air used in connection with the burner is free to flow into passage 21 formed in the casing 22 of a fluid actuated motor 23, said passage 21 being connected for this purpose to the main pipe line 11 leading to the spray nozzle 10 by means of a connecting pipe 24. As is well known, the air fed to the burner is maintained under pressure and as a result a certain amount of air will be forced through port 25 which forms a communication between the passage 21 and a chamber 26. Port 25 is controlled by needle valve 27 which projects through one wall of the casing and is formed at its outer end for engagement by a suitable tool for adjustment purposes.

The fluid motor comprises a flexible diaphragm 28 suitably mounted in a chamber formed in the casing 22 in advance of the needle valve previously described, this flexible diaphragm being provided with a stem 29 which projects through aperture 30 formed in the adjacent outer wall of the casing. A bell-crank lever 31 pivoted at 32 to a lug 33 carried by the casing is maintained in constant engagement with stem 29 of the fluid motor by means of weight 34. The lower end of the bell-crank lever is connected

by connecting rod 35 with one arm 36 of a second bell-crank lever 37 which is pivoted as at 38 to a bracket 39 carried by the sleeve 12 of the burner. The connecting rod is adjustable as shown. The arm 40 of connecting rod 37 engages the lower end of push rod 18 previously described.

Thus it will be apparent that when the burner is turned on and needle valve 27 suitably adjusted air will flow through port 25 and will gradually build up in the chamber 26. During this building up of the air pressure in chamber 26 the flexible diaphragm of the fluid motor will be in its normal position or in the position shown in the drawings, and the various other parts will be in their full line positions as shown in the drawings. This gradual building up of the air pressure in chamber 26 retards the action of the diaphragm 28 until ample time has elapsed for the ignition to take place. This retarded action of the diaphragm may be regulated as above explained by adjusting the needle valve 27. When the air pressure in chamber 26 has built up sufficiently it will actuate the fluid motor forcing the flexible diaphragm outwardly causing the depending arm of bell-crank lever 31 to swing to the right as viewed in the drawings, this in turn causing bell-crank lever 37 to be moved in a clock-wise direction thereby elevating push rod 18 together with the spark plug 14 to the position shown in dotted lines in the drawings. This results in the removal of the electrodes 13 from the fuel or oil spray.

The spark plug after having been elevated as just described will be maintained in such position as long as the burner is in operation. When the burner is shut off the air in chamber 26 will be vented out through the nozzle, whereupon the bell-crank lever 31 by reason of weight 34 carried thereby will be moved to its normal position returning diaphragm 28 at the same time and permitting the spark plug 14 to return by gravity to its igniting position.

It is desired to explain at this point that the nozzle in oil burning apparatus such as now used is always open when the burner shuts down, the control being effected at a point remote from the burner and incidentally also beyond the coupling 41 through which the fluid motor of the present apparatus connects with the air pipe line.

If desired, the port 25 may be so restricted as to produce the desired retarded action of the diaphragm 28 and subsequent removal of the electrodes from the oil spray without the provision of the storage chamber 26. In other words, as will readily appear to those skilled in the art, the apparatus may be so designed as to render unnecessary the use of the storage chamber for effecting the retarded action of the fluid motor.

In the embodiment shown in Fig. 2 of the drawings, 46 designates the air line to the burner. 47 designates the cylinder of a fluid motor connected by means of conduit 48 to the main air line 45. The sleeve for confining the flame of the burner is shown at 49 and the ignition means in the form of a spark plug bears reference character 50, the same being mounted reciprocally with respect to the sleeve and the electrodes of the plug projecting laterally through the sleeve and normally into igniting position. When the thermostat or other control of the oil burning system operates to turn on the burner, a portion of the air flowing through the main line 45 to the burner will be conducted to the cylinder 47 beneath the piston 51 therein and will slowly raise the latter as the pressure builds up. The air ahead of the piston will be compressed gradually in the space 52 of the cylinder, said air escaping slowly, however, through an adjustable needle valve 53. This produces the desired retarded action or travel of the piston so that the ignition means will not be removed from the fuel issuing from the burner until ample time has been allowed for ignition to take place. Piston rod 54 depends from the piston through the adjacent end head of the cylinder and is provided at its lower end with a longitudinally adjustable ball or the like 55. Intermediate the member 55 and the head of the cylinder, the rod 54 passes through an opening provided in one end of a lever 56 pivoted as at 57 to a lug or the like 58 carried by the cylinder head.

At a certain point in the upward travel of the piston the ball 55 engages lever 56 causing the outer end thereof to be rocked downwardly, which end is connected in any suitable manner as, for instance, by rod or the like 59 with one end of a lever 60 pivoted as at 61 to lug 62 carried by sleeve 49. The other end of lever 60 is attached to the spark plug 50. Thus, as lever 56 is rocked through the upward travel of piston 51, lever 60 will be rocked in such wise as to effect an elevation of the plug 50 and a removal of the electrodes thereof from the flame.

It will be obvious that instead of moving the electrodes out of the fuel spray after the latter has been ignited, said electrodes might be stationary and the spray moved either by moving the nozzle or by merely deflecting the spray. Thus, in its broadest aspect the invention contemplates rendering the spray and electrodes relatively movable to effect separation thereof after ignition takes place, whether as above explained this be effected by moving the electrodes out of the spray or by causing the spray to be moved away from the electrodes.

Furthermore, the invention is not restricted to an operation of the fluid motor by means of air derived from the oil burning system nor in fact is it limited to a fluid motor of any kind for effecting the separation of the

electrodes from the fuel or vice versa. Obviously, the actuating device might be operated from a source other than the air supply of the system, or if desired, other forms or types of mechanism might be employed in lieu of a fluid actuated device such as shown in the drawings.

While ignition means of the electrode type has been shown in the drawings, this has been done for illustrative purposes only and it is not desired to limit or restrict the invention in this particular. As explained at the outset of the specification, the present improvements are of broader adaptation, removal of igniting means of any of the various types being within the contemplation of the invention and many of the appended claims have been expressly drawn to cover the invention broadly in this respect.

In Fig. 3 means is disclosed for automatically breaking the ignition circuit to the spark plug each time the latter is removed from the fuel spray and again making or completing such circuit upon the return of the plug to igniting position.

Referring in detail to this figure of the drawings, a fluid actuated motor of the diaphragm type is shown at 70. The bell crank lever 71 contacts with the end of the protruding stem 72 of the motor and is actuated thereby for raising the spark plug to inoperative position in the manner hereinbefore described in connection with the embodiment of the invention shown in Fig. 1. An electrical contact member 73 is attached to the casing of the motor as shown and forms one terminal of the ignition circuit, not shown. The other terminal of the ignition circuit is shown at 74 and is carried by the bell crank lever 71 and is movable with the latter to make or break the circuit.

In the drawings the contact member 74 is carried by a spring pressed plunger 75 slidably mounted in a cylinder 76 which latter is screw-threadly mounted in a suitable opening 77 provided in the lever 71 immeidately above the contact member 73. This mounting of cylinder 76 permits of adjustment so that the proper relative position of the contacts 73 and 74 may be accurately effected. The other parts of Figure 3, such as the burner nozzle, the sleeve therefor, piping connections, spark plug and associated parts, are the same as shown in Figure 1 and bear the same reference numerals.

From the foregoing it will be obvious that upon actuation of the motor to raise or remove the spark plug out of the fuel spray, contacts 73 and 74 will be separated, thus breaking the ignition circuit. Upon the exhaust of the fluid pressure from the motor and the return of the parts to normal position, the contacts 73 and 74 will again engage to reestablish the ignition circuit. In the drawings a certain form and arrangement of ignition circuit controlling mechanism has been shown in order to illustrate one adaptation of this feature in conjunction with the invention. It will, of course, be appreciated, however, that this automatic control of the circuit might take a great variety of different forms, and the structure and combination shown has been selected as above indicated for purposes of illustration only, and not as defining limitations. It will also be obvious from the foregoing that a similar scheme might be devised for automatically controlling the flow of gas or other fuel to lighters of the pilot light type.

From the foregoing it will be apparent that the present improvements are susceptible of many changes and modifications without departing from the spirit of the invention, and accordingly it is not desired to limit or restrict the same to the particular form or arrangement of parts illustrated in the drawings, except where limitations appear in the appended claims.

The invention claimed is:

1. In oil burning apparatus, a spray nozzle, means for supplying oil to said nozzle, means for supplying air to said nozzle, means in the path of the spray issuing from said nozzle for igniting the same, and means actuated by the air fed to said nozzle for automatically removing said igniting means from said spray after the latter has been ignited.

2. In oil burning apparatus, a spray nozzle, a spar plug for igniting the fuel issuing therefrom, the electrodes of said plug normally projecting into the path of said spray, a conduit for supplying air under pressure to said nozzle, a fluid pressure motor, a port providing communication between said conduit and said motor, and means associated with said motor and actuated thereby for moving the electrodes of said plug out of the path of said spray at a predetermined time after the fuel starts to flow.

3. In oil burning apparatus, a spray nozzle, a spark plug for igniting the fuel issuing therefrom, the electrodes of said plug normally projecting into the path of said spray, a conduit for supplying air under pressure to said nozzle, a fluid pressure motor, a port providing communication between said conduit and said motor, means associated with said motor and actuated thereby for moving the electrodes of said plug out of the path of said spray at a predetermined time after the fuel starts to flow, and means for returning said parts to normal position upon release of the pressure in said conduit.

4. In oil burning apparatus, a spray nozzle, a spark plug for igniting the fuel issuing therefrom, the electrodes of said plug normally projecting into the path of said spray, a conduit for supplying air under pressure to said nozzle, a fluid pressure motor, a port providing communication between said con-

duit and said motor, adjustable means for restricting said port, and means associated with said motor and actuated thereby for moving the electrodes of said plug out of the path of said spray at a predetermined time after the fuel starts to flow.

5. In oil burning apparatus, a nozzle adapted to emit a spray of atomized fuel, means for igniting same, and means controlled by the atomizing component of the spray for removing the ignition means therefrom after ignition takes place.

6. In oil burning apparatus, a spray nozzle, a spark plug for igniting the fuel issuing therefrom, the electrodes of said plug normally projecting into the path of said spray, pressure controlled means for elevating said plug automatically so as to remove the electrodes thereof out of the path of said spray after ignition takes place, said spark plug having means associated therewith for biasing it to return to igniting position under the action of gravity when the burner is shut down.

7. In oil burning apparatus, a spray nozzle, a spark plug for igniting the fuel issuing therefrom, the electrodes of said plug normally projecting into the path of said spray, a conduit for supplying air under pressure to said nozzle, a fluid pressure motor, a port providing communication between said conduit and said motor, a lever pivotally associated with said motor and actuated in one direction by the latter for elevating said plug so as to remove the electrodes thereof out of the path of said spray after ignition takes place, and a weight for moving said lever in the opposite direction when the burner is shut down to thereby release the plug and permit it to return by gravity to igniting position.

8. The combination with the burner of an oil burning apparatus of the type having means for supplying at least one of the ingredients of the combustible fuel mixture to the burner under pressure and ignition means associated with the burner, of means controlled by the normal working pressure of said compressed ingredient for automatically removing said ignition means from the fuel mixture issuing from the burner after the fuel has been ignited and means for returning said ignition means to its normal igniting position when the burner is shut down.

9. The combination with the burner of an oil burning apparatus of the type having means for supplying a combustible fuel mixture under pressure to the burner and ignition means associated with the burner, of means controlled by the normal working pressure existing in said means adjacent the burner when the latter is in operation and operating independently of the heat of the burner for automatically removing said ignition means from said fuel mixture within a short interval after the flow of combustible mixture through said burner has been started.

10. In an oil burning apparatus, a burner of the type having means for supplying a combustible mixture thereto under pressure, a spark plug for igniting the combustible mixture issuing from the burner, the electrodes of said spark plug normally projecting into the path of the combustible mixture, means controlled by the normal working pressure existing in said means when the apparatus is in operation for automatically removing said electrodes from the combustible mixture after the latter has been ignited, and means associated with said last mentioned means and actuated thereby for automatically controlling the flow of current to said spark plug.

11. In an oil burning apparatus, a burner of the type having means for supplying a combustible mixture thereto under pressure, means for igniting the combustible mixture issuing from the burner, means controlled by the pressure existing in said means when the apparatus is in operation for automatically removing said igniting means from said combustible mixture at a predetermined time after a flow thereof through said burner has been started, and adjustable means for regulating the time required by the burner pressure controlled means to effect removal of the ignition means from the combustible mixture.

12. In an apparatus of the class described a burner nozzle, air and fuel supply connections therefor, an igniter in operative relation to the burner nozzle, means for supporting said igniter for movement into and out of the firing zone, a fluid pressure motor in communication with said air connection and operatively connected with the igniter for automatically moving the same out of the firing zone shortly after the air begins to flow to said burner and means for restoring the igniter to operative position when the air is shut off.

13. In an apparatus of the class described a burner nozzle, air and fuel supply connections therefor, an igniter, means for supporting the igniter for movement into and out of the firing zone, a fluid pressure motor operatively connected to the igniter and acting when operated to move the igniter out of the firing zone, means establishing communication between the fluid pressure motor and the air supply connection and having adjustable flow control means associated therewith whereby to regulate the time interval between the supply of air under pressure to the burner and the removal of the igniter from the firing zone, and means for restoring the igniter to operative position in the firing zone when the air is shut off.

14. An oil burner comprising an oil-atomizing device, a movable igniter, a pneumatic

device for controlling the movement of the igniter, a source of air pressure for operating both devices and means for retarding the operation of the latter device.

In witness whereof we hereto affix our signatures.

HOMER S. ROGERS.
RICHARD RADDATZ.