Nov. 17, 1953 W. G. ROWELL 2,659,426

OIL BURNER WITH HEAT RESPONSIVE FUEL CUTOFF

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Fig. 1.

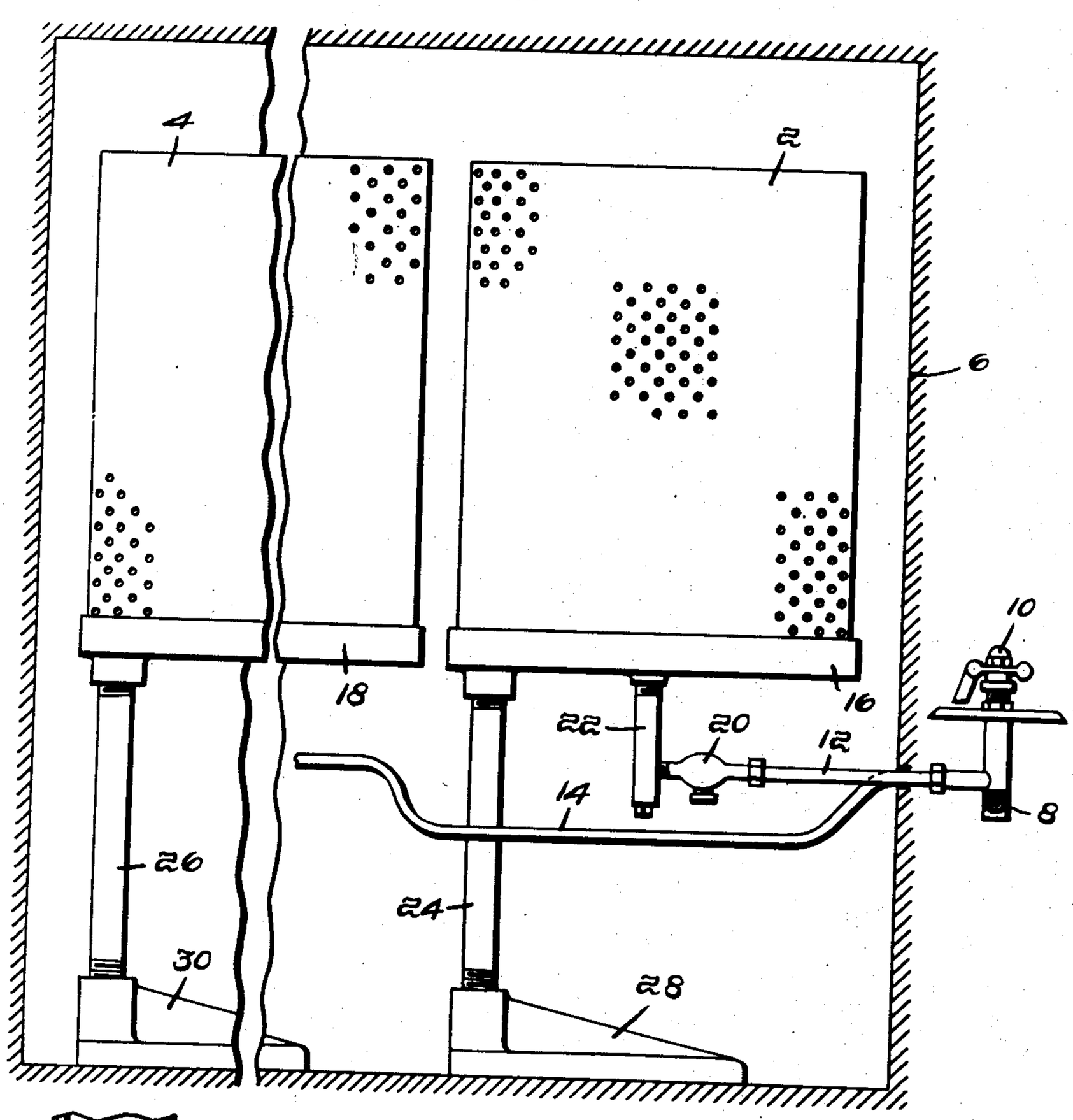
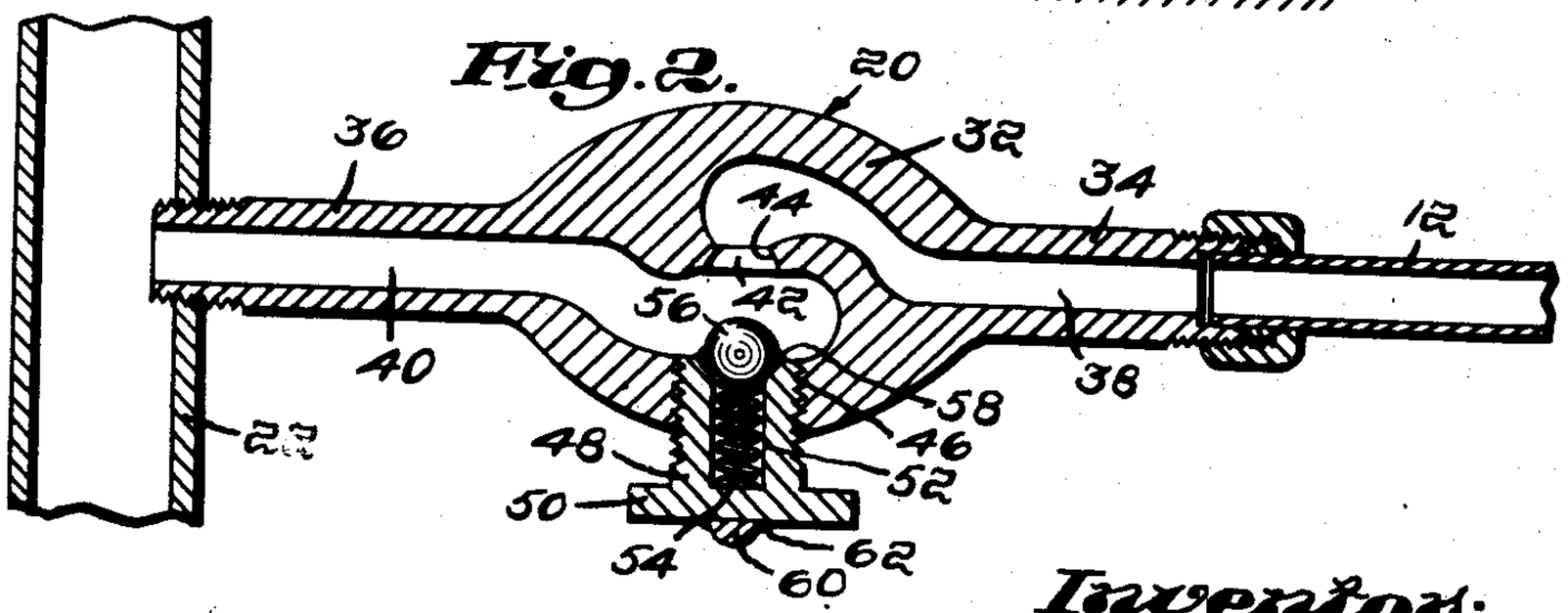


Fig. 2.



Inventor:
William G. Rowell,
By Cyaidley Chittick
Attorney

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Fig. 3.

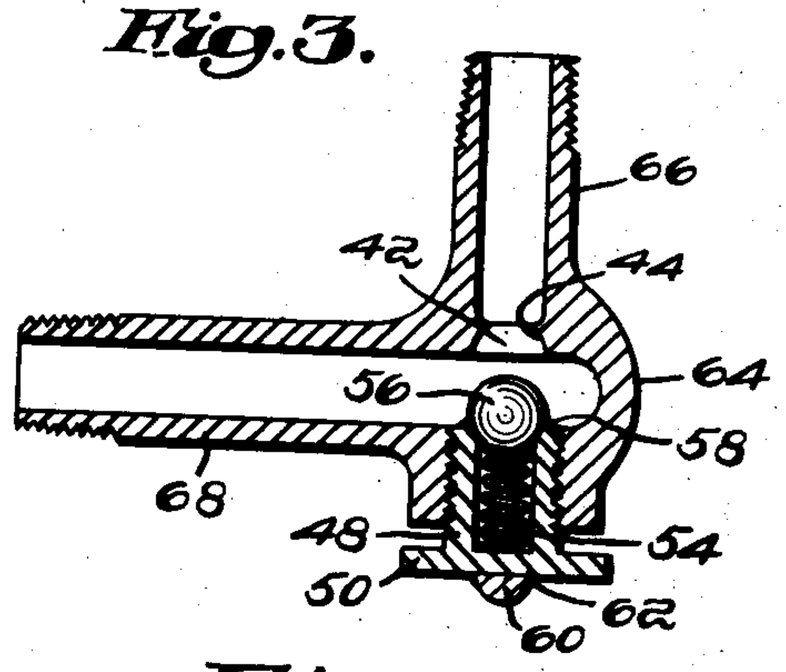


Fig. 4.

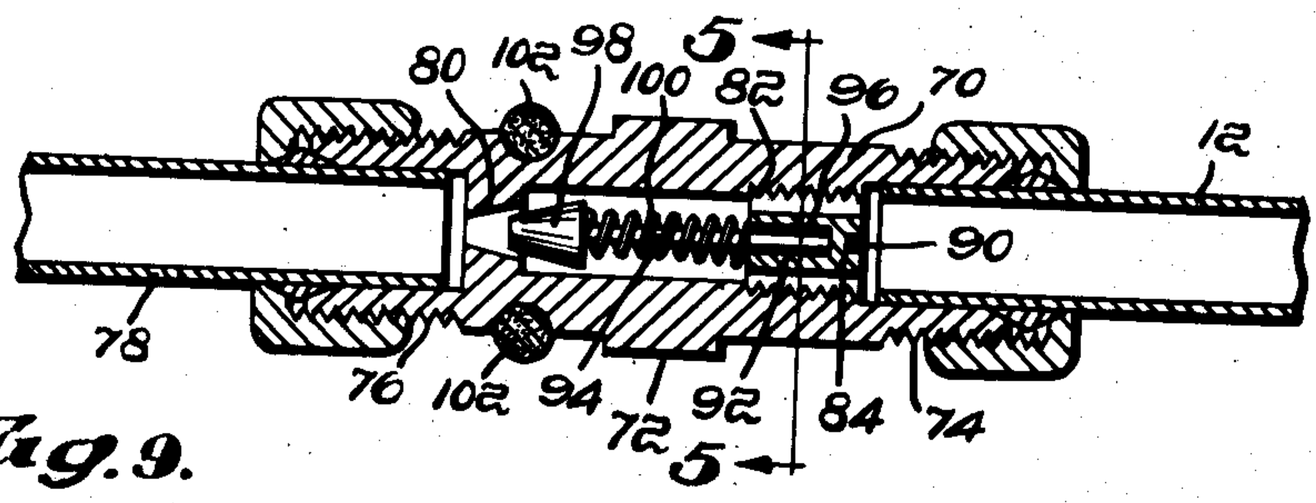


Fig. 9.

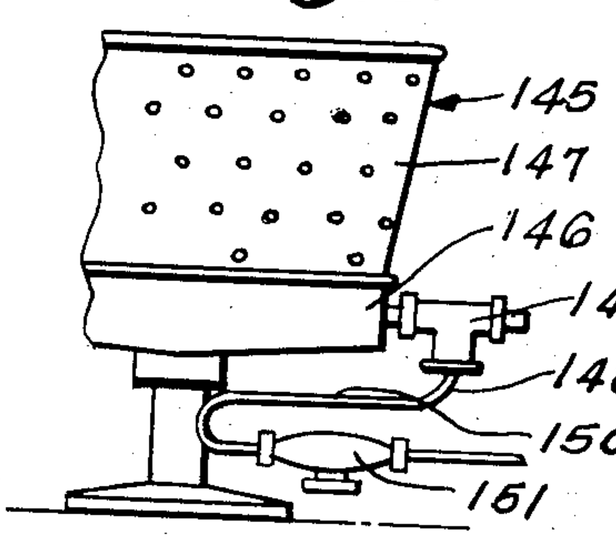


Fig. 5.

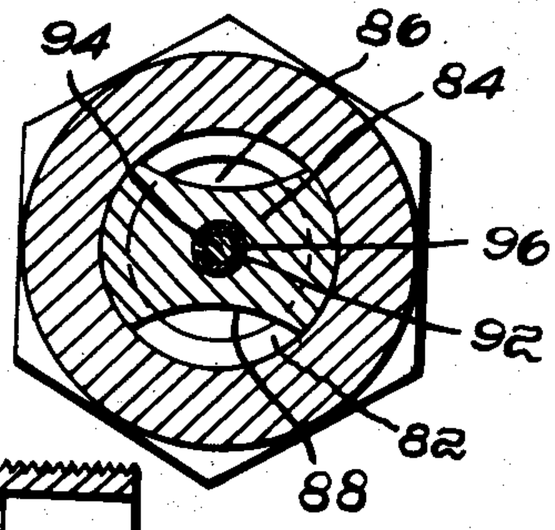


Fig. 8.

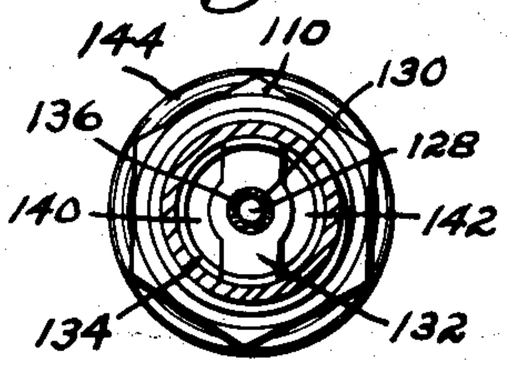


Fig. 6.

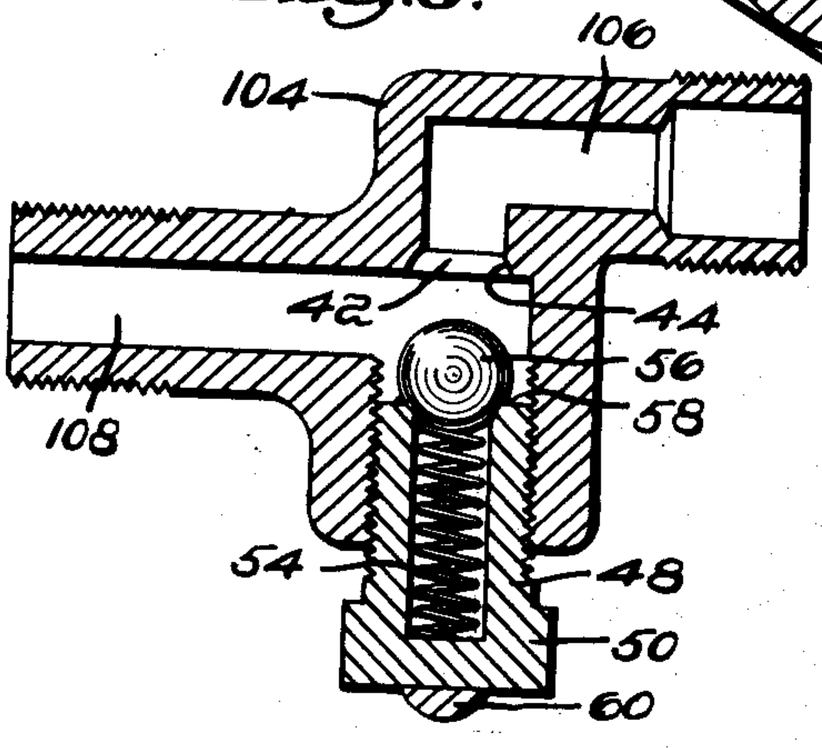
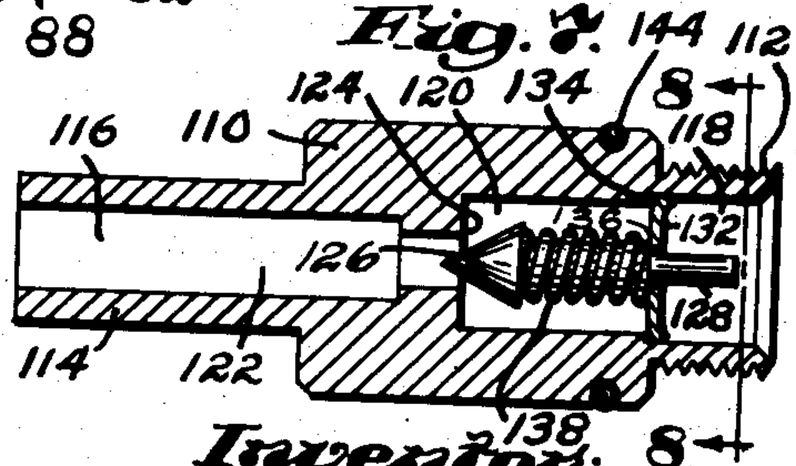


Fig. 7.



Inventor:
William G. Rowell,
by Cyprien Clutick
Attorney

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UNITED STATES PATENT OFFICE

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OIL BURNER WITH HEAT RESPONSIVE FUEL CUTOFF

William G. Rowell, Quincy, Mass., assignor to Scully Signal Company, Cambridge, Mass., a corporation of Massachusetts

Application May 12, 1950, Serial No. 161,518

6 Claims. (Cl. 158—42.4)

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This invention relates to a safety control system for use with oil burners. It is particularly concerned with the provision of an oil supply system for a burner in which is included a valve so located and constructed that it will close automatically when the temperature in the immediate proximity of the valve has risen to a predetermined degree.

The purpose of the invention is to prevent the spreading of an oil fire caused by overflow of oil from a conventional oil burner. In the ordinary case, the oil supplied to the burner will come from a constant level oil source, but the invention is effective to shut off the oil supply regardless of the nature of the supply source whenever there is a burning overflow. This result is accomplished by the inclusion in the oil supply line to the burner of a special type of valve located where it will be promptly actuated to cut off the oil supply whenever it is subjected to a high temperature such as that produced by the overflow of burning oil from the burner base.

The valve as shown in the present disclosure and used in this safety system has been designed particularly for use with range oil burners and pot burners which are in general use throughout the country. As the valve has been arranged with these burners in a new and novel manner, the invention comprises the combination of a burner, a carbon leg and a valve in an arrangement which will act as a safeguard against fire from overflowing burners.

Reference will be made hereinafter to a range burner in combination with the other parts of the invention but it will be understood that other burners, such as pot burners, utilizing liquid fuel supplied from a constant level tank are to be considered the equivalent of the range burners.

In the operation of a conventional range burner, the oil is turned on by manual operation of a valve. The oil flows from the supply tank to the base of the burner where it saturates a wick. As the fuel used with these burners is of low volatility, being an oil usually referred to in the trade as No. 2 oil or kerosene, the burner ignites slowly. However, after the wick is ignited and the temperature of the shells gradually rises, the oil vaporizes to a greater degree and combustion improves. In the meanwhile, the adjustment of the valve is cut back as the amount of oil needed during normal operation is less than is necessary for initial ignition. If the operator fails to reduce the oil supply at the proper time, or if the valve is inadvertently opened too wide during normal operation, the

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oil reaching the base will not be completely vaporized and burned. Instead it will rise in the base and overflow to create a dangerous fire of burning oil in the base of the fire box below the burner or on the floor if the burner is not in a confined area. Such fires are particularly hazardous as they are continuously fed by a steady supply of overflowing oil.

It is therefore more specifically an object of this invention to provide a novel combination of a burner and an automatic temperature control valve which will promptly and automatically shut off the supply of oil to the burner whenever the oil has overflowed from the burner base to cause a fire therebelow. Once the overflowing oil has been cut off, the fire below will burn itself out shortly and the dangerous situation will be eliminated.

The invention also includes a tell-tale for indicating to the user that the valve has functioned. This is desirable since there is no way of resetting the valve from the exterior due to its packless construction.

The invention also includes a replacement unit which may be inserted in the valve body so that the valve may then be ready for further service.

Studies have been made to determine the maximum temperatures that exist in positions immediately under burners during normal operation. These studies have also shown that immediately upon the overflow of any oil from the burner to create an oil fire below the burner, the temperature at the valve will rise appreciably above normal maximum operating temperature. The valve, therefore, has been designed to remain open at normal operating temperatures and to close at a higher temperature such as would be produced by the overflow of burning oil.

These and other objects of the invention will become more apparent as the description proceeds with the aid of the accompanying drawings in which

Fig. 1 illustrates the general combination of a range burner with a carbon leg and an automatically operable temperature controlled valve positioned for actuation under abnormal conditions and a second burner identical with the first in which for convenience the carbon leg and valve are not shown.

Fig. 2 is an enlarged cross section of one form of valve.

Fig. 3 is a cross section of a modified form of valve.

Fig. 4 is a cross section of another form of valve in which the valve housing must be removed from

the fuel line for replacement of the thermally operable valve unit.

Fig. 5 is an enlarged cross section on the line 5—5 of Fig. 4.

Fig. 6 is a cross section of still another form of the valve.

Fig. 7 is a cross section of another modification.

Fig. 8 is a vertical section on the line 8—8 of Fig. 7.

Fig. 9 is a view in elevation of a modification of the device as applied to a pot burner.

Referring to Fig. 1, there are shown two range burners 2 and 4 of the conventional perforated combustion tube type positioned within a firebox 6 with a chimney connection, not shown. These burners, however, might be within any other type of housing and might be supported in any convenient position. All that is required in such cases is that suitable draft conditions are present for proper combustion.

A constant level oil supply, not shown, is fed by a pipe 8 to a pair of valves 10 which control individually the oil flowing through pipes 12 and 14 to the burner bases 16 and 18 respectively. The burner bases are circular to receive the perforated combustion tubes and include circular concentric vaporizing troughs into which the oil initially flows and in which it is vaporized for combustion thereabove. An automatically controlled temperature valve 20 which may assume any of the specific forms disclosed herein or their equivalent is connected to pipe 12 and leads to a carbon leg 22 which depends from the burner base 16. A similar valve and carbon leg connect with pipe 14 and base 18 but these are not illustrated as they would be simply duplicates of parts 20 and 22.

The burners are supported respectively by posts 24 and 26 which are carried by the mounting plates 28 and 30. The range burners thus described and including the carbon legs and supports are conventional. The valve 20, however, is so located with respect to the base 16 and the carbon leg 20 that it will be in a position to be immediately influenced by any rise in temperature caused by overflowing burning oil. The rise in temperature thus created will cause the valve 20 to close automatically, thereby stopping the flow of oil to the base 16 even though the valve 10 is open. The valve 20 and all of the other valve forms hereinafter disclosed are of a type which when once closed will not re-open of themselves and therefore may be considered of the irreversible type.

In Fig. 2 is shown one form of valve construction which comprises a valve body 32 having threaded extensions on each end as at 34 and 36 for connection with pipe 12 and carbon leg 22 respectively. The inlet and outlet passages 38 and 40 are separated by a restricted area 42 which has about its periphery a valve seat 44.

Screwed into a suitable threaded opening 46 in the bottom of the body is a threaded plug 48 having a flange 50 which may be gripped by pliers or a wrench. The interior of plug 48 has a bore 52 in which is positioned a compressed spring 54. A ball valve 56 is secured at the upper end of bore 52 by fusible material 58.

When the temperature surrounding the body 32 rises to a predetermined degree, fusible material 58 will melt, freeing ball valve 56 so that compressed spring 54 will drive the ball valve forcibly against the corresponding valve seat 44 thereby effectively closing the valve to cut off further supply of oil to the burner.

In the preferred construction, ball valve 56 will have a depending stem which extends downwardly through the coils of spring 54 to eliminate any possibility of the ball valve slipping sideways from its position on top of spring 54 during the closing operation.

It will be observed that there is a tell-tale 60 secured to the under side of flange 50 by fusible material 62 which is designed to melt at approximately the same temperature as fusible material 58. Thus, whenever the valve closes, fusible material 62 will also have melted to enable tell-tale 60 to fall away from its normal position. In this way, after the burner has gone out, the user by feeling with his finger on the bottom of plug 48 can tell at once whether or not the valve has functioned. If the tell-tale is still present, the valve is open; if the tell-tale is gone, the operator knows that the valve is closed. He then shuts off valve 10 and removes plug 48. In so doing, ball valve 56 will be withdrawn also and a new plug 48 including the ball valve held in position by fusible material 58 and a tell-tale 60 may then be inserted in valve body 32 thereby putting the fuel line in condition for further operation of the burners under the control of valves 10.

A modified valve construction is shown in Fig. 3. This valve comprises a body 64 with the inlet and outlet legs 66 and 68 positioned at right angles. This construction may facilitate certain types of installations. The valve seat and ball valve and the supporting plug and other related parts have all been numbered to correspond with the similar parts previously referred to in Fig. 2 and further description is therefore not necessary. The valve functions in the same manner as the valve of Fig. 2. The tell-tale 60 may either be of non-fusible material secured by fusible material 62 or it may be composed in its entirety of fusible material which will flow away when the valve is actuated.

Another form of valve is shown in Fig. 4. In this construction it is necessary to remove the valve body from the supply line when it becomes necessary to insert a new valve unit. This valve comprises a body 70 having a hexagonal portion at 72 for easy gripping with a wrench or pliers. The threaded ends 74 and 76 connect with the supply line 12 and the carbon leg 22, not shown, which is in connection with pipe 78. The body 70 has a conical valve seat 80 but this valve seat may be in any other convenient form. The body is threaded interiorly at 82 to receive a threaded plug 84 which, as shown in Fig. 5, is cut away on opposite sides at 86 and 88 to permit fluid to pass thereby. The end of plug 84 is slotted at 90 to receive a screwdriver for proper adjustment. The interior of plug 84 has a bore 92 large enough to receive a valve pin 94 and fusible material 96 positioned between the bore and the valve pin. On the end of the valve pin is a valve 98 and a spring 100 under compression urges valve 98 in the direction of valve seat 80. As soon as the temperature surrounding body 70 rises to a predetermined degree, fusible material 96 will melt freeing valve pin 94 enabling spring 100 to drive valve 98 forcibly against seat 80, thereby closing the valve. A tell-tale 102 is provided in the form of a ring of fusible material set in a circumferential groove around body 70. When the temperature rises sufficiently to melt fusible material 96, the tell-tale 102 will also have melted so that by visual or manual inspection the user can tell whether the valve is open or closed.

If the valve has closed and the fire has gone

out, the user will then close valve 10 and will uncouple valve body 70 from pipes 12 and 78. Plug 84 is then unscrewed from the body and valve 98 removed. A new plug and valve may then be inserted in the body and a strip of fusible material wrapped around the body to act as a new tell-tale 102. Valve body 70 is then reinserted in the fuel supply line and the burner is again ready for operation.

In the construction shown in Fig. 6, this arrangement provides a body 104 having an inlet leg 106 and an outlet leg 108 arranged parallel but offset. This construction in certain cases facilitates the attachment to the carbon leg under the burner. The construction of the automatic valve is substantially the same as that shown in Figs. 2 and 3 and the parts have therefore been correspondingly numbered and reference to the previous description of these parts will suffice to explain the operation of the construction of Fig. 6.

The construction shown in Figs. 7 and 8 constitutes a simplified form of the basic construction generally disclosed in Fig. 4. The valve body 110 has a threaded extension 112 at one end, adapted to be connected with a fuel supply line in the usual manner. The extension 114 at the other end of the body is shown with a smooth exterior for connection with the carbon leg or a member leading to the carbon leg by any suitable connecting means. Extension 114 if preferred may be threaded if this will facilitate connection.

A bore 116, extending throughout the length of the valve body, has an entrance at 118, a main channel 120 and an outlet 122. A circular valve seat 124 is adapted to receive a conical valve 126 which is normally in open position. This valve has a valve stem 128 which extends through a somewhat larger circular opening 130 in a flat cross bar 132, the ends of which rest against a shoulder 134 at the inner end of the entrance 118.

Valve stem 128 is held in fixed position in relation with cross bar 132 by means of a small quantity of fusible material 136. A spring 138 is maintained in compressed condition between cross bar 132 and the head of valve 126.

The length of cross bar 132 is slightly greater than the diameter of entrance 118 and the ends of the cross bar are so formed that when the cross bar has been forced downwardly to the position shown against seat 134, it will resist removal.

Thus when fusible material 136 is melted by a rise in the temperature, valve stem 128 will be freed of cross bar 132 and valve 126 will be driven by the spring 138 firmly against valve seat 124, thereby to close the valve.

Cross bar 132 is of such transverse dimensions as to leave passages 140 and 142 on either side thereof which passages provide adequate space for liquid flow while the valve is open.

A tell-tale 144 in the form of a circular ring is positioned in a circumferential groove extending about the valve body. This tell-tale is made of fusible material designed to melt at the time the valve is actuated by fusing of material 136. Thus, by visual inspection or by feeling the valve body, the operator may be advised whether the valve is still open or has closed. If it has closed then it may be removed from the liquid supply line to be replaced by a new unit.

Fig. 9 is a view in elevation of a modification of the invention as applied to a typical pot burner

145. The burner consists, as is usual, of a vaporizing trough or receptacle 146 having extending upwardly therefrom a perforated side wall 147, which together with the vaporizing trough forms a combustion chamber. Extending from the side of the vaporizing trough 146 is a fuel supply line 148 having an enlarged portion 149 and having a portion 150 thereof extending beneath the burner. Positioned in this portion of the supply line is the irreversibly operable, high temperature responsive, automatically closing valve 151, this valve being similar to the valves described in the various modifications discussed above. It is apparent that burning oil overflowing from the pot burner will cause the valve to function in the manner described above in order to interrupt the flow of oil to the pot burner.

The specific temperatures at which the valves disclosed herein are caused to operate under different conditions of use are not set forth as it will be understood that the temperature will vary for specific situations. However, studies have shown that the temperature continuously prevailing in reasonably close proximity to the under side of a range burner base when the burner is in full operation will be of the order of 350 degrees Fahrenheit. The temperature will, of course, vary inversely with the distance from the under side of the base. When oil overflows from the base and is ignited on the bottom of the stove or on the floor immediately below the burner, the temperature in the vicinity of the carbon leg and the temperature controlled shut-off valve which is the subject of this invention will rise quickly and considerably, to a temperature range from 450 to 575 degrees. Accordingly, the fusible material utilized in each of these valves is especially designed to remain in a solid state to keep the valve open at a temperature, for example 350°, which is considerably higher than the temperature at which automatic shut-off valves of this general type have heretofore usually operated. The fusible material is arranged in a thin film which permits fast operation of the valve once the fusing temperature has been reached. The various parts of the valve are preferably made of materials having the same coefficient of expansion so as to eliminate strain as the temperature changes. It will be appreciated that premature actuation of the valve would be undesirable although not dangerous and therefore a proper study of the operating conditions to which the valves will be subjected must be made to determine the melting temperature of the fusible material to be used. In general, it may be said from tests thus far that a fusing point of about 361° will produce satisfactory results in the typical installation.

It is my intention to cover all changes and modifications of the examples of the invention herein chosen for purposes of the disclosure which do not constitute departures from the spirit and scope of the invention as defined in the claims.

I claim:

1. In combination, an oil burner of the vaporizing type including a vaporizing receptacle and having a perforated sidewall extending upwardly from said receptacle to form therewith a combustion chamber, an oil supply line extending underneath and connected to said burner, and an irreversible high temperature responsive automatically closing valve positioned in said line underneath and in close proximity to the base of said burner, said valve being directly and responsively subject to heat from burning

oil overflowing from said burner to interrupt the flow of oil to said receptacle.

2. In combination, an oil burner of the type having a vaporizing trough in the base thereof and a perforated tube extending upwardly from said trough to form therewith a combustion chamber, an oil supply line including a carbon leg communicating with said trough to supply oil thereto and depending directly from the base of said burner, and an irreversibly operable high temperature responsive automatically closing valve in the oil supply line leading to said carbon leg and located directly underneath the base of said burner, said valve being directly responsive to heat from burning oil that has overflowed from said burner to interrupt the oil flow to said trough.

3. In combination, an oil burner of the pot burner type having a vaporizing receptacle therein and a perforated tube extending upwardly from said receptacle and adapted to be supplied with oil from a substantially constant level source and subject to overflowing under improper conditions of operation, an oil supply line including a portion communicating with said vaporizing receptacle and a second portion positioned directly underneath the base of said burner, and an irreversibly operable high temperature responsive automatically closing valve positioned in said line directly underneath the base of said burner, said valve being directly responsive to heat from burning oil that has overflowed from said burner to interrupt the oil flow to said receptacle.

4. The combination set forth in claim 1 and including means positioned adjacent said valve to indicate the response of said valve to said overflowing burning oil.

5. The combination set forth in claim 1 and including fusibly releasable operating means connected to said valve.

6. The combination set forth in claim 1 and including fusibly releasable valve operating means connected to said valve and indicating means positioned adjacent said valve to indicate the response of said valve to said overflowing burning oil.

WILLIAM G. ROWELL.

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