No. 760,818. PATENTED MAY 24, 1904.

L. J. STRAIT.

HYDROCARBON OIL BURNER.

APPLICATION FILED JULY 17, 1901.

NO MODEL.

Fig. 1.

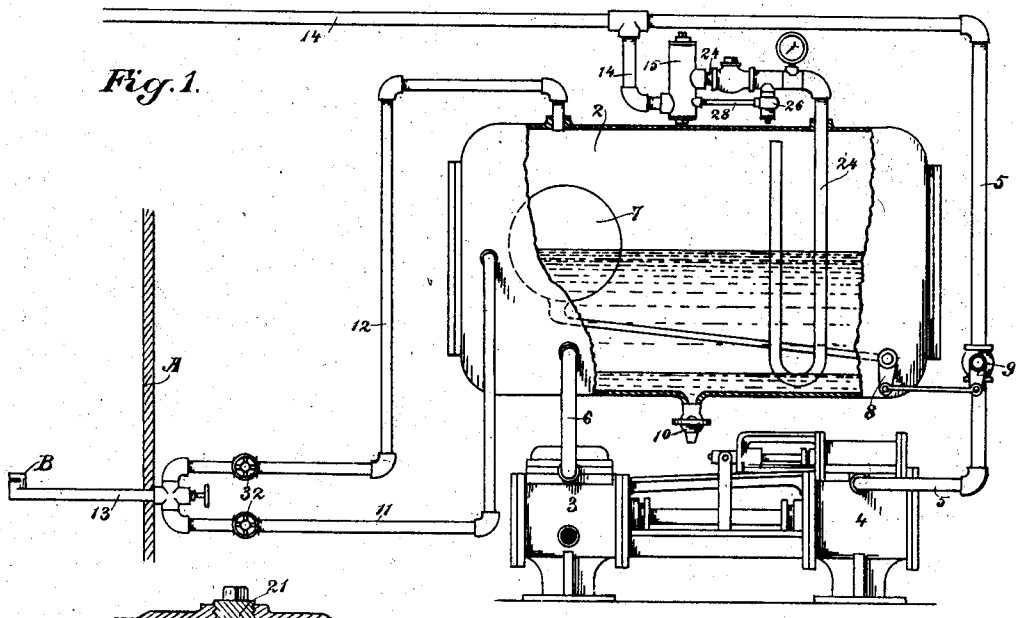
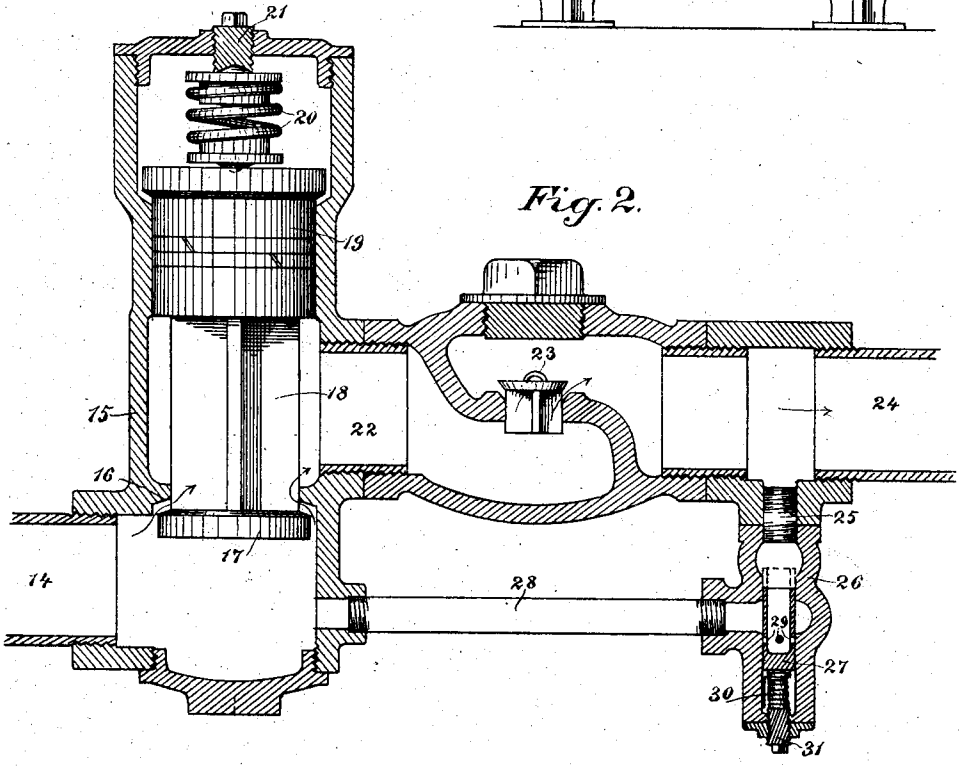


Fig. 2.



Witnesses,
C. A. Louise
G. F. Ascheck

Inventor,
Lucelle J. Strait
By Dewey Strong & Co. Attys

No. 760,818. Patented May 24, 1904.

UNITED STATES PATENT OFFICE.

LACELLE J. STRAIT, OF SAN FRANCISCO, CALIFORNIA.

HYDROCARBON-OIL BURNER.

SPECIFICATION forming part of Letters Patent No. 760,818, dated May 24, 1904.

Application filed July 17, 1901. Serial No. 68,633. (No model.)

To all whom it may concern:

Be it known that I, LACELLE J. STRAIT, a citizen of the United States, residing in the city and county of San Francisco, State of California, have invented an Improvement in Hydrocarbon-Oil Burners; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to a means for burning liquid hydrocarbons as a fuel, and has for its object to provide an improved automatic system in which the hydrocarbons are introduced into the combustion-chamber, in conjunction with steam under pressure, and means for automatically controlling and regulating the fire.

The invention consists of an oil reservoir or chamber, means for automatically keeping up a supply of oil within it, pipes connecting the steam-space of a boiler with the space above the oil in the chamber, and means for automatically regulating the pressure, pipes leading from the oil-space and the steam-space above it to a common burner, through which they discharge, and means for automatically regulating the supply of fuel to correspond with the steam requirements of the boiler, said means being controlled by the increase or decrease of steam-pressure within the boiler.

My invention also comprises details of construction which will be more fully explained by reference to the accompanying drawings, in which—

Figure 1 is a side elevation of the device. Fig. 2 is a vertical section through the regulating-valve.

As shown in the accompanying drawings, A represents the front of a boiler or other furnace, and B a burner of any suitable or well-known description. The particular kind of burner to be used forms no part of my present invention and is therefore not particularly illustrated or described.

2 is a chamber, tank, or reservoir which is designed to contain a sufficient amount of liquid hydrocarbon to be used as a fuel. This chamber-tank is kept supplied with a quantity of the oil, which should fill approximately one-half or a little more. The source of supply may be, as here shown, an oil-pump 3, actuated by an engine, as at 4, connecting with the piston-rod which is common to both plungers in the usual construction of such pumps, or any other suitable liquid-forcing device may be employed with suitable controlling mechanism. In the present case the piston of the engine-cylinder is driven by steam delivered thereto from the boiler through a pipe 5. The pipe 6 serves to conduct the oil from the pump into the oil-chamber. Within the chamber is a ball-float 7 with suitable connection, as at 8 and 9, which controls the valve through which steam is admitted to the engine-cylinder. Thus when the chamber is sufficiently full of oil the float will rise and through its connection will reduce or cut off the steam-supply to the engine-cylinder. The pump will then run slowly or stop until the oil in the chamber has become reduced, when the sinking of the float will again open the steam-admission valve and again set the pump in motion. By means of a blow-off cock, as at 10, the chamber may be discharged whenever desired. From this tank an oil-pipe 11 and a steam-pipe 12 deliver oil and steam respectively into a common chamber or connection 13, where they mingle and are led to the burner B. The pipe 11 communicates with the chamber below the surface of the oil therein, and the pipe 12 communicates with the upper part of the chamber. Both pipes have valves or cocks, as at 32, to regulate delivery to the burner. From the boiler to which the furnace A belongs the pipe 14 leads to the chamber 2, into the upper part of which it discharges, and a branch from this pipe may, in lieu of an independent connection, be connected with the pipe 5 and a pump-controlling valve 9.

Intermediate between the pipe 14 and the oil-chamber is a means for regulating the supply and pressure of steam within the chamber. This regulation might be effected by a hand-turned cock; but I prefer to make the regulation automatically. Various automatically-operating controlling-valves may be employed for this purpose. I here illustrate a form for such valve which is sufficient for the purpose and which may represent any suitable controlling device. As here shown, the

steam from the pipe 14 is delivered into the lower part of a valve chamber or casing 15, within which is a seat, as at 16. 17 is a main valve adapted to close against this seat or to drop away from it and allow steam from the pipe 14 to the chamber. The valve is provided with wings, as at 18, which serve as guides as they pass into the upper part of the chamber, and at the upper end these wings are connected with a plunger, as at 19, moving steam-tight in the cylinder portion of the upper part of the casing 15. The plunger is larger than the valve 17, and the greater steam-pressure thereon will close the valve. Above this plunger is a spiral or other spring, (represented at 20.) This spring is so disposed as to press upon the top of the plunger 19, and its tension may be regulated by a screw or equivalent device, as at 21. When there is no steam-pressure in the casing, the action of the spring 20 will force the valve 17 away from the seat 16 and will thus leave an open passage through the pipe 14 and this portion of the valve-casing. From this valve-casing 15 a passage 22 leads through an opening controlled by a check-valve, as at 23, and thence through a pipe or passage, as at 24, into the oil-chamber. A branch pipe or passage 25 leads from the pipe 24 into a casing 26, within which a supplemental valve 27 is slidable. The upper portion of this valve is made tubular and hollow, as shown, and the pipe 28, leading from the space below the valve 17, opens into the valve-chamber 26 against the side of the supplemental valve 27. This valve has openings or passages through its sides, as shown at 29, and in line with the pipe 28, so that pressure through the pipe 14 from the boiler passing through the lower part of the valve-chamber 15 and the pipe 28 is delivered directly into the interior of the valve 27 and thence through the pipe or passage 25. The supplemental valve 27 is normally retained when not under steam-pressure with the holes 29 in line with the pipe 28 and in readiness for the admission of steam; but when there is suitable steam-pressure within the chamber 2 it tends to force the valve 27 down until the passages 29 are out of line with the pipe 28 and closed. The valve 27 is normally held up in place by a spring, as shown at 30, and the tension of this spring is adjustable by a screw 31 or equivalent device. The tension of this spring is regulated to suit the requirements of the apparatus.

The operation of this device will then be as follows: Starting with no pressure in the boiler, both valves 17 and 27 will be open. When steam is raised in the boiler, it will enter the oil-chamber until a certain predetermined pressure is reached. This pressure should be enough to force the oil and steam from the chamber 2 to the burner and produce a minimum fire. For illustration I assume this pressure to be five pounds. As soon as this pressure is reached in the oil-chamber 2 it overcomes the pressure of spring 30 and the valve 27 is forced down until communication through it is cut off. Assuming the maximum boiler-pressure to be fifty pounds, the spring 20 is stiff enough to hold the main valve 17 open until the maximum boiler-pressure is reached, and steam at this pressure entering the oil-chamber will continue to increase the pressure, and consequently the intensity of the fire. As soon as the maximum boiler-pressure is reached it acts upon the plunger or piston 19 and closes the main valve 17, in which condition it will remain until the boiler-pressure falls sufficiently to allow the spring 20 to again open the valve. As soon as the valve 17 is closed the pressure in chamber 2 begins to fall and the fire correspondingly decreases until it is at its minimum intensity. If the pressure falls below five pounds, the spring 30 will open the valve 27 and admit steam from the boiler sufficient to keep up the fire, and this will be the condition unless the boiler-pressure falls below the maximum, when the main valve 17 will be opened and steam again be admitted to the oil-chamber to increase the fire. Thus any call upon the boiler for more steam opens the valve 17, increases the pressure in the oil-chamber, and thus increases the supply of oil and steam to the burner until the boiler-pressure is regained, when the valve 17 will be again closed. So long as a boiler-pressure of fifty pounds (or a maximum) is maintained, as stated, the valve 17 will remain closed. At the instant of closure of this valve the pressure in the chamber 2 would also be substantially equal to that in the boiler; but as steam and oil are constantly flowing to the burner this pressure in the chamber will at once commence to decrease and will continue to do so until the pressure has fallen below that of the spring 30, which should be sufficient to open the valve 27 at the time when the fire at the burner is at the lowest at which it will continue to burn. This pressure is assumed to be five pounds, and as soon as the spring 30 has moved the valve 27 until the ports 29 are in line with pipe 28 steam from the boiler will again enter the chamber 2 through this passage until the steam-pressure overcomes that of spring 30, when the valve 27 will again be moved until the ports 29 are closed. As the boiler-pressure is against the side of the valve 27, it can exert no force in the line of movement of the valve no matter how great the boiler-pressure may be, this pressure only acting to slightly increase the friction, which can be easily compensated. As long as steam is not used from the boiler the small fire above provided for will be sufficient; but if by use (as to an engine or otherwise) the boiler-pressure is reduced until the spring 20 overcomes the closing-pressure of valve 17 the latter will be immediately opened and full boiler-pressure admitted to the cham-

ber 2 and the discharge of oil to the burner correspondingly increased until boiler-pressure is again sufficient to close valve 17. The hydrocarbon oil within the chamber being acted upon by the steam which is introduced thereto will become heated, and a portion of the vapor will be given off from the oil and will mix with the steam in the upper part of the chamber. This steam will thus be partially charged with the combustible vapor, and the pressure is such that both the oil and the steam thus charged would be forced out through their respective passages 11 and 12 and mingle in the burner. There is a considerable advantage in thus charging the steam which is to be used with the hydrocarbon vapor as compared with the use of steam directly from a boiler which only meets the hydrocarbon in the burner itself. Suitable regulating-cocks may also be placed in the pipes 11 and 12, as shown at 32, and when these are once properly adjusted the steam-pressure within the chamber will thereafter serve to automatically regulate the combustion and keep the desired supply of steam within the boiler. Any condensation of the steam within the chamber forming water, which is heavier than the oil, the water will sink through the oil to the bottom, and the water and any dirt which may be mixed with the oil will be carried to the bottom of the chamber and may be drawn off at any time through valve 10.

An essential feature of this invention is the maintaining of a certain relation between the oil and the steam, which having once been fixed will remain essentially the same under all conditions of its uses.

The steam is admitted into the oil-chamber through a U-shaped bend or trap, and condensation within this trap will prevent any return of steam from the oil-chamber to the boiler.

If a regular steady fire is desired for any purpose, the oil-supply to the burner may be by gravity or by other regular pressure, and the steam-supply may be regulated by any well-known pressure-regulator, so as to bear the proper relation to the oil when these proportions have been determined, and the proportions will then be maintained independent of variations of pressure in the supply-boiler.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. An apparatus for the combustion of hydrocarbon oil consisting of a chamber, means for supplying oil thereto, means for introducing steam under pressure into the chamber above the oil, a burner and connection between the reservoir and burner, an automatically-operating main valve by which a normal pressure is maintained within the chamber, and an independent and automatically-operating supplemental valve by which a less pressure in the chamber is maintained when the main valve is closed, said supplemental valve being closed by an increase of pressure within the chamber when the main valve is opened to increase the chamber-pressure.

2. An apparatus for the combustion of hydrocarbon oil, consisting of a chamber, means for supplying oil thereto, a burner and connections between the chamber and burner, means for introducing fluid under pressure into the chamber above the oil, a spring-pressed and normally open main valve in the fluid connections and which is automatically closed when the maximum fluid-pressure is reached, a supplemental valve in said connections and which is normally closed by pressure from the chamber when the main valve is open, and means by which said supplemental valve is opened at a less fluid-pressure after the main valve is closed.

3. An apparatus for the combustion of hydrocarbon oil, consisting of a reservoir and means for supplying oil thereto, connections between said reservoir and a burner, a pipe through which fluid under pressure is introduced into the reservoir above the oil, a main automatically-operated valve located in the pipe and closable by a maximum fluid-pressure, a supplemental automatically-operated valve connected with the fluid-pressure pipe and normally closed by pressure from the reservoir when the main valve is open, and a spring by which the supplemental valve is opened when the main valve is closed and the minimum fluid-pressure within the reservoir is reached.

4. The combination in a hydrocarbon-oil burner and feeder therefor, of a reservoir and supply, connection between the reservoir and burner, a fluid-pressure-supply pipe leading to the reservoir, and main and supplemental valves controlling respectively independent supplies to said supply-pipe, said main valve constructed to be automatically closed above a maximum pressure of the fluid-supply and said supplemental valve constructed to be automatically closed above a fluid-pressure less than said maximum.

In witness whereof I have hereunto set my hand.

LACELLE J. STRAIT.

Witnesses:
S. H. NOURSE,
H. F. ASCHECK.