No. 784,436. PATENTED MAR. 7, 1905.

R. F. SCHROEDER.

HYDROCARBON FEEDER SYSTEM.

APPLICATION FILED SEPT. 28, 1901.

2 SHEETS—SHEET 1.

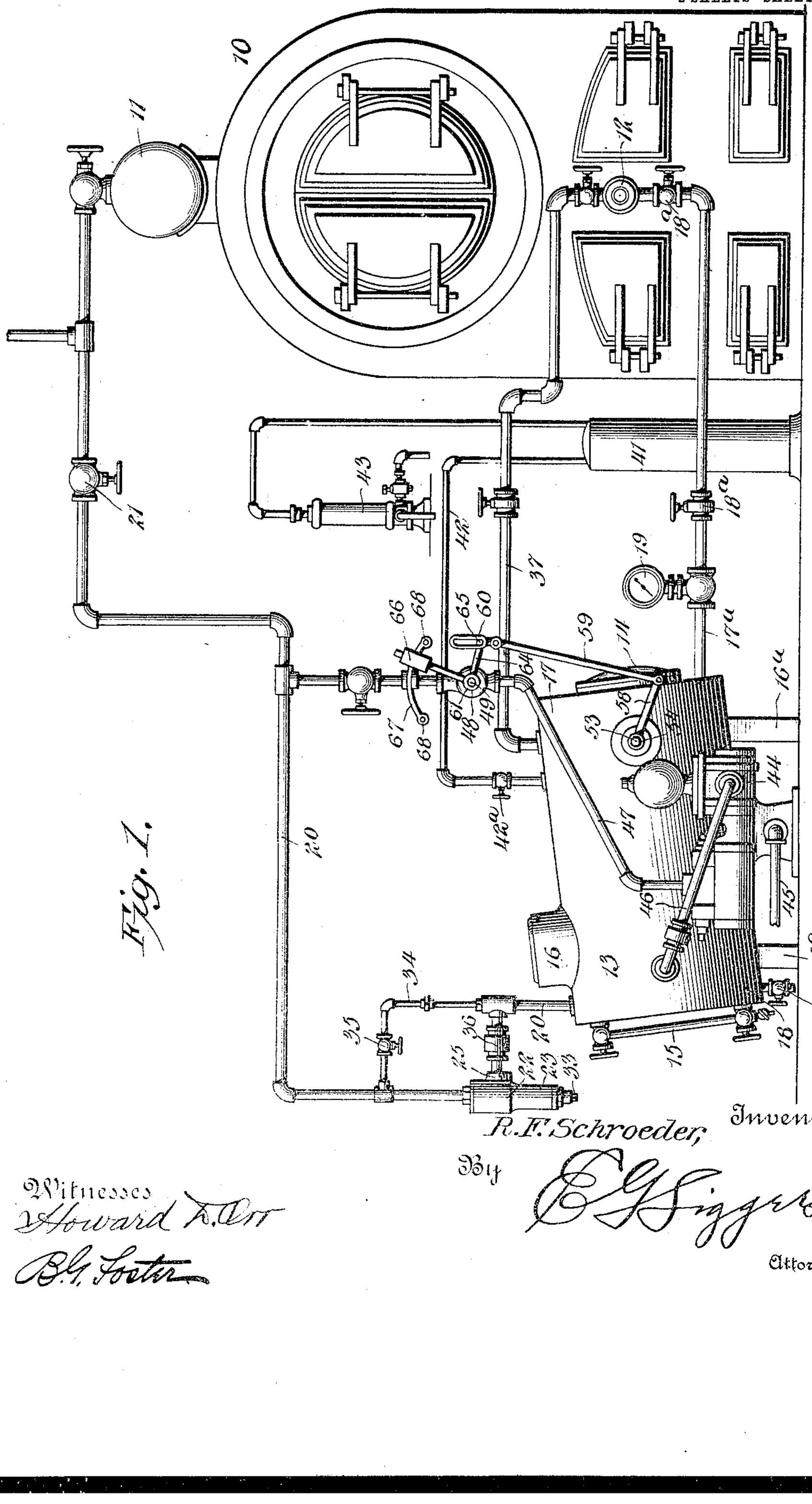

Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 2.

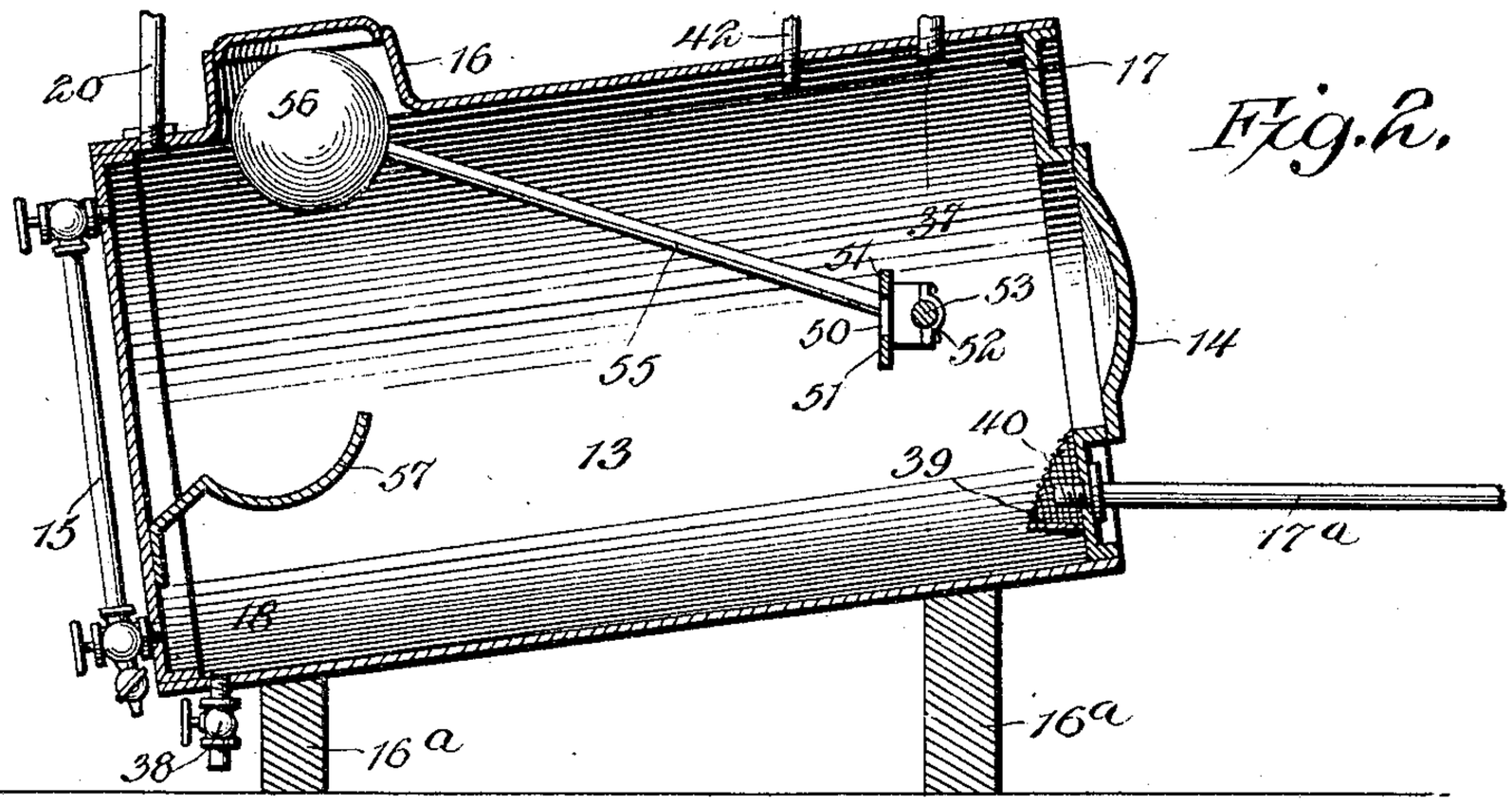


Fig. 3.

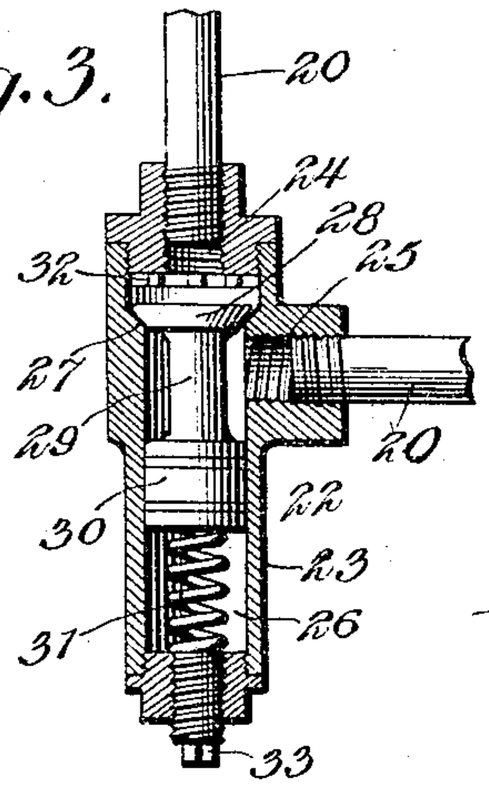


Fig. 4

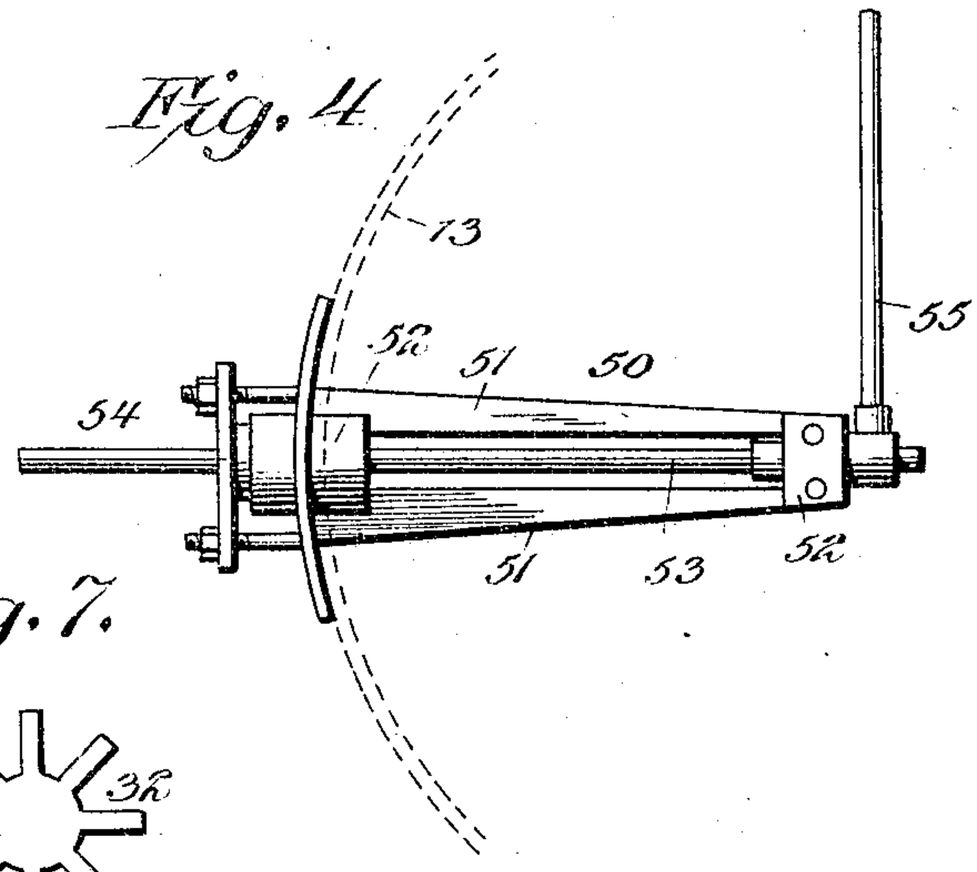


Fig. 7.

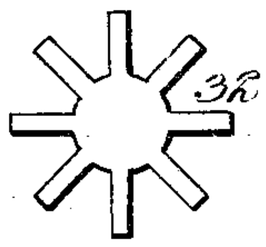


Fig. 5.

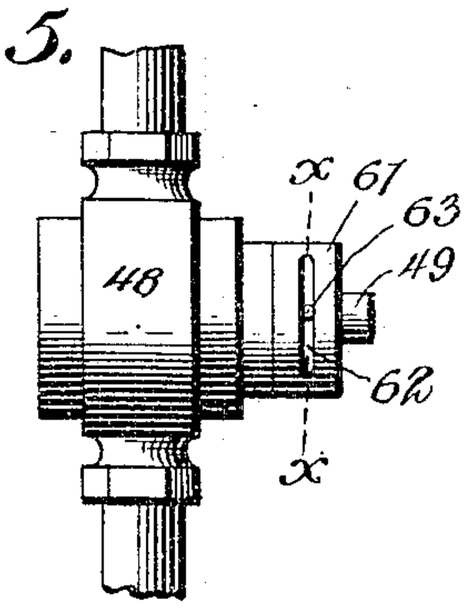
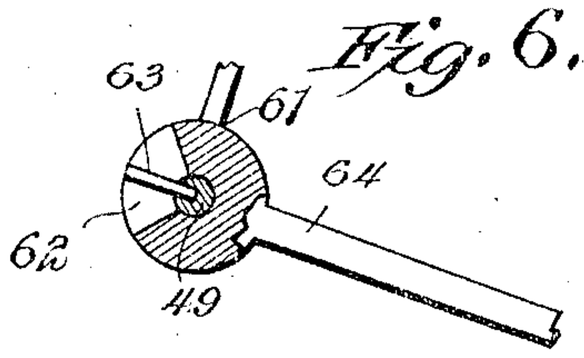


Fig. 6.



Witnesses
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No. 784,436. Patented March 7, 1905.

UNITED STATES PATENT OFFICE.

RICHARD FRANKLIN SCHROEDER, OF SACRAMENTO, CALIFORNIA.

HYDROCARBON-FEEDER SYSTEM.

SPECIFICATION forming part of Letters Patent No. 784,436, dated March 7, 1905.

Application filed September 28, 1901. Serial No. 76,912.

To all whom it may concern:

Be it known that I, RICHARD FRANKLIN SCHROEDER, a citizen of the United States, residing at Sacramento, in the county of Sacramento and State of California, have invented a new and useful Hydrocarbon-Feeder System, of which the following is a specification.

The present invention relates to systems for feeding hydrocarbon and similar oils to burners; and the prime object thereof is to provide a system which is automatic in action, requiring a minimum amount of attention and at the same time being comparatively inexpensive to install.

One of the particular features of the invention relates to the means for supplying the hydrocarbon to the burner or burners, a reservoir being provided which is so constructed that the crude oil employed is automatically relieved therein from impurities by the action of the water of condensation from the steam used in forcing the oil from the reservoir to the burner, so that said oil when it reaches the burner is in a purified condition.

Another important feature resides in novel mechanism for regulating the feed of the oil to the burner or burners by the steam-pressure of the boiler heated thereby, so that a predetermined pressure may be practically maintained at all times.

A still further object relates to means for automatically replenishing the supply of oil within the reservoir, said means being so constructed that when the level of the oil within said reservoir falls below a certain plane a new supply will be automatically fed thereto until the reservoir is again filled, whereupon the supply will be immediately and automatically cut off.

The preferred embodiment of these several features and others which will more fully appear is fully shown in the accompanying drawings and the construction and operation thereof is described in the following specification. The right is reserved, however, to make such changes and modifications from the construction shown and described as the scope of the appended claims will warrant.

In the drawings, Figure 1 is a view in elevation of the improved system, showing the same employed in connection with an ordinary and well-known form of steam-boiler. Fig. 2 is a vertical sectional view through the hydrocarbon-reservoir. Fig. 3 is a sectional view through the pressure-regulating valve. Fig. 4 is an elevation of the supporting means for the rock-shaft which carries the float. Fig. 5 is a detail view of the valve which controls the steam-supply to the pump. Fig. 6 is a sectional view on the line $x\,x$ of Fig. 5. Fig. 7 is a plan view of the guard-spider employed over the pressure-regulator valve.

Similar numerals of reference designate corresponding parts in all the figures of the drawings.

Referring now to Fig. 1 of the drawings, in which the complete system is shown, there is illustrated a well-known form of boiler (designated 10) having the usual steam-done 11. This boiler is heated by a burner 12, which may be of any well-known or desired construction, the same forming no part of the present invention. This burner 12 is supplied with hydrocarbon oil from a reservoir 13, said reservoir being constructed in the following manner: A cylindrical body is constructed from sheet metal, being preferably provided at one end with a detachable head 14 and at the other with a gage 15. It is furthermore provided on its upper side with a pocket 16 and is supported at an inclination of from ten degrees to fifteen degrees by means of suitable standards 16^a. The upper corner 17 thereby constitutes a dome, while the diagonally opposite lower corner 18 forms a well. From the lower portion of the upper end of the reservoir an oil-discharge pipe 17^a leads to the burner 12, said pipe being provided with suitable valves 18^a and preferably having a pressure-gage 19 connected therewith. In order to force the hydrocarbon oil from the reservoir to the burner, a steam-supply pipe 20 leads from the dome 11 of the boiler to the upper portion of the reservoir, said pipe being provided with a cut-off valve, as 21, and having an automatic pressure-regulating valve (designated as a whole by 22) located therein. The construction of this valve is clearly shown in Fig. 3 of the drawings.

A casing 23 is provided at one end with an inlet 24, into which one section of the sup-

ply-pipe is threaded, and an offset discharge-orifice 25, into which another section of said pipe is screwed. Directly opposite the inlet-port there is arranged a plunger-cylinder 26, and a valve-seat 27 is located between the inlet and outlet orifice. A valve 28 is slidably mounted within the casing and has a contracted neck 29, to the end of which is secured a plunger 30, that is located in the cylinder 26. A coiled tension-spring 31, also arranged in the cylinder, bears against the lower end of the plunger to normally hold the valve in open position against a spider 32, disposed over the inlet-orifice of the casing. The tension of this spring is regulated by means of an adjusting-screw 33, threaded into the end of the cylinder and bearing against the end of a coiled spring. The operation of this regulator is very simple. It will be observed that the valve opens against the pressure of the steam from the boiler, and it is held in open position by the coiled spring 31 until a predetermined pressure is reached, which pressure can be regulated be adjusting the tension of the spring in the manner described. The steam under ordinary conditions can therefore flow freely from the boiler, past the valve, and into the reservoir, creating a pressure in the latter which will force the oil through the pipe 17ª and into the burner. As soon, however, as the desired pressure has been reached in the boiler the valve 28 will be automatically closed, and as a consequence the pressure upon the oil relieved, thus decreasing the feed of oil to the burner. In order, however, to prevent the extinguishment of the flame at the burner, due from the entire lack of feed, a by-pass pipe 34 is connected at its ends with the supply-pipe 20 upon opposite sides of the pressure-regulator, this by-pass pipe having a valve 35, by means of which the supply of steam thereto may be regulated as desired. A check-valve 36 is also preferably employed in the main supply-pipe between the pressure-regulator and the reservoir to prevent any back pressure when starting the fire without steam-pressure, as is hereinafter described.

The steam employed in forcing the oil from the reservoir becomes impregnated with hydrocarbon vapor or gas and is therefore more valuable for use in the burner than steam direct from the boiler. To the end, therefore, that this impreguated steam may not be wasted, a steam-discharge pipe 37 leads from the dome 17 of the reservoir to the burner, where it mixes with the hydrocarbon oil and properly atomizes the same in a manner readily understood to those skilled in the art. Considerable steam condenses within the reservoir, and this water of condensation being heavier than the oil passes through the same and finally reaches the well 18, formed by the lower corner of the reservoir. During such passage it will collect the dirt and sediment contained in the hydrocarbon and carry it to the well, from which it may be removed by opening a valved discharge-vent 38, leading from said well. This sediment and water is prevented from getting into the oil-discharge pipe 17ª by means of an apron 39, that is secured to the inner walls of the casing of the reservoir, between the bottom thereof and the inlet end of the pipe, and a screen 40, extending from the outer or free end of the apron to the end wall, thereby completely inclosing the inlet end of the said pipe.

The apparatus so far described is capable of use only when there is sufficient steam-pressure in the boiler to force the oil from the reservoir and is inoperative when the boiler is cold. Means are therefore provided for starting the burner when there is no steam-pressure available. This means consists of an air-reservoir 41, connected with the dome of the reservoir by an air-conducting pipe 42, having a valve 42ª and supplied with compressed air by a water-motor 43, which may be attached in any desired manner to a city main or source of water-supply. It will therefore be seen that by operating this water-motor sufficient pressure may be obtained in the reservoir to feed the oil to the burner, the compressed air being prevented from passing into the boiler by means of the check-valve 36, already described. When sufficient steam-pressure is obtained in the boiler, the air-pressure may be cut off and the steam supplied. Mechanism is also provided for automatically supplying oil to the reservoir when the level therein falls below a certain plane, this mechanism being constructed and operating substantially as follows: A steam-pump 44 of well-known construction has connections through a supply-pipe 45 with a suitable source of oil-supply, and an oil discharge or conveyer pipe 46 leads from this pump to the reservoir. The pump is driven by steam obtained from the main supply-pipe 20 through a conveyer-pipe 47, which pipe is provided with a rotary throttle-valve of ordinary construction, (indicated at 48.) said valve having an exposed stem 49. (Clearly shown in Figs. 5 and 6.) A horizontally-disposed bracket 50 is secured within the reservoir contiguous to its upper end, said bracket, as shown in Fig. 4, consisting of spaced bars 51, connected at their opposite ends by alined journal-boxes 52. In these boxes is journaled a rock-shaft 53, one end of which, as 54, is located on the exterior of the reservoir. To the inner end is attached an arm 55, carrying a float 56, which float moves into the pocket 16 of the reservoir as the level of the hydrocarbon therein raises it, a seat 57, secured in the lower portion of the reservoir, receiving said float as the level lowers. To the exposed end of the rock-shaft there is secured a crank-arm 58, to the free end of which is pivoted a rod 59, having at its free end a pivoted slotted link 60. A bell-crank lever is journaled upon the

projecting stem 49 of the throttle-valve, a collar 61 being provided for the purpose, said collar having a longitudinally-disposed slot 62, into which projects a pin 63, secured to the shaft 49, all of which is clearly shown in Figs. 5 and 6. One arm, as 64, of the bell-crank lever has a terminal stud 65, that is slidably mounted in the slot of the link 60, while the other arm carries a weight 66, which may be adjusted toward or from the valve-stem. The movement of the bell-crank lever is limited by an arcuate plate 67, secured intermediate its ends to the pipe 47 and having terminal stop-pins 68, against which the arm or the weight abuts. The operation of this portion of the system will be apparent. Assuming the reservoir filled with hydrocarbon and the burner in operation, the valve will be in closed position or as shown in Fig. 1. As the oil discharges, the level thereof will of course be lowered, and as a consequence the float will likewise gravitate, thus raising the crank-arm 58 and the bell-crank lever without, however, effecting the movement of the throttle-valve, for the reason that said bell-crank lever has a limited independent movement by reason of the pin 63 engaging in the slot 62 of the collar. When, however, the float has lowered sufficiently to move the weight 66 of the bell-crank lever past its center of gravity, it will immediately drop, this being permitted because of the sliding engagement of the stud 65 in the slot of the link 60. During this movement the end of the slot 62 abuts against the pin 63 and as a result the valve-stem is moved, thus opening the valve and admitting steam to the pump. A new supply of oil will thereupon be fed to the reservoir, consequently raising the float and cutting off the steam-supply when the proper level has been reached. By this means it will be seen that a proper supply of hydrocarbon oil is always maintained within the reservoir, and a particular advantage resides in the fact that the pump is not brought into operation until the supply reaches a predetermined level, whereupon a full supply of steam is admitted thereto, which supply continues until the proper quantity of oil has been admitted, in which case the entire supply is immediately and completely cut off.

It will be seen that the system thus shown and described is entirely automatic in its operation after steam-pressure has been obtained in the boiler and that the preliminary pressure is obtained in an exceedingly simple manner. The crude oil is purified by the water of condensation from the steam used in forcing it from the reservoir, and this steam is also employed in atomizing and burning said oil. As a result there is practically no waste to the system and very little expense after the cost of installation.

From the foregoing it is thought that the construction, operation, and many advantages of the herein-described invention will be apparent to those skilled in the art without further description, and it will be understood that various changes in the size, shape, proportion, and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

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

1. In a hydrocarbon-feeder system, the combination with a hydrocarbon-reservoir having a steam-space at one of its upper corners, and a sediment-space in its diametrically opposite lower corner, of a steam-supply pipe connected to the reservoir above the sediment-space, a burner, a hydrocarbon-discharge pipe connecting the burner and the lower portion of the reservoir below the steam-space and above the plane of the sediment-space, a steam-discharge pipe leading from the steam-space to the burner, and a valved sediment-discharge vent connected with the sediment-space of the reservoir.

2. In a hydrocarbon-feeder system, the combination with a hydrocarbon-reservoir located at an inclination, of a steam-supply pipe connected with the upper portion of the lower end of the reservoir, a hydrocarbon-burner, a steam-discharge pipe connecting the upper corner of the reservoir to the burner, a hydrocarbon-discharge pipe connecting the lower portion of the upper end of the reservoir and the burner, and a sediment-discharge vent communicating with the lower corner of the reservoir.

3. In a hydrocarbon-feeder system, the combination with a hydrocarbon-reservoir, of a hydrocarbon-discharge pipe leading from the reservoir above the bottom of the same, and an apron secured to the wall of the reservoir between the bottom of the reservoir and the discharge-pipe, said apron extending into said reservoir and terminating short of the opposite wall thereof.

4. In a hydrocarbon-feeder system, the combination with a hydrocarbon-reservoir, of a hydrocarbon-discharge pipe leading from the reservoir above the bottom of the same, an apron secured to the wall of the reservoir between the bottom thereof and the discharge-pipe, said apron extending into the reservoir and terminating short of the opposite wall thereof, and a screen secured to the apron and to the wall of the reservoir above the discharge-pipe, thereby inclosing the inlet end of said discharge-pipe.

5. In a hydrocarbon-feeder system, the combination with a hydrocarbon-reservoir arranged at an inclination, of a hydrocarbon-discharge pipe leading from the lower portion of the upper end of the reservoir, an apron located between the bottom of the reservoir and the hydrocarbon-discharge pipe, and a

residue-vent leading from the lower end of the reservoir.

6. In a hydrocarbon-feeder system, the combination with a hydrocarbon-reservoir, of a burner, a connection between the burner and the reservoir, a pump having an inlet connection with the reservoir, a motive-fluid supply for the pump, a controlling-valve for the motive-fluid supply having a valve-stem, a weighted lever rotatably mounted on the stem, a stop carried by the stem for limiting the rotary movement of the lever upon the same, and means actuated by the hydrocarbon within the reservoir for shifting the weighted lever, and thereby actuating the valve.

7. In a hydrocarbon-feeder system, the combination with a hydrocarbon-reservoir, of a burner, a connection between the burner and the reservoir, a pump having an inlet connection with the reservoir, a motive-fluid supply for the pump, a controlling-valve for the motive-fluid supply having a valve-stem, a weighted lever provided with a collar which is rotatably mounted on the valve-stem, said collar having a slot, a pin carried by the stem and projecting into the slot of the collar, and means actuated by the hydrocarbon within the reservoir for shifting the weight and thereby actuating the valve.

8. In a hydrocarbon-feeder system, the combination with a hydrocarbon-reservoir, of a burner, a connection between the burner and the reservoir, a pump having an inlet connection with the reservoir, a motive-fluid supply for the pump, a controlling-valve for the motive-fluid supply, a weighted lever having a connection with the valve and provided with an offset arm, a float pivoted within the reservoir, and a connection between the offset arm of the weighted lever and the float, said connection including a link having a limited sliding movement upon said offset arm.

9. In a hydrocarbon-feeder system, the combination with a hydrocarbon-reservoir, of a burner, a connection between the burner and the reservoir, a pump having an inlet connection with the reservoir, a motive-fluid supply for the pump, a controlling-valve for the motive-fluid supply, a substantially horizontal bracket secured within the reservoir and comprising spaced arms connected by journal-boxes, a rock-shaft journaled upon the bracket in said boxes and passing through the walls of the reservoir, a float secured to the rock-shaft within the reservoir, a crank-arm secured to the exterior portion of the shaft, and connections between the crank-arm and the controlling-valve.

10. In a hydrocarbon-feeder system, the combination with a boiler, of a burner, a hydrocarbon-reservoir, hydrocarbon and steam conductors connecting the reservoir and burner, a steam-supply pipe directly connecting the boiler and the reservoir, an automatic valve located in said supply-pipe and operated by the pressure of steam therein, an automatically-operated pump for supplying oil under pressure to the reservoir, a steam-supply pipe connecting the boiler and pump, a valve arranged in said pipe, and means located in the reservoir for controlling the movement of the valve.

11. In a hydrocarbon-feeder system, the combination with a boiler, of a burner, a hydrocarbon-reservoir, hydrocarbon and steam conductors connecting the reservoir and burner, a steam-supply pipe directly connecting the boiler and the reservoir, an automatic valve located in said supply-pipe and operated by the pressure of steam, an automatically-operated pump for supplying oil under pressure to the reservoir, a motive-fluid supply for the pump, a valve controlling said supply, and means located in the reservoir for controlling the movement of the valve.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

RICHARD FRANKLIN SCHROEDER.

Witnesses:

W. A. GETT,

M. D. COFFMAN.