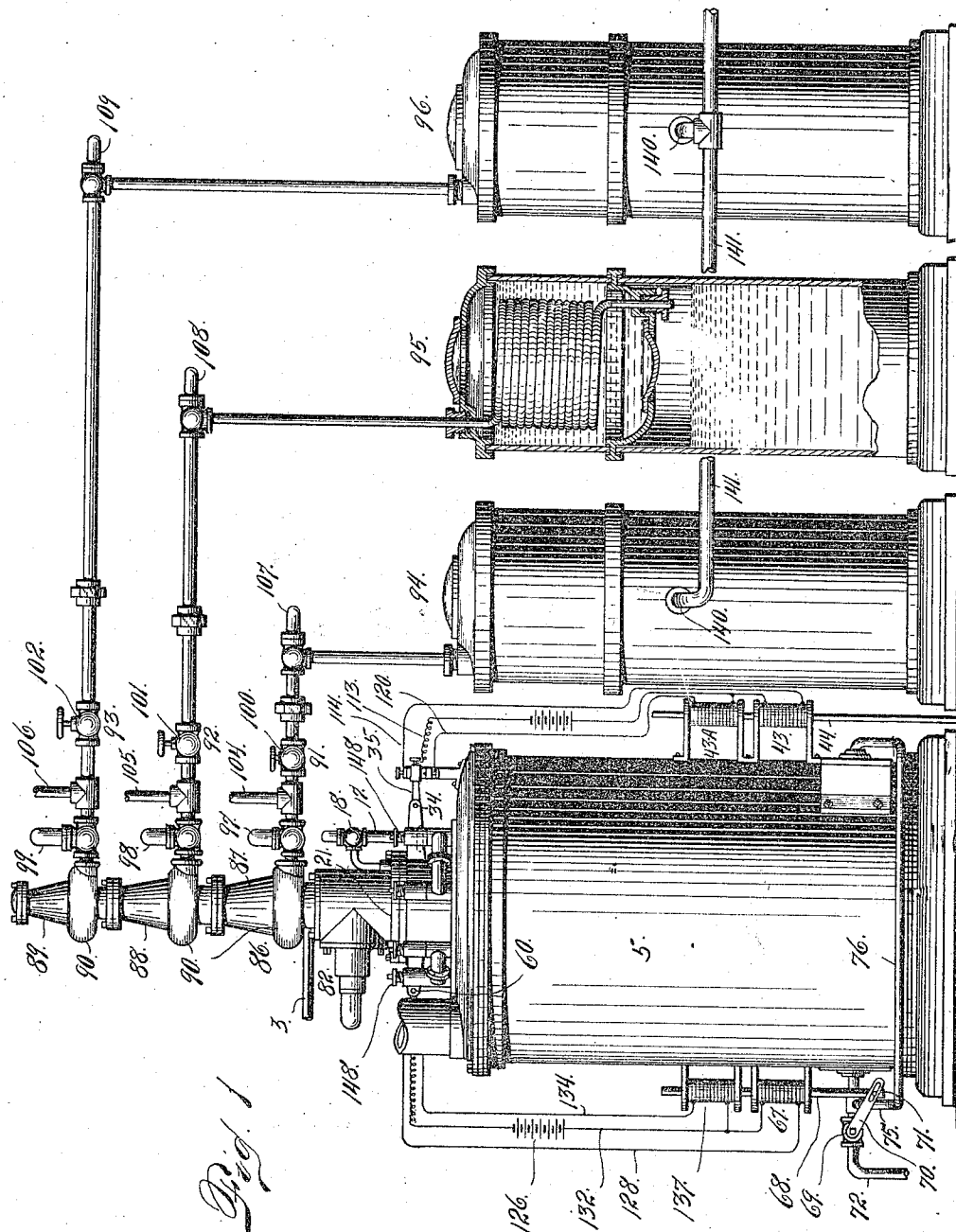


J. N. WINGETT.
 APPARATUS FOR REFINING LIQUIDS AND GASES.
 APPLICATION FILED JUNE 21, 1915.

1,229,189.

Patented June 5, 1917.
 5 SHEETS—SHEET 1.



Witnesses
 Otto E. Haddock
 Ebert W. Brien

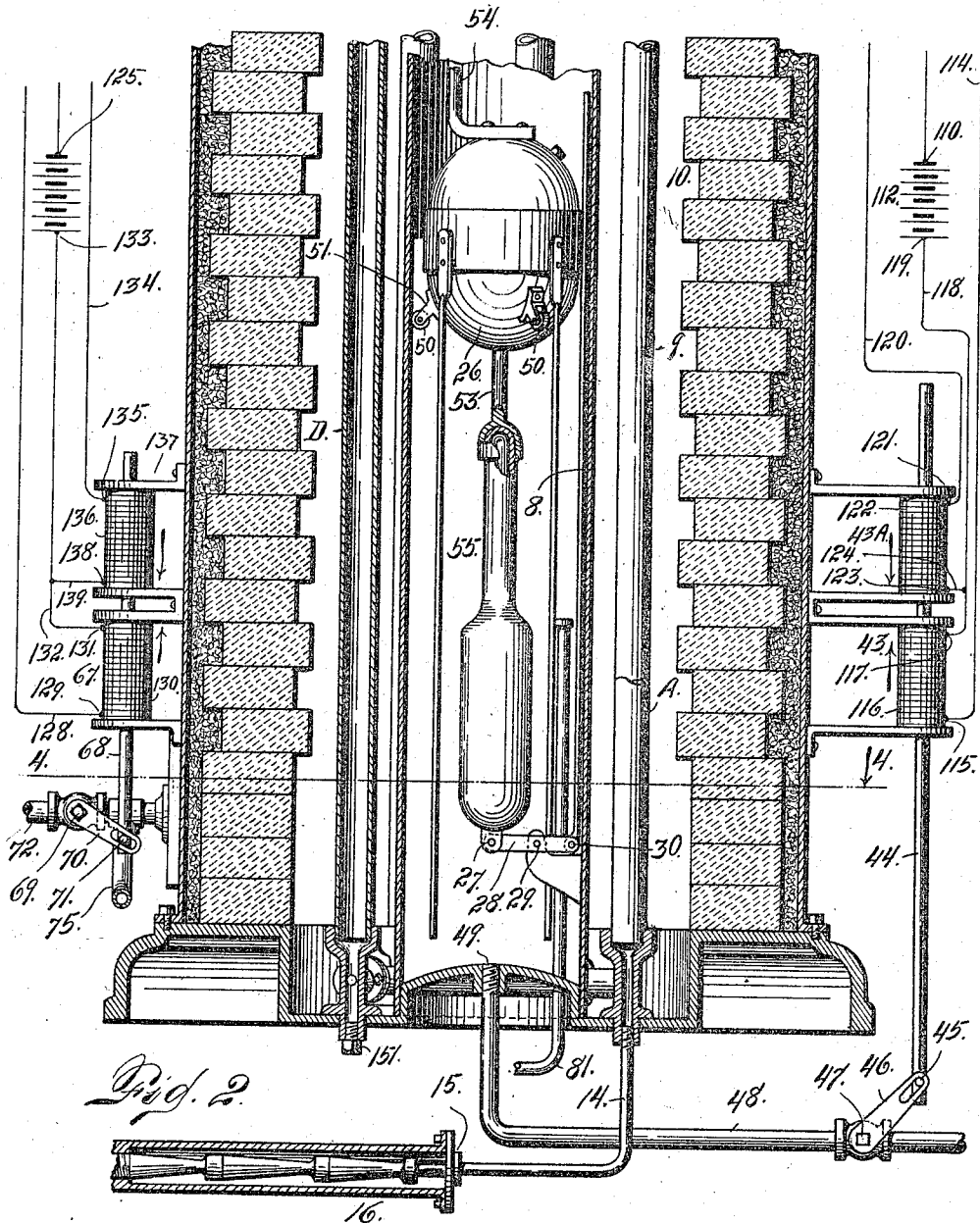
Inventor
 John N. Wingett.
 By A. J. Brien
 Attorney

J. N. WINGETT.
 APPARATUS FOR REFINING LIQUIDS AND GASES.
 APPLICATION FILED JUNE 21, 1915.

1,229,189.

Patented June 5, 1917.

5 SHEETS—SHEET 2.



Witnesses

Otto E. Haddock.
 Albert Bruen.

Inventor

John N. Wingett.
 By A. J. Corrie
 Attorney

J. N. WINGETT.
 APPARATUS FOR REFINING LIQUIDS AND GASES.
 APPLICATION FILED JUNE 21, 1915.

1,229,189.

Patented June 5, 1917.

5 SHEETS—SHEET 3.

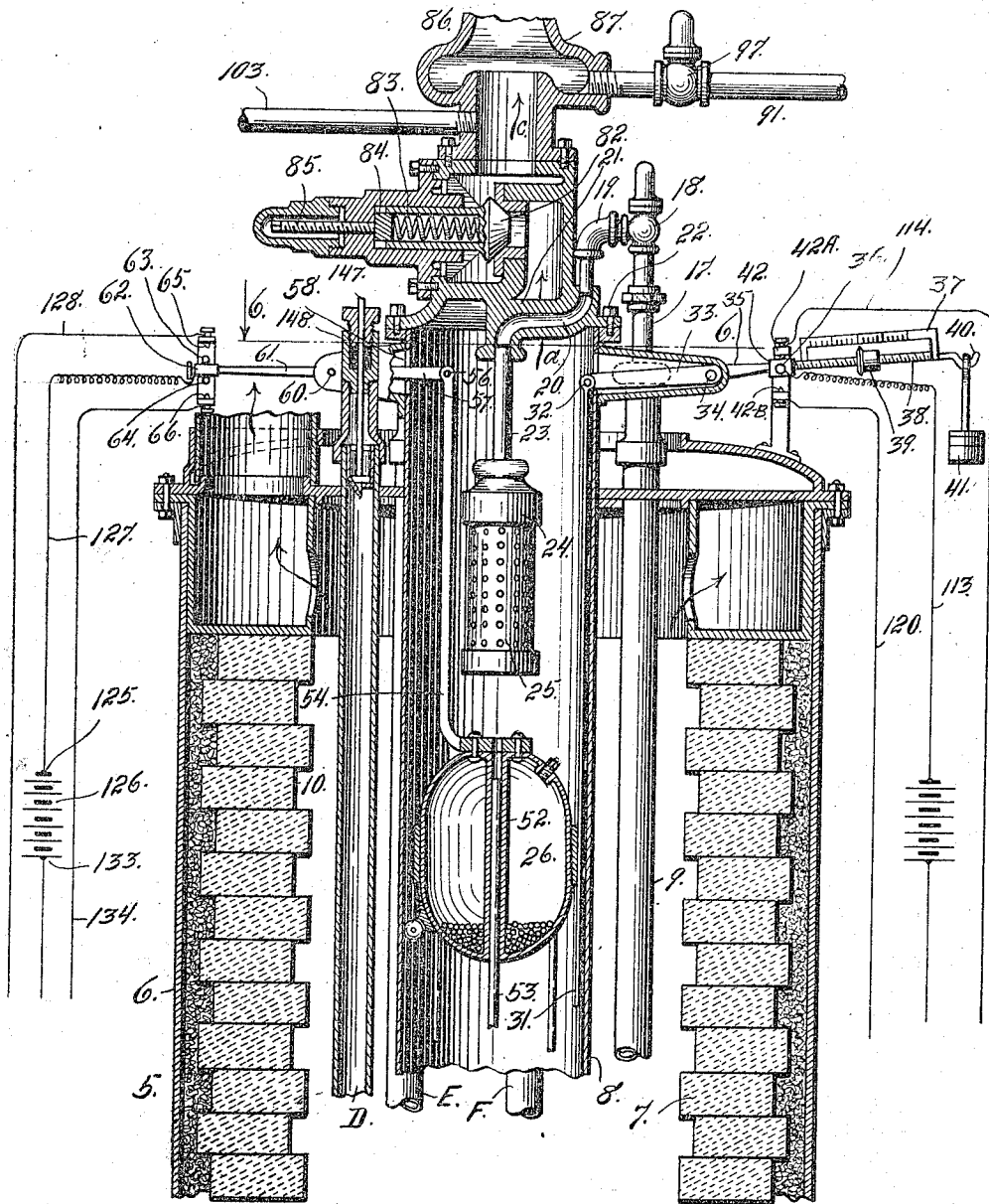


Fig. 3.

Witnesses
Otto E. Haddock
Hebert O'Brien

Inventor
John N. Wingett
 By *A. J. B. Bore*
 Attorney

J. N. WINGETT.
 APPARATUS FOR REFINING LIQUIDS AND GASES.
 APPLICATION FILED JUNE 21, 1915.

1,229,189.

Patented June 5, 1917.

5 SHEETS—SHEET 4.

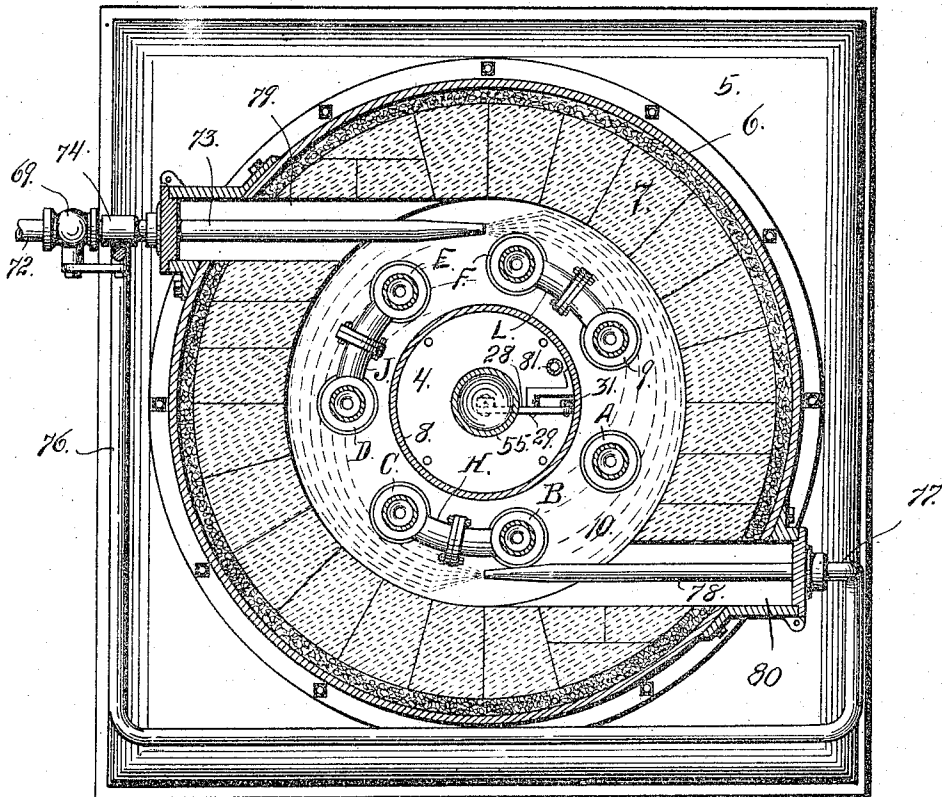


Fig. 4.

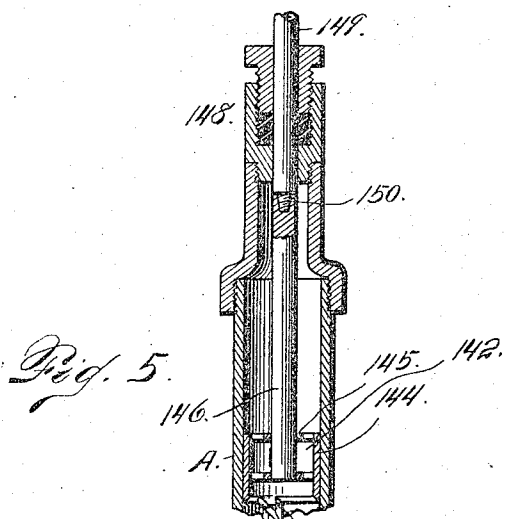


Fig. 5.

Witnesses
 Otto E. Huddick
 Herbert W. Brum

364

Inventor
 John N. Wingett.
 Attorney

APPARATUS FOR REFINING LIQUIDS AND GASES.

Patented June 5, 1917.

1,229,189.



Otto E. Hoddick.
Ebert O'Brien

John N. Wingett.

A. J. Conril Attorney

~~Attorney~~

UNITED STATES PATENT OFFICE.

JOHN N. WINGETT, OF DENVER, COLORADO, ASSIGNOR TO WARREN A. HAGGOTT,
TRUSTEE, OF DENVER, COLORADO.

APPARATUS FOR REFINING LIQUIDS AND GASES.

1,229,189.

Specification of Letters Patent.

Patented June 5, 1917.

Original application filed April 23, 1915, Serial No. 23,321. Divided and this application filed June 21, 1915.
Serial No. 35,238.

To all whom it may concern:

Be it known that I, JOHN N. WINGETT, a citizen of the United States, residing in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Apparatus for Refining Liquids and Gases; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

This invention relates to an apparatus for refining or compounding oils and other liquids, fluids and gases. One of the objects of the invention is to provide means whereby the substance to be distilled, refined or separated into its various parts, is subjected to the action of heat so that the various grades of fluid are vaporized or separated according to their various specific gravities.

This application is a division of my application Serial No. 23321 filed April 23, 1915, and entitled Process and apparatus for refining liquids and gases.

As set forth in the aforesaid application the apparatus relates more specifically to means for manufacturing petroleum ethers, petrol, gasoline or hydrocarbon products of light gravity, starting with any of the following: heavy or crude petroleum oils, kerosene, paraffins, lamp oils or any petroleum products or the like, or hydrocarbons from any source of supply but of such gravity and volatility that they do not respond or readily respond to or are not ignited by an electric spark or by such other means of ignition as are usually employed to ignite petrol, gasoline and the like when used for purposes of motive power in internal combustion or explosion engines at ordinary or prevailing atmospheric temperatures. Furthermore the hydrocarbons to be treated are to be in a liquid or vaporized state and oxygen or some other gas or gases containing a high percentage of oxygen is to be mixed with the hydrocarbons by some convenient means or apparatus, as they are injected into a retort, still or receptacle for the purpose of distilling, refining or separating; or the oxygen or gas or gases rich in oxygen may

be injected into the retort, still or receptacle where such hydrocarbons are being treated after the latter have been raised to a high temperature.

The invention covered by my present application is a suitable apparatus for carrying out the process briefly outlined in the preceding paragraph, being one form of mechanical construction capable of use in practicing the process. The said apparatus comprises generally speaking, a still or retort in which the material under treatment is vaporized and separated into the various grades desired; and condensing means through the medium of which the vaporized products are transformed or returned to a liquid condition.

Having briefly outlined my present invention I will now proceed to describe the same in detail reference being made to the accompanying drawing in which is illustrated an embodiment thereof. In this drawing,—

Figure 1 is an elevation partly in section of such apparatus.

Fig. 2 is a vertical longitudinal section taken through the lower part of the retort shown on a much larger scale than in Fig. 1.

Fig. 3 is a similar view taken through the upper portion of the retort shown on the same scale as Fig. 2.

Figs. 2 and 3 are made on different sheets for the reason that a single sheet is not large enough to illustrate the retort on the scale desired.

Fig. 4 is a horizontal section taken through the lower part of the retort on the line 4—4, Fig. 2, looking downwardly.

Fig. 5 is a sectional detail view taken through the upper extremity of one of the pipes located in the combustion chamber of the retort, the same being shown on a larger scale than in the other views.

Fig. 6 is a cross section taken on the line 6—6, Fig. 3, looking downwardly.

The same reference characters indicate the same parts in all the views.

Let the numeral 5 designate the retort or furnace in which the heat is generated for treating the crude petroleum oil or other fluids of the character heretofore indicated. The outer shell 6 of this retort which is composed of metal, is reinforced interiorly as shown at 7 in such a manner as to protect it from the high degree of heat re-

quired in carrying out the process. Centrally located within this retort is a vertically disposed casing 8 inclosing a chamber 4 into which the material as crude petroleum or other fluids to be treated, is discharged, being fed thereinto from a pipe 9 after passing through a number of similar pipes A, B, C, D, E and F, as hereinafter described, all of which are vertically disposed within the compartment 10 of the retort between the casing 8 and the outer wall 7. The lower extremity of each of these pipes is fitted into a tubular part. The lower portion of the pipe A is in communication with one extremity of a relatively small pipe 14, whose opposite extremity is connected as shown at 15 with an atomizer or fluid blending device 16 through which the material to be treated may be passed on its way to the retort. Within this instrument 16 oxygen or gas rich in oxygen may be mingled with the crude petroleum oil, for instance, to such an extent as to partially oxidize the same, as heretofore explained. The pipes A and B are connected at the top by a transversely arranged conduit G; the pipes B and C are connected at the bottom by a similar conduit H; the pipes C and D are connected at the top by a conduit I; the pipes D and E are connected at the bottom by a conduit J; the pipes E and F are connected at the top by a conduit K; and finally, the pipes F and 9 are connected at the bottom by a conduit L.

In order that this crude petroleum or other fluid may be subjected to a degree of heat sufficiently high for the purpose, it is caused to travel lengthwise of the compression chamber a number of times through the medium of the pipes A, B, C, D, E, F and 9, the said pipes being properly connected at the top and bottom for the purpose as heretofore described; and for this purpose, the fluid, as crude petroleum, after entering the lower part of the pipe A, as heretofore described, passes upwardly through said pipe, whose upper portion passes through the top of the retort, from which the fluid passes through the short connecting pipe G into the upper part of the pipe B; thence downwardly through the pipe B to the lower extremity thereof and thence through the short connecting pipe H to the lower part of the pipe C; thence upwardly through the pipe C to the upper extremity thereof; thence through the pipe I to the upper part of the pipe D; thence downwardly through said pipe D; thence from the lower portion of the pipe D through the connecting conduit J to the pipe E; thence upwardly through the pipe E to the top thereof; thence through the short connecting pipe K to the upper extremity of the pipe F; thence downwardly through the last named pipe to the lower

extremity thereof, and thence transversely through the short connecting pipe L to the lower extremity of the pipe 9 and thence upwardly through the last named pipe on its way to the chamber 4 of the retort.

The upper extremity of the pipe 9 extends beyond the retort and communicates with a pipe 17 at whose upper extremity is located a pressure releasing valve 18. The fluid within the pipe 9 is under such pressure as to open this valve, after which this material passes through an elbow-shaped conduit 19 and thence through a passage 20 formed in a cap 21 which is secured to the top of the casing 8 by cap screws 22. This passage 20 communicates at its inner extremity with a pipe 23 which is supported in the upper part of the chamber 4 and with which is connected a receptacle 24 whose walls are finely perforated as shown at 25 for the escape of the material fed into the treatment chamber 4 of the retort. By reason of the perforations in the receptacle, the material is further broken up as it enters the said chamber.

Within this chamber is located a hydrometer 55 whose upper extremity is guided by a float 26 and whose lower extremity is pivotally connected as shown at 27 with a lever 28 which is fulcrumed at 29, its opposite extremity being pivotally connected as shown at 30 with the lower end of a rod 31 whose upper extremity is connected as shown at 32 with one extremity of an arm 33 whose opposite extremity is made fast to a rock spindle 34 to which is also secured one extremity of a lever 35 which is fulcrumed at 36. The opposite arm of this lever has a graduated member 37 and a screw 38 upon which is mounted an adjustable indicator 39. The outer extremity of this lever arm terminates in a hook 40 with which is connected a weight 41. The member 39 is so adjusted with reference to the graduated member 37 as to determine the specific gravity of the liquid which will act upon the hydrometer and raise the same sufficiently to actuate the lever 35, and close an electric circuit by bringing a contact 42 into engagement (see Fig. 3) with an upper contact 42^A. The closing of this circuit energizes an electromagnet 43 which acts to raise a rod 44 whose lower extremity is connected as shown at 45 with a crank arm 46 which is connected with a valve 47 to open the same (see Fig. 2) whereby the heavy oil for instance, in the bottom of the chamber 4 may be drawn off through a pipe 48, one extremity of which is in communication with said chamber as shown at 49 while the other extremity may lead to any suitable receptacle. As the arm 37 moves downwardly to a position the reverse of that shown in Fig. 3, the contact 42 will be brought into engagement with a lower contact 42^B, whereby the circuit will

be closed through an electromagnet 43^a, which will act upon the rod 44 to move the latter downwardly and close the valve 47.

The float 26 is mounted within the chamber 4 and is suitably guided to rise and fall by means of antifrictional rollers 50, which are mounted on brackets 51 secured to the outer surface of the wall of the float and adapted to engage the inner surface of the casing 9. The central portion of this float constitutes a tube 52 which is open-ended to receive a rod 53 which is connected with the upper extremity of the hydrometer 55. This rod is of sufficient length to maintain its telescopic relation with the float tube 52 regardless of the fluctuations of the float and hydrometer within the operating chamber of the retort. As the liquid rises and falls in the chamber 4, the float also fluctuates, thus making it practicable to utilize the float for controlling the supply of fuel to the combustion chamber. And for this purpose, to the upper extremity of this float is rigidly secured the lower end of a rod 54 whose upper extremity is pivotally connected as shown at 56, with the inner extremity of an arm 57 which passes outwardly through an opening 58 formed in the wall of the casing 8 and through a small auxiliary casing 59, through whose outer extremity is passed a rock spindle 60. To one of the exposed extremities of this spindle is secured the inner end of a rock arm 61 to whose outer extremity is secured a contact 62 having upper and lower projections 63 and 64. Arranged respectively above and below these projections are contacts 65 and 66. As the float rises within the chamber 4 as the level of the heavy liquid rises, the arm 61 will be lowered to bring the projection 64 into engagement with the contact 66, whereby an electric circuit is closed through an electromagnet 136, whereby the armature 68 of the said magnet or solenoid is lowered sufficiently to further open a valve 69 with which is rigidly connected one extremity of a crank arm 70, the opposite extremity of said arm being connected as shown at 71 with the lower end of the armature 68, for the purpose. The further opening of this valve increases the supply of fuel to the combustion chamber, as the rise of the liquid in the treatment chamber necessary to lift the float and close the circuit through the magnet 137, indicates that more fuel is needed and that a greater proportion of the material under treatment should be vaporized. Again, as the liquid falls and reaches a sufficiently low level, the float will fall and finally close the circuit through a magnet 67, which will act to move the armature 68 downwardly and reduce the quantity of fuel supplied to the combustion chamber by partially closing the valve 69 or returning it to its normal position.

The fuel is fed to the combustion chamber

from a main supply pipe 72 and thence into a burner 73 which is in communication with the pipe 72 through the valve 69 and a short pipe member 74. Again, a branch pipe 75 leads downwardly from the pipe 72 and merges at its lower extremity into a pipe 76 which passes part way around the retort, its opposite extremity communicating with a short pipe member 77 which communicates with a fuel burner 78. These burners 73 and 78 enter the combustion chamber on opposite sides of the retort and are so arranged that the fuel discharged into the lower part of the combustion chamber therefrom is caused to take a circular direction within the combustion chamber, thus facilitating the uniform heating of the entire chamber, the flame and products of combustion being brought into direct contact with the pipes A, B, C, D, E, F and G. The burners 73 and 78 pass through openings 79 and 80, respectively, formed through the relatively thick walls of the retort. An inlet pipe 81 enters the lower part of the treatment chamber, its upper extremity being open for the discharge of oxygen or gases or materials rich in oxygen, into the treatment chamber, whereby the oxygen is caused to mingle with the material under treatment within the chamber 4, the lighter oils which are vaporized within the treatment chamber under the influence of the high degree of heat to which the material under treatment is subjected, rise within the said chamber as indicated by the arrow *a* (see Fig. 3) and act upon a check valve 82 to open the latter against the tension of a spring 83 which engages the valve piece at one extremity and a block 84 at the opposite extremity, the said block being acted on by a tension screw 85 for the purpose of regulating the tension of the spring, so that the valve 82 will open when the pressure of the vaporized material reaches a desired degree. This vapor will then pass through the port normally closed by the valve 82, and thence upwardly as indicated by the arrow *c* (see Fig. 3), into a dome 86 composed of a number of members 87, 88 and 89, the number of these dome members depending upon the number of grades of lighter oils into which the material is to be separated. The lower part of each of these members 87, 88 and 89 is provided with an enlargement 90 from which lead conduits 91, 92 and 93, respectively, their opposite extremities communicating with condensers 94, 95 and 96, respectively. The conduits 91, 92 and 93 are respectively provided with releasing valves 97, 98 and 99, which are set to release the vapor at the desired predetermined pressure. These pipes or conduits 91, 92 and 93 are also respectively provided with cutoff valves 100, 101 and 102, which may be utilized whenever desired.

The numeral 103 designates a pipe communicating with the lower part of the classifying dome 86, which pipe may be used for supplying nitrogen, or gases or material rich in nitrogen or any form of chemicals or gases from any desired source, while still under pressure or not, as desired.

The conduits 91, 92 and 93 are also respectively provided with pipes 104, 105 and 106, through which may be introduced any desired form of gases or chemicals from any desired source for deodorizing or for any other purpose.

The conduits 91, 92 and 93 are provided between their cutoff valves and condensers, with releasing valves 107, 108 and 109, respectively.

The electric circuits for energizing and de-energizing the magnets 43 and 43^A will now be described.

From the pole 110 of an electric source 112, a conductor 113 leads to the contact 42; while from the upper contact 42^A a conductor 114 leads to a terminal 115 of the coils 116 of the magnet 43. From the opposite terminal 117 a conductor 118 leads to a pole 119 of the source, completing the circuit. Again, assuming that the contact 42 is in engagement with the lower cooperating contact 42^B, the circuit may be said to pass from the pole 110 of the electric source through the conductor 113 to the contact 42; thence to the contact 42^B; thence through a conductor 120 to a terminal 121 of the coils 122 of the electromagnet 43^A. From the opposite terminal 123 of the coils of this magnet a short conductor 124 leads to the conductor 118 through which the current passes to the pole 119, completing the circuit when the contacts 42 and 42^B are in engagement.

The circuits of the magnets for regulating the valve 69 in the pipe 72 for supplying fuel to the retort, will now be described. If we assume that the contact 62 is in engagement with the cooperating contact 65, the current may be said to pass from a pole 125 of an electric source 126, thence through a conductor 127 to the contact 62, thence through the contact 65 to a conductor 128 and thence through the latter to a terminal 129 of the coil 130 of the magnet 67; while from the opposite terminal 131 of this coil, a conductor 132 leads to the opposite pole 133 of the source, completing the circuit.

Again, if it be assumed that the contact 62 is in electrical engagement with the lower cooperating contact 66, the current may be said to pass from the electric source through the conductor 127 to the contact 62, thence through the contact 66 and a conductor 134 to a terminal 135 of the coil 136 of the electromagnet 137; while from the opposite terminal 138 of this magnet, a short conductor 139 leads to the conductor 132 through

which the current passes to the pole 133 of the source, completing the circuit.

From the foregoing description the operation of the apparatus will be readily understood. The material to be treated may be first passed through the atomizer 16 where it is thoroughly mingled with oxygen from any suitable source, after which it is delivered to the pipe system within the combustion chamber of the retort, whereby it is caused to travel vertically through this system the entire length of the combustion chamber a number of times, whereby it is subjected for a considerable time to a high degree of heat, which necessarily places the lighter portions of the original crude petroleum, for instance, into a vaporized condition, after which it is delivered to the treatment chamber 4 of the retort. In this chamber, which is itself highly heated, the material will be separated into the heavier products and the lighter products, the former consisting of heavy liquid which settles in the bottom part of the treatment chamber, while the lighter products are in a vaporized condition and rise within the treatment chamber and pass out of the retort into the dome 86, where the lighter product is separated into a number of different grades varying in density, the lighter grades passing to the higher parts of the dome and the other grades taking different positions according to their specific gravities. Suitable conduits are connected with the dome at different elevations, whereby these different products are drawn off and conducted to condensers where they are returned to liquid form.

During the operation, oxygen or some gas rich in oxygen is introduced into the material under treatment and this introduction may be at any suitable stage of the operation. For instance, oxygen may be mingled with the product as it is passing through the atomizer 16 and consequently, before the crude petroleum, for instance, reaches the retort. Again, oxygen may be introduced through the pipe 81 into the material within the treatment chamber 4. Again, nitrogen or gases or materials rich in nitrogen may be introduced into the vaporized material at the base of the dome 86 and prior to the separation of the vaporized product into its various grades. The pipe 103 is employed for this purpose. Furthermore, a deodorizing gas may be introduced into the various grades of the lighter materials after they leave the dome of the retort and as they are passing through the conduits which lead to the respective condensers. In the drawing, pipes 104, 105 and 106 are employed for this purpose.

My improved apparatus, as set forth in this application, is intended to operate auto-

5 matically. For instance, the hydrometer is connected with a leverlike device having a graduated arm and an adjustable indicator, whereby this device may be so set that when the heavy oil in the bottom of the treatment chamber has reached a given level, the movement of the hydrometer will close an electric circuit which will open a valve in the conduit 48, whereby this heavy oil will be drawn off continuously from the retort as long as this level is maintained. But should the heavy oil fall below the normal or desired level, the fall of the hydrometer will close the circuit through the magnet 43, through whose agency the valve 47 in the draw-off conduit 48 will be closed to cut off the escape of the heavier oil from the retort until such time as there has been a further accumulation of the heavy oil, when the hydrometer will again assume its normal position and open the valve 47.

10 From this it should be understood that the operation of the apparatus is continuous and automatically controlled. The valve 69 which controls the supply of fuel is originally set to furnish a predetermined fuel supply to the combustion chamber of the retort and during the operation, if there is an undue accumulation of oil in the treatment chamber, indicating that a greater temperature is required in order to vaporize the required proportion of the material under treatment, this accumulation will act upon the float through the medium of which the circuit will be closed through the magnet 137, which will act as heretofore described, to further open the valve 69 and increase the fuel supply accordingly. Again, as the amount of oil within the treatment chamber diminishes to such an extent as to cause the float to fall the required distance, the circuit will be closed through the electromagnet 67 which will serve to actuate the valve 69 to cut off a part of the fuel supply. In this way, the supply of fuel to the combustion chamber of the retort, is automatically regulated.

15 At the beginning of the operation, it may be assumed that the valve 47 in the pipe 48 is closed, but as the heavier oil rises to the desired level in the treatment chamber, it will act upon the hydrometer to raise the same and the latter, by virtue of its connection with the lever 35, will close the circuit through the electromagnet 43, which will act through the armature 44 to open the valve 47 to the required degree for drawing off the heavy oil from the treatment chamber; but should the accumulation of heavy oil not be sufficient to maintain the hydrometer in the raised position, and should gradually diminish within the treatment chamber, the hydrometer will fall and act upon the lever 35 to close the circuit

through the magnet 43^A, which will actuate the armature 44 to close or partially close the valve 43, as may be required.

The condensers 94, 95 and 96 are in communication through outlet elbows 140 with a draw-off conduit 141, whereby any non-condensable gases or vapors may be removed from the condensers.

The pipes A, B, C, D, E and F within the combustion chamber are each supplied at its upper extremity with a tube cleaner 142, consisting of a scraper element 143 which is connected with the lower extremity of a sleeve 144 fitted into the pipe. This sleeve is connected by means of spiders 145 with a rod 146 which normally projects above the pipe as shown at 147 after having passed through a stuffing box 148 with which the upper extremity of the pipe is equipped. In order to operate this tube cleaner, a rod 149 may be threaded into the exposed extremity 147 of the stem, as shown at 150, this rod being of sufficient length to permit the movement of the tube cleaner through the tube its entire length or to the extent desired, in order to remove any sediment or accumulations which otherwise would have a tendency to stop the passage. Each of these pipes, except the one directly connected with the inlet pipe 14, is provided at its lower extremity with a screw plug 151, which may be removed for the purpose of allowing the loosened foreign material to escape.

What I claim is:

1. Apparatus of the class described, including a retort provided with a treatment chamber, a hydrometer therein, an outlet conduit connected with the treatment chamber for drawing off the heavier oils, a valve therein normally closed, and an operative connection between the hydrometer and the valve for automatically controlling the latter as the gravity of the oil fluctuates in the treatment chamber.

2. Apparatus of the class described, including a retort provided with a treatment chamber, a hydrometer therein, an outlet conduit connected with the treatment chamber for drawing off the heavier oils, a valve therein normally closed; an operative connection between the hydrometer and the valve for automatically controlling the latter as the gravity of the oil fluctuates in the treatment chamber, said means including an electromagnet device, a circuit in which said device is located, a lever connected with the hydrometer, and a circuit-make-and-break device cooperating with said lever.

3. Apparatus of the class described, including a retort provided with a centrally located treatment chamber surrounded by a combustion chamber, means for feeding the material to be treated through the com-

bustion chamber to the treatment chamber, a hydrometer within the treatment chamber, a conduit connected with the bottom of the treatment chamber for drawing off the heavy oil product, a valve in said conduit, and an operative connection between the hydrometer and the valve for automatically controlling the latter as the gravity of the oil fluctuates in the treatment chamber.

4. Apparatus of the class described including a retort provided with a centrally located treatment chamber surrounded by a combustion chamber, means for feeding the material to be treated through the combustion chamber to the treatment chamber, a hydrometer within the treatment chamber, a conduit connected with the bottom of the treatment chamber for drawing off the heavy oil product, a valve in said conduit, an operative connection between the hydrometer and the valve for automatically controlling the latter as the gravity of the oil fluctuates in the treatment chamber, said connection including a lever having one arm connected in operative relation with the hydrometer, an electromagnet device, a circuit in which the device is located, and a circuit-make-and-break device cooperating with the other arm of the lever.

5. Apparatus of the class described comprising a retort, a treatment chamber therein, a conduit connected with the lower part of the treatment chamber for drawing off heavy oils, a valve in said conduit, means for controlling said valve, including a hydrometer located within the treatment chamber, a lever having one arm connected in operative relation with said chamber, electromagnet devices arranged in opposing relation and connected in operative relation with the valve, and circuit-make-and-break devices cooperating with the opposite arm of the lever to alternately close the circuits of the electromagnet devices as the gravity of the oil rises and falls within the treatment chamber.

6. In apparatus of the class described, the combination of a retort having a treatment chamber surrounded by a combustion chamber, a hydrometer in the treatment chamber, a lever having one arm connected in operative relation with the hydrometer, the other arm being graduated, adjustably weighted and having a movable index, electromagnet devices arranged to act on the valve in opposing relation, electric circuits in which said devices are located, and make-and-break devices cooperating with said graduated lever arm for making and breaking said circuits as the gravity of the oil fluctuates in the treatment chamber.

7. The combination of a retort having a combustion chamber, and a treatment chamber surrounded by the combustion chamber,

a conduit for supplying fuel to the combustion chamber, a valve in said conduit, a float in the treatment chamber, an operative connection between the float and the valve for opening and closing the latter as the float fluctuates, said connection including two electromagnet devices, circuits in which said devices are located, said devices being connected with the valve in opposing relation, and a lever having one arm connected in operative relation with the float and circuit-make-and-break devices cooperating with the other arm of the lever for making and breaking the said circuits as the float rises and falls in the treatment chamber.

8. Apparatus of the class described comprising a retort having a treatment chamber surrounded by a combustion chamber, means for feeding the material to be treated into the treatment chamber through the combustion chamber, through the medium of a pipe system located within the combustion chamber, a separating dome extending upwardly from the retort, a spring-held valve adapted to open under pressure to allow volatilized products to pass into the said dome, conduits connected with the dome at different heights at one extremity, and condensers with which the other extremities of said conduits are connected.

9. Apparatus of the class described comprising a retort having a treatment chamber surrounded by a combustion chamber, means for feeding the material to be treated into the treatment chamber through the combustion chamber, through the medium of a pipe system located within the combustion chamber, a separating dome extending upwardly from the retort, a spring-held valve adapted to open under pressure to allow volatilized products to pass into the said dome, conduits connected with the dome at different heights at one extremity, condensers with which the other extremities of said conduits are connected, and means for introducing oxygen into material under treatment at different stages of the operation.

10. Apparatus of the class described comprising a retort having a treatment chamber surrounded by a combustion chamber, means for feeding the material to be treated into the treatment chamber through the combustion chamber, through the medium of a pipe system located within the combustion chamber, a separating dome extending upwardly from the retort, a valve set to open under predetermined pressure to allow volatilized products to pass into the said dome, conduits connected with the dome at different heights at one extremity, condensers with which the other extremities of said conduits are connected, and means for introducing oxygen into material under treatment at different stages of the operation.

11. Apparatus of the class described including a retort having a combustion chamber, a treatment chamber surrounded by the combustion chamber, and means for introducing the material to be treated into the treatment chamber, said means including a conduit passing through the combustion chamber and a valve between said conduit and treatment chamber and set to open un-

der any predetermined pressure to allow the material to pass from the conduit to the treatment chamber. 10

In testimony whereof I affix my signature in presence of two witnesses.

JOHN N. WINGETT.

Witnesses:

A. J. O'BRIEN,

A. EBERT O'BRIEN.