

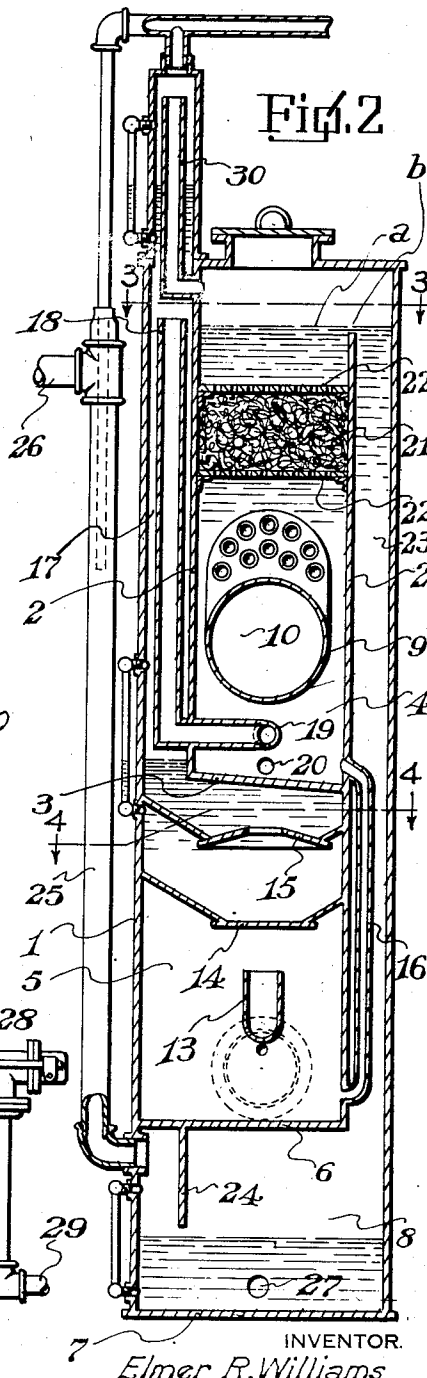
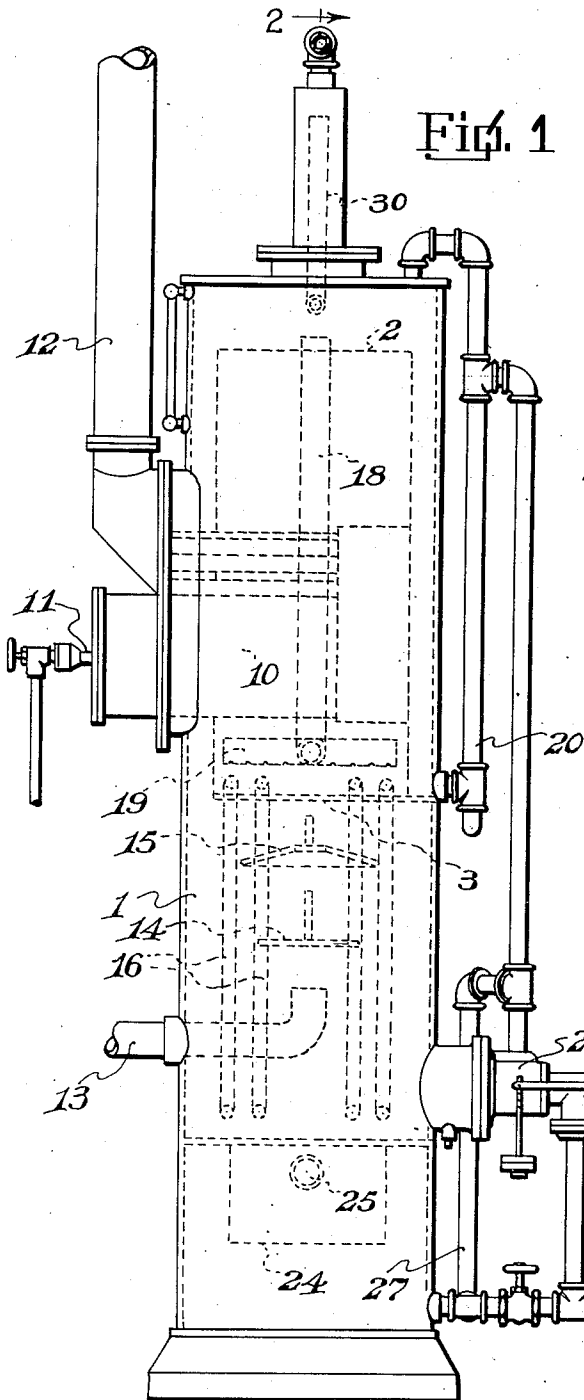
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E. R. WILLIAMS
OIL AND WATER SEPARATOR

2,562,653

Filed Dec. 17, 1947

2 Sheets-Sheet 1



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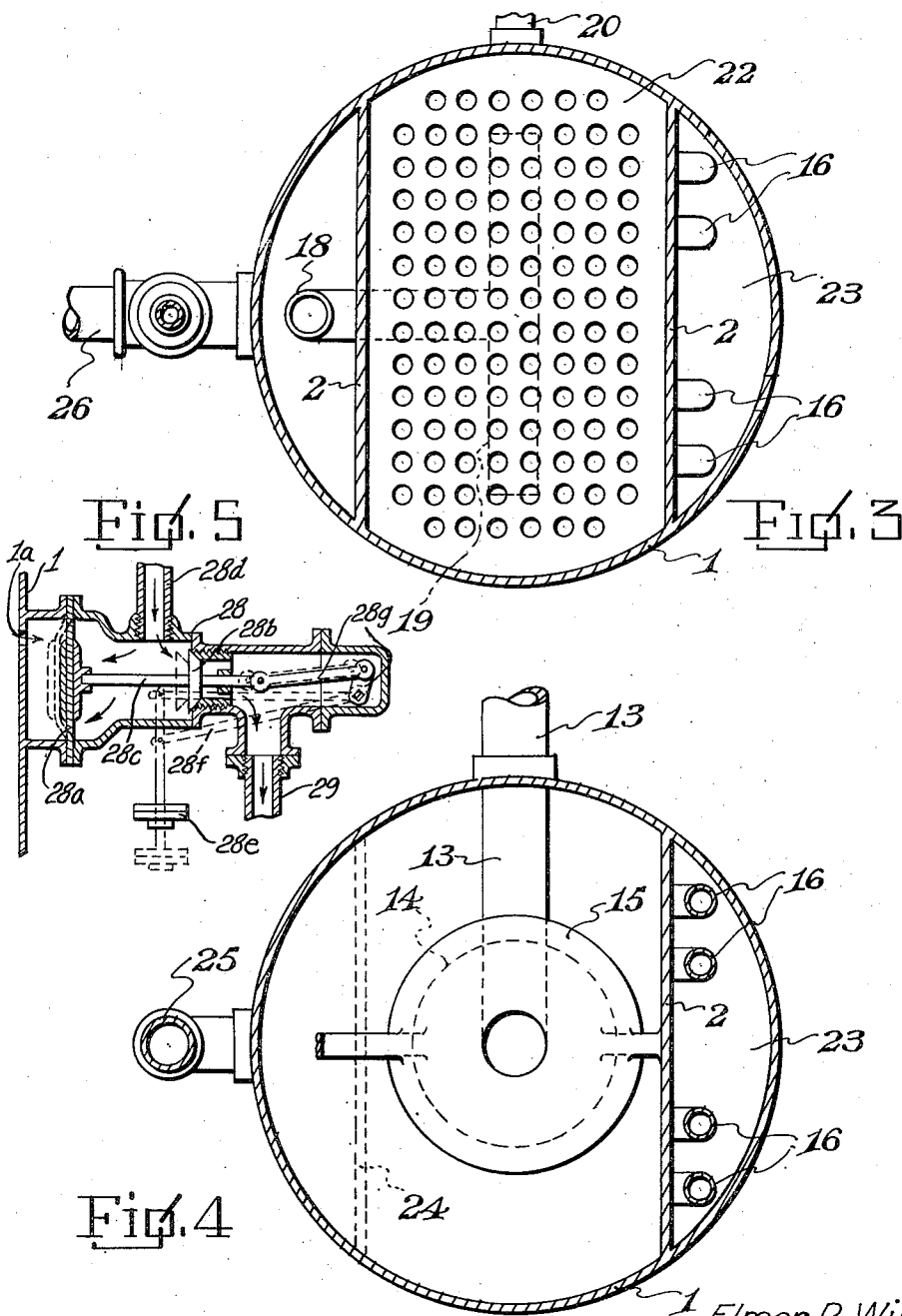
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OIL AND WATER SEPARATOR

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6 Claims. (Cl. 210—49.5)

1 The invention relates to oil and water separators, commonly called treater, and has for its object to provide a device of this kind whereby the free water, in the oil or emulsion, will be settled out of the oil before the oil reaches the heating chamber, thereby getting high efficiency in the removal of whatever water remains in the oil as it passes around the heater.

A further object is to provide means whereby the oil, after it passes the heater, will flow over the edge of a plate in a thin film, so there will be a minimum amount of turbulence when the oil passes from one chamber to the other. Also to provide means whereby the oil, after it passes the treating or heating chamber, will flow downwardly past a hot zone, then through a warm zone and through a cooler zone, which slow cooling action sets free any remaining water which may have been suspended in the oil.

A further object is to provide a treater having an upper heating chamber and a lower free water chamber, and means whereby free water in the lower chamber will be transferred from the lower end thereof to the free water separated in the heater chamber for removal from the treater.

A further object is to provide baffles in the free water chamber to separate as much as possible the water from the oil before it passes to the heater chamber.

With the above and other objects in view the invention resides in the combination and arrangement of parts as hereinafter set forth, shown in the drawing, described and claimed, it being understood that changes in the precise embodiment of the invention may be made within the scope of what is claimed without departing from the spirit of the invention.

In the drawing:

Figure 1 is a side elevation of the treater.

Figure 2 is a vertical transverse sectional view taken on line 2—2 of Figure 1.

Figure 3 is a horizontal sectional view taken on line 3—3 of Figure 2.

Figure 4 is a horizontal sectional view taken on line 4—4 of Figure 2.

Figure 5 is a vertical longitudinal sectional view through the regulator.

Referring to the drawings, the numeral 1 designates the vertically elongated casing of the treater, and disposed within said treater are spaced transverse walls 2, which, in combination with the bottom member 3, form an upper oil treating or heating chamber 4 and lower chamber 5. The lower chamber has a closed bottom 6, spaced upwardly from the bottom 7 of the cas-

2 ing to form the water settling chamber 8. Disposed within the heater chamber 4 is a heater 9 of the tube type, and having a combustion chamber 10. The heater is preferably of the gas type, and fuel is supplied thereto by a gas burner 11. The products of combustion from the combustion chamber 10 pass outwardly through the stack 12.

The oil to be treated enters the treater through the intake pipe 13 and is projected upwardly against a horizontal baffle 14, around the edges of which the oil passes and then through the frusto conically shaped baffle 15. These baffles free a large amount of the free water from the oil before it reaches the heating element hereinafter set forth. This free water collects in the bottom of the free water chamber 5 and is transferred upwardly by columnar pressure through the by-pass pipes 16 into the bottom of the heater chamber 4. After the oil passes the baffle 15 it moves upwardly, that is the oil and suspended water left therein, and thence through the passage 17 and overflows downwardly through the pipe 18, the lower end of which pipe terminates in a branch leading to a spreader head 19, where the oil with its remaining water is projected downwardly and then flows upwardly around the heating element 9.

The heating of the oil separates additional water therefrom, which water falls to the bottom of the heater chamber 4, and is taken off through the discharge pipe 20. After the oil is heated and separated, it passes upwardly through an excelsior chamber 21 and spaced baffles 22 where additional water is scrubbed from the oil. This additional water falls to the bottom of the heater chamber 4, where it is mingled with the water transferred from the bottom of the free water chamber 5 through by-pass pipes 16. This transfer is forced by the columnar pressure of the oil on the water, and the pump force forcing the oil into the treater.

After the oil passes the baffles 22 and rises to the oil level *a*, it overflows in a thin sheet at *b* over the upper edge of the transverse partition 2, and then passes downwardly through the side chamber 23, where it is again subjected to a heat exchange of high temperature to one side of the heating chamber. The oil on its further downward course will be subjected to a gradual cooling zone to one side of the free water chamber 5, which will remove any remaining water. The oil then enters the chamber 8 above the water level therein and passes under the baffle 24, and thence upwardly through the outlet pipe 25 to the

branch outlet pipe 26. Any water which may collect in the bottom of the chamber 8 will be forced therefrom by columnar pressure through the pipe 27, and will overflow into the regulator valve 28, and thence through the water outlet pipe 29. This water is balanced, as well as the water in pipe 20 by the gas pressure above the oil body plus the columnar pressure of the oil and water, and the same is true as to the oil in the oil passage 17 and discharge pipe 25. It is to be understood that any kind of pressure could be used. The regulator 28 is in communication with the lower portion of the chamber 5 and the lower portion of the chamber 8 and is set for actuation at a predetermined columnar pressure, plus the gas pressure above the column of liquid, hence the water level in the chamber 8 may be maintained. The water within the chamber 8 may be discharged therefrom if desired by opening the valve in the pipe 29 leading from the chamber 8. The device is pressure balanced by gas above the column of fluid, even in the passage 17, and it will be noted that the pipe 30 in communication with the gas above the heating element will pass through the pipe and will exert the same pressure on the column of liquid in the passage 17.

If the oil level, in the passage 17, should overflow, it will overflow into the pipe 30, and thence back to the oil body above the combustion chamber 4.

The regulator valve 28 is of the diaphragm type having a diaphragm 28a connected to a valve 28b by a valve stem 28c. The column in the spill over 20 is water with the gas pressure on the top thereof. The column inside the main vessel is water and oil with gas pressure on top. If both columns are of equal height the water column will weigh the most. Both of these columns are acting against each other on opposite sides of the diaphragm through port 1a and pipe 28d. The water column being the heaviest, when the overflow fills up, will push the diaphragm to the left and allow the column of water to dump by opening valve 28b up to the point when both columns are of the same weight. The area of the valve tends to neutralize that much area on the diaphragm, in favor of the inside column of oil and water, so to off-set this valve area so that true columnar influence will be exerted against both sides of the diaphragm, an adjustable weight 28e is provided on a lever 28f which controls the valve and diaphragm through linkage 28g, which will offset the pressure of the water against the valve, or can be made to favor either column. By the adjustment of the weight, the water column can be kept at any level desired, regardless of the oil and water column inside the vessel.

From the above it will be seen that a treater or separator is provided, by means of which the free water is allowed to settle therefrom, and to be forced therefrom before the oil is subjected to the heating operation, consequently a great deal more oil can be treated by the heating method than is possible where all of this unnecessary water, along with the oil, is initially discharged into the heating chamber around the heating element.

The invention having been set forth what is claimed as new and useful is:

1. An oil treater for separating water from the oil, said treater comprising a vertically elongated chambered casing, a chambered auxiliary casing within said elongated casing, one side of said auxiliary casing being spaced from the adjacent wall of the elongated casing thereby forming

ing a side return passage for oil from the upper end of the chamber of the elongated casing after a treating operation to the bottom of the chamber of the elongated casing below the auxiliary casing, the upper portion of the auxiliary casing being spaced from the adjacent wall of the elongated casing thereby forming an upwardly extending oil passage for the upward flow of oil, a partition in said auxiliary casing chamber dividing it into an upper heating chamber and a lower intake chamber, a heating element in said heating chamber, means for discharging oil to be treated into the lower intake chamber and forcing the oil upwardly towards the upper heating chamber, said upwardly extending oil passage to one side of the upper portion of the auxiliary casing being in communication with the oil supply chamber, an overflow pipe in the upwardly extending oil passage and into which overflow pipe oil passes downwardly and is discharged into the lower end of the heater chamber, the lower end of said overflow pipe extending into the heating chamber, a treated oil discharge pipe connected to the lower end of the elongated casing for discharging oil from the lower end of the chamber of the elongated casing below the auxiliary casing and means for discharging water from the lower end of the chamber of the elongated casing below the treated oil discharge and means for maintaining an oil level in the casings.

2. A device as set forth in claim 1 including a pressure equalizing port in communication between the oil level at the upper end of the auxiliary casing and the oil in the passage to one side of the upper end of the auxiliary casing.

3. A device as set forth in claim 1 wherein the upper end of the auxiliary casing terminates below the upper end of the chamber of the elongated casing thereby forming an overflow edge.

4. A device as set forth in claim 1 including a scrubbing screen in the upper end of the auxiliary casing.

5. A device as set forth in claim 1 including water by-pass pipe connections between the lower end of the intake chamber and the lower end of the heater chamber and means for discharging separated water from the lower end of the heating chamber.

6. A device as set forth in claim 1 including water by-pass pipe connections between the lower end of the intake chamber and the lower end of the heating chamber, a discharge pipe connection between the lower end of the heating chamber and the lower end of the elongated casing chamber and a regulator valve in said discharge pipe connection, said regulator valve being controlled by pressure within the intake chamber.

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