F. G. WHITE & W. J. BARNHART.

OIL TREATING DEVICE.

APPLICATION FILED OCT. 19, 1915.

1,242,292. **Patented Oct. 9, 1917.**

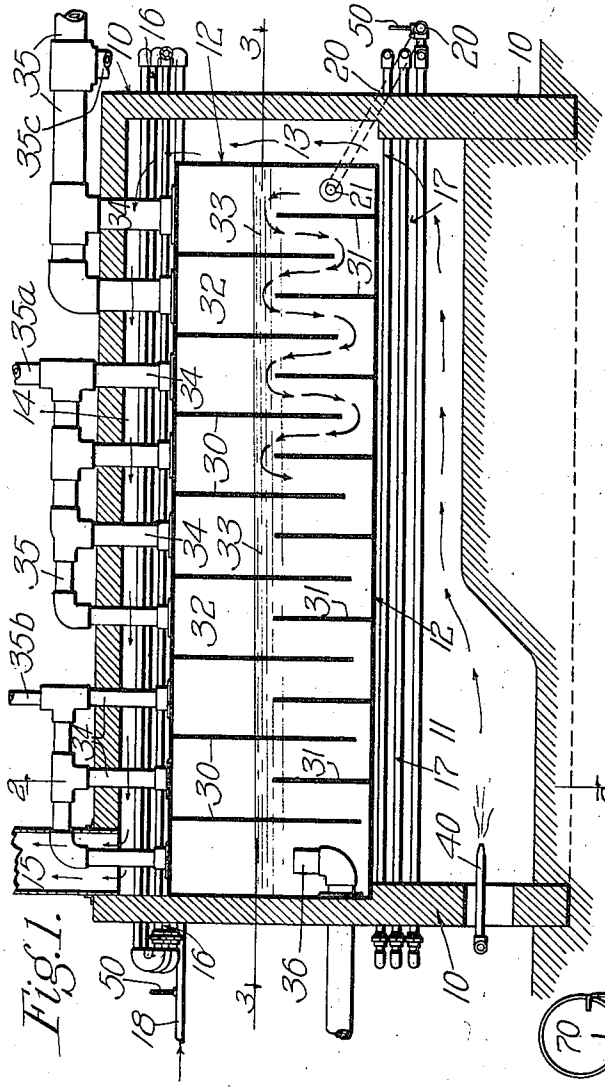


Fig. 1.

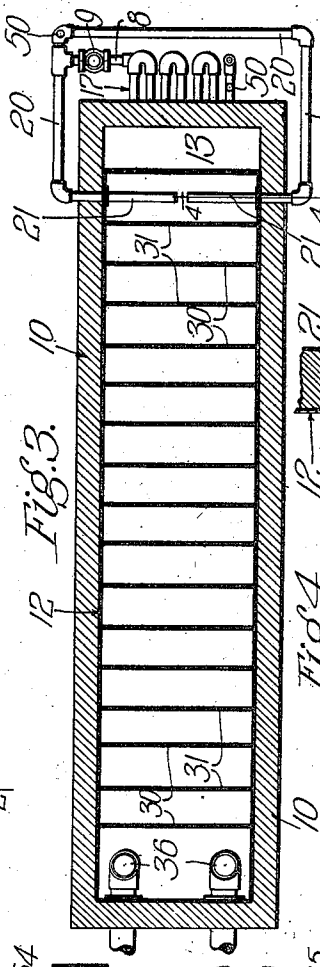


Fig. 3.

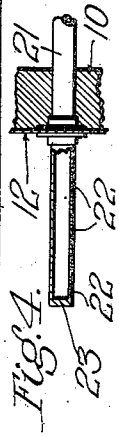


Fig. 4.

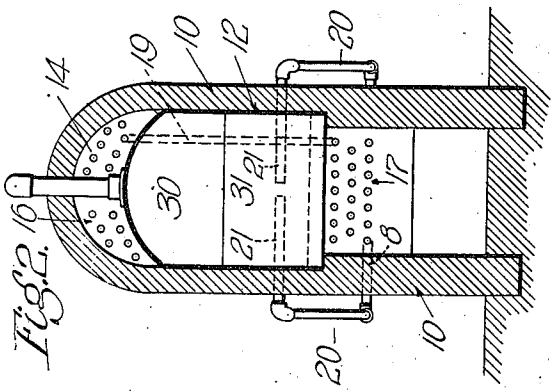


Fig. 2.

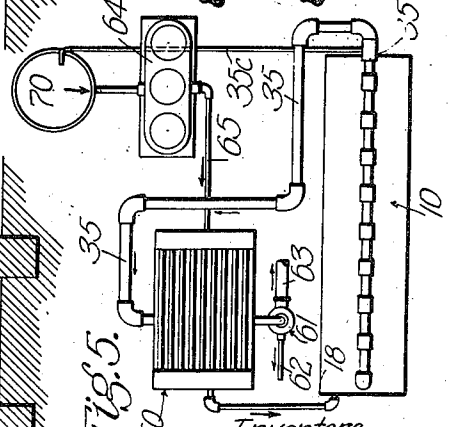


Fig. 5.

Inventors
Floyd G. White and
Walter J. Barnhart,
by James I. Barnes
their Attorney.

UNITED STATES PATENT OFFICE.

FLOYD G. WHITE, OF LOS ANGELES, AND WALTER J. BARNHART, OF MARICOPA, CALIFORNIA.

OIL-TREATING DEVICE.

1,242,292. Specification of Letters Patent. Patented Oct. 9, 1917.

Application filed October 19, 1915. Serial No. 56,772.

To all whom it may concern:

Be it known that we, FLOYD G. WHITE and WALTER J. BARNHART, citizens of the United States, residing at Los Angeles and Maricopa, respectively, in the counties of Los Angeles and Kern, respectively, State of California, have invented new and useful Improvements in Oil-Treating Devices, of which the following is a specification.

This invention relates to devices for treating oil; and particularly to a device for treating oil emulsion for removing water therefrom, although, as will be understood from the following specification, our device is not limited to such use and may be used for oil distillation.

Generally speaking, it is an object of our invention to provide an efficient means for vaporizing constituents of, or liquids carried by, oil and to separate the vapors from the oil. And it is a particular object to vaporize and separate water from oil or oil emulsion. During such separation of water, there is also separated a certain amount of the more volatile constituents of the oil—that is, the oil may be "topped" at the same time when the water is separated off. The details of construction and operation of our invention will be apparent from the following specification, taken in connection with the accompanying drawings, in which, for the purpose of this specification, we have illustrated a preferred form of our invention, and in which drawings Figure 1 is a longitudinal central vertical section of our improved device, Fig. 2 is a cross section taken as indicated by line 2—2 on Fig. 1, Fig. 3 is a horizontal section taken as indicated by line 3—3 on Fig. 1, Fig. 4 is an enlarged detail section taken as indicated by line 4—4 on Fig. 3, and Fig. 5 is a diagrammatic plan of a plant including our device.

In the drawings there is shown a suitable furnace inclosure 10 of convenient dimensions and proportions, built in the configuration illustrated. In the lower part of the furnace inclosure there is a furnace chamber 11 over which is suspended the heating pan 12. A draft space 13 is left open at the rear end of the heating pan and also a space 14 is left open above the heating pan so as to form a draft passage leading from the furnace chamber 11 to the stack 15, at the upper forward part of the inclosure 10. There are two coils of heating pipe 16 and 17 arranged above and below the heating pan in the manner and position shown. The inlet for oil is through the pipe 18 leading to one end of the upper coils 16; and the oil, having first traversed this upper coil, is then led through the connecting pipe 19 to the lower coil 17. Having traversed the lower coil 17 the oil is then led through connection 8 and valve 9 to the pipes 20 which lead to the pipes 21 projecting into the lower part of the rear end of pan 12. These pipes 21 are perforated on their under sides, as shown at 22, and are stopped at their ends, as shown at 23, so that the oil is discharged from the pipes 21 downwardly into the lower part of one end of the pan 12. The valve 9 is a pressure valve; that is, it is a valve of such construction that it will open and allow the passage of oil from the coil 17 into the pan 12 only when a certain predetermined pressure has been raised upon the oil in the coil.

The construction of the pan 12 is shown in Figs. 1, 2 and 3. Longitudinally spaced vertical baffles 30 and 31 extend alternately from the top and bottom of the pan 12, so as to divide the interior of the pan into a series of chambers 32 in which the gases and vapors given off from the oil 33 may rise to find outlet through the individual discharge pipes 34, of which there is one for each of the chambers 32. These pipes 34 may either lead to a common discharge pipe 35 through which the gases and vapors are withdrawn, as indicated in Fig. 5, or there may be several discharge pipes 35^a, 35, 35^b, etc., through which different classes or qualities of vapors may be separately withdrawn. The baffles 30 which extend from the top of the pan extend to points fairly close to the bottom of the pan; and those baffles nearest the front end of the pan extend closer to the bottom of the pan than do those baffles nearest the rear end of the pan. The baffles which extend from the bottom of the pan extend to a point about midway between the top and bottom of the pan; so that, to leave any chamber the liquid must pass through a "trap"; and this makes more certain the leaving of the gases in the chamber 32; that is, the gases which have once been given off are not liable to be carried with the liquid into the next chamber. The heated oil enters at 21 and discharges through the outlets 36 at the front end of

the pan. The upper baffles being closer to the bottom at the discharge end, the passage of the liquid thereunder is more restricted at that end and, as a result the flow of liquid on the bottom of the pan is faster at the hotter forward end than at the cooler rear end. It will also be noted that the volume of the liquid decreases toward the forward end, due to the removal of the vapors, etc.

Any suitable source of heat may be employed in chamber 11; such as an oil burner 40. The oil to be treated is forced under pressure (either by pressure from a tank or pump) through the pipe 18 to the upper coil 16 and is therein partially heated. The heat absorbed by the oil in the upper coil is heat that would be otherwise wasted; and thus we accomplish a saving of heat. Thence the oil passes down to the lower coil 17 where it is further heated to a maximum temperature. From the coil 17 the heated oil passes to the pan 12 and flows forwardly through the pan, absorbing further heat from the combustion in chamber 11; and further vapors of water (and constituents of the oil) are driven off. It will be noted that the passage of the oil through the pan is necessarily circuitous and is necessarily along a vertically undulating route, as indicated by the arrows in Fig. 1. The upward travel of the oil in each of the chambers 32 materially aids in the escape of the vapors and gases, for this upward travel brings every part of the oil to or near the surface so that the vapors and gases may easily escape. Furthermore, the agitation due to the circuitous travel of the oil aids the liberation of the gases and vapors. The oil is heated under pressure in the pipe coils, such pressure depending upon the pressure for which the valve 9 is set. And the pressure for which the valve 9 is set will depend upon the temperature to which it is decided to raise the oil in the coils; the pressure held upon the oil being preferably sufficient to prevent vaporization in the coils at the temperature desired. When the pressure is relieved, by the oil passing into the pan 12, the vapors of water and of other constituents of the oil are immediately generated and passed out through the pipes 34. During forward passage of the oil along the pan 12, the oil is further heated, and the additional vapors are given off through the pipes 34; and in this manner the remaining water is vaporized from the oil, so that the oil passing through the outlets 36 is entirely, or practically entirely, free of the water which it formerly held. Thermometers 50 may be placed at suitable positions on the coils of the pipes, as indicated so that the temperature of the oil may be taken at various points; as it enters into the upper coil 16, and at its point of entry to the lower coil 17, and at delivery from the lower coil 17 into the pan 12. In a typical instance, in a plant capable of handling about one hundred barrels per hour, handling oil emulsion carrying about ten per cent. water, the oil is made to enter the upper coil at a temperature of about one hundred thirty five degress Fahrenheit and is therein raised to a temperature of about one hundred ninety degrees Fahrenheit, at which temperature it enters the lower coil. During its passage through the lower coil it is heated to a temperature of about three hundred eighty five degrees Fahrenheit. The valve 9 is adjusted to hold a sufficient pressure to prevent vaporization under said temperature. Upon passing the valve 9 the pressure immediately falls, and the temperature thereupon falls due to vaporization of the water and certain constituents of the oil. There is no pressure in the pan. The pressure will not rise as the oil moves forwardly through the pan, but further vapors will be formed to be freely discharged through the pipes 34. The maintenance of the pan at a steady temperature, which is accomplished by uniform heating conditions and uniformity of pressure in the pan, does away very effectively with any tendency to foam. If, in the discharge and freeing of the vapors, the liquid "foams" and any liquid is carried off with the vapors, such liquid may be separated out by any suitable means. We have shown a separation pipe 35^e into which such liquids may drop from the pipe 35; and pipe 35^e may lead back to the oil tank 70 as shown in Fig. 5.

The gases and vapors passing off through pipes 35 may be led to a condenser 60, illustrated in Fig. 5, and thence to any suitable form of separator 61 from which the liquids may be led by pipe 62 and the gases by pipe 63. The liquids will comprise certain oil constituents and water, which may be afterward separated in any suitable manner. The cooling agent for the condenser 60 may be the original oil itself. This oil may be supplied to a suitable pump 64 and thence be pumped through pipe 65 to the condenser 60 and thence flow through pipe 18 to the upper coil 16. The oil is thus heated, to approximately the temperature hereinbefore stated, before entering the upper coil 16, and the heat of the vapors passing through the pipe 35 is retained within the system.

As hereinbefore indicated, the gases and vapors may either be taken off all together or the gases and vapors from different chambers 32 may be kept separate. Thus the rearmost chambers may discharge to the pipe 35, and those next forward to a pipe 35^a, and so on; and the vapors first given off can be kept separately from those laterally evolved. By such arrangement the oil may not only be freed of its water but frac-

tional distillation may take place as the oil moves forwardly into chambers where its temperature is increased.

There are several features of our invention that we may emphasize. We may note particularly the construction of the pan which allows and induces the operation herein set forth; and we may especially point to the action induced by the valve 9. This valve keeps a certain predetermined pressure uniformly on the oil in the heating chamber (the coils of pipe) so as to prevent formation of vapor therein; and immediately the heated oil has passed the valve and flowed into the pan the vapors are generated and pass off, with the result that the water in the oil is practically entirely removed. The prevention of formation of gas or vapor in the pipes obviates any accumulation of gas in pockets and thus prevents any hammering due to such accumulation. Further, the excessive pressures heretofore required to force the oil through the pipes are eliminated. And the prevention of gas pockets also prevents burning of the pipes as the pipes are kept uniformly full of liquid.

Having described a preferred form of our invention, we claim:

1. In an oil treating device, a furnace, a coil of pipes arranged therein, means to force oil under pressure through the pipes to be heated therein, a heating pan in said furnace into which the end of the pipe coil discharges at one end, said pan embodying a closed receptacle having vertically longitudinally spaced baffles therein extending alternately from the top and bottom of the pan so that the oil flowing from end to end of the pan must follow a vertically undulating route, a pressure valve at the end of the pipe coil before discharge to the pan to maintain a certain predetermined pressure on the oil in the pipe coil, and means to conduct away the vapors arising from the oil in the pan.

2. In an oil treating device, a heating pan embodying an elongate closed receptacle with inlet and outlet at opposite ends, said receptacle being interiorly subdivided into a plurality of chambers by longitudinally spaced vertical baffles extending alternately from the top and bottom of the receptacle, and vapor outlets one for each of said chambers at the top of the pan.

3. In an oil treating device, a heating pan embodying an elongate closed receptacle with an inlet at the lower part of one end and an outlet at the lower part of the opposite end, said receptacle being interiorly subdivided into a plurality of chambers by longitudinally spaced vertical baffles extending alternately from the top and bottom of the receptacle, the baffles which extend from the top extending closer to the bottom at the outlet end than at the inlet end, and the baffles which extend from the bottom extending about midway to the top, and vapor outlets one for each of said chambers at the top of the pan.

4. In an oil treating device, a furnace, a heating chamber therein, means to force oil under pressure through the chamber to be heated therein, discharge valve means to hold a pressure on the oil in the chamber, a pan in the furnace into one end of which the oil discharges from the discharge valve, said pan embodying a horizontal closed receptacle divided into a plurality of compartments by vertical baffles spaced longitudinally of the receptacle, said baffles extending alternately from the top and bottom of the receptacle; and means to conduct vapors away from each of the compartments of the pan.

5. In an oil treating device, the combination of means to heat the oil under pressure, a heating pan into which the heated oil is discharged and in which the pressure on the heated oil is relieved, said pan embodying a horizontal receptacle with inlet and outlet at opposite ends, said receptacle being interiorly divided into a plurality of spaced baffles extending alternately from the top and bottom of the receptacle, and vapor outlets one for each of said compartments at the top of the pan.

In witness that we claim the foregoing we have hereunto subscribed our names this 7th day of October, 1915.

FLOYD G. WHITE.
WALTER J. BARNHART.

Witness:
ELWOOD H. BARKELEW.