

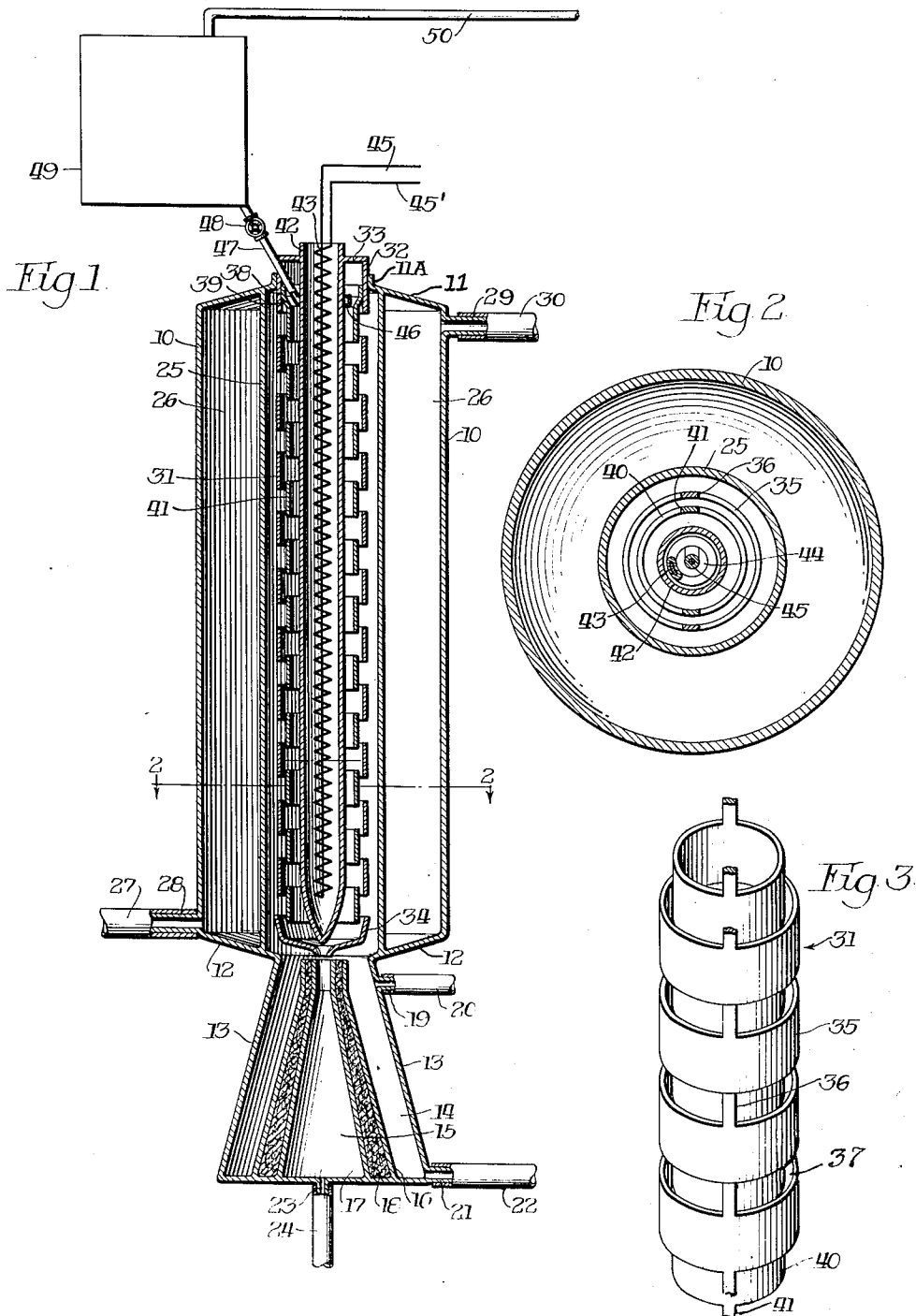
April 25, 1933.

R. E. WILSON

1,905,201

VACUUM DISTILLATION

Filed Jan. 2, 1930



Inventor
Robert E. Wilson.

By Bruce K. Brown atty.

UNITED STATES PATENT OFFICE

ROBERT E. WILSON, OF CHICAGO, ILLINOIS, ASSIGNOR TO STANDARD OIL COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF INDIANA

VACUUM DISTILLATION

Application filed January 2, 1930. Serial No. 417,889.

This invention relates to a vacuum distillation process for petroleum oils and relates more particularly to a process for refining heavy lubricating oils under high vacuum.

The object of the invention is to provide a means for preventing excessive heat losses and for further minimizing entrainment in a vacuum still of the type described in a co-pending application by Payne and Miller, Serial No. 417,585, filed December 30, 1929.

Other objects will be apparent as the detailed description of my invention proceeds.

The invention contemplates the use of staggered baffle plates spaced between the heating element and the condensing surface of the still covered by the Payne and Miller application, the baffle plates being so designed that no droplet of heavy oil can be ejected from the evaporating column to the condensing surface. The baffle plates also serve to prevent heat transfer from evaporating surface to condenser surface in that they tend to reflect heat back to the evaporating surface and to radiate heat toward the evaporating surface.

My invention will be clearly understood from the description of the preferred embodiment which is illustrated in the accompanying drawing, wherein

Figure 1 is a vertical section through my improved apparatus, Figure 2 is a section taken along the lines 2—2 of Figure 1, and Figure 3 is a perspective of my improved baffle arrangement.

I have shown my still enclosed in a tank having cylindrical sidewalls 10 and a top wall 11. A circular opening is provided in the top wall 11 which terminates in an annular flange 11A which supports the heating element and baffles as will be hereinafter described.

To the bottom wall 12 I secure a suction flask 13, divided into a condensate receiver 14 and a residue receiver 15 by concentric vertical walls 16 and 17 separated by suitable insulating material 18.

The usual side arm 19 of this flask is connected by a tube 20 to a suitable cooler

and vacuum pump (not shown). The condensate is removed from the bottom of chamber 14 through outlet 21 and pipe 22 which leads to a barometric seal or a wet vacuum pump (not shown). The residue from the inner chamber 15 is removed through outlet 23 which is also connected by pipe 24 to a suitable barometric seal or wet vacuum pump.

A cylinder 25 is mounted in cylinder tank 10 between top wall 11 and bottom wall 12, cylinder 25 being slightly larger in diameter than the opening in top 11. This arrangement provides a cooling tank 26 through which water or other cooling fluid may be circulated. This fluid is preferably introduced through pipe 27 and opening 28 and is removed through opening 29 and pipe 30.

The outer baffle 31 is preferably a metallic cylinder and is supported at its upper end 32 by flange 11A. The top 33 of cylinder 31 supports the heating element, as will be hereinafter described. The bottom of this baffle forms a funnel 34 for catching any entrained liquid which may have been deposited on the upper part of the cylinder.

The baffle cylinder 31 may be described as an elongated cylinder having a series of horizontal slots or it may be described as a plurality of horizontal rings 35 separated and held in position by vertical posts 36.

Inside of this baffle cylinder I provide a similar baffle cylinder 37 which is secured to the first named baffle by having its upper end 38 expanded against it. Baffle 37 is made in exactly the same way as baffle 31; it has horizontal slots or rings 40 spaced by posts 41. It is mounted so that the slots in the respective cylinders are in staggered relation, the slot of one baffle being entirely covered by the ring of the other baffle. By this means any oil particle ejected from the evaporation surface is positively prevented from being projected against the condenser surface.

The evaporating surface is a vertical column 42. This may be an elongated tube provided with an electric heating element, 43, wrapped on insulating tube 44, and connected to suitable terminals 45 and 45'. 100

An oil distributor 46 is mounted on the upper end of evaporator column 42, the oil being supplied to the device through a conduit 47 in amounts regulated by valve 48.

5 The oil supply tank 49 is connected by a conduit 50 to a suitable vacuum pump, (not shown). The operation of my invention may be described as follows:

The system is evacuated through pipes 10 20 and 50 to an absolute pressure below 50 mm. and the temperature of the evaporator column is brought to about 600° F. Water is circulated through the cooling chamber 26 and charging stock is admitted from tank 15 49 by properly adjusting valve 48. This charging stock may be a topped Mid-Continent crude, either before or after dewaxing. The oil moves by gravity down the heating column in a thin film and the lower 20 boiling constituents are driven off as vapors, which are condensed on cylinder 25. The condensate runs down cylinder 25 to chamber 14 and is removed through pipe 22, while the residue drops from the heating 25 column and baffles into funnel or cup 34 which directs it into chamber 15, from which it is removed by pipe 24.

Any particles of oil ejected from the heating column are caught by the baffle rings, 30 and entrainment is therefore substantially eliminated. The most important feature of my invention, however, is the fact that these baffle rings in the position indicated serve to insulate the condenser surface from the 35 heating column by reflecting and radiating the heat back against the film of oil. A polished surface will, of course, reflect more heat than a dull surface, and I therefore contemplate the use of highly polished surfaces on my baffle plate, heating surface, and 40 condenser plate.

While I have described in detail a preferred embodiment of my invention, it is understood that I am not limited thereto 45 except as defined by the following claims.

I claim:

1. In vacuum distillation apparatus, a substantially vertical evaporating surface, means for heating said evaporating surface, 50 means for flowing oil in a thin film over said surface, a condenser surface mounted close to said evaporating surface and substantially parallel thereto, and means interposed between said evaporating surface and said 55 condenser surface for preventing excessive heat losses to the condenser.

2. In vacuum distillation apparatus, wherein a condenser surface is mounted adjacent and substantially parallel to a substantially vertical evaporator surface, means 60 for distributing oil in a film over said evaporator surface, and means including a plurality of staggered baffle plates for preventing entrainment and for preventing exces-

sive heat transfer between said evaporator surface and said condenser surface.

3. In vacuum distillation apparatus, wherein a condenser surface is mounted adjacent and substantially parallel to a substantially vertical evaporator surface, means 70 including a plurality of staggered baffle plates for preventing entrainment and for preventing excessive heat transfer between said evaporator surface and said condenser 75 surface, said baffle plates having a polished heat reflecting surface facing said evaporator surface.

4. In vacuum distillation apparatus, a vertical heating column, means for distributing oil on said column, whereby said oil 80 flows downwardly thereon in a thin film, a vertical condenser surrounding said heating column, baffle plates mounted between said heating column and said condenser for preventing entrainment and for minimizing 85 heat transfer between these elements.

5. The method of distilling heavy hydrocarbon oils which comprises flowing it in a thin stream over a heated surface, condensing 90 evaporated components on an adjacent condenser surface, and reflecting and radiating heat toward said heated surface by baffle plates spaced between said heating column and said condenser. 95

6. In a vacuum distillation apparatus, a polished heating surface, a polished condenser surface adjacent thereto, polished staggered baffle plates between said heating surface and said condenser surface for preventing entrainment and excessive heat losses. 100

7. In an apparatus of the class described, a vertical cylindrical heater, a vertical cylindrical condenser surface surrounding said heater, means for cooling said condenser surface, a column of spaced annular rings between said heater and said condenser and a staggered column of similar rings between said first column of rings and said heater, the staggered rings acting as baffles to prevent entrained oil particles from being ejected from the heater to the condenser surface. 105 110

Signed this 6th day of December, 1929, at Chicago, Illinois. 115

ROBERT E. WILSON.