Aug. 15, 1950 G. R. SKOPECEK 2,518,574

REFLUX SPLITTER

Filed May 13, 1946

Fig-1

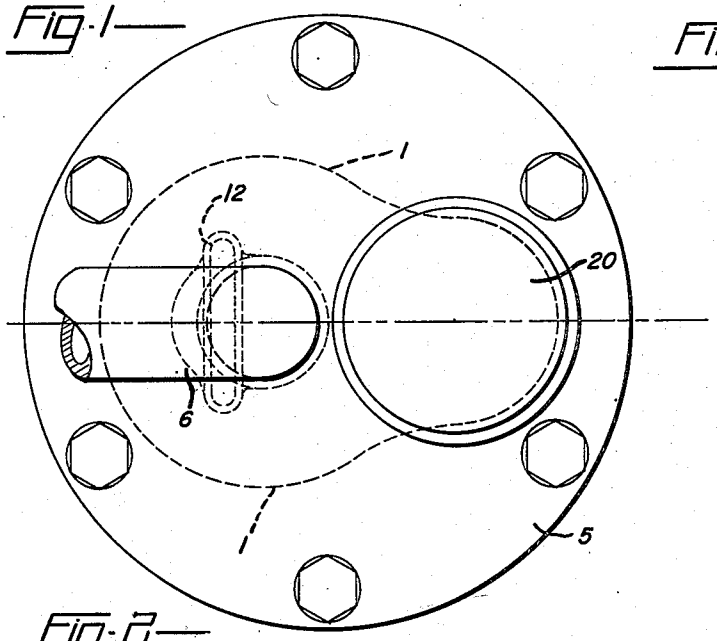


Fig-3

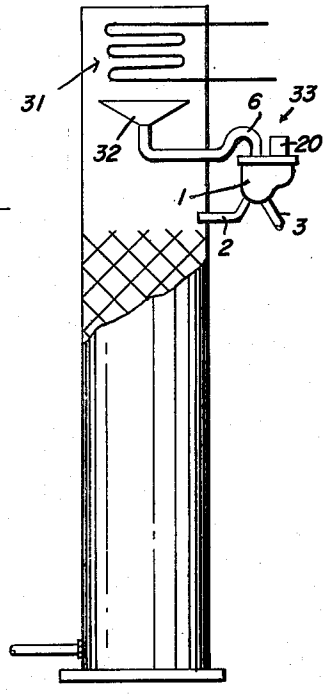
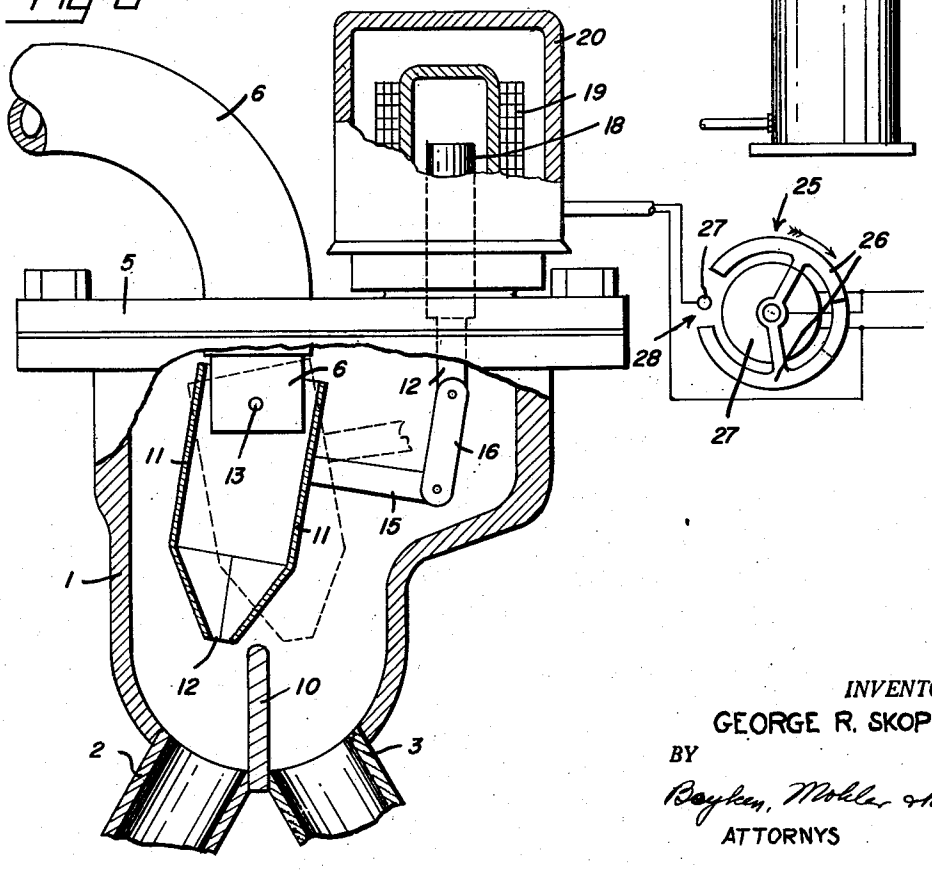


Fig-2



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REFLUX SPLITTER

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1 Claim. (Cl. 261—110)

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This invention relates to a reflux splitter and has for one of its objects the provision of a device that is adapted for splitting reflux coming from a bubble tower in a manner for returning a more accurate portion thereof to the tower than heretofore.

In the commercial process of refining petroleum and other refining processes, where stills, bubbie towers, fractionating towers, or the like, are employed and a certain amount of the reflux is returned to the tower, it is not particularly important that the amount of reflux so returned be as exact as in pilot installations. Hence in commercial installations, conventional valve of the globe, plug or gate type, and others may be employed even though inaccuracy is inescapable by reason of their structure and method of operation.

In a pilot installation the utmost accuracy is essential. If a 1:20 or a 1:1 or any intermediate ratio between the reflux returned and that which is carried away is desired, there can be no inaccuracy. The ratio must be accurate.

By the present invention this accuracy is made possible.

In the drawings, Fig. 1 is a plan view of the reflux splitter.

Fig. 2 is a part elevational, part sectional view of the splitter of Fig. 1.

Fig. 3 is a reduced, semi-diagrammatic view showing a packed bubble tower with the reflux splitter indicated.

In detail, a housing 1 is provided, which housing comprises a hollow body formed with a bottom having a pair of openings into which are secured the open ends of a pair of conduits 2, 3, which conduits are preferably cylindrical pipe extending divergently downwardly. Conduit 2 may then extend horizontally back into the upper end of the bubble tower 4 (Fig. 3) while conduit 3 may extend to any desired point away from said tower.

The housing 1 has a top wall 5 (Figs. 1, 2) that may be removably secured on the body 1 in fluid tight relation to the latter, and a pipe 6 extends downwardly through said top wall into said body and terminates in the latter in a downwardly directed open end spaced above the upwardly directed open ends of conduits 2, 3.

Preferably, the upper ends of conduits 2, 3 are closely adjacent each other and a vertically extending cut-off baffle plate 10 extends upwardly between said conduits to a point intermediate the open ends of said conduits and the lower open end of pipe 6. Said baffle plate is integral with body 1 and is preferably rounded on its upper edge

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so that any liquid striking the same will promptly be drained to one side or the other or both, and the plane bisecting the downwardly directed open end of pipe 6 and also bisecting the space between the upper ends of conduits 2, 3.

The open ends of said conduits 2, 3 provide inlets for liquid and the sides of the housing 1 as well as the sides of baffle plate 10 extending substantially vertically to the edges of said inlets so that liquid deposited at opposite sides of the baffle 10 will flow directly into the inlets with the least resistance.

Pivotally secured to the end of pipe 6 that projects into the housing is a vertically extending, tubular open-ended nozzle 11 having a discharge outlet 12 in its lower end, and which lower end is preferably tapered substantially as shown. The outlet 12 is preferably elliptical in contour in direction longitudinally of the baffle as indicated in Fig. 1.

The diameter of the upper end of the nozzle, is larger than that of the pipe 6, and horizontally axially aligned pivots 13 (only one shown in Fig. 2) connect the upper end of the nozzle with the pipe 6, the lower end of pipe 6 being within the upper end of nozzle 11.

If the nozzle were to hang vertically from the pivots, the discharge end of the nozzle would be directly over the upper edge of baffle plate 10 close to said edge. Upon swinging the nozzle, the lower end will move to one side or the other of the baffle and directly over either inlet 2 or inlet 3 as the case may be.

Extending from one side of nozzle 11 is an arm 15 that is secured to said nozzle at one of its ends while the opposite end of said arm is pivotally secured to one end of a relatively short link 16. The opposite end of link 16 is pivotally secured to the lower end of a vertical extension 17 that extends downwardly from a vertically disposed solenoid core 18, said core being in a solenoid 19. Solenoid 19 is supported and enclosed in a case 20 that may form part of the housing or housing cover 5. The casing is liquid tight and is preferably secured on the top 5 of the housing with the extension 19 of the solenoid core freely reciprocable vertically upon vertical movement of the core 18 up or down according to whether the coil 19 is energized or not.

When the core 18 is at the bottom of its stroke, to which position it moves by gravity when the current to the coil 18 is broken, the nozzle 11 will be swung to a position in which its discharge end is over conduit 2. When the coil 19 is energized, the core 18 will be lifted and held elevated in

coil 19 with the nozzle 11 swung to a position in which its discharge end is over the conduit 3. This swinging movement is rapid and the discharge of reflux from the nozzle is not discontinued at any time nor is there any noticeable change in the quantity steadily delivered, which would not be the case were plug, gate, globe or other conventional valves used.

The coil 19 may be energized in any suitable manner but in any event, the control should be such that any desired ratio of the amount of reflux deposited with conduit 2 to the amount deposited in conduit 3 should be obtainable. One method would be to provide a motor driven switch 25 in an electrical circuit leading to coil 19. The segments 26 of said switch may be driven by a synchronous electric motor 27, and as long as contact between segments 26 and contact 27 is established, the core 18 will be elevated and reflux will be deposited in conduit 3, but as soon as the contact is broken, the nozzle 11 will instantly swing to the opposite side of the baffle plate 16 for discharge into conduit 2. The time during which said nozzle will discharge into conduit 2 is dependent upon the time during which the contact is broken. As segments 26 may be rotated relatively to provide a short or a long gap 28, it will be seen that any desired ratio can be established between the amount of reflux discharged into conduit 2 and that discharged into conduit 3. There are many different types of motor driven switches that may be employed, so no claim is made to this feature in itself.

A typical arrangement of the reflux splitter of this invention relative to a packed tower 30 such as a bubble tower is diagrammatically indicated in Fig. 3 in which vapor is condensed in the upper portion of the tower by a condenser 31, and the condensate or reflux is received in a receptacle 32 from which it goes to the splitter generally designated 33.

Inasmuch as the housing 1 including the cover and all conduit and pipe attachments are fluid tight, and as the case 20 for the solenoid is also in fluid tight relation with the cover, it will be seen that no packing is required, and all moving elements may be freely movable with the minimum friction. These features together with the fact that the cut-off from one conduit to the other is practically instantaneous and without noticeable change in the velocity and volume of liquid being discharged through the nozzle, results in a highly accurate proportioning of the flow of reflux from one conduit to the other. As already stated, this latter result is of vital importance in pilot plant operations.

I claim:

A reflux splitter comprising a hollow body, a supply pipe for reflux extending through one of the walls of said body and into the upper portion of the latter, a pair of conduits opening into said body in the lower portion thereof, an open ended generally vertically extending nozzle positioned within said body with its upper open end positioned for receiving reflux from said supply pipe during swinging of said nozzle about a horizontal axis, pivot means supporting said nozzle within said body for said swinging, the sides of the lower open end of said nozzle being flattened to provide a horizontally elongated discharge opening at said lower end extending parallel with the axis about which said nozzle is adapted to swing on said pivot means, the open ends of said pair of conduits being respectively positioned below said discharge opening at opposite ends of its stroke during swinging of said nozzle, and a vertically extending cut-off baffle positioned between the upper open ends of said pair of conduits, the upper edge of said baffle being horizontally elongated and parallel with said discharge opening and positioned to provide a relatively slight clearance between it and the discharge end of said nozzle during swinging of the latter across said baffle.

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