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W. A. PETERS, JR

RECTIFIER APPARATUS

Filed April 28, 1923

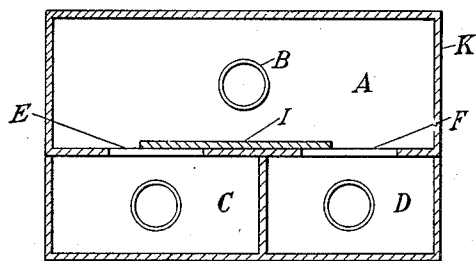


Fig. 1

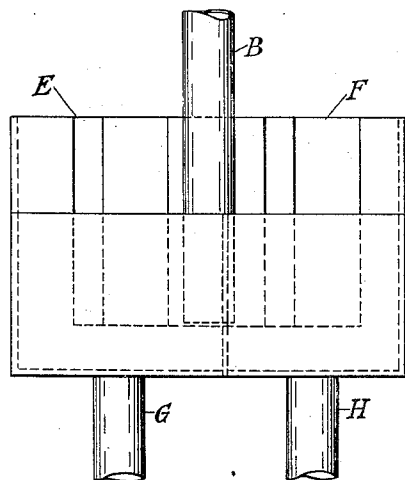


Fig. 2

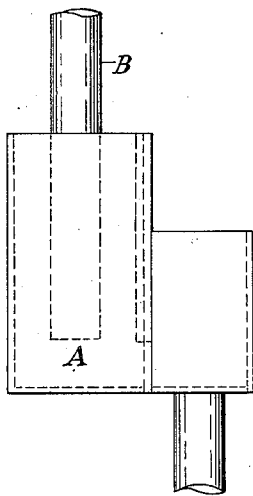


Fig. 3

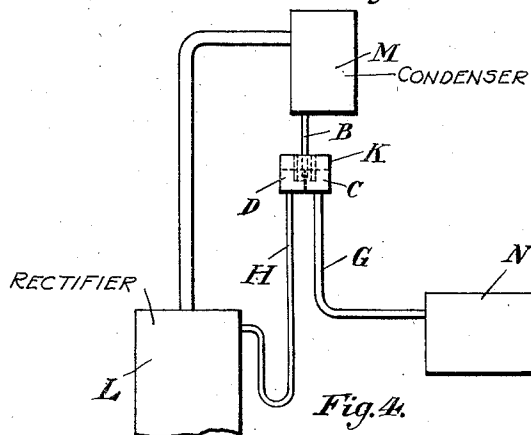


Fig. 4.

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RECTIFIER APPARATUS.

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This invention relates to apparatus for automatically controlling the composition of distillate produced in any rectifier column and especially in a continuous rectifier column.

Heretofore it has been customary to draw off distillate from the condenser of a rectifier through a tester in which the strength or composition of the liquid could be read by means of a hydrometer and the rate of flow could be judged by running the liquid out through a weir. The rate of flow on which the composition of the distillate depends could then be controlled either by hand or by an automatically operating thermostat.

I have found that the composition of the distillate is determined largely by the ratio of the amount of distillate withdrawn to that returned to the column as reflux. This is especially true in the separation by distillation of materials like alcohol and water or acetone and water where the separation is easy for dilute solutions but becomes increasingly difficult with more concentrated solutions.

For example, if it is desired to separate in a continuous rectifier a mixture of alcohol and water containing about 50% alcohol so as to recover 92% alcohol as distillate and water with very little alcohol as residue, this mixture would be fed to a column of any standard type at about the middle section. Steam would be blown in at the bottom of the column, distillate withdrawn from the top and water allowed to run to waste out the bottom.

In a particular case a column filled with small glass rings was used. The height of the packing above the point where the feed was introduced was 8' and below was 6' 6". If, now, the amount of the distillate withdrawn is $\frac{1}{2}$ of the amount returned to the column as reflux, the percentage alcohol in the distillate will remain close to 92 as long as liquid containing from say 25 to 75% alcohol is fed to the column and the temperature of the vapors in the column at the feed plate is kept between 85 and 95° C. Thus the composition of the distillate remains practically constant in spite of large variations in the composition and amount

of the feed and large fluctuations in the temperature of the vapor at the feed plate. This simplifies the operation of the column and makes it possible to control it with a comparatively insensitive thermostat.

The chief object of my invention is to provide an apparatus which will automatically maintain a predetermined ratio between the amount of distillate withdrawn and the amount returned to the column as reflux. In order to obtain a constant ratio of this kind, I may employ a double weir which may or may not be adjustable.

One form which my invention may assume is exemplified in the following description and illustrated in the accompanying drawings, in which Fig. 1 is a plan view of one form of weir regulator; Fig. 2 is a front elevation, Fig. 3 a side elevation of the same, and Figure 4 is a conventional view of a distilling apparatus with the regulator installed therein, the column being broken away and the showing of the regulator simplified.

The illustrated apparatus comprises, in general, see Figure 4, the column L connected with the condenser M, and the regulator vessel K, the regulator being connected with the condenser M by the line B to receive condensate therefrom and being connected with the column L, and the storage receptacle N by the line H and the line G. The regulator comprises, see Figures 1, 2 and 3, the vessel K divided into compartments A, C and D, the compartment A communicating with C and D over the weirs E and F.

Distillate from the condenser enters the compartment A through the line B, from thence it flows into compartments C and D through the weirs E and F. That flowing to compartment C is withdrawn through line G to a cooler or to storage. That flowing to D is returned through line H to the column.

By moving the plate I the relative widths of the weirs E and F may be changed, thereby changing the ratio of distillate withdrawn to distillate refluxed.

Although I have described a particular apparatus embodying my invention, it will be understood that I do not exclude other

embodiments thereof such as orifices in place of simple weir openings, or a plug cock receiving the condenser liquor and dividing it.

5 I claim:

1. In a rectifier apparatus, in combination, a rectifier column, a condenser therefor, a pair of cooperative weir units, means for conducting condensate from the condenser
10 to a position behind said weir units in position to flow thereover, means for adjusting the width of the two weir units, and means for returning the liquid, which passes over one of said units, to the column.

15 2. In a rectifier apparatus, in combination, a rectifier column, a condenser therefor, a pair of cooperative weir units, means for conducting condensate from the condenser to a position behind said weir units in position to flow thereover, means for adjusting
20 the width of one of said units, and means

for returning the liquid, which passes over one of said units, to the column.

3. In a rectifier apparatus, in combination, a rectifier column, a condenser communicating with said column substantially at its upper part so as to receive vapor therefrom, a vessel communicating with the condenser and adapted to receive condensate therefrom, said vessel comprising two weir units
25 arranged to allow the condensate to flow thereover and adapted to divide the condensate into two portions so that the ratio between the amounts of liquid in said portions shall remain constant, means for changing
30 the width of one of said weirs so as to vary said ratio, and means for conveying liquid from one of said weir units to said column.
35

In testimony whereof I affix my signature.

WILLIAM A. PETERS, JR.