

March 30, 1943.

G. EBERHARDT

2,315,190

RECTIFYING COLUMN

Filed Nov. 14, 1940

FIG. 1.

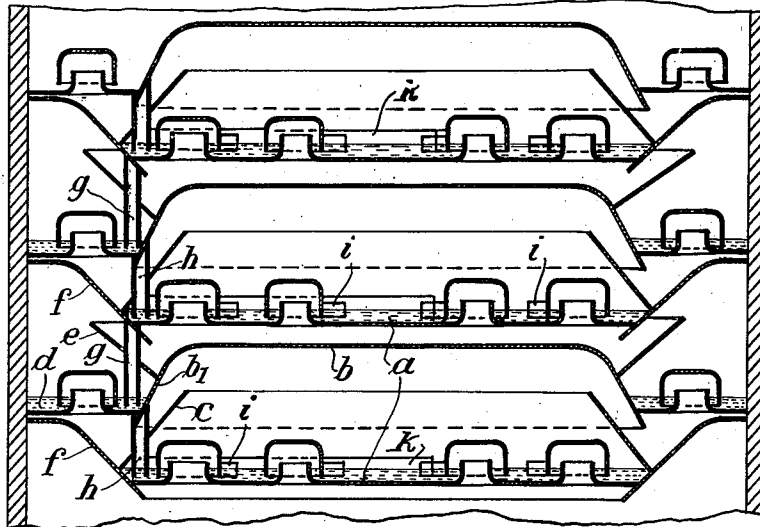
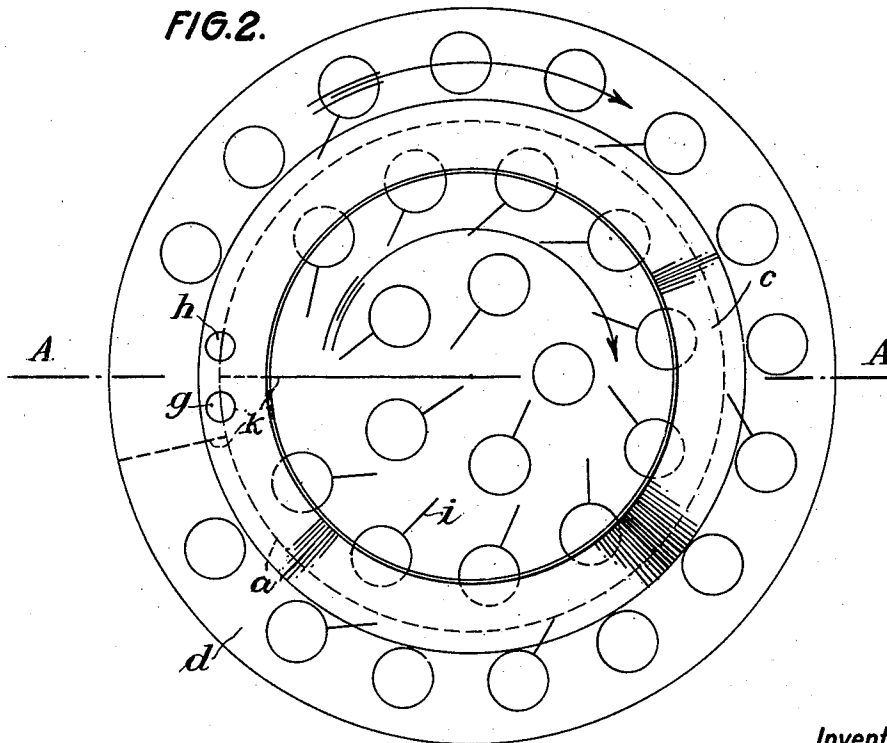


FIG. 2.



Inventor
Georg Eberhardt

By His Attorneys

Hutz and Joslin

UNITED STATES PATENT OFFICE

2,315,190

RECTIFYING COLUMN

Georg Eberhardt, Bitterfeld, Germany; vested in
the Alien Property CustodianApplication November 14, 1940, Serial No. 365,666
In Germany November 2, 1939

2 Claims. (Cl. 261-114)

The invention relates to a rectifying column containing plates being arranged in a distance of less than 150 mms. one from another.

One of the problems arising in the construction of rectifying columns is to obtain an output as high as possible with dimensions as small as possible. Even with a distance of about 150 mm. between the individual plates it has not been possible hitherto at the usual and practically necessary velocity of the vapor of about 0.5 m./sec. to arrive at an entirely satisfactory working of the column.

Better rectifying results were obtained when filling bodies were arranged between the plates and care was taken that between the rectifying plate and the layer of filling bodies such a large interspace was formed that a foaming layer could develop. With such an arrangement the filling bodies have not only the purpose to separate, be it even in an atomized state, particles of liquid from the vapor but they also serve as a large additional rectifying surface for vapor and liquid. It has, however, been found that by exceeding a certain velocity of the vapor which in the main depends upon the structure of the layer of filling bodies, the reflowing of the precipitated particles of liquid to the plate does not take place as completely as desired and the efficacy of the said arrangement is diminished or even nullified at a relatively small critical velocity.

With the known rectifying devices it has always proved to be disadvantageous that the distances between the several plates had necessarily to be about 150 mms. or more. Therefore, the problem arose to reduce the said distances by special arrangements and to increase at the same time the velocity of the vapor in such a manner that the output of the rectifying column was maintained or even improved.

The device according to the present invention fulfills the said requirements. The invention is based on the following known measures:

The liquid flows in the same sense and the plates are arranged in stagger at equal distances, a circular plate with cyclic conduct of the liquid, the subdivision of which is directed by guide means, alternating with a ring-shaped plate.

The invention is illustrated by way of example in the accompanying drawing, wherein:

Fig. 1 is a sectional elevation, and

Fig. 2 is a sectional plan view of a rectifying column equipped with plates in accordance with the present invention.

According to the present invention between the several plates, superimposed in stagger, are ar-

5 ranged plane-like means partly forming channels so that the vapor streaming from one plate to the next following plate must repeatedly change its direction, preferably by more than 90°, the idea playing a decisive part that, owing to their weight, the particles of the liquid carried along cannot by far follow the compulsory change of the direction so rapidly as the particles of vapor and, consequently, must be separated by 10 impinging upon the guide planes. Furthermore, the guide planes which are arranged between the different plates and which serve as arresters for the particles of liquid carried along and as a means for repeatedly influencing the direction of 15 the flow of vapor are arranged so that the particles of liquid not volatilized are returned in their entirety to the plate from which they were drawn upward.

Figs. 1 and 2 show the arrangement according to this invention on staggered plates known per se. Above the circular plate *a* there are mounted a hood *b* with arrester planes *b₁* and a conical sheet *c* also serving as arrester. The lower border of this sheet is only loosely placed or attached 20 only at some spots so that the liquid may pass underneath the border of said sheet. In a similar manner arrester planes *e* and *f* are arranged above the circular plate, *d* and *g* and *h* are the places where the liquid to be returned flows, whereas *k* means a partition wall and *i* is one of the guide planes arranged on the plate *a* and 30 fastened to a bubble cap, *k* and *i* being the parts which serve to regulate the direction of the particles of liquid.

The rectifying column works, for instance at two plates, as follows:

The vapor enters from below into plate *a*, whereas the liquid, entering at *h*, flows, in a cycle and guided in its distribution by planes *i* and the partition wall *k*, over the surface of the plate to the outlet *g*. The vapors being in equilibrium with the liquid leaves the plate radially, without essentially mixing, and by means of parts *b*, *b₁*, *c* and *f* arranged according to this invention they 40 are caused to change their direction several times, advantageously by more than 90°. By this operation the particles of liquid carried along are thrown out of the path of the vapor owing to their weight and impinge upon the surfaces of the inserted parts *b*, *b₁*, *c* and *f*, are totally precipitated there, run back downwards and return to the rectifying plate *a*. This process takes place in a corresponding manner, if the vapor entering the ring-shaped plate from below leaves the latter and is guided through the channel formed by 50

the reflecting planes e and f and furthermore on all plates of the column so that practically the highest efficiency is obtained.

The fact that by the planes arranged according to this invention in a rectifying column practically all particles of liquid carried along by the vapor but being rectified by the latter are precipitated on the arrester planes and simultaneously, also at a very high velocity of the vapor, are entirely reconducted to the plate, involves the special advantage that it is now possible to reduce the spaces between the individual bottoms to 100 mms. or less whereas, hitherto, a working free from objections could only be obtained with distances between the several bottoms of about 150 mms. and more. Moreover, the quantities rectified per unit of time are simultaneously enhanced.

Protection is claimed for all new aforesaid characteristic features taken in combination or separately.

I claim:

1. In a rectifying column for mixtures of liquids, circular and annular plates alternately arranged above one another in stagger, a hood forming a reflecting plane above each of said circular plates, a conical reflecting plane between

each hood and circular plate, said hood and said reflecting plane forming an outlet under the annular plate immediately above, annular reflecting planes arranged one above the other between said annular plates and forming a channel under the circular plate between said annular plates, guiding means upon said circular plates to regulate the flow of the liquid and means to lead the liquid separated on the reflecting planes to the plate thereunder.

2. In a rectifying column, circular and annular perforated plates alternately arranged above one another in stagger, a hood forming a reflecting plane above each of said circular plates, a conical reflecting plane between said hood and said circular plate, said hood and said reflecting plane forming a channel with an outlet under the annular plate immediately above, annular reflecting planes arranged one above the other between said annular plates and forming a channel with an outlet under the next higher situated circular plate and means to lead the liquid separated on the reflecting planes to the annular plate thereunder.

GEORG EBERHARDT.