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SIEVE-BOTTOMS FOR DISTILLING, RECTIFYING AND WASHING COLUMNS

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3 Sheets-Sheet 1

Fig. 1

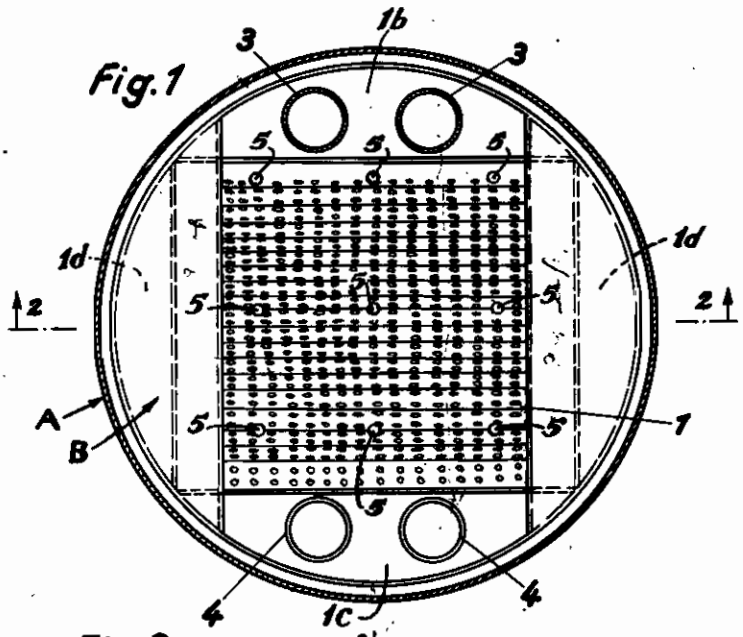

Fig. 2

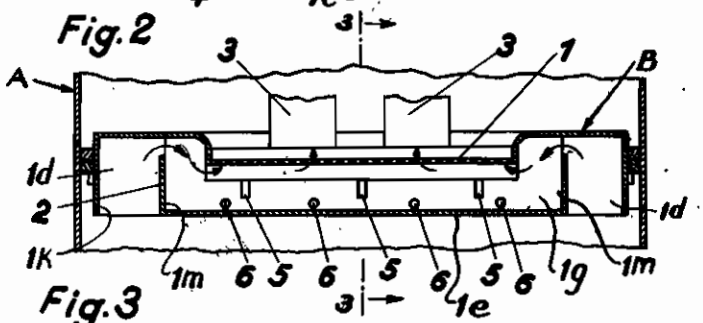

Fig. 3

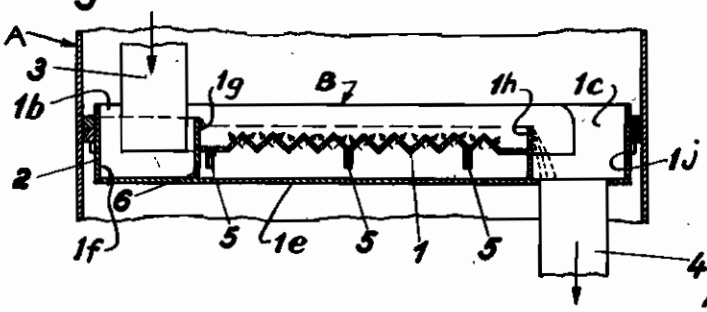

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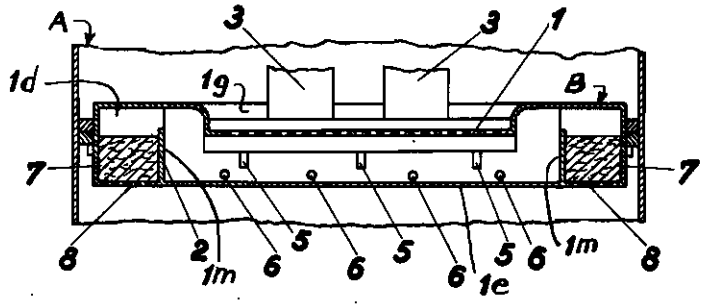
Fig.4



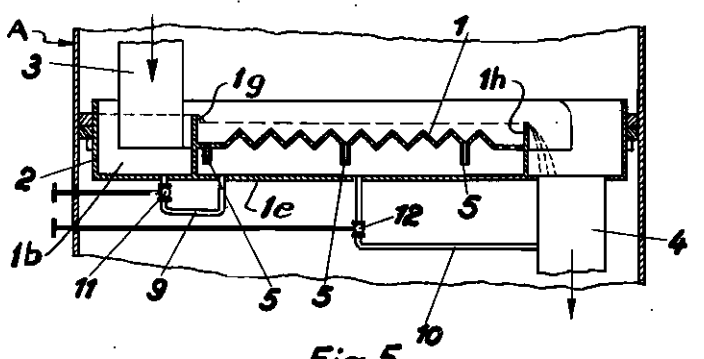


Fig.5

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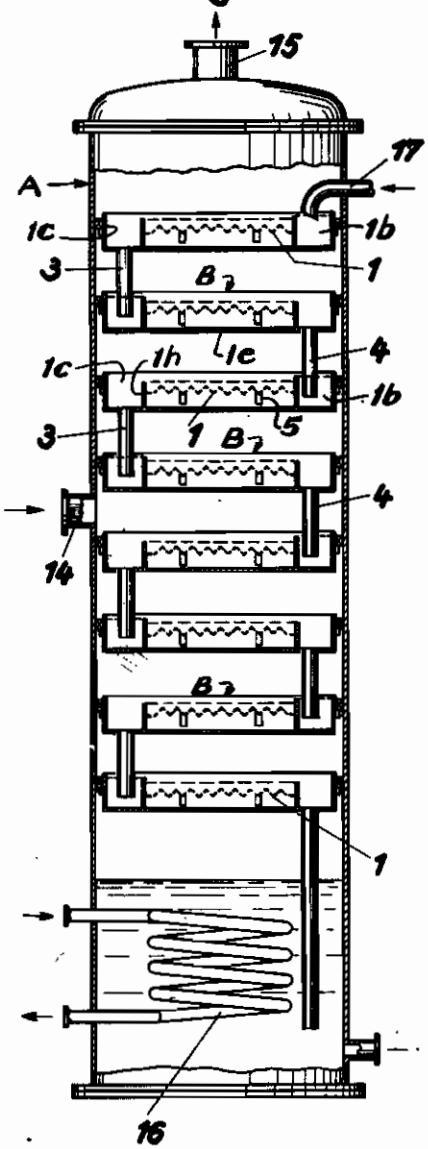
Fig. 6



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ALIEN PROPERTY CUSTODIAN

SIEVE-BOTTOMS FOR DISTILLING, RECTIFYING AND WASHING COLUMNS

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Application filed December 10, 1940

It is well known to use bottoms for fractional columns and the like which constitute a plain sieve or screen. Such bottoms have a good efficiency, but they have the disadvantage that the fluid is only retained on the bottom at a certain minimum load, and there is a tendency for uneven functioning of the holes at low load or inclined position of the bottom. The same disadvantage, particularly at low load, is also found in bell- or tunnel-bottoms.

This invention, in eliminating the disadvantages of the known arrangement, gives a sieve-bottom especially suitable for a wide working range. For this purpose the invention consists in its general form in that, the sieve-bottom is formed undulatory. Through this formation of the bottom it is avoided, that by inclination of same vertical to the direction of flow a section of the sieve-bottom becomes inoperative. In this way a good contact between the fluid and the vapours is assured at all points of the bottom.

The effective section of the bottom according to invention is preferably formed rectangular, in order that the free segments remaining on either side of this surface can be utilized for the gas-inlet. According to invention the sieve-bottom itself is fitted in a collecting box which serves to receive the return- or washing-fluid respectively, and into which the gasses or vapours enter laterally in order that they first of all reach the underside of the sieve-bottom. Hereby is attained, that the laterally entering gases or vapours sink the existing fluid level in the collecting box below the sieve-bottom, so far that, conforming with the existing load a corresponding sieve-bottom surface becomes free. At smallest loads only the crest holes of the undulation are freed. By increased load the gases or vapours displace the fluid in the collecting box beneath the sieve-bottom which rises through the tubes provided in the sieve-bottom.

Thus a mutual reaction exists between the quantity of gas or vapour respectively, and the lower fluid level. Under constant load the level remains constant. Herewith the disadvantage could arise that by duration the fluid in the collecting box be affected by the temperature prevailing within this box, it thereby sustaining chemical changes. But in order to avoid this, and in accordance with a further characteristic of the invention, orifices are provided below the sieve-bottom in the box which receives the return- or washing-fluid respectively, and through which a part of the fluid flows ensuring a constant renewal. Instead of these orifices a connecting pipe with cock can be provided between fluid inlet and the underside of the sieve.

The bottom according to invention offers another advantage over bell-bottoms, in that the areas required for the gas-inlet, and for the fluid in- or outlet respectively, are so arranged that a maximum effective exchange-area remains free. To this comes that the exchange-area has a rectangular form thereby constituting ideal flow conditions.

A further advantage over bell- or tunnel-bottoms is to be seen in that with a low or medium load the fluid in the collecting box is mixed with gas bubbles form its very base, thus the fluid in the collecting box participates over its whole depth in the exchange with vapours.

For some fractional processes it is desirable to keep the loss of pressure of the bottom as small as possible. In this case, when the load is so great, that the whole sieve-bottom area is free it is possible to drain the fluid in the collecting-box into the bottom below by a drain-cock operated externally, thus normal operating conditions as with a plane sieve-bottom are attained.

This invention offers a further possibility; in that baffles or contacting means, such as a packing material, can be fitted in the gas-inlet cross-sections. Herewith a considerably increased free-space velocity and therewith a decreased column cross-section or a smaller distance between the several bottoms is attained. Packing or contacting materials which extensively avoid the detrimental carrying away of fluid drops by the gases can be utilized most effectively.

In the accompanying drawings several constructional examples of sieve-bottoms as per the invention are shown.

Fig. 1 shows a plan view, whilst Fig. 2 shows a section A—B of Fig. 1, and Fig. 3 a section C—D of Fig. 2.

Figs. 4 and 5 show further constructional forms of the bottom as per invention, whereas Fig. 6 shows a sectional view of a distillation column into which the sieve-bottoms as per invention are fitted.

The undulatory formation of the sieve-bottom 1 is best seen in Fig. 3. The bottom is arranged in the collecting box 2, in which as may also be seen from the drawing, the fluid flows in over the edge of this box through socket 3. The fluid leaving the box on the opposite side, flows through socket 4. Rising-pipes 5 are arranged in the sieve-bottom in order that with heavy loading the fluid may pass through the bottom onto the upper-side of same. In the side-walls

of box 2, orifices 6 are formed through which a part of the fluid may enter the collecting box below the sieve-bottom, ensuring a continuous renewal of the fluid here also.

In the constructional form shown in Fig. 4 contacting materials 7 are arranged in the gas-inlet cross-sections. These which may for example consist of Raschig-rings whose diameter is equal to the height, are held in position by sieves 8.

In the constructional example shown in Fig. 5 a connecting pipe 9 is arranged between the inflowing section of collecting box 2 and the underside of sieve 1, and fitted with a valve 11 instead of the orifices 6 shown in Fig. 3. Furthermore this diagram shows a pipe-line 10 with stop-cock 12 which by a correspondingly heavy load permits the fluid under the undulatory bottom 1 to be let into draining-socket 4.

In order to show the arrangement of the sieve-bottoms as per invention in a column, a whole distillation column is shown in Fig. 6. This column which is constructed in the usual form consists of a shell 13 with openings 14 and 15 for charging the liquid to be distilled and leading off the vapours being fractionated. Within the column eight sieve-bottoms are provided, which are given the reference 1 in accordance with Figs. 1–5. In the lower part of the column a heating coil 16 is provided in the usual manner in order to vaporize a part of the liquid. The vapours thus produced pass through the several bottoms, and after being fractionated leave the column by the opening 15. The sieve-bottoms are filled with reflux which is introduced into the column by the pipe 17 and descends from one bottom to the next below by the overflow-pipes 3 or 4 respectively. Fig. 6 does not show how the gases can reach the underside of the sieve-bottoms, but this can be seen from Figs. 2 and 4.

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