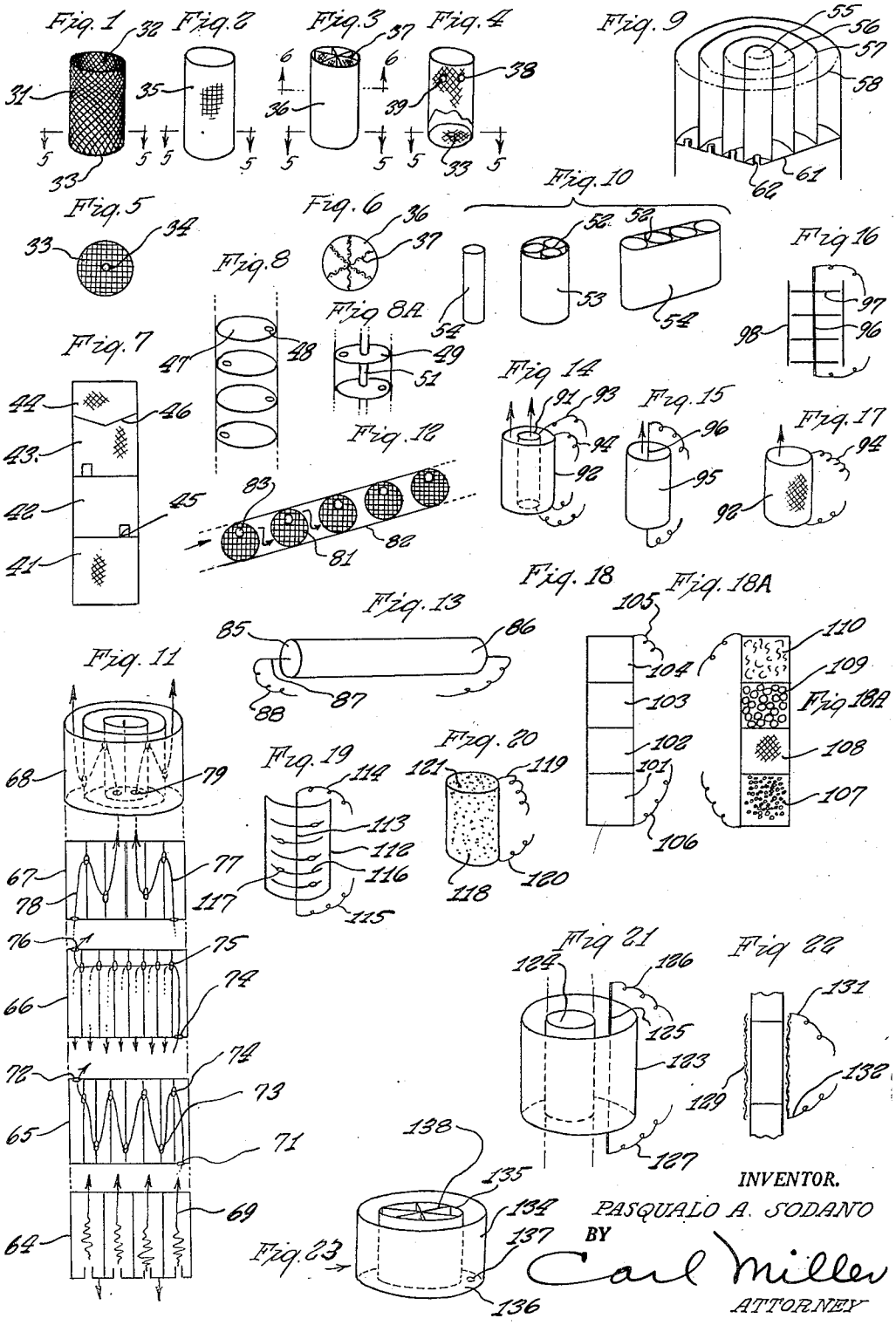
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EVAPORATIVE AND CAPILLARITY TOWER

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EVAPORATIVE AND CAPILLARITY TOWER

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1 Claim. (Cl. 219—38)

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This invention relates to evaporating towers.

It is an object of the present invention to provide different arrangements of screening or capillary material for contacting liquid-liquid, liquid-vapor, vapor systems, solid-liquid, solid-gas systems or combinations of these systems by passing of the said system on, over or through the provided arranged material surfaces which can be provided in sections and or stacked one upon the other.

It is another object of the present invention to provide different arrangements of heated screens or surface materials for removing or receiving vapors, or liquids from liquids, or liquid-solids or solids, and for improving the contacting of liquid-liquid, liquid-vapor, vapor systems, solid-liquid, solid-gas systems or combinations of these systems by passing of the said system on, over or through the provided arranged material surfaces which can be provided in sections, and, or stacked one upon the other.

Other objects of the present invention are to provide evaporation, distillation, extraction and absorption towers for general diffusional processes which are of simple construction, inexpensive to manufacture, easy to assemble and efficient in operation.

For other objects and for a better understanding of the invention, reference may be had to the following detailed description taken in connection with the accompanying drawing, in which:

Figs. 1, 2, 3 and 4 are respectively perspective views of different forms of evaporating towers embodying the features of the present invention.

Fig. 5 is a transverse sectional view looking down upon the bottoms of the towers shown in the above figures and as viewed on lines 5—5 of the respective figures.

Fig. 6 is a transverse sectional view taken on line 6—6 of Fig. 3.

Fig. 7 is an elevational view of a still further form of the invention showing a plurality of sections arranged in stacked relationship.

Fig. 8 is a fragmentary perspective view showing the arrangement of the bottoms of a multiple section tower wherein the holes are one hundred and eighty degrees apart.

Fig. 8A is a view similar to Fig. 8 but with a central heating shaft extending through the tower bottoms.

Fig. 9 is an illustrative view of a tower comprising a plurality of concentric sections.

Fig. 10 is a collective view of a tower formed of a plurality of hollow cylinder sections connected together by an external wall.

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Fig. 11 shows a still further form of the invention including a miscellaneous collection of arrangements stacked one above the other.

Fig. 12 is a perspective view of a collection of spaced screens arranged on an incline to permit the liquid to drain upon leaving the respective screens.

Fig. 13 is a perspective view of a horizontal tower element having a heating element or rod extending through it.

Fig. 14 is a perspective view of two concentric elements with electric terminals connected to the same to heat them.

Fig. 15 is a perspective view of a vertical column with a heated connector rod extending through it.

Fig. 16 is a sectional view, in elevation, showing a heating rod extending vertically upwardly through the same and with conducting plates vertically spaced on the heating rod.

Fig. 17 is a perspective view of a single column with terminals extending from the opposite ends of the same.

Fig. 18 is a side elevational view of a collection of sleeves having terminals extending respectively from the upper and lower ends of the same, the sleeves being stacked one upon the other.

Fig. 18A is a tower similar to that shown in Fig. 18 but employing different materials over which the fluids may pass upon extending from one end to the other.

Fig. 19 is an illustrative view of a heating control arrangement embodying the curved conducting surfaces.

Fig. 20 is a perspective view of a sleeve having a heat control and a heat conducting packing.

Fig. 21 is a perspective view of an arrangement with an internal sleeve eccentrically arranged within an outer sleeve and with a heat control rod extended through the outer sleeve.

Fig. 22 is a diagrammatic view of an external heat control sleeve extended outside or around a tower section.

Fig. 23 is a perspective view of a tower section using concentric sleeves with the inner sleeve having radially extending walls.

Referring now to Figure 1, 31 represents a sleeve formed of capillary material with an open top 32 and a closed bottom 33, Fig. 5, having a central hole 34 therein through which vapor may easily pass. The sleeve material is cut so that the strands of the material extend across one another and at forty-five degrees and one hundred and thirty-five degrees. In Fig. 2, the capillary or mesh material sleeve 35 is shown wherein the

mesh strands run at zero and ninety degrees. The sleeve 35 has the bottom 33 shown in Fig. 5. It will accordingly be apparent that the evaporative tower can be arranged with the strands extending at different angles with the horizontal.

In Figure 3, a sleeve 36 of mesh or capillary material has radially extending partitions 37 crossing one another at the center of the sleeve 36 as shown clearly in Fig. 6, thereby providing for additional screen surface for various diffusional process systems. The larger the screen surface the more effective the evaporating operation.

In Figure 4, there is shown a tower formed of mesh having the bottom 33 with a hole 34 therein and with holes for the outward flow of gas at 38 and 39. In Figure 7, there is shown a tower arrangement comprising vertical sections 41, 42, 43 and 44 stacked one about the other. The number of sections in any tower is not to be limited but depends upon the use to which the tower is to be put. These sections may also be of a series and can be of any single piece or of multiple pieces and assembled together in sections. Opening 45 controls the liquid level of the screen sections. Between the two upper sections is a liquid drain 46. The liquid drain 46 may or may not be of capillary or screen material. It is however preferably made of screened material.

In Figure 8, there is shown an arrangement of disc type 47 of capillary material having respectively vapor openings 48. The discs are arranged so that the openings 48 are alternately one hundred and eighty degrees apart, whereby to cause a circuitous path of the vapor flow in passing from one space to another space. In Figure 8A, discs 49 similar to the discs 47 are assembled upon a central shaft or rod 51 which may serve to provide the necessary heat to the evaporating tower to render more effective the evaporating action.

In Figure 10, a plurality of screen or mesh sleeves 52 may be assembled within container 53 in cluster relationship or may be assembled in rows within a connection 54. In Figure 9, there is shown a section formed of a plurality of concentric sleeves 55, 56, 57 and 58. These sleeves are arranged on a drain 61 and the drain has a plurality of vapor risers 62 communicating with spaces between the sleeves and another inner sleeve. In Figure 11, there is shown a plurality of sections and arrows indicating the vapor flow to the sections, in which there is illustrated the direction of flow of vapor through the stacked arrangement with the vapor walls in the section arranged in a somewhat different manner. There is provided a plurality of sections 64, 65, 66, 67 and 68. The holes can be so formed in the bottoms and in the sides of the multiple sleeves as to provide parallel flows in parallel spaces or series flow through parallel spaces in serpentine fashion. For instance, in section 64 the flow as indicated by the arrow 69 is parallel through different spaces of the section. In section 65, the vapor enters at 71 and passes upwardly and downwardly through the parallel spaces and finally outwardly through 72. Holes 73 and 74 are provided between adjacent spaces. In section 66 the vapor enters one side as at 74 and then passes upwardly and laterally through top holes 75 in the several partitions. The vapor will flow outwardly through openings 76. In section 67 there is provided for a double or multiple serpentine flow of vapor through the several parallel spaces. Part of the vapor will take a path 77 while the other will assume path 78. A similar parallel flow arrangement is provided through section 68 except that the respective flows enter the inner portions of the bottom of section 68 at 79 and leave the outer spaces.

In Figure 12, there is shown a collection of screened discs 81 arranged in a drain tube 82 which is slightly inclined. The upper paths of the discs have vapor holes 83 through which vapor passes to one space after the other.

In Figure 13, there is shown a sleeve having open ends 85; 86 is a tower wall through which is extended a heating rod 87 with terminals 88 extending from the opposite ends of the same. The sleeve is of mesh material.

In Figure 14, there is shown concentric internal and external sleeves 91 and 92 respectively having lead wires 93 and 94 extending therefrom. These wires will conduct current to the respective sleeves to heat the same for the purpose of promoting the evaporating action within the sleeves.

In Figure 15, there is shown a sleeve 95 with a central heating rod 96, the construction being similar to that shown in Figure 13 except that the sleeve is extended vertically to permit the upward flow of vapor.

In Figure 16, the heating rod 96 is provided with laterally extending discs 97 connected to the rod in vertically spaced relationship so that heat will be conducted outwardly from the rod. This heating arrangement is within a column wall 98.

In Figure 18, there is shown a plurality of capillary sections 101, 102, 103 and 104. These sections are tied together electrically and have terminals 105 and 106 extending from the same. When current is extended through the section, the same will be heated to give better evaporating action. In Figure 18A, there is shown the same tower as in Figure 18, but with different particles in each of the sections whereby to further improve the evaporating action. In the bottom section, there is a packing of glass beads 107. In the section thereabove is a wire packing 108. In section 103 is a collection of rings 109 and in the top section is a collection of beryl pieces 110.

In Figure 19, there is shown an illustrative sectional view of a sleeve 112 having a central heating element 113 with terminals 114 and 115 extending from the same. Connected to this terminal 113 are a plurality of vertically spaced heat conducting elements or drains which are dished and are indicated at 116. Each of these have openings 117 through which vapor may pass upon moving upwardly through the tower.

In Figure 20, there is shown a sleeve 118 having terminals 119 and 120 extending from the same and packed with a heat-conducting packing 121.

In Figure 21, there is shown an outer sleeve 123 and an inner sleeve 124 eccentrically disposed within the sleeve 123. These sleeves are of mesh or capillary material and the inner sleeve 124 is offset so as to provide space for a heating rod 125 having terminals 126 and 127 extending therefrom.

Figure 22 shows a jacket type of heater as indicated at 129 formed of mesh material and adapted to surround the tower sections. Terminals 131 and 132 extend from the jacket 129.

In Figure 23, there is shown concentric sleeves 134 and 135. The sleeve 135 is within the sleeve 134. The section has a bottom 136 with an

opening 137 therein for receiving the vapors. Within the inner sleeve 135 are a plurality of radially extending partitions 138 to give added area.

It should now be apparent that the various sections forming a part of the tower can be made in many different ways and the apparatus formed by these sections can be effective in any number of processes dealing with vapors or liquids where it is desired to have the liquids deposited on large areas either for the purpose of being evaporated or for the purpose of collecting the same from vapors and condensations.

While various changes may be made in the detail construction, it shall be understood that such changes shall be within the spirit and scope of the present invention as defined by the appended claim.

Having thus set forth and disclosed the nature of my invention, what is claimed is:

A distillation apparatus comprising a plurality of concentrically disposed cylindrical bodies of mesh material, a common drain bottom of mesh material for said bodies and a plurality of vapor risers communicating with the spaces between the cylindrical bodies of mesh material and extending upwardly from the drain bottom, said drain bottom being of conical shape with the low point at the center thereof, said risers being extended respectively at different levels, there being at least one riser in each of the spaces.

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