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J. H. BREGEAT

FILLING ELEMENT FOR GAS AND LIQUID CONTACT APPARATUS

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Fig. 1.

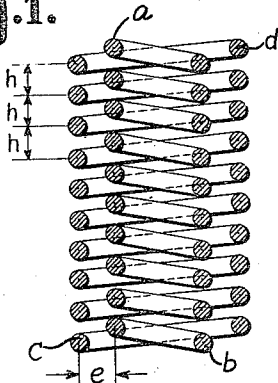


Fig. 2.

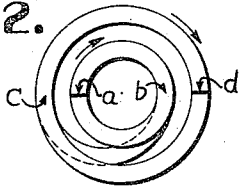


Fig. 3.

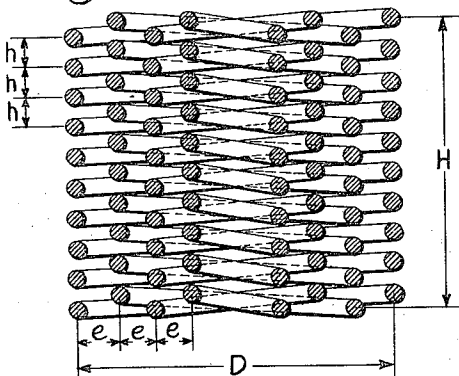


Fig. 4.

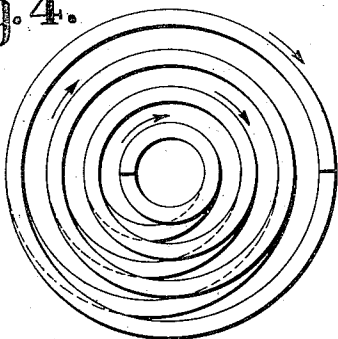
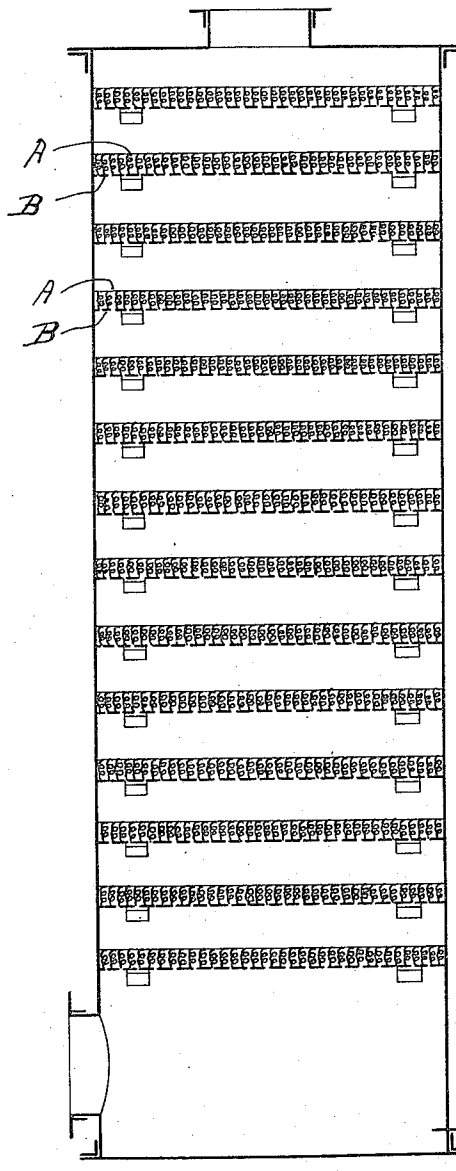


Fig. 5.



INVENTOR.

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FILLING ELEMENT FOR GAS AND LIQUID CONTACT APPARATUS.

Application filed December 17, 1920. Serial No. 431,527.

To all whom it may concern:

Be it known that I, JEAN HENRY BRÉGEAT, a citizen of the French Republic, and a resident of Paris, Department of the Seine, France, have made certain new and useful Improvements in Filling Elements for Gas and Liquid Contact Apparatus, of which the following is a specification.

The present invention concerns filling employed, either in industrial chemistry or in laboratories, permitting intimate contact between fluids passing through columns where certain chemical or physical phenomena are to come to pass. It consists essentially in the realization of a multiple effect filling able to facilitate either intimate contact, or exchange of temperature between two fluid currents, for example—currents of gaseous fluids, currents of liquid fluids or currents of fluids, one gaseous and one liquid, to instigate change in direction, diffusions and shocks in a fluid strata, and to constitute filtering medium.

Many devices have heretofore been proposed for accomplishing some one or more of the above effects, by causing intimate and prolonged contact between, say, liquid and gas, traversing a column.

In the filling which is the object of this invention, recourse is had to an arrangement which acts by compelling and multiplying deviations, shocks, changes in direction splashing, and prolonged contact. My filling material allows, other things being equal, of better results and efficiency than any other arrangement heretofore employed or proposed, having in view the meeting of the above requirements.

The filling device embodying my invention is characterized by an assembly of coils of the same axis, (co-axial) helices made together of the same wire, ribbon or body of elongated form (as a rolled, drawn or extended wire or filament, solid or hollow, and, of any cross section whatsoever), the spacing of said helices being preferably equal and their winding being done preferably in the same direction, but going alternately from top to bottom, then from bottom to top and so on,—that is to say, that

if the winding of an interior coil is to the right (in the direction of the hands of a watch) and proceeds from top to bottom, that of the coil immediately outside it is also to the right and proceeds from bottom to top and so on and so arranged that one turn does not touch any other turn belonging either to the same coil or to another coil of the same element.

The filling device thus formed can include any number of co-axial coils; and the accompanying drawings which form a part of this specification show by way of illustration two forms of filling devices embraced in my invention. Such filling devices can be made by any suitable machine.

In said drawings,

Figure 1 is a vertical section of a filling element made up of two co-axial coils, which are preferably made of one piece of material.

Figure 2 is a plan view of the element shown in Figure 1.

Figure 3 is a vertical section of a filling element made up of four co-axial coils, which are preferably made of one piece of material.

Figure 4 is a plan view of the element shown in Figure 3, and

Figure 5 is a vertical sectional view of a column wherein the filling elements herein described may be employed:

In Figures 2 and 4, the spiral portions show the connections between the several helical coils.

The elongated body in the form of wire or ribbon may be of any material whatsoever,—solid or hollow, the surfaces of which may, if desired, be grooved. The material may be ductile—hot or cold—on the one hand, and, on the other hand, the material should be suited to the properties of the liquids, gases, vapors or smokes to be treated.

The substance conveniently chosen to constitute the material of which the above mentioned elongated body is to be made is shaped as by binding, viz, is wound first from top to bottom, making an interior coil, starting from a point *a* (Figures 1 and 2) and in the direction of the hands of a

watch (Figure 2, plan view) as far as point *b*,—resulting in what may be termed as a right-handed coil, of small diameter—then to point *c*. From there the material is wound in the same direction, but going from bottom to top, making a coil of greater diameter, forming an exterior coil, and so on up to the point *d*,—resulting in what may be termed as a left-handed coil of large diameter. The two windings of the two connected coils of the device of Figures 1 and 2 are of opposite hand. The outer coil is spaced a short distance, *e*, away from the inner coil. Also the several turns of each coil are spaced (as at *h*) from each other.

The ends of the elongated body as well as the points from which each coil is started or ended, such as *a*, *b*, *c*, *d*, can be situated in diametrically different planes.

The utilization of the filling elements above described consists in placing them in any order whatsoever, or at random, either in continuous mass, or in separate groups, in appropriate chambers.

Independently of the material of which the filling elements are made, the space or pitch *h* and the separation or space *e* (Figures 1 and 3) are to be determined in each particular case according to the nature of the fluids to be treated and according to the end in view.

Moreover, the height or overall length *H* of a filling unit ought, in general, to be chosen equal to the outside diameter *D* (Figure 3) of the external coil; but in certain cases, it is advisable to make the diameter *D* and height *H* (Figure 3) of the filling units vary, in a given container, according to the positions which they are made to occupy in the space which they occupy.

Finally, and if the form (circular cylinder) of the filling elements above is such that the form—with a given *D* and *H*—corresponds to a minimum of bulk for a maximum surface of contact, it is to be understood that all other geometric forms (elliptical cylinders, or prisms, or cones, etc.) which could be given to the filling elements made up as above described, are included within the scope of my invention.

As an example, the above filling elements might be used advantageously in the apparatus (columns) used for the distillation and rectification of liquid mixtures. Such apparatus is generally set up and put into operation in such a way that the liquid mixture feeding the column—descending toward the base of said column—goes on exhausting methodically the most volatile of the constituents (by distillation or vaporization) while the vapors emitted by this liquid—going up toward the top of the column, go on enriching themselves methodically in the most volatile constituents (by rectification).

As other examples of the use of these filling elements, I mention "washers or scrubbers", "exchangers", "dust removers", "separators", "purifiers", "condensers" and similar apparatus—all apparatus aiming toward the intensive realization of intimate contact, direction, changes, splashing, and shock. Thus these may be used in the absorption column in my prior Patents 1,315,700 and 1,315,701.

An apparatus broadly illustrative of the above is shown in Figure 5 wherein the shell or casing thereof has a series of grids *B* one above the other each carrying a mass or collection of filling elements or devices such as above described and collectively constituting a layer *A*. These several layers collectively constituting the filling within the casing.

In the appended claims, the term "gas" is used in its broad sense including not only fixed gases but also vapors, and the gas may carry finely divided particles of solids in suspension, as in the case of smoke treatment.

What I claim is—

1. A filling in a fluid contacting apparatus, comprising contact elements made in the form of a plurality of connected helical-coil-shaped elements, the successive convolutions of the helices being spaced apart sufficiently to leave a space therebetween, such space being of sufficient size to contain gases while the convolutions are wetted with a liquid.

2. A filling in a gas and liquid contact apparatus, comprising contact elements each made in the form of a plurality of substantially coaxial coils, such coils being alternately right-handed and left-handed.

3. A filling in a gas and liquid contact apparatus, comprising contact elements each made in the form of a plurality of coaxial coils, such coils being alternately right-handed and left-handed and each element so consisting of a plurality of coils being composed of a single piece of material.

4. A device set forth in claim 2, in which every portion of the multi-coil element is spaced away from the nearest portions of adjacent convolutions of the same coil and adjacent coils, sufficiently to permit free gas spaces to wholly surround such portions when such convolutions are wetted with liquid.

5. A fluid contact apparatus having therein a layer of filling devices, said devices each being composed essentially of a long piece of material in the form of connected coils with one coil located within another coil, the windings of which coils are of opposite hands.

6. A fluid contact apparatus for use as herein described, having a collection of filling elements, each of said elements consisting of a long piece of material in the form

of connected inner and outer members, at least one of which members has the form of a helical coil.

7. A layer of filling devices in a gas and liquid contact apparatus as herein described, such devices each consisting of an elongated piece of material in coil formation, the successive convolutions of such coil being

spaced apart sufficiently to leave spaces therebetween, such spaces being sufficiently large to be filled with gas when the element is wholly wetted with liquid. 10

Specification signed this 23rd day of Nov. A. D. 1920.

JEAN HENRY BREGEAT.