

May 22, 1928.

1,670,593

S. P. MILLER

MIXING MACHINE AND PROCESS

Filed Dec. 3, 1923

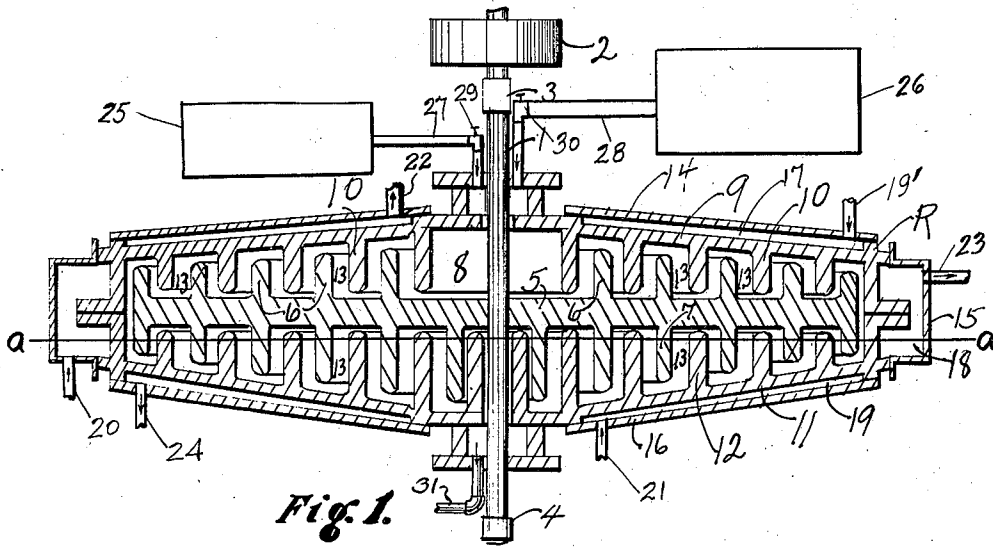


Fig. 1.

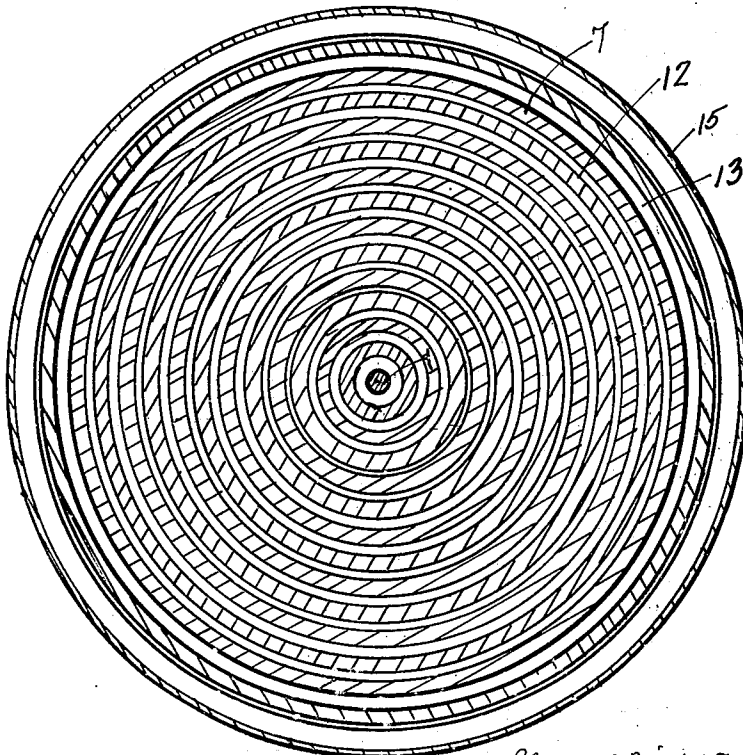


Fig. 2. *Stuart P. Miller, Inventor*
By his Attorney, Chas. W. Mortimer

Patented May 22, 1928.

1,670,593

UNITED STATES PATENT OFFICE.

STUART P. MILLER, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE BARRETT COMPANY, A CORPORATION OF NEW JERSEY.

MIXING MACHINE AND PROCESS.

Application filed December 3, 1923. Serial No. 678,100.

This invention relates to a mixing apparatus and the process. It relates more particularly to the mixing of one substance with another in a continuous manner. It is particularly adapted for the mixing of two or more liquids where it is desired to form an emulsion and is especially adapted for the mixing of materials, one at least of which is liquid, so as to bring about intimate contact when chemical reactions are desired.

The invention will be understood from the description in connection with the drawings in which,

Fig. 1 is a section in elevation of a device for carrying out the invention; and

Fig. 2 is a section along the line *a-a* of Fig. 1.

In the drawings, reference character 1 indicates a shaft that may be either vertical or horizontal or at an intermediate angle. This shaft may be driven by a motor or pulley 2 that receives power from any convenient source. The shaft 1 is mounted in bearings 3 and 4 and carries a disc shaped rotor 5 having concentric rings 6 and 7 on its upper and lower surfaces respectively, the first ring being spaced a short distance from the shaft 1 to form a pocket or opening 8. The disc 5 is surrounded on its upper side by the upper half 9 of a receptacle R to the lower side of which are attached concentric rings 10 projecting into the spaces between the rings 6. In a like manner, the lower half 11 of the receptacle R is provided on its upper side with concentric rings 12 which project into the spaces between the rings 7. The rings 6, 7, 10 and 12 are of such thickness and are so spaced apart that a meandering channel 13 of narrow width is left therebetween. The particular type of rings shown in the drawing are merely illustrative of one embodiment contemplated by my invention. The rings may be of equal width rather than progressively narrower from the inside to the outside ring as shown. Also rings of other cross-sectional shapes may be employed, such for instance as rings having a square or triangular cross-section. These rings need not necessarily be made continuous but may be interrupted at intervals, or series of circumferential rows of closely spaced pins or pegs may be substituted for one or more of these rings in which case the clearance between the pins

in the stator and those in the rotor or between rings and pins should be made very small.

The receptacle R may be surrounded by a jacket or jackets containing cooling fluids. In the drawing are illustrated plates 14, 15 and 16 surrounding the spaces 17, 18 and 19 through which cooling fluids may be circulated by introducing the same into the inlet pipes 19', 20 and 21, and withdrawing the same through the pipes 22, 23 and 24 so as to utilize the counter-current principle of regulating the heat. It is obvious that instead of having the separate jackets as indicated, the receptacle R may be surrounded by a single jacket and channels may be provided therein to enable the cooling fluid to flow in the countercurrent direction. Two feed tanks 25 and 26 are illustrated in the drawings and are provided with outlet pipes 27 and 28 having valves 29 and 30 therein for controlling the feed of the materials to the machine. More than two feed tanks may, of course, be used when it is desired to mix more than two sorts of materials, and the tanks may be located either above or below the receptacle R and the materials fed into the receptacle in any convenient manner.

The operation is as follows: The materials that are to be thoroughly mixed are introduced through the feed pipes 27 and 28 in the desired proportions into the pocket 8 while the shaft 1 is being driven at a high speed and causing the disc 5 and rings thereon to revolve correspondingly. The substances flow outwardly along the meandering path 13 on one side of the disc 5 around the outer edge of the disc and then inwardly along the other side of the disc 5 through the meandering path to the outlet 31. In their passage along the meandering path the materials will also be carried circumferentially and become thoroughly mixed by passing through narrow passages between relatively moving surfaces, their linear speed of travel along the outer or larger rings of the disc 5 being, of course, greater than that along the inner or smaller rings. The mixed materials may, if desired, be fed from the outlet 31 into the mouth of a similar machine placed in any convenient position and driven in like manner. A series of such machines may be installed adjacent each other or one below the other and the discs

5 of each of them may be driven either from a common shaft or from separate shafts and the materials may then be readily fed from one into another one in the series.

The machine has been found to be adapted for the polymerization of the polymerizable constituents such as coumarone, indene, etc., in solvent naphtha by the use of polymerizing agents such as sulfuric acid, etc. In using the machine for this purpose the solvent naphtha and the sulfuric acid of the desired strength are fed into the machine and in their passage therethrough they become thoroughly mixed so that the polymerization takes place in a very rapid and effective manner. The polymerized products are continuously withdrawn and may then be neutralized, washed and distilled in the usual manner. It is to be understood, however, that the machine is not limited to the mixing of any two materials as it may be employed for emulsifying or intimately mixing a large variety of materials.

I claim:

1. The process of mixing substances which comprises introducing the same into a mixer and circulating them therethrough in opposite directions along meandering channels of different widths.
2. The process of mixing substances which comprises introducing the same into a mixer and circulating them therethrough in opposite directions along meandering channels of different widths while one side of said channel is moving relative to the other.
3. The process of mixing substances which comprises introducing the same into a mixer, circulating them therethrough in opposite directions along meandering channels of different widths while one side of said channel is moving relative to the other and different portions are moving at different lineal speeds.
4. The process of mixing substances which comprises introducing the same into a mixer and circulating them therethrough radially and circumferentially both towards and away from the periphery along meandering channels of narrow width.
5. The process of mixing substances which comprises introducing the same into a mixer and circulating them therethrough along a meandering channel of narrow width first away from and then towards the center.
6. In a mixing device, a rotatable disc

having concentric smooth surfaced rings thereon, a stationary casing juxtaposed to said disc carrying smooth surfaced rings projecting into the interstices of said first named rings to form narrow channels between the rotatable and stationary rings.

7. In a mixing device, a rotatable disc having concentric rings on both sides thereof, a casing surrounding said disc and having rings between said first named rings.

8. In a mixing device, a rotatable disc having concentric rings on each face thereof, a casing surrounding said disc and having rings between said first named rings and means for feeding material within the smallest rings on one side thereof.

9. In a mixing device, a rotatable disc having concentric rings thereon, a case surrounding said disc and having rings between said first named rings, and means for feeding material near the center of one side of said disc and withdrawing it from near the center of the other side.

10. In a mixing device a rotatable disc having concentric smooth surfaced rings thereon, a stationary casing surrounding said disc and carrying smooth surfaced rings which project into the interstices of said first named rings to form narrow channels between the rotatable and stationary rings.

11. In a mixing device a rotatable disc having concentric rings on both sides thereof, a stationary casing surrounding said disc, having rings between said first named rings and forming narrow channels therewith.

12. In a mixing device, a rotatable disc having concentric smooth surfaced rings of different widths thereon, a casing surrounding said disc and having smooth surfaced rings thereon of similar width to those upon the first named disc, said second named rings projecting into the interstices of said first named rings.

13. In a mixing device, a rotatable disc having concentric smooth surfaced rings thereon, the width of which decreases from the center to the periphery of the disc, a casing surrounding said disc and having smooth surfaced rings thereon of similar width similarly disposed, said second named rings projecting into the interstices of said first named rings.

In testimony whereof I affix my signature.

STUART P. MILLER.