

May 30, 1933.

F. C. OVERBURY

1,911,644

PROCESS FOR MIXING MATERIALS

Original Filed Dec. 7, 1925

2 Sheets-Sheet 1

Fig. 1

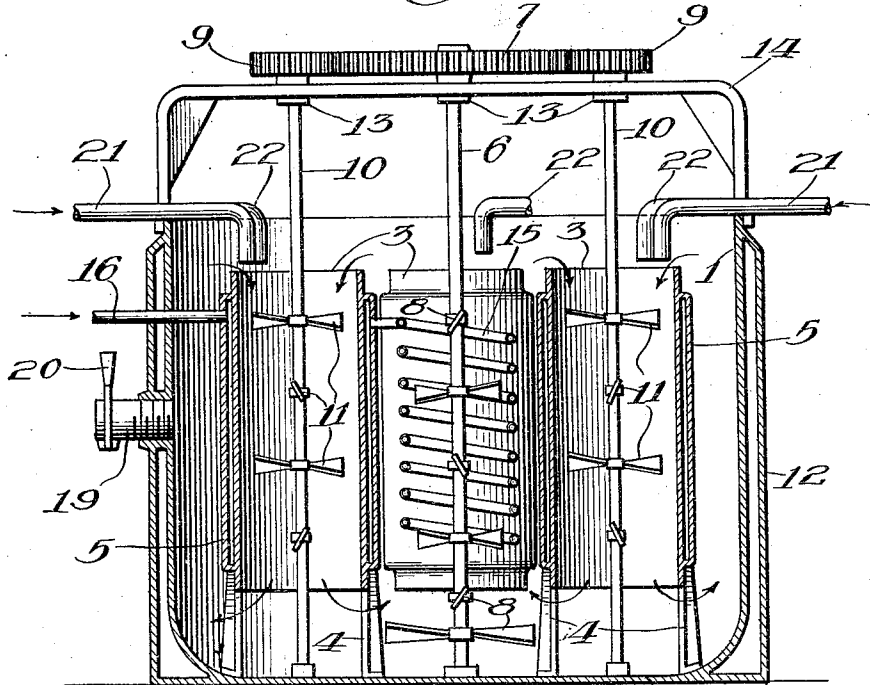
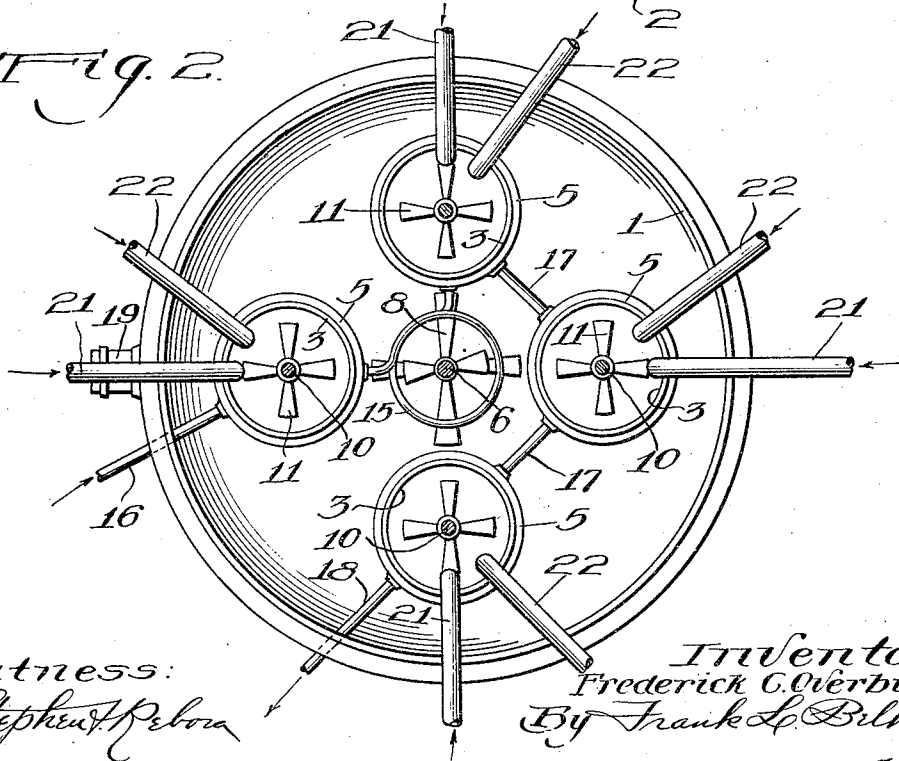


Fig. 2



Witness:
Stephen Nelson

Inventor:
Frederick C. Overbury
By *Frank L. Belknap*
Atty.

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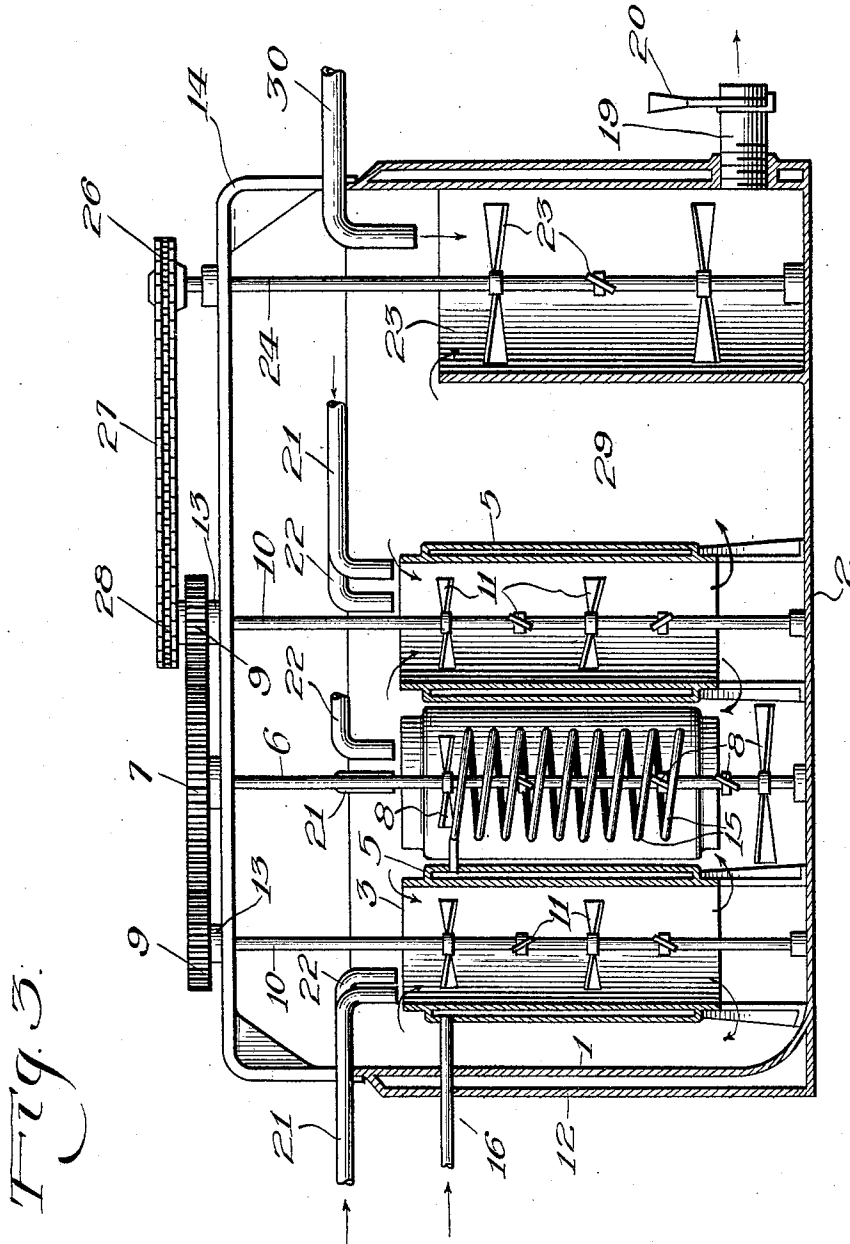


Fig. 5.

Witness:

Stephen A. Pelora

Inventor:
Frederick C. Overbury,
By *Frank L. Belknap*

Atty.

UNITED STATES PATENT OFFICE

FREDERICK C. OVERBURY, OF PASADENA, CALIFORNIA, ASSIGNOR TO THE FLINTKOTE CORPORATION, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS

PROCESS FOR MIXING MATERIALS

Original application filed December 7, 1925, Serial No. 73,609. Divided and this application filed June 14, 1930. Serial No. 461,130.

This application is a division of my co-pending application Serial No. 73,609, filed December 7, 1925, now Patent No. 1,789,320 of Jan. 20, 1931.

5 This invention relates to process for mixing materials, and refers more particularly to a process for producing emulsions and mixtures thereof, and is more specifically directed to a process in which relatively large quantities of emulsion and mixtures thereof can be produced, with a higher rate of production. The invention is also designed to accommodate a plurality of streams of material undergoing simultaneous emulsification. By dividing these streams instead of introducing a combined stream, better emulsification and finer dispersion will result. The process is also designed to provide a better method of controlling the temperatures than may be effected with present types of apparatus.

The present application is in part an improvement on the process described in co-pending application filed jointly in the name of Frederick C. Overbury and Lester Kirschbraun, Serial No. 343,392 on December 9, 1919.

30 Briefly, the improvements in the present invention comprise a plurality of open ended mixing or emulsifying conduits preferably equi-spaced from each other and supported in an enlarged chamber in which a bulk supply of the end product is maintained. Agitating elements are mounted in the individual conduits, each conduit having separate inlets for the materials to be mixed or emulsified therein.

40 In the drawings, Fig. 1 is a diagrammatic cross sectional view of the improved apparatus. Fig. 2 is a top plan view of Fig. 1, eliminating the gears and bearing support therefor, for the sake of clearness. Fig. 3 is a cross sectional side elevational view of a somewhat modified type of apparatus.

45 Referring more in detail to the drawings, 1 designates a main chamber or vessel for containing a bulk supply of the end product having a closed base 2 and open to the atmosphere at its upper end. A plurality of open ended conduits are mounted within the

vessel, their lower open ends being spaced away from the base 2 and supported by means of the supports 4, and their upper ends disposed below the normal level of the bulk supply of end product in the container. There may be any number of these open ended conduits 3 preferably equi-spaced from each other. The conduits are preferably provided with jackets 5 for the purpose of permitting a cooling medium or a heating medium to pass therethrough, thereby controlling the temperature of the ingredients being mixed or agitated within each conduit. A main driving shaft 6 carrying the large gear 7 is mounted within the main chamber substantially centrally thereof, which shaft is preferably provided intermediate its length with propeller or agitator blades 8. It is understood of course, that there may be any number of these propeller or agitator blades and that they may be spaced at varying distances from each other, although it is preferable to provide propeller blades having an upward pitch. The enlarged gear 7 is adapted to mesh with the small pinion gears 9 to drive the propeller shafts 10. One of these propeller shafts 10 is mounted in each of the conduits 3 and is also provided intermediate its length with propeller or agitator blades 11.

80 The container 1 is also provided with a jacket 12 for the introduction of a cooling or heating medium. The bearings 13 for the shafts 6 and 10 may be supported on the bracket support 14 mounted above the container.

The particular form of drive shown, constitutes a mechanical advantage over present types of equipment, in that the main driving shaft 6 need not operate at as high a speed as the auxiliary driving shafts 10, being regulated by the ratio between gears 7 and 9. The propellers 11 on the shafts 10 are so disposed and pitched as to force the material thereto downwardly through the conduits 3 and upwardly in the direction of the arrows into the space between the conduits 3 and the walls of the container 1. The propeller blades 8 on the other hand are pitched so as to cause an upward flow

of the mixture between the conduits 3, particularly in the central section between said conduits. In this central space referred to, and disposed circumferentially about the shaft 6 is placed a coil 15 adapted to have circulated therethrough a heating or cooling medium in order to regulate and maintain a predetermined or efficient operating temperature within the mass. An inlet pipe 16 communicates with one of the jackets 5 for the purpose of introducing the heating or cooling medium, this particular jacket discharging said heating or cooling medium into the cooling coil 15, which cooling coil discharges said heating or cooling medium into another jacket 5, and from this jacket through the connecting pipes 17 into the jacket 5 in the last conduit. The heating or cooling medium may then be withdrawn through the discharge pipe 18. It is understood of course, that the travel and circulation of the heating or cooling medium described, is purely diagrammatic, and that any other means of introducing said cooling or heating medium may be employed.

One of the objections to the present types of mixing and emulsifying equipment of the general character described where a heavy pastry product is manufactured, is the difficulty of maintaining a predetermined range of low temperatures where such low temperatures are required. A considerable amount of heat is generated in the present types of equipment due to friction of the propeller, and it becomes difficult to absorb this heat partially for the reason that the pasty mass in flowing along the walls of the vessel 1, tends to deposit on said walls by the cooling action of the wall and thereby insulating the mass from further cooling action. In order therefore, to assist this cooling action, the coils 15 and the jackets 5 and 12 are provided so that by the propulsive action of propellers 8 the mixed mass is caused to flow constantly between and about the coils 15.

The mixer is provided with the drawoff 19 which may be provided with the knife valve or gate 20, and a plurality of pipes 21 and 22 are provided discharging into each of the conduits 3, preferably two for each conduit.

The operation of the process and apparatus should be apparent from the foregoing description.

Where it is desired to continuously produce an emulsion of say a normally adhesive waterproofing material dispersed in aqueous suspension by means of a colloid, regulated quantities of the waterproofing material may be introduced through the pipe 21 and the aqueous suspension containing the colloid through the pipe 22. It is obvious of course, that any number of these conduits may be used to emulsify such materials, and that another or others may be used merely

as a secondary mixing device by refraining from introducing any new materials to be emulsified.

Also, the present invention contemplates the simultaneous emulsification of two or more different types of waterproofing material, for example, in one or more conduits, one type of waterproofing material such for instance, as asphalt, may be undergoing emulsification while simultaneously in another or others, a different type of waterproofing material such for instance, as a resinous pitch may be undergoing emulsification, so that the finished product will have different constituents as its internal phase. It is also obvious that the different conduits may be supplied with different types of emulsifying agent such as different kinds of clay, bentonite or other colloid. The addition of various fillers, coloring agents and fibres may also be made by employing one or more of the conduits 3 for this purpose while emulsification is taking place in an adjacent conduit or conduits.

Now briefly describing Fig. 3, the apparatus there described, is similar to the apparatus shown and described in Figs. 1 and 2, including as part of the mixing unit an additional mixing chamber 23 in which rotates the driving shaft 24 provided with the propeller or agitator blades 25 and having a sprocket 26 at its upper end, which sprocket is driven by means of the sprocket chain 27 meshing with a similar sprocket 28 mounted on the bearing 4 of shaft 6. The mixed or emulsified mass will flow upwardly into the space 29 and eventually over the wall of the conduit 23. Fillers, pigments, fibres and other materials may be introduced to the conduit 23 through the inlet pipe 30, the intermediate mixture being agitated and thoroughly incorporated together by means of the propeller blades 35 in this auxiliary conduit 23 and withdrawn through the outlet 19 controlled by valve 20.

By the use of the apparatus shown in Fig. 3, it is possible to produce as a continuous operation, an emulsified mixture containing a filler or pigment, or the like. It is understood of course, that I do not wish to limit myself to the manufacture of emulsions, as the process and apparatus may be advantageously employed for producing dispersions and emulsions of various types, and is also adapted for preparing many other products in which it becomes necessary to mix a plurality of ingredients at substantially the same time, or in substantially the same place.

It will be apparent that by providing a plurality of small conduits 3, the invention lends itself not only to a simple emulsification and mixing, but further to additional admixtures with other materials, while undergoing emulsification.

For example, in using the present inven-

tion for producing emulsion paints, one or more of the conduits 3 may be used to produce an emulsion, that is, such conduits may receive regulated quantities of colloid and paint base while the other conduits may receive regulated quantities of pigment in aqueous suspension.

The present invention is particularly directed to either continuous or batch operation.

The present invention utilizes one of the principles of the co-pending application referred to, namely that the mixing of fresh charges of material should take place in the presence of a bulk supply of previously formed end product, in order to produce the most satisfactory results.

I claim as my invention:

1. A process of the character described, comprising circulating a bulk supply of mixed end product, in simultaneously agitating and mixing in a plurality of separated mixing zones portions of the circulating end product with fresh charges to be mixed, in discharging the mixed products from each mixing zone into the bulk supply, in introducing to each mixing zone the materials to be mixed, and in withdrawing from said bulk supply regulated quantities of the mixed end product.

2. A process of the character described, comprising circulating a bulk supply of mixed end product, in simultaneously agitating and mixing in a plurality of separated mixing zones portions of the circulating end product with fresh charges to be mixed, in discharging the mixed products from each mixing zone into the bulk supply, in continuously introducing to each mixing zone the materials to be mixed, and in continuously withdrawing from said bulk supply regulated quantities of the mixed end product.

3. A process of producing dispersions, comprising circulating a bulk supply of mixed end product, in introducing into separated mixing zones communicating with the bulk supply, regulated quantities of materials to be mixed, in thoroughly incorporating in said separate mixing zones said materials and portions of said end product while they are being forced in a downward direction, discharging the mixed mass from each mixing zone into the bulk supply of end product, imparting an upward movement to said bulk supply to maintain the bulk supply in constant circulation, and withdrawing regulated quantities of dispersed end product.

4. A process of the character described, comprising circulating a bulk supply of mixed end product, in agitating and mixing in a mixing zone portions of the circulating end product with fresh charges to be mixed, in simultaneously subjecting portions of the

end product to agitation in a second zone separate and removed from the first zones and withdrawing from said bulk supply regulated quantities of the end product.

5. A process which comprises circulating a bulk supply of end product, simultaneously agitating and mixing in a plurality of separated mixing zones portions of the circulating end product with fresh charges of material to be mixed therewith, said bulk supply of end product being caused to flow upwardly in the space surrounding the separated mixing zones and downwardly while being agitated in said mixing zones, withdrawing from said bulk supply regulated quantities of the end product.

6. A process of producing emulsion paints which comprises introducing separate regulated streams of colorable pitchy base and emulsifying agent into each of a plurality of separate zones in a mixing chamber, agitating and mixing the materials thus introduced into said separate zones to produce colorable emulsion therein, introducing an aqueous suspension of pigment into another zone in said chamber separate from the first named zones, and causing an intermingling and thorough mixing of the colorable emulsion formed in said first named zones with the pigment suspension.

7. A process of producing emulsion paints which comprises introducing separate regulated streams of colorable pitchy base and emulsifying agent into each of a plurality of separated zones in a mixing chamber, agitating and mixing the materials thus introduced into said separated zones to produce colorable emulsion therein, introducing an aqueous suspension of pigment into another zone in said chamber separate from the first named zones, and causing an intermingling and thorough mixing of the colorable emulsion formed in said first named zones with the pigment suspension, and maintaining and circulating in said mixing chamber a bulk supply of the colored emulsion thus formed.

8. A process of producing emulsion paints which comprises introducing separate regulated streams of colorable pitchy base and emulsifying agent into each of a plurality of separated zones in a mixing chamber, agitating and mixing the materials thus introduced into said separated zones to produce colorable emulsion therein, introducing an aqueous suspension of pigment into another zone in said chamber separate from the first named zones, and causing an intermingling and thorough mixing of the colorable emulsion formed in said first named zones with the pigment suspension, maintaining and circulating in said mixing chamber a bulk supply of the colored emulsion thus formed, and withdrawing from

said bulk supply regulated quantities of the colored emulsion paint.

9. A process of producing emulsion paints which comprises introducing separate regulated streams of colorable pitchy base and emulsifying agent into each of a plurality of separated zones in a mixing chamber, agitating and mixing the materials thus introduced into said separate zones to produce colorable emulsion therein, introducing an aqueous suspension of pigment into another zone in said chamber, separate from the first named zones, discharging the materials from all of said zones into a bulk supply maintained in said mixing chamber, effecting circulation of said bulk supply to thoroughly mix said pigment with the colorable emulsion from the first named zones, and withdrawing from said bulk supply regulated quantities of colored emulsion paint.

10. A process for the manufacture of aqueous dispersions of waterproofing materials, which comprises circulating a bulk supply of mixed end product, simultaneously introducing into a plurality of separated mixing zones communicating with the bulk supply and containing an aqueous suspension of emulsifying media, a plurality of separate streams of said waterproofing materials, and agitating the mixture in each zone to effect dispersion of said waterproofing materials.

11. A process for the manufacture of aqueous dispersions of waterproofing materials, which comprises circulating a bulk supply of mixed end product, simultaneously introducing into a plurality of separated mixing zones communicating with the bulk supply and containing an aqueous suspension of emulsifying media, a plurality of separate streams of said waterproofing materials, withdrawing the mixture from said zones and combining the same and subjecting the combined mixture to agitation whereby to effect dispersion of said waterproofing materials.

12. A process for the manufacture of aqueous dispersions of waterproofing materials, which comprises circulating a bulk supply of mixed end product, simultaneously introducing a plurality of separate streams of waterproofing materials of different characteristics to a plurality of separated mixing zones communicating with said bulk supply and containing an aqueous suspension of emulsifying media, combining the thus formed mixtures with the different types of waterproofing materials and agitating the combined mass to effect dispersion of said waterproofing materials.

13. A process for the manufacture of aqueous dispersions of waterproofing materials, which comprises circulating a bulk supply of mixed end product, simultaneously introducing a plurality of separate streams

of waterproofing materials to a plurality of separated mixing zones communicating with said bulk supply and containing an emulsifying agent while separately introducing predetermined quantities of emulsifying agents of different character, and agitating the mixture thus formed to effect dispersion of said waterproofing materials.

14. A process for the manufacture of aqueous dispersions of waterproofing materials, which comprises circulating a bulk supply of mixed end product, simultaneously introducing a plurality of separate streams of waterproofing materials of different characteristics to a plurality of separated mixing zones communicating with said bulk supply and containing an aqueous suspension of emulsifying media, simultaneously introducing further quantities of emulsifying agents of different character and agitating the mixture to effect dispersion of the different types of waterproofing materials.

15. A process for the manufacture of aqueous dispersions of waterproofing materials, which comprises circulating a bulk supply of mixed end product, simultaneously introducing into separated mixing zones communicating with the bulk supply regulated quantities of materials to be mixed, thoroughly incorporating in said separate mixing zones said materials and portions of said circulating end product while they are being forced through said zones, discharging the mixed mass from each mixing zone into the bulk supply of end product and withdrawing regulated quantities of dispersed end product from said circulating bulk supply.

16. A process for the manufacture of aqueous dispersions of waterproofing materials, which comprises circulating a bulk supply of mixed end product, simultaneously introducing into separated mixing zones communicating with the bulk supply regulated quantities of materials to be mixed, thoroughly incorporating in said separate mixing zones said materials and portions of said circulating end product while they are being forced through said zones, discharging the mixed mass from each mixing zone into the bulk supply of end product, separately controlling the temperature in each of said mixing zones, and withdrawing regulated quantities of dispersed end product from said circulating bulk supply.

17. A process for the manufacture of aqueous dispersions of waterproofing materials, which comprises circulating a bulk supply of mixed end product, simultaneously introducing into separated mixing zones communicating with the bulk supply regulated quantities of materials to be mixed, thoroughly incorporating in said separate mixing zones said materials and portions of said circulating end product while they are

being forced through said zones, discharging the mixed mass from each mixing zone into the bulk supply of end product, separately controlling the temperature in each of said mixing zones and separately controlling the temperature intermediate said zones, and withdrawing regulated quantities of dispersed end product from said circulating bulk supply.

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In testimony whereof I affix my signature.
FREDERICK C. OVERBURY.

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