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HOMOGENIZING UNIT

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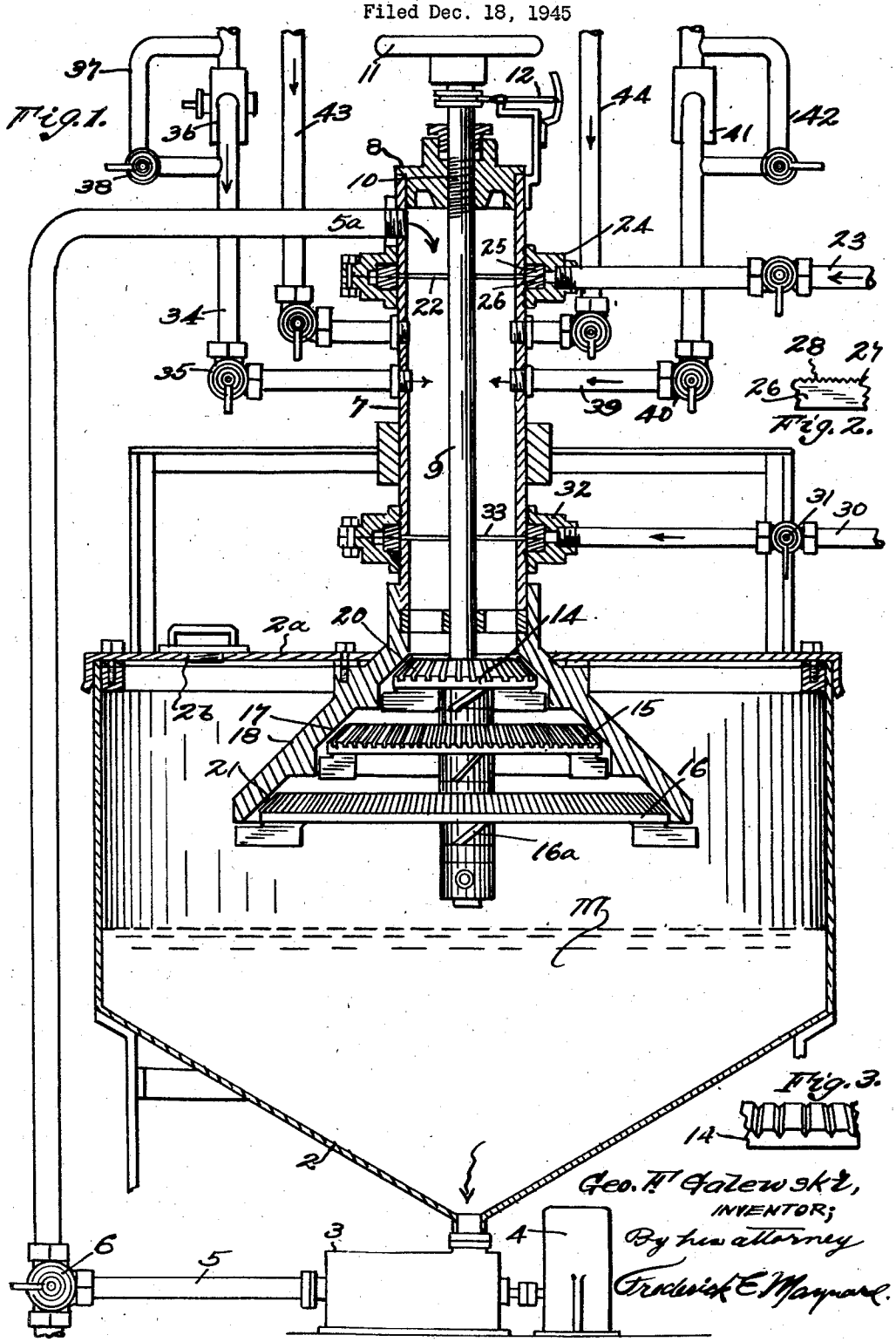


Fig. 1.

Fig. 2.

Fig. 3.

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HOMOGENIZING UNIT

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7 Claims. (Cl. 259—8)

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This discovery is in industry apparatus and methods for the homogenization of liquids and semi-liquids such as gels with or without the presence of additive solids and air or other gases heated or unheated, and is an invention, particularly, of apparatus for carrying on divers methods of homogenizing an extensive variety of substances inclusive of solids, liquids and semi-liquids and gases, all of any desired temperatures; and extends to means for making emulsions when so desired.

It is an object of this invention to provide a simple, practical, substantial, reasonably low cost, reliable, compact, and highly efficient unit for the thorough subdivision of a considerable stream of a selected, bulk mixture of various ingredients; the bulk mix being of a liquid state capable of continuous bulk circulation for a time period necessary for generation of the desired, ultimate product.

An object of the invention is to provide a homogenizing apparatus which incorporates means whereby to perform various processes needed for the homogenization of numerous, greatly different bulk mixtures in a facile and rapid manner; with great economy both as to machine operation, time and labor, and maximum efficiency with use of a minimum of waste and use of the several ingredients set out for the selected operation of producing a desired, homogenized product; whether complete in itself or prepared for further utility.

It is particularly an object of the invention to provide a homogenizing unit which will be at once recognised by experts in numerous arts as especially adaptable for the performance of certain methods which may be either well known or, indeed, may be strict trade or industry secrets. This for the reason that the instant apparatus incorporates numerous features all or any combination of which can be brought into coordinate operation with close adjustments for gas and liquids control, and at prescribed temperatures.

One of the objects of the invention is to provide a homogenizing unit in which a bulk of selected ingredients can be continuously circulated and while circulated kept at a desired bulk pressure, and to provide means for the ready control of the rate of speed in the circuit so that in cases where critical points are reached in the running operation of the material speed can be regulated by adjustment of the circulating agency; a pump, for instance.

Further, an object of the invention is to provide, in a homogenizing unit, a simple and reliable device provided with parts more or less of nozzle form for breaking a flowing stream of the bulk material, hereinafter called the "mix," down into a great number of subdivisions which are ultimately so fine as to produce the desired homogeny. In this connection, it is an object of the invention to provide a subdividing device in which there is a plurality of freely and relatively rotative wheels arranged in spaced relation on a common axial support and which wheels are severally provided with passageways, in considerable number, through which the circulated bulk mix is forcibly driven; as by the above mentioned pump, for instance. Further an object is to gradually reduce the size of the jets of mix discharged by the several wheels. Also, an object is to provide a nozzle device including a system of freely movable wheels having capacity for rotation and being given such motion only by the reaction of the passing stream jets.

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The invention consists in certain advancements in the art of homogenizing fluids, in various selected liquids and gases mixture, as set forth in the ensuing disclosure and having, with the above, additional objects and advantages as hereinafter developed, and whose constructions, combinations and subcombinations, and details of means, and the manner of operation and the several possible adjustments will be made manifest in the following description of the herewith illustrative embodiment; it being understood that modifications, variations and adaptations may be resorted to within the scope, spirit and principles of the invention as it is more directly claimed in conclusion.

Figure 1 is a vertical, axial section of the machine.

Figure 2 is a detail fragment of a steam spray ring.

Figure 3 is a detail fragment of a form of one of the nozzle wheels.

As presently shown a funnel-form tank, of any desired size and material, is connected at its bottom 2 to a pump 3, preferably of the positive screw-action type, and this pump is preferably driven by a variable speed motor 4 so that at critical steps as may obtain in some homogenizing processes of given mixes M, the machine attendant may carefully change the speed of the pump and therefore the rate of flow of the mix as it is driven into a circulating pipe 5, in which is a suitable flow control valve 6.

A standing mixing column 7, of tubular form, is rigidly mounted in association with the tank

and the pipe 5 has a discharge end 5a spilling freely into the column just below a cap 8 closing the top of the column and through which turnably extends the upper end of a stem 9 having a threaded portion 10 engaging bore threads of the cap; the outer end of the stem having a hand wheel 11 whereby the stem is rotated to effect close regulation of the homogenizing device detailed hereinafter; the stem having a gage feature 12 to indicate the state of adjustment of the stem and thereby of the said device.

A feature of this invention is that the column 7 constitutes a back pressure chamber, when the pump has charged the column to its capacity with a mass of the mix that is to be processed, and to effect this back-pressure accumulation the foot of the column is substantially closed by a means which, in the instant invention, consists of the device which has for another use the gradual discharge of the bulk mix from the column in the form of a large number of stream jets or subdivisions of the mass issuing from the column—under pump pressure.

A further feature of the invention is that means are provided whereby selection can be made for the individual or aggregate infeed of various substances, such as pastes, pigments, oils, acids and reagents to the column in carefully controlled amounts, at their own desired temperatures, and moreover means are included for individually supplying a heating medium to the column to heat the bulk mix therein, and means are provided for inlet of air or other gas, at desired temperature, to the column; all or some of the infeeding media being at sufficient pressure, if desired to force the mix past the foot located nozzle device, aside from or until the pump 3 comes into circulating action of the mix.

Referring to the foot nozzle device this consists of a system of vertically spaced disc-like wheels 14, 15 and 16 loosely, coaxially mounted on the lower end of the stem 9 with their rims substantially nesting with the inner conical face 17 of a conical shell 18 rigidly affixed to the lower end of the column 7. As here shown these wheels gradually increase in diameter, downwardly on the stem, and have conical rim faces complementary to the near, conical face 17 of the shell. It may here be stated that the wheels have no attritional or grinding effect and are relatively freely movable.

For the purpose of thoroughly subdividing the mix M into numerous and size-differentiated jets under pressure set up in the column each wheel 14, 15 and 16 is provided with a very considerable number of passageways from top to bottom and are here shown as consisting of open top ducts or channels 20 formed in the conical, rim face of each wheel. The channels 20 of the top or smallest wheel 14 are of larger cross-section than the channels of the other wheels; the channels grading downward in cross-section in the lower wheels in the system. In Fig. 1 the channels of wheel 14 are shown as of rectangular cross-section but various other sections may be employed as desired; Fig. 3 showing channels of V-section in a wheel. Not only is the material finely subdivided whilst flowing from the column through the passageways of the nozzle wheels but additional mixing effect is secured by the adjustment of the set of wheels as to the near face 17 of the shell to form a very constrictive annular vent 21 around the rim of each wheel. This adjustment is made by the hand wheel 11 to raise or lower the set of nozzle wheels; the degree of adjustment being indicated by the gage 12.

At the upper end of the column 7 there is provided an annular orifice 22 to which a heating medium such as steam may be supplied from a pipe 23 tapping a collar 24 around the column and in which is fixed an annular spray device in the form of upper and lower rings 25—26 with closely juxtaposed inner faces 27 which are suitably corrugated, as shown in Fig. 2, at 28 to form passageways directly to the column orifice 22. By this device a discal diaphragm of steam, or, if desired, other medium, is shot transversely into the chamber of the column 7 and the incoming discharge product from the pipe 5 is forced through the steam diaphragm as desired to very quickly bring the mix to a desired temperature.

The means for supplying separately into the column 7 streams of the desired oils, pastes, gels, liquids and gas, under desired and controlled temperature and pressure from storage vessels (not shown) includes apparatus as follows: at any suitable level in the column an air or other gas feeding pipe 30, having a control valve 31, taps into a diaphragm forming collar 32 leading evenly to an annular orifice 33 in the wall of the column. By this collar device 32 a sustained diaphragm of the given gas at desired temperature and pressure intercepts the downwardly pumped bulk mix M in the column in a manner to expeditiously and thoroughly entrain in the mix.

A pipe 34 taps into the column 7 and has a control valve 35 outwardly beyond which is a suitable pressure pump 36 to force an ingredient, say oil, to the column. A by-pass pipe loop 37 connects to the pipe 34 at each side of the pump 36 and has a valve 38 whereby to carefully regulate or calibrate the desired proportion of this supply of ingredient. A pipe 39, equipped with a control valve 40, supplies another ingredient, water for instance, by pressure from a relative pump 41 past a calibrating by-pass 42. Other ingredients are supplied by like-equipped pipes 43 and 44 at desired rate of flow, pressure and temperature. It is understood that all components can be brought to temperatures other than normal (atmospheric), as desired by suitable agencies most conveniently disposed for economic operation of the exercised process.

The tank 2 may be entirely uncovered or if preferred may have an air tight cover 2a fitted to the parts to hold a suitable degree of fluid pressure in the tank during operation, and to control fumes, in some instances. Dry comminuted solids or stiff pastes can be dropped into the top of the tank if it is open, or by way of a pluggable handhole 2b in the cover 2a.

The wheels may have means, as blades 16a to incite rotation during liquid flow.

What is claimed is:

1. Homogenizing apparatus having, in combination, a tank, a standing hollow column having at its foot a stream homogenizing, freely rotative disc valve choking flow at its rim from the bottom edge face of the column to the tank to form a film, a pipe for circulating contents of the tank to the top of the column and having a head discharge outlet thereto and the pipe having a positive-action pump to force the circulated material in homogenizing films past said valve, and means having inlets below the said outlet for supplying ingredients of the material to the column.

2. The apparatus of claim 1; and a ring jet means for discharging gaseous media in trans-

verse diaphragm form across and into the column below the pipe outlet for intermixture with the circulated mixture.

3. The apparatus of claim 1; and means forming vertically spaced jet ring orifices around the column wall for discharging separate discal diaphragms of gaseous media across the column and into the contents of the column.

4. The apparatus of claim 1; and means consisting of jet rings in the wall of the column for discharging transverse diaphragm-form jets of gaseous media into the column.

5. In apparatus of the class described; a standing column, having a conical foot shell means to introduce ingredients to be treated into the column, and mixing means disposed close to the inner face of the shell and substantially closing the foot of the column and including a set of freely rotative, conic rim, film forming coaxially spaced wheels of increasing diameter downward and having differential nozzle rim passageways for subdivisional flow of the film past the wheels in succession; the passageways of successive wheels being smaller downward in the order of the wheels.

6. Apparatus as of claim 5; and means for varying the position of the wheel rims as to the shell wall to change the clearance space; said passageways being open along their length to the said space, and from top to bottom of the wheels.

7. The apparatus of claim 5; the angle pitch face of the said foot shell being common to the angle of the rims of the wheels; whereby the flow of the film from wheel to wheel is effected with a minimum of detrimental turbulence.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
51,518	Martin	Dec. 12, 1865
1,291,877	Herrbold	Jan. 21, 1919
1,524,651	Hapgood	Feb. 3, 1925
1,839,456	Anderson	Jan. 5, 1932
2,074,673	Sackett	Mar. 23, 1937
2,132,854	Knott	Oct. 11, 1938
2,252,076	Jutenbock	Aug. 12, 1941

FOREIGN PATENTS

Number	Country	Date
119,077	Austria	Sept. 25, 1930
554,085	Great Britain	June 18, 1943
554,573	Great Britain	July 9, 1943