

May 4, 1937.

P. L. A. THIBERGE

2,078,983

PROCESS AND APPARATUS FOR MIXING AND EMULSIFYING LIQUIDS

Filed May 22, 1929

Fig. 1

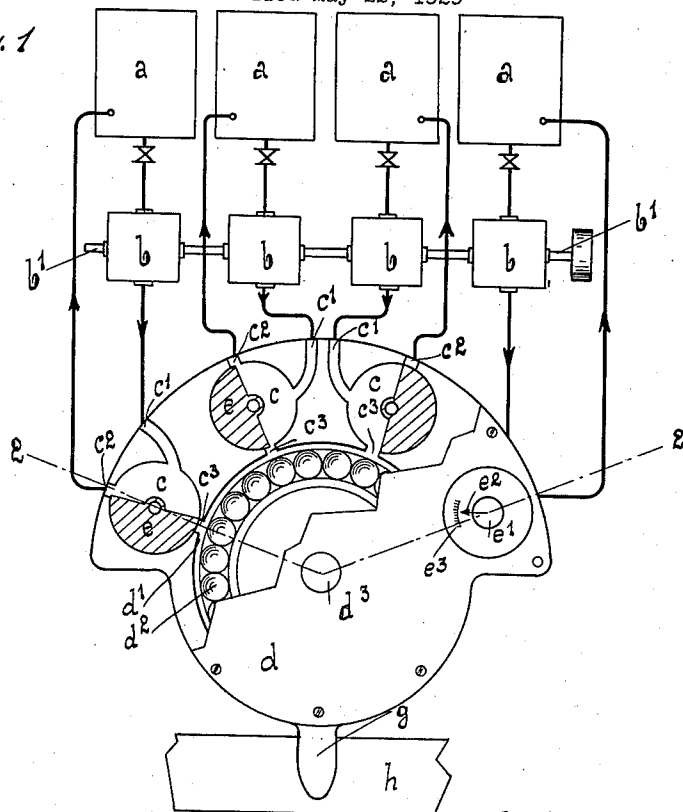
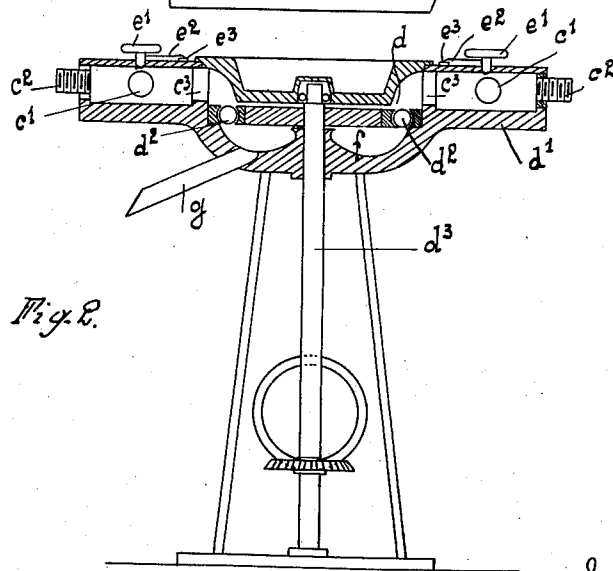


Fig. 2



Inventor
Paul Louis Armand Thiberge
By Addison A. Armstrong
attorney

UNITED STATES PATENT OFFICE

2,078,983

PROCESS AND APPARATUS FOR MIXING
AND EMULSIFYING LIQUIDS

Paul Louis Armand Thiberge, Nanterre, France

Application May 22, 1929, Serial No. 365,214
In France May 29, 1928

43 Claims. (Cl. 259—8)

My invention relates to a process and an apparatus of the continuous operating type for mixing and emulsifying liquids including viscous liquids in definite proportions, and in particular lubricating oils, varnishes, colors and the like.

As is known in the art the principle of the industrial operations employed in the mixing of miscible liquids is generally as follows:

The liquids entering into the composition of the mixture are measured by gauging one after the other in mixing vats or mixing machines. The stirring up of the liquids is subsequently effected by injecting air, by mechanical agitation, or frequently by short-circuited pumping.

In the case of viscous liquids the mass is heated for diminishing the viscosity of the constituents which facilitates agitation and promotes the distribution of the different liquids in the mass.

This method necessitates voluminous installation which leads to a considerable investment, expenses for heating and stirring which are rather high and a great loss in time in the case of viscous liquids.

In addition, the installations employed lack flexibility and small mixtures are not able to be effected in the same apparatus as large mixtures.

Finally the accuracy attained in measuring by gauging the vats is entirely relative.

My improved process contemplates effecting all the operations of mixing in a continuous and automatic manner as much concerning the measuring of the constituents as their mixing and all that irrespective of the tonnage involved.

My apparatus permits obtaining a very large output with very reduced overall dimensions.

By its automatic character I attain great security in operation and procure economy in manual labor.

The operations may be brought about cold, even for viscous substances which constitutes a very great advantage over processes known in the art.

My apparatus in addition allows manufacturing of special products such as emulsions and the use of a phase consisting of a solid suspended in a liquid medium.

The process consists principally in causing the different constituents to flow in continuous fashion in the form of a thin sheet and in subjecting them during a predetermined length of time to a sort of wire drawing action, preferably at a high velocity and with changes in direction, in a way to create a swirling region favorable to the mixture. The expression "flowing in the form of a thin sheet" as used in this specification

by me is intended to convey the idea of causing flow under a small section, that is, it is intended to also include flowing in the form of small threads.

The apparatus for mixing for carrying the process into practice is preferably composed of surfaces sliding against each other, such as balls, small wheels or rollers disposed after the fashion of bearings and to which the thin sheets are led by distributing members. One preferred form of such mixing means would be a ball bearing, and would be classified under the generic term of "planet action" means.

One preferred embodiment of my invention is illustrated in the accompanying drawing by way of example forming part of this specification and in which—

Fig. 1 is a complete diagrammatic view of my improved apparatus; and

Fig. 2 is a section taken along the line 2—2 of Fig. 1.

Referring to the drawing showing one embodiment of my invention, the liquids to be mixed are stocked in vats *a* from which they are drawn by means of piston pumps *b* having equal cylinders and provided in the proportion of one pump per vat as illustrated. Said pumps are connected to a common arbor *b'* and are driven by an electric motor having a speed such that the filling of the cylinders takes place regularly under which conditions the output of all the pumps is identical.

The outlet pipe of each pump is connected to a distributing-gage composed of a chamber *c* each provided with three openings or orifices of equal section *c'* *c''* *c'''*. The said section corresponds to that of the outlet orifice of the pumps. One of the openings *c'* is connected to the outlet pipe, that of *c''* constitutes a by-pass and is connected to the supply vat whereas the third *c'''* opens directly into the collector *d'* of the mixer *d*. Said three openings having the same section therefore furnish the same output. A shutter *e* properly adjusted and pivoted on a shaft is adapted to completely close one of the openings and to completely open the other and for intermediate positions to obtain by means of the two openings *c''* *c'''* complementary outputs, whose sum is equal to the output of the inlet opening *c'*, that is, the outlet of the pump. It is therefore possible, under these conditions above mentioned, and irrespective of the output of the pumps, to fraction the said output in a proper predetermined manner and to lead a flow of liquid to the mixer whose relative intensity is defined in ad-

vance and maintained constant during the period of operation.

The position of the shutter is regulated by a milled knob e^1 provided with a pointer e^2 displaceable over a graduated sector e^3 .

The distributors, whose number may vary like the pumps according to the number of constituents to be mixed, are concentrically disposed with the mixer d and the liquid leaving the outlet of the distributors is led to the mixer by the collector d^1 (Fig. 2).

The mixer d is composed of a ball or roller bearing through which filters the liquids which become kneaded and intensely stirred while passing therethrough. Said bearing is mounted on a vertical arbor d^3 supported by step bearings and driven by an electric motor.

After filtration through the bearing the liquid falls into a trough f , flows out through a spout g and into a receiving trough h .

The operation of the apparatus is as follows:

After having opened the valves of the stock tanks, the corresponding shutters are placed in their proper position and the motor of the mixer started as well as that of the pumps. The speed of the pumps and the mixer are regulated in accordance with the products being treated. In the case of viscous products, the speed of pumping must be reduced. The cleaning of the apparatus takes place automatically by the passage of the treated liquids. When it is desired to pass from one mixture to another, it is merely necessary to collect the first few liters poured separately.

In the case where very viscous liquids are to be treated the measures of gauging in the apparatus acting as a distributor may become slightly altered due to the diminution of the section of the openings provoked by the presence of an adhering layer of liquid which is stationary on the walls thereof. This is principally noticeable for measures corresponding to a slight opening of one of the openings.

In order to overcome this inconvenience, I create a pressure in the gauge distributor apparatus.

This is obtained by giving the openings c^2 and c^3 an equal section, but smaller than the section of the outlet of the pump and the inlet opening c^1 .

By reason of the reduction of openings c^2 and c^3 , the liquid stream in clearing them takes a speed which is greater than its speed of entering the distributor at c^1 which has for effect to increase the friction thereof in the openings and to considerably reduce the thickness of the stationary layer adhering thereto.

The output of openings c^2 and c^3 remain complementary and their sum equal to the output of the pump.

While I have described what I deem to be the preferred form of my device and process with which the same is used, I do not wish to be limited thereto as there might obviously be changes made in the form, construction, and arrangement of the constituent elements as well as their modus operandi without departing from the spirit of my invention as comprehended within the scope of the appended claims.

Having described my invention what I claim as new and desire to secure by Letters Patent is:

1. In an apparatus for mixing and emulsifying liquids, the combination of a plurality of stock tanks, pumps of equal output each associated with one of the said stock tanks, means for actuating simultaneously the said pumps, at the same

speed, a distributing chamber for each pump having three openings, means for connecting one of said openings to the outlet of its respective pump, means for connecting another of said openings to the respective stock tank of its distributing chamber, rotary mixing means for said distributing chambers, means for connecting the third of said openings to said mixing means, and distributing means in each of said distributing chambers adapted to control said openings in a way to give a complementary flow through two of said openings whose sum is equal to the output of the respective pump thereof.

2. In an apparatus for mixing and emulsifying liquids, the combination of a plurality of stock tanks, a supply pump associated with each of said stock tanks, a distributing chamber connected to the outlet of each of said pumps each having three openings of equal section corresponding to the outlet of said pumps, means for connecting one of said openings to the outlet of its respective pump, means for connecting another of said openings to the respective stock tank of its distributing chamber, rotary mixing means for said distributing chambers, means for connecting the third of said openings to said mixing means, and distributing means in each of said distributing chambers adapted to control said openings in a way to give a complementary flow through two of said openings whose sum is equal to the output of the respective pump thereof.

3. In an apparatus for mixing and emulsifying liquids, the combination of a plurality of stock tanks, a supply pump associated with each of said stock tanks, a distributing chamber connected to the outlet of each of said pumps each having three openings of equal section corresponding to the outlet of said pumps, means for connecting one of said openings to the outlet of its respective pump, means for connecting another of said openings to the respective stock tank of its distributing chamber, a plurality of relatively slidable surfaces adapted to receive the liquid passing through said distributing chambers and distributing means in each of said distributing chambers adapted to control said openings in a way to give a complementary flow through two of said openings whose sum is equal to the output of the respective pump thereof.

4. In an apparatus for mixing and emulsifying liquids, the combination of a plurality of stock tanks, a supply pump associated with each of said stock tanks, a distributing chamber connected to the outlet of each of said pumps each having three openings of equal section corresponding to the outlet of said pumps, means for connecting one of said openings to the outlet of its respective pump, means for connecting another of said openings to the respective stock tank of its distributing chamber, a rotary mixing means for said distributing chambers, means for connecting the third of said openings to said mixing means, and a rotary tumbler in each of said distributing chambers adapted to control said openings in a way to give a complementary flow through two of said openings whose sum is equal to the output of the respective pump thereof.

5. In an apparatus for mixing and emulsifying liquids, the combination of a plurality of stock tanks, a supply pump associated with each of said stock tanks, a distributing chamber connected to the outlet of each of said pumps each having three openings of equal section corresponding to the outlet of said pumps, means for

connecting one of said openings to the outlet of its respective pump, means for connecting another of said openings to the respective stock tank of its distributing chamber, a plurality of relatively slidable surfaces adapted to receive the liquid passing through said distributing chambers and a rotary tumbler in each of said distributing chambers adapted to control said openings in a way to give a complementary flow through two of said openings whose sum is equal to the output of the respective pump thereof.

6. In an apparatus for mixing and emulsifying liquids, the combination of a plurality of stock tanks, a supply pump associated with each of said stock tanks, a distributing chamber connected to the outlet of each of said pumps each having three openings of equal section corresponding to the outlet of said pumps, means for connecting one of said openings to the outlet of its respective pump, means for connecting another of said openings to the respective stock tank of its distributing chamber, a rotary mixing means for said distributing chambers, means for connecting the third of said openings to said mixing means, a rotary tumbler in each of said distributing chambers adapted to control said openings in a way to give a complementary flow through two of said openings whose sum is equal to the output of the respective pump thereof, and means associated with each of said tumblers for indicating the angular position thereof.

7. In an apparatus for mixing and emulsifying liquids, the combination of a plurality of stock tanks, a supply pump associated with each of said stock tanks, a distributing chamber connected to the outlet of each of said pumps each having three openings of equal section corresponding to the outlet of said pumps, means for connecting one of said openings to the outlet of its respective pump, means for connecting another of said openings to the respective stock tank of its distributing chamber, a plurality of relatively slidable surfaces adapted to receive the liquid passing through said distributing chambers, a rotary tumbler in each of said distributing chambers adapted to control said openings in a way to give a complementary flow through two of said openings whose sum is equal to the output of the respective pump thereof, and means associated with each of said tumblers for indicating the angular position thereof.

8. In an apparatus for mixing and emulsifying liquids, the combination of a plurality of stock tanks, a supply pump associated with each of said stock tanks, a distributing chamber connected to the outlet of each of said pumps each having three openings of equal section corresponding to the outlet of said pumps, means for connecting one of said openings to the outlet of its respective pump, means for connecting another of said openings to the respective stock tank of its distributing chamber, a rotary mixing means for said distributing chambers, means for connecting the third of said openings to said mixing means, a rotary tumbler in each of said distributing chambers adapted to control said openings in a way to give a complementary flow through two of said openings whose sum is equal to the output of the respective pump thereof, a manually operable knob carried by each of said tumblers, a pointer carried by said knob, and a graduated scale cooperating with said pointer for indicating the angular position of said tumblers.

9. In an apparatus for mixing and emulsifying

liquids, the combination of a plurality of stock tanks, a supply pump associated with each of said stock tanks, a distributing chamber connected to the outlet of each of said pumps each having three openings of equal section corresponding to the outlet of said pumps, means for connecting one of said openings to the outlet of its respective pump, means for connecting another of said openings to the respective stock tank of its distributing chamber, a plurality of relatively slidable surfaces adapted to receive the liquid passing through said distributing chambers, a rotary tumbler in each of said distributing chambers adapted to control said openings in a way to give a complementary flow through two of said openings whose sum is equal to the output of the respective pump thereof, a manually operable knob carried by each of said tumblers, a pointer carried by said knob, and a graduated scale cooperating with said pointer for indicating the angular position of said tumblers.

10. A process for continuously mixing liquids of various viscosities in definite proportions, which comprises causing the constituents to flow in definite predetermined quantity relationship, forming the various flows into thin liquid sheets, bringing such liquid sheets into contact, giving to said liquid sheets a general rotary motion of high velocity thereby submitting them to forces accruing from the rotary motion, overcoming said forces through using pressure for feeding the liquid sheets, submitting said liquid sheets to secondary local swirling and rotating motions of high velocities and opposite directions whereby the resulting action of such combined forces and motions is the breaking of such liquid sheets into very minute elements and said minute elements are subjected to intimate mutual contact by which the constituents are formed into a homogeneous compound of predetermined viscosity.

11. A process for continuously mixing liquids of various viscosities in definite proportions which comprises continuously causing a flow of the constituent liquids in the form of thin liquid sheets, regulating the flow of such sheets to predetermined relative proportions, bringing into contact said liquid sheets thus formed, and subjecting said liquid to a cold rolling process including a general rotating motion of high velocity, subjecting the sheets to centrifugal forces, and overcoming such centrifugal forces through forcible peripheral feeding of the liquid sheets, and creating local secondary motions of opposite directions, the combination of such motions and forces breaking the continuity of the sheets of liquids into minute elements and kneading together said elements into a homogeneous compound of predetermined viscosity.

12. In an apparatus for mixing together and emulsifying various liquids, the combination of a plurality of pumps, means for driving said pumps at a speed to produce an equal output from each pump, a plurality of supply means for feeding the liquids to said pumps, a distributing chamber for each pump, a common rotary means for mixing together the liquids from said distributing chambers, means for leading the liquid from the outlet of each pump to its respective distributing chamber, means for leading the liquid from each of said distributing chambers to said common rotary mixing means, adjustable means located within each distributing chamber, means for leading the liquid from each distributing chamber back to said supply means and said

adjustable means controlling the amount of liquid fed from said distributing chamber to said rotary mixing means and from said distributing chamber to said supply means.

5 13. In an apparatus for mixing together and emulsifying various liquids, the combination of a plurality of pumps, means for driving said pumps at a speed to produce an equal output from each pump, a plurality of supply means for feeding
10 said liquids to said pumps respectively, a distributing chamber for each pump having three openings, means for conducting liquids between one of said openings and the outlet of its respective pump, means for conducting liquid from another of said openings to the respective supply
15 means of its pump, rotary means common to all of said distributing chambers for mixing together the liquids from said distributing chambers, means for conducting liquid from the third of said
20 openings of all of said distributing chambers to said mixing means and a rotary distributing valve in each of said distributing chambers controlling the two last mentioned openings in a way so as to give sections of flow through said
25 two openings whose sum is constant and substantially equal to the section of flow through said first mentioned opening.

14. In an apparatus for mixing together and emulsifying various liquids, the combination of
30 a plurality of pumps, means for driving said pumps at a speed to produce an equal output from each pump, a plurality of supply means for feeding said liquids to said pumps respectively, a distributing chamber for each pump having three
35 openings, means connecting one of said openings to the outlet of its respective pump, means for connecting another of said openings to the respective supply means for its pump, a rotary means having connection with all of said distributing chambers for mixing together the liquids
40 received from said distributing chambers, means for connecting the third of said openings of all of said distributing chambers to said mixing means and means for controlling the flow of liquid through the last two of said openings.

15. In an apparatus for mixing together and emulsifying various liquids, the combination of a plurality of stock tanks for said liquids, a supply pump associated with each of said stock tanks,
50 means for driving all of said pumps at a speed to provide an equal output from each pump, a distributing chamber for each pump, a common rotary means for mixing together the liquids received from all of said distributing chambers,
55 means for connecting each of said distributing chambers with the outlet of its respective pump, means for connecting each of said distributing chambers with said common rotary mixing means, means connecting each distributing
60 chamber with the stock tank supplying its respective pump and adjustable means associated with each distributing chamber for returning to each stock tank any portion of the output of the corresponding pump that is not fed from the distributing chamber to the mixing means.

16. In an apparatus for mixing together and emulsifying various liquids, the combination of a plurality of stock tanks for the liquids, a supply pump associated with each of said stock tanks,
70 means for driving all of said pumps at a speed to produce an equal output for each pump, a distributing chamber for each pump having three openings, means connecting one of said openings to the outlet of its respective pump, means connecting another of said openings to the respec-

tive stock tank of its distributing chamber, rotary means common to all of said distributing chambers for mixing together the liquids from said distributing chambers, means for connecting the third of said openings of all of said distributing chambers to said rotary mixing means and a rotary distributing valve in each of said distributing chambers controlling the two last mentioned openings to give sections of flow of liquid thereover whose sum is constant and substantially equal to the section of flow through said first mentioned opening.

17. In an apparatus for mixing together and emulsifying various liquids, the combination of a plurality of pumps of a predetermined output, positively interconnected driving means for said pumps so as to produce a substantially equal output from each pump, a plurality of supply means for feeding said liquids to said pumps, a distributing chamber for each pump, a common rotary means for mixing together the liquids from all of said distributing chambers, means connecting each of said distributing chambers with the outlet of its respective pump, means connecting each of said distributing chambers with said common rotary mixing means, means connecting said distributing chamber with the supply means for its corresponding pump and adjustable means for controlling the disposition of any portion of the output of the corresponding pump that is not fed from the corresponding distributing chamber to said mixing means.

18. In an apparatus for mixing together and emulsifying various liquids, the combination of a plurality of pumps of predetermined output positively interconnected driving means for said pumps to produce an equal output from each pump, a plurality of supply means for feeding liquids to said pumps, a distributing chamber for each pump having three openings, means connecting one of said openings to the outlet of its respective pump, means for connecting another of said openings to the respective supply means of its pump, rotary means common to all of said distributing chambers for mixing together the liquids received from said distributing chambers, means connecting the third of said openings of all of said distributing chambers to said rotary means and a rotary distributing valve located in each of said distributing chambers controlling the two last mentioned openings so as to provide sections of flow through said two openings whose sum is constant and substantially equal to the section of flow of liquid through said first mentioned opening.

19. In an apparatus for mixing together and emulsifying various liquids, the combination of a plurality of pumps of predetermined output, positively interconnected driving means for driving said pumps at a speed to produce an equal output from each pump, a plurality of supply means for feeding liquids to said pumps, a distributing chamber for each pump having three openings, means connecting one of said openings to the outlet of its respective pump, means connecting another of said openings to the respective supply means of its pump, rotary means for mixing together the liquids from said distributing chambers, means for connecting the third of said openings of all of said distributing chambers to said rotary means and means associated with said distributing chamber for controlling the flow through the last two of said openings.

20. In an apparatus for mixing together and emulsifying various liquids, the combination of

a plurality of stock tanks for the liquids, a supply pump of predetermined output associated with each of said stock tanks, positively interconnected driving means for said pumps for driving said pumps at a speed to produce an equal output from each pump, distributing means for each pump, rotary means for mixing together the liquids from said distributing means, means connecting each of said distributing means with the outlet of its respective pump, means connecting each of said distributing means with said rotary mixing means, means connecting each of said distributing means with its respective stock tank and means associated with said distributing means for controlling the supply of liquid returned to its respective stock tank, said liquid returned to its respective stock tank corresponding to the liquid not fed from the corresponding distributing means to said mixing means.

21. In an apparatus for mixing together and emulsifying various liquids, the combination of a plurality of stock tanks for the liquids, a supply pump of predetermined output associated with each of said stock tanks, positively interconnected driving means for said pumps driving said pumps at a speed to produce an equal output from each pump, a distributing chamber for each pump having three openings, means connecting one of said openings to the outlet of its respective pump, means connecting another of said openings to the respective stock tank of its distributing chamber, rotary means for mixing together the liquids received from said distributing chambers, means connecting the third of said openings of all of said distributing chambers to said mixing means and a rotary distributing valve in each of said distributing chambers controlling the flow of liquid through the two last mentioned openings so as to give sections of flow through said last two openings whose sum is substantially constant and is substantially equal to the section of flow of liquid through said first mentioned opening.

22. In an apparatus for mixing together and emulsifying various liquids, the combination of a plurality of stock tanks for the liquids, a supply pump of predetermined output associated with each of said stock tanks, positively interconnected driving means for said pumps for driving said pumps at a speed to produce an equal output from each pump, a distributing chamber for each pump having three openings, means connecting one of said openings to the outlet of its respective pump, means connecting another of said openings to the respective stock tank of its distributing chamber, rotary means for mixing together the liquids from said distributing chambers, means connecting the third of said openings of all of said distributing chambers to said mixing means and means controlling the flow of liquid through said last mentioned two openings.

23. In an apparatus for mixing together and emulsifying various liquids, the combination of a plurality of pumps having all the same output, positively interconnecting driving means for actuating said pumps at the same speed so as to maintain substantially the same output therefrom, a plurality of supply means for feeding liquids to said pumps, a distributing chamber for each pump, rotary means for mixing together the liquids received from all of said distributing chambers, each of said distributing chambers having an inlet connected with the outlet of its respective pump and two outlets, the sum of the cross sections of which are substantially equal to the cross section of said inlet, one of said out-

lets being connected to said rotary mixing means and the other of said outlets being connected to the corresponding supply means for said distributor and means associated with each distributor for simultaneously opening one outlet and closing the other outlet at the same rate.

24. In an apparatus for mixing together and emulsifying various liquids, the combination of a plurality of pumps having the same output, positively interconnected driving means for actuating pumps at the same speed to produce a substantially equal output from each pump, a plurality of supply means for feeding liquids to said pumps, a distributing chamber for each pump having an inlet and two outlets, the sum of the cross sections of said outlets being substantially equal to the cross section of said inlet, means connecting said inlet to the outlet of the corresponding pump, means connecting one outlet to the respective supply means of its corresponding pump, rotary means for mixing together the liquids from said distributing chambers, means connecting the other outlet to said mixing means and a rotary distributing valve in each of said distributing chambers operative to simultaneously open one outlet and close the other outlet at the same rate.

25. In an apparatus for mixing together and emulsifying various liquids, the combination of a plurality of piston pumps, means for driving said piston pumps at a speed to produce an equal output from each of said pumps, a plurality of supply means for feeding liquids to said pumps, a distributing chamber for each pump having an inlet and two outlets, the sum of the cross sections of said outlets being substantially equal to the cross section of said inlet, means for connecting said inlet to the outlet of its corresponding pump, means for connecting one of said outlets to the respective supply means for its corresponding pump, rotary means for mixing together the liquids received from said distributing chambers, means for connecting the other of said outlets in all of said distributing chambers to said mixing means and a rotary distributing valve located in each of said distributing chambers for opening one of said outlets and closing the other of said outlets at the same rate.

26. In an apparatus for mixing together and emulsifying various liquids, the combination of a plurality of stock tanks for the liquids, a supply piston pump of predetermined output associated with each of said stock tanks, positively interconnected driving means for actuating all of said pumps at the same speed to produce a substantially equal output from each pump, a distributing chamber for each pump having three openings, means connecting one of said openings to the outlet of its respective pump, means connecting another of said openings to the respective stock tank, rotary means in the form of ball bearings for mixing together the liquids received from said distributing chambers, means connecting the third of said openings of all of said distributing chambers to said mixing means and a rotary distributing valve in each of said distributing chambers controlling the last mentioned two openings so as to give cross sections of flow of liquid therethrough whose sum is constant and at most equal to the cross section of flow of the first mentioned opening.

27. In an apparatus for mixing together and emulsifying various liquids, the combination of a plurality of pumps of substantially equal output, means for driving said pumps at a speed to produce a substantially equal output from each

pump, a plurality of supply means for feeding liquids to said pumps, rotary means for mixing together the liquids delivered by said pumps, means connecting the outlets of said pumps to said mixing means and means comprising controlling the amount of liquids fed from the output of said pumps to said mixing means and controlling the amount of excess liquid from the outputs of said pumps to be returned to the respective supply means.

28. In an apparatus for mixing together and emulsifying various liquids, the combination of a plurality of stock tanks, a supply pump associated with each of said stock tanks, means for driving said pumps at a speed to produce an equal output from each pump, a distributing chamber connected to the outlet of each of said pumps, each of said distributing chambers having three openings, means for connecting one of said openings to the outlet of its respective pump, means connecting another of said openings for leading away overflow, rotary mixing means for mixing the liquids received from all of said distributing chambers, means connecting the third of said openings to said mixing means and a distributing valve in each of said distributing chambers controlling the last mentioned two openings to provide a flow of liquid therethrough whose sum is substantially equal to the flow of liquid through said first mentioned openings.

29. In an apparatus for mixing together and emulsifying various liquids, the combination of a plurality of stock tanks, a supply pump associated with each of said stock tanks, means for driving said pumps at a speed to produce an equal output from said pump, a distributing chamber connected to the outlet of each of said pumps, each of said distributing chambers having three openings, means connecting one of said openings to the outlet of its respective pump, means connected to another of said openings for leading away overflow, mixing means comprising a plurality of relatively slidable surfaces to receive the liquids from said distributing chambers, means connecting the third of said openings to said mixing means and a distributing valve in each of said distributing chambers controlling the last mentioned two openings so as to provide a flow of liquid therethrough whose sum is substantially equal to the flow of liquid through the first mentioned openings.

30. In an apparatus for mixing together and emulsifying various liquids, the combination of a plurality of stock tanks, a supply pump associated with each of said tanks, means for driving said pumps at a speed to produce substantially an equal output from each pump, a distributing chamber connected to the outlet of each of said pumps, each of said distributing chambers having three openings, means connecting one of said openings to the outlet of its respective pump, means connected to another of said openings for leading away overflow, mixing means comprising a plurality of relatively slidable surfaces to receive the liquids from said distributing chambers, means connecting the third of said openings to the space between said relatively slidable surfaces and a rotary member in each of said distributing chambers controlling the last mentioned two openings so as to provide a flow therethrough whose sum is equal to the flow through said first mentioned opening.

31. In an apparatus for mixing together and emulsifying various liquids, the combination of a stationary member, a second member rotatably

mounted with respect to said first member, means for rotating said second member, rolling friction elements located between said stationary member and said second member so as to form a continuous series of friction elements moving along a circular path between said members, means for positively feeding at constant rates of delivery the liquids to be mixed at spaced points around the circular path of said friction elements into the space between said members and means connected to one of said members for leading away the complete mixture of said liquid.

32. In an apparatus for mixing together and emulsifying various liquids, the combination of a stationary vertical cylindrical member, a second cylindrical member coaxially rotatable within said first member, means for rotating said second member, rolling friction elements located between said two members so as to form a continuous series of friction elements moving along a circular path between said members, means located above said members for positively feeding at constant rates of delivery the liquids to be mixed at spaced points around the circular path of said friction elements into the space between said members and means located below said members for leading away the mixture of liquids produced.

33. In an apparatus for mixing together and emulsifying various liquids, the combination of a stationary member, a second member rotatable relative to said first member, means for rotating said second member, rolling friction elements located between said members so as to form a continuous series of friction elements moving along a circular path between said members, a plurality of pumps, a plurality of supply means for feeding the liquids to said pumps, a distributing chamber for each pump, means connecting each of said distributing chambers with the outlet of its respective pump, means connecting each of said distributing chambers with the space between said stationary and second members at spaced points along the circular path of said friction elements, means connected with said distributing chamber for returning excess of liquid to the respective supply means for each pump and adjustable means associated with each distributing chamber for controlling the supply of liquid fed by each pump to the space between said stationary member and said rotatable member and the supply of liquid returned to said supply means.

34. In an apparatus for mixing together and emulsifying various liquids, the combination of a stationary vertical cylindrical member, a second cylindrical member coaxially rotatable within said first members, means for rotating said second member, rolling friction elements located between said two members so as to form a continuous series moving along a circular path between said members, a plurality of stock tanks for the liquids, a supply pump associated with each of said stock tanks, a distributing chamber for each pump having three openings, means for connecting one of said openings to the outlet of its respective pump, means connecting another of said openings to the respective stock tank of its distributing chamber, means connecting the third of said openings with the space between said stationary member and rotatable member, said last named means for all of said distributing chambers being connected at spaced points around the path of said friction elements so that all of said distributing chambers feed their re-

spective liquids at different points along said circular path and a rotary distributing valve in each of said distributing elements for controlling the last mentioned two openings therein so as to provide cross sections of flow through said openings whose sum is substantially constant and substantially equal to the cross section of flow through said first opening.

35. A device of the class described comprising a liquid supply, means for feeding said liquid in constant volume from said supply, a receptacle receiving said liquid mixing means, said receptacle having an outlet for said liquid for directing said liquid to said mixing means, means controlling said outlet so as to deliver the liquid from said receptacle in a quantity varying from the supply of liquid received by said receptacle and said receptacle having a second outlet controlled by said means controlling said first outlet so that the excess of liquid fed into said receptacle over that delivered from said receptacle may be eliminated from said receptacle thereby permitting said liquid to be fed in constant volume to said receptacle.

36. A device of the class described comprising a liquid supply, means for feeding said liquid in constant volume from said supply, a receptacle receiving said liquid mixing means, said receptacle having an outlet for said liquid for directing said liquid to said mixing means, means controlling said outlet so as to deliver the liquid from said receptacle in a quantity varying from the quantity fed to said receptacle, said receptacle having a second outlet, means controlling said second outlet in cooperation with the control of said first mentioned outlet so that the excess of liquid fed into said receptacle over that delivered from said receptacle may be removed from said receptacle.

37. A device of the class described comprising a liquid supply, means for feeding said liquid in constant volume from said supply and under a substantially constant pressure, a receptacle receiving said liquid mixing means, said receptacle having an outlet for said liquid for directing said liquid to said mixing means, means controlling said outlet so as to deliver the liquid from said receptacle in a quantity varying from the quantity fed into said receptacle and along substantially the same pressure, said receptacle having a second outlet controlled by said means controlling said first outlet so that the excess of liquid fed into said receptacle over that delivered from said receptacle may be returned to said liquid supply while maintaining throughout said system substantially a constant pressure of liquid.

38. A device of the class described comprising a stock tank for liquid, a pump associated with said stock tank, means for driving said pump so as to place said liquid under a predetermined pressure and at the same time cause a pre-

termined flow of liquid, a distributing chamber, said distributing chamber having an inlet and two outlets, means for connecting said inlet to the outlet of said pump, mixing means, means for connecting one of said outlets to said mixing means, means for connecting the other outlet to said stock tank and means associated with said distributing chamber for simultaneously opening one outlet and closing the other outlet therein at substantially the same rate.

39. A device of the class described comprising a stock tank for liquid, a pump associated with said stock tank, means for driving said pump so as to place said liquid under a predetermined pressure and at the same time cause a predetermined flow of liquid, a distributing chamber, said distributing chamber having an inlet and two outlets, means for connecting said inlet to the outlet of said pump, mixing means, means for connecting one of said outlets to said mixing means, means for connecting the other outlet to said stock tank and a rotary distributing valve located in said distributing chamber for simultaneously opening one outlet and closing the other outlet at substantially the same rate.

40. A process of mixing viscous liquids, particularly lubricating oils, at normal temperatures without the application of heat comprising feeding streams of different oils at normal temperature at predetermined relative flows, and then mixing said streams of oil at normal temperature by rolling contact to form a homogeneous blend at normal temperature.

41. A process of mixing viscous liquids, particularly lubricating oils at normal temperatures without the application of heat comprising feeding streams of different oils at normal temperature under pressure, then breaking said streams into small individual films with a release of said pressure and then continuously rolling together said films so as to form a homogeneous blend at normal temperature.

42. A process of mixing viscous liquids, particularly lubricating oils, at normal temperature without the application of heat comprising feeding streams of different oils at normal temperature at predetermined relative flows, then breaking said streams into small individual films and then continuously rolling together said films so as to form a homogeneous blend at normal temperature.

43. A process of mixing viscous liquids, particularly lubricating oils, at normal temperature without the application of heat, comprising feeding streams of the different oils at normal temperature at predetermined relative flows, breaking said streams into small individual films by centrifugal force and then continuously rolling together said films so as to form a homogeneous blend at normal temperature.

PAUL L. A. THIBERGE.