Jan. 11, 1938. H. DAUBENMEYER 2,104,853

HOMOGENIZING NOZZLE DEVICE

Filed April 1, 1936 2 Sheets-Sheet 1

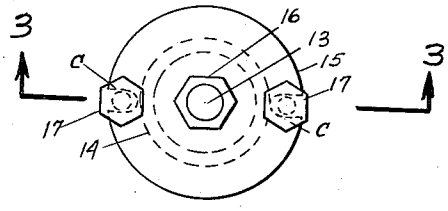



Fig. 2

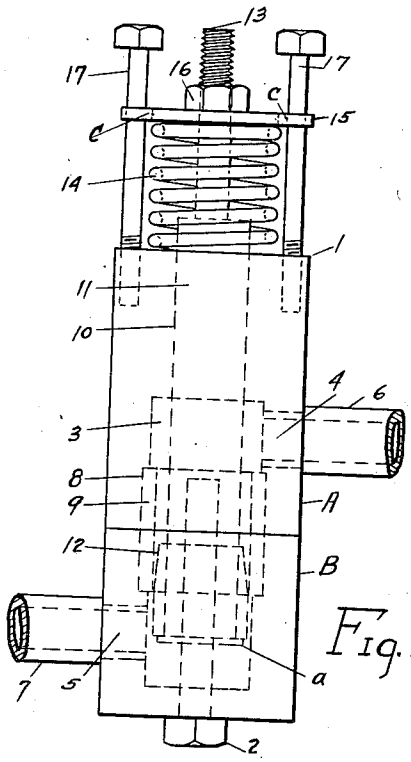



Fig. 1

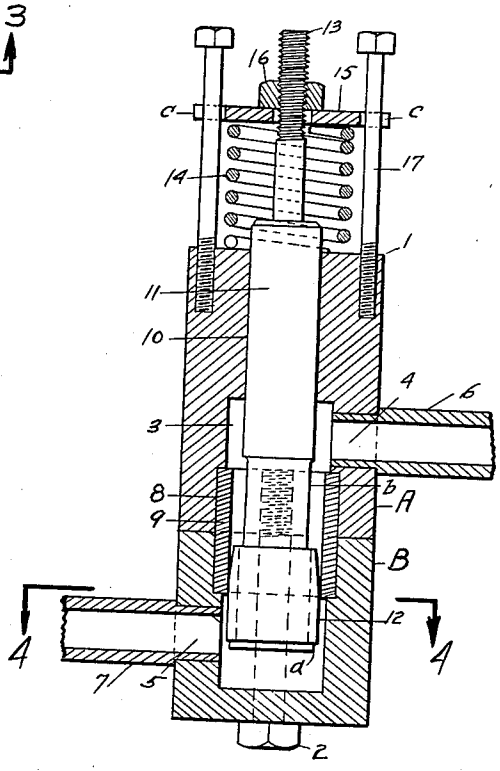



Fig. 3

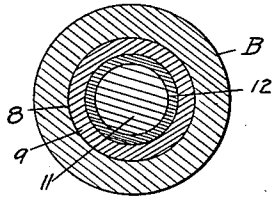



Fig. 4

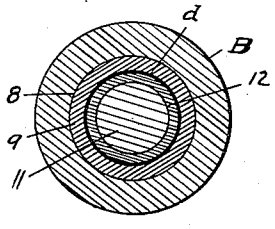



Fig. 5

INVENTOR.

BY Homer Daubenmeyer

Myron J. Dikerman

ATTORNEY.

Jan. 11, 1938. H. DAUBENMEYER 2,104,853

HOMOGENIZING NOZZLE DEVICE

Filed April 1, 1936 2 Sheets-Sheet 2

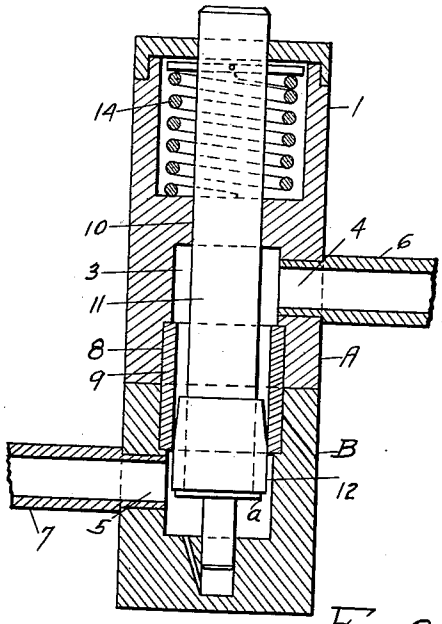



Fig. 8

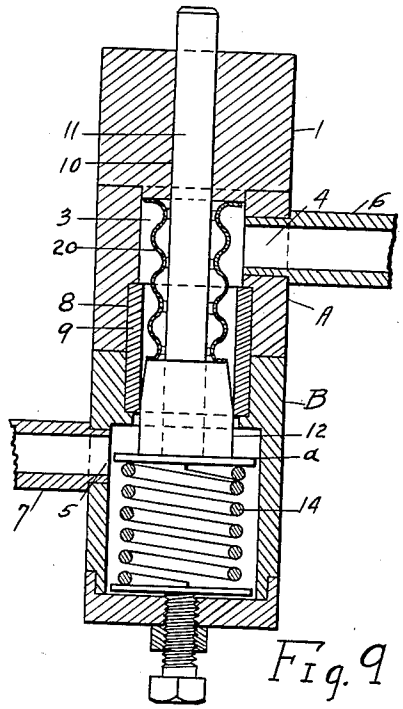



Fig. 9

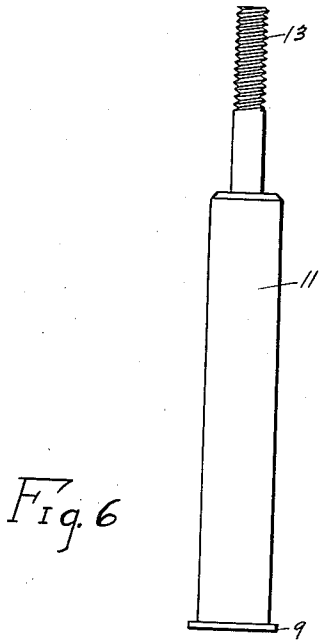



Fig. 6

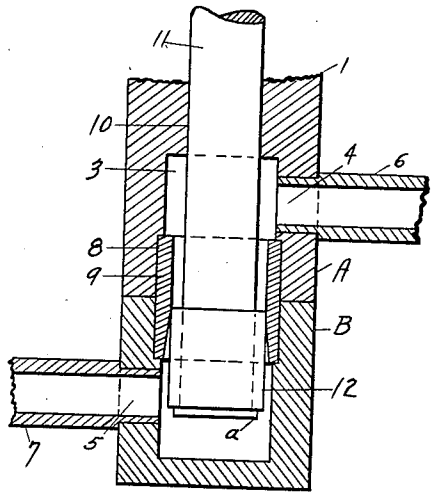



Fig. 7

INVENTOR.
Homer Daubenmeyer
BY
Myron J. Dikeman
ATTORNEY.

Patented Jan. 11, 1938

2,104,853

# UNITED STATES PATENT OFFICE

2,104,853

## HOMOGENIZING NOZZLE DEVICE

Homer Daubenmeyer, Detroit, Mich., assignor of one-half to Howard A. Miller, Detroit, Mich.

Application April 1, 1936, Serial No. 72,217

3 Claims. (Cl. 99—265)

The object of my invention is to produce a homogenizing device adapted for any liquid mixture which can be changed by breaking up the particles into more minute form and preventing them from recombining into their original state, thereby forming a homogeneous solution.

Homogenizing action is the result of volume and pressure that is accomplished by forcing a volume through a small passage thereby creating pressure.

Another object is to produce a homogenizing device that may be installed in any suitable liquid pipe line suitable for forcing liquids therethrough under pressure by means of a connected pressure pump.

A further object is to produce a homogenizing device which may be easily dis-assembled and cleaned from any particles that may collect therein from the various liquids with which it may be used.

A still further object is to produce a homogenizing device that will automatically function with liquid pressure as may be applied thereto, and act as a relief valve should the unit become clogged.

Another object is to produce a homogenizing unit that is simple in construction, easily and efficiently operated and that can be manufactured at a very low cost.

These several objects are attained in the preferred form by the construction and arrangement of parts more fully hereinafter set forth.

Similar parts on all drawings are marked by similar numerals or letters.

Fig. 1 is an elevation of the assembled nozzle showing the exterior design and means for connecting the unit within a liquid pressure pipe line.

Fig. 2 is a top view of the unit shown in Fig. 1 showing the body design and spring means for regulating the operating valve.

Fig. 3 is a vertical sectional view lengthwise of the unit, taken on line 3—3 of Fig. 2, showing the general arrangement of the operating parts and sections.

Fig. 4 is a cross-sectional view taken on the line 4—4 of Fig. 3 showing the plunger valve in its closed position.

Fig. 5 is also a cross-sectional view taken on the same line 4—4 of Fig. 3 when the tapered valve bushing is slightly depressed showing the thin annular passage formed therein.

Fig. 6 is a modified design of the internal valve rod, and may replace the type shown in Fig. 3.

Fig. 7 is a partial longitudinal sectional view taken on the line 3—3 of Fig. 2 showing a modified bushing taper formation applied to the casing bushing instead of the valve bushing previously shown.

Fig. 8 is a longitudinal sectional view through the casing, the same as would be taken on line 3—3 of Fig. 2, showing a casing modification with the valve spring mounted inside the casing end.

Fig. 9 is another longitudinal sectional view similar to Fig. 8, but illustrating further modification with the valve spring placed below the valve plunger instead of above as previously shown, and also illustrates the application of a valve stem bellows for sealing the bearing joints and prevent leakage.

Many liquid products, such as milk, cream, ice cream mixtures, or similar emulsions, are subject to a separation of their various comprising elements, often forming tiny globules of fat or oil particles or similar formations which become separated from the containing solution. It then becomes necessary, in producing a homogeneous mixture, to convert or break up these tiny particles, usually accomplished by some mechanical means whereby the liquid is forcibly passed through fine orifices, or by the pressure and expansion means. Various mechanical devices have been devised for homogenizing liquids, but which is usually accomplished with great difficulty due to constant clogging of the fine orifice openings, or unsanitary conditions resulting therefrom. My device is so designed as to remove these defects, yet produce a perfect homogenizing unit, simple, effective and safe.

In general, my device comprises an elongated casing formed with a cylindrical chamber therein and provided with suitable inlet and outlet passages. The casing chamber carries a tapered plug valve slidably mounted therein and which functions with the chamber wall shoulder in a manner to control the liquid passage therethrough, and is actuated by liquid pressure forced thereagainst. The valve plunger is restrained in a closed position by an attached coil spring which may be synchronized with different liquid pressures as may be applied thereto.

I will now describe more fully the detailed construction of my device, referring to the drawings and the marks thereon.

The casing 1 may be made of any suitable metal, either cast, rolled or drawn, and is preferably formed in an elongated cylinder comprising a body section A and an end section B, both turned to the same external diameter and securely joined together by the stud bolts 2. The cas-

ing 1 is formed with a cylindrical chamber 3 lengthwise therein, positioned concentric with the casing axis and extended into body and end casing sections. Through the casing side walls are formed suitable inlet and outlet passages 4 and 5 respectively, each opening into opposite chamber ends as illustrated in Fig. 3 of the drawings, and are herein shown as provided with tubular pipe fittings 6 and 7 pressed and sweated therein and forming sealed joints with the casing walls. If desired, threaded fittings may also be used where such is permitted. A cylindrical recess 8 is formed near the center section of the chamber 3, preferably symmetrical with the abutting casing section end joints, and carries tightly fitted therein a hardened tubular bushing 9 and which extends in both casing sections. Also within the body section A is formed a cylindrical bearing 10, preferably hardened and ground, and positioned concentric with the casing chamber axis. Said bearing 10 extends from the inner chamber to the casing end and carries slidably mounted therein a cylindrical plunger rod 11. The plunger rod 11 is of a length to extend nearly to the chamber bottom, and is preferably formed with a head end *a* and body recess *b*, and with the remaining surface ground to form a sliding joint with the casing bearing 10, yet pressure tight therein. If desired, a special bellows casing 20 may be inserted between the valve plunger and chamber ends, sealed therewith, forming a perfect liquid tight joint for the sliding valve rod bearing 10, and which may not require the close fitting previously mentioned. Also the recess *b* in the valve rod 11 may also be omitted if desired, and the plain valve rod as shown in Fig. 6 substituted therefor. The recess *b* is preferably formed as a part of the machine construction but is not essential to the operation of the unit. On the lower end of the plunger rod 11 is mounted a hardened valve bushing 12 tightly fitted thereon, said bushing 12 being slightly tapered at its upper end, and with its lower cylindrical bushing walls ground to accurately fit within the casing bushing walls 9, slidable therein but forming closed joints therewith. If desired, the bushing taper may be formed on the inner surface of the casing bushing 9 instead of on the valve bushing and as illustrated in the Fig. 7 of the drawings. Within the outer end of the plunger rod 11 is mounted a threaded stud bolt 13, positioned concentric with the plunger axis, and carries mounted thereon a heavy compression coil spring 14, stressed to any desired tension by means of the engaging washer 15 and adjusting nut 16 mounted on the bolt end. If desired, the bolt section 13 may be made integral with the plunger rod as a part thereof. Mounted on the upper end of the casing 1, on opposite sides of the coil spring 14, are two adjusting bolts 17, each threadably attached to the casing and positioned to engage the recesses *c* formed in opposite sides of the washer 15. The bolts 17 may be adjusted to any desired length for limiting the movement of the coil spring 14 and connected plunger rod 11, as the attached spring washer 15 engages with the adjusted bolt heads. The strength and stress of the coil spring 14 may be varied as required by the viscosity and composition of the passing liquid, and the desired pressure to which the liquid is subjected, or required to break up the separated particles. The spring 14 may also be installed within the casing chamber, or special recess, either above or below the plunger valve, as illustrated in Figs. 8 and 9.

When a liquid is forced into the chamber 3 through the inlet pipe 6 and under pre-determined pressure from an attached pressure unit, it tends to force the plunger rod 11 down and against the attached retarding coil spring 14, sufficiently for producing a thin annular passage opening *d* between the walls of the casing bushing 9 and the plunger bushing 12 due to the slight taper of the upper plunger bushing end, as shown in the Fig. 5 of the drawings, allowing the liquid to be forced therethrough and out of the outlet pipe 7. The extremely thin annular orifice *d* functions to crush or grind the tiny globules or separated particles and re-unite the liquid in a homogeneous emulsion solution by the rapid passage of the liquid forced therethrough.

Should the annular orifice become clogged by any sediment or separated particles, so as to seal the tapered bushing recess, preventing its effective operation, the resulting increased liquid pressure formed within the chamber 3 will force the entire plunger bushing 12 downward and below the casing bushing 9, sufficiently to allow the escape of the clogging sediment and sudden release of the excess chamber pressure.

This homogenizing nozzle is a self cleaning unit when ever sufficient pressure is applied thereto. The unit may also be cleaned manually by removing the stud bolts 2 and attached casing end section B. The device is also self compensating for wear, and also compensates for any pulsations as may be produced by the pressure pump with which this unit is used and the subsequent variable delivery, because it produces a variable orifice in operation due to its slide action.

It is apparent that my device is subject to various modifications in both general design and detail arrangement without departing from the spirit of my invention, and I therefore claim not only the design herein illustrated, but any modification thereof that is substantially a substitution of parts and sections herein shown.

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

1. A homogenizing liquid nozzle adapted for breaking down separated particles or globules in liquid or like compositions and used with such liquids under high pressures, comprising a body casing formed with an elongated cylindrical chamber therein provided with suitable inlet and outlet liquid pipe passage openings in opposite chamber casing ends, suitable pipe connections mounted within each of said pipe passage openings, a hardened tubular bushing tightly fitted within said chamber walls positioned approximately centrally between the inlet and outlet pipe passage openings, a release plunger valve with hardened valve bushing, slidably mounted within said chamber bushing forming joints therewith at the valve closed position, said valve bushing being slightly tapered at its upper end portion within said chamber bushing designed to form a variable relief annular passage when said valve is slightly displaced within the casing bushing, spring means mounted on said casing and connected to said release valve member in a manner for retaining it in its closed position within the chamber bushing until overcome by displacement liquid pressure applied thereto through the chamber inlet pipe passage opening causing a slight valve displacement and thin annular valve opening.

2. A homogenizing nozzle device adapted for breaking down separated particles in liquid and

like solutions and used with such liquids under high liquid pressure, comprising a body casing formed with a cylindrical chamber therein having inlet and outlet liquid passage openings at opposite chamber ends, a tubular bushing securely fitted within said chamber positioned between the inlet and outlet openings and forming liquid tight joints with the chamber wall, a plunger shaft with hardened valve bushing on one end, slidably mounted within said chamber, said plunger shaft being projected through the casing end wall within a suitable bearing and positioned with said valve bushing slidably mounted within the chamber bushing, overlapping at one end and forming a joint therewith, said valve bushing being slightly tapered at its upper overlapping end, spring means mounted on said casing end and attached to the projected valve shaft end in a manner to retain said valve bushing in its closed position within the chamber bushing until overcome by displacement liquid pressure applied thereto through the chamber inlet opening causing a valve displacement and slight annular valve passage.

3. A homogenizing nozzle, comprising a casing member formed of two sections securely attached together and having a cylindrical chamber extended within both casing sections, said chamber being provided with inlet and outlet pipe passages at opposite chamber ends, a tubular bushing securely fitted within said chamber near the center thereof forming liquid tight joints therewith, a plunger shaft with valve bushing on one end slidably mounted within said casing with the plunger shaft end projected through the casing end within a suitable bearing and positioned with the valve bushing slidably mounted within the lower end of the chamber bushing forming a joint therewith, one of said bushings being tapered for its overlapping portion, and a heavy coil spring mounted on the casing end connected to the projected plunger shaft end in a manner to adjustably retain said valve bushing in its closed position within the chamber bushing until overcome by displacement liquid pressure applied thereto through the chamber inlet passage, slightly opening the valve.

HOMER DAUBENMEYER.