Nov. 6, 1928. 1,690,799

E. A. SNOW

METHOD OF AND MEANS FOR REDUCING THE VISCOSITY OF LIQUIDS

Filed April 4, 1927

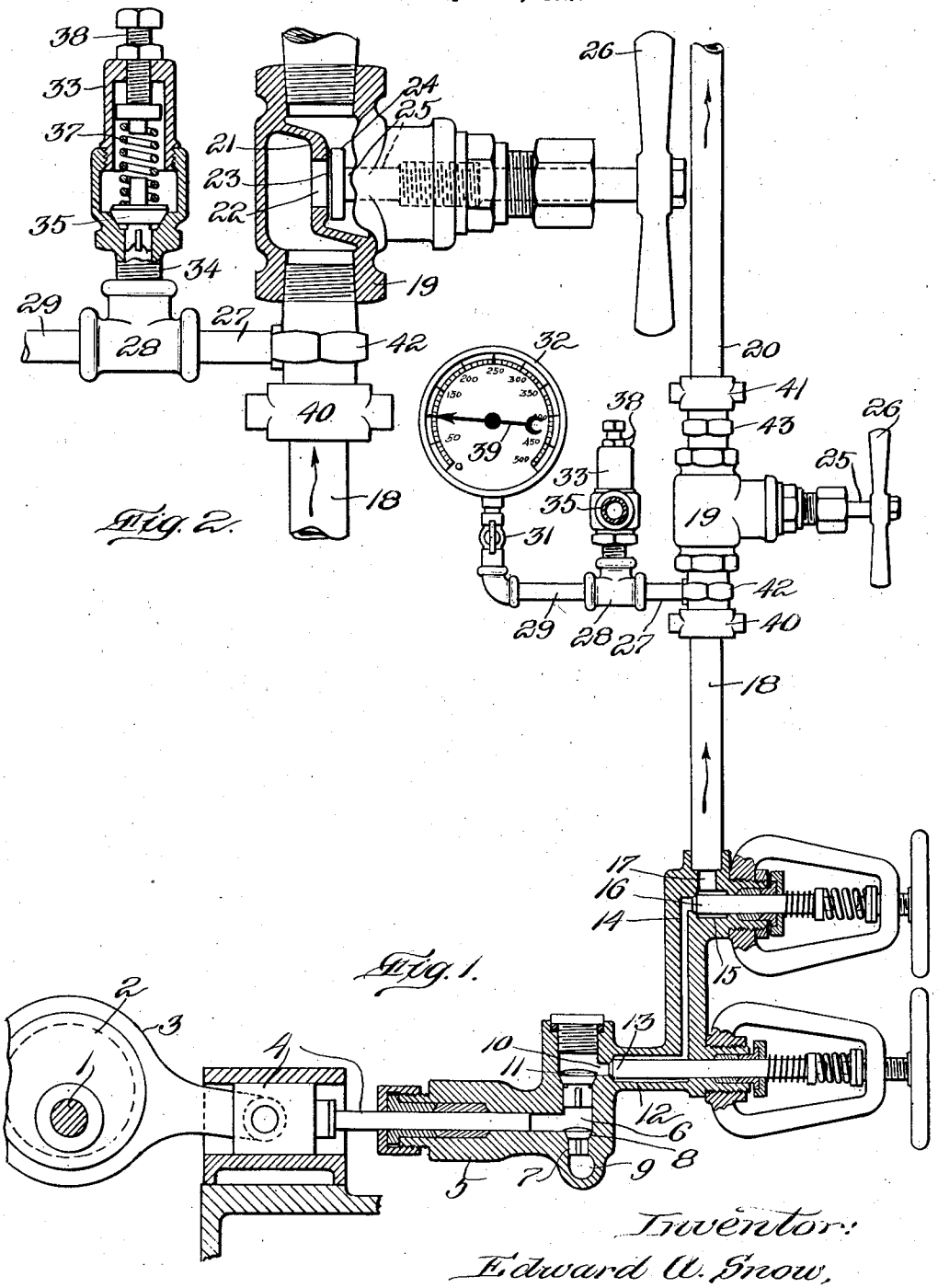


Fig. 2.

Fig. 1.

Inventor:
Edward A. Snow,
by Arthur C. Randall
Atty.

Patented Nov. 6, 1928. 1,690,799

UNITED STATES PATENT OFFICE.

EDWARD A. SNOW, OF READING, MASSACHUSETTS.

METHOD OF AND MEANS FOR REDUCING THE VISCOSITY OF LIQUIDS.

Application filed April 4, 1927. Serial No. 180,980.

My invention relates to a method of and means for reducing or eliminating the viscosity of certain liquids.

In the manufacture of ice cream it is common practice to subject the mix to homogenizing effects preparatory to cooling, ageing and freezing in order that the product will be smooth and free from lumps, and this part of the process is carried out by use of homogenizing apparatus including a pressure pump and one or more homogenizing valves. In passing the mix through the valve or valves of a homogenizing machine the constrictions provided by the valves, in conjunction with the friction and very high pressure under which the mix is forced through said constrictions, operate to break up all of the solids such as butter fat, albumin, ash and the like, with the result that upon leaving the homogenizing machine or apparatus the mix is a thoroughly homogenized emulsion, but it is also objectionably thick and viscous. From the homogenizing machine the mix has heretofore ordinarily been conducted through a conduit or pipe directly to the cooler, and owing to the viscous condition of the mix as it leaves the homogenizing apparatus and reaches the cooler, together with the further stiffening or thickening effects produced by the cooler itself, it has resulted in so increasing the degree of viscosity of the mix as to often prevent, and always interfere more or less, with the flow thereof over and from the cooler and also often clogged the cooling apparatus and stopped its operation. By the use of my invention the viscosity of the mix as it is transferred from the homogenizer to the cooler is reduced to a predetermined degree such that free flow of the same over and from the cooler is obtained. Furthermore, owing to the degree of fluidity established by use of this invention the mix flows over the cooler properly and freely so that it does not freeze thereon and is more thoroughly and properly aerated and cooled than has heretofore been possible. In using homogenizing apparatus alone to prepare the mix for the cooling operation it has heretofore been possible to control or regulate the viscosity of the homogenized mix only in the sense that the homogenizing action of the machine changes the condition of the mix from that of a freely flowing liquid to a comparatively stiff thick viscous emulsion varying in degree of viscosity with the degree of homogenizing action effected by the machine. Therefore, when the mix was very thoroughly homogenized it was necessarily rendered objectionably thick and viscous.

My invention contemplates providing the offtake conduit into which the mix is delivered from a homogenizing apparatus, with a constriction so proportioned as to capacity that the back pressure produced by the same is less than an effective homogenizing pressure. That is to say, this constriction is so regulated as to capacity that while the initial or homogenizing pressure may be, and herein is, utilized to propel the homogenized mix through this new constriction yet the back pressure created by this constriction is less than the pressure required to produce homogenizing effects at this constriction. For example, homogenizing pressures are in the neighborhood of two or three thousand pounds per square inch, at least, whereas this constriction that I provide in the offtake pipe conduit is proportioned or regulated so that only about one hundred pounds back pressure is created thereby. I find that by passing a viscous liquid through a constriction of this sort under a pressure less than that required to produce homogenizing or disintegrating effects, the viscosity of said liquid is reduced and that the degree of reduction can be varied by varying the capacity of this constriction. In other words, the distinguishing feature of my invention resides in the employment of a constriction through which a viscous liquid is forced under a pressure that is less than that necessary to produce homogenizing effects so that said liquid is "de-viscidified" so to speak. I have also found that while the homogenizing process is best carried out under temperatures ranging from 110 Fah., to 150 Fah., best results are secured in connection with the employment of this feature of my invention by subjecting the liquid to this viscosity reducing treatment at a temperature of 110 degrees Fah., approximately or thereabouts, or the same as that of the mix as it leaves the homogenizing machine.

Other features of my invention are hereinafter pointed out.

In the accompanying drawings:

Figure 1 is a diagrammatic view of a homogenizing apparatus or machine having associated therewith an apparatus containing the present invention.

Figure 2 is a detail hereinafter described.

Having reference to the drawings 1 repre-

sents a shaft provided with one or more, usually three, eccentrics 2, each connected by a strap 3 with a piston 4 operating in a cylinder 5. This, or these, cylinders 5 communicate with a chamber 6 having an inlet 7, controlled by a check valve 8, and connecting with a conduit 9 through which the untreated ice cream mix or the like is supplied to the machine. The chamber 6 is also provided with an outlet 10 controlled by a check valve 11, said outlet delivering to a chamber 12 containing a homogenizing valve 13 which controls the delivery end of the outlet 10. The chamber 12 is connected by a port 14 with a second chamber 15 containing a homogenizing valve 16 which controls the delivery end of the port 14. The chamber 15 is provided with an outlet 17 which heretofore has been directly connected with the cooler. In accordance with the present invention, however, the outlet 17 is connected by an offtake conduit 18 with the inlet port of an ordinary globe valve fitting 19 whose outlet port is connected by a conduit 20 with the cooler, or other destination of the mix or liquid. The fitting 19 includes an interior partition 21 formed with a port 22 and a seat 23 for a flat valve 24 by means of which the capacity of the port 22 is determined and regulated. The valve 24 is rotatably connected with the inner end of a stem 25 having threaded engagement with the valve casing of fitting 19 so that by rotation thereof the valve 24 may be adjusted toward and from its seat 23 to regulate the capacity of the port 22 whereby the proper operating conditions may be established. At its outer end the stem 25 may be provided with a handle 26 through which the valve 24 is manually adjusted or set. The conduit 18 communicates with a branch nipple 27 connected at its outer end with a T 28 whose opposite port is connected by a nipple 29, elbow 30 and stop cock 31 with a pressure gauge 32.

The valve 24 is ordinarily set just out of contact with its seat 23 and the homogenized liquid, impelled by the homogenizing pressure, is forced through the constricted passage thus provided between the valve and its seat and the effect of the combined velocity and attenuation of the liquid established and effected by this constriction is to thin out the mix, that is, the liquid is de-viscosed or, in other words, its viscosity is reduced to the desired degree of fluidity.

The valve 24 is properly positioned by making use of the gauge 32 and is gradually closed while the homogenizing machine is in operation until the back pressure created by the valve builds up in the conduit 18 to one hundred pounds as indicated by the gauge 32, and this will be the usual operative position for said valve at which it is left set. As a safeguard against subjecting the gauge 32 to injurious pressures from the conduit 18 a safety valve 33 is provided that is connected with the T 28. This safety valve 33 may be of standard construction provided with a nipple 34 to be screwed into the T 28 and with an outlet 35, the inlet 34 and outlet 35 being normally cut off one from the other by a valve 36 held normally closed on its seat by a spring 37. The abutment for the upper end of this spring 37 is a screw 38 by means of which the effective pressure of the spring 37 may be established as desired. In practice the abutment 38 is adjusted so that the valve 36 opens under a pressure of say three hundred pounds.

The stop cock 31 is provided as means whereby communication between the gauge 32 and the conduit 18 may be so adjusted or regulated that the pulsating pressure within the conduit 18 due to the reciprocatory movements of the piston 4 will not vibrate the hand 39 of the gauge 32. That is, by partially closing the stop cock 31 the movements of the piston 4 are prevented from vibrating the hand 39 and at the same time the latter is free to be adjusted by the pressure within the conduit 18.

The ends of the conduit sections 18 and 20, which may be sanitary piping, are provided with couplings 40 and 41, respectively, to engage with nipples 42 and 43 screwed into the inlet and outlet ports of the valve fitting 19.

The valve 18, for best results, should be placed about 12 inches away from the last homogenizing valve 16.

What I claim is:

1. The method of reducing the viscosity of coagulated liquids which consists in impelling the coagulated liquid through a conduit containing a liquid accelerating constriction, by a pressure insufficient to produce homogenizing effects.

2. The method of preparing ice cream mix which consists in forcing the same through a homogenizing valve by a pressure sufficient to secure homogenizing effects and thereafter reducing the viscosity of the homogenizing mix by passing the same through a constriction under a pressure less than the homogenizing pressure.

3. The combination of a valve fitting whose inlet is adapted to be connected with a supply of coagulated liquid under pressure and having a normally unyielding valve adapted to be adjusted and set so as to maintain a relatively low pressure upon the inlet side thereof that is less than a pressure sufficient to effect homogenizing action, and a pressure gauge connected with the inlet of said valve fitting.

4. The combination of a valve fitting having an inlet adapted to be connected with a supply of coagulated liquid under pressure and including a normally unyielding valve adapted to be adjusted and set to provide a constriction that creates a back pressure less than that sufficient to effect homogenization;

a pressure gauge connected with the inlet of said valve fitting, and a safety valve connected with the inlet of said fitting and operating automatically to open under a relatively low pressure less than that sufficient to effect homogenization.

5. The combination with a pressure pump; a homogenizing valve whose inlet is connected with the outlet of said pump; a conduit connected with the outlet of said homogenizing valve and a liquid viscosity reducing constriction in said conduit which creates a non-homogenizing back pressure less than the homogenizing pressure of said pump.

6. An apparatus constructed in accordance with claim 5 and including a pressure gauge connected with said conduit between the homogenizing valve and said constriction.

7. An apparatus of the character described constructed in accordance with claim 5 and including a safety valve connected with said conduit between said homogenizing valve and said constriction operating automatically to open under a back pressure greater than is sufficient to reduce the viscosity of the liquid discharged into said conduit from said homogenizing valve.

8. An apparatus of the character described constructed in accordance with claim 5 wherein said constriction is adjustable and including a pressure operated indicator connected with said conduit between the homogenizing valve and said constriction for use in adjusting the latter.

9. An apparatus of the character described constructed in accordance with claim 5 and including an automatically operated relief valve connected with said conduit between said homogenizing valve and said constriction.

Signed by me at Boston, county of Suffolk and State of Massachusetts, this 9th day of March, 1927.

EDWARD A. SNOW.