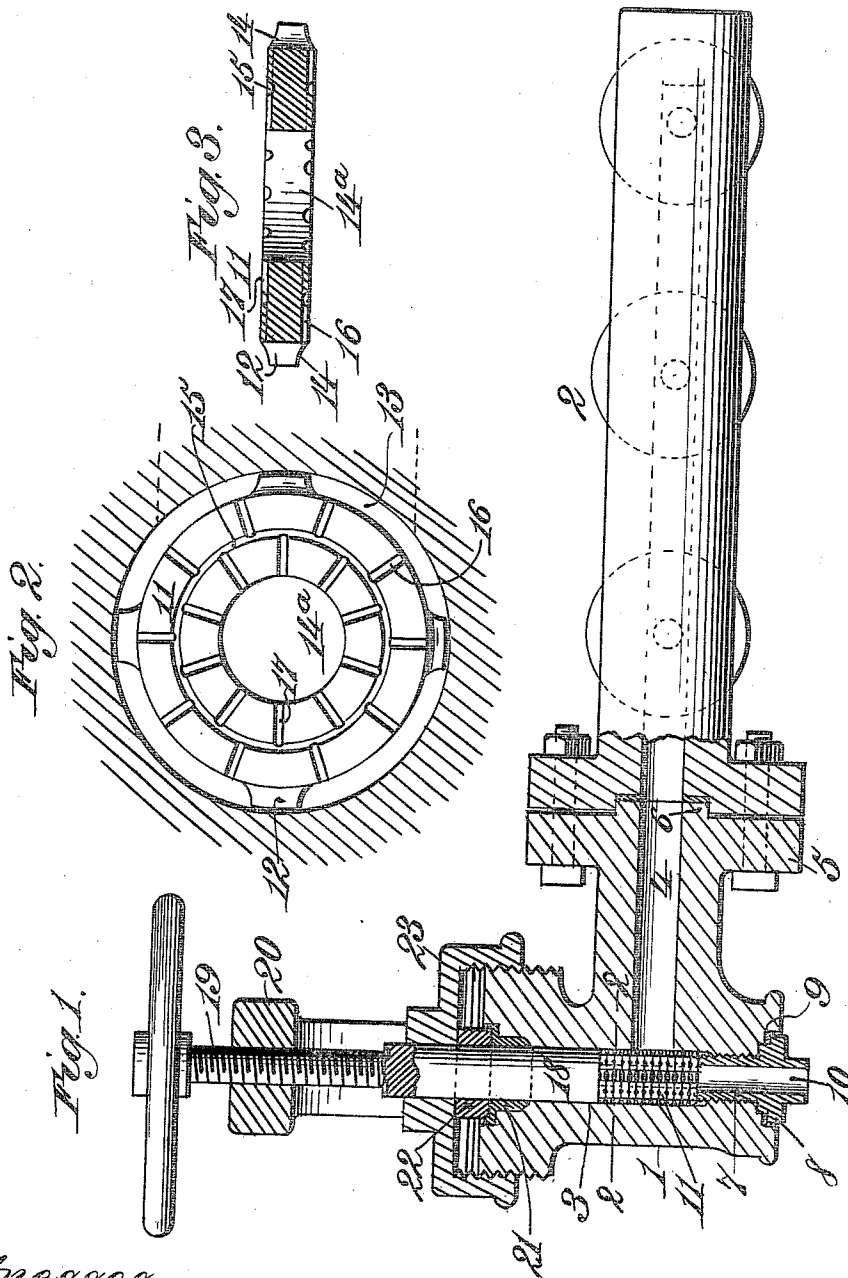


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EMULSIFIER.

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973,328.

Patented Oct. 18, 1910.



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# UNITED STATES PATENT OFFICE.

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## EMULSIFIER.

973,328.

Specification of Letters Patent.

Patented Oct. 18, 1910.

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*To all whom it may concern:*

Be it known that I, JOSEPH WILLMANN, at present a subject of the Emperor of Germany, having announced my intention of becoming a citizen of the United States, residing at Derby, in the county of New Haven and State of Connecticut, have invented certain new and useful Improvements in Emulsifiers, of which the following is a specification.

My present invention relates to an emulsifying apparatus for liquids, such as milk, which contains fat globules, and it has for its object to provide a relatively simple, efficient and reliable apparatus of this character which embodies means for dividing a flowing body of milk, under pressure, into a plurality of relatively minute streams which are directed against the peculiarly arranged surfaces and also against each other at such a velocity as to break up the fat globules to such an extent as to homogenize the product and prevent rising of the fatty constituents to the top of a body of the liquid.

To these and other ends, the invention consists in certain improvements, and combinations and arrangements of parts, all as will be hereinafter more fully described, the novel features being pointed out particularly in the claims at the end of the specification.

In the accompanying drawing Figure 1 represents a sectional view of an emulsifying or homogenizing apparatus constructed in accordance with my present invention; Fig. 2 represents a transverse section on the line 2—2 of Fig. 1 and upon an enlarged scale showing the formation and arrangement of the grooves or passages upon the surface of each disk or element; and Fig. 3 represents a transverse section taken diametrically through one of the emulsifying disks or members.

Similar parts are designated by the same reference characters in the several views.

An emulsifying or homogenizing apparatus constructed in accordance with the present invention is shown in its preferred form in the accompanying drawing, it consisting of a casing 1 and a pump 2, the latter being capable of delivering a flowing body of the milk or liquid to the casing at a relatively high pressure and continuously. The casing 1 in the present instance is provided with a bore 3 which is preferably cylindrical,

and a passage 4 leads to the bore 3 preferably at a perpendicular thereto, this passage 4 communicating with the pump. In the present instance, the casing is provided with a flange 5 and a boss 6 which form a member of a coupling whereby the casing may be firmly attached to the outlet of the high pressure pump.

A shoulder is formed toward the outlet end of the bore 3 preferably by a removable or separately formed bushing 7, the latter being threaded or otherwise tightly fitted into the casing, and it also has a head or flange 8 which bears upon a packing ring 9 so as to form a perfectly fluid-tight fit upon the casing. This bushing has a bore 10 through which the emulsified or homogenized liquid may discharge from the casing, and a delivery pipe or other means may be attached to the bushing 7 to conduct the emulsified liquid to any desired point.

The emulsifying or homogenizing action is produced within the casing by a set of assembled or superposed elements which are held positively in intimate relation under heavy compression and have relatively minute passages or ducts through which numerous streams of the liquid are directed at high velocity and are caused to impinge upon suitable surfaces that will cause disintegration of the fat globules. I preferably employ a set of disks 11 which are duplicates and are mounted or arranged in superposed relation within the bore 3 of the casing. Each disk is flat and its opposed surfaces are ground or formed perfectly true so that when the disks are assembled, they will fit precisely against one another. The periphery of each disk is provided with a suitable number of bosses or lugs 12 which are adapted to rest against the wall of the bore 3 of the casing and thereby center the disks therein and at the same time form a number of segmental circumferentially spaced passages 13 between the set of disks and the wall of the bore. The disks are placed at that point in the bore where the passage 4 communicates therewith, and in order to permit the body of milk flowing from the high pressure pump through the passage 4 to reach all of these segmental passages 13, the faces of the bosses or lugs 12 are reduced or tapered as at 14 whereby means of communication between these circumferentially spaced passages will be established. The center of

each disk is formed with an aperture 14<sup>a</sup> so that when the disks are assembled, a passageway will be formed through the disks which communicates with the outlet passage or bore 10 in the bushing 7. The milk in passing from the circumferential passages 13 to the central passage formed by the apertures 14<sup>a</sup> in the disk is divided into numerous relatively minute streams which travel at a relatively high velocity and such streams are directed against each other and also against surfaces which are so arranged as to cause the disintegration of the fat globules. In the present instance, the dividing of the body of the liquid into the minute streams is effected by forming minute passages or ducts between the adjacent disks. These ducts may be conveniently formed by grooving one or both faces of each disk.

I generally prefer to groove both faces of each disk in order to insure to the greatest degree a thoroughness in the operation and, moreover, the apparatus has a greater capacity in that case. In the present instance, I provide the faces of each disk with an annular or circumferential groove 15 which is preferably concentric with the axis of the disk, and two sets of inwardly extending grooves 16 and 17, the grooves 16 extending from the periphery of the disk to and communicating with the circumferential groove 15, while the inner set of grooves 17 lead from the circumferential groove 15 to the aperture 14<sup>a</sup> in the center of the disk. These two sets of grooves 16 and 17 are preferably arranged in radial relation and they are also staggered with respect to one another, the radial relation of the grooves 16 and 17 to the circumferential groove 15 causing the liquid to be projected into the circumferential groove 15 at a normal, and the staggered or alternating relation of the grooves 16 and 17 will cause the liquid from each groove 16 to be projected abruptly against the wall of the groove 15, whereupon this stream of liquid is divided into equal bodies which flow in opposite directions around the circumferential groove 15 and these divided bodies from one radial groove 16 meet the equal divided bodies of liquid flowing in reverse directions from the adjacent grooves 16 at the entrance to the radial grooves 17, the impact of these equal bodies of liquid at such points insuring complete disintegration of the fat globules and also diverting these streams or bodies of liquid into the grooves 17, this result being secured by spacing one set of radial grooves about the circumferential groove 15 equidistantly or midway between the other set of radial grooves.

The set of disks are held in close and firm positive contact with one another under high compression so as to prevent the liquid from following any other course than through the

passages provided for the liquid, and any suitable means may be provided for producing and maintaining such compression. In the present instance, I provide a plunger 18 the lower end of which rests firmly upon the top of the set of disks and a compression screw 19 bears upon a seat formed upon the top or outer end of the plunger, this compression screw being fitted into a yoke or other suitable support 20 attached to the casing, and a packing is provided for the plunger which will effectively prevent the escape of the liquid under high pressure. This packing in the present instance consists of a cupped packing ring 21 which encircles the plunger 18, a gland 22 bears upon the packing ring, and a nut or cap 23 bears upon the gland 22 and is threaded or otherwise suitably attached to the casing.

I claim as my invention:—

1. An emulsifying or homogenizing device comprising a casing having a passage for conducting a flowing body of liquid and also having a bore communicating therewith, a set of centrally apertured disks assembled in said bore, each disk having a face formed with a circumferentially extending groove, and sets of inner and outer radially extending grooves arranged in alternating relation, the radial grooves of one set communicating with said circumferential groove at points equidistantly between the points where the other set of radial grooves communicate with said circumferential groove, and means for maintaining a positive compression upon the assembled disks to cause the liquid to flow solely through said grooves in the faces of the disks.

2. An emulsifying or homogenizing device embodying a casing provided with a passage for conducting a flowing body of liquid and also having a cylindrical bore communicating with said passage, a set of disks assembled in superposed relation in said bore, each disk having an inner aperture for the passage of liquid and also having intimately engaging faces, a face of each disk being formed with a circumferentially extending groove and sets of inner and outer radially extending grooves arranged in alternating relation, the radial grooves of one set communicating with said circumferential groove at points equidistantly between the points where the other set of radial grooves communicate with said circumferential groove, said grooves constituting the sole means of communication for the liquid between said bore of the casing and the inner apertures of the disks, the major portion of each disk being smaller in diameter than said bore in the casing and having a plurality of circumferentially spaced bosses which cooperate with the wall of said bore and thereby center and position the disks in proper relation to one another within the

bore, and means for maintaining a positive compression upon the assembled disks to cause a flow of liquid solely through the grooves in their faces.

- 5 3. An emulsifying or homogenizing device comprising a casing provided with a passage for conducting a flowing body of liquid and also having a cylindrical bore communicating with said passage, a bushing  
10 formed separately from the casing and removably threaded therein at one end of said bore and in axial alinement therewith, a set of disks assembled in said bore, each disk  
15 having an inner aperture for the passage of the liquid and also having intercommunicating radial and circumferential passages formed in its face for conducting liquid between said bore and said inner aperture,

the major portion of each disk being less in diameter than that of the bore, each disk 20 having a set of circumferentially spaced bosses which fit closely within and cooperate with the walls of said bore to center and maintain the assembled disks in proper operative relation, and means acting upon the 25 assembled disks to positively maintain their faces in intimate relation to cause the liquid to flow solely through said passages.

In testimony whereof I have hereunto set my hand in presence of two subscribing 30 witnesses.

JOSEPH WILLMANN.

Witnesses:

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CHAS. S. HYER.