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F. E. LICHTENTHAELER
APPARATUS FOR MIXING LIQUIDS

Filed Sept. 28, 1923

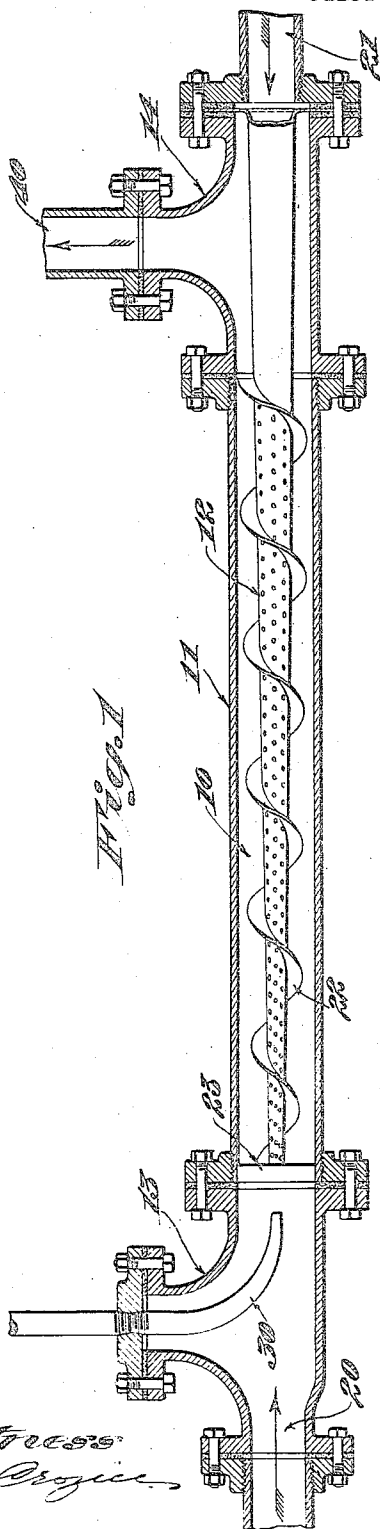
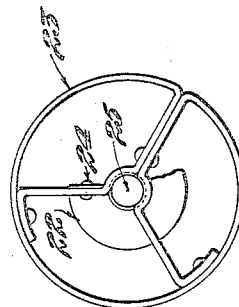
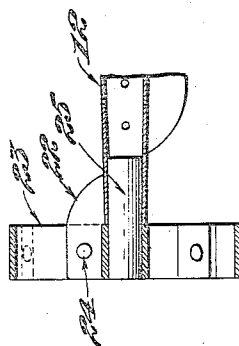
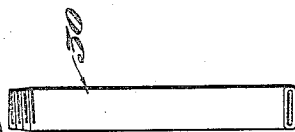


Fig. 1

Fig. 2

Fig. 3

Fig. 4



Witness:
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UNITED STATES PATENT OFFICE.

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APPARATUS FOR MIXING LIQUIDS.

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To all whom it may concern:

Be it known that I, FRANK EDWARD LICHTENTHAELER, a citizen of the United States, residing at Newton Highlands, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Apparatus for Mixing Liquids; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to apparatus for mixing liquids.

The object of the invention is to produce an apparatus for intimately mixing two liquids together, and to this end the invention consists in the apparatus hereinafter described and particularly defined in the claims.

In the accompanying drawings illustrating the preferred form of the invention, Fig. 1 is a longitudinal sectional elevation of the apparatus; Figs. 2, 3 and 4 are details hereinafter referred to.

The illustrated embodiment of the invention is described as follows: The apparatus consists of a mixing chamber 10 enclosed in a casing 11 into which a perforated sparger 12 is introduced. At one end of the casing 11 is mounted the inlet T 13, and at the other end is mounted the outlet T 14. One of the liquids is introduced at 20 and flows in the direction of the arrow to the mixing chamber, where it begins to mix with the liquid introduced at 21, which latter liquid flows into the sparger. The sparger is provided with a large number of small holes through which the second liquid is discharged in fine streams into the first liquid entering at 20. The sparger is tapered from end to end, as shown, so that the first liquid entering at 20 accelerates in velocity as it passes by the sparger. The sparger is provided with a helical vane which causes the first liquid to take up a rotary motion as it passes through the mixing chamber. The extreme end of the sparger is supported in a spider 23, shown in elevation in Fig. 2 and in section in Fig. 3. As shown, it consists of a single

piece of copper bent to form a support for the small end of the sparger to which the vane is riveted at 24. The end of the sparger is plugged by the rod 25 which closes its end, causing all of the second liquid to be discharged into the first liquid through the perforations in the sparger.

The inlet T is provided with an injector pipe 30 for the admission of steam for the purpose of heating or sterilizing or promoting flow of the first liquid, if desired. An elevation of the injector pipe 30 is shown in Fig. 4.

The particular embodiment of the invention illustrated in the drawings is designed for the mixing of molasses wort, the molasses being the liquid above referred to as the first liquid which enters at 20, and the water being the second liquid which enters at 21. Steam is introduced through the injector pipe 30. Molasses flowing by gravity from an elevated tank or introduced by means of a pump, flows in at the inlet T and passes through the spider, its motion being accelerated if necessary by the injector 30, and it begins there to take up the helical motion by reason of the vane 22, which is wound around the sparger pipe. The water is introduced through the sparger and is discharged in small jets into the whirling mass of molasses, the latter being presented to the water in thin layers so as to secure the intimate admixture of the water and the molasses. In addition it is to be observed that the vane on the sparger is a uniform distance from the surface of the sparger, and so, therefore, it approaches closer and closer to the walls of the casing 11 as it passes through the mixing chamber. This coerces more and more, therefore, the whirling motion of the molasses and the efficient mixing of the water and molasses. As the molasses moves through the mixing chamber from the entering end toward its discharge end, its velocity increases, as the cross-section of the mixing chamber for the outflow of the mixture is smaller than the cross-section for the inflow of the mixture. Violent turbulence of the materials is availed of to secure the intimate mixing of the molasses and water.

The water is admitted under pressure from an elevated tank or from a pump. The amounts of water and molasses are determined in the ratio of the mixture desired, and as they flow into the mixer the mixing is completed and the intimate mixture formed in the apparatus is discharged at the outlet 40.

The apparatus commends itself by reason of the small amount of power required to effect an intimate mixture of the liquids. This is secured by the presentation of the liquids in small and determined fractions to each other in such manner that one liquid is projected in small streams into thin layers of the other liquid, the spiral motion of the liquid and the increase of velocity with which it flows out of the discharge end over that at which it entered at the inlet end of the mixing chamber contributing to the efficient operation of the apparatus.

The invention is adapted for mixing different kinds of liquids together. It may be efficiently used not only for mixing molasses wort, but also for mixing alcohol and ether and also for mixing alcohol and a denaturant. In fact, the injector pipe may be availed of for the purpose of introducing a third liquid, so that the mixture will comprise two main bodies of liquid and a third liquid, as, for example, the apparatus may be used for the mixing of ethyl alcohol introduced at the right hand end, wood alcohol introduced at the left hand end, and pyridine introduced by the injector pipe. These liquids so introduced may be efficiently and intimately and homogeneously mixed by the apparatus.

The invention is not limited to the particular embodiment in which it is illustrated, but may be embodied in other forms within the purview of the invention as defined in the claims.

Having thus described the invention, what is claimed is:

1. An apparatus for mixing liquids having, in combination, a mixing chamber, means for admitting a liquid to one end of the mixing chamber, means for admitting another liquid into the other end of the chamber, and means for projecting fine streams of the latter liquid into the stream of the first liquid as it flows through the mixing chamber.

2. An apparatus for mixing liquids having, in combination, a mixing chamber, means for introducing one liquid to one end of the mixing chamber, means for introducing a second liquid into the mixing chamber, and a stationary vane for setting up a whirling motion in the liquids as they pass through the mixing chamber.

3. An apparatus for mixing liquids having, in combination, a mixing chamber having an opening at one end to receive one

liquid, an opening at the other end to receive a central pipe through which a second liquid is introduced into the mixing chamber, said pipe being provided with a large number of small holes through which the second liquid is discharged in fine streams into the moving body of the first liquid.

4. An apparatus for mixing liquids having, in combination, a tube, means for introducing one liquid at one end of the tube, a perforated pipe for introducing a second liquid into the tube, and a vane in the tube for causing the liquids to take up a whirling motion as they pass through the mixing chamber.

5. An apparatus for mixing liquids having, in combination, a mixing chamber provided with an opening at one end for the admission of one liquid, and provided with a second opening at the other end for the discharge of the liquid, and a sparger introduced through the second end tapering from the second end to the first, said sparger being provided with small holes through which the second liquid is discharged in fine streams into the moving body of the first liquid.

6. An apparatus for mixing liquids having, in combination, a mixing chamber provided with an opening at one end for the admission of one liquid, an opening at the other end through which a sparger enters the mixing chamber for introducing a second liquid into the mixing chamber, the sparger being provided with a discharge opening for discharging a second liquid into the stream of the first liquid, a vane in the mixing chamber for causing the liquid passing therethrough to take up a whirling motion.

7. An apparatus for mixing liquids having, in combination, a mixing chamber provided with an opening at one end for the admission of liquid, an injector pipe directing the flow of fluid in the direction toward the inlet opening of the mixing chamber for supplying fluid to the entering liquid, a sparger entering the mixing chamber from the other end tapering from end to end provided with a large number of small holes to discharge fine streams of the second liquid into the stream of the first liquid.

8. An apparatus for mixing liquids having, in combination, a mixing vessel having openings at opposite ends, the opening at one end affording admission for one of the liquids, and the opening at the other being provided with a sparger through which the second liquid is introduced into the mixing chamber, the cross-sectional area of the chamber being reduced toward its discharge end so as to thereby to secure the increased velocity of flow of the liquid as it travels through from the mixing chamber.

9. An apparatus for mixing liquids hav-

ing, in combination, a mixing chamber consisting of a piece of pipe having an opening at one end for admission of one or more liquids, and an opening at the other end 5 through which a tapered pipe enters provided with holes through which a second liquid is discharged into the mixing chamber, the tapered pipe being provided with a helical vane for setting up a whirling action in the liquid flowing through it, and the 10 taper of the pipe acting to increase the velocity of the flow of liquid as it is discharged at the discharge end of the mixing chamber.

FRANK E. LICHTENTHAELER.