

July 21, 1953

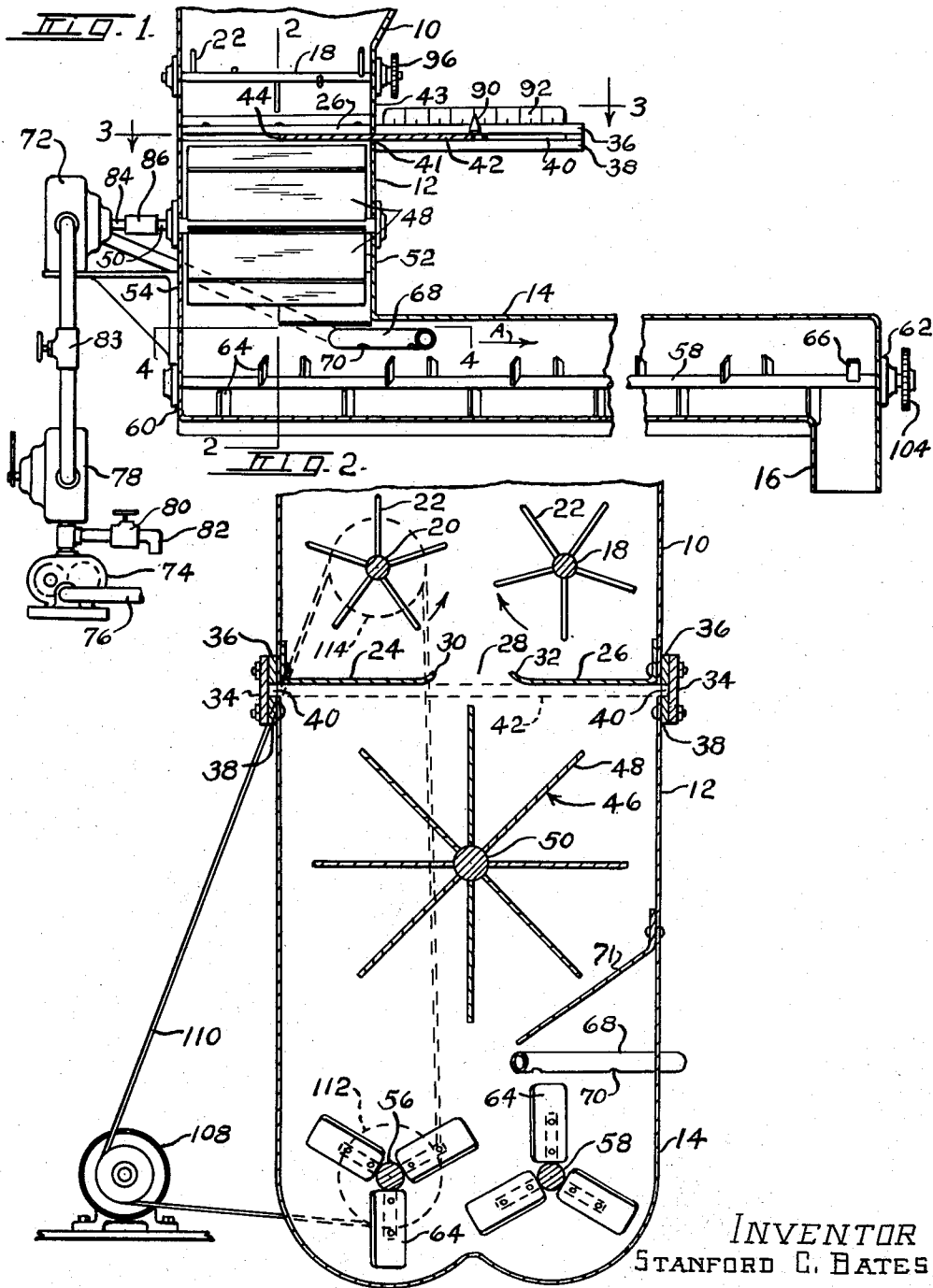
S. C. BATES

2,646,260

FEED MIXING APPARATUS

Filed Feb. 15, 1951

2 Sheets-Sheet 1



INVENTOR
STANFORD C. BATES

BY *F. D. Keiper*

ATTORNEY

July 21, 1953

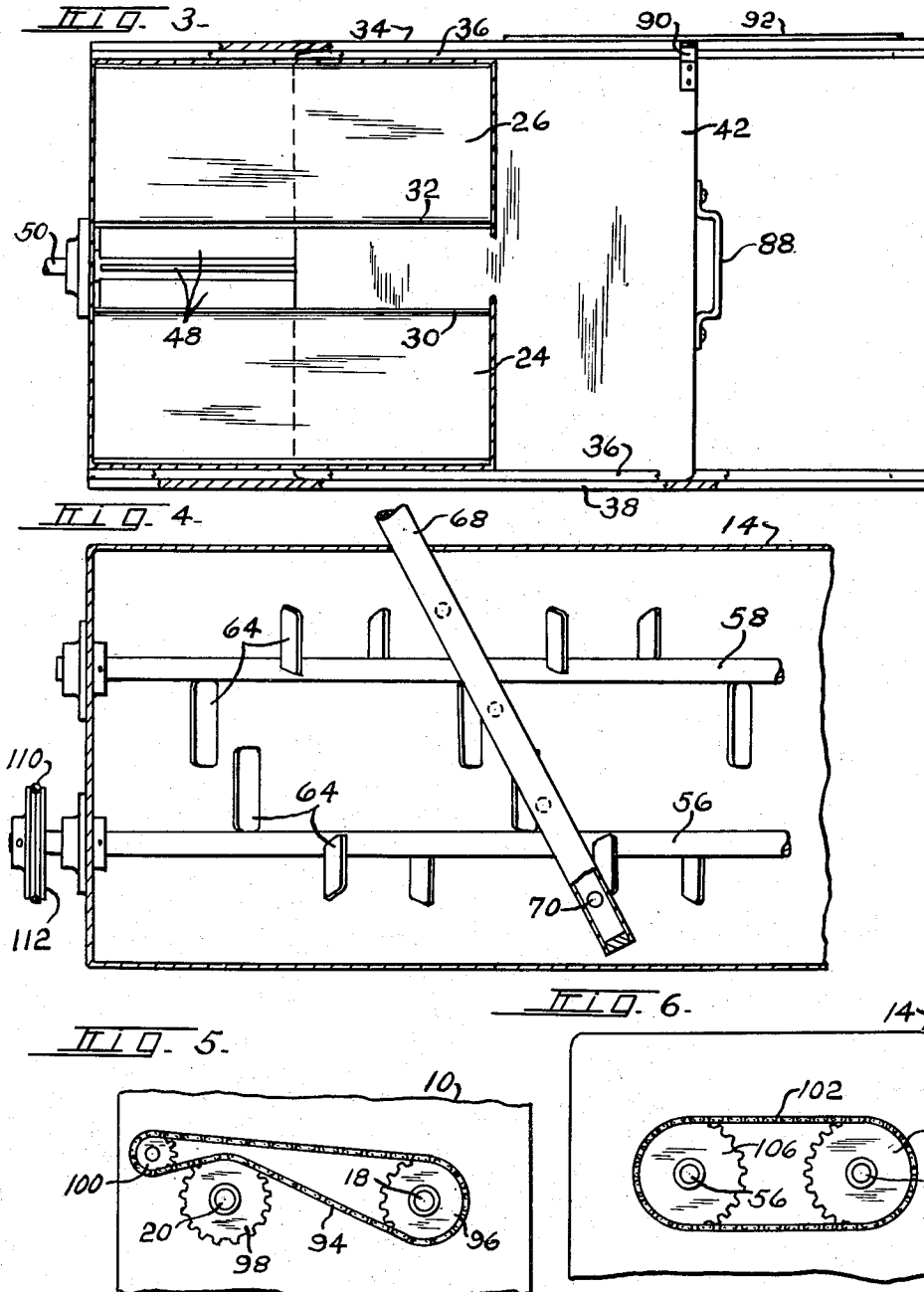
S. C. BATES

2,646,260

FEED MIXING APPARATUS

Filed Feb. 15, 1951

2 Sheets-Sheet 2



INVENTOR
STANFORD C. BATES

BY *F. D. Keiper*
ATTORNEY

UNITED STATES PATENT OFFICE

2,646,260

FEED MIXING APPARATUS

Stanford C. Bates, Rome, N. Y.

Application February 15, 1951, Serial No. 211,169

3 Claims. (CL 259—9)

1

This invention relates to feed mixing apparatus, and more particularly to apparatus adapted to mix feed with liquids such as molasses while maintaining a uniform volumetric ratio.

In feed mixers utilized for mixing molasses with mixed dairy feeds comprising bran, gluten, hominy, distillers grain, and the like, great difficulty is had in producing a mixture having uniform or desired proportions. The variations in the viscosity of molasses or other liquids such as corn syrups and the like to be mixed, due to temperature and other factors, has rendered accurate control by ordinary methods an impossibility. The varying cost of molasses makes it desirable to control the proportions closely. Also it is desirable to have a uniform feed and mix, since when the proportions of molasses, for example, get out of hand, the mixed product may be unduly sticky, rendering it difficult to pack. Since the proportions in practice may vary from 5% to 15% by weight, uniformity in the continuous mixing process is highly desirable, to prevent a too-sticky mix, or a mix lacking in the quantity or percent of molasses bargained for.

An object of the present invention is to provide relatively simple apparatus for effectively and continuously introducing molasses or the like into a feed mixer in strict proportion to the quantity of feed being introduced.

A further object of the invention is to provide apparatus of the type described, wherein any desired proportions may be continuously introduced for mixing, and in which the proportions may be readily varied to suit varying demands.

A further object of the invention is to provide a feed mixer in which the quantity of liquid supplied controls the quantity of feed introduced, and in which common metering apparatus serves to control the feed introduced.

A further object of the invention is to provide apparatus of economical construction, rugged in design, and in which protection against jamming of the liquid measuring meter is provided.

Still another object of the invention is the provision of a feed measuring gate mechanism, the power requirements for operation of which are negligible, and which may be drivably connected to the indicator shaft of a common metering device acting as a motor.

The above and other novel features of the invention will appear more fully hereinafter from the following detailed description when taken in conjunction with the accompanying drawings.

2

It is expressly understood that the drawings are employed for purposes of illustration only and are not designed as a definition of the limits of the invention, reference being had for this purpose to the appended claims.

In the drawings, wherein like reference characters indicate like parts:

Figure 1 is a longitudinal sectional view of the apparatus;

Figure 2 is an enlarged transverse section taken substantially on the line 2—2 of Figure 1;

Figure 3 is a horizontal section taken substantially on the line 3—3 of Figure 1;

Figure 4 is a horizontal view taken substantially on the line 4—4 of Figure 1;

Figure 5 is a fragmentary end view of the upper portion of the apparatus shown in Figure 1; and

Figure 6 is a fragmentary end view of the lower portion of the apparatus shown in Figure 1.

Referring to Figure 1, there is shown a hopper 10 adapted to receive feed from a bin located above or by conveyor, a measuring chamber 12 located therebelow, and an elongated mixing chamber 14, one end of which is beneath the measuring chamber 12 and the other end of which is adapted to discharge as at 16 into dispensing apparatus such as bag filling mechanism. The hopper 10 may be of rectangular cross-section, and is provided with a pair of spaced shafts 18 and 20, preferably driven in opposite directions and journaled in the opposite side walls of the hopper. Each of the shafts is provided with a plurality of beater arms 22 arranged upon the shafts in staggered relation along the length. The hopper 10 is provided with a bottom wall composed of opposed shelf-like members 24 and 26 which provide an opening or outlet 28 of elongated rectangular shape centrally of the bottom of the hopper. The shelf-like members may have upwardly turned edges 30 and 32.

The hopper 10 is mounted upon the measuring chamber 12 by two connecting strips 34 on opposite sides, the connecting strips being spaced by reinforcing laterally spaced edge strips 36 and 38, the structure providing guideways 40 on opposite sides between the top of the measuring chamber and immediately below the bottom of the hopper, and a narrow slit 41 between the wall 43 of the hopper and the wall 52 of the chamber. The strips 36 and 38 and the connecting strip 34 are extended laterally away from the hopper 10 and measuring chamber 12 to provide extended guideways adapted to re-

ceive a sliding plate 42 adapted to enter through the slit 41. Such plate may be manually positioned so that its inner edge 44 will control the length of the rectangular opening 28.

In the measuring chamber 12, there is provided a measuring device in the form of a revolving gate 46, such gate comprising a series of rectangular radially extending blades 48 mounted upon a shaft 50 journaled in the opposite walls 52 and 54 of the measuring chamber. The axis of the shaft 50 is substantially parallel to the longitudinal dimension of the rectangular opening 28 and mounted substantially beneath such opening a distance slightly greater than the radial length of the blades 48. The blades 48 extend substantially from wall to wall.

The measuring chamber is mounted directly above one end of the mixing chamber 14, so that feed measured by the revolving gate 46 is dropped into the end of the mixing chamber. Extending lengthwise through the length of the mixing chamber are beater shafts 56 and 58 journaled in the end walls as at 60 and 62, such beater shafts having a plurality of paddles or blades 64 suitably inclined to drive the feed and mix the same lengthwise in the direction of arrow A within the mixing chamber. The end paddles such as 66 may be pitched at substantially 90° so as to propel the mixture downwardly into the discharge outlet 16. At the head end of the mixing chamber, there is positioned a liquid supply conduit 68 having a number of outlet ports 70, such conduit being adapted to feed liquids such as molasses to the mixing chamber in the inlet end, so that as the feed and molasses are progressed along the length of such chamber, the feed and molasses become intimately and uniformly mixed. To prevent molasses or molasses-laden feed from inadvertently coming in contact with the gate 46, a splash guard 71 may be positioned beneath one side of the gate.

The viscosity of molasses varies widely with temperature, and in order to assure uniform proportions between the feed and molasses or other liquid, a feature of the invention resides in the driving of the revolving gate 46 from a volumetric metering device such as 72 arranged in the supply conduit 68. In practice, it is usual to supply molasses to the mixing chamber under pressure, as by a gear pump 74 drawing molasses from a supply duct 76. Such gear pump may deliver fluid under pressure through a metering device 78 and thence to the metering device 72, the shaft of which is directly connected to the revolving gate 46. The pressure developed by the gear pump 74 may be regulated by a pressure regulating valve such as 80, with a return connection 82 to the source of supply. The rate of flow may be controlled by the valve 83.

The metering device 72 is of the common well-known displacement type having a shaft 84 driven by the flow of liquid therethrough, the rotation of the indicator shaft 84 being in direct proportion to the volume of the liquid passing through the meter. The meter acts as a motor. The shaft 84 is coupled with the shaft 50 through a resilient sleeve 86 of rubber or rubber-like material, whose grip upon the respective shafts is such as to provide a positive drive under normal circumstances, but which will also permit slippage should the rotary gate 46 become jammed by reason of foreign matter interfering with the rotation of the blades. It will be appreciated that the shaft 84 of the meter acting as a motor 72, in apparatus commonly on the market, does

not provide any great amount of torque since the function of such meter is ordinarily to serve as an indicator. However, the revolving gate construction described requires substantially no torque to cause rotation thereof in the measuring of feed delivered to it from the hopper, and in fact, the gravity movement of the feed into the gate has to some extent a tendency to assist the gate in its rotation. Thus, the meter 72 in driving the gate is not loaded to any appreciable extent and serves as a satisfactory medium for either driving the gate or constraining it in its rotation to a rotation speed directly proportional to the flow of molasses or other substance through the meter 72. The coupling 86 may be provided with clamping devices such as hose clamps to tighten the grip to any desired degree upon the respective shaft ends, so that the actual torque transmittable can be set, before slippage, so that the meter will be protected against any possible overload.

It will also be appreciated that feed such as bran and other grains will tend to fill the spaces between the adjacent vanes of the gate, the nature of the substance being such that when the space is filled, no more substance will flow because of the natural tendency of the feed to pile up and not to seek a common level. It is only essential that the gate be placed sufficiently near the opening 28 so that the construction effectively prevents feed from being delivered through the measuring chamber except by rotation of the gate and the successive filling of the angular spaces between the adjacent vanes. It will thus be seen that the revolving gate will accurately measure the quantity of feed passed thereby, and that the quantity will be in direct proportion to the rate of rotation of the gate and the flow of molasses or other liquid through the metering device or motor 72.

Since it is desirable to change the proportions between the molasses or other liquid and the quantity of feed continuously passed through the apparatus to suit various customer requirements, there is provided the plate 42 which is slidably mounted in the guideways 40, which plate may be positioned so as to control the length of the rectangular opening 28. The exposed end of the plate is provided with a handle 88 so as to render the same readily movable to whatever position is desired, and the plate may have affixed to one edge thereof an indicator 90 cooperating with a scale 92, so that an operator may set the plate at any desired position to provide or regulate the rate of feed through the rectangular opening 28. It will thus be seen that not only will the proportions between the liquid and feed be closely controlled by the revolving gate and the direct connected meter 72, but also the proportions may be at will changed in order to supply a mixture of any particular percentage desired by the customer.

The beater shafts 20 and 18 are indicated as driven in reverse directions, and such reverse rotation is obtained by a chain drive 94 meshing with sprockets 96 and 98 on the ends of the shafts 18 and 20, the chain extending over an adjustable idler sprocket 100. The beater shafts 56 and 58 may be driven in the same direction by a chain 102 linking together sprockets 104 and 106 mounted on the ends of the shafts 56 and 58. A source of power for driving the beater shafts 18 and 20 and the mixer shafts 56 and 58 is provided in the form of a motor 108 having a

belt drive 110 to pulleys 112 and 114 on the shafts 56 and 20, respectively.

The operation of the apparatus will appear from the foregoing description. It will be understood, however, that the beater arms 22 in the hopper 10 serve the purpose of agitating the feed and breaking up any tendency of lumps whereby the feed will uniformly drop through the rectangular opening 28 at a rate sufficient to completely fill the angular spaces formed by the blades or vanes of the rotating gate 46. It will also appear that the mixing shafts 56 and 58 with their respective blades will thoroughly commingle the feed and molasses in causing this mixture to move to the outlet end of the mixing chamber.

The arrangement shown comprises a relatively compact organization in which the feed is directly fed to the meter driven gate and thereafter discharged into the mixing chamber. It will, of course, appear that a metered quantity of feed might be conveyed by a conveyor to a mixing chamber at a distant point, and that the unitary arrangement shown is not essential to securing the advantages of accurate proportioning by the mechanism described.

It will be seen that the percentage proportions for which the apparatus may be set may be readily checked by comparing the weight of the delivered material over a short period of time with an indicator such as 78, and that once a specific percentage has been established, the apparatus can be relied upon to maintain such percentage continuously.

Although a single embodiment of the invention has been illustrated and described, it is to be understood that the invention is not limited thereto. As various changes in the construction and arrangement may be made without departing from the spirit of the invention, as will be apparent to those skilled in the art, reference will be had to the appended claims for a definition of the limits of the invention.

What is claimed is:

1. A feed mixing apparatus comprising, a feed supply hopper having a bottom wall provided with an elongated rectangular discharge opening, means for fluffing feed within said hopper to continuously supply a quantity of feed for discharge through said opening, a measuring chamber located beneath said hopper and having end walls extending downwardly from the hopper and arranged transversely of the opening at either end thereof, a revolving gate journaled in said end walls on a shaft extending parallel with the longitudinal dimension of said opening and spaced below said opening, said gate comprising rectangular radial vanes uniformly angularly spaced on said shaft of a radial width to sweep close to said opening, and of an axial length commensurate with the length of said opening, plate means slidably mounted between said hopper and measuring chamber and immediately adjacent said bottom wall for regulating the length of said opening, a mixer chamber beneath said gate having conduit means for supplying a liquid medium to be mixed with feed in said chamber, means for supplying a liquid medium through said conduit means under pressure, a liquid flow motor in said conduit means having a rotary shaft rotatable exactly in proportion to the flow of liquid through said motor and conduit means, and means connecting said shaft with said gate en-

tirely independent of said pressure supply means, whereby said gate is driven or retarded by said shaft, and rotated in direct proportion to the flow of liquid medium through said motor and conduit means.

2. A feed mixing apparatus comprising, a feed supply hopper, power driven beaters mounted in said hopper, said hopper having a bottom wall provided with an elongated rectangular discharge opening, means for regulating the size of said opening, a feed flow measuring chamber beneath said hopper, a multi-bladed revolving gate mounted in said measuring chamber, said gate having a shaft extending longitudinally beneath said opening, and having a plurality of rectangular radial blades equally spaced angularly around said shaft of an axial length commensurate with said opening, said shaft being located a distance beneath said opening slightly greater than the radius of said blades, and said gate having a tendency to rotate by the weight of feed contained therein, a mixing chamber adapted to receive feed discharged from said measuring gate, conduit means for introducing molasses into said mixing chamber, a source of molasses under pressure connected to said conduit means, and motor means in said conduit means directly responsive to the quantity of flow of molasses in said conduit means, said motor means having a shaft driven in direct proportion to the quantity of flow of molasses through said motor and conduit means, and means connecting said driven shaft to said gate shaft to provide a sole means for rotating said gate, or constraining the rotation of said gate to angular movement directly proportional to the flow of molasses in said conduit means.

3. A feed and liquid mixing apparatus comprising, a feed supply hopper, having an outlet, a mixing chamber, rotary means associated with said outlet and interposed between said hopper and chamber for controlling the rate of delivery of feed to said chamber from said hopper in quantities proportional to movement of said means, power means for delivering liquid into said chamber for mixing with said feed, including a discharge conduit, liquid flow motor means having a shaft interposed in said conduit, means for connecting said shaft to said rotary means, said shaft of said motor means being adapted to rotate in direct proportion to flow of liquid through said motor means and drive or constrain said rotary means to movement in direct proportion to liquid flow through said motor means, whereby feed delivery and liquid delivery are maintained in fixed proportion.

STANFORD C. BATES.

References Cited in the file of this patent UNITED STATES PATENTS

Number	Name	Date
857,742	Lanquist	June 25, 1907
1,023,411	Behrmann	Apr. 16, 1912
1,413,345	Morris	Apr. 18, 1922
2,032,900	Alger	Mar. 3, 1936
2,073,779	Bramsen	Mar. 16, 1937
2,164,257	Riza	June 27, 1939
2,237,787	Marshall	Apr. 8, 1941
2,276,237	Lowry	Mar. 10, 1942
2,507,290	Wright et al.	May 9, 1950