

Dec. 10, 1929.

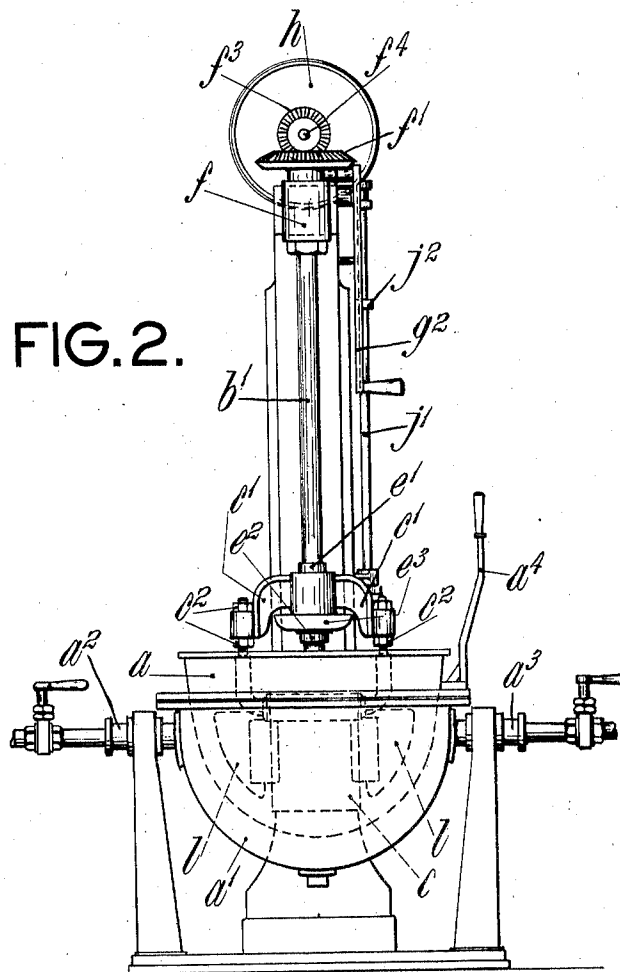
R. HEAD

1,738,898

MIXING APPARATUS

Filed May 9, 1925

2 Sheets-Sheet 2



INVENTOR:

Ronald Head.

ATTORNEY: W. H. H. H. H.

UNITED STATES PATENT OFFICE

RONALD HEAD, OF LONDON, ENGLAND, ASSIGNOR, BY MESNE ASSIGNMENTS, TO BAKER PERKINS COMPANY, INC., OF SAGINAW, MICHIGAN, A CORPORATION OF NEW YORK

MIXING APPARATUS

Application filed May 9, 1925; Serial No. 29,039, and in Great Britain May 29, 1924.

This invention relates to mixing apparatus for dry, liquid, or semi-liquid substances and the object is to provide an apparatus which will produce an efficient circulation of the substance under treatment without however permitting a swirling motion of said substance in the pan or other vessel in which the mixing operation is taking place.

The invention comprises, in conjunction with a receptacle containing an axially disposed helical mixing member, a non-rotatable sleeve or the like surrounding said mixing member and forming an open ended chamber or tunnel in which the mixing member rotates, deflecting means being also provided adjacent an end of said chamber the action of the parts being such that the substance under treatment is caused to circulate endwise through said chamber in one direction and is reversed outside said chamber whereby swirling motion is reduced to a minimum.

The invention also comprises other features of construction, arrangement and combinations of parts all as set forth in appended claims and hereinafter described with reference to the accompanying drawings in which:

Fig. 1 is a side elevation with parts in section; Fig. 2 is a front elevation and Fig. 3 a plan view of Fig. 1.

The apparatus shown in the drawings comprises a receptacle or pan *a* suitably of hemispherical shape as shown or of cylindrical or conical form and suitably open at the top if required. The said receptacle is jacketed at *a*¹ for reception of a tempering medium such as steam which is admitted and exhausted through hollow trunnions *a*² *a*³ about which the receptacle may also be tilted as by means of a lever *a*⁴. When not tilted the receptacle is held in operative position by a suitable catch *a*⁵. The receptacle *a* normally contains an axially disposed and rotatable, continuous or broken bladed worm, screw, or helical mixing member *b* which is closely surrounded by a non-rotatable but axially adjustable sleeve or the like *c* which forms an open ended chamber or tunnel in which the worm or screw revolves, there being provided above said worm or screw and the sleeve, a baffle or

deflecting member *d* the periphery or outer part of which is downwardly directed as at *d*¹. The sleeve *c* is of such size as to leave a space *x* below between its lower edge and the receptacle base and another space *y* above between its upper edge and the baffle.

The material to be mixed is placed in the receptacle and is carried by the worm *b* up through the tunnel formed by the sleeve *c* and out at the top, being then directed by the baffle *d* downwardly outside the tunnel back to the lower end thereof and again up through same, thus being maintained in continuous circulation without to any extent causing a swirling motion of the substance round the receptacle.

The sleeve *c* is mounted to be adjustable vertically in relation to the worm *b* and baffle *d*, this being suitably effected by carrying said sleeve on arms *c*¹ adjustably connected by bolts and nuts *c*² to a bracket *e*. By this means the spaces *x* and *y* at the top and bottom of the sleeve may be varied according to the kind of substance under treatment. The baffle *d* is mounted on a vertical shaft *b*¹ carrying the worm *b* and this mounting is shown as of an adjustable character by threading the baffle *d* on a screwed portion of the shaft *b*¹ and fixing in position by a set-screw *b*² so that the position of the baffle in relation to the sleeve and worm may be altered to provide in all cases ample space for the circulation of the substance whatever the position of adjustment of the sleeve.

Alternatively to the above the action of the worm may take place in the reverse direction, that is to say, the circulation of the substance may be downward in the tunnel and upward outside same.

The shaft *b*¹ carrying the worm is shown as having one of its bearings in the bracket *e* there being provided below the bearing a drip cup *e*³ to collect lubricant and prevent it falling into the receptacle *a*. Collars *e*¹ *e*² are provided on the shaft at each side of the bracket so that the shaft may be raised and lowered therewith as hereinafter explained. The shaft *b*¹ also has bearing in another upper bracket *f* and is rotated by bevel gears *f*¹ *f*², the former carried in

the bracket and slidably mounted on a shaft by means of a spline f^2 . The bevel wheel f^3 is mounted on a shaft f^4 carried in bearings f^5 on the bracket f and is attached to one element f^6 of a clutch, which co- operates with another clutch element g slidably splined on said shaft f^4 and under the action of a shift lever g^2 . The shaft f^4 also carries step pulleys h and is driven by a belt h^1 from other step pulleys h^2 by driving shaft h^3 or any other appropriate driving mechanism may be used. On the shaft f^4 are further loosely mounted two bevel-wheels i^1 which engage a bevel-wheel i^2 on a screw shaft i^3 connected to the lower bracket e and between the bevels i^1 i^2 is slidably splined a dog clutch i^4 adapted to co-operate with dogs on the side of one or other of said bevels. The dog clutch is slid into engagement with one or other of the bevels by means of a bell-crank j connected to an operating rod j^1 provided with stop abutments j^2 .

By the construction described the shaft b^1 can be driven from the shaft f^4 when the clutch elements f^6 and g are engaged or stopped when disengaged and by operating the rod j^1 the screw shaft i^3 may be driven in one or other direction through the respective pairs of bevels i^1 i^2 or i^1 i^2 to raise or lower the bracket and consequently the shaft b^1 with the worm b and baffle z . When these parts have been raised sufficiently to clear the receptacle a as at the end of a mixing operation, the receptacle may be tilted to discharge the contents and is free for cleaning or other purposes.

With the above mechanism there may also be used rotatable scraping means for cleaning the interior of the receptacle during the mixing operation. These means may comprise one or more arms k mounted on the shaft b^1 and in substantially close contact with the interior wall or base of the receptacle. The arms k may however be driven at a variable speed in relation thereto to the worm if desired. When driven as illustrated in unison with the worm which may revolve at a high speed, (although means may be provided for varying this speed as by means of the step pulleys mentioned) and in order to further minimize any tendency to produce a swirling motion of the substance, there may be provided in the receptacle outside the worm and its enclosing sleeve fixed baffle plates l two of which are shown mounted on the exterior of the sleeve c , but sufficient being provided to prevent such swirling. The baffles are however, so shaped or of such size as not to impede the circulating action of the substance as previously explained. If variable speed is imparted to the scraper arms k the baffles may probably not be needed as the speed of the scraper arms can be reduced to avoid any swirling motion.

In the above description it has been assumed that the apparatus is of the vertical type; that is, the worm revolves about a vertical axis, but the invention is equally applicable to forms in which the worm rotates about a horizontal or inclined axis, the function being the same in all cases and requiring but slight modifications in the arrangement of the parts.

The worm or screw may if desired be caused to rise and fall whilst revolving if the machine is of the vertical type or to move endwise if working horizontally or on an inclined axis.

What I claim as my invention and desire to secure by Letters Patent of the United States is:—

1. In a mixing apparatus, a mixing chamber, an open ended sleeve positioned axially of the mixing chamber, means for mounting said sleeve whereby it may be adjusted relatively to the bottom of said receptacle, a rotatable helical mixing member mounted within said sleeve, a shaft for driving said helical mixing member, and a deflector carried by said shaft and adjustable therealong with respect to one end of the sleeve to control the discharge of material from the adjacent end of the sleeve.

2. In a mixing apparatus, a mixing receptacle, an axially disposed open ended sleeve mounted in said mixing receptacle, a helical mixing member mounted in said sleeve and serving to cause a circulation of material acted upon therethrough, a deflector adjacent one end of said sleeve, means for adjusting the sleeve relatively to the bottom of the mixing receptacle to control the rate of flow to the lower end of the sleeve, and means for adjusting the deflector relative to the upper end of the sleeve to control the rate of discharge of material from the upper end thereof.

3. In a mixing apparatus, a receptacle, an open ended sleeve mounted in said receptacle, a rotatable helical mixing element mounted within said sleeve, means for rotating said mixing element, and means for moving said mixing element longitudinally of said sleeve during its rotation therein.

In witness whereof I have signed this specification.

RONALD HEAD.