

Nov. 15, 1927.

J. H. L. BOETTCHER

1,649,564

MIXING MACHINE

Filed Nov. 24, 1925

2 Sheets-Sheet 1

Fig. 1.

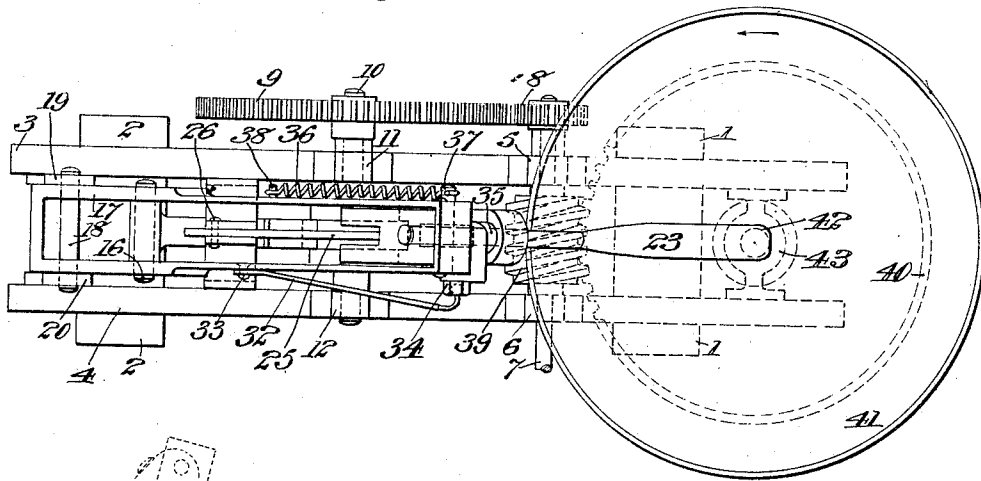
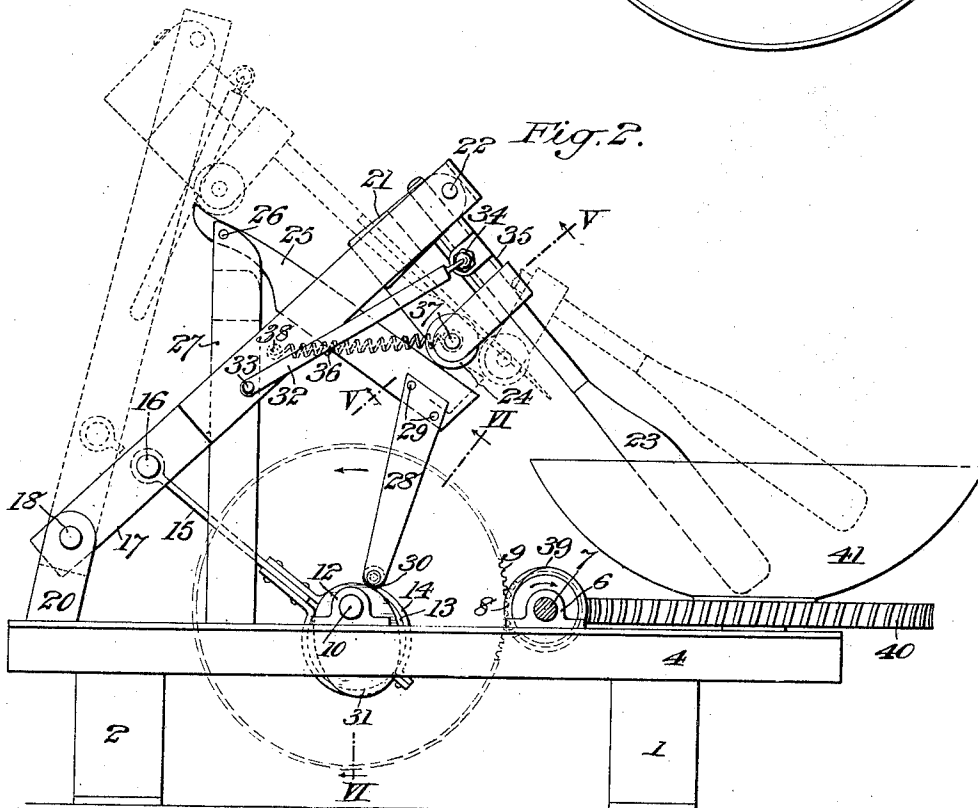


Fig. 2.



INVENTOR

Jacob H. L. Boettcher

BY

Brothman
his ATTORNEYS

Nov. 15, 1927.

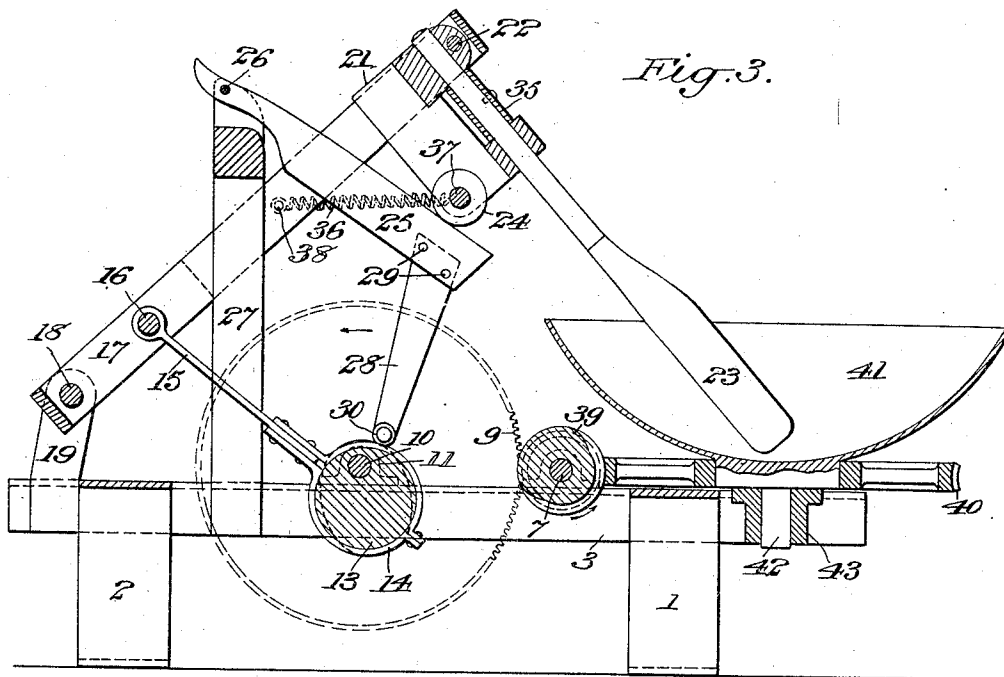
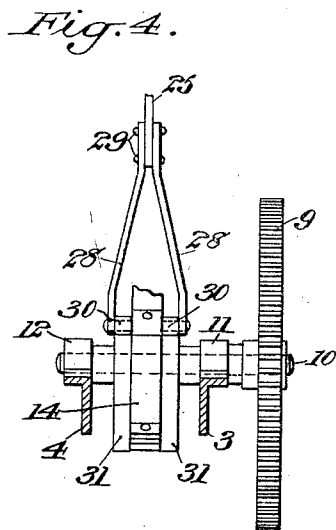
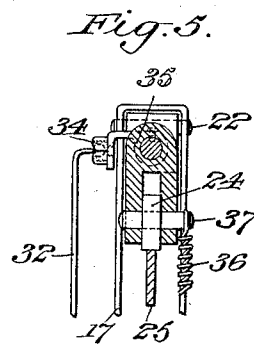
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INVENTOR
Jacob W. Z. Boettcher
BY
Brotherhood
his ATTORNEYS

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UNITED STATES PATENT OFFICE.

JACOB HEINRICH LUDWIG BOETTCHER, OF ORANGE, NEW JERSEY, ASSIGNOR TO DEVICES CORPORATION OF NEW JERSEY, OF ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

MIXING MACHINE.

Application filed November 24, 1925. Serial No. 71,084.

This invention relates to an apparatus for mixing materials and is particularly adapted for operating upon substances such as dough, candy, and granular materials.

5 It has for an object to provide such an apparatus that mechanically performs the act of mixing by means of a motion similar to that used in the most approved form of hand mixing, in which a substantially radial motion is made from near the edge of the vessel containing the substance to approximately the center thereof, followed by a lifting and turning movement of the hand implement.

10 Another object consists in providing such an apparatus which is rapid and uniform in operation.

A further object consists in providing certain improvements in the form, construction, and arrangement of the several parts whereby the above named and other objects may effectively be obtained.

20 A practical embodiment of the invention is represented in the accompanying drawings, in which

25 Fig. 1 represents a top plan view of the apparatus,

Fig. 2 represents a side elevation thereof, parts being shown in different positions in full and dotted lines.

30 Fig. 3 represents a vertical central section thereof,

Fig. 4 represents a detail section taken substantially in the plane of the line VI—VI of Fig. 2, looking in the direction of the arrows, and

35 Fig. 5 represents a detail section taken substantially in the plane of the line V—V of Fig. 2 looking in the direction of the arrows.

40 The apparatus includes a suitable framework which, in the present instance, consists of legs 1, 2, to the upper part of which is secured a pair of angle iron beams 3, 4.

Bearings 5, 6 are carried on the beams 3, 4, and in them is mounted a drive shaft 7, which is actuated from a suitable source of power (not shown), such as an electric motor.

45 At one end of the drive shaft 7 is fixed a pinion 8 which meshes with a gear 9 that is fast on a shaft 10, which latter is mounted in bearings 11, 12 that are secured on top of the beams 3, 4.

50 An eccentric 13 is fast to the shaft 10, and is embraced by a two-part strap 14 which

is arranged so that the eccentric can rotate therein. The strap 14 is fastened to a pitman 15 that has its other end pivoted at 16 to a skeleton arm 17.

The arm 17 has one end mounted for swinging movement on a pin 18 that is carried in uprights 19, 20 secured near one end of each of the beams 3, 4.

It will be seen that the construction just described is such that rotation of the eccentric 13 will impart reciprocating motion to the pitman 15 and oscillating motion to the swinging arm 17.

The arm 17 has a head piece 21 pivoted in its upper end at 22, and a mixing blade or paddle 23 has its inoperative end rotatably secured in the head piece 21.

A roller 24 is carried by the head piece 21 and adapted for operative contact with a track 25. One end of the said track is pivoted at 26 in a skeleton upright 27 that is carried on the beams 3, 4, and the other end of the track has a downwardly projecting bifurcated arm 28 rigidly fixed thereto, as by rivets 29 or the like.

55 The arm 28 is provided, at its lower extremities, with a pair of like rollers 30 that are designed to abut and travel upon the peripheries of a pair of like, substantially oval, cams 31 which are fast to the shaft 10 on either side of the eccentric 13.

From the description thus far given, it will be seen that the oscillating movement of the arm 17, above mentioned, will serve to reciprocate the paddle 23 substantially in the direction of its length, while the rotation of the cams 31 will oscillate the track 25 about the pivot 26, and thereby oscillate the head piece 21 about its pivot 22, so as to correspondingly oscillate the paddle 23 in a substantially vertical plane. During this operation the roller 24 rides on the track 25 and the shape of the upper edge of the latter also regulates the last named oscillating movement of the paddle.

60 A third movement is imparted to the paddle, which is an oscillating movement about its longitudinal axis, and this is accomplished by a link 32 which has one end pivoted at 33 in the arm 17, while the other end is connected, by means of a ball and socket joint 34, with a sleeve 35 that is pinned to the shank of the paddle 23.

It will be seen that the oscillating movement of the head piece 21 about its pivot 22

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will tend to move the ball and socket joint 34 toward or away from the pivot and thus oscillate the paddle 23 about its longitudinal axis.

5 A retractile coil spring 36 has one end fast to the axle 37 of the roller 24, and its other end fast to a pin 38 upon the arm 17. This serves to maintain firm contact between the roller 24 and the track 25.

10 The drive shaft 7 has a worm 39 fast thereto, which worm meshes with a wheel 40. The said wheel is fast to the bottom of a vessel 41, and a stub shaft 42 extends downwardly from the vessel 41 and is mounted for rotation in a bearing 43 carried in the beams 3, 4.

By the arrangement thus described, the rotation of the drive shaft 7 serves to rotate the vessel 41 simultaneously with the actuation of the other parts of the apparatus, and the timing of the gear train is such that the rotation of the vessel is comparatively slow in order that the paddle 23 may make a plurality of cycles of operation during each revolution of the vessel 41. I have found it desirable also to have an uneven ratio between the rotary drive of the vessel and the actuation of the paddle so that the latter will not move into the vessel at the same points on the circumference of the vessel during each rotation. For instance, if the ratio of rotation between the stub shaft 42 on the vessel and the shaft 10, which carries the eccentric 13, is one to four and one-half, the desirable effect just mentioned will be obtained.

I believe that the operation of the apparatus will be substantially understood from the foregoing description, but it may briefly be said that, as the vessel 41 is slowly rotated, the paddle 23 is given a combined movement whereby it is projected in a substantially radial direction from the circumference of the vessel to the center thereof, which said motion causes the operative end of the paddle to travel on a curve because of the combined longitudinal movement imparted to the paddle by the swinging of the arm 17 and the oscillating movement about the pivot 22 imparted by the track 25. As the operative end of the paddle progresses toward the center of the bottom of the vessel, it begins to turn about its own axis. This motion continues, and, as the paddle rises after reaching the center of the vessel, the flat blade is brought into substantially a vertical plane, thereby facilitating the lifting of the paddle through and out of the material upon which it is operating. This is somewhat analogous to the feathering of an oar in the case of rowing a boat. After the blade of the paddle has been thus lifted upwardly and out of the material in the vessel, the paddle is retracted to its initial position and is also turned on its longitudinal

dinal axis so as again to bring its blade into a plane which is substantially normal to the vertical. This cycle of operations may be, of course, indefinitely continued and, by reason of the uneven gearing ratio between the drive of the vessel and drive of the paddle, the latter will scoop downwardly into the material at a different point at the beginning of each complete rotation of the former. The similarity of this movement to that which experience has proved to be best in the case of manual mixing will be apparent to those familiar with the subject, notably persons acquainted with culinary operations or the manufacture of food and chemical products.

Fig. 2 represents two positions of the parts in dotted lines, and a third position in full lines.

While the various parts of the apparatus have been shown as provided with plain bearings, for simplicity of illustration, it will be apparent that suitable ball or roller bearings may be employed in any appropriate location, in accordance with custom.

It will also be understood that various changes may be resorted to in the form, construction, and arrangement of the several parts; and that I do not intend to be limited to the details herein shown and described except as they are included in the claims.

What I claim is:

1. In apparatus of the character described, a mixing implement, means for imparting cycles of operation to it, and means for giving it three movements during each cycle, one of said movements being substantially longitudinal with respect to its axis, another of said movements being substantially a swinging movement about its inoperative end as an axis, and another of said movements being substantially oscillatory about its longitudinal axis.

2. In apparatus of the character described, a mixing implement, means for imparting cycles of operation to it, means for giving it three movements during each cycle, one of said movements being substantially longitudinal with respect to its axis, another of said movements being substantially a swinging movement about its inoperative end as an axis, and another of said movements being substantially oscillatory about its longitudinal axis, a material vessel mounted for cooperation with the implement, and means for rotating said vessel during the operation of the implement.

3. In apparatus of the character described, a mixing implement, means for imparting cycles of operation to it, means for giving it three movements during each cycle, one of said movements being substantially longitudinal with respect to its axis, another of said movements being substantially a swinging movement about its inoperative end as an

axis, and another of said movements being substantially oscillatory about its longitudinal axis, a material vessel mounted for co-operation with the implement, and means for rotating said vessel during the operation of the implement, the ratio of rotation of the vessel to the cycles of operation of the implement being uneven so that the implement will act at a different point on the circumference of the vessel at the beginning of two successive rotations of the latter.

4. In apparatus of the character described, a mixing implement, a support therefor, a track in operative engagement with the implement, a link connecting the implement to its support, and means for imparting swinging movement to the said support, the said track, and the said link.

5. In apparatus of the character described, a mixing implement, a support therefor pivoted at one point, a track in operative engagement with the implement and pivoted at another point, a link connecting the implement to its support and pivoted on the support, and means for imparting swinging movement to the said support, the said track, and the said link about their respective pivots.

6. In apparatus of the character described, a mixing implement, a support therefor pivoted at one point, a head piece carrying the implement and pivoted in said support, a track in operative engagement with the head piece and pivoted at another point, and means for imparting swinging movement to the said support, the said head piece, and the said track about their respective pivots.

7. In apparatus of the character described, a mixing implement, a support therefor pivoted at one point, a head piece carrying the implement and pivoted in said support, a track in operative engagement with the head piece and pivoted at another point, a link connecting the implement to its support at a pivot point other than the pivot of the head

piece, and means for imparting swinging movement to the said support, the said head piece, the said track, and the said link, about their respective pivots.

8. In apparatus of the character described, a mixing implement, a support therefor pivoted at one point, a head piece carrying the implement and pivoted in said support, a track in operative engagement with the head piece and pivoted at another point, a link connecting the implement to its support at a pivot point other than the pivot of the head piece, means for imparting swinging movement to the said support, the said head piece, the said track, and the said link, about their respective pivots, and means for yieldingly holding the head piece in engagement with the track.

9. In apparatus of the character described, a mixing implement, a pivoted support therefor in which the implement is pivoted, a track in operative engagement with the implement, a support in which the track is pivoted, cam mechanism for swinging the implement support and the track support about their respective pivots, and a link pivotally connected to the implement and its support.

10. In apparatus of the character described, a mixing implement, a pivoted support therefor in which the implement is pivoted, a track in operative engagement with the implement, a support in which the track is pivoted, cam mechanism for swinging the implement support and the track support about their respective pivots, a link pivotally connected to the implement and its support, and means connecting the implement and its support for yieldingly urging the implement to maintain contact with the track.

In testimony, that I claim the foregoing as my invention, I have signed my name this 20th day of November, 1925.

JACOB HEINRICH LUDWIG BOETTCHER.