Aug. 9, 1955 C. C. POWELL 2,714,786

AUTOMATIC EGG-CLEANING MACHINES

Filed Sept. 22, 1952 6 Sheets-Sheet 1

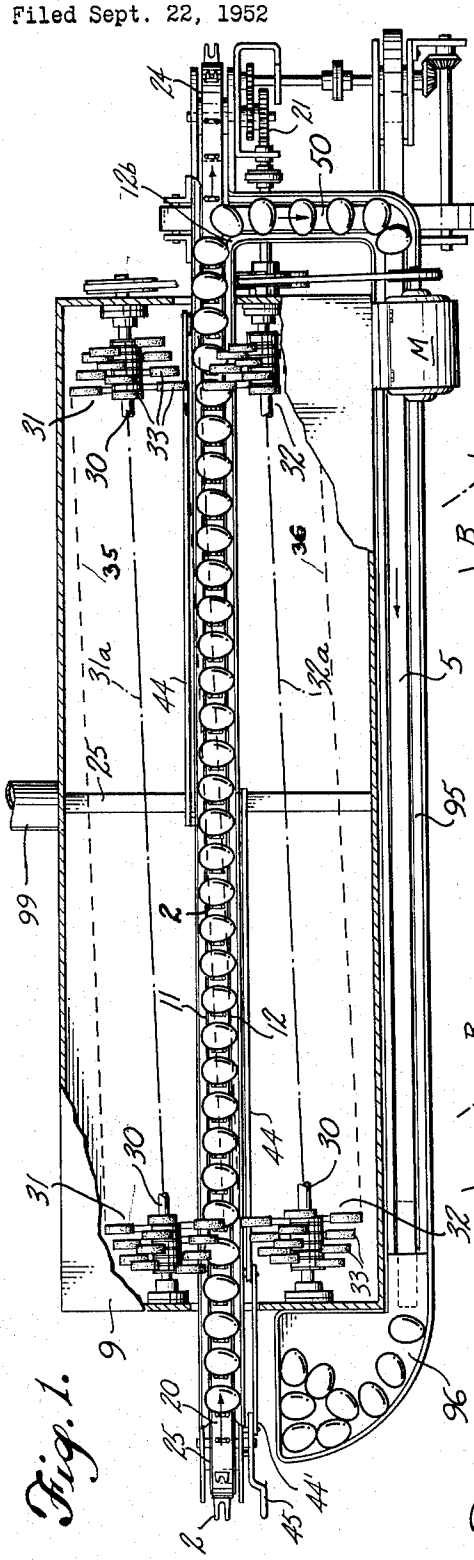


Fig. 1.

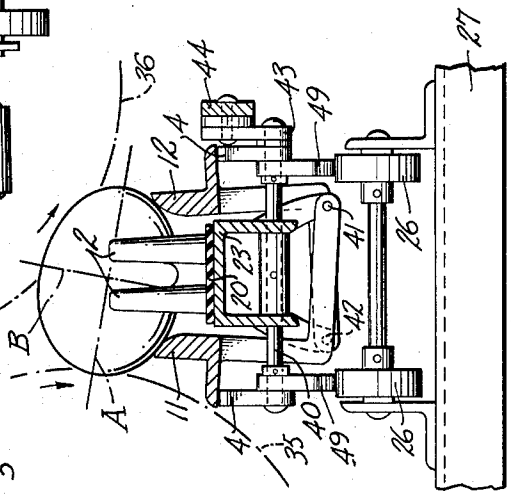


Fig. 7.

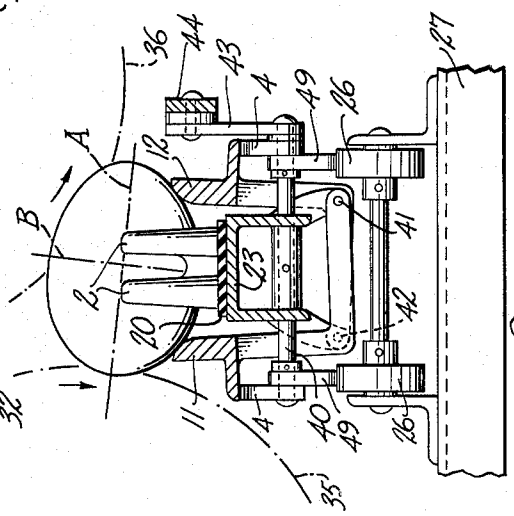


Fig. 6.

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AUTOMATIC EGG-CLEANING MACHINES

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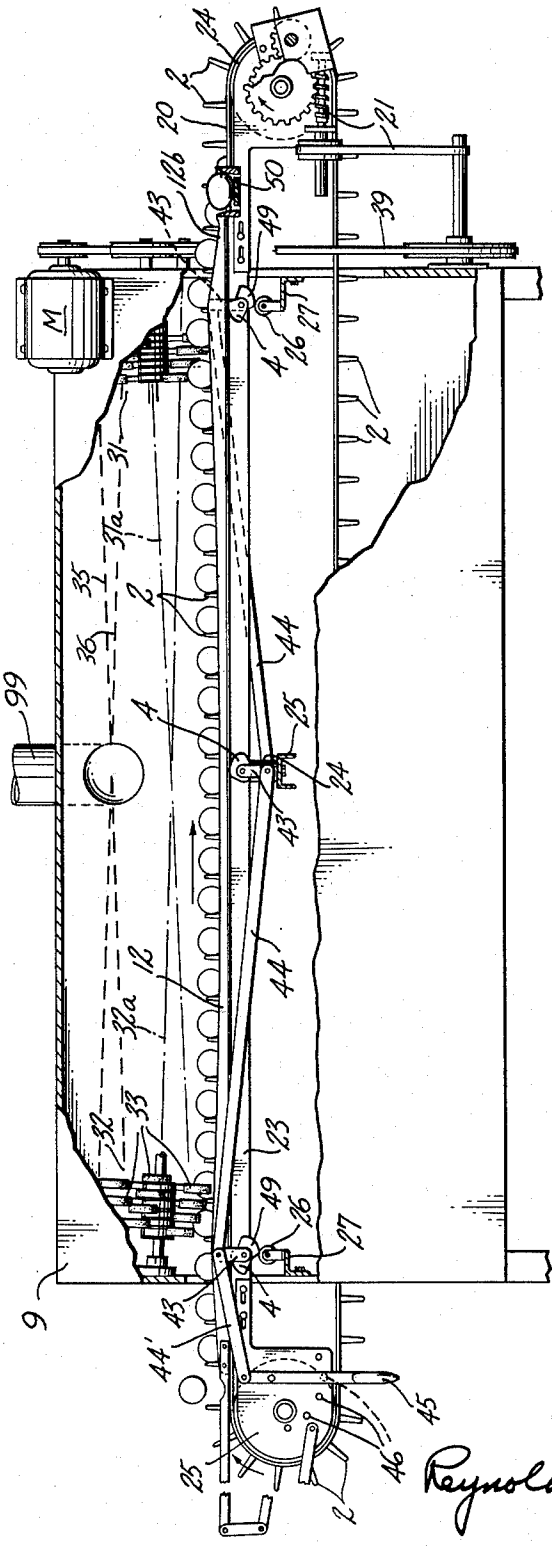


Fig. 2.

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AUTOMATIC EGG-CLEANING MACHINES

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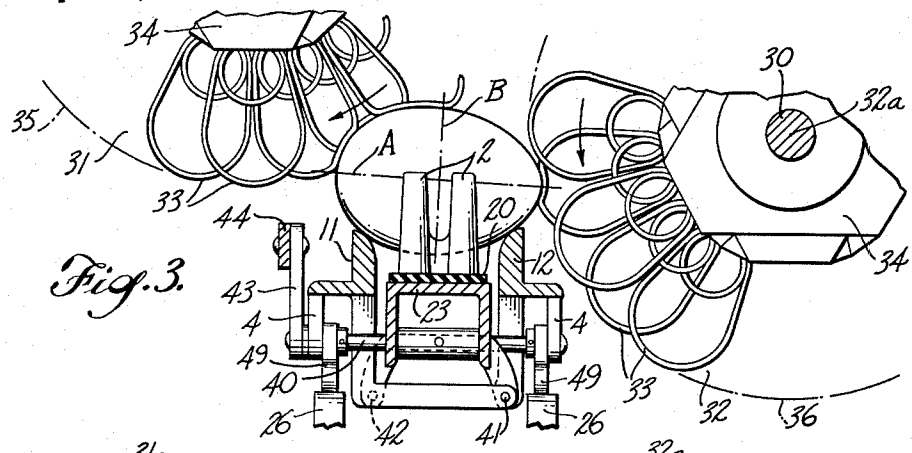


Fig. 3.

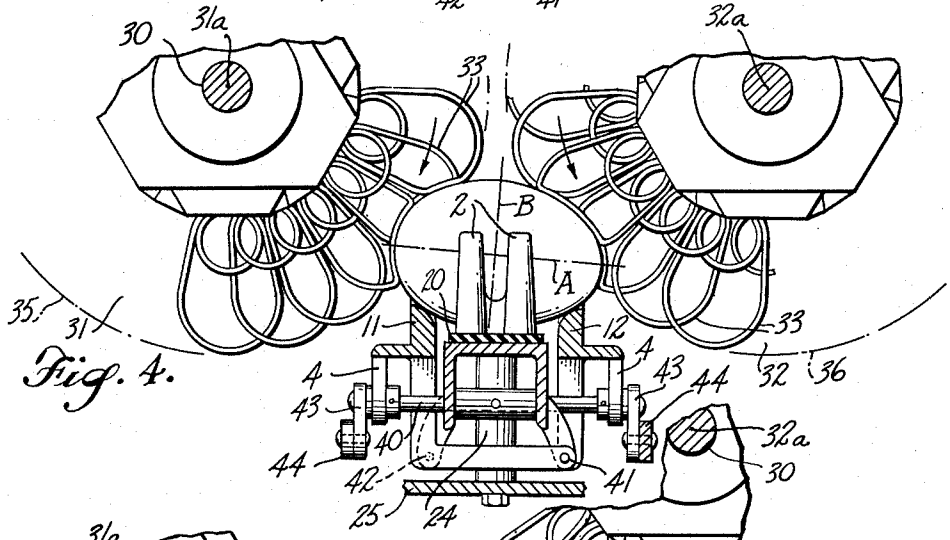


Fig. 4.

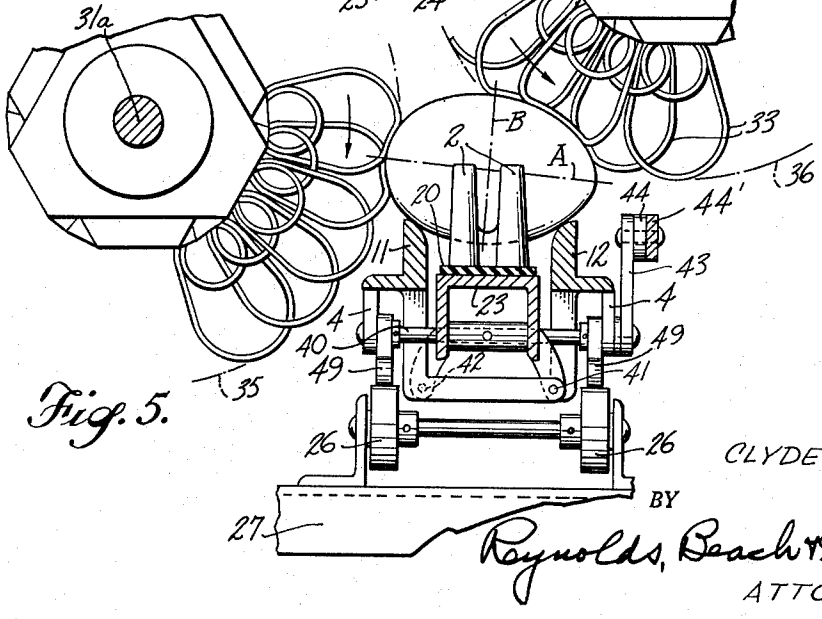


Fig. 5.

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AUTOMATIC EGG-CLEANING MACHINES

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Fig. 8.

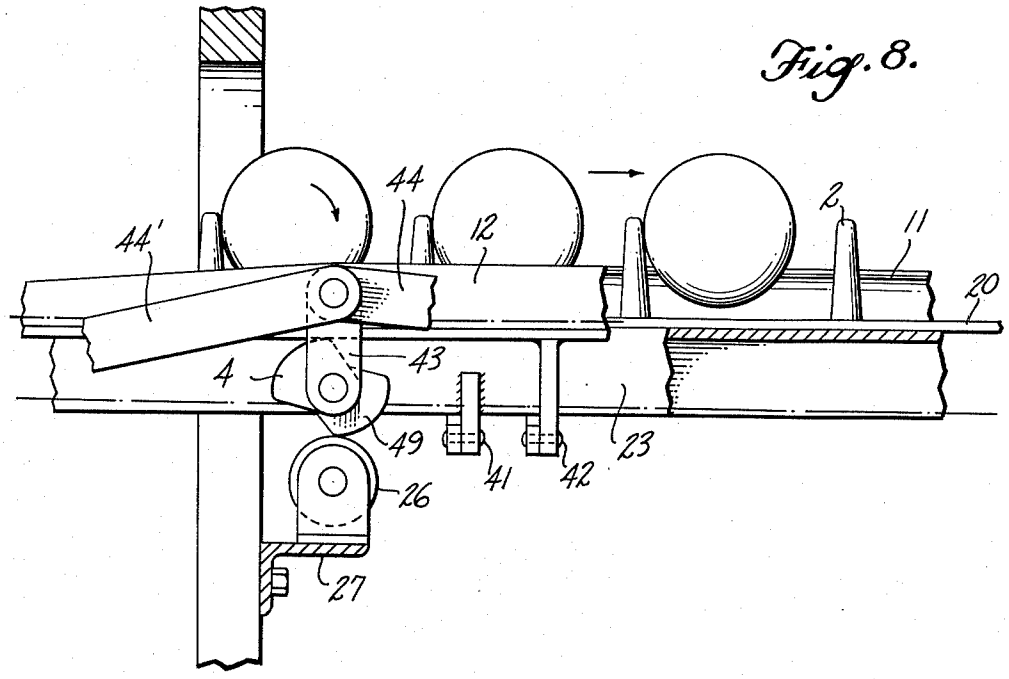
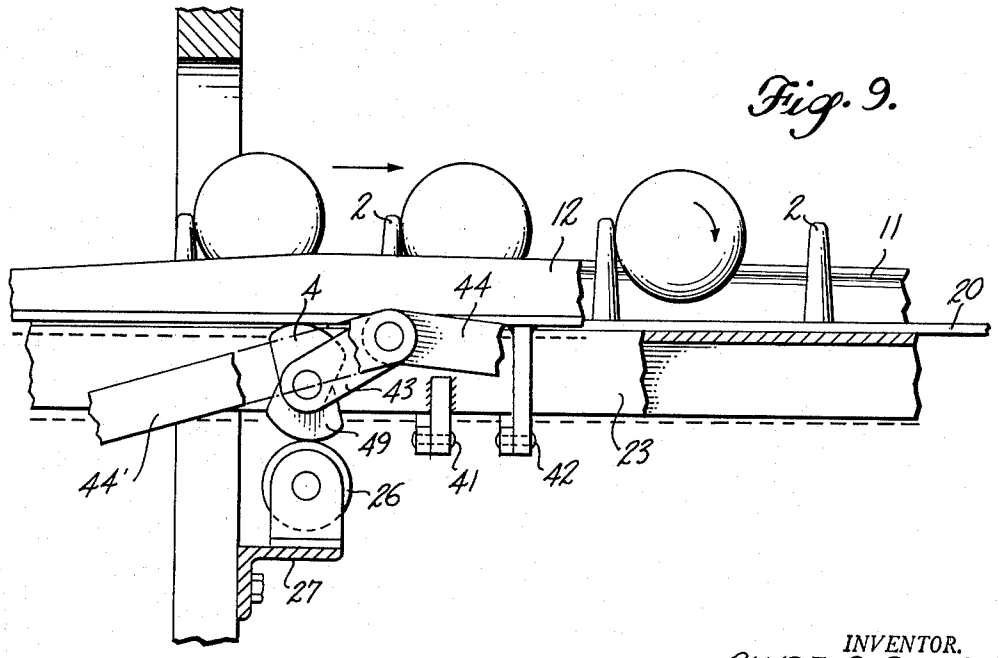


Fig. 9.



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AUTOMATIC EGG-CLEANING MACHINES

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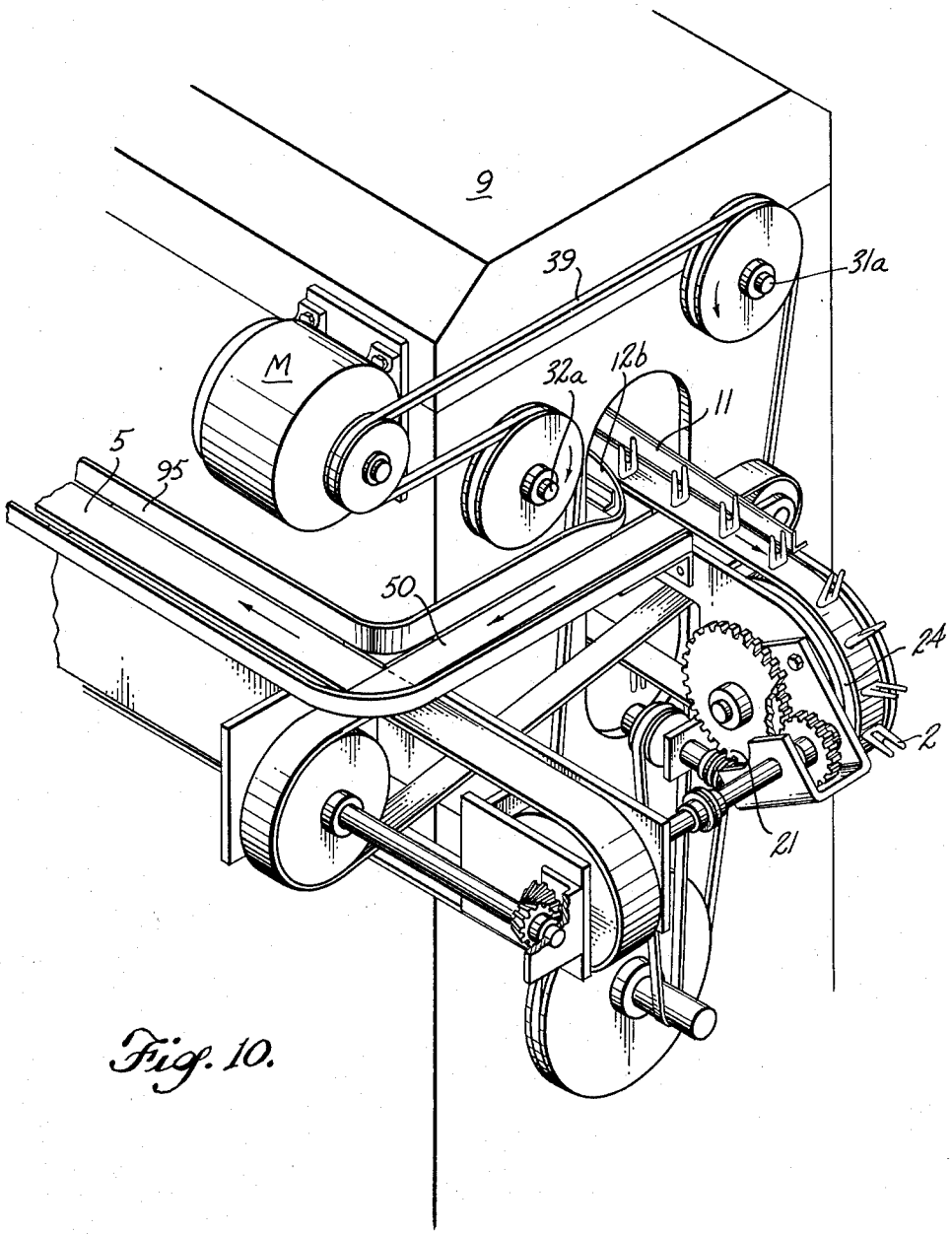


Fig. 10.

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AUTOMATIC EGG-CLEANING MACHINES

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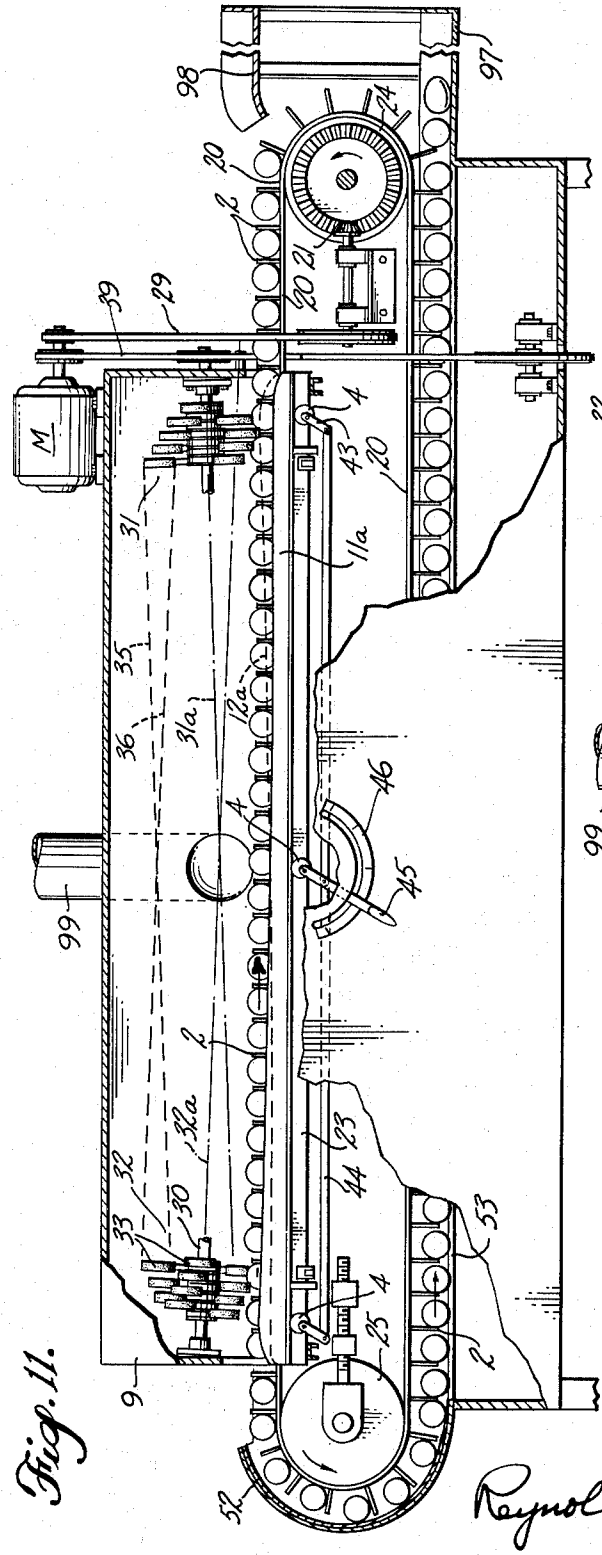


Fig. 11.

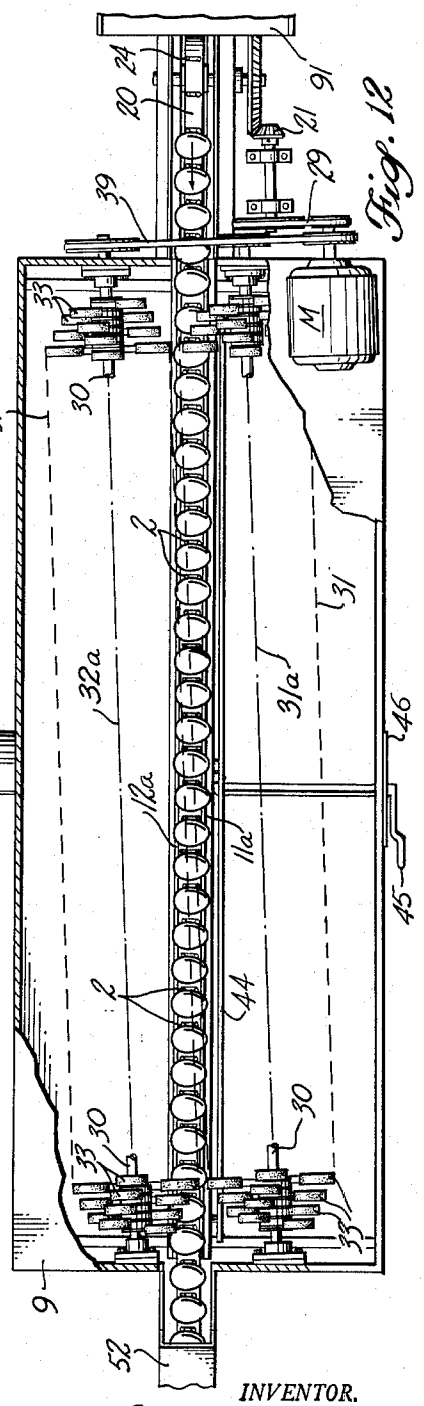


Fig. 12.

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United States Patent Office 2,714,786 Patented Aug. 9, 1955

2,714,786

AUTOMATIC EGG-CLEANING MACHINES

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Application September 22, 1952, Serial No. 310,892

20 Claims. (Cl. 51—23)

The present invention concerns a machine, and a method, for cleaning eggs by subjecting them individually to the abrasion of numerous small, locally yieldable elements such as loops arranged to rotate in loci that define two cylinders disposed generally parallel to the path along which the eggs are advanced, while at the same time insuring presentation of each polar zone of an egg effectively to the abrasive cylinders, by a gradual shift in the position relationship of the egg's axis to the axes of the respective cylinders. Primarily the abrasion is for the purpose of removing adhered dirt, although in areas where there is no such dirt, some slight abrasion of the shell may occur.

An egg-cleaning machine of the general nature indicated above is disclosed in my prior Patent No. 2,554,878 dated May 29, 1951. In that patent, the two cylindrical axes are parallel to each other and to the path of advance of the eggs, and in order to effect the desired shift in the egg's axis relative to the cylinders' axes, and so to present alternatively and effectively the opposite polar zones and equatorial zones of each individual egg to the abrasive elements, the track along which the eggs advanced is itself oscillated from side to side, first toward one cylinder and then toward the other, and so on reversely and alternatively during the passage of the egg along that track. In contrast, the present invention contemplates that the track be fixed and non-oscillatory, that the egg itself (in a preferred embodiment) be not tilted during its advance, even by opposite inclination of the two fixed tracks (as in the secondary embodiment), and that the presentation of the opposite polar zones to the abrasive cylindrical elements be accomplished primarily by the expedient of fixing the axes of the two abrasive cylinders in oppositely skewed positions with respect to one another and with respect to the path of advance of the eggs along the track. The progression of a rolling egg along its path gradually but effectively alters its position relative to the two skewed cylinder axes, to present the opposite poles for abrasion. By so doing, the construction of the egg-cleaning machine is simplified; the only movable parts are the cylinders and the egg-advancing belt, and a single motor will serve to rotate the cylindrical abrasive members and also to advance the eggs; and the guide for the belt is stationary (though preferably adjustable to accommodate different sizes of eggs, and for like purposes), hence with the simplification of the construction, the chance for malfunctioning is reduced and the cost is lessened.

It is an object of the present invention to provide an egg-cleaning machine of the type which will permit the use of a cylindrical abrasive member of the type shown in the Miller et al. patent, No. 2,018,967, dated October 29, 1935, which abrasive member incorporates numerous small, flexible, abrasive loops flung outwardly by the rotation of their supporting structure to be drawn over an egg passing lengthwise alongside the cylinder. Such a cylindrical abrasive member is of simple, inexpensive construction, thoroughly satisfactory in use, and permits

ready substitution of fresh abrasive loops for worn loops.

Still another object of the present invention is to provide an egg-cleaning machine of the general nature indicated which incorporates means whereby it may be adjusted to accommodate with equal facility and efficiency eggs varying in size from the smallest to the largest.

In connection with the principal feature, the skewed axes of the cylindrical abrasive members and their relationship in position to the path of advance of the eggs, it is a further object to provide a track for the eggs which, although fixed in any given position of adjustment, will nevertheless be adjustable to maintain the eggs close to the loci of the loops at every stage of the eggs' advance, and, in the secondary embodiment, to do so by effecting a reversal of the inclination of the major axis of each egg as it advances along such track, to the end that the polar zones are alternatively and more surely presented to the action of the abrasive loops.

With these objects in mind, and others as will appear hereinafter, my invention comprises the novel elements and the novel construction and arrangement of the parts thereof in an egg-cleaning machine, and the novel method of cleaning eggs, all as shown in the accompanying drawings, as described in this specification, and as will be more particularly pointed out by the claims terminating the same.

Figure 1 is in general a plan view with parts broken away, illustrating the complete egg-cleaning machine, and Figure 2 is a general side elevational view, also with parts broken away, illustrating the same.

Figure 3 is an enlarged cross-sectional view at one end—for example the feed end—illustrating the position relationship between the axes of the two abrasive cylinders and of each with relation to the egg's path of advance; Figure 4 is a similar view but illustrating the same relationships at a point generally midway between the ends of the egg's path and of the length of the cylinders; and Figure 5 is a similar view illustrating the relationship of the parts at the end opposite Figure 3—that is, for example, at the discharge end of the egg-cleaning machine.

Figure 6 is a view similar to Figure 3, but illustrating especially the adjustment of the egg-cleaning machine to accommodate the jumbo size eggs, and Figure 7 is a view similar to Figure 6, but illustrating parts in the adjustment corresponding to that which best accommodates peewee size eggs.

Figure 8 is a detail side elevational view illustrating particularly the track-adjusting mechanism, in one position of adjustment, corresponding to Figure 6, and Figure 9 is a similar view showing parts in a different position of adjustment, corresponding to Figure 7.

Figure 10 is an isometric view of the discharge and of the machine, illustrating particularly one possible style of egg return, and the drive arrangement for the machine.

Figure 11 is a side elevational view similar to Figure 2, and Figure 12 is a plan view similar to Figure 1, showing a modified form of machine that incorporates the same general principles.

The path of advance of eggs through such a machine is defined by two generally parallel rails **11** and **12**, which may be considered as fixed in position at a spacing such that each engages beneath an egg, outwardly of its minor axis B, when that egg is placed with its major axis A directed tarnsversely of the track constituted by the two rails **11** and **12**. The egg rolls along the track thus constituted and being engaged by upstanding pins or pushers **2**, spaced at intervals upon a belt **20** that passes over a driving pulley **24** and a driven pulley **25**, these pushers **2**, which are broadened in the direction transversely of the path of advance of the eggs, tend to keep the egg's major

axis A always oriented transversely of the direction of advance. The upper run of the belt **2** is supported upon a channel-like longitudinally directed bar **23**.

An abrasive cylindrical element **31** is disposed generally parallel to and outside of the rail **11**, and a similar abrasive cylinder **32** is similarly disposed with relation to the rail **12**. Other than to note that each such cylinder includes a shaft **30**, a central core **34**, and numerous flexible abrasive loops **33**, spaced angularly about the cylinder and distributed lengthwise thereof, it seems unnecessary to describe such cylinders in detail inasmuch as they are already disclosed in the Miller et al. patent and in my prior patent referred to hereinabove, and any locally yieldable abrasive cylindrical element will serve instead. The loops **33**, when each cylinder is rotated, are flung centrifugally outwardly and the outer ends of the loops collectively describe a cylindrical locus **35** for the cylinder **31** and **36** for the cylinder **32**, the two of which approach closely, at least at one point, and are always close enough to the egg's path to swipe an egg of a large or an average size as it advances along the tracks.

The shafts **30** of the cylinders are journaled at their ends in a frame or casing, indicated generally at **9**, in an orientation which will shortly be described in detail, and they are driven in the rotative senses indicated by the arrows in Figures 3, 4, and 5, to move conjointly downwardly and inwardly toward their point of closest approach, to urge the egg which they swipe gently downwardly upon the tracks, rather than to urge the egg upwardly.

It will be remembered that the loci **35** and **36**, respectively, are each cylindrical. The axis **31***a* or **32***a*, respectively, of each such cylinder is skewed with relation to the axis of the other cylinder, and with relation to the path of advance of the eggs, as defined generally by the rails **11** and **12**, in the following fashion. The feed end is at the left in Figures 1 and 2, and the discharge end at the right; in Figures 11 and 12 the reverse is true. At the feed end one such cylinder, for example the cylinder **31**, which is at the left facing in the direction of advance, has its axis **31***a* located considerably higher but laterally appreciably closer to its rail **11** than the location of the axis **32***a* of the cylinder **32** with relation to its rail **12** on the right. The axis **32***a*, at this end, is located more or less on a level with the prolongation of the major axis A of the egg on the track. This relative location of the two axes is indicated in Figure 3. At the discharge end the situation is reversed, and at this discharge end, shown in Figure 5, the axis **31***a* of the cylinder **31** is considerably lower and laterally farther outward from its rail **11** than is the axis **32***a* of the cylinder **32** with relation to its rail **12**. The axis **31***a* is now the one which is on a level with the egg's major axis A, extended. At a median point in the length of the cylinders the two axes are both at the same level, and at the same lateral spacing outwardly with respect to their corresponding rails, and this relationship is shown in Figure 4.

One purpose of this skewing, as has already been stated, is to keep the cylinders close enough to the advancing egg, without interferance between the cylinders at any point, to swipe both hemispheres of the egg throughout its advance. A further purpose is to alter the manner of engagement of the cylinders with the respective hemispheres of the egg. By reason of this skewing of the axes of the two cylinders, the cylindrical locus **36** of the cylinder **32** intersects the locus of one polar zone or polar cap of an egg as it rolls down the track **12** (see Figure 3), whereas the opposite cylindrical locus **35** intersects the equatorial zone, and a zone intermediate the equatorial zone and the polar zone, but the polar zone only to a slight degree, at the opposite end of the same egg, as the egg rolls down its track **11**. At the median point in the length of the path of advance of the egg each cylindrical locus engages primarily the intermediate zone and has left the equatorial zone, but to some degree still engages each its polar zone. By the time the egg reaches the opposite end of its path of advance and the position relationship of the two cylindrical loci **35** and **36** has been reversed, the locus **35** which initially engaged primarily the equatorial zone now engages primarily its polar zone or cap of the egg, whereas the locus **36** which initially engaged primarily the opposite polar zone, now engages primarily the equatorial zone of that same end of the egg.

A similar effect is produced, or the effect of skewing the cylinders' axes is augmented, by altering the shape of the rails' upper egg-supporting edge as viewed from the side from a straight to a somewhat curved conformation; see Figure 2 and compare Figures 3, 4, and 5. The rails **11** and **12** are both higher at the feed end than at their longitudinal midpoint, where the cylindrical orbits **35**, **36** approach each other most closely and where the rails are of equal height, and become higher again at the discharge end. Their heights at points correspondingly distant from the midpoint need not be equal, and in fact the rail **11** would preferably be slightly higher at the feed end (Figure 3) than the rail **12**, to elevate this end of the egg and thus to keep it within the locus of cylinder **31**, and at the discharge end the rail **12** would preferably be slightly highter than the rail **11**, to elevate this end of the egg and thus to keep it within the locus of cylinder **32**. In these ways each end of the egg is kept within the locus of both cylinders, throughout their length and notwithstanding their divergence at their ends as a result of their skewing. More particularly, since the feed end of cylinder **31** is elevated above the feed end of cylinder **32**, the left end of the egg as viewed in Figure 3 is elevated correspondingly by the greater height of the feed end of rail **11** as compared to that rail's height at its midpoint, and by the slightly greater height of rail **11** relative to rail **12** at their feed ends; the reverse is true at the discharge end, as seen in Figure 5; at the midpoint the minimum height of the two rails, and their equality in height, avoids forcing them unduly into the two abrasive cylinders. Viewed from the side, each rail is curved at its upper edge. Each rail, considered with relation to its cylinder, describes approximately a helix of long pitch. These effects can be heightened by increasing the curvature of the rails, in a manner later described in detail; such increased curvature is particularly desirable with smaller sizes of eggs, and is described in conjunction with the adjustment laterally of the rails relative to one another.

It will be remembered that in all cases the loops **33** swipe lengthwise of the egg and generally in the direction toward the poles, thereby holding the egg down on its tracks, and each cylinder conforms locally to the curvature of the egg in the region where they engage the egg's shell and their loops are drawn thereover rapidly to effect an abrasive action. They do not strike an appreciable blow, and there is little danger of breaking the shell of the egg, and yet their abrasive action repeated many, many times in the course of advance of the egg, coupled with the continuous rotation of the egg about its axis A, thoroughly cleans the egg in all areas of its shell.

This cleaning action is effective whether or not the egg is tilted endwise as it traverses the length of its path of advance or is kept untilted during such advance. In other words, the two rails **11** and **12** may be substantially precisely parallel, as they are in the form of Figures 1 to 10 inclusive, and the skewed relationship of the respective cylinders will cleanse its alternate polar zones; this is the preferred arrangement. Alternatively, the rails **11** and **12** may themselves be relatively skewed, as in Figures 11 and 12, in order to effect tilting of the transversely disposed major axis A of the egg, from a position tilted in one direction at the feed end to a tilt in the opposite direction at the discharge end. Thus, as is shown best in Figure 11, the left hand rail **11***a* may be lower at the feed end than is the rail **12***a* at this same end, whereas at the discharge end the rail **11***a* is appreciably higher than the rail **12***a*, as the dotted line indicates. In effect, if not in fact, each such rail describes approximately a helical

twist from one end to the other, each with relation to its skewed cylinder, the rail **11***a* with relation to the cylinder **31**, and the rail **12***a* with relation to the cylinder **32**, and by this means the major axis of the egg is reversed from an upward tilt to the right if it were viewed as in Figure 3, to an upward tilt to the left if it were viewed as in Figure 5. It is preferred that this change of the tilt of the major axis A, when the same is employed, be continuous from one end to the other of the path of advance of the egg, and that the egg be not tilted back and forth during its travel, but tilted only once from one extreme to the opposite extreme tilt. This is so because with relation to the skewed cylindrical loci, this opposite relative inclination of the rails more surely presents the polar cap to that cylinder which is best fitted to swipe it and then at the opposite end of the path of advance presents the opposite polar cap to the other cylinder best able to swipe the latter.

It is obvious that if the skewed axes **31***a* and **32***a* were extended indefinitely they would at some point spread so far apart that the cylindrical loci **35** and **36** would fail to touch an egg of normal or average size. Where that point would be located would depend upon numerous factors, such as the size of the eggs, the relative angle of the axes, the trueness of the cylindrical shapes, as for example, the presence or absence of swelling at their ends, the straightness of the tracks or their departure from straightness along curved lines, their opposite inclination as already discussed, etc. Since one such factor is the straightness or curvature of the tracks, I have in the preferred form incorporated mechanism for curving the tracks when this is desired, but since this mechanism is physically coupled with adjusting mechanism to accommodate different sizes of eggs, it will be described in conjunction therewith.

Eggs vary appreciably in size. There is quite a range between the smallest size, the peewee eggs, and the largest size, the jumbo eggs. Since it is obvious that the egg should not be forced deeply into the cylindrical loci at their point of closest approach, for fear of breaking them, and yet must be kept within range of each such locus throughout the entire path of advance of the egg, it has been found extremely desirable to provide means whereby the egg-cleaning machine of this invention can be adjusted to accommodate the different sizes of eggs. An average adjustment for standard size eggs is indicated in Figures 3, 4 and 5. Figure 6, however, shows an adjustment for jumbo eggs and Figure 7 an adjustment for pullet or for peewee eggs. In order to effect such adjustments, each rail is pivotally mounted to tilt about a longitudinal axis, the rail **11** at **41** and the rail **12** at **42**, at the opposite side of and beneath the longitudinal frame element or bar **23**. Each rail is engaged from beneath by one or preferably by several cam-like elements or eccentrics **4** upon oscillating spindles **40**, which bear beneath the respective rails. Each such spindle **40** is journalled in the longitudinal bar **23**, and when these cams are rotated, they will tilt and so will elevate or permit depression of the corresponding rails **11** and **12**. Preferably all cams are connected for conjoint operation, as by securing on each shaft or spindle **40** an arm **43** and joining those arms by links **44**, one at one side of the track for half the track's length, the other at the opposite side and end of the track. This disposition of the links avoids interference between the links and the cylindrical loci, as would occur if, in Figure 3 for example, the link **44** were located at the right, or if, in Figure 5, it were located at the left. A control handle **45** placed exteriorly of the housing or frame **9** and linked at **44'** to the cam system enables adjustment to the different positions, and these positions may be determined by cooperating stop or indicator means **46**.

In the foregoing description of the mechanism to adjust the machine for different sizes of eggs it has been assumed that the longitudinal bar **23** is a fixed and straight part of the frame. For most purposes and at some times it is, and at a median point lengthwise it is fixedly anchored to the frame by means of the post **24** upstanding from the rigid cross bar **25**. At its ends, however, the longitudinal bar **23** is unsecured, and, being somewhat flexible (as also are the rails **11**, **12**) its ends can be bent upwardly. Thereupon, in effect the rails as viewed from the side rise even farther at their ends above their midpoints than they do inherently. To this end companion cams **49** which are fast to the two end spindles **40**, and which bear on the rollers **26** mounted on rigidly fixed cross bars or frame elements **27**, rock when the spindles **40** and cams **4** are rocked, and thereby produce a force reacting from the fixed frame upwardly on the ends of the longitudinal bar **23**, wherein the spindles **40** are journaled, to bend its ends upwardly relative to its fixedly anchored center or median portion, at **24**, **25**. The same bending force acts through the bar **23** on the ends of the tracks, bending them upwardly also.

Thus whenever the tracks are urged laterally together to accommodate smaller eggs, their ends are also urged upwardly. By such bending they are brought closer to the diverging ends of the relatively skewed cylindrical loci **35**, **36**. A smaller egg, as it rolls along the tracks, would the sooner depart from such loci than a larger egg, if the tracks remained precisely straight, hence the lateral approach of the tracks, and the bowing upwardly of their ends, each acts to accommodate the machine to smaller eggs, and of course, the relaxing of the bowing and the lateral spreading of the tracks better accommodates larger eggs.

It is convenient to effect return of the eggs to the same end from which they were fed into the machine. That may be readily accomplished where desired by providing a return chute **95**, with an impositive feed return belt **5** moving along its bottom; a short transfer chute and belt at **50** receives the eggs from the feed belt **20** and delivers them to the return belt **5**, and the latter deposits them upon a table **96**. The track **12** is inclined at **12***b*, at the discharge end (see Figure 2), whereas the track **11** is not, and this has the effect of tilting the egg sidewise upon the transfer belt **50**.

In the form of machine illustrated in Figures 11 and 12 the eggs return by a path immediately beneath their initial path of advance. A hood **52** overlies the path of the eggs as they travel about the pulley **25**, merging into a bottom track **53**, which supports the eggs as they travel back toward the feed end under the influence of the pushers **2**. Arrived at the feed end, they may be discharged upon a table **97**, having been fed to the machine from a feed table **98**.

There is no bowing upwardly of the ends of the rails in the form of Figures 11 and 12, hence only cams **4**, each fixedly pivoted in the frame, and connected for conjoint movement in the manner already described, are needed. These cams bear beneath the rails **11***a* and **12***a* to tilt the latter for approach or recession, as has been described.

Considerable dust accompanies the cleaning operation wherefore it is preferred that it be housed in, and a suction duct **99** may be provided for collecting and conveying away the dust as it rises.

A single motor M may drive all parts of the machine. It is shown as provided with a belt **39** connected to both the cylinders **31** and **32** to drive them in the relatively reverse rotative senses, and either this same belt or, in Figures 11 and 12, a separate belt **29** is provided to drive the speed reduction drive **21** of the egg-advancing means. While the suction fan or blower for removing dust is not shown, it, too, may be driven from the motor M, if desired.

I claim as my invention:

1. An egg-cleaning machine comprising two generally horizontally disposed, parallel, and fixedly positioned rails spaced apart to support the opposite ends of indi-

vidual eggs as they roll, for advance along a definite path defined by said rails, means so to advance individual eggs in spaced relation and with their major axes always directed transversely, by rolling them along said rails, two cylinders disposed generally at opposite sides of the paired rails and so of the eggs' path of advance and rotative in non-coincident orbits, each cylinder incorporating peripheral abrasive elements to swipe an egg passing within its orbit, and means supporting said cylinders for rotation, said supporting means being relatively so located that the cylinders' axes are disposed in skewed relation to the path of advance of the eggs, from a position at the feed end wherein the axis of a first cylinder is lower and laterally farther from its rail than the axis of the second cylinder with relation to its rail, to a reversed position at the discharge end wherein the axis of said first cylinder is higher and laterally closer to its rail than the axis of the second cylinder with relation to its rail, the cylinder-supporting means being further so located that the cylinders are both positioned close enough to their respective rails that their respective abrasive elements will collectively swipe the entire adjacent hemisphere of each egg during the course of the egg's advance along said rails.

2. An egg-cleaning machine as in claim 1, including means to rotate the two cylinders each in the sense to move its abrasive elements inwardly and downwardly relative to the abrasive elements of the other cylinder.

3. An egg-cleaning machine as in claim 1, characterized in that the two rails dip lower at their midpoint than at their ends.

4. An egg-cleaning machine as in claim 1, including means to spread or to effect approach of the rails laterally relative to one another, to vary their lateral spacing from each other.

5. An egg-cleaning machine as in claim 1, wherein the rails are somewhat flexible, means to restrain upward movement of the rails at a generally median point of their length, and adjusting means to flex the ends of the two rails vertically upwardly with relation to their restrained median portions.

6. An egg-cleaning machine as in claim 5, including means operatively engaged with the rails at points spaced therealong, and operable to spread or to effect approach of the rails relative to one another substantially equally at all points in their length, to vary their lateral spacing from each other.

7. An egg-cleaning machine as in claim 1, including means to bend the two rails to elevate their ends with relation to their midpoint.

8. An egg-cleaning machine as in claim 1, wherein the rails are somewhat flexible, including means to restrain upward bodily movement of the rails at a midpoint in their length, means supporting the individual rails for bodily movement at their ends in a generally vertical direction, and cam means operatively engaging each rail so to move its ends relative to its midpoint, and so to vary its spacing relative to its adjacent cylinder.

9. An egg-cleaning machine as in claim 1, wherein the rails are somewhat flexible, means to anchor the rails against substantial vertical movement at a generally median point in their length, cam means reacting between each end of both rails and a fixed abutment, to raise the ends of the rails relative to their median portions, and means joining all said cam means for conjoint operation.

10. An egg-cleaning machine as in claim 1, including arms supporting each rail and directed laterally towards the opposite rail, and pivotally fixedly mounted each at its end distant from its rail, and means to tilt each rail about the pivot axis of its supporting arms.

11. An egg-cleaning machine as in claim 10, wherein each rail-tilting means includes a plurality of eccentric cams spaced longitudinally of its rail, in a common vertical plane, and each bearing beneath its rail, and means joining the several cams, of both rails, for conjoint angular movement about their respective pivot axes, for bodily movement of the rail in a generally vertical direction.

12. An egg-cleaning machine as in claim 1, including a fixed frame, a generally rigid but slightly flexible bar extending lengthwise alongside the rails, the rails also being somewhat flexible, means to support the bar at its median portion from said frame, and said rails from said bar for lateral tilting movement of each rail towards and from the other rail, cam means mounted on said bar, and engageable with the rails at their median portion and also adjacent their two ends, further cam means mounted on said bar adjacent its ends and reacting from said frame upon said bar, and means to shift all said cam means conjointly, the cam means at the ends being conjointly of greater throw than the cam means at the median portion, to tilt the rails laterally towards or from each other throughout their length, and simultaneously to flex the bar, and consequently the rails, vertically at their ends.

13. An egg-cleaning machine as in claim 1, characterized in that each rail is curved longitudinally in generally helical relation to its adjacent skewed cylinder, and each oppositely to the other rail, and by so much the two rails depart from parallelism.

14. An egg-cleaning machine as in claim 1, characterized in that each rail lies substantially in a single vertical plane, but each is curved as viewed from the side, a first rail, being that one which is adjacent the first cylinder, being higher than the second rail at their feed ends, the two rails being generally of equal height at the longitudinal median position, and the first rail being lower than the second rail at their discharge ends.

15. An egg-cleaning machine as in claim 14, including additionally means to elevate or to lower the rail's end portions relative to their respective cylinders.

16. An egg-cleaning machine as in claim 14, including additionally means to spread or to effect approach of the rails laterally towards one another to vary their lateral spacing.

17. An egg-cleaning machine comprising a first and a second track generally fixedly spaced apart in general parallelism to support individual eggs rolling therealong with their major axes disposed always transversely, means to advance eggs individually along said tracks in spaced relationship, from a feed end to a discharge end, a first and a second rotative cylinder, each including peripheral abrasive elements, the first disposed alongside and outwardly of the first track and the second alongside but at the outer side of the second track, each with its axis directed generally lengthwise of the tracks, and spaced only sufficiently therefrom to maintain each hemisphere of an egg, as it rolls along the tracks, generally within the effective orbits of the corresponding cylinder's abrasive elements, the first such track and its corresponding cylinder being relatively fixedly positioned with the cylinder's axis at the feed end outward of the track but approximately on a level with a prolongation of the major axis of an egg upon the tracks, but with that first cylinder's axis at the discharge end elevated materially above such level, and more nearly vertically above that first track, whereby the first cylinder and the first track lie in mutually skewed relation, and the second track and its second cylinder being similarly relatively fixedly positioned but reversely relatively skewed, that is to say the second cylinder having its axis at the discharge end located outward of the second track but approximately on a level with the prolongation of the major axis of an egg upon the tracks, but with that second cylinder's axis at the feed end elevated materially above such level, and more nearly vertically above that second track.

18. The method of cleaning an egg which comprises rolling the egg about its major axis along a substantially straight path arranged to tilt the egg, as it rolls, from an initial end position wherein its major axis is uptilted at

one pole through a given angle to the horizontal to a final end position wherein that axis is more nearly horizontal, subjecting the egg as it rolls to an abrasive swiping action along two cylindrical loci at respectively opposite sides of its path, which cylindrical loci are oriented with their axes skewed relative to such path, so that a prolongation of the major axis beyond one pole at the initial end position more nearly intersects the axis of the adjacent locus than does a prolongation of such major axis beyond the opposite pole, in the same initial end position, come to intersecting the axis of the other locus, and, at the final end position, a prolongation of the major axis beyond the second-mentioned pole more nearly intersects the axis of its adjacent locus than does a prolongation of the major axis beyond the first-mentioned pole come to intersecting the axis of its adjacent locus.

19. The method defined in claim 18, characterized in that the abrasive action is continuous throughout the egg's advance along its path, and shifts by virtue of the reversal of direction of the egg's axis with respect to the axes of the two loci, as the egg rolls, from substantially polar zone engagement along the cylindrical locus at its initially uptilted end and substantially equatorial zone engagement along the other cylindrical locus at its initially downtilted end, to the reverse condition at the final end of its path of advance, namely, of substantially equatorial zone engagement at its initially uptilted end, and substantially polar zone engagement at its initially downtilted end, whereby all areas are exposed to generally the same abrasive effect as the egg rolls along its path.

20. The method of cleaning an egg which consists in locating two peripherally abrasive but locally yieldable cylinders in adjacent but mutually axially skewed relationship, supporting and advancing individual eggs by rolling them along a path intermediate said cylinders, always with their major axes directed transversely of such path, guiding the eggs as they advance to present the polar region of one hemisphere to one such cylinder, and at the same time the equatorial region of the opposite hemisphere to the other cylinder, and by the time the egg reaches the other end of its path reversing its relation to the two cylinders to present the other polar region to the other cylinder and the equatorial portion of the opposite hemisphere to the first such cylinder, and rotating said cylinders during passage of the egg in mutually opposite senses, to urge the egg towards its support by its contacts with the rotating cylinders.

References Cited in the file of this patent

UNITED STATES PATENTS

1,964,295	Miller et al.	June 26, 1934
2,018,967	Miller et al.	Oct. 29, 1935
2,554,878	Powell	May 29, 1951