March 25, 1941. P. GUGGENHEIM 2,235,877

EGG GRADER APPARATUS

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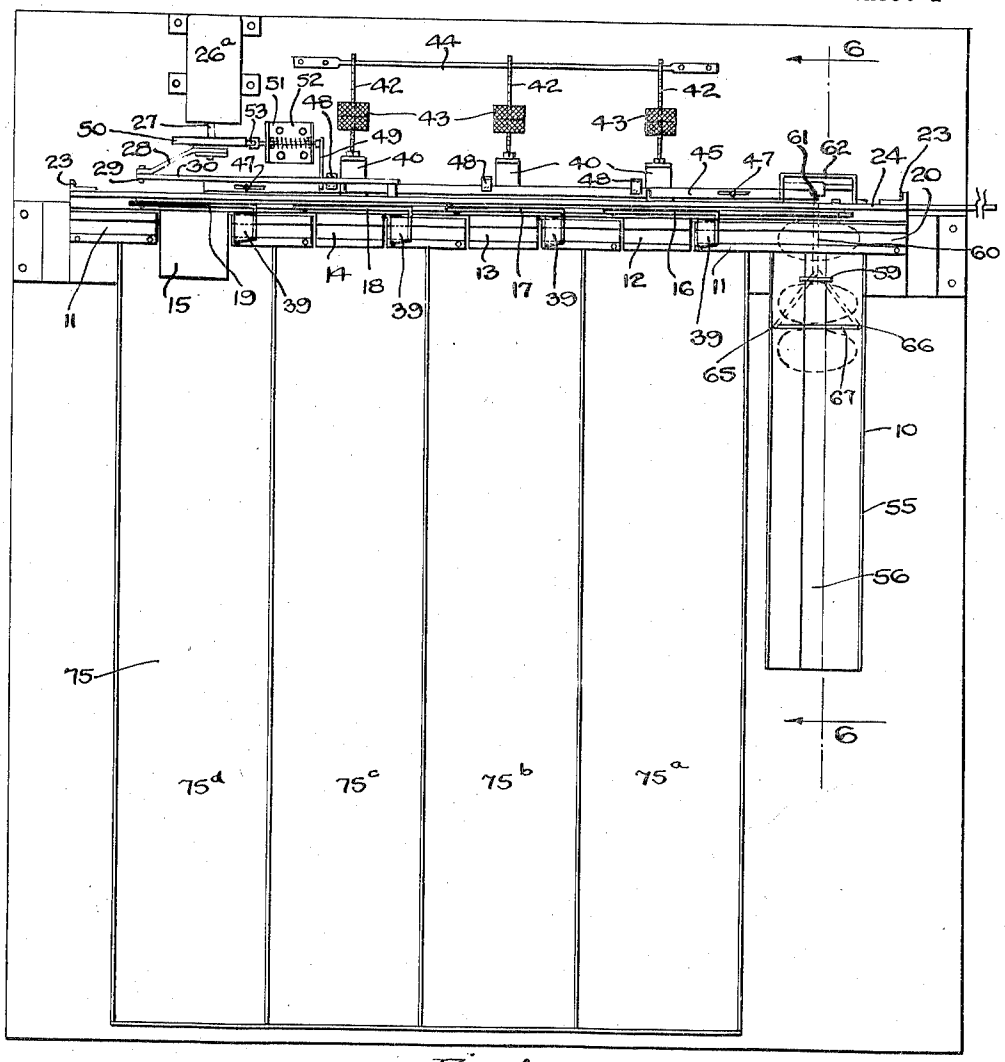


Fig. 1

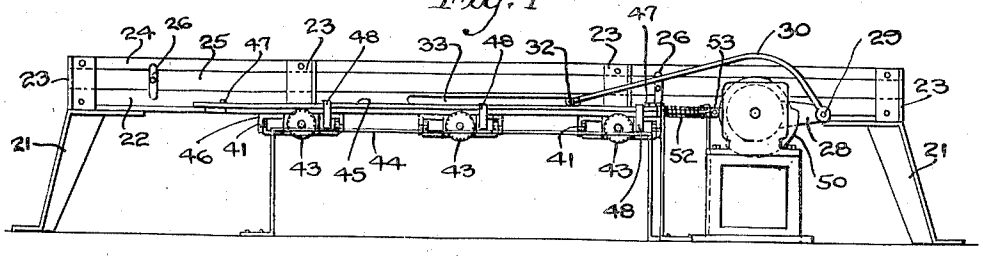


Fig. 2

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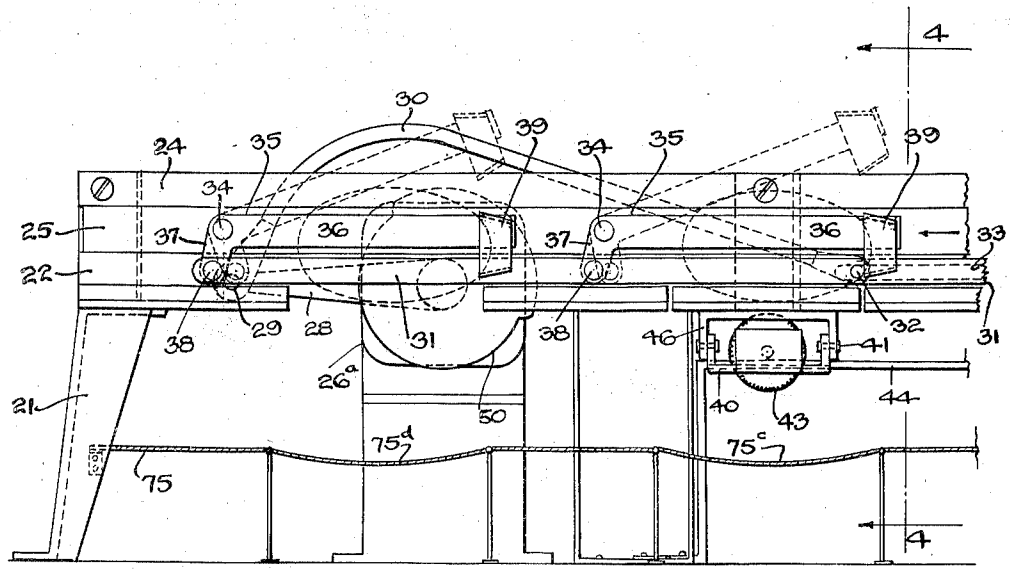


Fig. 3

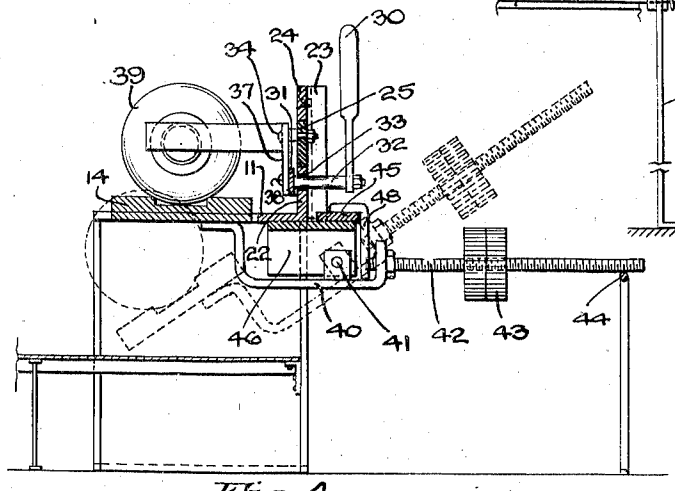


Fig. 4

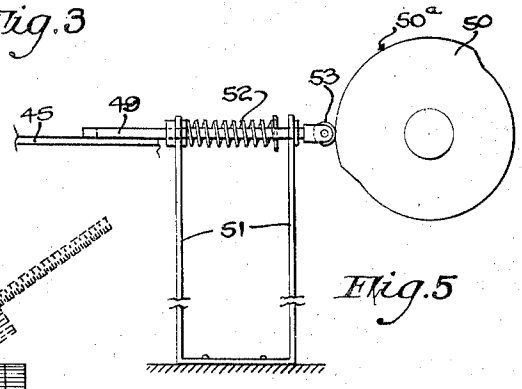


Fig. 5

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EGG GRADER APPARATUS

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Fig. 6

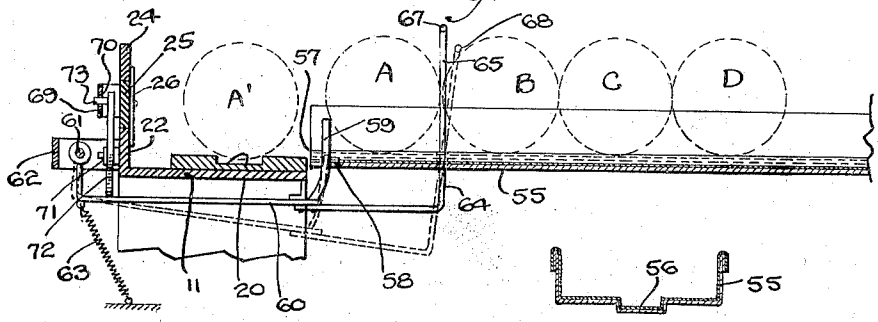


Fig. 7

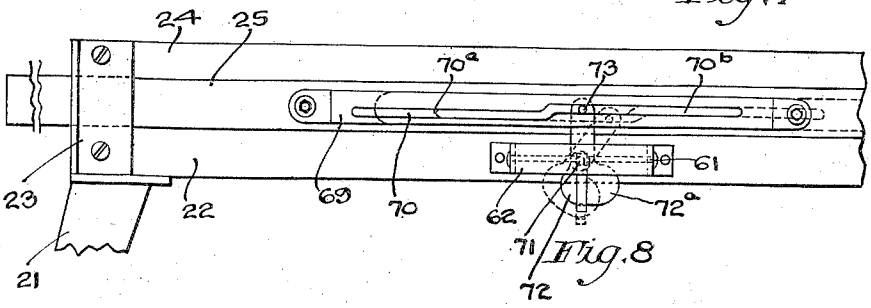


Fig. 8

Fig. 10

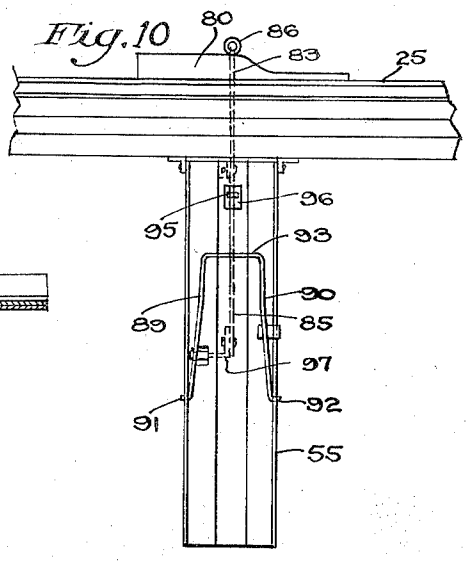
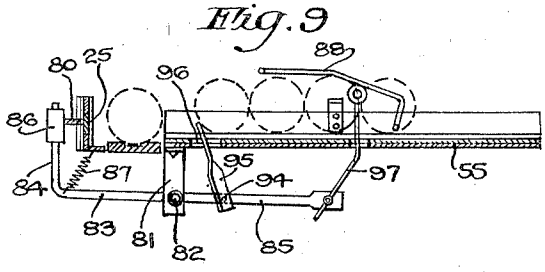


Fig. 9



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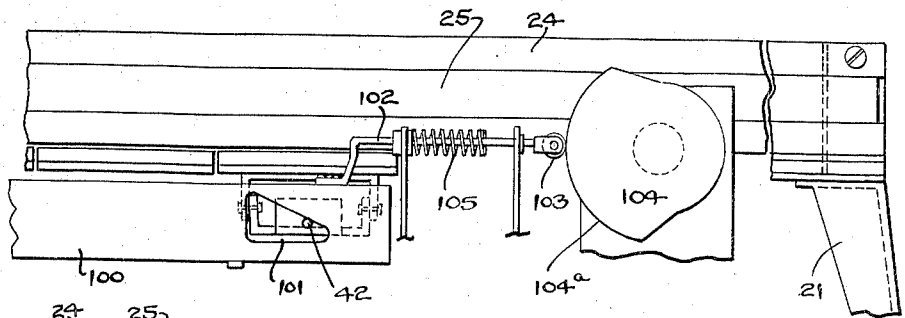
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March 25, 1941. P. GUGGENHEIM 2,235,877

EGG GRADER APPARATUS

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Fig. 11



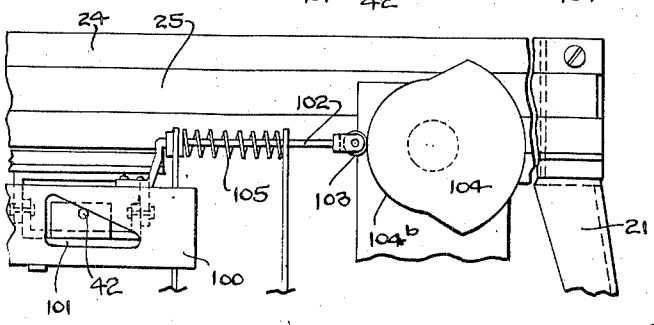


Fig. 12

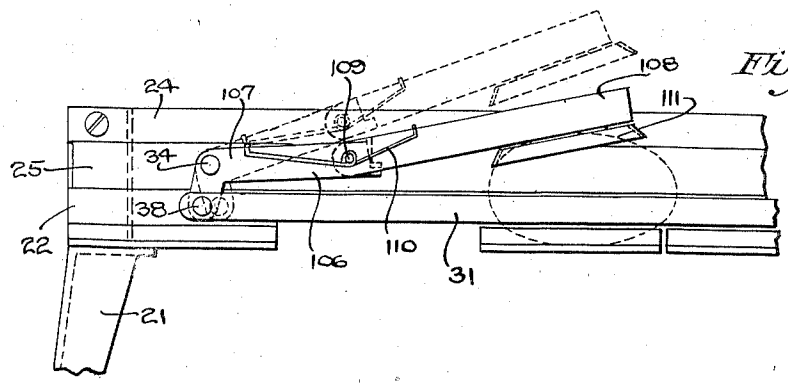


Fig. 13

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Patented Mar. 25, 1941 2,235,877

UNITED STATES PATENT OFFICE

2,235,877

EGG GRADER APPARATUS

Paul Guggenheim, Philadelphia, Pa., assignor to Philadelphia Metal Works, Incorporated, Philadelphia, Pa., a corporation of Pennsylvania

Application March 3, 1938, Serial No. 193,706

3 Claims. (Cl. 209—121)

This invention relates to grading machinery and more particularly to an apparatus for grading such articles as eggs, packaged foods, fruit and things of a like nature, by weight.

Heretofore and prior to this invention, graders of the type to which this invention appertains transferred the articles being graded by means of gripping devices which gripped the article at the commencement and then released it at the end of a reciprocatory stroke of the gripping device. The said gripping devices naturally required not only considerable maintenance care due to their complexity and number of moving parts, but also careful adjustment to insure proper gripping pressure which, if too slight, would fail to properly grip the articles being graded, and, if too great, might damage them. According to the present invention, there is provided an apparatus for grading articles by weight including a series of scale pans, each responsive to a differently adjusted weight, and a set of conveying elements which shift or slide the articles being graded over the scale pans, the arrangement being such that gripping of the article is entirely eliminated.

In the present apparatus, the several scale pans serve conjointly with stationary intervening elements to provide a longitudinally extending guide trough along which the articles to be graded are initially propelled and to that end it is an object of the present invention to provide means for locking the scale pans in non-weighing position during forward travel of the article conveying elements and until that instant when the conveying elements are on their return stroke and definitely removed from engagement with the articles being graded.

A further object is to provide an apparatus suitable for grading such fragile articles as eggs wherein a plurality of conveying elements arranged in longitudinally spaced relation simultaneously traverse independent but similar orbits of movement disposed in a common vertical plane, the orbital path of movement of each conveying element being such that during a certain portion thereof it forwardly traverses a depressed rectilinear path along which an article is shifted from a given scale pan to the next succeeding one, while during another portion thereof it reversely or rearwardly traverses a path sufficiently elevated above the scale pans to clear and engage a second article which may be resting on said given scale pan.

A further object of the present invention is to provide an apparatus for grading articles by weight which includes an automatic feeding mechanism that does not require accurate placing therein of the articles to be graded, the said automatic feeding mechanism consisting of a minimum of moving elements assembled to provide a unit which is self-contained and detachable as such from the article-grading apparatus per se and which is adapted to be operated by a simple driving connection between it and a movable part of the grading apparatus.

A further object of the present invention is to provide an apparatus for the grading of eggs wherein the possibility of crushing or breaking the eggs is reduced to a minimum; wherein there is not necessary delicate adjustment of parts on the apparatus; and wherein the eggs are selectively carried through the apparatus by a shifting mechanism having a reciprocatory motion, the said mechanism providing a slow and cushioned engagement of the shifting elements with the articles to be graded, a rapid delivery to the next succeeding scale pans of all articles weighing less than a predetermined amount, and a slow disengagement of the shifting elements from the articles as the latter are brought to rest on the several scale pans.

A still further object of the present invention is to provide an apparatus for grading articles which may be readily adapted for grading according to two or as many more classifications as may be desired and wherein a plurality of articles are selectively handled at one time.

A more specific object of the present invention is to provide a grader of the above described character wherein relatively all the parts thereof are capable of being stamped or pressed out and wherein the number of machined parts is reduced to a minimum, thus making possible a substantial reduction in the overall cost of the apparatus without sacrificing in any respect its ruggedness or efficiency of operation.

Other objects and advantages of the invention will appear more fully hereinafter, it being understood that the invention consists substantially in the combination, construction, location and relative arrangement of parts, all as will be described hereinafter, as shown in the accompanying drawings, and as finally pointed out in the appended claims.

In the accompanying drawings:

Figure 1 is a top plan view of an egg grading apparatus constructed in accordance with and embodying the principles of the present invention;

Figure 2 is a rear elevational view of Figure 1 as viewed from the motor side of the apparatus;

Figure 3 is a front elevational view showing the drive end of the apparatus on a somewhat enlarged scale;

Figure 4 is a vertical sectional view on the line 4—4 of Figure 3 showing the weighing pans in article weighing and discharging position, the latter being shown by dotted lines;

Figure 5 is a side elevational detail view of the cam operated drive for the damper mechanism;

Figure 6 is a vertical sectional view through the automatic feeder taken on the line 6—6 of Figure 1;

Figure 7 is a typical transverse sectional view of the feeder trough;

Figure 8 is a rear elevational view of a part of the automatic article feeding mechanism;

Figure 9 is a sectional view similar to Figure 6 of an alternative type of feeder showing the stop in raised position;

Figure 10 is a plan view of Figure 9;

Figures 11 and 12 show an alternative type of damper bar for maintaining the scale pans locked against movement, the bar being respectively shown in said figures as in locking and unlocking positions; and

Figure 13 shows an alternative type of article shifting element.

Referring now to the drawings and more particularly to Figures 1 to 5 thereof, it will be observed that the eggs to be graded are delivered to the grading apparatus by means of an automatic feeding mechanism, designated generally by the reference numeral 10, which feeding mechanism will be hereinafter described. The eggs are successively delivered to a longitudinally extending fixed platform 11 of the grading apparatus from whence they are propelled over one or more of a series of scale pans 12, 13 and 14 by means of reciprocating pusher elements 16, 17, 18 and 19.

The fixed platform 11 of the apparatus is interrupted at spaced intervals in its length to provide a series of spaces within which are respectively disposed the weighing scale pans 12, 13 and 14, it being observed that when the scale pans are locked against weighing movement, by means to be hereinafter described, they serve conjointly with the stationary portions of the platform 11 to provide a continuous support along which the eggs may be shifted. To insure against lateral displacement of the eggs during their travel along the platform, the stationary portions of the latter as well as the intervening scale pans 12, 13 and 14 are longitudinally grooved, as at 20, to provide a continuous guide track extending from the feeding mechanism 10 to the final discharge plate 15 of the apparatus.

The guide platform 11, which is suitably supported at a convenient elevation by legs 21—21, is provided along its rear edge with an upstanding flange 22 to which is secured, by means of angle braces 23—23, a flat bar 24 arranged in the plane of and in vertically spaced relation with respect to the flange 22. Disposed between the members 22 and 24 is another flat bar 25 which is adapted to freely slide to and fro in the vertical plane common to said members 22, 24 and 25. The bar 25 is maintained against lateral displacement from said vertical plane by suitable clips 26 (see Figure 2) secured to its rear face at longitudinally spaced intervals and overlying the rear faces of the upper and lower stationary bars 22 and 24, it being understood, of course, that any other suitable means may be provided for this purpose. However, whatever means are so provided they must permit free movement of the bar 25 longitudinally with respect to the stationary bars 22 and 24.

Arranged to the rear and toward the extreme left-hand or discharge end of the apparatus is the motor unit 26a for driving the apparatus, this unit including a motor which drives a power shaft 27 through a suitable gear reduction drive (not shown), the shaft 27 having fixed to its outer end a drive arm or crank 28, the free extremity of which is pivotally connected, as at 29, to one end of a reciprocating rod 30. This latter rod 30, which may be of any desired cross-section, is bent into the form most clearly shown in Figure 3 to provide what may best be termed as a "goose-neck" connection between the crank arm 29 and a shifting bar 31 located immediately in front of the flange 22 of the apparatus. The connection between the goose-neck 30 and the shifting bar 31 is effected by means of a transverse pin 32 rotatably secured to the free end of the goose-neck 30 and projecting through an elongated slot 33 provided in the stationary flange 22 and secured in any suitable manner to the shifting bar 31. The slot 33 in the flange 22 is of a length sufficient to permit free and unimpeded travel of the pin therealong to the full extent of the stroke of the goose-neck 30 in each direction, it being observed in this connection that upon rotation of the crank arm 28 the goose-neck 30 imparts a reciprocatory motion to the shifting bar 31. The width of the slot 33 is somewhat greater than the diameter of the pin 32 which traverses the slot so that a limited amount of vertical play is permitted in the shifting bar 31 during its reciprocatory movement. It is important to observe at this point that due to the peculiar shape of the goose-neck 30 and its angular relation with respect to the crank arm 28, its intervention between said crank arm 28 and the shifting bar 31 affords a reduction in the speed of movement of said shifting bar 31 both at the beginning and at the end of each stroke thereof in either direction.

Pivotally secured, as by the pins 34, to the slidable bar 25 are a plurality of article-propelling members 35, these latter being arranged in spaced relation along the said bar 25. In the apparatus illustrated, four such article-propelling members are shown. Each of these latter members includes a bell crank lever arm, the longer branch 36 of which extends lengthwise of the direction of travel of the articles on the apparatus, while the shorter branch 37 thereof projects downwardly and has its free extremity secured to the shifting bar 31 by a transverse pin or other such pivotal connection 38. The free outer extremity of the longer branch 36 of each article-propelling member is provided with a cup-shaped member 39 which is adapted to engage one side of the article to be propelled from one station of the apparatus to the next. The shifting bar 31 is thus suspended from the upper sliding bar 25 by the short branches 37 of the bell crank article-propelling members 35 and in consequence thereof any movement which may be imparted to the shifting bar 31 results in a corresponding but delayed movement of the upper sliding bar 25. This lag in movement of the sliding bar 25 with respect to the shifting bar 31 is due to the fact that as the shifting bar reverses its direction of movement, the article-propelling members 35 are caused to oscillate about their pivots 34 through a limited arc. During this limited arc of oscillation of the members 35 about their pivots 34, the shifting bar 31 may move in one direction or another without imparting any corresponding movement of the sliding bar 25. When, however, the members 35 reach the limit of their oscillation in one direction or another, continued movement of the shifting member results in corresponding movement of the sliding bar 25. In the particular apparatus shown, the oscillatory movement of the members 35 about their pivots 34 is determined by the play permitted between the pin 32

extending transversely from the free extremity of the goose-neck 30 and the slot 33 which it traverses during reciprocatory movement thereof. From the foregoing, it will be apparent that as the shifting bar 31 is propelled in its forward direction, that is, in the direction of the arrow shown in Figure 3, the frictional resistance offered to the free movement of the sliding member 25 will cause it to lag behind the shifting bar in consequence of which the members 35 are caused to oscillate about their respective pivots 34 into their full-line positions shown in Figure 3. On the other hand, when the shifting bar 31 is reversed in its direction of movement and moves from left to right (see Figure 3) due again to the frictional resistance offered to the movement of the sliding bar 25, the latter lags behind the shifting bar 31 in consequence of which the members 35 are caused to oscillate about their respective pivots 34 into the dotted line positions shown in Figure 3. As shown most clearly in Figures 1 and 3, it will be observed that the relation of the parts heretofore described is such that when the shifting bar is in its extreme left-hand position the several article-propelling members 35 are so disposed relatively to the several scale pans 12, 13 and 14 that the articles respectively propelled thereby are centrally disposed upon the scale pans.

It will be observed that these scale pans, which are all of similar construction, total one less than the total number of article-propelling members 35 employed, this for a reason which will be apparent hereinafter. As appears most clearly in Figures 1, 2 and 4, each of the scale pans 12, 13 and 14 is carried by a bracket 40 which is pivoted, as at 41, to a fixed part of the under structure of the apparatus. Projecting rearwardly from each bracket 40 is a screw 42 upon which is threaded a balancing weight in the form of a pair of locking nuts 43. It will be understood that by axially adjusting the weighted nuts 43 along the screw 42, the scale pan may be balanced for articles of predetermined weights. Where the apparatus is employed for grading eggs by weight, the first scale pan 12 would be adjusted to discharge therefrom only such eggs as exceed a predetermined maximum weight, the next scale pan 13 would be adjusted to discharge eggs of a lower than maximum weight, the third scale pan 14 would be adjusted to discharge eggs of still lower weight but above a predetermined minimum, while eggs less than said minimum would eventually be discharged by way of the final discharge plate 15 of the apparatus. To prevent the scale pans 12, 13 and 14 from lifting above the horizontal plane of the platform 11, an elevated bar 44 is provided to the rear of the apparatus upon which the third weighing rods 42 are adapted to rest, this bar 44 serving also conjointly with the said weighted rods 42 to maintain the scale pans at rest and in a common horizontal plane at all times except when one or the other of said scale pans is depressed to discharge therefrom an egg of a weight sufficient to cause the scale pan to dip.

In the proper operation of this apparatus, it is desirable that the several weighing pans operate to weigh the eggs only after they are definitely at rest upon the weighing pans and, to that end, locking means are provided for rendering the weighing pans 12, 13 and 14 inoperative to weigh or discharge any eggs except during the return movement of the shifting members, this means including a flat detent bar 45 which rests upon any suitable fixed element of the apparatus, such as the brackets 40 upon which the weighing pans are pivotally supported. This detent bar 45 is free to shift within the limits afforded by the pin and slot connections 47 provided for securing it in proper position (see Figures 1 and 2) and is provided with a plurality of longitudinally spaced depending detents 48, one of the latter being provided for each weighing unit. It will be apparent that by shifting the detent bar 45 to the right (as viewed in Figure 1), the several detents 48 thereof assume positions immediately above the pivoted brackets 40 of the weighing units to restrain the latter against weighing movement, such locked condition of the latter being shown most clearly in Figure 4.

In order that this locking of the weighing units be effected automatically immediately as the shifting bar 31 commences its forward or egg-propelling stroke, the detent bar 45 is actuated by a spring-pressed member 49, the operation of which is controlled in turn by a cam 50 keyed to the motor drive shaft 27. The member 49 is slidably supported within a suitable mounting 51 therefor and is so biased by the compression spring 52 that it tends normally to shift the detent bar 45 out of locking position. The free end of the spring-pressed member 49 is provided with a cam roller 53 which is in constant engagement with the cam 50, the latter being of such shape (see Figure 5) and so angularly related to the crank arm 28 that during the forward stroke of the shifting bar 31 the member 49 is forced outwardly against the compressive force exerted by the spring 52 to shift the detent bar 45 into scale-locking position.

It will be noted that the cam 50 is of such configuration that the high surface 50*a* thereof is of a linear extent sufficient to maintain the detent bar 45 in weighing pan-locking position during the time interval that the eggs are in motion along the grooved track of the apparatus and for such additional time as is required for the eggs to come definitely to rest upon their weighing pans. On the other hand, the low surface 50*b* of the cam is of a linear extent sufficient to insure unlocking of the detent bar 31 for an interval of time long enough for the several weighing pans to accurately weigh the eggs. Preferably, the weighing interval commences immediately after the members 39 are definitely disengaged from the eggs at the end of the forward stroke of said members and terminates immediately prior to the instant when the eggs are re-engaged by said members at the beginning of their forward stroke.

As has been previously mentioned, the grading apparatus is provided with a feeding mechanism 10 adapted automatically to feed the articles to be graded successively into position upon the receiving end of the platform 11 for engagement by the first one of the series of shifting members 35. As appears most clearly in Figures 1, 6, 7 and 8, this feeding mechanism 10 includes an inclined through 55 extending laterally with respect to the receiving end of the fixed platform 11 of the apparatus, the inclination of this trough 55 being such that the several articles placed thereon tend to move under the influence of gravity toward the plaform 11. To insure proper positionment of the articles during their movement along the inclined trough 15, the latter is provided with a laterally extending groove 56 which serves as a guide for the articles. Where the apparatus is employed for grading fragile articles, such as eggs, it is preferable to coat or otherwise cover the trough with a cushioning material, such as rubber, to prevent

damage to the articles. The trough, of course, may be of any suitable length to accommodate any desired number of articles to be graded.

As appears most clearly in Figures 1 and 6, the discharge end 57 of the trough terminates just short of the fixed platform 11 of the apparatus and is notched out in said end to provide an opening 58 through which is upwardly projected a stop member 59, which latter serves, when in the full-line position shown in Figure 6, to interrupt the free movement of the eggs along the trough 55 and onto the platform 11. However, when the stop member 59 is depressed into the dotted line position shown in Figure 6, the articles are free to move by gravity along the inclined trough 55 toward the platform 11.

It will be noted that the stop member 59 is fixed to and carried by the free end of a pivoted lever arm 60 which is pivoted, as at 61, within a bracket 62 secured to the rear face of the upstanding flange 22 of the fixed platform 11 of the apparatus. The pivoted lever 60 is of the angular shape most clearly shown in Figure 6 and is so connected by a tension spring 63 to a fixed point on the apparatus that it tends normally to assume the full-line position shown in Figure 6. Also fixed to and carried by the lever 60 in suitably spaced relation to the stop 59 is a second stop member 64, preferably in the form of a wire bail having upstanding laterally spaced legs 65 and 66 connected at their tops by a cross-member 67. The stop 64 thus forms in reality an inverted U and it is so arranged relatively to the stop 59 that when the lever is in its full-line position shown in Figure 6, the stop 59 engages the first egg, while the stop 64 is in an elevated position ineffective to hinder the free passage of any eggs therethrough. However, when the lever is depressed into the dotted line position shown in Figure 6 so as to retract the stop 59 into a position permitting the egg theretofore engaged by it to pass freely from the delivery trough onto the weighing platform 11 of the apparatus, the second stop 64 is correspondingly depressed sufficiently to engage, as at 68, the next succeeding egg, to prevent the latter from moving down the delivery trough. Thus, the stop members 59 and 64 of the feeding mechanism cooperate to insure delivery of the eggs one at a time to and upon the weighing platform 11 and by suitably timing the actuation of the lever 60 with respect to the operation of the egg-shifting members 35, it will be apparent that a single egg is delivered to and upon the receiving end of the platform 11 only after the egg previously delivered thereto had been shifted along the track 11 to and upon the first of the series of weighing pans 12, 13 and 14.

To effect automatically this desired single delivery of the eggs from the delivery trough 55 to the platform 11, the shifting bar 25 is provided upon the rear face thereof with a cam member 69, the main body of which is spaced from the bar 25 and is provided with a cam slot 70 of the shape best shown in Figure 8. Pivoted upon a fixed part of the apparatus, as at 71, is a second cam member 72 the upper end of which is provided with a laterally extending stud or pin 73 projecting freely through the cam slot 70 of the member 69. The lower part of the pivoted cam member 72 is of such configuration (see Figure 8) and is so arranged with respect to the lever 60 that tilting of the pivoted cam 72 into the dotted line position shown in Figure 8 causes the lever 60 to be depressed against the action of the tension spring 63. In this connection, it will be observed that the cam slot 70 is divided into communicating vertically offset portions 70a and 70b so that when the pin 73 of the pivoted cam member 72 traverses the slotted portion 70b the cam member 72 is maintained in its vertically upright position, while when said pin traverses the portion 70a of the cam slot, the pivoted cam 72 is necessarily tilted into its dotted line position. In other words, so long as the pin 73 of the cam 72 rides in the portion 70b of the cam slot, the lever 60 is unaffected by the cam and is maintained in its raised position under the influence of the tension spring 63. On the other hand, when the said pin 73 is caused to traverse the portion 70a of the cam slot, tilting of the cam 72 about its pivot 71 is effected, in consequence of which the toe 72a of the member 72 depresses the lever 60 against the restraining influence of the tension spring 63. Inasmuch as the bar 25 derives its reciprocatory motion from the motor drive of the apparatus through the intervention of the gooseneck 30, the shifting bar 31 and the egg-shifting members 35, it will be seen that the feeding mechanism 10 is likewise operated by the motor drive of the apparatus and is controlled in operation by the motion of the reciprocating bar 25.

As appears most clearly in Figure 1, it will be observed that the apparatus includes a collecting-tray 75 of canvas or other suitable material which extends forwardly from a point beneath the platform 11 and is divided by suitable partitions into a plurality of compartments 75a, 75b, 75c and 75d corresponding in number to the number of egg-discharging stations on the apparatus, which in the case illustrated total four, the last of which consists of the inclined final discharge plate 15 from which the lightest weight eggs are discharged into the receiving compartment 75d. The compartments 75a, 75b and 75c, of course, respectively receive eggs of weights respectively sufficient to over-balance the predeterminedly balanced weighing pans 12, 13 and 14, the eggs delivered from the pan 12 being of heaviest weight and those from the pan 14 of lightest weight.

In operation of the apparatus, it will be understood that the eggs to be graded are initially placed upon the feeding trough 55 of the feeding mechanism in the tandem relation shown most clearly in Figure 6 and in which the eggs are designated by the reference characters A, B, C and D. When the stop members 59 and 64 of the feeding mechanism are depressed into their dotted line position by the means heretofore described, the first egg A rolls onto the platform 11, as indicated by the reference character A'. The eggs B, C and D are, however, restrained from movement along the trough 55 by the second stop 64 and it is not until the egg A' has been shifted from its initial position on the platform 11 to the first scale pan 12 that the lever 60 is returned to its uppermost position to thereby permit the eggs B, C and D to roll under their own weight down the trough 55 to the point where the egg B is engaged by the stop 59, it being thus apparent that the two stops 59 and 64 coact to permit only that egg which is located therebetween to roll onto the platform 11 for subsequent engagement by the shifting member 35. In other words, the stops 59 and 64 alternate to interrupt the passage of the eggs down the feeding trough 55, the stop 59 being operative to interrupt the movement of all eggs positioned behind it, while the stop 64 is operative to interrupt the movement of all but the first egg in the line. As an egg is delivered

onto the platform 11, the shifting members 35 move from their full-line position shown in Figure 1 into positions to the right thereof so that the extreme right-hand cup-shaped element 39 of the egg-shifting members engages behind the eggs so positioned on the platform 11 preliminarily to shifting it to the left and onto the first scale pan 11. If the egg so positioned on the scale pan 11 is of a weight insufficient to overbalance said scale pan, it will remain thereon, but if it is of heavier than predetermined weight the scale pan 12 will dip and the egg will be discharged therefrom into the compartment 75a. As the egg reaches the first station on the apparatus, i. e., the scale pan 12, the next succeeding egg B in the feeding trough 55 is delivered to the platform 11 and is there engaged by the element 39 of the first shifting member 35. Simultaneously, the element 39 of the second shifting member 35 engages the first egg if the latter is lighter than the predetermined weight necessary to effect its discharge from the scale pan 12 and both eggs A and B are simultaneously shifted leftward along the platform 11, the first egg to the second station or scale pan 13 and the second egg to the first station or platform 12. This action continues with all of the eggs so that at one time as many as four eggs may be simultaneously shifted from one station to the next in the apparatus disclosed. It will be understood, of course, that the shifting members 35 operate continuously within the permissible limits of their movement to shift an egg from one station to another so that each egg is progressively shifted through the several stations until it reaches that one from which it is discharged by reason of its own weight. Thus, all eggs above a maximum predetermined weight are immediately discharged from the scale 12 into the compartment 75a, while all eggs below a predetermined minimum weight are discharged from the final discharge plate 15 into the compartment 75d, the compartments 75b and 75c receiving eggs of intermediate weights. It will be apparent that the action is fully automatic and that once the eggs are placed in the trough of the feeding mechanism 10 no further attention is required to sort them according to weight. Because of the fact that the weighing pans are positively locked against movement from the time that the eggs are engaged by the several shifting members 35 until the time that the eggs are shifted into their new positions and the said members 35 are definitely withdrawn from engagement with the eggs, accurate weighing of the eggs is insured.

Figures 9 and 10 show a modified form of feeding mechanism in which a horizontally disposed longitudinally extending cam member 80 is secured to the sliding bar 25 of the grading apparatus. Secured to the trough 55 of the feeding mechanism at its inner end is a depending bracket 81 to which is pivoted, as at 82, a lever 83 having the angularly related arms 84 and 85. Rotatably journalled upon the upper end of the arm 84 of the lever 83 is an elongated cam roller 86 which engages the edge of the cam member 80. A tension spring 87 interconnects the lever 83 and a fixed part of the apparatus to normally urge the cam roller 86 into constant contacting engagement with the actuating edge of the cam member 80.

Pivotally secured to the trough 55 of the feeding mechanism is a U-shaped bail 88, the opposite legs 89 and 90 of which are respectively pivoted to the opposite side walls of the trough 55, as at 91 and 92. The cross member 93 of the bail serves the same function as the cross member 67 of the stop 64 shown in Figure 6. Pivotally secured to the lever 83, as at 94, is a stop 95 which projects upwardly through a suitable aperture 96 in the base of the trough 55 into the path of movement of the eggs positioned in said trough. Also carried by the lever 83 is an actuating member 97 for actuating the rear stop 88. The stops 95 and 88 of Figures 9 and 10 respectively serve the same purpose and operate in substantially the same manner as do the stops 59 and 64 of Figure 6, it being observed that as the sliding bar 25 reciprocates, the cam member 80 is likewise reciprocated and causes the cam roller 86 to move toward and away from the face of the bar 25 to thereby oscillate the lever 83 about its pivot 82. If desired, by suitably weighting the free end of the lever 83, the tension spring 87 may be dispensed with, in which case the feeding mechanism could be disassociated bodily from the grading apparatus without requiring any mechanical disconnection of parts. It will be understood, of course, that either type of automatic feeding mechanism disclosed could be employed in association with the grading apparatus without affecting the construction or operation of the latter because in both cases actuation and control of the stops of the feeding mechanism is obtained through the sliding bar 25 of the grading apparatus.

Figures 11 and 12 show a modified form of stop mechanism for automatically locking the scale pans 12, 13 and 14 against weighing movement during the interval hereinbefore referred to when such weighing is not desired. In place of the horizontally disposed detent bar 45 and its depending detents 48 shown in Figure 4, the modification of Figures 11 and 12 employs a vertically disposed detent bar 100 in which is provided a plurality of longitudinally spaced apertures 101 each of substantially triangular shape. This vertically disposed detent bar 100 is suitably supported for longitudinal shifting movement and is so located that the several threaded rods 42 of the weighing pan project freely through the triangular aperture 101 of the bar. Secured to the bar 100 is a spring pressed rod 102 which is fitted at its free extremity with a cam roller 103 for engagement with the cam 104 corresponding to the cam 50 of Figure 5. As appears quite clearly in Figures 11 and 12, the triangular apertures 101 are each so arranged that the hypothenusal edges thereof are inclined with respect to the horizontal and respectively constitute cam surfaces which function to cam the rods 42 of the weighing pans downwardly when the detent bar 100 is shifted from right to left. Figure 11 shows the detent bar 100 shifted into scale pan locking position by the cam 104, it being observed that the high surface 104a of the cam has forced the rod 102 to the left against the influence of the compression spring 105. Figure 12 shows the rod 102 forced to the right under the action of this compression spring 105 with the cam roller 103 thereof engaging the low surface 104b of the cam, thereby so locating the weight rods 42 of the scale pan within the apertures 101 as to permit them to lift into the raised position shown. This raised position of the rod 42 as shown in Figure 12 corresponds, of course, to a lowered position for the scale pans, thereby permitting eggs to be discharged therefrom. It will thus be seen that the mechanism of Figures 11 and 12 is functionally and operatively similar to the mechanism shown

in Figures 1 to 4 for locking the weighing devices in inoperative position.

Figure 13 shows a modified construction of egg shifting member which may be employed in lieu of the member **35** as shown in Figures 1 to 4. In place of the previously described rigid arm **36** of the egg shifting member **35**, the modified construction employs a split arm **106**, the parts **107** and **108** thereof being pivotally connected, as at **109**. A wire spring **110** so interconnects the members **107** and **108** as to normally maintain the latter extended in straight-line relation. Secured to the outer extremity of the spring pressed part **108** is a downwardly presenting cup-shaped element **111** which is shaped to more or less snugly fit over the upper side of an egg (shown by the dotted line in Figure 13).

The spring **110**, while sufficiently strong to insure a firm engagement of the member **111** with the egg, is nevertheless not so strong as to possibly crush the egg. The member **106** with its spring-pressed part **108** thus operates to pull the eggs along the grading platform of the apparatus and through the various weighing stations thereof, the spring-pressed part **108** being so angularly adjustable with respect to the part **107** to which it is pivoted as to compensate for and insure proper engagement with eggs of different sizes.

It will be understood, of course, that the various modifications shown in Figures 9 to 13 of the drawings may be employed in lieu of their equivalent constructions shown in Figures 1 to 8 without altering or in anywise affecting the cycle of operations of the apparatus as previously described. It will also be understood that the apparatus may be modified in still other respects without departing from the general principles thereof and it is contemplated that such modifications may be made from time to time. From the foregoing description, it will be apparent that the present invention provides an apparatus for grading eggs and other articles by weight which includes a plurality of weighing devices each responsive to predeterminedly adjusted different weights and a set of cooperating article shifting members for shifting the articles to be graded successively to the several weighing devices. By the provision of means for insuring the locking of the several weighing devices to render them inoperative as the articles to be graded are shifted along the grading platform of the apparatus, and which means operate to release the weighing devices only after the articles have come definitely to rest upon the several weighing pans, accurate grading of the articles is insured. Also, by providing the grading apparatus with a feeding mechanism of the character described and shown in the drawings, a minimum of attention is required during the operation of the grading apparatus. While in the foregoing description the apparatus has been described as for grading of eggs, it will be understood, of course, that the present apparatus is adapted for grading various other articles and it will be understood, therefore, that the invention is not at all intended to be limited solely to an egg grading apparatus.

What is claimed as new and useful is:

1. In an apparatus for grading articles by weight, having a horizontal track including at spaced intervals therein a series of pivoted weighing pans respectively responsive to different weights, and propelling means for shifting the articles to be graded along said track for discharge from said weighing pans, respectively, as said articles exceed in weight the minimum necessary to depress said weighing pans into inclined, article discharging position; characterized by that the propelling means comprise a pair of vertically spaced longitudinal bars disposed longitudinally of the track, and forming a longitudinal guideway, a slidable bar disposed in said guideway, a series of spaced article propelling devices pivotally mounted on said slidable bar, each of said devices comprising a bell crank lever pivoted at its corner to said slidable bar, one arm of said bell crank lever having an article engaging element at its free end, the other arm of said bell crank lever being suspended from said pivot point, a longitudinally reciprocable strip, pivotal connections between the lower ends of each of said other arms and said strip, and power means for reciprocating said strip.

2. In an apparatus for grading articles by weight, having a horizontal track including at spaced intervals therein a series of pivoted weighing pans respectively responsive to different weights, and propelling means for shifting the articles to be graded along said track for discharge from said weighing pans, respectively, as said articles exceed in weight the minimum necessary to depress said weighing pans into inclined, article discharging position; characterized by that the propelling means comprise a longitudinal guideway disposed above and in rear of said track, a slidable bar disposed in said guideway, a series of spaced article propelling devices pivotally mounted on said slidable bar, each of said devices comprising a bell crank lever pivoted at its corner to said slidable bar, one arm of said bell crank lever having an article engaging element at its free end, the other arm of said bell crank lever being suspended from said pivot point, power means for operating said propelling means and a reciprocable bar pivotally connected to the lower ends of each of said other arms and connected to said power means.

3. In an apparatus for grading articles by weight, having a horizontal track including at spaced intervals therein a series of pivoted weighing pans respectively responsive to different weights, and propelling means for progressively shifting the articles to be graded along said track for discharge from said weighing pans respectively as said articles exceed in weight the minimum necessary to depress said weighing pans into inclined, article discharging position; characterized by that the said apparatus is provided with means for positively maintaining said pans in a common horizontal plane while the articles are being shifted, said means comprising a longitudinally disposed plate having a plurality of openings through which the beams of said scales pass, one face of said opening being in engagement with said beam throughout the shifting operation, and means for moving said plate so as to release said pan for operation when the shifting devices are out of engagement with said articles.

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