Aug. 15, 1944. R. M. EDINGTON 2,355,715

MACHINE FOR GRADING ARTICLES BY WEIGHT

Filed June 1, 1942 3 Sheets-Sheet 1

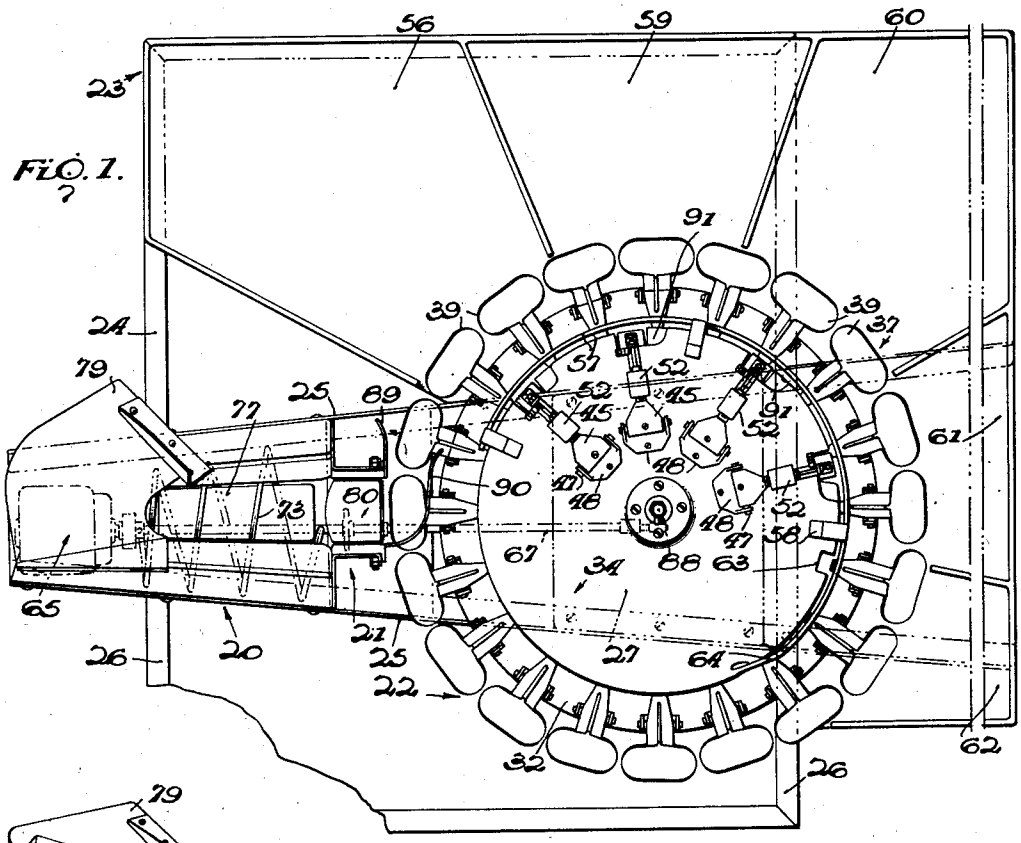


FIG. 1.

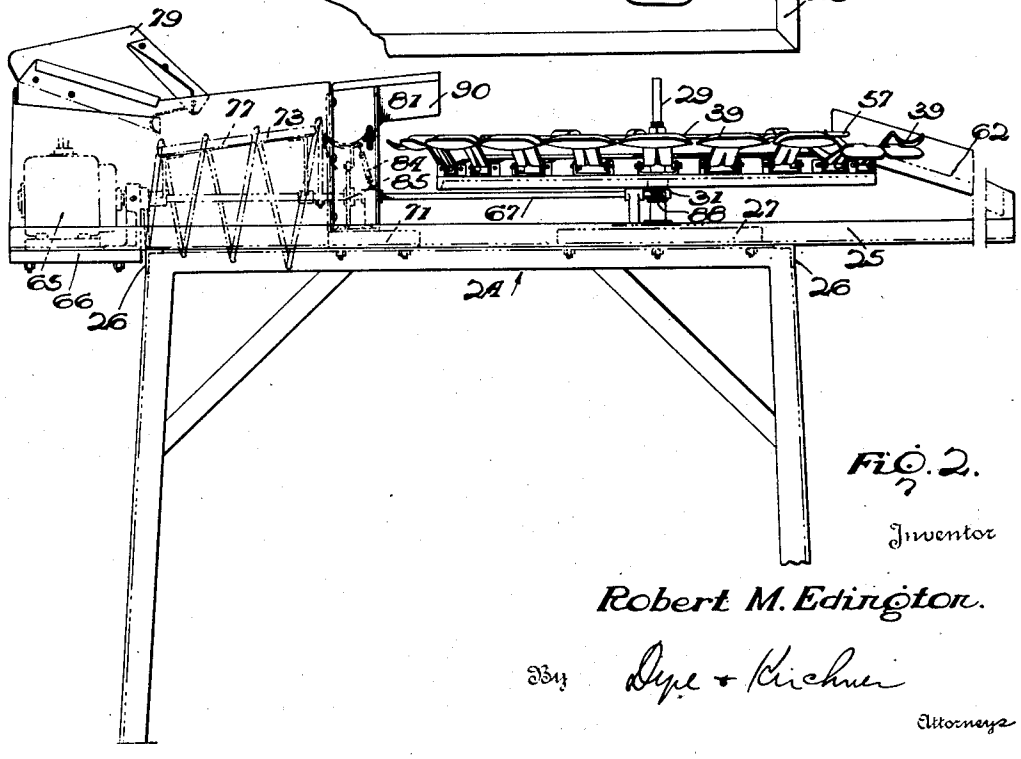


FIG. 2.

Inventor

Robert M. Edington.

By Dyer & Kirchner

Attorneys

Aug. 15, 1944. R. M. EDINGTON 2,355,715

MACHINE FOR GRADING ARTICLES BY WEIGHT

Filed June 1, 1942 3 Sheets-Sheet 2

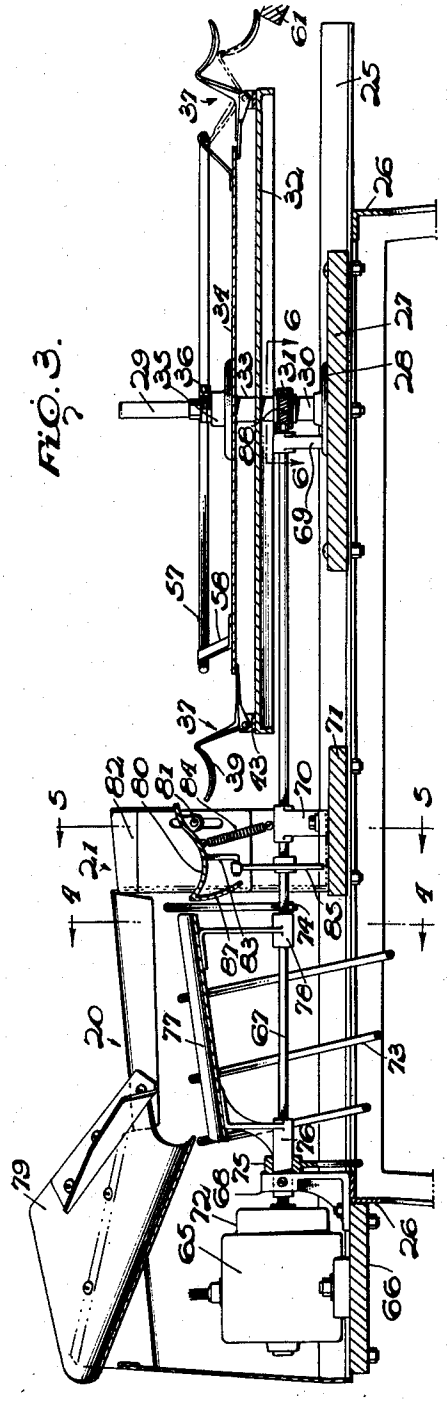


FIG. 3.

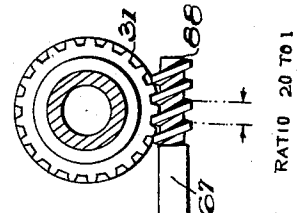


FIG. 6.

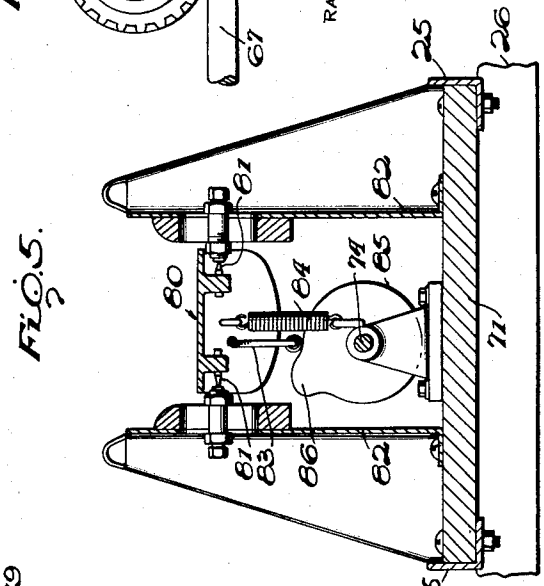


FIG. 5.

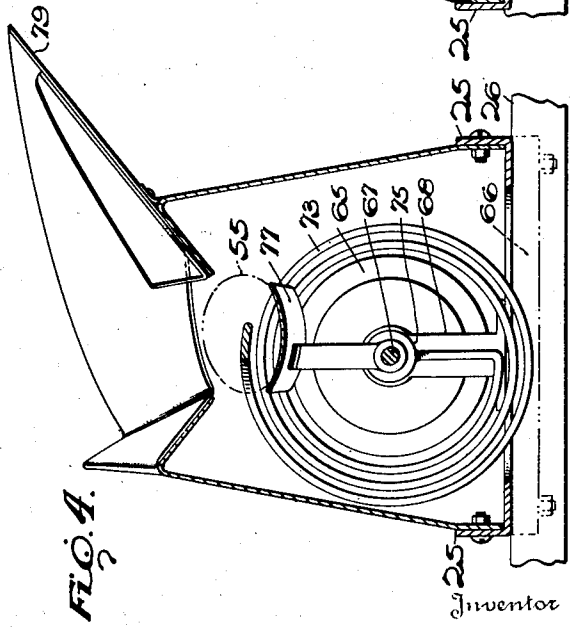


FIG. 4.

Inventor

Robert M. Edington.

By Dyer & Kirchner

Attorneys

Aug. 15, 1944. R. M. EDINGTON 2,355,715

MACHINE FOR GRADING ARTICLES BY WEIGHT

Filed June 1, 1942 3 Sheets-Sheet 3

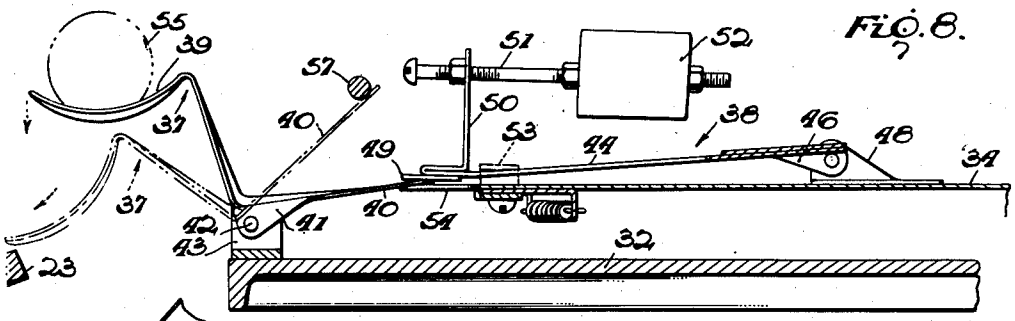


FIG. 8.

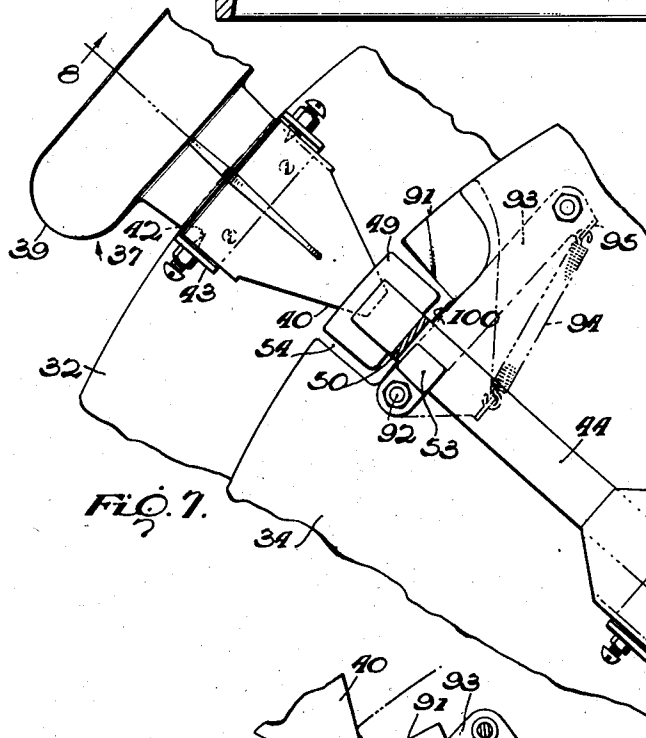


FIG. 7.

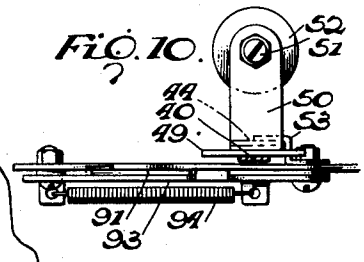


FIG. 10.

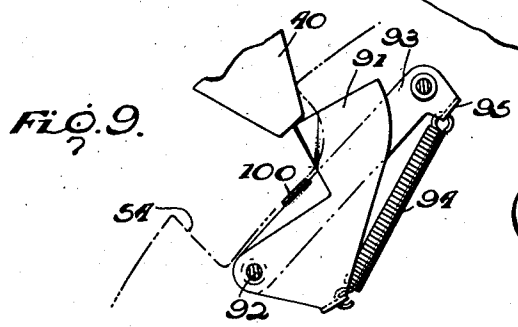


FIG. 9.

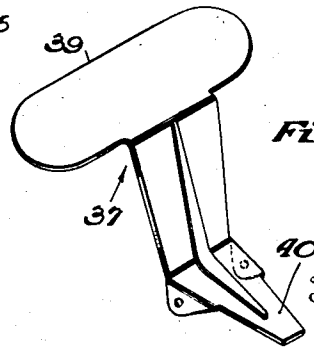


FIG. 11.

Inventor

Robert M. Edington.

By Dyer & Kirchner

Attorneys

Patented Aug. 15, 1944

2,355,715

UNITED STATES PATENT OFFICE

2,355,715

MACHINE FOR GRADING ARTICLES BY WEIGHT

Robert M. Edington, Landis Township, Cumberland County, N. J.

Application June 1, 1942, Serial No. 445,328

5 Claims. (Cl. 209—121)

The present invention relates to machines for grading articles by weight and more particularly comprises certain useful improvements in means for continuously and automatically separating eggs or the like into groups or collections accurately graded according to weight.

Machines of this general type have heretofore been proposed but the best of the prior art machines known to me possess numerous disadvantages and shortcomings which have kept them from becoming widely adopted.

Many of the previous machines have included article-handling elements that were too rough in their operation to permit use on such fragile articles as eggs, ripe fruit or the like. Others are devoid of feeding means, so that the articles must be manually set one by one in the machines, and these are obviously objectionable and commercially impracticable because their operation involves excessive labor costs. Still others are slow and uncertain in their operation, or are expensive to make, operate and maintain.

Objects of the invention therefore are concerned with providing a grading machine that can be manufactured at low cost, that will be durable and foolproof in operation, that will perform its grading function expeditiously, rapidly and with complete safety to fragile articles like eggs, fresh fruit and the like, that will entail a minimum of labor and other operating costs, that will be compact and of neat and balanced appearance, that will be simple in construction, and that will in general be superior to the best machines of the prior art.

With the foregoing and other objects in view, as will be apparent to those skilled in the art from the following specification, a preferred embodiment of the invention is shown on the accompanying drawings, in which

Figure 1 is a plan view of a machine constructed in accordance with the principles of the invention;

Fig. 2 is a side elevational view;

Fig. 3 is a vertical longitudinal sectional view taken through Fig. 1 and on a slightly enlarged scale;

Fig. 4 is a vertical transverse sectional view through the feeding device, taken on the line 4—4 of Fig. 3;

Fig. 5 is a vertical transverse sectional view through the transfer mechanism, by which articles are moved from the feeding device to the turntable, taken on the line 5—5 of Fig. 3;

Fig. 6 is a horizontal transverse sectional view taken through the vertical post which mounts the turntable, on the line 6—6 of Fig. 3;

Fig. 7 is a detail, fragmentary top plan view of the weighing or stationary plate and the projecting part of the associated turntable, showing a scale and an article holder;

Fig. 8 is a radial sectional view through part of the turntable and the weighing or stationary plate, showing one of the scales and article holders in side elevation, this view being taken on the line 8—8 of Fig. 7;

Fig. 9 is a fragmentary top plan view taken beneath the stationary plate showing one of the holder-releasing gates in releasing position;

Fig. 10 is an edge elevational view of the weighing or stationary plate showing one of the scales and its associated gate; and

Fig. 11 is a perspective view of one of the article holders.

The general principle of the invention comprises moving a plurality of individually loaded article holders relatively to a plurality of scales, each of which is set differently and is arranged to cause discharge of an article the weight of which equals or exceeds the scale setting, and then returning the empty holders, each positioned to receive another article, back to an article loading point for repetition of the cycle. In a prefered form of embodiment the foregoing type of mechanism is combined with feeding means at the loading point for unfailingly and automatically depositing one article from a bulk lot onto each of the holders as it passes the loading point. Of course suitable separated compartments are provided for receiving the articles in graded groups.

Such a machine, designed particularly for the grading of eggs, is illustrated in the drawings. It comprises a feeding device 20, a loading device 21, weighing means 22, and graded article receiving means 23. The whole machine may be mounted as a unit on a skeleton framework or bed 24 set on legs of convenient height.

The weighing means, which in some respects is the most important part of the machine and which embodies numerous novel features, will first be described.

The framework 24 comprises near-parallel angle iron members 25, 25, extending generally lengthwise of the machine and bolted or otherwise rigidly secured to the cross members 26, 26 of a rectangular member connecting the tops of the legs. Bolted to these members 25, 25 is a bed 27 to the approximate center of which is rigidly fastened the flanged foot 28 of a vertical

post 29. A bushing 30 having an integral helical pinion 31 is rotatably mounted on this post and is given bearing support by the flanged foot 28, or by some interposed washer, anti-friction thrust bearing or the like, omitted from the drawings in the interest of simplicity of illustration. The bushing 30 has fast on its upper end the hub portion of a turntable 32, which may be a circular plate of metal flanged at its periphery for stiffness.

Spaced above the turntable 32 by a bushing 33 sleeved over the post 29 is a plate 34 the hub 35 of which is held fast on the post by a setscrew 36. This stationary plate is of less diameter than the turntable 32, so that the peripheral margin of the latter extends out beyond the stationary plate, and on this projecting margin are mounted a plurality, twenty in the illustrated machine, of article holders 37. On the stationary plate are mounted a lesser number, as for example four in the illustrated machine, of scales or weighing devices 38. The arrangement is such that when the turntable is rotated, each holder 37 will be passed successively by each of the scales 38, by which it will be weighed and which will operate to discharge from it an article having a weight equal to or greater than that at which the particular scale is set. The precise manner and mechanism by which this is accomplished will now be explained.

Each holder comprises a spoon or holder portion proper 39 and a tripping arm 40, angularly related and both preferably forming integral parts of a single stamping, as best appears in Fig. 11. The spoon is conveniently dished and appropriately proportioned to receive one of the articles which the machine is designed to grade, which in the present case are eggs. Between the spoon and the tripping arm the holder has a pair of downturned ears 41 each of which is apertured to receive a pivot pin 42 by which the holder is pivotally mounted in a suitable bracket 43 fixed on the rim of the turntable 32 in such a way that the lengthwise axis of the holder is radial of the turntable and the spoon of the holder overhangs the edge of the turntable.

Each of the scales, one of which is shown in detail in Figs. 7 and 8, comprises a weighing beam in the form of an arm 44 pivoted at one end on the stationary plate 34 in such a way that it extends radially of the plate with its free end approximately flush with the rim of the plate. The pivot mounting may be made generally like that of each of the holders 37, as by enlarging the beam 44 laterally through the medium of a plate 45 riveted or welded to its inner end. This plate has downturned ears 46 apertured to provide bearings for pintles 47 set through bracket members 48 fastened to the upper surface of the plate 34.

At its outer end each beam 44 is folded back on itself a short distance to provide a stiffened end portion to the under surface of which is fastened a foot plate 49. Inwardly of this folded portion the beam is turned up as a short standard 50. This standard mounts a horizontal screw 51 which extends back so as generally to overlie the beam 44, where it carries a weight 52 which may be meshed with the screw 51 or otherwise arranged for adjustment along it. Of course the weight keeps the beam 44 normally down in engagement with the plate 34, but the beam is free to rock upwardly about its pivot 47. Upward movement is restrained and limited by a clip or bridge 53 covering the beam just inwardly of its standard 50. The foot plate 49 of the beam rests in a notch 54 formed in the edge of the plate 34, so that the plate 49 and plate 54 normally lie in the same horizontal plane.

The scales 38 are arranged radially about a portion of the plate 34, and each scale is adjusted to a predetermined weight setting by appropriately positioning its weight 52 lengthwise of the screw 51. These settings are so related that progressively less force acting up against the stiffened end portion 49 is required to lift the beams 44, considering the scales in the order in which the holders move past them, which is clockwise in Fig. 1.

Each holder 37 has its tripping arm 40 engaged beneath the rim of the plate 34, and the turntable 32 is rotated by means presently to be described so that each holder is moved successively past all the scales 38. It will be evident that if an article, such as an egg 55, is carried in the spoon 39 of a holder, the arm 40 of that holder will bear up against the under surface of the periphery of the plate 34 with a force determined by the weight of the article. The holder will be held by this engagement in upright or article-holding position, as shown in Fig. 3. At the first scale the arm 40 leaves the periphery of the plate 34 and enters a notch 54, in which it ceases to engage the plate 34 and comes into engagement solely with the end portion 49 of the beam 44. This scale is weighted at the heaviest predetermined setting, which may for example be such as to cause it to release an egg having a weight equal to or greater than twenty-four ounces to the dozen. If the egg carried by the holder is of such weight, it will lift the beam 44 as far as permitted by the clip 53, which will be enough to permit the arm 40, on continued movement of the holder, to slip over the edge of the plate 34 on the far side of the notch 54. At this point there will be nothing to maintain the holder in upright position, so that it will rock about its pivot to lower the spoon and allow the egg to roll by gravity therefrom into a gently inclined compartment 56 of the receiving bin 23. In this rocking movement the holder swings from the full line position of Fig. 8 to the dotted line position. In this latter position it is limited and stopped by engagement of the tripping arm 40 with a cam rail 57 mounted on bracket fingers 58 around a portion of the peripheral margin of the plate 34, and the holder continues its movement around the plate in this position. If, however, the egg in the holder is not heavy enough to overbalance the weight 52, the holder is maintained in upright position and, on further movement of the holder, the arm 40 continues engaged with the under side of the margin of the plate 34 beyond the notch 54 until the next scale is reached. This scale is set at a predetermined lower weight, such for example as one which will release an egg weighing twenty-two ounces to the dozen. If the egg is of such weight, it will be released by the second scale to roll into the compartment 59; otherwise it will continue in the upright holder for release by one or another of the next scales into one or another of the compartments 60, 61.

If any egg be too light for release by the last scale into the last compartment 61, the weight 52 of which is adjusted to the lightest setting, it will be released into the final compartment 62 when the arm 40 of its holder enters an uncovered notch or slot 63 formed in the plate 34 opposite the compartment 62. At this point all the holders not previously rocked to discharge

position are lowered, so that beyond the slot 63 in the cycle the arms 40 of all the holders are engaged with the cam rail 57. Shortly beyond the slot 63 the cam rail descends to fastened engagement with the plate 34 just beyond an opening 64 in this plate, through which all the arms 40 are returned to their original position beneath the periphery of the plate 34. Thus all the holders are returned in upright position to that point in their path of travel which may be considered the starting point of the cycle, ready to receive more eggs to be graded.

At this starting point, which of course is anterior to the first scale and posterior to the opening 64, I provide means for automatically supplying an individual article to each of the holders. This means will now be described.

An electric motor 65 is mounted on a base 66 bolted to the angle iron members 25 at their outer ends. The shaft 67 of this motor is slightly offset from radial relation to the turntable 32 and stationary plate 34, and is mounted in bearing brackets 68, 69, and 70 arranged as shown in Fig. 3 on the motor base 66, the bed 27, and an intermediate bed 71 fastened to the angle iron members 25 between the parts 66 and 27. Suitable reduction gearing 72 is associated with the motor to drive the shaft 67 at any desired rate.

A stiff wire conveyor worm 73 has its forward end portion 74 made fast to the shaft 67, as is shown in Fig. 3, and its rear end portion 75 mounted for rotation around an elongated shaft bearing sleeve 76 which extends from the bracket 68. The worm is of frusto-conical shape, flaring forwardly, and encircles an inclined channel plate 77 which slopes upwardly in the direction of drive of the conveyor 73. This channel plate is bracketed at its rear end on the bearing sleeve 76 and at its forward end on another sleeve 78 which rotatably receives the shaft 67. An outwardly flaring chute or hopper 79 is disposed to receive a comparatively large number of objects such as the eggs 55 and to feed these objects to the low receiving end of the incline 77 over which the upper runs of the conveyor 73 are traveling with just sufficient spacing between them to accommodate one article. Thus the articles are separated from the group in the hopper and are moved in single file, one between each successive pair of convolutions of the conveyor 73, upwardly along the incline 77.

At the inner end of the incline the eggs are rolled one at a time through the transfer mechanism 21 which comprises a receiving plate 80 having a peculiar shape as shown in Fig. 3. This receiver is dished to accommodate an individual egg and has a comparatively high inclined floor at its far side to stop the rolling movement of the egg delivered to it from the incline 77. The receiver is pivoted at 81 in the side walls of a housing 82 which generally encloses the motor and feeding mechanism 20 and has an open top receiving the chute 79 and permitting observation of the movement of the eggs on the incline 77.

The receiver 80 has a cam follower 83 depending from its portion which holds an egg, and this cam follower is kept by a spring 84, connected between the receiver and the bearing 70, in engagement with a cam 85 fast on the shaft 67. This cam has a rise 86 (Fig. 5) at one point on its periphery so arranged that once in each revolution of the shaft 67 the receiver 80 will be elevated to roll an egg to the right in Fig. 3 and discharge it over its far side. The conveyor 73 and cam 85, being both mounted on the same shaft 67, rotate together and the two parts are so adjusted that the receiver 80 will begin to rise about its pivot 81 only after an egg has been deposited on it by the conveyor 73. In actual practice only a single egg is contained between each pair of adjacent convolutions of the conveyor 73, so that only one egg is positioned on the receiver 80 each time the receiver rocks to transfer the egg, but it is convenient to form a depending apron 87 on the receiver 80 simply to prevent the dropping of some small foreign object that may become mixed with the eggs or the like down beneath the receiver 80 should such an object be discharged from the incline 77 when the receiver is in elevated position.

The shaft 67 carries at its outer end a worm 88 which is meshed with the pinion 31 to drive the turntable 32. Thus movement of the turntable and movement of the conveyor 73 and the receiver 80 are synchronized, and the arrangement is such that each time the receiver 80 rises to discharge an egg, one of the holders 37 will be positioned to receive the discharged egg. This is easily accomplished by selecting an appropriate gear ratio for the worm 88 and pinion 31. In the illustrated example, where twenty holders are used, this ratio is such that one revolution of the shaft 67 will drive the pinion 31 and consequently the turntable 32 through one-twentieth revolution.

As shown in Fig. 1, the housing 82 may include a pair of guard members 89, 90, extending outwardly from the housing as shown in Fig. 1 to define a pathway which restrains an egg discharged by the transfer device 21 so that it will be positively stopped on a receiving holder 37 and will be permitted to move with that holder only in the direction in which the holder moves.

It some times happens that an egg being weighed at one of the scales 38 just balances the weight 52, so that the end portion 49 of the beam 44 is lifted just enough to cause the advancing edge of the holder arm 40 to strike squarely against the thickness of the stationary plate 34 defining the far side of the slot 54. This would of course stall the machine or result in bending or breakage of some of the parts. In order to prevent such an occurrence, I enlarge each slot 54 to make it considerably wider than would be necessary merely to pass the advancing edge of an arm 40 and arrange a gate 91 to cover the extra width of the slot 54. This gate is pivoted at 92 to slide between the under face of the plate 34 and a bridging support 93 fastened thereto and is normally held in closed position over the extra area of the slot by a light coil tension spring 94 connected between the gate and an ear 95 downturned from the support 93. The gate is easily retracted against the tension of the spring 94 whenever its forward edge is met by the advancing edge of an arm 40, and the arm is released through the enlarged slot as soon as its trailing edge clears the portion 49 of the beam 44. Thereupon the gate 91 is restored by the spring 94 to closed position limited by the ear 100 which is upturned from the bridge 93. In this way jamming is rendered impossible, even when the weight of an egg or other object in a holder more or less equally balances the adjusted setting of a scale.

As indicated in Fig. 7, the leading edge of the gate 91 may be slightly upturned so that the under surface of this edge lies in the common plane

of the under surfaces of the foot plate 49 and the stationary plate 34. Thus, an arm or finger 40 which is not weighted enough to lift a beam 44 rides smoothly under and in contact with the plates 34 and 49 and the gate 91, successively, while one that is weighted enough to lift the beam 44 to the limit permitted by its clip 53 will pass beneath the foot plate 49 and above the leading edge of the gate 91, and one weighted just enough to lift the foot plate partially may strike the leading edge of the gate and push it back as shown in Fig. 9 so that the finger 40 will be released through the enlargement of the slot 54 exposed by the retracted gate.

The compartments 56, 59, 60, 61 and 62 of the bin 23 are arranged with floors that slope gently downwardly and outwardly and have upper, inner edges that almost meet the outer lip of a holder spoon portion 39 when in tipped or discharging position, so that the egg is not dropped to such floor. The bin 23 or its component compartments may be mounted as a whole or separately on the framework members and may if necessary be blocked up at their outer ends. Of course these bin compartments may be made of any appropriate size and capacity to receive any number of the graded articles.

I have found in practice that the machine may be driven safely at such a rate of speed as will grade ten or more crates of eggs per hour. At this rate of speed two operators are required, one to keep the hopper 79 reasonably filled with eggs to be graded, and one to remove graded eggs from each of the compartments.

It will be observed from the drawings that all the parts with which the eggs or other articles come in contact are so related that the articles at no points in their movement from one part to another fall through any appreciable distance. If desired, some or all of such parts may be suitably cushioned, as by having pads of felt or the like cemented to them, but I have found in actual practice that not even this precaution is necessary to adapt the machine to handle eggs safely, inasmuch as the eggs roll in the act of being transferred between the several parts and in no case is the drop great enough to injure an egg.

It is believed that the foregoing description, read in connection with the drawings, sufficiently discloses the principles of the invention and the best mode in which I have contemplated applying those principles. Obviously the invention is capable of embodiment in other and differently modified forms, all of which, to the extent that they embody the principles of the invention which are novel and useful, are intended to be pointed out by the appended claims and to be considered within the scope and purview thereof.

I claim:

1. In a machine for grading articles by weight, a fixed circular plate having a generally solid marginal zone interrupted by a plurality of spaced slots, a plurality of scales of predetermined different weight settings each comprising a weighted lever mounted radially on the plate and projecting over one of said slots, a plurality of article holders each mounted to rock about a pivot and having on one side of the pivot an article support and having on the other side of the pivot a finger disposed beneath the marginal zone of the plate, and means moving said holders relatively to said plate and concentrically thereto to bring each holder successively into parallelism with each lever, whereby a holder will rock about its pivot to discharge an article carried by it when the weight thereof overbalances and raises a weighted lever so that the holder finger passes through the adjacent slot.

2. In a machine for grading articles by weight, a plate having a generally solid marginal zone interrupted by a plurality of spaced slots, a plurality of scales of predetermined different weight settings each comprising a weighted lever mounted on the plate and having a portion extending substantially parallel to the plate and substantially right angularly to the outer edge of said marginal zone projecting over one of said slots, a plurality of article holders each mounted to rock about a pivot and having on one side of the pivot an article support and having on the other side of the pivot a finger narrower than said slot and disposed beneath the marginal zone of the plate, and means moving said holders relatively to said plate to bring each holder successively into parallelism with each lever, whereby the fingers will move successively transversely under the projecting portions of the levers and will exert a lifting force against them so that a holder will rock about its pivot to discharge an article carried by it when the weight thereof overbalances and raises a weighted lever so that the holder finger passes through the portion of the slot adjacent to the lever.

3. In a machine for grading articles by weight, a plate having a generally solid marginal zone interrupted by a plurality of spaced relatively wide slots, a plurality of scales of predetermined different weight settings each comprising a weighted lever mounted on the plate and having a portion projecting over part of the width of one of said slots, a plurality of article holders each mounted to rock about a pivot and having on one side of the pivot an article support and having on the other side of the pivot a finger narrower than said slot and disposed beneath the marginal zone of the plate, means moving said holders relatively to said plate, whereby a holder will rock about its pivot to discharge an article carried by it when the weight thereof overbalances and raises a weighted lever so that the holder finger passes through the portion of the slot beyond and uncovered by the lever, and a gate pivoted on the plate and yieldably covering the portion of the slot uncovered by the lever so as to release any finger which may slightly raise the lever and strike the edge of said gate.

4. In a machine for grading articles by weight, a plate having a notched edge, a scale having a beam extending generally right angularly to the edge of the plate and rockable about a pivot axis generally parallel to said edge, said beam including a portion extending over the notch in the edge of the plate, an article holder comprising a pivoted lever having an article support on one side of the pivot and a finger on the other side, and means moving the article holder relatively to the plate so that said lever will be disposed parallel to said beam and beneath the same and the finger will be urged by the weight of the article upwardly first against the plate and then against the portion of the beam which extends over the notch in the plate, whereby the full lifting force of the weight of the article will be applied to the beam as soon as the finger enters the notch and the beam will be lifted to pass the finger through the notch and permit the holder to tip and release the article if the weight thereof is great enough to overbalance the beam.

5. In a machine for grading articles by weight, a slotted plate, a weighing beam having a por-

tion extending over the slot, a pivoted article holder having a finger movable under the plate and urged by the weight of its article up against the plate and against said portion of the beam to lift the beam if the weight of the article is great enough to overbalance the beam, and a gate pivoted on the plate and yieldably extending into the slot so as to be engaged and displaced by the finger so as to increase the effective width of the slot and pass the finger when the named portion of the beam rises only sufficiently to bring the finger into the plane of the plate.

ROBERT M. EDINGTON.