March 18, 1941. R. E. J. NORDQUIST 2,235,725

CAN WEIGHING MACHINE

Filed Dec. 3, 1936 5 Sheets-Sheet 1

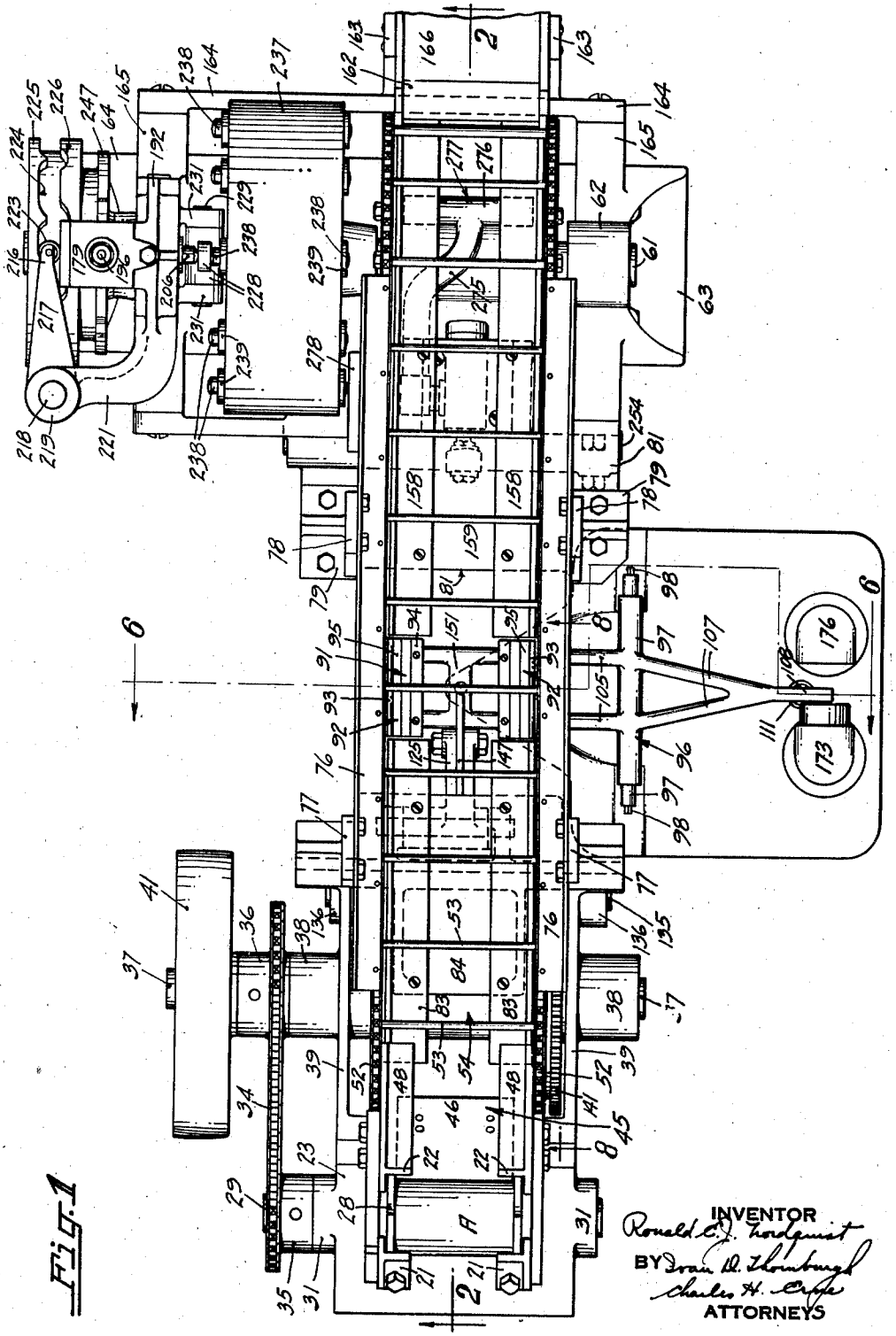


Fig. 1

INVENTOR
Ronald E. J. Nordquist
BY Evan W. Thornburgh
Charles H. Carpe
ATTORNEYS

March 18, 1941. R. E. J. NORDQUIST 2,235,725

CAN WEIGHING MACHINE

Filed Dec. 3, 1936 5 Sheets-Sheet 2

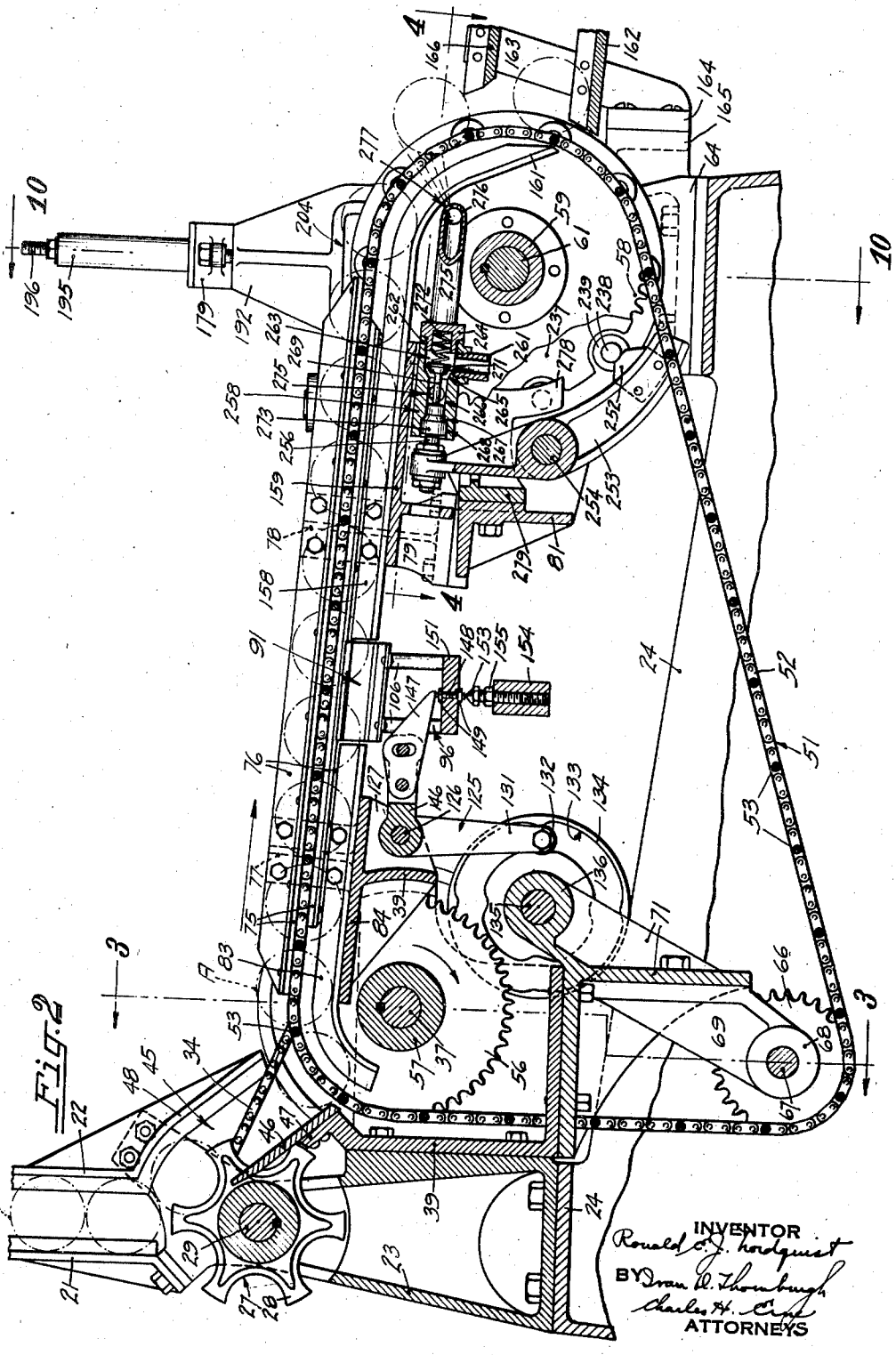


Fig. 2

INVENTOR
Ronald E. J. Nordquist
BY Dean B. Thornburgh
Charles H. Clapp
ATTORNEYS

March 18, 1941. R. E. J. NORDQUIST 2,235,725

CAN WEIGHING MACHINE

Filed Dec. 3, 1936 5 Sheets-Sheet 3

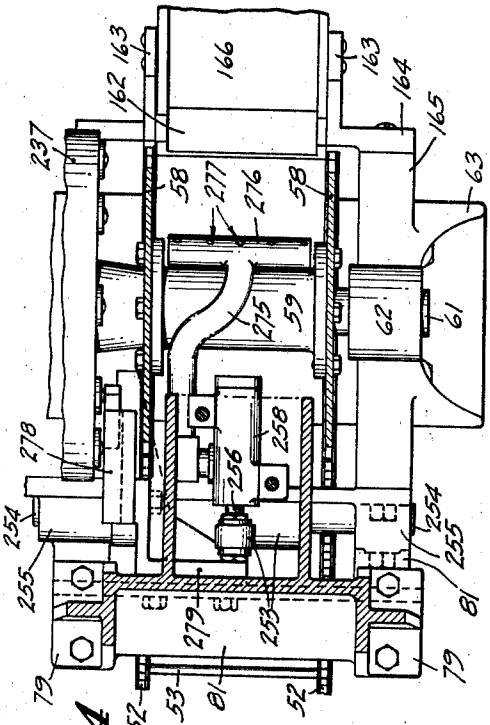


Fig. 4

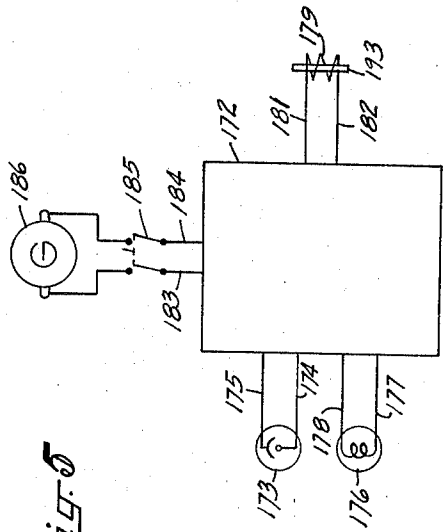


Fig. 5

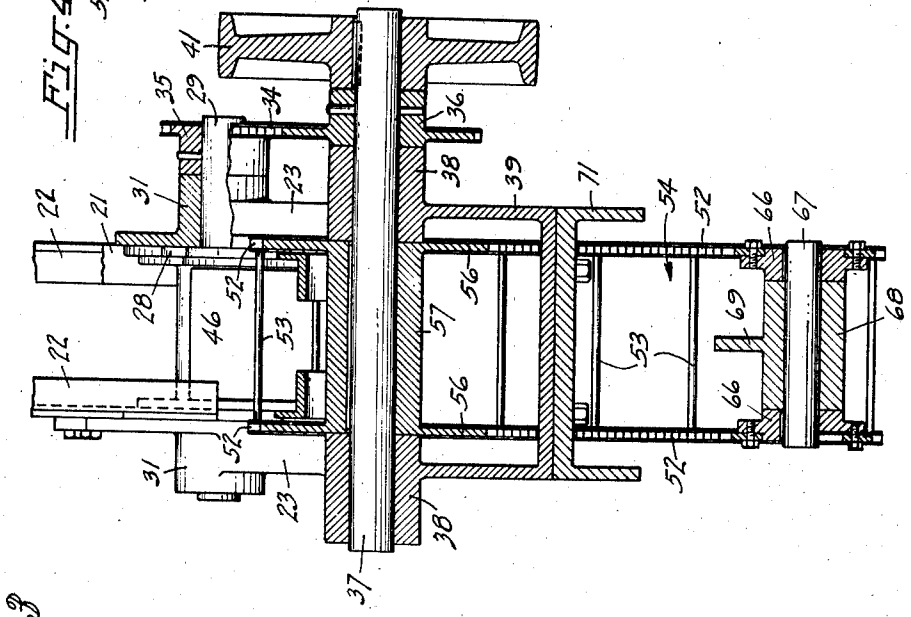


Fig. 3

INVENTOR
Ronald E. J. Nordquist
BY Dean A. Thornburgh
Charles H. Cuffe
ATTORNEYS

March 18, 1941. R. E. J. NORDQUIST 2,235,725

CAN WEIGHING MACHINE

Filed Dec. 3, 1936 5 Sheets-Sheet 4

Fig. 6

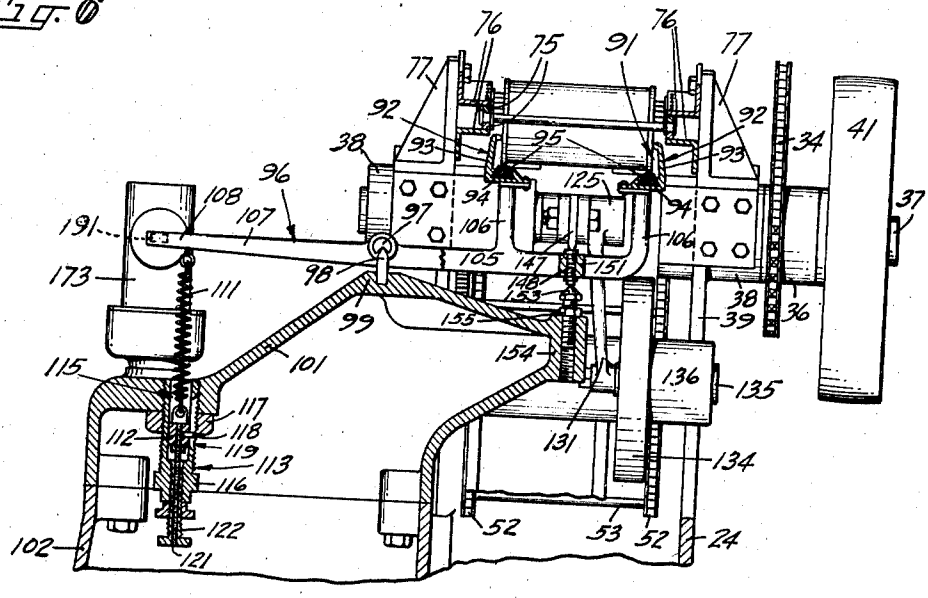


Fig. 8

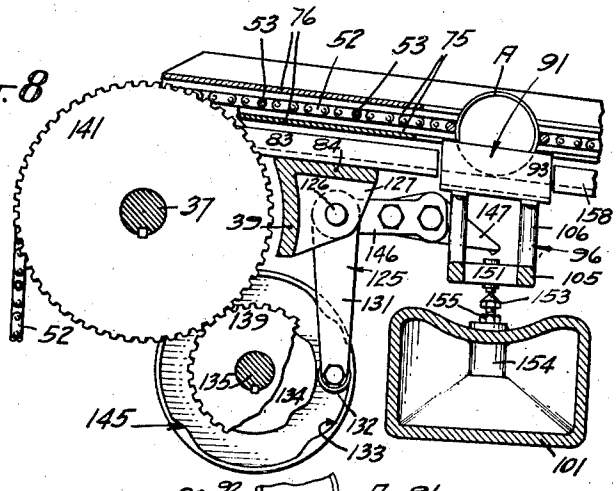


Fig. 7

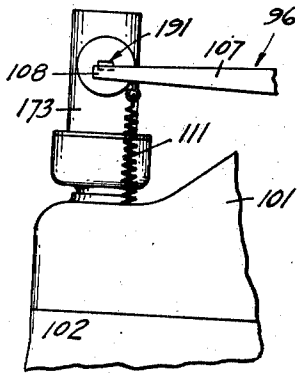
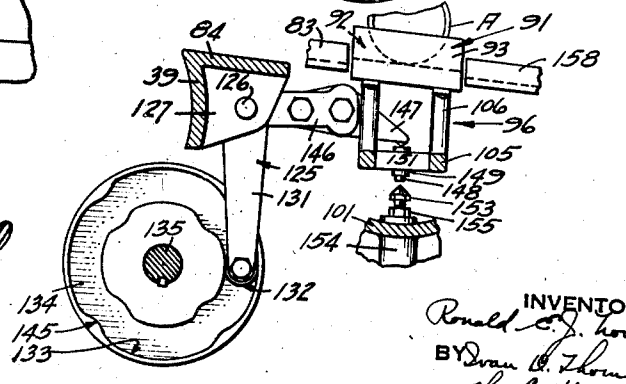


Fig. 9



INVENTOR
Ronald E. J. Nordquist
BY Evan A. Thornburgh
Charles H. Cook
ATTORNEYS

March 18, 1941. R. E. J. NORDQUIST 2,235,725

CAN WEIGHING MACHINE

Filed Dec. 3, 1936 5 Sheets-Sheet 5

Fig. 10

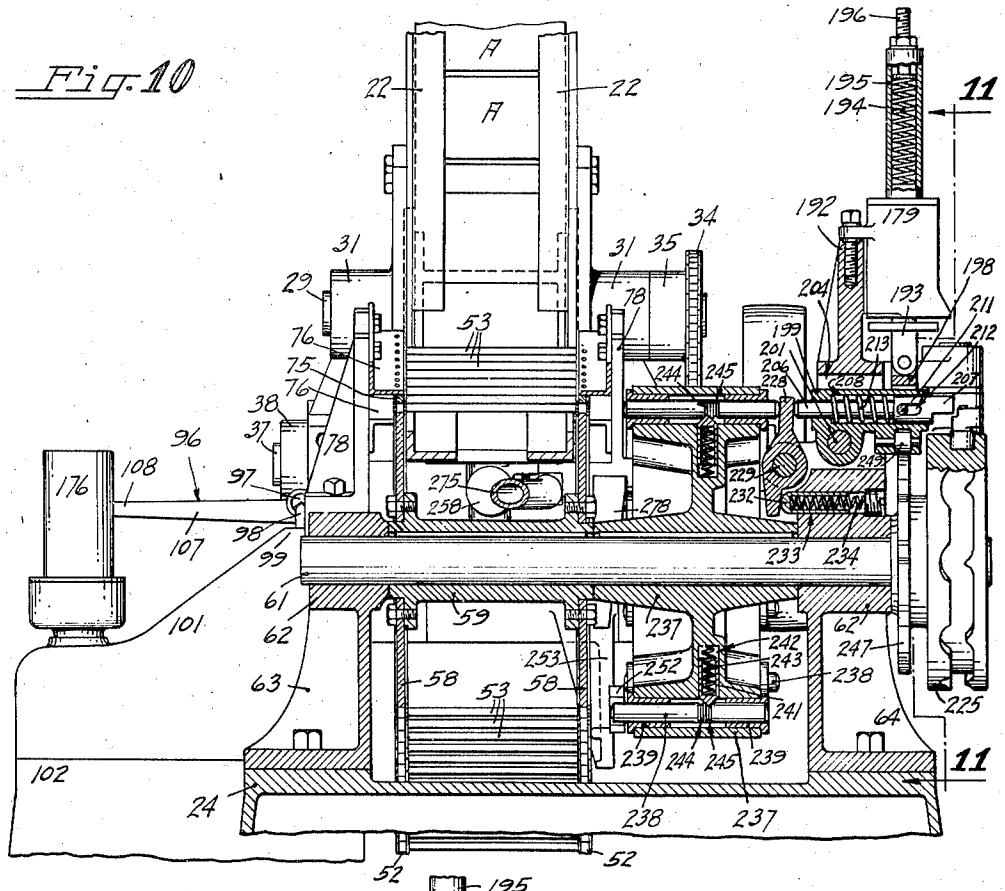
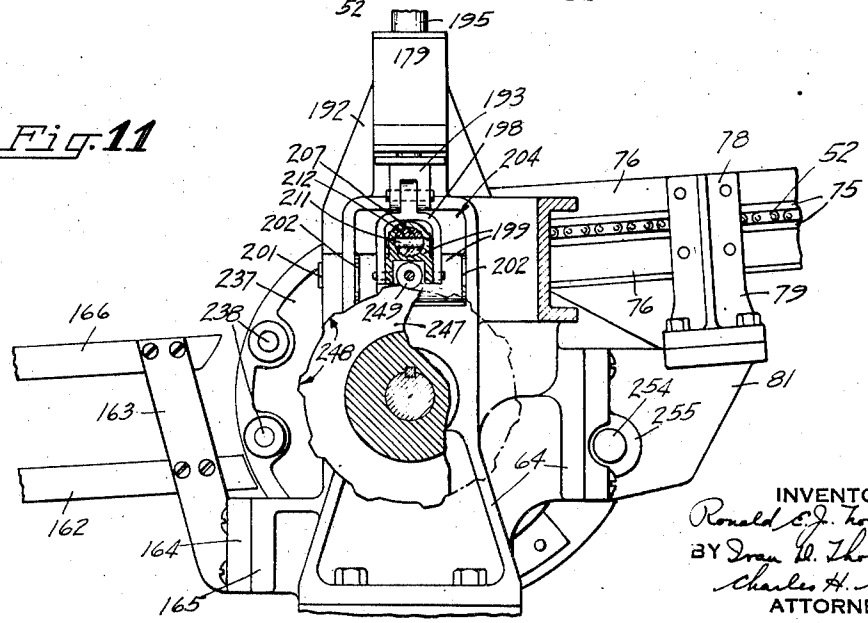


Fig. 11



INVENTOR
Ronald E. J. Nordquist
BY Dean W. Thornburgh
Charles H. Cook
ATTORNEYS

BEST AVAILABLE COPY

Patented Mar. 18, 1941 2,235,725

UNITED STATES PATENT OFFICE

2,235,725

CAN WEIGHING MACHINE

Ronald E. J. Nordquist, Maplewood, N. J., assignor to American Can Company, New York, N. Y., a corporation of New Jersey

Application December 3, 1936, Serial No. 114,073

8 Claims. (Cl. 209—121)

The present invention relates to a can weighing machine and has particular reference to such a machine in which photo-electric control elements are utilized to set in motion delayed action discharge devices including an electro-magnet or solenoid for removing under-weight or slack filled cans which are weighed while they are moving with other properly filled cans in a continuous procession through the machine.

An object of the invention is the provision of a can weighing machine wherein filled cans to be tested for weight are moved in a continuous procession across a sensitive weighing device which weighs all cans and detects underweight cans and which is actuated by such under-weight cans to operate photo-electric control elements cooperating with can discharge devices for separating the detected under-weight cans from full-weight cans.

Another object is the provision in such a machine of delay timing instrumentalities which are set by the photo-electric control elements when an underweight can is detected and which delay the action of the discharge devices until the detected can is in a predetermined position in its path of travel through the machine, the can being ejected by a blast of air when it reaches this predetermined position.

Still another object is the provision in such a machine of instrumentalities for holding the weighing device rigid and in full-weight can position while a can to be tested is entering and while a tested can is leaving the weighing device this provision insuring more accurate detecting results.

A further object is the provision of a machine of this character wherein vibration of a can moving across the weighing device while being weighed is absorbed by resilient runways so that true and accurate weight of each can will be obtained.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings:

Figure 1 is a top plan view of a can weighing machine embodying the instant invention;

Fig. 2 is a longitudinal section taken substantially along the line 2—2 in Fig. 1, parts being broken away;

Fig. 3 is a vertical transverse section taken substantially along the broken line 3—3 in Fig. 2, with parts broken away;

Fig. 4 is a horizontal section taken substantially along the line 4—4 in Fig. 2, parts being broken away;

Fig. 5 is a wiring diagram of the electric circuit used in the machine;

Fig. 6 is a vertical transverse section taken substantially along the line 6—6 in Fig. 1, with parts broken away, the view illustrating balance beam and photo-electric cell devices utilized in the machine;

Fig. 7 is a detail elevation of a portion of the balance beam and photo-electric cell devices illustrated in a different position from that shown in Fig. 6;

Fig. 8 is a longitudinal section taken substantially along the line 8—8 in Fig. 1, and illustrating the balance beam in full-weight can position;

Fig. 9 is a view similar to Fig. 8 with certain parts removed and showing the balance beam in under-weight can position;

Fig. 10 is a vertical transverse section taken substantially along the line 10—10 in Fig. 2; and

Fig. 11 is a part elevation part sectional view taken substantially along the broken line 11—11 in Fig. 10.

In the machine illustrated in the drawings as a preferred embodiment of the instant invention, filled and sealed cans A are weighed and tested to determine those which may be slack filled. The cans are received from any suitable source of supply and are rolled through the machine on their sides in a continuously moving procession. Each can during its procession rolls across a weighing platform which is disposed in the path of travel of the cans and which is secured to a balance beam.

During movement of a can onto the weighing platform the latter is clamped momentarily in its full weight can position and this action overcomes the sudden live load shock of the can entering thereupon. When the can is fully on the platform and while it is still moving across it, the platform is unclamped or released so that it will then perform its regular weighing function. This insures accurate weighing.

If the can is properly filled or is above a predetermined limit of weight the weighing platform remains stationary or substantially so. If, however, the can is below the predetermined weight limit the platform will rise and tilt the balance beam on which the platform is supported. This indicates a slack filled or under-weight can.

Movement of the balance beam actuated by such a slack filled can uncovers a ray of light from a suitable source which is thereupon caused

to act on a photo-electric cell associated with a slack fill discharge mechanism for removing these under-weight cans from the machine. The photo-electric cell when acted on sets a delay timing device which causes the discharge mechanism to direct a blast of air against the detected slack filled can when it reaches the discharge end of the machine. The slack filled can is thus removed at the proper time and directed into a special discharge runway for refilling or other disposition.

Properly filled cans do not affect the photo-electric cell since the ray of light is blocked off at such a time and air does not flow against the good cans as they pass by the slack filled discharge mechanism. At the discharge end of the machine the good cans are removed by cam action and are rolled out into a full can runway for further distribution.

A preferred form of machine as illustrated in the drawings includes a can receiving and timing mechanism for receiving the cans A from any suitable source of supply such as a preceding machine or the like and for feeding them into the weighing machine in timed order. The cans are received horizontally, i. e. on their sides, in a runway comprising pairs of vertically disposed spaced and parallel guides 21, 22 (Figs. 1, 2, 3 and 10). The machine ends of these guides are bolted to a bracket 23 fastened on top of a main frame 24.

The cans fall by gravity from the machine end of the runway into pockets 27 of a rotating can timing turret 28. This turret is mounted directly under the runway on a horizontal shaft 29 which is journaled in bearings 31 formed in the bracket 23.

The can timing turret 28 is rotated continuously in a clockwise direction (as viewed in Fig. 2) by a chain 34 which takes over a sprocket 35 carried on the turret shaft 29. The chain is driven by a sprocket 36 mounted on a main drive shaft 37 (Figs. 1, 2, 3 and 6) journaled in bearings 38 formed in a drive shaft bracket 39 bolted to the side of the bracket 23. Main shaft 37 is preferably the main driving shaft of the machine and is continuously rotated in any suitable manner, as by a belt pulley 41 thus driving the can turret 28 and the other parts of the machine in unison.

Rotation of the can timing turret 28 carries the cans individually into an inclined chute 45 (Fig. 2) which includes a sloping bottom plate 46 on which the cans roll from the pockets 27 of the timing turret into the machine proper. Plate 46 is secured to an upper flanged edge 47 of the driving shaft bracket 39. Above the chute curved and sloping guide extensions 48 formed on the lower ends of the can guides 22 direct the moving cans in their movement along the bottom plate.

Cans A as they leave the chute 45 are picked up by a continuously moving chain conveyor 51 which lifts them into rolling position for further movement through the machine. The conveyor comprises a pair of spaced and parallel endless chains 52 which extend the full length of the machine. These chains are connected by spaced and parallel transverse rungs or rods 53 which set off a plurality of individual spaces or pockets 54 into which the cans are received. The rungs keep the pocketed cans separated and loosely confined so that they are free to roll on their sides.

The chains 52 are driven in unison and in time with the discharge of cans from the chute 45 so that the timed cans following in order will fall individually into successive pockets of the conveyor as it moves past the end of the chute. The chains are driven by spaced sprockets 56 which are disposed at the can entrance end of the machine and are formed on a hub 57 mounted on the main drive shaft 37.

The top run of the chains 52 slopes downwardly at a slight angle toward the discharge end of the machine where they take over a pair of spaced sprockets 58. These sprockets are bolted to a hub 59 (Fig. 10) which is mounted on a horizontal shaft 61 journaled in bearings 62 formed in brackets 63, 64 secured to the top of the main frame 24. The chains also pass over a pair of spaced chain tightener sprockets 66 which are mounted on the outer ends of a short shaft 67 carried in a bearing 68 formed in an idler bracket 69. The idler bracket is adjustably bolted to a cam bracket 71 which is secured to the bottom of the main drive shaft bracket 39.

Between the sprockets 56, 58 the chains 52 are supported in channels so that they will not sag and so that the rungs 53 will not in any way affect the weighing of the cans. Accordingly, the chains are guided by upper and lower longitudinal narrow channel rails 75 (Figs. 2, 10 and 11) which engage against the tops and bottoms of the chain links. These rails are riveted to upper and lower angle iron supports 76 (see also Fig. 1) which are disposed above and below the chains and which extend parallel therewith.

The ends of the supports 76 adjacent the sprockets 56 are bolted to transversely spaced uprights 77 formed on the side walls of the main shaft bracket 39. The opposite ends of the supports adjacent the sprockets 58 are bolted to transversely spaced uprights 78 which are formed on a bracket 79 (see also Fig. 4). Bracket 79 is bolted to a cross-bracket 81 which in turn is fastened to the main brackets 63, 64.

The cans A as they are retained in spaced and rolling condition by the conveyor 51 are supported by and ride upon a pair of spaced and parallel angle iron tracks 83 which extend as far as the weighing device. These tracks are parallel with the chains and are therefore at a slight angle to the horizontal so that the cans will roll freely down the incline and toward the weighing device. The tracks are secured to an inclined table 84 which is an integral part of the main shaft bracket 39.

It should be noted that the can entrance ends of the tracks 83 extend adjacent the chute 45 (Fig. 2) where they are curved downwardly in parallelism with the chains 52 taking over the sprockets 56. The tracks therefore also cooperate with the conveyor chains during the time they are lifting the cans into rolling position.

The can tracks 83 terminate near the middle of the machine and adjacent a weighing platform 91 (Figs. 1, 2, 6, 8 and 9) of the weighing device across which the cans successively pass. The cans are guided across the platform by a pair of spaced and parallel guide members 92 (Fig. 6) each having a vertical leg 93 and a horizontal base 94, the latter, in effect, forming continuations of the can tracks 83. The cans roll directly on sponge rubber rails 95 which are secured in the bases 94 of the guide members. These rubber rails provide cushions for absorbing the shock and vibration of the rolling cans as they enter upon and roll across the weighing platform.

The weighing platform 91 is carried on the inner end of a balance beam 96 (Figs. 1, 2, 6, 7, 8 and 9) which is disposed at right angles to the path of travel of the cans and is formed with a cross-bar 97 on which the beam is balanced. The

cross-bar bears on knife edges 98 (Fig. 6) secured in bosses 99 formed in a cover plate 101 which is bolted to the top edge of an extension 102 of the main frame 24.

The balance beam 96 is also formed with a pair of forwardly extending spaced and parallel arms 105 which at one end merge with the cross-bar 97. The inner or opposite ends of the arms are provided with vertical uprights 106 which carry the can guide members 92 of the weighing platform 91 already described. On the opposite side of the cross-bar, the beam is formed with a pair of converging arms 107 which merge at their outer ends into a beam extension 108.

A counter-balance spring 111 (Figs. 6 and 7) is provided for counter-balancing the weight of a full-weight can rolling across the platform 91 so that such a properly filled can will not tilt the balance beam. The upper end of this spring is secured to the balance beam extension 108. The lower end of the spring is connected to a block 112 of a sensitive spring adjusting device 113. This device is utilized to regulate the tension of the spring 111 within close limits so that it can be set to actuate the balance beam when a slack-filled can rolls onto the weighing platform 91.

Spring adjusting block 112 is disposed in a bore 115 formed in the upper end of a stationary barrel 116 which is threaded into the top wall of the cover plate 101 of the frame extension 102. A locknut 117 on the barrel holds the latter in position. The block is prevented from turning in the bore by a pin 118 secured in the block and which projects into a slot 119 formed in the side of the barrel. The block carries a depending rod 121 which is threaded into an adjusting nut 122. The adjusting nut in turn is threaded into the lower end of the barrel.

The rod 121 is provided with a thread of fine pitch while the nut 122 is formed with a coarse pitch thread. Thus when the adjusting nut is turned it moves vertically in the barrel and the rod 121 is moved vertically in the opposite direction but over a shorter distance thereby creating a differential action which gives sensitive adjustment to the block 112 and hence the spring 111 connected therewith.

Provision is made for holding or clamping the balance beam 96 and the weighing platform 91 connected therewith in its full-weight can position against movement by the counter-balance spring 111 during the time a can is rolling onto the platform to be tested, and while a tested can is leaving the platform. This is effected by positive cam action through a bell crank lever 125 (Figs. 1, 2, 6, 8 and 9).

The bell crank 125 is mounted on a short shaft 126 which is carried in suitable bearings in webs 127 formed on the bottom of the table 84 of the main shaft bracket 39. A depending arm 131 of the bell crank lever carries a cam roller 132 which engages within a cam groove 133 formed in a face cam 134. The cam is mounted on a shaft 135 journaled in bearings 136 formed in the chain tightener bracket 71.

Cam 134 is rotated continuously in time with the other moving parts of the machine by a pinion 139 (Fig. 8) which is mounted on the cam shaft 135. This pinion meshes with a driving gear 141 which is keyed to the continuously rotating main driving shaft 37. The cam is thus rotated in time with the passage of cans A through the machine. This rotation of the cam causes undulations 145 formed in the cam groove 133 to rock the bell crank 125 in a clockwise direction (as viewed in Fig. 2) each time a can is about to enter upon the weighing platform 91.

Rocking of the bell crank 125 depressed a substantially horizontal arm 146 formed thereon which carries an adjustable finger 147. The outer end of the finger extends over the top of the balance beam arms 105 and projects above and in line with a vertical stud 148 (Figs. 2 and 6). The stud is held by locknuts 149 in a cross-bar 151 (see also Figs. 1, 8 and 9) which ties together the balance beam arms 105 adjacent their inner ends. Depression of the bell crank finger pushes the stud down, bringing its lower end into engagement with a stop pin 153 which is threaded into a boss 154 formed in the cover plate 101. This action holds the balance beam 96 and the weighing platform 91 in a predetermined stationary position which is preferably the full weight position of a can being tested.

The stop pin 153 is adjustable in its boss 154 so that it may be set to bring the tops of the rubber can rails 95 of the weighing platform flush with the can tracks 83 when the weighing platform is held stationary in the full weight can position. This results in a smooth transfer of the can from the tracks 83 to the platform. A locknut 155 holds the stop pin 153 in position after it is properly adjusted.

The holding of the weighing platform 91 and balance beam 96 in full weight can position is only a momentary action but is of sufficient duration to insure that a tested can leaving the platform is fully clear of it and the next following can to be tested is fully on the platform before the latter and the balance beam are released to perform their weighing function.

Release or unlocking of the balance beam is effected by a further rotation of the cam 134. This moves the bell-crank arms 131, 146 in a counter-clockwise direction (as viewed in Fig. 2) and thereby raises the finger 147 out of engagement with the holding stud 148. The weighing platform and balance beam are thereupon free to function under the combined tension of the counter-balance spring 111 and the weight of the can which is rolling across the platform at that time.

All cans after testing roll off the platform while still being restrained within the pockets 54 of the moving chain conveyor 51 and pass onto a pair of spaced and parallel angle iron tracks 158 (Figs. 1 and 2). These tracks are similar to the can tracks 83 and form a continuation of them. The tracks 158 are secured to the top of a table 159 which is formed as a part of the bracket 79. These tracks are parallel with the chain conveyor and therefore are also inclined downwardly at a slight angle toward the discharge end of the machine.

The discharge end of the tracks 158 adjacent the sprockets 58 is curved downwardly in parallelism with the chain conveyor 51 as it passes over the sprockets 58. At their extreme discharge ends the tracks 158 are flared outwardly toward the chains 52 forming stationary runs 161. Just beyond the end of the track there is located a full-weight can discharge chute 162 (Figs. 1, 2, 4 and 11) which is secured to uprights 163 formed on a bracket 164 bolted to extensions 165 of the main brackets 63, 64. The uprights extend above the full-weight can discharge chute and support an under-weight can discharge chute 166.

A more detailed explanation of the can weighing operation and the deficient or slack filled can

detection will now be considered. If a can A being tested on the released weighing platform 91 is of full weight or slightly under-weight but above a predetermined limit of under-weight or slack fill, the weight of the can substantially equalizes the resistance of the counter-balance spring 111 and therefore the can has no moving effect on the balance beam. In such a case the weighing platform remains stationary or substantially so and in the full-weight can position as shown in Fig. 8.

Such a full-weight can after testing and when reaching the discharge end of the machine, is pushed or cammed out of its conveyor pocket 64 by the ends 161 of the tracks 158 as the can rolls past. The can thus discharged passes into the full weight can discharge chute 162 and is directed to any suitable place of deposit.

If a can A being tested is slack filled, i. e. light-weight to an amount less than the predetermined limit of under-weight, it cannot hold the platform balanced against the action of the counter-balance spring 111. In other words, the lightness of the can permits the balance beam 96 to tilt on its knife edges 98 under the action of the counter-balance spring. The outer end of the beam is thereupon drawn down while the weighing platform carrying the can moves up into the position shown in Fig. 9. The bell crank finger 147 in its raised position serves as a stop for limiting too great an upward movement of the platform.

This movement of the balance beam constitutes the act of weighing a slack-filled can and leads to the weight detection step referred to. Such beam movement immediately brings into effective action certain continuously moving delay timing devices which are associated with other can discharge instrumentalities. The latter when actuated eject such a can into the under-weight can chute 166 when it reaches the discharge end of the machine. This will now be explained.

The delay timing mechanism is set in motion by electric control devices (schematically shown in Fig. 5) which include a suitable photo-electric relay 172 having a photo-electric cell 173 connected thereto by wires 174, 175. A lamp 176 is connected to the relay by wires 177, 178, and an electro-magnet or solenoid 179 is also connected to the relay by wires 181, 182. Electric energy is supplied to the relay and the parts associated therewith in any suitable manner as by lead wires 183, 184 and a service switch 185 which connect with a source of power such as a generator 186.

Such a photo-electric control is in itself a well known commercial article and provides for a beam of light emanating, for example, from the lamp 176 which striking on the photo-electric cell 173 will affect the solenoid 179. The solenoid may be energized or deenergized according to the arrangement of the circuits within the relay 172. In the present use of the control the solenoid is deenergized whereupon the resulting movement is utilized to properly direct the under-filled can as desired.

In the form herein illustrated the photo-electric cell 173 and the lamp 176 are mounted adjacent each other on the cover plate 101 (Figs. 1, 6, 7 and 10) and are on opposite sides of the balance beam arm extension 108. The photo-electric cell is fully shielded except for a small window 151 (Figs. 6 and 7) which is covered by the arm extension 108 during normal operation of the machine as when full weight cans are passing over the weighing platform. The beam of light from the lamp 176 is thus normally prevented from entering the photo-electric cell 173 and the solenoid 179 is maintained energized.

The tilting of the balance beam 96 under the influence of a slack-filled can as has already been fully discussed causes the arm extension 108 to move out of the path of the light beam and thereby to uncover the cell window 191. The beam of light now striking upon the photo-electric cell excites the latter and sets up a short circuit which deenergizes the solenoid 179.

The solenoid is vertically mounted adjacent the discharge end of the machine on an upright 192 (Figs. 1, 2, 10 and 11) which is formed on top of the main frame bracket 64. A movable core 193 disposed within the solenoid extends above the top thereof and engages against the lower end of an expansion spring 194. The spring is confined within a sleeve 195 formed on top of the solenoid. The upper end of the sleeve is closed and carries a setscrew 196 for adjusting the pressure of the spring. De-energization of the solenoid permits the spring 194 to depress the core with a sudden snap action.

The lower end of the core 193 extends below the solenoid and is bifurcated. This end of the core is connected to a yoke 198 which is secured to the free end of a rocker arm 199 mounted on a pivot pin 201 carried in bearings 202 formed in the upright 192 (Fig. 11). The arm extends into an opening 204 which is formed in the upright.

The rocker arm 199 may be considered the first element in the delay timing mechanism and as the description proceeds it will be observed how the time lag is obtained from the initial movement of the solenoid core.

The rocker arm carries a horizontally positioned shouldered plunger 206 having an enlarged head 207 disposed in a bore 208 formed in the arm. The plunger is slidably confined in the bore by a pin 211 secured in the arm end which extends through a slot 212 formed in the plunger head. An expansion spring 213 located within the bore and surrounding the plunger bears against the head 207 and tends to keep it extended beyond the forward end of the rocker arm.

Depression of the solenoid core 193 lowers the forward end of the rocker arm 199 and brings the head 207 of the plunger 206 into alignment with a cam actuated hammer 216 (Figs. 1 and 10). The hammer is formed on one end of a lever 217 mounted on a vertical pivot shaft 218 carried in a bearing 219 formed in an arm 221 of the upright 192. The hammer end of the lever also carries a cam roller 223 which engages within a cam groove 224 of a cam 225 mounted on the continuously moving conveyor shaft 61.

Cam groove 224 is formed with a plurality of undulations 226 which act upon the roller 223 to move the hammer 216 inwardly toward the plunger head 207 at the same time a can is passing across the weighing platform 91. Thus when a slack-filled can causes the plunger head 207 to be lowered into alignment with the hammer, the latter strikes the end of the plunger and pushes it inwardly against the resistance of its spring 213.

This movement is transmitted to a transfer lever 228 which is mounted on a pivot shaft 229 carried in bearings 231 formed on the upright 192. The lower end of the lever engages against a spring barrel 232 disposed in a bore 233 formed

in the bracket 64 above the bearing 62. The barrel carries a spring 234 which exerts its force against the lever and hence keeps the upper end of the lever against the rear end of the plunger 206.

The moving transfer lever 228 is disposed adjacent a timing drum 237 (Figs. 1, 2, 4, 10 and 11) mounted on the continuously rotating conveyor shaft 61 which carries the hammer cam 225. The drum carries a plurality of timing pins 238 slidably confined in bushings 239 which are arranged in a circle adjacent the periphery of the drum. These pins normally project beyond the side of the drum which is adjacent the transfer lever.

Each pin 238 is held in projected position by a pointed conical headed spring barrel 241 (Fig. 10) disposed at right angles to the pin in a radial bore 242 formed in the drum. An expansion spring 243 located within the barrel tends to keep the latter extended with its pointed end engaged in a groove 244 formed in the pin. The pin is thus yieldingly confined against lateral sliding movement within its bushing 239.

There is one timing pin 238 for each undulation 226 of the hammer cam groove 224 and the rotating drum 237 is so timed that when movement of the transfer lever 228 takes place a timing pin 238 is in line to be engaged and shifted. This shifting of the pin causes its rear end to project beyond the rear face of the drum, the spring barrel 241 snapping out of the pin groove 244 and entering into an adjacent groove 245. The pin is now held yieldingly but firmly in this extended position.

All of these movements take place successively following the lowering of the solenoid core 193 and after each such displacement or setting of a timing pin 238, the core of the solenoid is mechanically lifted to its original position against the resistance of the core spring 194. This insures a quicker action and relieves the solenoid from the extra load of lifting the core against the resistance of the spring. The energizing circuit therefore is used only to hold the solenoid core in its upper position. This mechanical raising of the core is effected by an edge cam 247 (Figs. 1, 10 and 11) which may be an integral part of the cam 225. The edge cam 247 is formed with spaced ridges 248 which engage against a cam roller 249 mounted in the free end of the rocker arm 199.

The extended timing pin 238 is carried around in a clockwise direction (as viewed in Fig. 2) with the rotating drum 237 through several idle stations before its corresponding weighed and detected slack-filled can finally reaches a position adjacent the discharge chute 166. When the can does arrive the extended timing pin engages and actuates a discharge element which blows the can out of its conveyor pocket 54 and into the chute.

The extended pin rides over a cam shoe 252 (Figs. 2 and 10) which is secured to one side and at the lower end of an air valve operating lever 253 mounted on a pivot pin 254 carried in bearings 255 (Figs. 4 and 11) formed in the cross-bracket 81. The upper end of the lever carries a stud 256 held by adjustable locknuts.

Riding of the extended pin 238 over the cam shoe 252 rocks the operating lever 253 causing the lever stud 256 to open a normally closed air valve 258. This permits a blast of compressed air to escape and to impinge against the slack-filled can. The valve is secured to the bottom of the table 159.

Air under pressure is supplied to the valve by any suitable means as by way of a supply pipe 261 which is threaded into the valve casing (indicated by the numeral 262). The pipe communicates with a chamber 263 formed in one end of the valve casing. A cap 264 threaded into the end of the casing provides one end wall of the chamber. The opposite wall is formed with an inner valve seat 265 which merges into a horizontal bore 266. The outer end of the bore is provided with an auxiliary valve seat 267 which merges into an enlarged bore 268 also formed in the valve casing.

The horizontal bore 266 houses a valve stem 269 having at its inner end a disc valve 271 which is normally held against the inner valve seat 265 by an expansion spring 272. This spring is carried in the cap 264. The opposite end of the valve stem is provided with an auxiliary disc valve or head 273 which is disposed in the enlarged bore 268 adjacent the valve seat 267. Thus there are two valves on the stem, one at each end, the inner valve being normally closed and the outer normally open. The outer valve is located in line with the operating lever stud 256.

The moving operating lever 253 pushes the valve stem 269 inwardly or to the right as viewed in Fig. 2. This separates the inner valve 271 from its seat 265 permitting air from the pipe 261 and chamber 263 to pass into the horizontal bore 266. At the same time the outer valve 273 is seated against its seat 267 and this prevents escape of the air through that end of the valve thus serving as a stuffing box.

Air within the bore 266 passes into and through a conduit 275 (Figs. 1, 2 and 4) one end of which is threaded into the valve casing and is in communication with the horizontal bore 266. The other end of the conduit is formed into an elongated blower head 276 having a plurality of discharge holes 277 arranged in a line in one side thereof. This head is located under the curved ends 161 of the can tracks 158 and is adjacent the under-weight can chute 166.

Thus when the escaping air of the opened valve rushes out by way of the conduit 275, head 276 and holes 277 it impinges against the side of the slack-filled can then in line with the blower holes. The can is thereby lifted out of its pocket 54 in the conveyor 51 and blown into the can chute 166 as has already been described. It should be understood that this is done by a sharp blast of air, the valve being only momentarily opened by the slight rocking of the operating lever 253 which is only held in shifted position during the short time the extended timing pin 238 is riding over the cam shoe 252.

The extended timing pin 238 having done its work, is pushed back into its original position so that it will be in place and ready for another slack-fill can if such a can is detected at the time the pin again passes the movement transfer lever 228. Such replacement of the pin as effected by a stationary cam block 278 (Figs. 1, 2, 4 and 10) formed on a base 279 which is bolted to the cross-bracket 81. The extended end of the pin sweeps against the side of the cam as the pin is carried up and around by the timing drum 237. This action pushes in the pin where it is again held by the spring barrel 241 engaging within the pin groove 244.

It is thought that the invention and many of its attendant advantages will be understood from

the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. In a can weighing machine, the combination of can tracks for supporting filled cans in rolling position, a continuously moving conveyor having pockets for loosely confining and separating cans received therein and for rolling them along said can tracks in a processiona. order, a weighing platform interposed in the path of travel of said cans for weighing each can as it rolls thereover, a balance beam supporting said weighing platform for detecting cans under a predetermined weight, a full weight can discharge chute disposed adjacent one end of said conveyor, an under-weight can discharge chute disposed adjacent said full weight can discharge chute and at a point remote from said weighing platform, a cammed section contiguous with said can tracks for removing full weight cans from the conveyor after weighing and for depositing them into said full weight can discharge chute, discharge instrumentalities adjacent said under-weight discharge chute for discharging detected under-weight cans into its chute, and photo-electric elements operable by the under-weight can movement of said balance beam for causing actuation of said under-weight can discharge instrumentalities after said under-weight can has been moved by said conveyor to said discharge chute.

2. In a can weighing machine, the combination of a can weighing platform, a balance beam supporting said weighing platform for detecting cans under a predetermined weight, a conveyor for moving cans to be weighed onto and off of said platform, discharge devices including an air blast for removing under-weight cans from said conveyor at a point remote from said weighing platform, a swinging lever for actuating said air blast, photo-electric elements responsive to the under-weight can movement of said balance beam for causing actuation of said swinging lever and in turn said air blast to discharge from the machine such under-weight can, and timing devices controlled and actuated by said photo-electric elements for in turn engaging and actuating said swinging lever at predetermined intervals to cause the discharge of said under-weight can.

3. In a can weighing machine, the combination of a can weighing platform, a balance beam supporting said weighing platform for detecting cans under a predetermined weight, an endless chain conveyor arranged to roll cans continuously in processional order across said platform for weighing them while moving, a discharge station in the path of said conveyor and spaced from said weighing platform, discharge devices including an air blast at said discharge station for removing under-weight cans from said conveyor, a swinging lever for actuating said air blast, photo-electric elements responsive to the under-weight can movement of said balance beam for causing actuation of said swinging lever and in turn said air blast, and delaying actuation of the latter until said under-weight can has been moved by said conveyor from said weighing platform to said discharge station, and timing devices controlled and actuated by said photo-electric elements for in turn engaging and actuating said swinging lever at predetermined intervals to cause the discharge of said under-weight can.

4. In a can weighing machine, the combination of a can weighing platform, a balance beam supporting said weighing platform for detecting cans under a predetermined weight, a conveyor for moving cans to be weighed onto and off of said platform, resilient can supporting means on said weighing platform for absorbing shock and vibration of a can moving thereacross during weighing, a discharge station in the path of said conveyor and spaced from said weighing platform, discharge devices at said discharge station for removing under-weight cans from said conveyor, an electro-magnet having a spring actuated core for rendering operative said discharge devices, photo-electric elements operable by the under-weight can movement of said balance beam for causing actuation of said spring actuated core, and means automatically operative to engage said core and return the same to normal position after its actuation by said spring.

5. In a can weighing machine, the combination of a continuously moving longitudinally disposed conveyor having can receiving pockets therein, means for feeding cans to be weighed into said pockets respectively, a weighing platform disposed in the path of said conveyor, means for temporarily holding said weighing platform against movement in full weight can position while a can to be weighed is being moved thereon and while a weighed can is being moved therefrom, a photo-electric cell for detecting the presence of a light-weight can on said platform, means including an air blast disposed in the path of said conveyor and spaced from said weighing platform for ejecting light-weight cans from the machine, and a rotary drum having transversely movable timing pins thereon actuated by said photo-electric cell for in turn actuating said air blast to discharge such detected light weight can after the latter has been moved by said conveyor into the path of said air blast.

6. In a can weighing machine, the combination of a continuously moving longitudinally disposed conveyor having can receiving pockets therein, means for driving said conveyor, means for feeding cans to be weighed into said pockets respectively, a weighing platform disposed in the path of said conveyor, means for temporarily holding said weighing platform against movement in full weigh can position while a can to be weighed is being moved thereon and while a weighed can is being moved therefrom, said holding means being automatically operative to release said platform for a weighing operation after the can to be weighed has been moved thereon, a photo-electric cell responsive to the position of said scale platform for detecting the presence of a light-weight can on said platform, means disposed in the path of said conveyor and spaced from said weighing platform for ejecting light-weight cans from the machine, and a rotary drum having transversely movable timing pins thereon controlled by an electro-magnet in turn actuated by said detecting means for actuating said ejecting means to discharge such detected light weight can after the latter has been moved by said conveyor into the path of said ejecting means.

7. In a can weighing machine, the combination of a continuously moving longitudinally disposed conveyor having can receiving pockets therein, means for feeding cans to be weighed into said pockets respectively, a weighing platform disposed in the path of said conveyor, means

for temporarily holding said weighing platform against movement in full weight can position while a can to be weighed is being moved thereon and while a weighed can is being moved therefrom, said holding means being automatically operative to release said platform for a weighing operation after the can to be weighed has been moved thereon, a photo-electric cell responsive to the position of said scale platform for detecting the presence of a light-weight can on said platform, means including an air blast disposed in the path of said conveyor and spaced from said weighing platform for ejecting light-weight cans from the machine, and a rotary timing drum having movable timing pins thereon controlled by an electro-magnet in turn actuated by said detecting means for actuating said air blast to discharge such detected light-weight can after the latter has been moved by said conveyor into the path of said air blast.

8. In a can weighing machine, the combination of a can weighing platform, a balance beam supporting said weighing platform for detecting cans under a predetermined weight, compressed air discharge mechanism remotely disposed relative to said weighing platform for discarding such detected underweight cans by a blast of air, a conveyor for moving cans onto and off of said weighing platform for weighing and also for moving the weighed cans past said discharge mechanism, an air valve for controlling the actuation of said mechanism, delay timing devices including a rotary timing drum having transversely movable pins thereon for operating said air valve only for a detected underweight can and only when such a can reaches said mechanism, and photo-electric elements responsive to movement of said balance beam caused by detection of an underweight can for controlling the actuation of said movable pins to operate said air valve to discharge a said detected underweight can from the machine.

RONALD E. J. NORDQUIST.