

April 14, 1936.

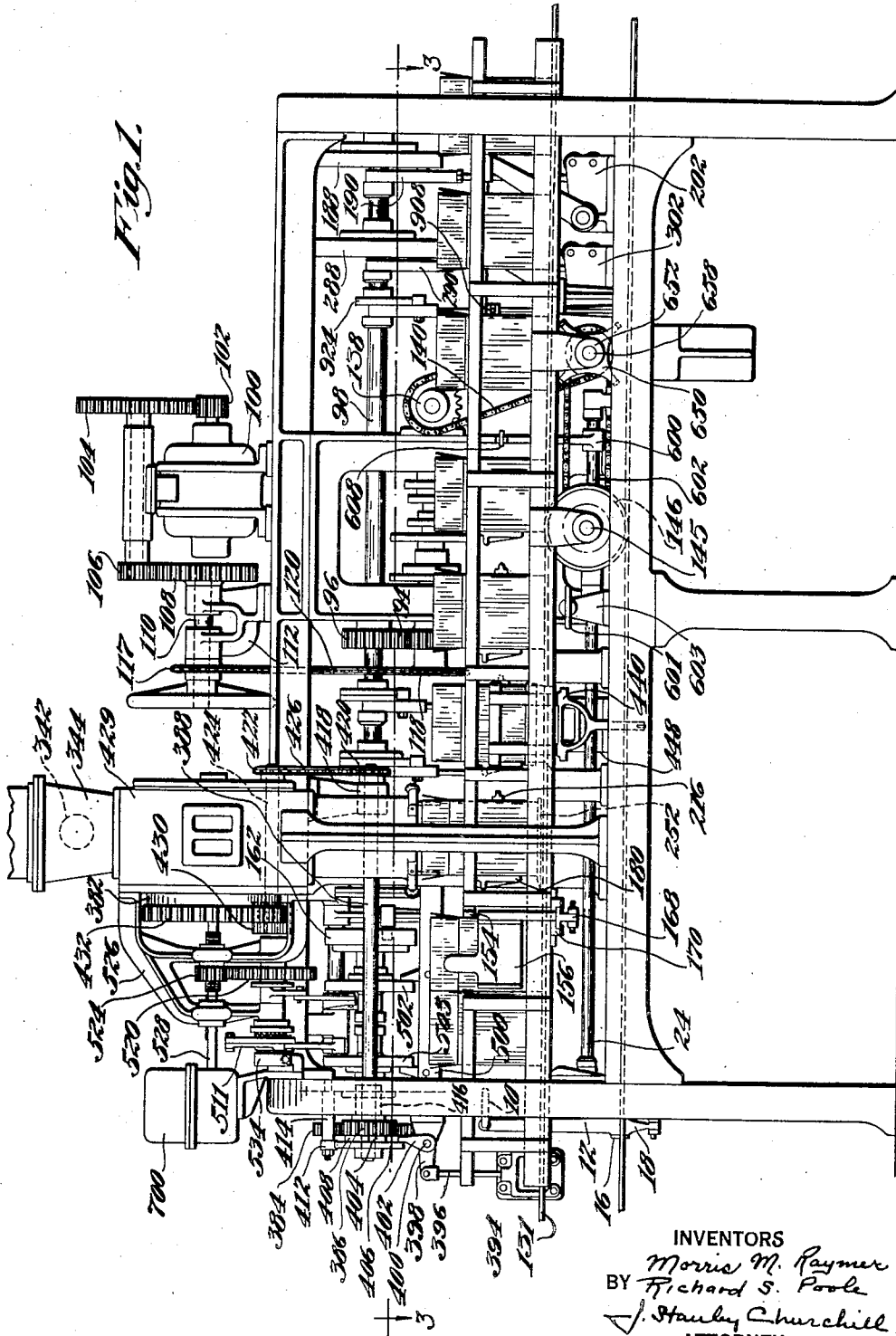
M. M. RAYMER ET AL

2,037,484

PACKAGING MACHINE

Filed Nov. 10, 1930

11 Sheets-Sheet 1



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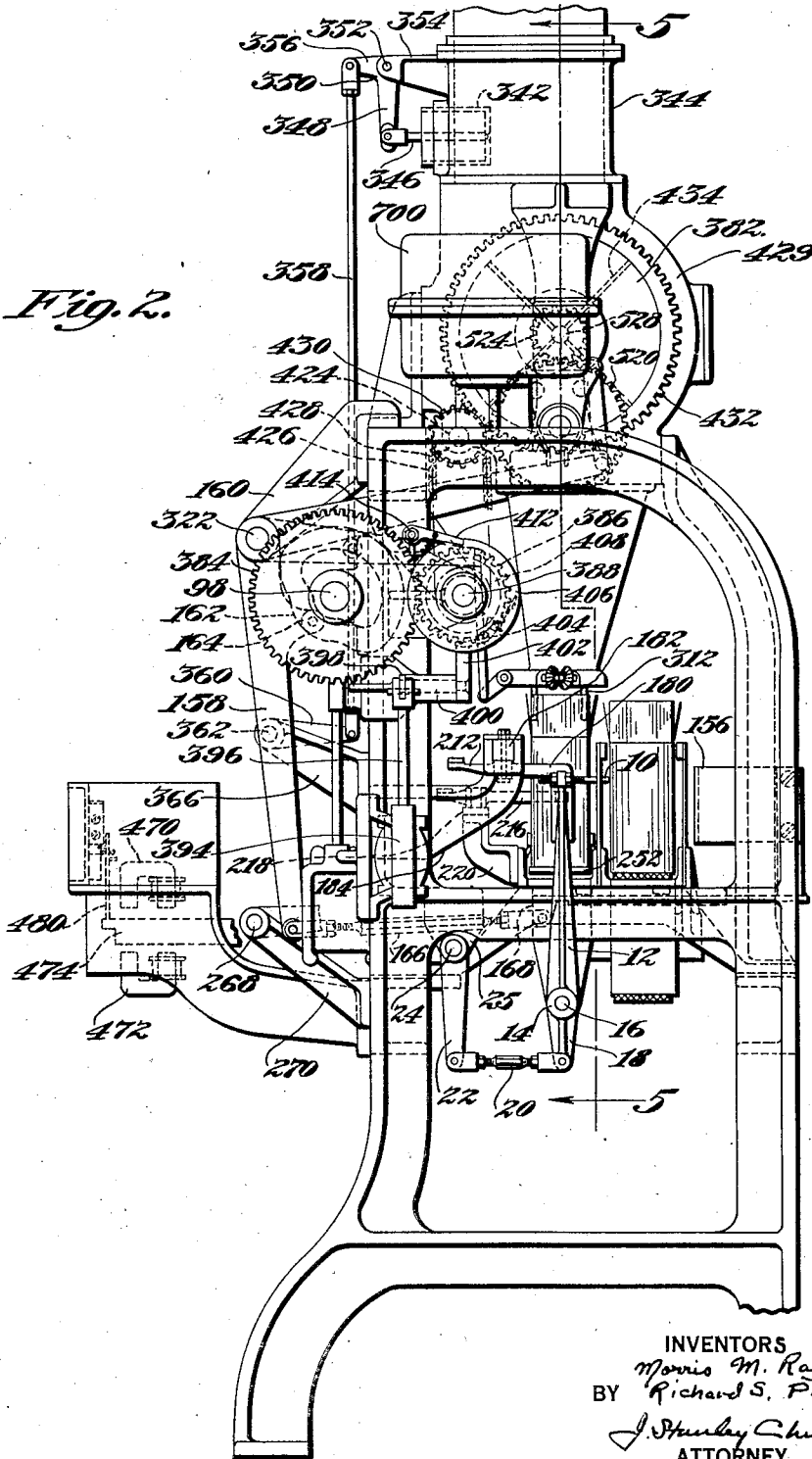
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Fig. 2.



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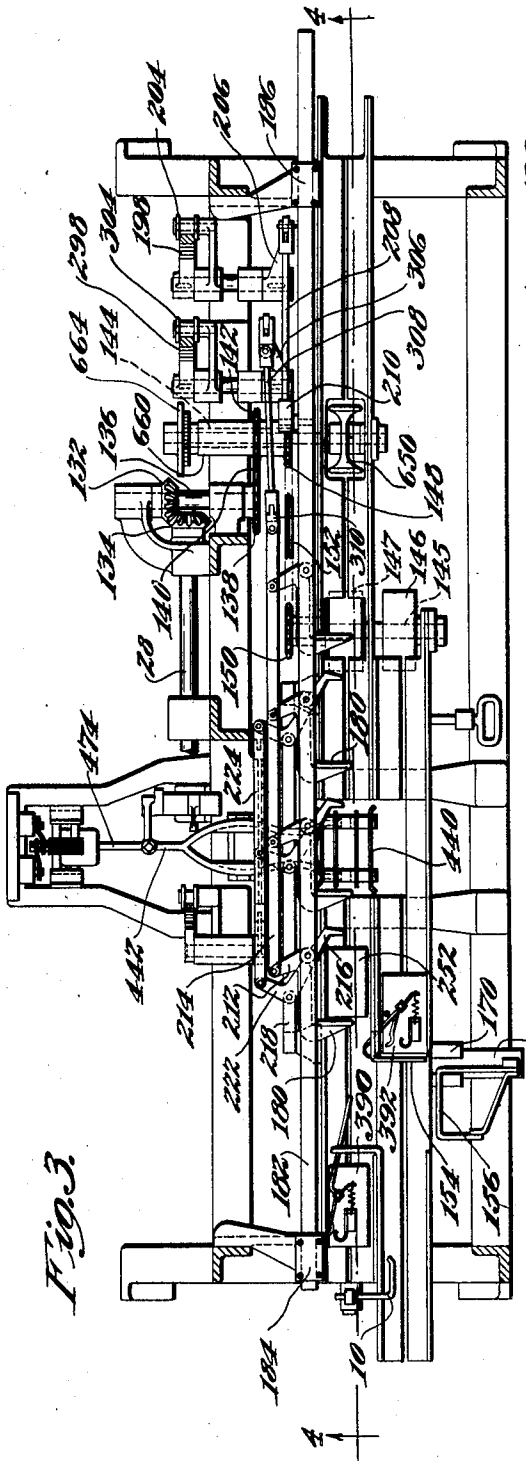


Fig. 3.

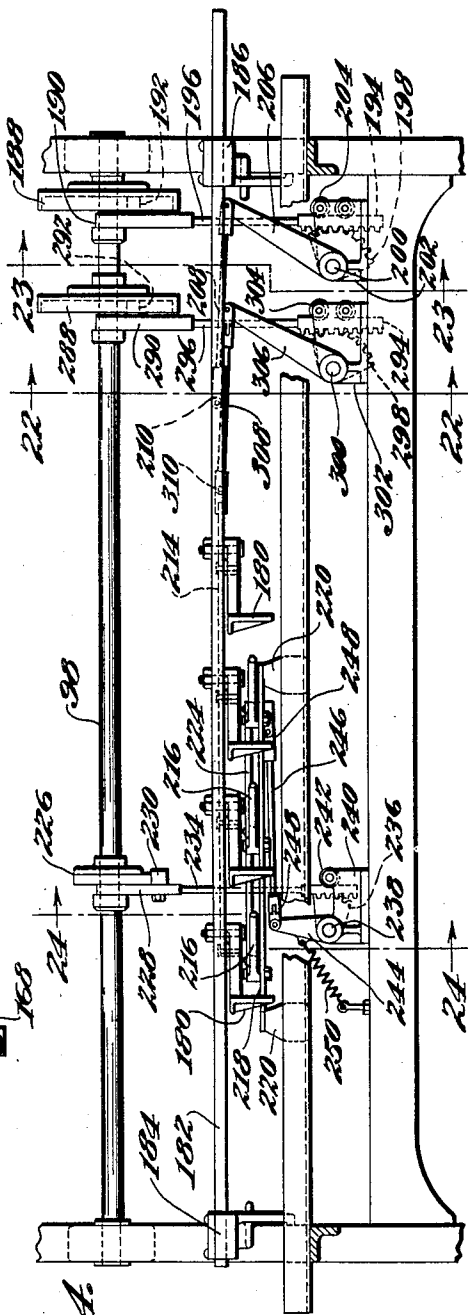


Fig. 4.

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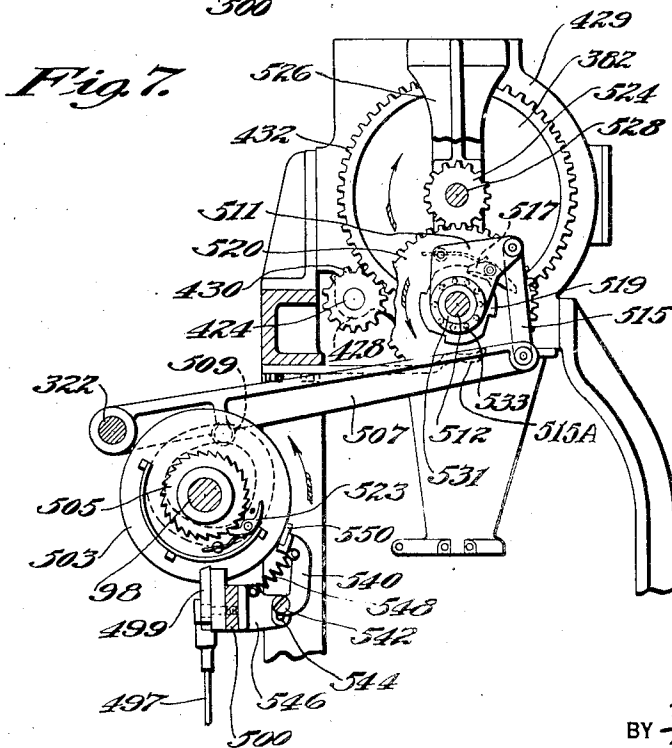
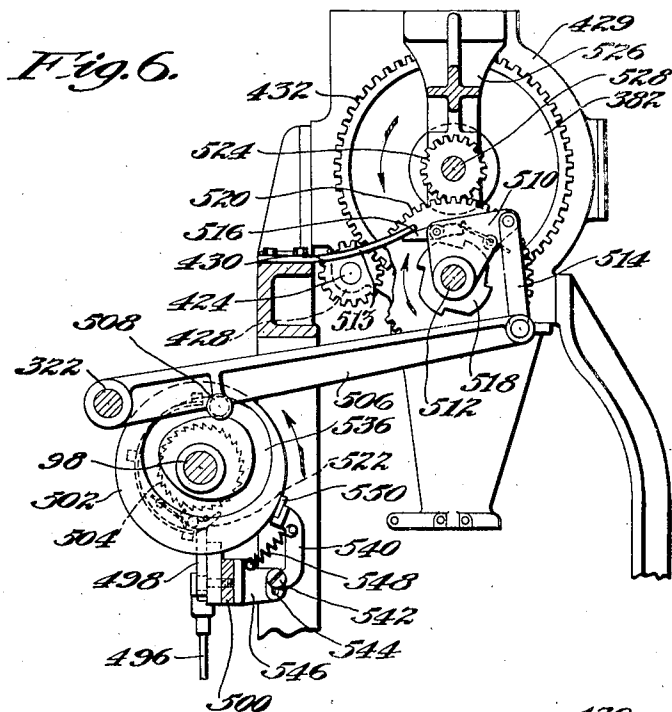
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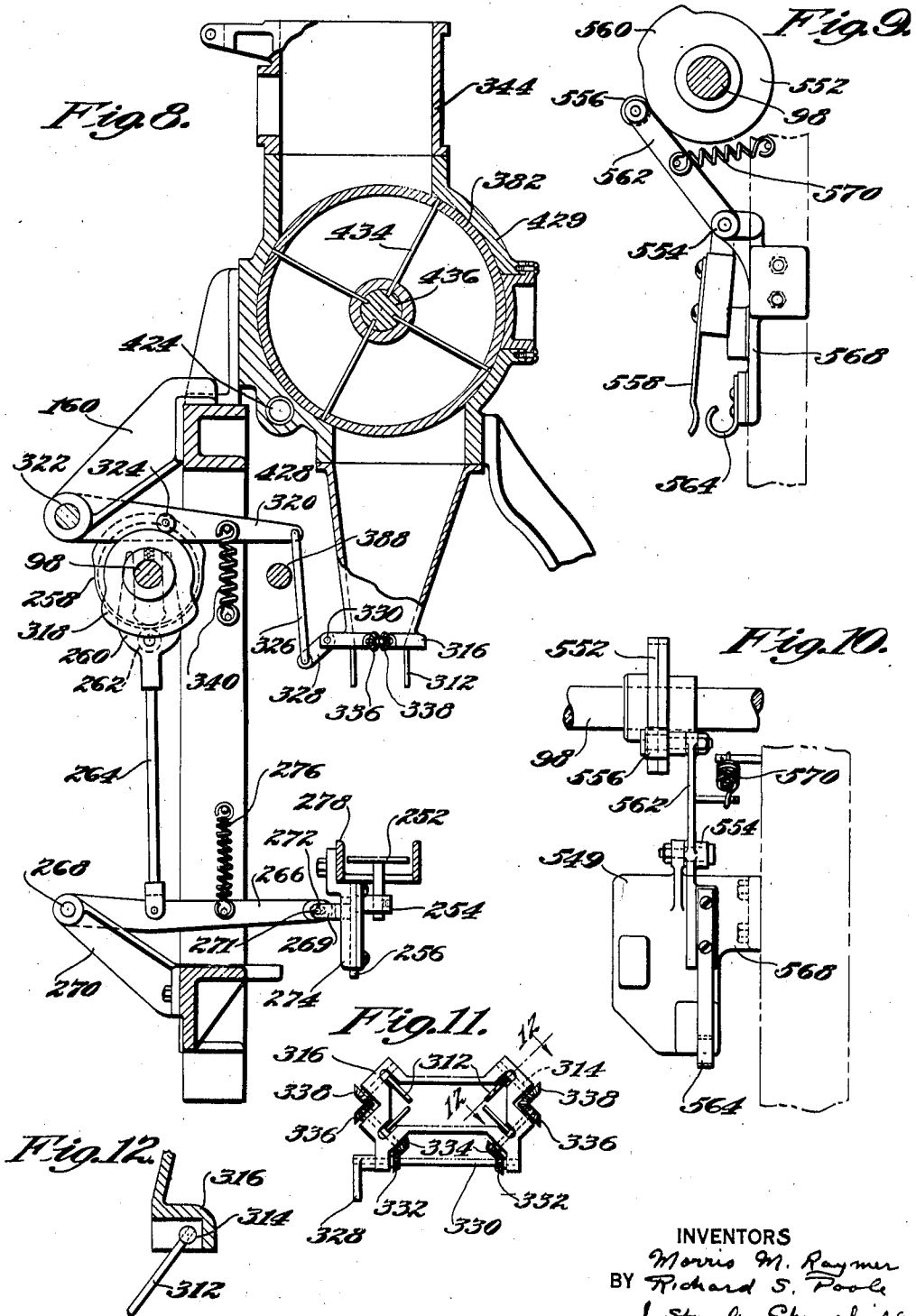
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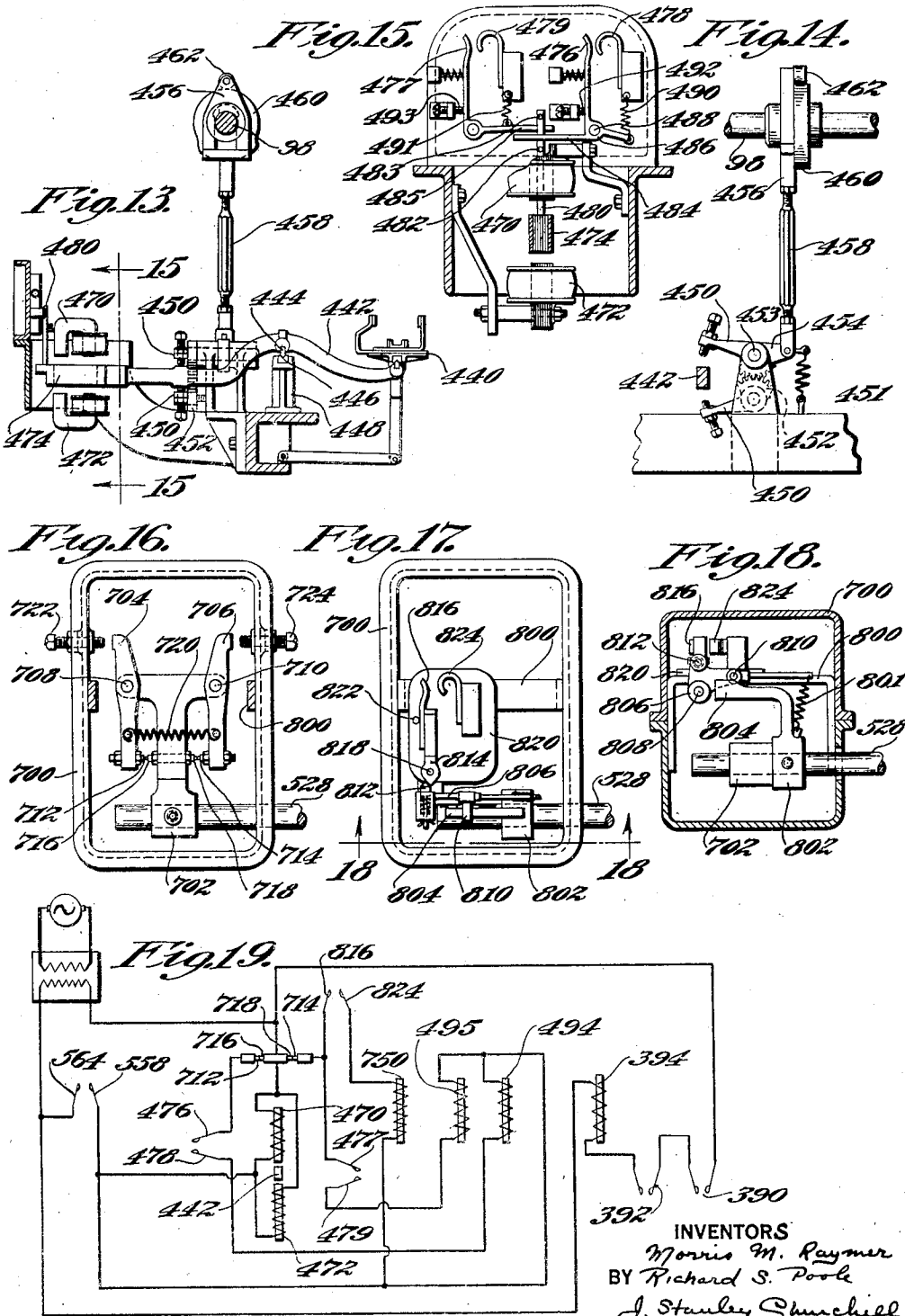
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Fig. 20.

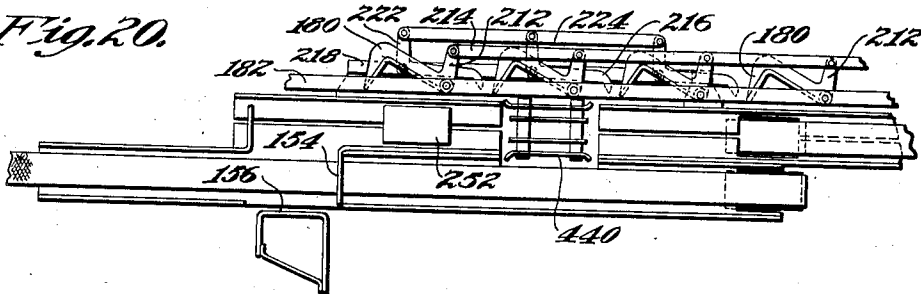


Fig. 21.

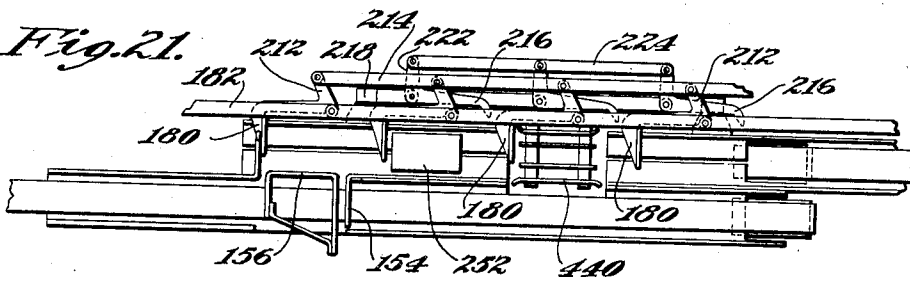


Fig. 22.

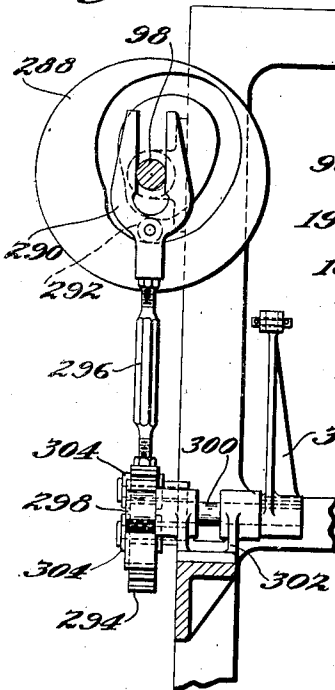


Fig. 23.

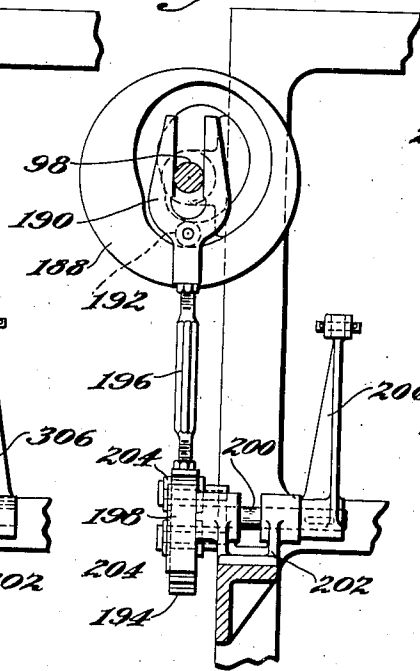
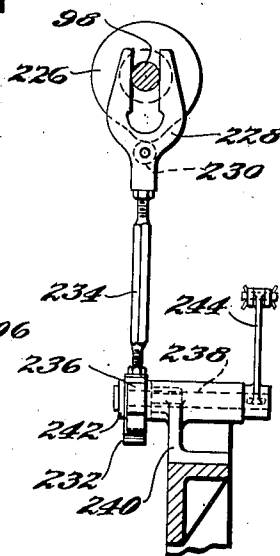


Fig. 24.



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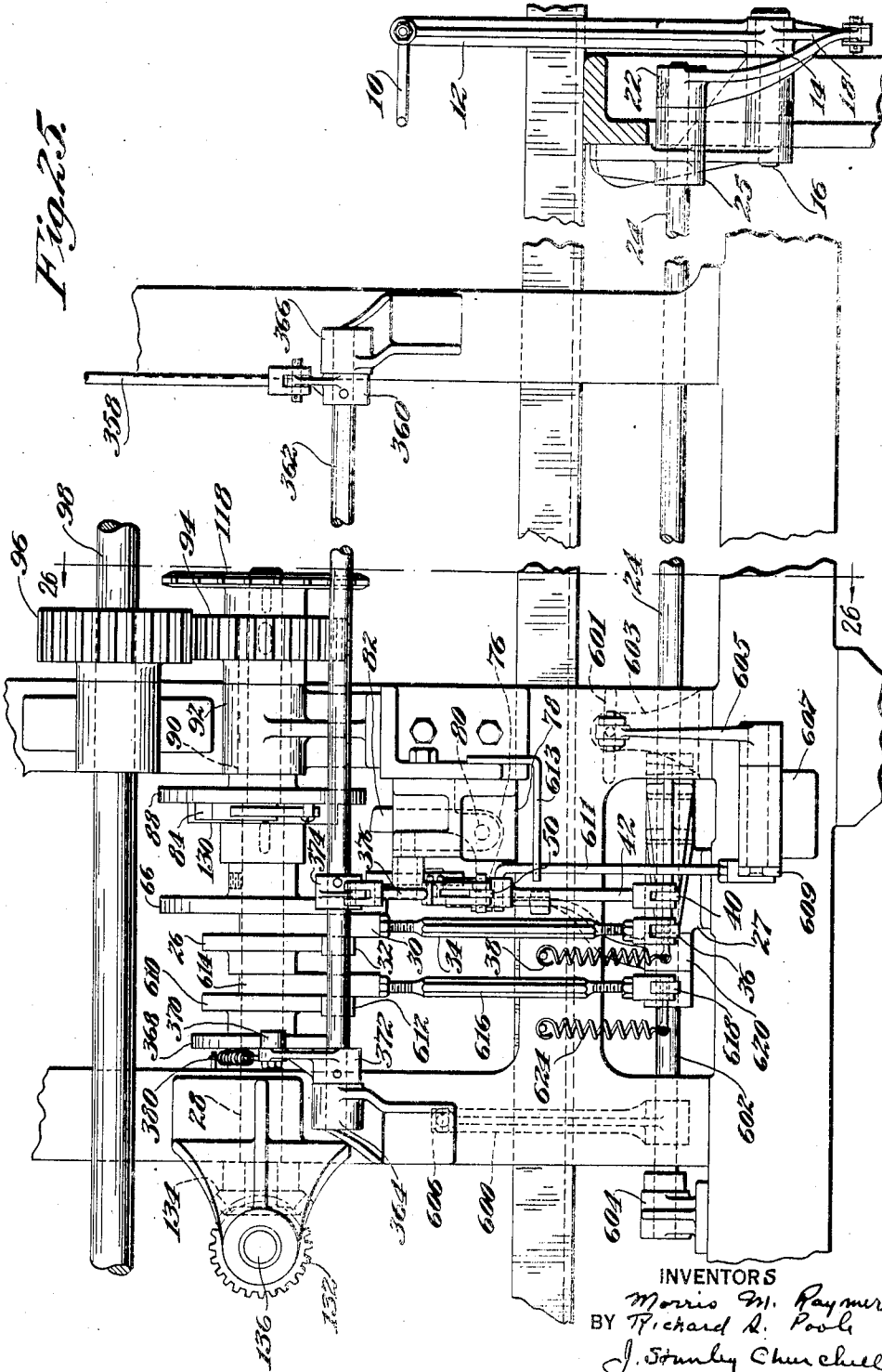
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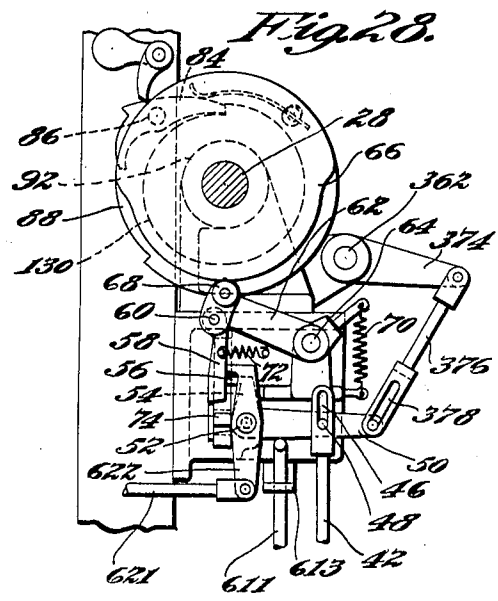
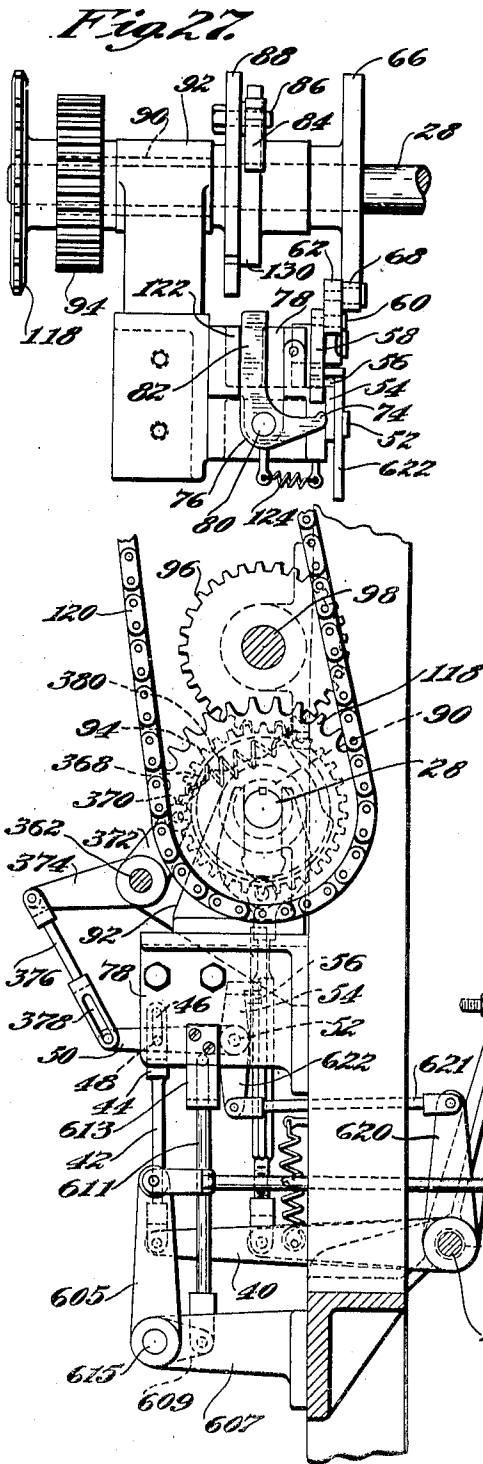
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2,037,484

PACKAGING MACHINE

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Application November 10, 1930, Serial No. 494,526

9 Claims. (Cl. 249—2)

This invention relates to a packaging machine.

Experience has demonstrated that packaging machines of the type heretofore used in connection with the introduction of various kinds of material into a package, including the various types of weighing machines and measuring machines heretofore employed for such a purpose, are rendered inaccurate in their operation by those variations in the density of the material which ordinarily occur during the commercial use of such machines. It has been recognized that substantial variations occur in the density of various commodities caused by variations in the manufacture of succeeding batches of the commodity, variations in the size of the individual articles of the commodity, and in some instances the weather itself has some effect upon the density. At the present time the usual practice has been for the operator of the packaging machine to manually attempt to control the flow of the commodity from the filling hopper to compensate for variations in the density of the material. This procedure has not proven satisfactory and many instances of underfilled or overfilled packages have resulted.

In general the object of the present invention is to provide a packaging machine of the type which operates to form definite loads of the commodity and in which provision is made for testing the load and for controlling the operation of the machine in the event that the load when tested is found to vary from a standard load to the end that the machine may operate to form loads of a uniform and standard amount.

A further and more specific object of the invention is to provide a packaging machine of the type which operates to deposit a definite load of the commodity in a package, and in which provision is made for testing the load and for controlling the operation of the machine to cause succeeding loads to approach a standard load while permitting the operation of the machine to continue if the tested load is found to conform to a standard load.

With these general objects in view, and such others as may hereinafter appear, the invention consists in the machine and in the various structures, arrangements and combinations of parts hereinafter described and particularly defined in the claims at the end of this specification.

In the drawings which illustrate the preferred embodiment of the invention, Fig. 1 is a front elevation of the machine; Fig. 2 is a side elevation viewed from the left in Fig. 1; Fig. 3 is a sectional view on line 3—3 of Fig. 1; Fig. 4 is a sectional

view with parts omitted taken on the line 4—4 of Fig. 3; Fig. 5 is a section taken on the line 5—5 of Fig. 2; Figs. 6 and 7 are enlarged sectional details of the volume reducing and volume increasing mechanisms respectively taken on the lines 6—6 and 7—7 of Fig. 5; Fig. 8 is a section taken on the line 8—8 of Fig. 5; Figs. 9 and 10 are side and front elevations respectively of a cam operated switch; Fig. 11 is a bottom plan view of the bag spreader; Fig. 12 is a detail on the line 12—12 of Fig. 11; Figs. 13 and 14 are details in side and front elevation respectively of the scale beam and grippers; Fig. 15 is a section on the line 15—15 of Fig. 13; Fig. 16 is a detail of a switch box with the cover removed showing the limit switch; Fig. 17 is a detail showing the shaker switch; Fig. 18 is a sectional end view taken on the line 18—18 of Fig. 17; Fig. 19 is a wiring diagram to be referred to; Figs. 20 and 21 are partial plan views showing the carrier fingers in different positions; Fig. 22 is an enlarged detail on the line 22—22 of Fig. 4; Fig. 23 is an enlarged detail on the line 23—23 of Fig. 4; Fig. 24 is an enlarged detail on the line 24—24 of Fig. 4; Fig. 25 is a rear elevation showing the safety levers and connections; Fig. 26 is a section on the line 26—26 of Fig. 25; Figs. 27 and 28 are front and side elevations respectively showing details of the clutch mechanism; and Figs. 29 and 30 are side and rear elevations respectively of the shaker mechanism.

Referring to the drawings, in general the different features of the present invention are illustrated in a packaging machine of the general type in which the material to be packaged is delivered from a source of supply into a measuring hopper from which measured loads of the material are discharged in succession into successive packages presented into operative position beneath the hopper. Provision is made for checking the weight of the loaded packages in order to determine whether or not the package is over-weight or under-weight, and for controlling the operation of the measuring hopper to automatically increase or decrease the amount of the measured load to the end that loads of predetermined weights may be introduced into succeeding packages. Provision is also made for controlling the operation of the machine in a novel and superior manner as will be described.

Referring now to Fig. 1, the packages are conveyed into the machine upon an incoming conveyor belt, arriving in a position in front of a package pusher 156, as shown in Figs. 2 and 3, and by which they are pushed over into a position to be conveyed by pusher members, as will be

described, in timed relation and successively into operative position beneath a supply hopper and onto a scale, and thence conveyed from the machine, as will be described.

5 During the operation of the machine, as each package is brought into operative position beneath the supply hopper, provision is made, as will be described, for elevating the package into a position in close proximity to the bottom of the
10 discharge pipe leading downwardly from a measuring drum which is interposed between the supply hopper and the discharge pipe, as illustrated in Figs. 5 and 8. The measuring hopper, as illustrated in Fig. 8, comprises a drum having
15 a plurality of partitions radially arranged to subdivide the drum into a plurality of separate compartments, and provision is made, as will be described, for intermittently rotating the drum to present each compartment from filling position
20 in contact with the supply hopper to discharging position in contact with the discharge pipe leading downwardly therefrom, and as a result during the operation of the machine successive measured loads of the material are deposited
25 into successive packages. As herein shown, one side wall of the measuring drum is formed by the end of a drum 382, Fig. 5, and provision is made for controlling the volume of each measuring compartment by movement of the
30 drum 382 in or out to decrease or enlarge the width of the measuring drum, and consequently to decrease or increase the amount of the measured load deposited in the succeeding packages. The machine is provided with a scale upon which each
35 filled package is moved and the scale unlocked to permit the package to be weighed. The scale is counter-weighted to correspond to a predetermined load and operates to check the weight of each filled package. In the event that the scale
40 moves out of balance, that is, is either depressed by an over-weight package, or rises by reason of an under-weight package, provision is made for effecting the movement of the drum 382 in or
45 out of the measuring hopper, thereby effecting a decrease or increase of the load by a definite increment. As succeeding packages are filled, the increased load is weighed by the scale, and if found to still vary from the predetermined weight, the drum 382 is moved another increment, thus
50 eventually bringing the weight of the packages to a predetermined amount. In the illustrated machine this result is secured through mechanism which may be described as follows.

Referring now to Figs. 13, 14 and 15, after having been filled, the package is moved onto the
55 scale pan 440 of a scale beam 442 supported on knife edges 444 in bearings 446 in a bracket 448 forming part of the machine frame. During the movement of the package onto the scale pan, the scale beam is held locked by scale beam gripper members 450 which are operated in unison by the
60 cooperation of segments 452. One of the grippers is arranged to be actuated by a cam 460 on the cam shaft 98, acting through a cam roll 462 in the fork 456 and connected by a link 458 to an arm 454 secured to the shaft 453 upon
65 which one of the gripper members 450 is attached, whereby the gripper members are operated to lock the scale by the action of the cam operating in timed relation to the movements of
70 the packages, and are opened when permitted to do so by the cam through the medium of a spring 451.

In order to initiate the operation of the mechanism for increasing or decreasing the volume of

the hopper by a definite increment as above stated, when the scale indicates that the package is under-weight or over-weight, as herein shown and as best illustrated in Fig. 13, the scale is provided with two magnets 470, 472, positioned
5 above and below the counterweight end 474 of the scale beam 442. When an over-weight package is indicated by the scale beam, the end 474 of the scale beam is raised into the magnetic field of the upper magnet 470, and is thereby attracted
10 against the armature of the magnet operating to effect a closing of an electric circuit at the contact points 476, 478. This result is accomplished as herein shown, by the engagement of a pin
15 482 projecting from a stud 480 on the scale beam with an arm 484 of the bell crank lever 486, as shown in Fig. 15. The latter is pivoted upon a pin 488 supported in a suitable bracket within the switch box and the movable contact 476
20 forms the second arm of the bell crank. A spring 490 serves to normally urge the parts of the switch into open circuit position against an adjustable stop screw 492. When the contacts 476, 478 are
25 closed upon the movement of the scale beam on the over-weight package, an operating electric circuit is closed, as will be hereinafter described, with respect to the wiring diagram of Fig. 19, and which includes a solenoid 494, see Fig. 5. The armature of the solenoid is connected to a
30 link 496 attached at its upper end to a pivoted pawl stop 498, and when the solenoid 494 is energized in the manner above described the link 496 is raised, swinging the pawl stop 498 from the tail of a spring-pressed pawl 522, see
35 Figs. 5 and 6, and permitting the pawl 522 to engage the ratchet 504. The ratchet 504 is fast in the cam shaft 98, and operates to drive the cam 502 loose on the cam shaft, and upon which the pawl 522 is mounted when the pawl
40 and ratchet are engaged. The cam 502 makes one revolution, the pawl stop 498 being permitted to return into the path of the tail of the pawl 522, as will be described, and at each revolution of the cam 502 the drum 382 is moved inwardly
45 a definite increment through connections including a cam roller 508 which rides in the cam path 536 of the cam 502, a lever arm 506 pivoted at 322, link 514, and pivoted pawl carrier 510. The pawl carrier 510 is oscillated at each revolution of the cam 502 a sufficient distance to advance a ratchet 518 with which a pawl 516
50 engages a quarter turn. In this manner the shaft 512 upon which the ratchet is mounted is turned a quarter turn at each revolution of the cam 502. The shaft 512 is provided with a gear 520 fast
55 thereon which is arranged to mesh with a gear nut 524 mounted in a bracket 525 and through which the threaded shaft 528 screws so that upon each quarter turn of the shaft 512 and gear 520 the gear nut 524 makes one revolution and forces
60 the threaded shaft 528 inwardly the axial distance of one thread on the shaft. In this manner it will be observed that each revolution of the cam 502 is utilized in advancing or moving the shaft 528 a definite increment, and by reference
65 to Fig. 5 it will be observed that the shaft 528 is secured to the hub of the drum 382 so that the drum is moved inwardly a definite increment of each revolution of the cam 502, thus diminishing the volume of each measuring compartment within the drum by a definite increment.

The operation of the mechanism thus far described may be summarized as follows. As the packages are brought into the machine each

package is presented in position to receive its measured load, and after the package has received its measured load it is automatically moved onto the scale. The scale is definitely counter-weighted to correspond to the desired correct load, and after the package has been moved onto the scale pan the scale is unlocked, and in the event of an over-weight package the scale pan is depressed and the counter-weight end of the scale beam raised into the field of the magnet 470. The magnet 470 operates to draw the counter-weight end of the scale beam up into a position where an electric circuit is closed at the contacts 476, 478, thus energizing the solenoid 494, and through the connections described permitting the cam 502 to make one revolution. The circuit is controlled so that after the cam 502 has started to make its revolution the pawl stop 498 is again returned to the path of the pawl to prevent further rotation of the cam 502 until such time as an over-weight package again releases the pawl stop 498. As a result, at each indication of an over-weight package, the drum 382 comprising one wall of the various measuring compartments in the measuring drum is moved inwardly to decrease the volume of each measuring compartment by a definite increment. If the next succeeding package is still over-weight this cycle of operation will be repeated and eventually the packages running through the machine will be provided with measured loads corresponding to a correct weight.

In order to increase the volume of the measuring compartments of the measuring drum, when the scale beam indicates that a package is under-weight, the counter-weight end of the scale beam 442 is arranged to be drawn by the magnet 472 into circuit closing position to close an electric circuit at the contact points 477 and 479. For this purpose a pin 483 projecting from a stud 480 secured to the end of the scale beam is arranged to engage the arm 485 and to rock it in a clockwise direction, viewing Fig. 15, to cause the contact arm 477 to move into contact with and close the circuit at the contact 479. A spring 491 serves to normally hold the contact 477 in open circuit position against an adjustable stop screw 493. When the circuit is thus closed at the contacts 477, 479, the solenoid 495 is energized, operating to raise up the link 497 and throwing out a pawl stop 499 from the path of the tail of a pawl 523. When the pawl stop is thrown out, the spring pressed pawl 523 mounted on the cam 503 is permitted to engage the ratchet 505. The ratchet 505 is fast on the cam shaft 98 while the cam 503 is loose on the cam shaft 98, so that in this manner the cam is driven from the cam shaft through the pawl and ratchet, making a complete revolution and at the end of which the pawl is again removed by the pawl stop from engagement with the ratchet. At each rotation of the cam 503 a spring pressed pawl 517 operates to advance a ratchet 519 the distance of one tooth, receiving its motion through a pivoted pawl carrier 511, link 515, lever arm 507 pivoted at 322, and carrying a cam roller 509 which rides in the path of the cam 503. The pawl carrier 511 carries a spring pressed pawl 517 which is designed to cooperate with a ratchet 519. As herein shown provision is made for permitting slipping between the pawl 517 and ratchet in the event that a condition arises in the operation of the machine where the volume increasing mechanism and the volume decreasing mechanism become opposed, as will

be described. As illustrated in Figs. 5 and 7, the pawl carrier 511 is loosely mounted on the hub of the toothed member 531 of a spring pressed pin and tooth clutch 533 of any usual or preferred construction, the toothed member being secured to a countershaft 512. The ratchet 519 with which the pawl 517 cooperates forms the other member of the spring pressed pin and tooth clutch 533 so that motion is imparted to the shaft 512 through the pawl to the ratchet and thence through the clutch 533 to the shaft 512. The shaft 512 is provided with a gear 520 which meshes with the gear nut 524 operating to turn the gear nut in a clockwise direction in Fig. 7, forcing the adjusting screw 528 to the left, viewing Fig. 5, and consequently moving the hopper drum 382 to the left to increase the volume of the individual measuring compartments of the measuring drum. A friction bearing 534 is provided on the end of the shaft 512 in order to prevent the shaft from rotating after the pawl 517 has stopped pushing the ratchet and the clutch 533 insures the prevention of any damage to the operating parts of the machine should the pawl and ratchet drives of the volume increasing and decreasing mechanism become opposed to one another. During the normal operation of the machine it will of course be understood that provision is made for holding out one of the pawls 516, 517 from engagement with its ratchet in order to permit the driving of the two pawls 516, 517 to effect the turning of the shaft 512 and the consequent rotation of the spindle 528 to effect movement of the upper drum 382 in the manner above described. Any usual or preferred form of mechanism may be employed for this purpose, and as herein shown conventional fixed members 513, 515A are secured to a part of the machine frame in a position to engage the tail of the respective pawls 516, 517, as shown in Figs. 6 and 7. The fixed members 513, 515A comprise the usual members employed for engaging the tail of the pawl to disconnect the pawl from the ratchet commonly employed in all pawl stop mechanisms.

Referring now to Figs. 6 and 7, the cams 502, 503 are, as will be observed, loose on the shaft 98, and in order to hold the cams stationary when the pawls are not engaged with their ratchets, a friction stop mechanism is provided, each of which as herein shown may comprise a friction piece 550 for engaging the cam, mounted on a lever 549 pivoted on a stud 542 adjustably mounted in a slot 544 of a bracket 546 on the cross bar 500. A spring 548 is provided for yieldingly urging the friction piece against the cam.

The various instrumentalities for performing the different operations in the present machine are herein shown as driven from an electric motor 100, see Fig. 1, through a pinion 102, reduction gears 104, 106, and gear 108, on one end of a countershaft 110 journaled in bearings in a bracket 112. The shaft 110 is connected through sprockets 117, 118 and chain 120 running thereover with the drive shaft 28 of the machine which is, during the operation of the machine, driven continuously.

Provision is made for conveying packages in succession into the machine by an incoming conveyor comprising a conveyor belt 131 which runs around pulleys at each end thereof. The packages are, as above described, and as will be seen by reference to Fig. 3, brought in by the incoming conveyor belt into a position in front of a package pusher 156 by which they are conveyed

over into position to be moved in timed relation to the various operations of the machine into filling position, and thence carried onto the testing scale, and finally being delivered upon the outgoing or discharge conveyor also comprising a belt running around suitable pulleys at each end thereof. Provision is made for driving both the incoming and outgoing belts, and, as herein shown, the driving pulleys 146 and 147 for the incoming and outgoing belts respectively are mounted upon a common drive shaft 145, and the drive shaft 145 is driven from the main drive shaft 28 of the machine through cooperating bevel gears 132, 134 and through a sprocket 138 on the shaft 135 upon which the bevel gear 132 is mounted, and thence by a chain 140 running over the sprocket 138 and a sprocket 142 on a hollow shaft 144. The hollow shaft 144 is provided with a sprocket 148 around which a chain 152 travels over a second sprocket 150 on the end of the pulley drive shaft 145.

In the operation of the machine, each package as it is conveyed into the machine on the incoming conveyor arrives against a fixed stop 154 in front of the package pusher 156. The package pusher 156 is actuated by a lever 158 pivoted in a bracket 160 secured to the machine frame and oscillated by a cam 162 and cam roller 164. At its lower end the lever 158 is connected by a link 166 to a slide 168 carrying the pusher 156. The slide 168 is arranged to slide in suitable guides 170 on the underside of the conveyor rails, as shown in Figs. 1, 2 and 5.

After a package has been brought up against the fixed stop 154 and has been moved by the package pusher transversely into alignment with the discharge pipe of the supply hopper and with the scale pan of the check scale, provision is then made for advancing the package into a position beneath the filling hopper in readiness for elevation of the package up into filling position. The package moving mechanism about to be described also serves to advance the package until it reaches the continuously operating discharge belt by which it is carried from the machine. For this purpose the machine is provided with a plurality of package engaging members or hooks 180, mounted on a bar 182, slidable in bearings 184, 185 on the machine frame. The actuating bar 182 is reciprocated from a cam 188 on the main cam shaft 98, through a roller 192, carried by a fork 190 (see Figs. 4 and 23) connected by a link 196 to a rack 194. The rack 194 engages with a segment 198 on a shaft 200 journaled in a bracket 202. Suitable guide rolls 204 are provided for holding the rack in mesh with the segment. The shaft 200 is provided with a lever 206 secured thereto, connected by a link 208 to the bar 182 at 210. From the description of the mechanism it will be apparent that the bar 182 is reciprocated at each revolution of the cam 188 through the rack 194 and segment 198 and other connections described.

Provision is made for withdrawing the hooks 180 from the path of the packages when the hooks are moved with the bar 182 to the left, viewing Figs. 3 and 4, such position being illustrated in detail in Fig. 20, in order that the hooks may be again repositioned ready to again advance the packages when the bar and hooks are again moved to the right, viewing Figs. 3 and 4. For this purpose the hooks are provided with arms 212 connected to a link 214 arranged to be reciprocated by a cam 288 mounted on the main cam shaft 98, as shown in Fig. 22. The cam 288 has co-

operating with it a cam roll 292 carried on the fork 290 and connected by a link 296 to a rack 294. The rack 294 cooperates with the segment 298 on the shaft 300 mounted in the bracket 302, to rock the shaft. Suitable guide rolls 304 cooperate with the rack to hold it against the segment. The shaft 300 is provided with a lever arm 306 connected by a link 308 to the link 214, and, as illustrated in Fig. 4, a universal joint 310 is provided between the link 308 and the link 214. Through the mechanism described, the link 214 is reciprocated at each revolution of the cam 288 and operates to withdraw the hooks 180 from the path of movement of the packages during the return movement of the hooks.

In order to prevent the packages advanced by the hooks 180 from advancing too far as the packages are brought into each station by the hooks 180, it is preferred to provide the machine with a plurality of stop fingers 216, which are illustrated in Figs. 3 and 4, as mounted upon a stationary bar 218 attached to a bracket 220. The stop fingers 216 are provided with arms 222 and the arms 222 are connected together by a link 224. The link 224 is arranged to be reciprocated by an actuating cam 226, see Fig. 24, on the main cam shaft 98 through a cam roll 230 on the fork 228, and the fork 228 is connected to a rack 232 by a link 234. The rack cooperates with a segment 236 on a shaft 238 mounted in a bracket 240. Suitable guide rolls 242 are provided for holding the rack in mesh with the segment. The shaft 238 is provided with a lever 244 secured thereto and the latter is connected by a link 246 and universal joint 248 to the link 224. A tension spring 250 is provided for holding the cam roll 230 against its cam 226. From the description of the mechanism thus far, it will be observed that the link 224 is at each revolution of its actuating cam 226 reciprocated and operates to withdraw the stop fingers 216 from the path of the packages, and the timing of the cam is such that the stop fingers are thus withdrawn during the cycle of operation of the machine when the hooks 180 are operating to advance the packages to a succeeding station.

In the operation of the machine, the package, after having been advanced by the package pusher 156 into a position to be engaged by one of the hooks 180, is advanced into position beneath the filling hopper and on top of a plate 252. Provision is then made for elevating the package and the plate into a position in which the mouth of the package is adjacent the discharge end of the filling hopper, and for this purpose the plate 252 is adjustably mounted in a hub 254, see Fig. 8. The hub 254 is mounted upon a slide 256 arranged to slide in a guide bracket 274 secured to the package guide rail 278. Provision is made for actuating the slide to raise and lower the elevating plate 252, and for this purpose the cam 258 on the main cam shaft 98 is connected thereto through the cam roll 262, fork member 260, link 264, and through an actuating lever 266 pivoted at 268 in a bracket 270 secured to the machine frame. The lever 266 is connected to a hub 269 also projecting from the slide 256 through a pin 271 in the hub 269 which is arranged to slide in a slot 272 in the lever 266 to permit the slide 256 to follow a straight line motion. A spring 276 serves to hold the cam roll 262 against the cam 258.

Provision is also made for spreading the mouth of the package to facilitate the entrance of the goods therein from the filling hopper, and par-

particularly for spreading the mouth of the lining of a lined package, and for this purpose a plurality of fingers 312, preferably four in number, are fastened to pins 314, mounted in bearings 316, see Fig. 11. The fingers are arranged to be moved to perform their spreading operation by mechanism including a cam 318 secured to the main cam shaft 98, a lever 320 pivoted on the shaft 322 and carrying the cam roll 324 which cooperates with the cam 318, a link 326 connecting the lever 320, and a second lever 328 secured to the end of the shaft 330. The shaft 330 carries bevel gears 332 which drive gears 334, 335 and 338. A spring 340 holds the cam roll against the cam.

From an inspection of Figs. 8 and 11, it will be observed that in the illustrated machine the bearings 316 in which the pins 314 are mounted carrying the spreader fingers 312, are located at each corner of the mouth of the filling hopper and the arrangement is such that the spreader fingers extend angularly from each corner of the discharge mouth of the hopper. When the fingers are swung to perform their spreading operation, they engage and cooperate with the corners of the mouth of the package or lining to align the package accurately with the discharge mouth of the hopper. It will be observed that in their normal position the fingers extend from each corner toward the center of the discharge mouth of the hopper, and in their operation swing downwardly and outwardly toward each corner. This arrangement has been found to operate most efficiently upon all types of packages and linings, particularly as in many instances the mouth of the package or lining tends to collapse toward the center.

Through the mechanism thus far described, the package has been brought into a position ready to receive a load of the goods from the filling hopper, and provision is now made for introducing a measured load into the package from the hopper. Accordingly in the operation of the machine, at this time the hopper drum 362 is revolved a quarter of a turn and the goods are dumped from the compartment which registers with the discharge pipe from the hopper down into the package. The hopper drum 362 is intermittently rotated through mechanism including a spur gear 384 on the main cam shaft 98 which meshes with a gear 386 loosely mounted on the hopper drive shaft 388. Provision is made, as will be described, for controlling the operation of the hopper drive shaft, and consequently of the hopper drum 362, from the packages entering the machine in order that the hopper drum 362 may not be revolved to discharge goods in the event that no packages are being fed into the machine, and as herein shown the operation of the hopper drive shaft 388 is controlled from two contact switches 390 and 392, see Fig. 3, which are arranged, as will be described, to be closed by a package entering the machine, and which when closed serve to energize a solenoid 394, see Figs. 1 and 2. The armature of the core of the solenoid is connected by a link 396 to a lever 398 pivoted upon a pin 400. The lever 398 has connected with it a pawl stop 402, and when the solenoid 394 is energized, the lever is rocked to move the pawl stop 402 out of the path of the tail of a spring-pressed pawl 404 secured in the disk 406 and to permit the pawl 404 to become engaged in a one-toothed ratchet 408 secured to the gear 386. In this manner the hopper drive shaft 388 is driven from the main cam shaft through the gear 384, gear 386, and through the

ratchet and pawl 408, 404. Provision is made for preventing the driving disk 406 from revolving in a reverse direction, and for this purpose a pawl 412 pivoted upon a stud 414 is arranged to engage a notch in the driving disk 406. Provision is made for driving the hopper drum 362 from the hopper drive shaft, and as herein shown the hopper drive shaft is journaled in bearings 416, 418, and is provided with a sprocket 420 which drives a sprocket 422 on the shaft 424 through a chain 426 running over both sprockets. The shaft 424 is mounted in a bearing 428 of the hopper 429, and is provided with a gear 430 secured thereto which operates to drive the gear 432 forming a part of the drum 362. The hopper drum is, as illustrated, provided with four slots into which the hopper blades 434 are fitted, and the blades themselves are secured to a shaft 436 mounted in the hopper 429, thus sub-dividing the hopper drum into four measuring compartments.

After each package has been thus filled, the elevating plate 252 is operated through its cam to lower the package into package moving position, and thereafter the package is moved by the hooks 180 to position it upon the scale pan 440 of the scale by which the package and its load is weighed to determine whether it varies from a predetermined weight, and in the event that the package and load is found by the scale to vary from a predetermined weight, provision is made, as has been described, for increasing or decreasing the volume of the measuring hopper to increase or decrease the load delivered to the next succeeding package by a definite increment. In this manner the operation of the machine is controlled so that the machine operates with maximum efficiency to deliver packages containing loads of uniform weight.

A cam operated switch 549, Figs. 9 and 10, is provided which closes the circuit to energize the scale beam magnets 470 and 472, the solenoids 494 and 495, and the shaker solenoid 750. The purpose of this is to keep the circuit open until the scale balances. The cam 552 secured to the main cam shaft 98 actuates a bell crank lever 554, one arm of which carries a cam roll 556 and the other arm carries a contact spring 558. When the high part 560 of the cam forces the arm 562 down, the contact spring 558 is pressed against the contact spring 564 which is mounted upon the switch bracket 568. A spring 570 holds the roll against the cam.

In order to control the machine, a number of control mechanisms are provided, including a control mechanism for stopping the machine in the event that no packages are being fed into the machine by the incoming conveyor; a similar control mechanism for controlling the machine from the packages being discharged from the machine to stop the machine in the event of a jam on the discharge conveyor; control mechanism for enabling the machine to be started and stopped manually; and mechanism for controlling the machine in accordance with the flow or supply of goods to the filling hopper, to the end that the machine may automatically stop if no material is being supplied to the filling hopper and measuring drum. These four control mechanisms are so correlated that the machine will be stopped if any one of the control mechanisms functions. On the other hand the machine cannot be re-started unless a supply of goods is in the hopper, a supply of packages is on the incoming conveyor, unless the discharge conveyor is free to convey packages from the machine, and

unless the control handle is in the position to start the machine. In other words, there are four conditions necessary to be complied with in order that the machine may be started.

5 In the illustrated machine, the incoming conveyor, the discharge conveyor, and the supply hopper are each provided with an individual feeler or detector, and provision is made for operatively connecting all of said feelers or detectors to a
10 common machine controlling mechanism by which the machine is stopped when any of the feelers detect an abnormal condition, that is when there are no packages on the incoming conveyor, or
15 when a jam occurs on the outgoing conveyor, or when the supply of material to the filling hopper falls.

Referring to the drawings, Figs. 2 and 25, the detecting mechanism for detecting the absence of packages being supplied to the machine by the
20 incoming conveyor is herein shown as comprising a bent rod 10 secured in a hub on the upper arm 12 of a lever 14 pivoted on a stud 16. The lower arm 18 of the lever 14 is connected by a link 20 to a lever 22 pinned to an actuating shaft 24 supported in bearings 25, 27. Provision is made for
25 rocking the actuating shaft 24 from a cam 26 on the drive shaft 28, and for this purpose the cam has cooperating with it a cam roller 32 mounted on a fork 30 and the fork is connected by a link
30 34 and lever 36, the latter being pinned to the shaft 24. The spring 38 serves to hold the cam roll 32 against the periphery of the cam 26. The actuating shaft 24 is provided with a lever
35 40 is connected by a link 42 having a slot 46 in the upper end 44 thereof to one arm of a lever 50 through a pin 48 extended through the slot 46. The lever 50, see Figs. 27 and 28, is pivoted
40 at 52 and is provided with an upstanding arm 54 provided with a bent portion 56 adapted to engage and throw out the
45 pawl stop tripping member 58. The pawl stop tripping member 58 is pivoted at 60 on the end of a cam lever 62. The cam lever 62 is pivoted
50 at 64 and is arranged to be oscillated by a cam 66 on the drive shaft 28. A coil spring 70 serves to hold the cam roll 68 against the cam 66 and a second spring 72 serves to hold the tripping member 58 against the bent portion 56. In the operation
55 of the device, as long as the packages are being fed into the machine, the spring 38 will cause the feeler 10 to engage the package each time that the shaft 24 is permitted to be rocked by the cam 26, and the pawl stop tripping member 58 will operate to trip the pawl stop 76 by the
60 engagement of the tripping member 58 with the end 74 of the pawl stop 76 when the tripper 58 is rocked downwardly under the influence of the cam 66, as will be apparent from an inspection of Figs. 27, 28. The pawl stop 76 is pivoted at 80,
65 and when it is rocked in the manner described by the descent of the tripping member 58, the arm 82, see Fig. 27, is moved out of the path of a spring-pressed pawl 84 comprising a part of a pawl and ratchet clutch 84, 130 through which motion
70 is imparted from the continuously driven shaft 28 to the cam shaft 98. The spring pressed pawl 84 is pivotally secured at 86 on a disk 88 and the latter is provided with a long hub 90 journaled in a bracket 92. The hub 90 is provided with a driving gear 94 which meshes with the gear 96 to drive the cam shaft 98. The hub 90 with the
75 disk 88 and gear 94 are loosely mounted on the shaft 28. The pawl 84 cooperates with a ratchet 130 secured to the shaft 28 and the ratchet drives

the disk 88 and consequently the cam shaft 98 through the medium of the pawl 84.

When, however, the feeler 10 does not engage the package on the incoming conveyor during its detecting stroke, then the movement of the feeler
5 will be continued beyond the line of the edge of the packages and the abnormal movement of the feeler in this respect will rock the shaft 24 and consequently raise the lever 40 an abnormal amount, and through the engagement of the bot-
10 tom of the slot 46 with the pin 48 cause the lever 50 to be raised and consequently will cause the arm 54 to move the tripping member 58 about its pivot, and as the tripping member descends under
15 the influence of its cam 66, the end of the tripping member will not engage the end 74 of the pawl stop 76, thus permitting the pawl stop to remain in the path of the pawl 84 and to disengage the pawl and ratchet clutch 84, 130. The
20 pawl stop 76 is normally urged against a projection 122 on the bracket 78 by a spring 124 to cause the pawl stop to line up with the pawl 84.

In order to control the machine from the discharge conveyor, the latter is provided with a discharge feeler arranged to operate to stop the
25 machine in the event that the feeler engages a package and thereby indicates that the discharge conveyor is filled. As herein shown, the discharge feeler comprises a lever 600 secured to a shaft 602 journaled in bearings 604 and the bearing 27. This shaft 602 is herein shown as separate from but aligned with the shaft 24 above
30 referred to. A tapped hole in the end of the lever receives a yoke 606 provided with a roller 608, see Fig. 26. The lever 600 is oscillated by a cam 610 on the drive shaft 28 through a cam roller 612 on the fork 614. The fork 614 is connected by a link 616 to a lever 618 secured to the shaft 602. Another lever 620 secured to the shaft 602 is connected by a link 621 to a member 622 similar in
35 construction and mounted by the side of the corresponding member 54 above referred to, and which cooperates with the tripping member 58 and which, as long as the feeler 600 does not engage a package at each cycle of the machine,
40 moves away from the tripper 58, and consequently the tripper 58 moves the pawl stop 76 out of the path of the pawl 84, so that the machine continues in operation.

The feeler 600 is urged on its detecting stroke
45 by a cam spring 624, see Fig. 25, and as has been stated, as long as the feeler 600 does not engage a package on the discharge conveyor, thus indicating that no jam exists on the discharge conveyor, then the pawl stop 76 is moved out of the path of the pawl 84, permitting the pawl and
50 ratchet clutch to remain in operation and the machine to continue in operation. When, however, on its detecting stroke the feeler 600 does engage a package, then the member 622 will operate to position the tripper 58 out of the path of the end 74 of the pawl stop 76 so that the tripper
55 58 will not engage and move the pawl stop 76, and as a result the pawl stop will remain in the path of the approaching pawl 84 and stop the machine.

In the illustrated machine provision is made for detecting the failure of a supply of the material being fed to the measuring drum and for
60 controlling the operation of the machine to stop the same in the event of failure of a supply of goods to the measuring drum, and as herein shown the machine is provided with a plunger 342, see Fig. 2, mounted to be movable in and out of the portion 344 of the hopper above the meas-
65 70 75

uring drum and through which the goods flow to the measuring drum. The plunger 342 is secured to a rod 343 which is connected to one arm 348 of a bell crank lever 359 pivoted at 352 on an ear 354 projecting from the side of the portion 344 of the hopper. The second arm 356 of the bell crank is connected by a link 358 to a lever 360 secured to a rock shaft 362. The shaft 362 is journalled in bearings 364, 366 and is arranged to be rocked by a cam 368 (see Figs. 25 and 26) through the cam roll 370 and lever 372 secured to the rock shaft 362. A spring 380 holds the cam roll against the cam.

From an inspection of Figs. 2, 25 and 26, it will be observed that the shaft 362 is connected through the lever 374 and link 376 to the end of the arm 50 above referred to. The end of the link 376 is provided with a slot 378 through which a pin projecting from the arm 50 is extended. In the normal operation of the machine, as long as goods are being supplied to the measuring drum through the portion 344 of the hopper, the plunger 342 is moved inwardly against the goods by the tension in the spring 380 and the plunger is returned at each cycle of operation by the cam 368. During this normal movement of the plunger 342, the arm 50 is not raised because of the pin and slot connection between the link 376 and the arm 50. When, however, goods are not supplied to the portion 344 of the hopper, then under the influence of the spring 380 the plunger 342 continues beyond its normal travel in its movement into the hopper and consequently through the connecting linkage effects an extended rocking of the shaft 362 beyond its normal movement, and consequently through the lever 374 and link 376 the arm 50 is raised. The lever 50, see Figs. 27 and 28, is pivoted at 52 and is provided with an upstanding arm 54 provided with a bent portion 56 adapted to engage and throw out the pawl stop tripping member 58. The pawl stop tripping member 58 is pivoted at 60 on the end of a cam lever 62. The cam lever 62 is pivoted at 64 and is arranged to be oscillated by a cam 66 on the drive shaft 28. A coil spring 70 serves to hold the cam roll 68 against the cam 66 and a second spring 72 serves to hold the tripping member 58 against the bent portion 56.

When the lever 50 is raised, the arm 54 will move the tripping member 58 about its pivot, and as the tripping member descends under the influence of its cam 66 the end of the tripping member will not engage the end 74 of the pawl stop 76, thus permitting the pawl stop to remain in the path of the pawl 84 and to disengage the pawl and ratchet clutch 84, 130. The pawl stop 76 is normally urged against a projection 122 on the bracket 78 by a spring 124 to cause the pawl stop to line up with the pawl 84. From this description, therefore, it will be apparent that when the plunger 342 detects the absence of goods flowing in the portion 344 of the hopper, the pawl and ratchet clutch 84, 130 will be disengaged and the operation of the machine stopped.

Provision is made for permitting the machine to be stopped and started by hand, and for this purpose the machine is provided with a stopping and starting handle 601 supported in a bracket 603 and connected to a lever 605 secured to a stud 615 journalled in a bracket 607. The stud 615 has secured to it a lever 609 connected to a bent rod 611 which engages the kicker lever 59. The rod is guided vertically in the angle bracket 613 and in the operation of the machine when the handle 601 is pushed to the left, viewing Fig. 26,

the rod 611 will cause the lever 50 to be raised and thereby move the tripping member 58 out of the path of the end 74 of the pawl stop 76, permitting the latter to remain in a position to disengage the pawl 84 to thereby stop the machine. Providing there are packages on the incoming conveyor, that there is material in the hopper, and further provided that no jam exists on the outgoing conveyor, then movement of the operating handle 601 to the right, Fig. 26, will operate to restart the machine.

In order to maintain control of the movement of the wall 382 of the measuring drum within certain definite limits to thereby limit the maximum and minimum capacity of the measuring drum and the loads delivered thereby, provision is made for automatically discontinuing movement of the wall of the measuring drum when such maximum or minimum limits are reached. For this purpose one end of the volume adjusting screw 528 is arranged to extend into the switch box 709, see Fig. 16, and the end of the shaft 528 is provided with an arm 702 clamped thereto to move with the shaft as the volume is increased or decreased. The arm 702 is provided with two contact levers 704, 706, pivoted at 700 and 710. The lower ends of these levers are provided with contact points 712, 714 which are held in contact with points 716, 718, mounted upon the arm 702 by a connecting spring 720. The upper ends of the levers 704, 706 are provided with jaws which are adapted to be engaged by set screws 722, 724. In the operation of the mechanism, when a predetermined minimum volume is reached, the lever 706 comes in contact with the set screw 724, and upon further movement of the shaft 528 operates to break the contact between the points 714, 718. The points 714, 718 are connected into the circuit which energizes the solenoid 494, and consequently when the circuit becomes broken further movement of the wall 382 ceases. In addition to preventing the delivery of loads of less than a predetermined size, the present arrangement serves to prevent the drum 382 from becoming jammed in the hopper 429 by too extended movement into the hopper. Similarly when a predetermined maximum volume is reached, the lever 704 is brought into contact with the set screw 722 and operates to break the circuit which energizes the solenoid 495 at the points 712 and 716, thus preventing further movement of the volume adjusting screw 528 outwardly from the hopper, and which in addition to preventing the production of loads of above a predetermined size, also prevents the drum 382 from being drawn entirely out of the hopper 429.

Provision is made for shaking the goods in the package in order to settle the goods, particularly in the event of certain characters of goods the density of which may vary from time to time. Provision is also made for controlling the operation of the shaking mechanism in accordance with the volume controlling mechanism above referred to by which the volume of the measuring drum is increased or decreased under control of the testing scale. In practice, with a given size package and with goods of average density the load may vary between certain limits which ordinarily fill the package without shaking. When the density, however, becomes less, it is desirable that the shaking mechanism be operative, and accordingly under such conditions the volume controlling mechanism above referred to will operate to increase the volume of the measuring drum in order that the weight of the load in the

package may be standard, and provision is made for initiating the operation of the shaking mechanism in order that the increased bulk of the load may be contained in the standard package. As herein shown, a shaker 650 is arranged to rotate with the shaft 658 under the belt 654. The shaker is provided with fins 656 which are arranged to lightly tap the under side of the belt. The shaft 658 is supported in a bearing 652 and extends through the hollow shaft 144 in the bearing 660. The sprockets 142 and 148 previously described serve to drive the conveyor 654, and in addition to drive the ratchet 662 on the other end of a hollow shaft 144, as shown in detail in Fig. 29. A pawl carrier disk 664 is secured in the end of the shaft 658 and the spring pressed pawl 666 carried by the disk is engaged by the ratchet 662 to drive the shaft 658.

As above indicated, the pawl and ratchet clutch 666, 662 is controlled to be permitted to drive the shaft 658 to operate only when the density of the material decreases, necessitating the operation of the volume control mechanism above referred to, to increase the volume of the load. As herein shown, the switch illustrated in detail in Figs. 17 and 18 is mounted upon a support 800 inside the switch box 700. A lever 802 clamped to the volume adjusting screw 528 is provided with a cam portion 804 which actuates a bell crank lever 806 pivoted at 808. The bell crank is provided with a cam roll 810 on one arm and with a spring-pressed pin 812 fitted in a hub in the other arm. This pin is provided with a cone shaped point adapted to engage with a V-shaped point on a contact spring lever 814. The spring lever 814 carries a contact spring 816 and is pivoted on a stud 818 located upon the supporting plate 820. The movement of the lever is limited in one direction by a stop pin 822 and in the other direction connection is made with a contact spring 824 mounted on the supporting plate 820. With this construction of switch, when the screw 528 travels to the right, as viewed in Figs. 5 and 18, indicating that the volume is becoming less, the roll 810 will ride on the high point of the cam 804 and the shaker contact points 816, 824 will remain separated, as shown in Fig. 17. When the screw 528 travels to the left, viewed in Fig. 18, indicating that the volume is becoming greater, the roll 810 will ride on the low point of the cam 804 and force the spring pressed pin 812 to the right, as viewed in Fig. 17, over and on the other side of the V-shaped point on the lever 814. The roll 810 is held against the cam 804 by a spring 801. This will close the contact points 816 and 824 and energize the solenoid 750. The solenoid is connected to a pawl stop 752 which is swung when the solenoid is energized to permit the ratchet 662 to become engaged with the pawl 666 to drive the shaker. When the solenoid becomes de-energized upon breaking of the points 816, 824 upon movement of the adjusting screw 528 in the reverse direction, the pawl stop 752 will be positioned to disengage the pawl from the ratchet and consequently disengage the clutch and terminate the operation of the shaker. The pawl 754 is provided to engage in a notch 756 in the disk 664 to prevent the shaker from reversing.

A retarding lever 901 is provided for holding the package over the shaker for a sufficient time to permit the operation of the shaker to effectively settle the goods within the package. This lever 901 is herein shown as supported upon a stud 902 secured in a bracket 904 bolted to the un-

der side of the conveyor rails. One arm 906 of the lever 901 carries the retarding finger 908. This finger 908 is clamped friction-tight between two collars 910, 912 to a stud 914. If a second package should be forced against the first package as the latter is held by the retarding finger, the finger is arranged to slip between the collars and allow the packages to be continued to be moved by the conveyor. The second arm 916 on the lever 901 is connected to the cam fork 918 by a link 920. The roll 922 in the fork rides on the cam 924 secured to the main cam shaft 88. A spring 926 is provided for holding the roll against the cam.

While the different features of the present invention have been herein illustrated as embodied in a packaging machine of the measuring type, it will be understood that they may with equal advantage be embodied in other forms of packaging machines, such for example as packaging machines of the weighing type.

Having thus described the invention, what is claimed is:—

1. In a packaging machine, in combination, a measuring device for delivering a measured load into a package, a scale, means for moving a package with a measured load therein onto the scale, and mechanism controlled by the scale for increasing or decreasing the measured load thereafter, delivered by the measuring device in the event that the package with its load is found to vary from a predetermined weight.

2. In a packaging machine, in combination, load forming mechanism at one station, a scale counter-weighted to a standard load located at a different station, means for presenting packages in succession into a position to receive a load, and for then moving a package with its load upon the scale, and means controlled by the scale for increasing or decreasing by a definite increment the amount of the next succeeding load accordingly as the tested load is found to be below or above a standard load.

3. In a packaging machine, in combination, load forming mechanism at one station, a scale counter-weighted to a standard load at a different station, means for presenting packages in succession into a position to receive a load, and for then moving a package with its load upon the scale, and mechanism controlled by scale to increase or decrease the amount of each succeeding load delivered by the load forming mechanism in the event that the scale indicates a variation in the tested load from the standard.

4. In a packaging machine, in combination, load forming mechanism located at one station, means located at a different station for controlling the size of the load formed by the load forming mechanism, means operatively connected with said controlling means for testing the amount of each load, and package moving means for presenting packages in succession first to the load forming mechanism to receive their loads and then to the testing mechanism, and for then moving them from the machine.

5. A packaging machine having, in combination, load forming mechanism including a measuring drum provided with a movable wall, load testing mechanism including a scale, and mechanism for varying the volume of each of succeeding loads produced by the load forming mechanism including an electrical circuit adapted to be closed when the scale is moved out of balance under the influence of an under-weight or over-weight load, and connections between the elec-

trical circuit and said movable wall of the measuring drum to effect movement of the drum to vary the volume thereof.

5 6. A packaging machine having, in combination, load forming mechanism including a measuring drum provided with a movable wall, load testing mechanism including a scale, and mechanism for varying the volume of each of succeeding loads produced by the load forming
10 mechanism including two electrical circuits, one adapted to be closed by the scale under the influence of an over-weight load and the other under the influence of an under-weight load, and connections between said circuits and the movable
15 wall of the measuring drum for moving the latter in or out to decrease or increase the volume of the measuring drum.

7. In a packaging machine, in combination, load forming mechanism for forming successive
20 loads, load testing mechanism cooperating with the load forming mechanism to test each load formed thereby, mechanism controlled by the load testing mechanism for varying the operation of the load forming mechanism to increase or decrease
25 the volume of the load, and mechanism operatively connected to and controlled by the load varying mechanism for controlling the operation of the latter to thereby limit the extent to which the load may be increased or decreased.

8. In a packaging machine, in combination, means for handling flowable solid material and forming a load thereof, a scale for testing the load thus formed, means for effecting movement
5 of each load from the load forming means to the testing scale, and means for increasing or decreasing the amount of each succeeding load delivered by the load forming mechanism in the event that the tested load varies from a standard
10 load.

9. In a packaging machine, in combination, load forming mechanism, a scale, means for presenting packages in succession to a position to receive a load, and for then moving a package with
15 its load onto the scale, means controlled by the scale for increasing or decreasing the amount of each succeeding load delivered by the load forming mechanism accordingly as the tested load is found to be below or above the standard load,
20 shaking mechanism for settling the load in the packages and control mechanism for operating the shaking mechanism only when the operation of the load forming mechanism is varied to increase the volume of the load.
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