Nov. 24, 1931. B. E. TAYLOR 1,833,007

MACHINE FOR CLEANING TIN CANS

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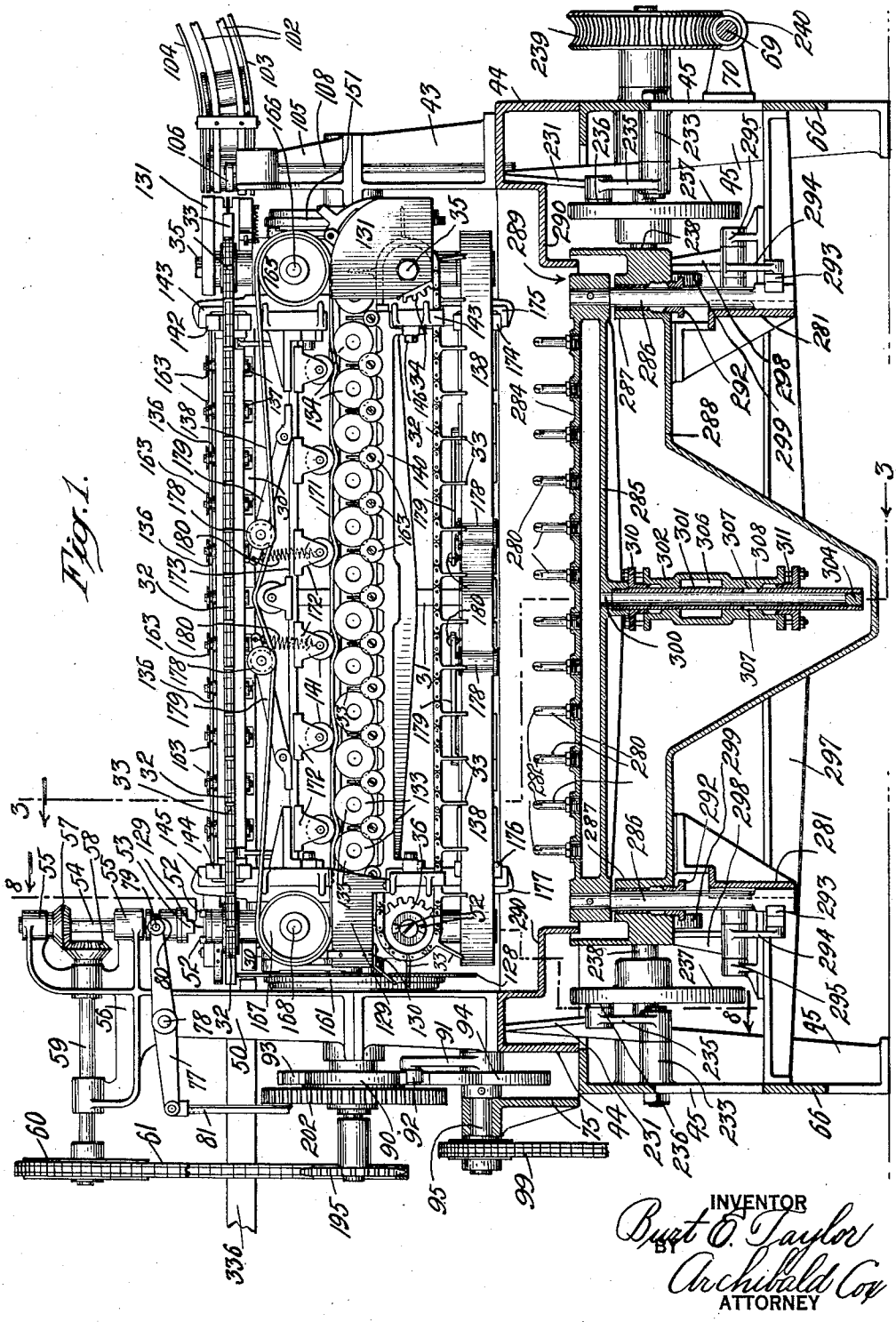


Fig. 1.

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MACHINE FOR CLEANING TIN CANS

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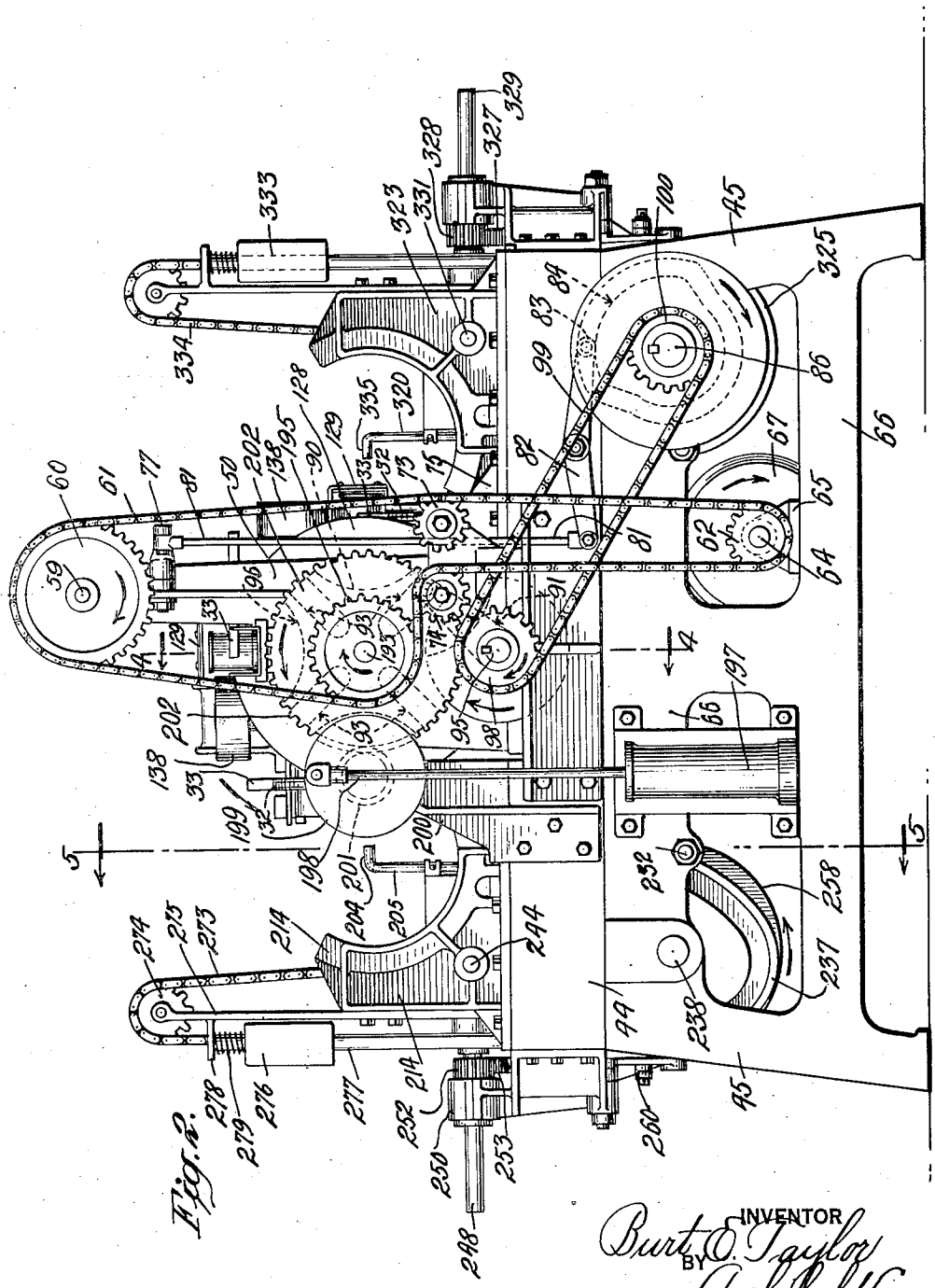


Fig. 2.

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MACHINE FOR CLEANING TIN CANS

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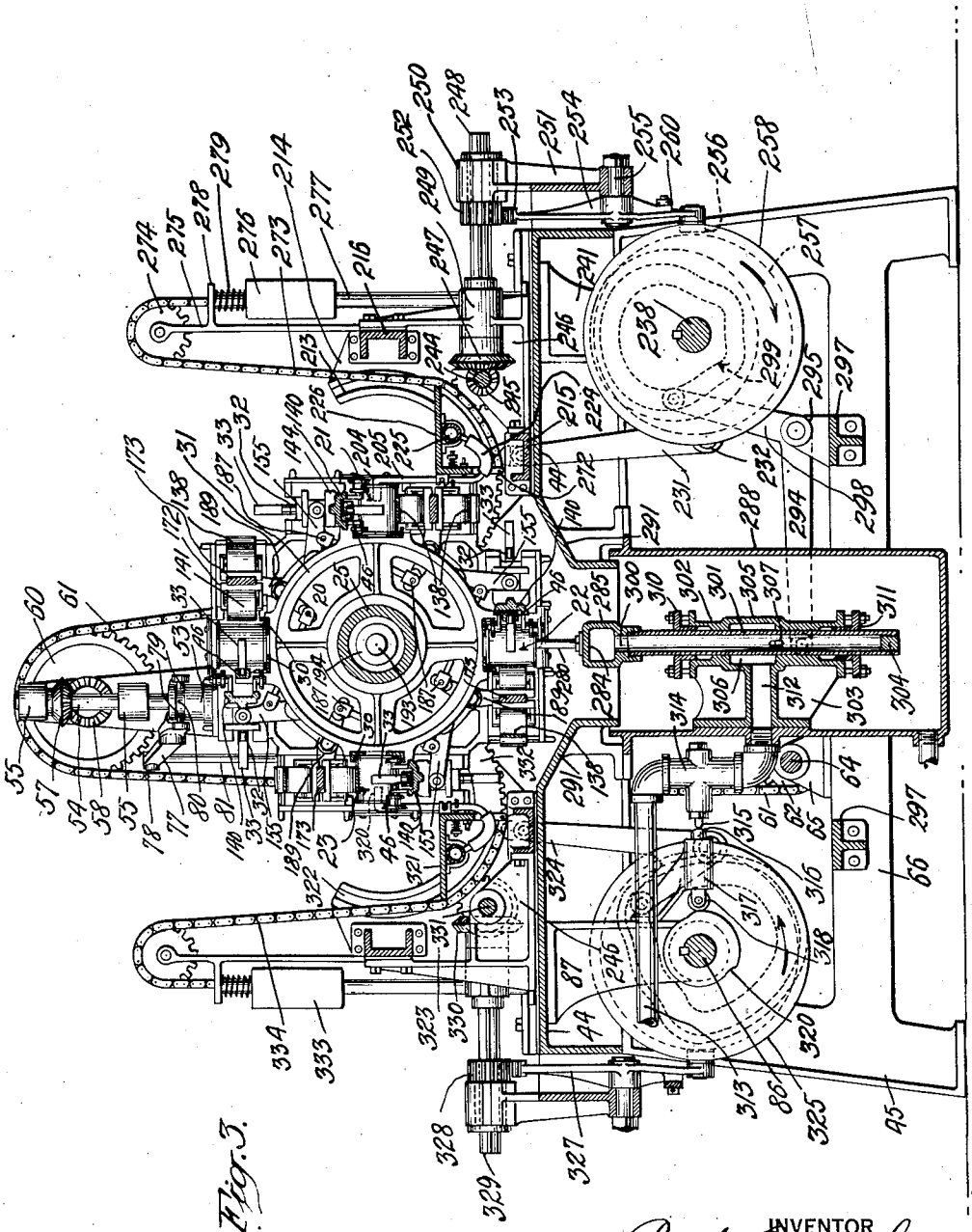


Fig. 3.

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MACHINE FOR CLEANING TIN CANS

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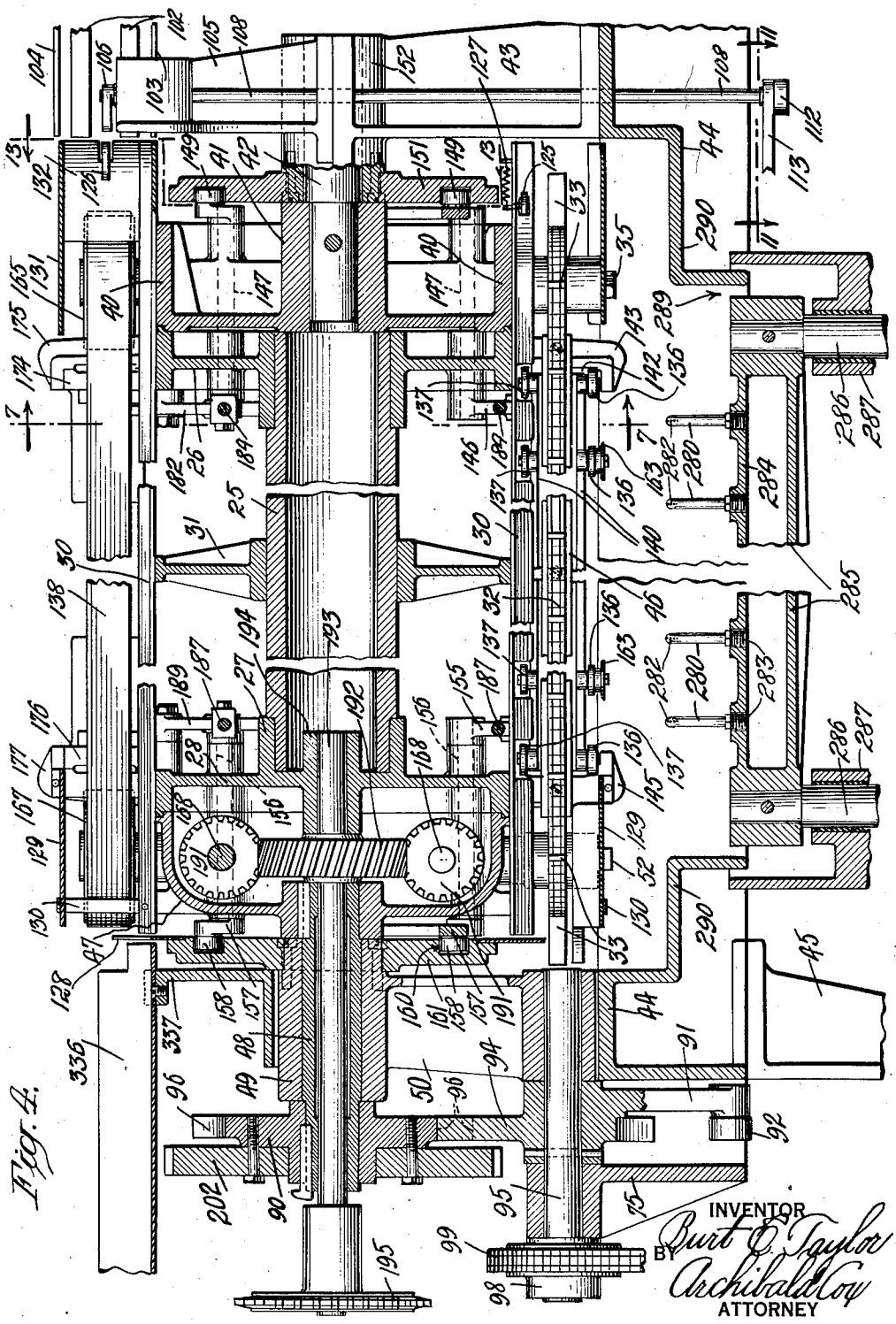


Fig. 4.

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MACHINE FOR CLEANING TIN CANS

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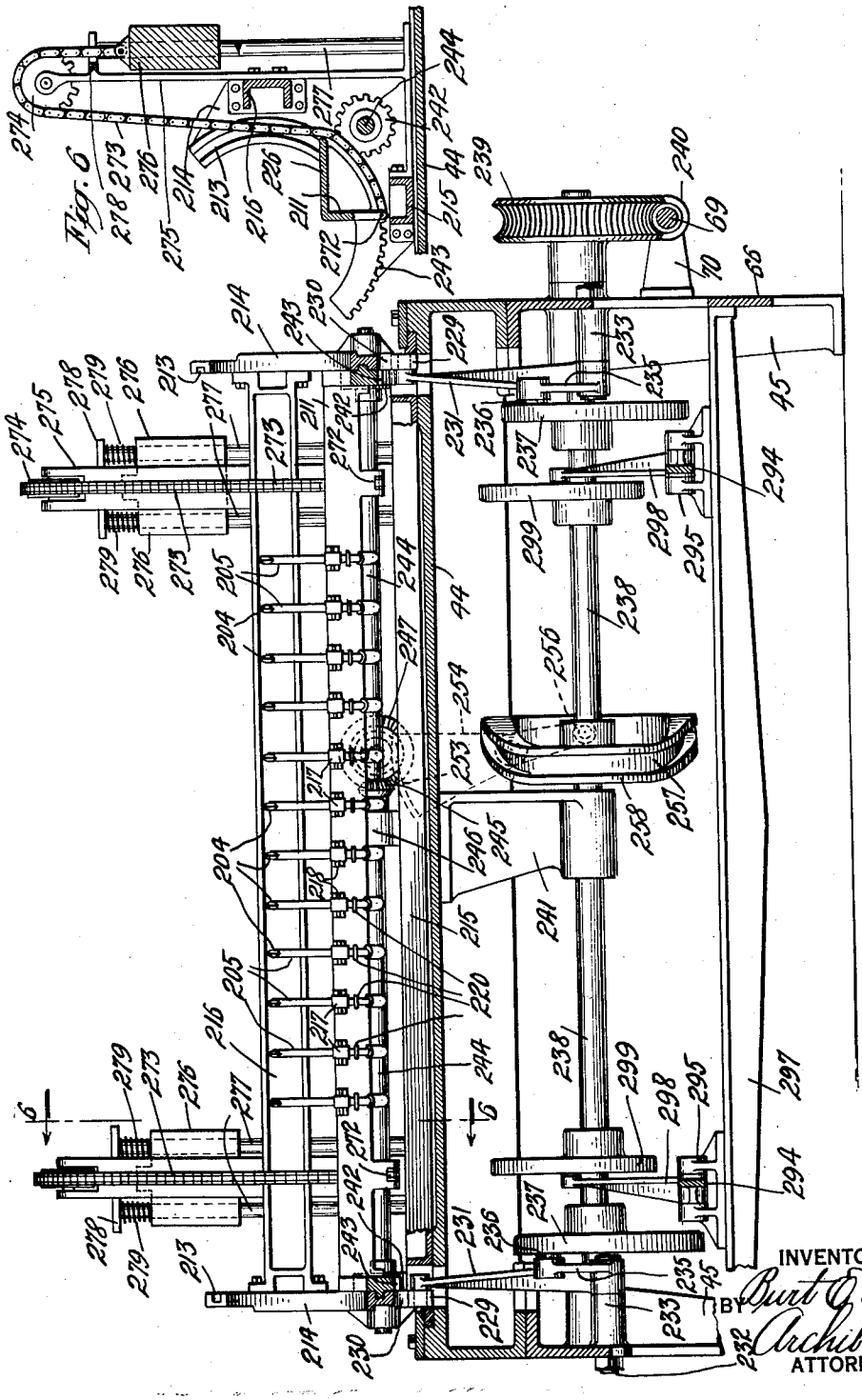


Fig. 5.

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MACHINE FOR CLEANING TIN CANS

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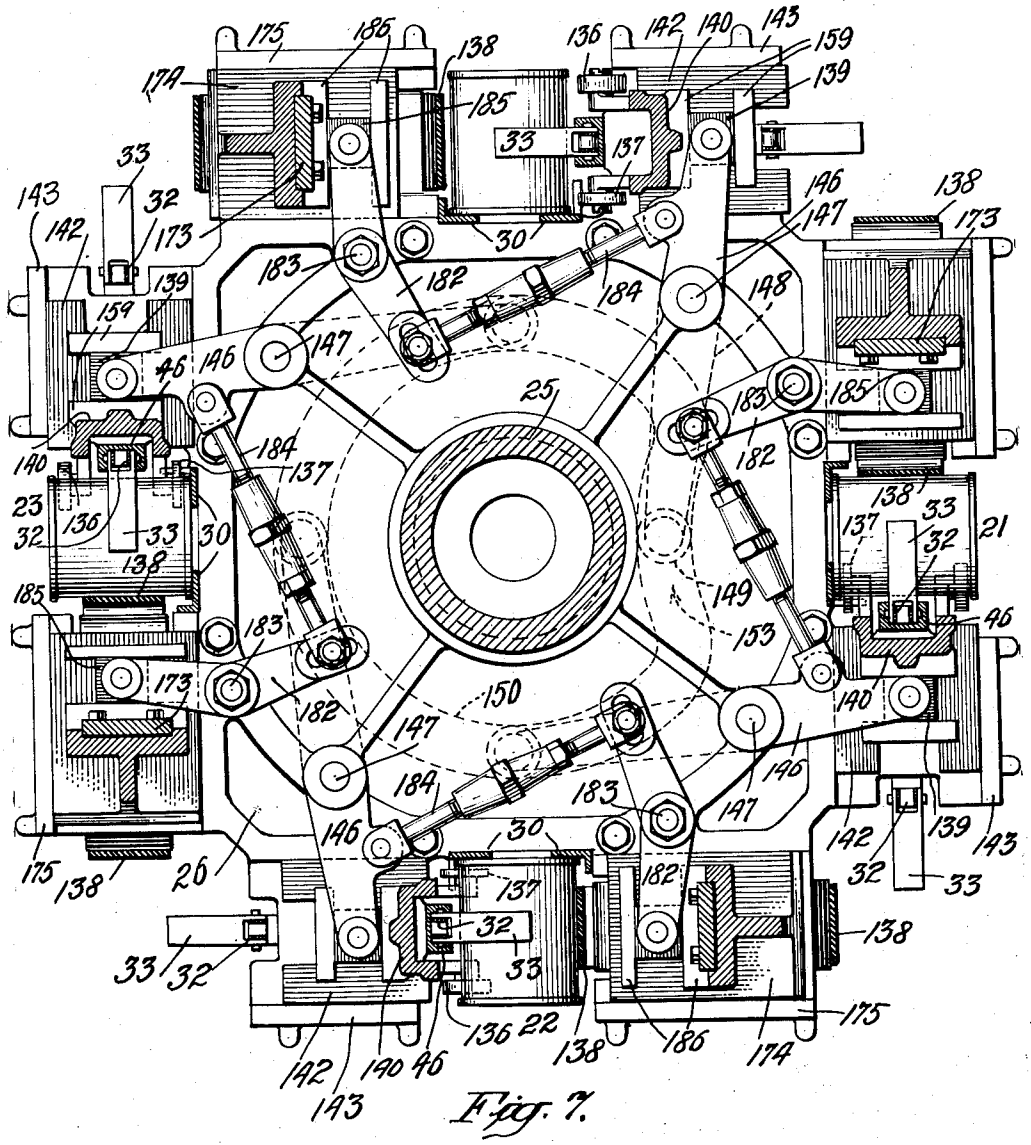


Fig. 7.

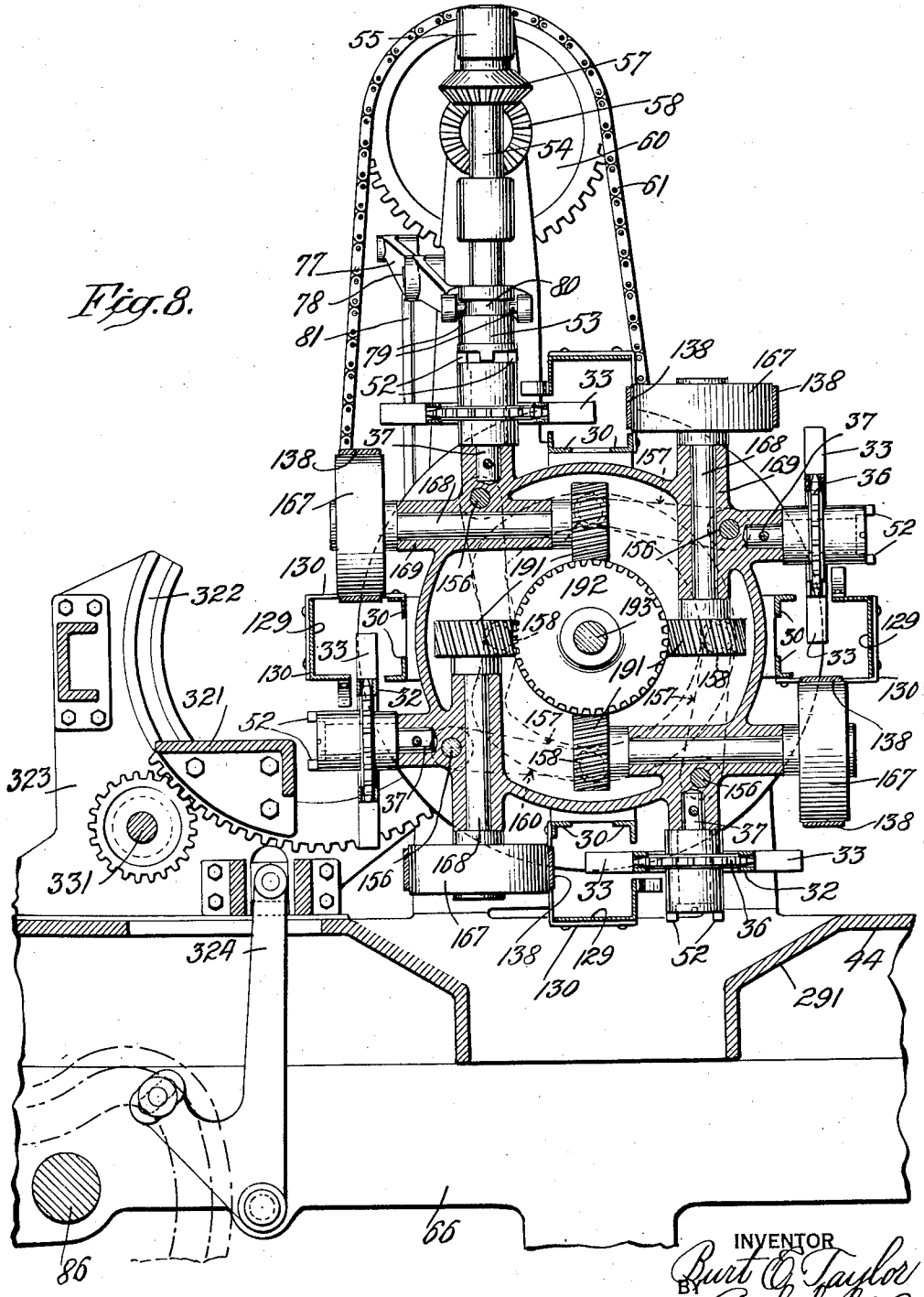
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MACHINE FOR CLEANING TIN CANS

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Fig. 8.



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MACHINE FOR CLEANING TIN CANS

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Fig. 9.

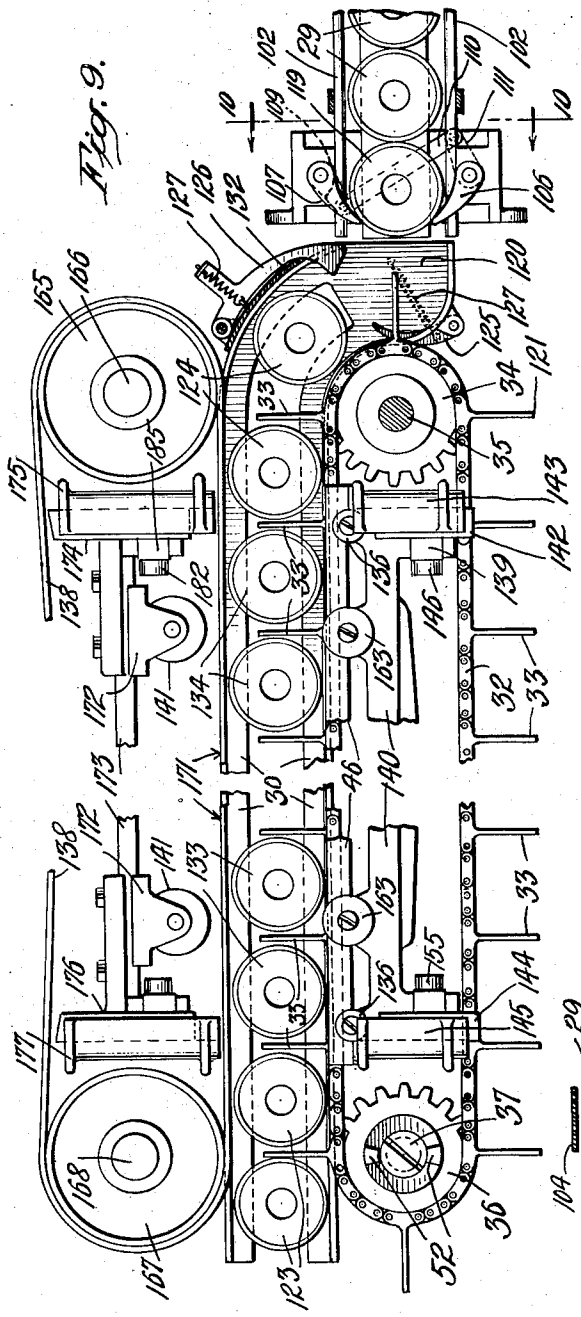


Fig. 11.

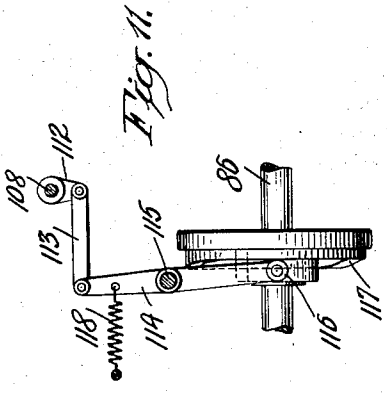
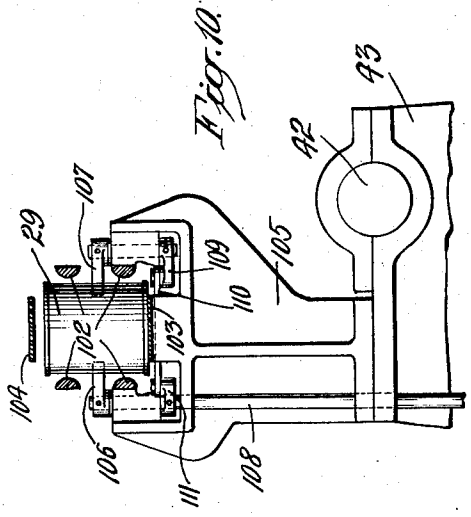


Fig. 10.



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Fig. 12.

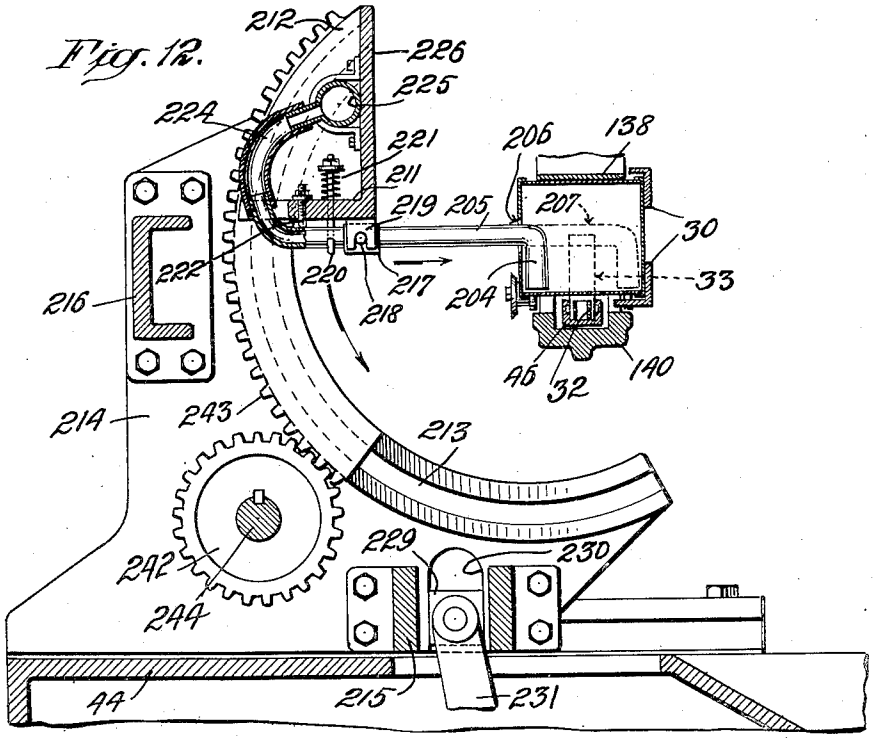


Fig. 13.

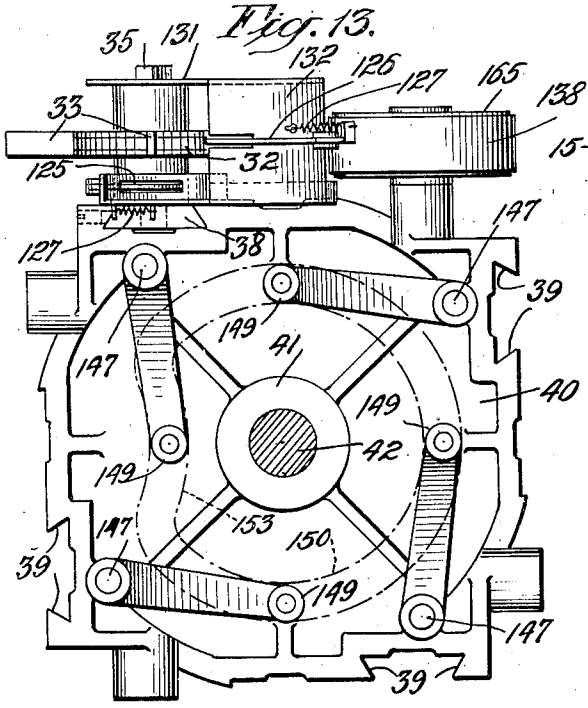


Fig. 14.

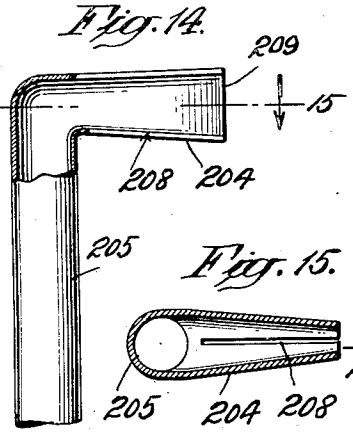


Fig. 15.

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Nov. 24, 1931. B. E. TAYLOR 1,833,007

MACHINE FOR CLEANING TIN CANS

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Fig. 16.

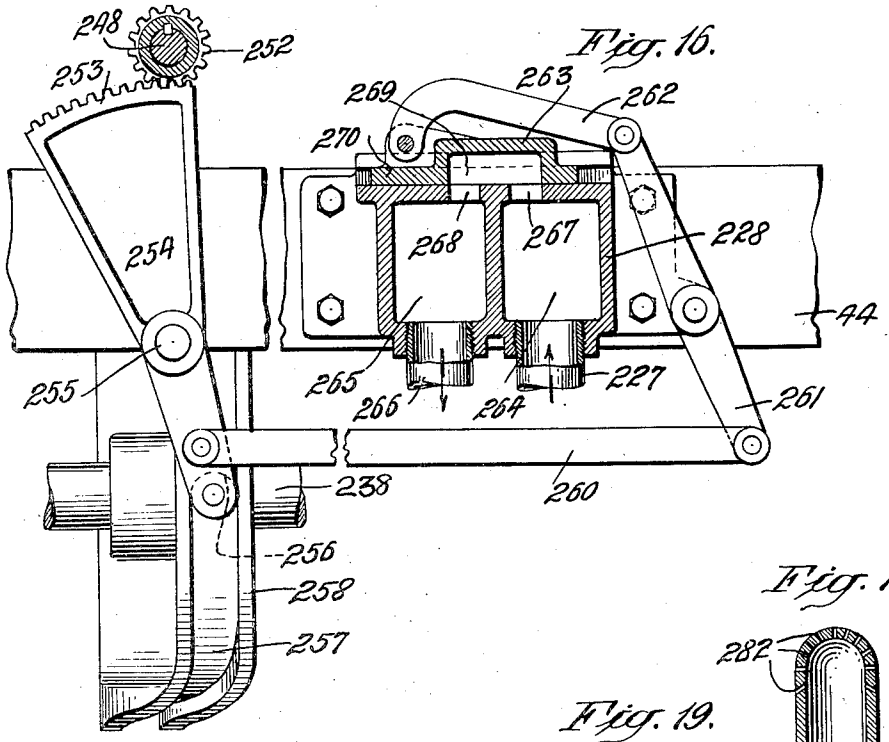


Fig. 18.

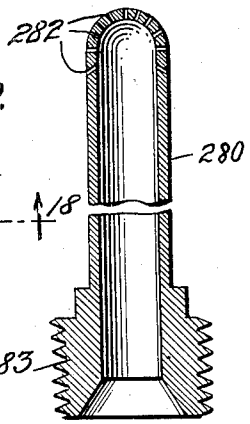


Fig. 19.

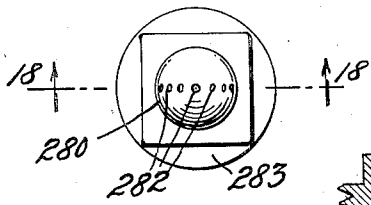
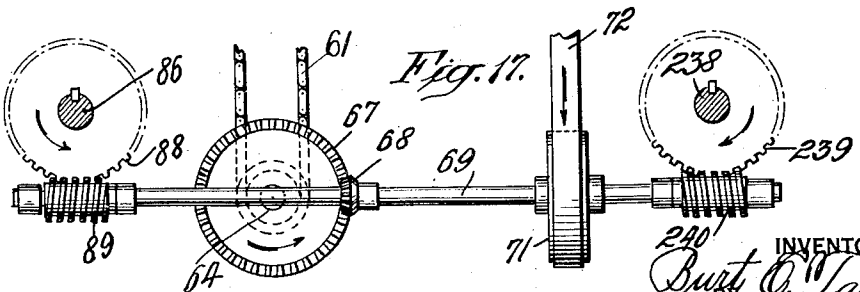


Fig. 17.



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Patented Nov. 24, 1931 1,833,007

UNITED STATES PATENT OFFICE

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MACHINE FOR CLEANING TIN CANS

Application filed December 3, 1927. Serial No. 237,508.

The invention relates to an improvement in machines for cleaning tin cans. More particularly the invention is concerned with preparing for sterilization the tin cans used in the preservation of food products, such as condensed milk. The general object of the invention is to produce a machine which will efficiently and rapidly clean the inner surfaces of cylindrical tin cans. Another object of the invention is to produce a machine of this character having provision for removing the loose particles of dust and other dirt from the interior of the cans, washing the inner surfaces of the cans and then removing the moisture therefrom, thereby putting the cans in condition for sterilization. A more specific object of the invention is to produce an improved machine of this character having provision for performing the dusting, washing and drying operations simultaneously on separate batches of cans. Further objects of the invention, incidental to the accomplishment of the foregoing objects, will be pointed out as the description proceeds. To these ends the invention consists in the improved can cleaning machine hereinafter fully described and particularly pointed out in the appended claims.

In the accompanying drawings illustrating the preferred form of the invention, Fig. 1 is a side elevation of the improved machine, with the can washing devices and associated parts shown in longitudinal section; Fig. 2 is a rear end elevation of the machine shown in Fig. 1; Fig. 3 is a transverse section taken on the line 3—3 of Fig. 1; Fig. 4 is a vertical longitudinal section on an enlarged scale through the upper part of the machine, with central duplicated parts broken away; Fig. 5 is a vertical longitudinal section taken on the line 5—5 of Fig. 2; Fig. 6 is a section taken on the line 6—6 of Fig. 5, looking in the direction of the arrows; Fig. 7 is a section, on an enlarged scale, taken on the line 7—7 of Fig. 4; Fig. 8 is a vertical section, on an enlarged scale, taken along the line 8—8 of Fig. 1; Fig. 9 is a top plan, with the midde part broken away, of one of the sections of the carrier for supporting the cans during the cleaning and washing operations, and showing its relation to the can chute; Fig. 10 is a transverse section taken on the line 10—10 of Fig. 9; Fig. 11 is a section taken on the line 11—11 of Fig. 4; Fig. 12 is a side elevation, with supporting parts in section, of one of the units of the vacuum devices for removing the particles of dirt and moisture from the interior of the cams; Fig. 13 is an end elevation, taken on the line 13—13 of Fig. 4, of the rotatable drum for supporting the cans and showing one of the can rotating devices mounted thereon: Fig. 14 is a detail sectional elevation of one of the vacuum nozzles; Fig. 15 is a section taken along the line 15—15 of Fig. 14; Fig. 16 is an enlarged side elevation, partly in section, of one of the vacuum device actuating means and of one of the vacuum controlling valves; Fig. 17 is a side elevation of the main drive shaft of the machine and showing its relation to the cam shafts; and Fig. 18 is a longitudinal section taken on the line 18—18 of Fig. 19 which is a top plan of one of the washing fluid nozzles.

In the illustrated embodiment of the invention is shown a machine of the rotary type, although it will be understood that other types of machines may be constructed embodying the principles of the invention as defined in the claims. The machine as illustrated comprises a rotatable, longitudinally-arranged carriage generally indicated at 20, Fig. 3, provided on its periphery with devices for rotatably supporting three separate batches of cans on which the dusting, washing and drying operations are performed while the cleaned cans are being discharged and a fresh batch of uncleaned cans is fed onto the carriage. The carriage rotates intermittently in a clockwise direction, viewing Fig. 3, and while the cleaned cans are being discharged from the uppermost can supporting devices and the uncleaned cans fed thereonto, the cans supported at station 21 on the right hand face of the carriage are undergoing the dusting operation, the cans supported at station 22 on the lower face of the carriage are undergoing the washing opera-

tion, and the cans supported at station 23 on the left hand face of the carriage are undergoing the drying operation. These various operations are performed during the momentary pauses of the carriage between each quarter rotation thereof. As the carriage comes to a stop to permit the clean cans to be discharged and to receive the uncleaned cans, the devices which perform the dusting, washing and drying operations move toward the cans, enter them to perform their respective functions and then withdraw from the cans to inoperative position. Thus each batch of cans is successively dusted, washed and dried while the carriage is completing one rotation, and since the three operations of dusting, washing and drying the cans are performed simultaneously with the discharge of the cleaned cans and the feeding of the uncleaned cans into the machine, it will be understood that after the carriage has completed one rotation so as to charge all the can supporting devices with cans, the machine will discharge four batches of cleaned cans during each complete rotation of the carriage.

The can supporting carriage 20 comprises a central hollow shaft 25 (Fig. 4) fixed at one end in the hub of a spider 26 and at the other end in the central, circular flange 27 of a spider 28. The spiders 26 and 28 are four-sided members, as best shown in Fig. 7, and each alined pair of sides supports the parts which hold the cans rotatably for the dusting, washing and drying operations. As the uncleaned cans 29 (Fig. 9) enter the machine they are received by the can holding devices then uppermost on the carriage, and travel, top side up, along a can run composed of the parallelly arranged angle irons 30 extending from the spider 26 to the spider 28. The middle sections of the four can runs 30 are supported by the spider 31 mounted on the middle part of the hollow shaft 25.

Each batch of cleaned cans is discharged from its runway 30 and the succeeding batch of uncleaned cans is placed thereon by means of a conveyor chain 32 provided with the laterally extending, can engaging fingers 33. Each conveyor chain 32 is endless and at one end passes over a sprocket wheel 34 mounted on a stud 35 and the other end passes over a sprocket wheel 36 mounted on a stud 37. Each stud 35 is carried by a slide 38 (Fig. 13) which is adjustably received in a dovetailed guide 39 formed in each of the four sides of a head 40 which is secured to the outer side of the spider 26. The hub portion 41 of the head 40 receives tightly the inner end of a shaft 42 journaled in the upright 43 rising from the table 44 supported on the legs 45. The table 44 is an elongated rectangle in plan and supports the carriage 20 and the can dusting and drying devices, whereas the can washing device is supported from the legs 45. The studs 37 are fixed in the periphery of a dish-shaped head 47 secured to the outer side of the spider 28. The head 47 is secured to and supported by the inner end of a sleeve 48 journaled in the bearing 49 of the upright 50 rising from the rear end of the table 44. To prevent the middle part of the inner section of each conveyor chain 32 from sagging a channel-shaped guide 46 is provided, secured at its forward end to a projection on the spider 26 and secured at its rear end to a projection on the spider 28.

Each conveyor chain 32 is driven intermittently (at the end of each quarter rotation of the carriage 20) by the following parts:—The outer end of the hub of each sprocket wheel 36 is provided with the clutch lugs 52 adapted to be engaged, when the rotation of the carriage has brought its conveyor chain uppermost, by means of a clutch 53 slidingly mounted on the lower end of an upright shaft 54 journaled in the bearings 55 carried by the bracket 56 which constitutes an upward extension of the upright 50. On the shaft 54 is mounted a spur gear 57 which is driven by a spur gear 58 carried by the forward end of a horizontally arranged shaft 59 journaled in the bracket 56. On the outer end of the shaft 59 is mounted a sprocket wheel 60 over which passes the upper end of a chain 61 the lower end of which passes over a sprocket 62 fixed on the rear end of a shaft 64 journaled in bearing blocks 65 supported on the cross-pieces 66 connecting the end legs 45. On the forward end of the shaft 64 is mounted a beveled gear 67 driven by a pinion 68 mounted on the main drive shaft 69 journaled in brackets 70 secured to the front end of the machine. On the shaft 69 is mounted a pulley 71 driven by a belt 72. The chain 61 passes over the idler sprockets 73 and 74 mounted on studs secured in the base 75 resting on the rear end of the table 44 and which serves to support the upright 50. The shaft 69 is constantly driven by the belt 72 from any convenient source of power and thus the upright shaft 54 and the clutch are constantly driven.

As the carriage 20 comes to a full stop at the end of each quarter rotation, the constantly rotating clutch 53 is lowered into driving engagement with the clutch lugs 52 of the sprocket wheel 36 under it to drive the uppermost conveyor chain 32 to discharge from the machine the cans which have just been cleaned and to bring into the machine a batch of uncleaned cans. When the requisite number of uncleaned cans have been brought onto the uppermost can run 30 the clutch 53 is disengaged from the clutch lugs 52. The means for raising and lowering the clutch member 53 comprises a lever 77 pivoted at 78 in the upper end of the upright 50. The forward end of the lever 77 is bifurcated and is provided with inwardly projecting pins

79 which are loosely received in a groove 80 formed in the upper part of the clutch member 53. The rear end of the lever 77 is pivotally connected with the upper end of a link 81 the lower end of which is pivotally connected with one arm of a lever 82 fulcrumed on the rear end of the table 44. The free end of the other arm of the lever 82 carries a roll 83 which travels in a cam path 84 of a disk mounted on the rear end of a cam shaft 86 which extends throughout the length of the machine and is journaled at each end in the legs 45, the middle section of the shaft being supported by the bracket 87 (Fig. 3) depending from the under side of the table 44. On its forward end the shaft 86 is provided with a worm gear 88 which is driven by a worm 89 carried by one end of the shaft 69.

The mechanism for intermittently turning the carriage 20 through a quarter rotation at a time to aline the clutch lugs 52 with the clutch 53, and to present the batches of cans supported on the carriage successively to the various cleaning devices comprises a Geneva gear consisting of the slotted plate 90 splined on the outer end of the sleeve 48 and an arm 91 carrying on its free end a roll 92 arranged to enter successively the four slots 93 of the plate 90. The arm 91 extends radially from the hub of the lock plate 94 fixed on the shaft 95 journaled in the upper part of the base 75. The lock plate 94 is adapted to cooperate with the dished portions 96 in the periphery of the plate 90 in the usual manner to lock the plate 90 and the parts connected therewith at the end of each quarter rotation of the carriage 20. On the outer end of the shaft 95 is mounted a sprocket wheel 98 over which passes one end of a chain 99, the other end of which passes over a sprocket wheel 100 fixed on the rear end of the cam shaft 86.

The cans to be cleaned are fed into the machine from a chute comprising the lateral guides 102, a bottom strip 103 and top strip 104. The forward discharge end of the chute terminates in close proximity to the receiving ends of the can runs 30 and is supported on the bracket 105 resting on the upright 43. When twelve cans have been fed into the machine the next succeeding cans in the chute are held back by a pair of stop fingers 106 and 107. The finger 106 is mounted on the upper end of a vertically arranged rod 108 journaled in the brackets 43 and 105 and the finger 107 is pivotally mounted on the upper end of the bracket 105. The finger 107 is operatively connected with the finger 106 by means of an arm 109 fixed to the finger 107 and pivotally connected at its outer end to one end of a link 110 the other end of which is pivotally connected with the arm 111 fixed on the upper end of the rod 108 under the finger 106. The lower end of the rod 108 carries an arm 112 (Fig. 11) connected by the link 113 with one arm of a lever 114 pivotally mounted at 115 on the under side of the table 44 and carrying on its free end a roll 116 held against a face cam 117 mounted on the cam shaft 86 by a spring 118. When the batch of clean cans has been brought uppermost on the carriage and the conveyor chain has been started to discharge them from the machine the stop fingers 106 and 107 are opened by the action of the cam 117 so that the lowermost can 119 in the chute will pass onto the receiving platform 120 of the uppermost can run 30 in position to be engaged by the next succeeding conveyor finger 121 in order that no blank spaces may occur between the fingers of the conveyor chain, the action being such that as twelve cleaned cans are discharged twelve uncleaned cans are fed into the machine.

The arrangement of the conveyor chains and of the parts which rotate the cans while they are undergoing the cleaning operations is such that after one cycle of operations has been completed sixteen cans are carried on each can run, of which only the twelve middle cans are operated upon as the carriage rotates to present the cans to the cleaning devices. The arrangement is such that two cleaned cans are carried around a second time before being discharged and two uncleaned cans are carried around once before being moved forward by the conveyor chains into position for the cleaning operations. This mode of operation will be made clear from a study of the arrangement of parts shown in Figs. 1 and 9. For this purpose each can run is extended at its discharge end to accommodate two cleaned cans 123 and at its receiving end to accommodate two uncleaned cans 124. At its receiving end each can run 30 curves in conformity with the bend of the conveyor chain 32 around its sprocket wheel 34, as clearly shown in Fig. 9, and opens outwardly against the discharge end of the can chute. To prevent more than one can from being picked up by the conveyor fingers 33 as they sweep around the sprocket wheel 34 the spring pressed retarding fingers 125 and 126 are provided, the inner ends of which project inwardly into the path of travel of the cans into the can run, the strength of the springs 127 being sufficient to hold back the cans as they come from the chute under the action of gravity, but permitting the fingers 125 and 126 to admit the cans into the can run under the action of the conveyor fingers 33. In order to prevent the two undischarged clean cans 123 from falling off the can runs 30 during the rotation of the carriage, an annular plate 128 is supported from the upright 50 and the discharge end of each can run is provided with the guard plate 129 supported at its outer end by the brackets 130 and supported at its inner end on an outwardly pro-

jecting part of the spider 28. To prevent the two uncleaned cans 124 carried by the receiving end of each can run from accidental displacement during the rotation of the carriage, the receiving end of each can run is provided with a guard plate 131 supported at one edge by the arcuate wall 132 rising from the outer curved side of the receiving end of the can run and is supported on its opposite edge on the stud 35.

When twelve uncleaned cans have been fed into the machine, thereby pushing forward the two uncleaned cans 124 to the positions indicated at 133 in Figs. 1 and 9, the ninth and tenth cans of the new lot occupy the positions indicated at 134. The twelve middle cans on the uppermost can run are now in position to be engaged by the can rotating means and to be carried around step by step to be presented to the dusting, washing and the drying devices. Immediately after the uppermost conveyor chain 32 has come to rest after discharging twelve clean cans and bringing twelve uncleaned cans into the machine, a series of upper rolls 136 and lower rolls 137 and a driving belt 138 are moved toward each other into engagement with the cans to separately rotate the cans in the positions they occupy on the can run. There are thirteen upper and lower rolls 136 and 137 pivotally mounted on lateral projections on the inner face of a bar 140 and each pair of upper and lower rolls is adapted to engage with and support two adjacent cans and for this purpose enters the space formed by the divergent walls of each pair of adjacent cans. To facilitate this mode of operation the conveyor fingers 33 come to rest substantially opposite the rolls. The belt 138 is forced against the opposite sides of the cans by the rolls 141 so as to assure an efficient driving connection between the belt and the cans.

The bars 140 carrying the can engaging rolls are arranged to move toward and from the cans and for this purpose each bar is formed at its forward end as a slide 142 held in a guide 143 projecting outwardly from the spider 26, and at its rear end is formed as a slide 144 received in a guide 145 extending outwardly from the spider 28. The slides 142 and 144 are actuated simultaneously, moving the rolls 136 and 137 into engagement with the cans and withdrawing them therefrom. For this purpose each slide 142 is connected with the free end of an arm 146 of a bell crank lever the pivot pin 147 of which is fulcrumed in the spider 26. The free end of the other arm 148 of the bell crank carries a roll 149 which travels in a cam path 150 formed in a plate 151 fixed on the inner end of the bearing 152 mounted on the upper end of the upright 43 and in which the shaft 42 is journaled. By reference to Fig. 4 it will be seen that the pivot pin 147 of each bell crank comprising the arms 146 and 148 passes through the spider 26 and head 40. It is thus clear that as the carriage 20 rotates, the roll 149 is caused to travel in the cam path 150 and that as the roll enters the active portion 153 of the cam path the slide 142 is moved away from the cans and as the roll leaves the active part 153 of the cam path the slide 142 is moved toward the cams. To permit the free end of each arm 146 to move relatively to its slide 142 it is pivotally connected with a block 139 which travels in the guides 159 on the slide 142. The mechanism for actuating the slides 144 is a duplication of the parts for actuating the slides 142. Each slide 144 is slidingly connected with the free end of the arm 155 of a bell crank the pivot pin 156 of which passes through the spider 28 and head 47, and the other arm 157 of which carries a roll 158 which travels in the cam path 160 formed in a plate 161 secured to the inner face of the bearing 49. The rim of the plate 161 supports the arcuate guard 128.

To prevent the cans from accidental displacement during the cleaning operations performed upon them and also while the carriage is rotating, the eleven middle outer rolls 136 are provided with the guard disks 163 which project laterally over the outer ends of the cans during the rotation thereof, as indicated best in Fig. 1.

Each belt 138 for rotating the cans during the cleaning operations passes at its forward end over a pulley 165 mounted on a pin 166 fixed in the head 40, and at its rear end passes over a pulley 167 fixed to a shaft 168 journaled in a bearing 169 formed in the dish-shaped head 47. The pulleys 165 and 167 thus rotate in a fixed position relatively to the cans. To bring the inner section 171 of each belt 138 into driving engagement with the adjacent sides of the cans I mount the rolls 141 on brackets 172 carried by the inner face of a bar 173 secured at its forward end to a slide 174 received in a guide 175 carried by the spider 26 and at its rear end to a slide 176 received in a guide 177 carried by the spider 28. By moving the slides 174 and 176 inwardly the rolls 141 are forced against the outer face of the inner section 171 of the belt 138 thereby bringing the belt into proper driving engagement with the cans. There are six rolls 141 which are located opposite the openings between each successive pair of cans as shown in Fig. 1. The slack of each belt 138 is taken up by two rolls 178 carried by the arms 179 pivotally mounted on the outer face of the bar 173. The springs 180 secured at one end to the free ends of the arms 179 and at the other end to the two middle brackets 172 serve to force the rolls 178 into engagement with the outer face of the outer section of the belt 138.

The rolls 141 are moved inwardly to force the inner section 171 of the belt 138 into engagement with the adjacent sides of the cans

at the same time that the rolls 136 and 137 are moved inwardly into engagement with the cans, as indicated above. The mechanism for moving the rolls 141 inwardly synchronously with the inward travel of the rolls 136 and 137 is connected with and actuated by the mechanism which moves the rolls 136 and 137. Each lever arm 146 is connected by an adjustable link 184 with the slotted inner end of a lever 182 pivoted at 183 on the spider 26. The free end of the lever 182 is pivotally connected with a block 185 slidingly received in the guides 186 formed on the slide 174. At the other end of the machine each slide 176 is similarly connected with the levers 155 by the links 187 and the levers 189.

Since the mechanism for moving the can engaging rolls toward and from the cans and for moving the belt engaging rolls 141 toward and from the inner section 171 of the belt is actuated only while the carriage 20 is moving, it will be understood that the carriage must begin its cycle of step by step movements before the cans are engaged and rotated by the rolls 136 and 137 and the belt 138. It will be further understood that the can engaging rolls and the belt are moved away from the cans before the carriage comes to a stop with the clean cans in position to be discharged.

The belts 138 are constantly driven, both while they are in driving engagement with the cans and while they are disengaged therefrom. The means for driving the belts 138 comprise the following elements:—The inner end of each shaft 168 carries a worm gear 191 which meshes with and is driven by a centrally located worm 192 fixed on a shaft 193 the inner end of which is journaled in a centrally located bearing 194 carried by the spider 28 and the outer end of which is journaled in the bushing 48. On its outer end the shaft 193 carries a sprocket wheel 195 over which passes one section of the chain 61. It is thus seen that the shaft 193 and the parts connected with it are constantly driven from the shaft 64.

To bring the carriage to a gradual and gentle stop at the end of each quarter rotation thereof, I provide a dash pot 197 mounted on the rear end of the machine. The piston rod 198 of the dash pot is connected with a crank disk 199 journaled in the bracket 200. Secured to the crank disk 199 is a pinion 201 which meshes with and is driven by a gear 202 secured to the Geneva gear member 90.

The arrangement is such that the piston rod 198 is moved upwardly as the carriage 20 completes a quarter rotation. This causes the dash pot piston to create a vacuum in the dash pot which results in bringing the carriage to a stop without jar or excessive vibration. When the carriage begins its quarter rotation the vacuum in the dash pot assists in giving the carriage a quick start.

The first of the cleaning operations to be performed upon the cans is that of removing the dust and other loose particles of dirt from the interior of the cans. The removal of the loose particles of dirt from the interior of the cans is effected by subjecting them to a vacuum. The vacuum dust removing device comprises a series of nozzles 204 adapted to enter the cans and to be moved axially thereof in close proximity to the top, bottom and side walls of the interior of the cans. There are twelve nozzles which are located opposite the centers of the twelve middle rotating cans which occupy the position indicated at 21 in Fig. 3. For this purpose each nozzle 204 is offset inwardly at right angles to its supporting tube 205, which when the vacuum device is inoperative is held in an upright position, as shown in Figs. 2 and 5, and is given a horizontal position during the dust removing operation, as shown in Fig. 12. The tubes 205 are so mounted that when the dusting operation is to be performed they are advanced toward the cans until the now horizontally arranged nozzles 204 enter the holes 206 in the outer head of the cans. The tubes 205 are then swung upwardly into the horizontal position shown in Fig. 12, after which they are moved axially inwardly of the cans, as indicated by the dotted lines 207, to bring the outer end of the nozzles 204 close to the inner surfaces of the bottoms of the cans. The tubes 205 are then retracted axially of the cans to the position shown in full lines in Fig. 12, the tubes are then swung into their vertical position again with the nozzles 204 still within the center holes 206 of the cans, and thereafter the tubes are moved away from the cans to their original inoperative position, as shown in Fig. 2. In order that the inner surfaces of the tops and bottoms of the cans may be subjected to the action of the vacuum the nozzles 204 are flattened laterally, as shown in Fig. 15, and are provided with a slot 208 which passes through the outer and inner walls of the nozzles. The greater part of the loose particles of dirt larger in size than what is commonly known as dust will naturaly fall under the action of gravity onto the sides of the cans as the carriage moves the cans from the receiving station on the top of the carriage to the dust removing station, indicated at 21. For this reason the mouth portion 209 of the nozzles is of greater capacity than the slot 208.

The nozzle tubes 205 are supported on the inner face of a plate 211 extending lengthwise of the machine and secured at its ends in the segments 212 provided on their outer faces with tongues which fit and slide in the arcuate grooves 213 formed in the heads 214 connected by the channel irons 215 and 216 and arranged to slide laterally on the right hand

side of the table 44 (facing Fig. 3) toward and from the cans occupying station 21. The lower end of each nozzle tube 205 is detachably and yieldingly secured to the face of the plate 211. For this purpose it carries a block 217 provided with laterally projecting ears 218 received in the slotted sides of a block 219 secured to the upper edge of the face of the plate 211. The hooked end 220 of a bolt passed through the plate 211 engages with the outer face of the lower end of each tube 205 below the block 217. The shank of each bolt is provided with a spring 221 of sufficient tension to hold the tube in operative position during normal operations but yielding under manual action to permit of the ready dismounting of the tube. An adjustable stud 222 also passed through the plate 211 engages with the rear face of the lower end of each tube 205 to cooperate in holding the tube in proper operative position.

Each nozzle tube 205 is connected at its lower end by a flexible coupling 224 with a manifold pipe 225 extending lengthwise of the machine and fastened to the lower face of a plate 226 integral at its front edge with the upper edge of the plate 211 and secured at its ends to the arcuate sections 212. The manifold pipe 225 may be connected in any convenient manner by means of a flexible coupling with the intake 227 of a valve 228 (Fig. 16) mounted on the outer face of the right side of the table 44 and acting (as described hereafter) to control the suction action of the nozzles 204.

The mechanism for moving the nozzles 204 toward and from the cans comprises at each end of the machine a block 229 adapted to slide in a vertically arranged slot 230 formed in the inner lower edge of each head 214. Each block 229 is pivotally connected to the upper end of an arm 231 of a bell crank lever fulcrumed on pivot pins 232 supported in the bosses 233 projecting inwardly from the cross plates 66 connecting the legs 45, as best shown in Fig. 5. The other arms 235 of the bell cranks carry on their outer ends the rolls 236 which travel in cam grooves formed in the outer faces of the disks 237 mounted on the cam shaft 238 carrying on its forward end the worm gear 239 driven by the worm 240 mounted on the shaft 69. The shaft 238 is journaled at its outer ends in the webs or cross-pieces 66 and at its middle point is supported by the bearing 241 depending from the under side of the table 44. The cam paths in which the rolls 236 travel are so shaped that the heads 214 carrying the nozzles 204 are advanced towards the cans to cause the nozzles to enter the central openings 206 of the cans and are then arrested while the nozzle tubes 205 are swung upwardly into horizontal position, after which the heads are again advanced to carry the nozzles to the bottoms of the cans. In the reverse action, the heads 214 are moved outwardly carrying the nozzles to the outer heads of the cans, at which point the heads 214 are again arrested to permit the nozzle tubes 205 to swing into vertical position, after which the heads 214 are moved into their outermost position.

The means for swinging the nozzle tubes 205 into horizontal position to permit the nozzles 204 to travel axially in the cans and for returning the nozzle tubes 205 to vertical position again comprises at each end of the machine a pinion 242 which meshes with an arcuate rack 243 formed on the outer edge of the segments 212. The pinions 242 are mounted on a shaft 244 journaled at its outer ends in the heads 214 and journaled at its middle in the web 246 supported from the channel irons 215 and 216. Adjacent the web bearing 246 the shaft 244 carries a beveled pinion 245 which meshes with and is driven by a beveled gear 247 mounted on the inner end of a shaft 248 journaled at its inner end in the bearing 249 supported by the web 246 and at its outer end in the bearing 250 formed on the upper end of a bracket 251 secured to the right hand side of the machine. Slidingly splined on the middle section of the shaft 248 is a gear 252 which is turned by a gear segment 253 formed on the upper end of a lever 254 pivoted at 255 on the bracket 251. The lower end of the lever 254 carries a roll 256 which travels in a peripheral cam path 257 of a cam 258 mounted on the middle of the cam shaft 238. The shape of the cam path 257 and its relation to the cam paths in the disks 237 is such that while the heads 214 pause after bringing the vertical nozzle tubes 205 close to the outer heads of the cans the shaft 244 is rotated to cause the pinions 242 to move the segments 212 upwardly in their grooves 213, thereby bringing the nozzle tubes 205 to a horizontal position. The shaft 244 is arrested in its rotation while the nozzles 204 are caused to move inwardly to the bottoms of the cans and are withdrawn to the heads thereof again. The shaft 244 is then again actuated by the cam 258 to swing the segments 212 into their normal position and restore the nozzle tubes 205 to their normal upright position.

While the cam 258 is rotating the shaft 244 to swing the nozzle tubes 205 up into horizontal position, the nozzles 204 are connected with the vacuum creating means. This is accomplished by pivotally connecting the lower end of the lever 254 by a link 260 with the lower end of a lever 261 mounted on the side of the table 44 near the valve 228. The upper end of the lever 261 is pivotally connected by a link 262 with a slide 263 which acts to connect the chamber 264 with the chamber 265 and to cut it off therefrom. The chamber 265 is connected by the pipe 266 with the vacuum creating means (not shown).

The chamber 264 is provided with an outlet 267 and the chamber 265 is provided with an inlet 268. The outlet of the chamber 264 and the inlet of the chamber 265 are adapted to open into a space 269 formed in the slide 263. In the arrangement of the parts as shown in Fig. 16 the nozzles 204 are connected with the vacuum creating means because the outlet 267 of chamber 264 and the inlet 268 of chamber 265 both open into the space 269 of the slide 263. This condition of the parts continues while the nozzles 204 travel from the heads of the cans to the bottoms thereof and return to the heads, since during this time the shaft 244 does not rotate. When the nozzles 204 have reached the heads of the cans, oscillation of the lever 254 in the opposite direction under the action of the cam path 257 causes the part 270 of the slides 263 to be moved over the inlet 268 of chamber 265, thereby cutting off the chamber 264 and the nozzles 204 from the vacuum creating means while the nozzle tubes 205 are being returned to their normal upright position. While the lever 254 is turning counter-clockwise (viewing Fig. 16) to rotate the shaft 248 to swing the nozze tubes 205 up into horizontal position, the slide 263 is moving in a left hand direction to uncover the inlet 268 of the chamber 265 and thereby connect the chamber 264 and the nozzles 204 with the vacuum creating means.

To counter-balance the weight of the parts supporting the nozzles 204 while they are being swung upwardly and downwardly on the arcuate heads 214, each segment 212 is connected at the point 272, where the plate 211 joins the segments, with the lower end of a chain 273 which passes upwardly over a sprocket wheel 274 pivoted on the upper end of a bracket 275 rising from the rear of the head 214. The other end of the chain 273 is connected with a weight 276 which loosely embraces two rods 277 rising from the table 44 and held at their upper ends by the shelf 278 projecting outwardly from the bracket 275. The arrangement of the parts is such that the descent of the weights 276 assists in swinging the nozzle tubes 205 up into horizontal position, and the upward travel of the weights exerts a braking action on the return of the nozzle tubes 205 and their supporting means into normal position. To prevent jar at the end of the return of the nozzle supporting parts to normal position springs 279 are interposed between the upper end of the weights and the shelves 278.

After the nozzles 204 have been withdrawn from the cans and they are retreating to their inoperative positions, the carriage 20 is actuated to advance the cans to station 22. In this position the cans are topside down presenting the holes 206 in position to be entered by the upright nozzles 280 of the can washing device. The nozzles 280, shown in detail in Figs. 18 and 19, are provided at their closed upper ends with a row of radially directed perforations 282 and are threaded at their lower ends 283 into the upper plate or wall 284 of a manifold 285 extending longitudinally under and in alinement with the lowermost row of cans on the carriage 20. Each nozzle 280 is located opposite the center of the can over it, and the manifold 285 is arranged to be raised to enter the perforated top ends of the nozzles 280 into the mouths of the cans for the washing operation, after which the manifold 285 is lowered to withdraw the nozzles from the cans to permit the washed cans to be swung up into station 23 for the drying operation.

The mechanism for supporting and raising and lowering the manifold 285 comprises two vertically arranged rods 286 secured at their upper ends in the two extremities of the manifold (Fig. 1). The upper ends of the rods 286 are slidingly received at the points 287 in the ends of a tank 288 located under the open space 289 of a trough 290 through which the manifold 285 rises and descends. The lower squared ends of the rods 286 slide in guides 281 depending from the under surfaces of the ends of the tank. The trough 290 is formed by the downwardly projecting middle walls 291 of the central part of the table 44 and opens at its bottom into the upper end of the tank 288. (See Figs. 1 and 3). The upper edges of the tank 288 overlie slightly the lower edges of the trough 290 to prevent the escape of water during the washing operation. Leakage of water from the tank 288 around the joint between the rods 286 and their bearings at the points 287 is prevented by the glands 292.

The lower ends of the rods 286 are connected by a pin and slot connection 293 with the free ends of the arms 294 of bell cranks pivoted on the brackets 295 supported on one of the bars 297 extending lengthwise of the machine and supported at their ends by the cross-pieces 66. The free ends of the other arms 298 of the bell cranks carry rolls which travel in cam paths 299 formed in the outer faces of cam disks mounted on the cam shaft 238. The cam paths 299 are so formed that when the dusted cans have been brought into the lowermost station 22 the manifold 285 is caused to rise and insert the perforated ends of the nozzles 280 in the mouths of the inverted cans, holding the nozzles in this position while the cleansing fluid is ejected through the nozzles, and then lowering the manifold 285 again to withdraw the nozzles from the cans to permit the next quarter rotation of the carriage.

The cleansing fluid is admitted at the middle point 300 of the bottom of the manifold 285 through a vertically arranged tube 301 mounted to slide in a guide 302 supported by the web 303 in one side of the tank 288. The

lower end of the tube 301 is stopped by a plug 304. The middle portion 305 of the guide 302 is enlarged to provide a space 306 for the admission of cleansing fluid which enters the tube 301 through the ports 307 when, in the upward travel of the manifold 285 and the tube 301 they enter the space 306. The ports 307 are shut off by the lower end 308 of the guide 302 when the nozzles 280 have been retracted from the cans and the manifold has returned to inactive position. In order that the pressure of the cleansing fluid in the space 306 may be distributed equally upwardly and downwardly, the upper end of the guide 302 is provided with a gland 310 and the lower end of the guide is provided with a gland 311.

The cleansing fluid enters the conduit 312 connected with the space 306 through a pipe 313 in which is interposed a pop valve 314, the stem 315 of which is engaged by one end of a plunger 316 carried by a bearing 317 supported from the bracket 87. On its other end the plunger 316 carries a roll 318 which bears against the periphery of a cam 320 mounted on the cam shaft 86. The action is such that as the ports 307 advance into the lower part of the space 306 the cam 320 acts to force the plunger 316 against the valve stem 315 and open the valve 314 to admit washing fluid under pressure into the space 306. The valve remains open until the nozzles 280 are to be retracted from the cans.

On the completion of the washing operation and the withdrawal of the nozzles 280 from the cans, the carriage 20 is again advanced through a quarter rotation to bring the cans to the drying station. The devices for removing any moisture which may remain in the interior of the cans are an exact duplicate in construction and mode of operation of the devices which remove the loose particles of dirt from the interior of the cans. For this reason only the salient features of the moisture removing devices will be described: These comprise a series of nozzles 320 corresponding in number and arrangement to the twelve rotating cans supported on the carriage 20 and located opposite the central holes in the outer ends thereof. The nozzles 320 are mounted on a frame work 321 supported at its ends in the arcuate grooves 322 of the heads 323 rising from the ends of the left hand side of the table 44, viewing Fig. 3. The levers 324 for moving the heads 323 toward the cans to bring the nozzles 320 into operative relation therewith and for moving the heads 323 outwardly to withdraw the nozzles 320 from the cans are actuated by cams mounted on the cam shaft 86. The nozzles 320 are swung from vertical to horizontal position by means of the cam 325 mounted on the cam shaft 86 and which actuates the lever 327 the upper end of which is toothed to mesh with the gear 328 slidingly splined on the shaft 329 which carries on its inner end the gear 330 for rotating the shaft 331 on the outer ends of which are mounted the gears which mesh with the segments 332 supporting the frame 321 in the grooves 322 of the heads 323. The counter-weights 333 are connected by the chains 334 with the nozzle supporting frame 321.

When the cans which have just been washed and out of which the greater part of the water has drained through the openings 206 (the cans being in inverted position at this time) are swung into horizontal position at the drying station 23, the nozzles 320 are actuated to advance toward the cans, enter the cans and travel axially thereof so as to bring the offset ends 335 thereof in close proximity of the entire inner surfaces of the cans. This permits the effective withdrawal of the moisture therefrom under the action of a vacuum controlled by a valve arranged to be operated by the lever 327 in the same manner in which the valve 228 is operated by the lever 254.

When the nozzles 320 have performed their function of withdrawing the moisture from the interior of the cans and while they are retreating from the cans, the carriage 20 is again actuated to bring the batch of cans which have just been through the dusting, washing and drying operations uppermost on the carriage in position to be discharged from the machine through the chute 336, the receiving end of which is supported by the bracket 337 in alinement with the discharge end of the uppermost can run 30.

What I claim as new and desire to secure by Letters Patent is:—

1. A machine for cleaning the inner surfaces of cylindrical tin cans comprising, means for supporting a can, means for rotating the can on its longitudinal axis, means for removing loose particles of dirt from the interior of the can, means for injecting washing fluid into the can, means for drying the inner surfaces of the can, and means for presenting the rotating can successively to the various means for performing the cleaning operations upon the inner surfaces of the can.

2. A machine of the character described comprising, means for removing the loose particles of dirt and dust from the interior of cans, means for injecting washing fluid into the cans, means for removing particles of moisture from the interior of the cans, means for supporting and rotating the cans on their longitudinal axes, and means for actuating the supporting means to present the cans successively to the dusting, washing and drying devices.

3. A machine of the character described comprising, means for supporting and ro-

tating a cylindrical can on its longitudinal axis, said can having a central hole in one end, a nozzle adapted to be connected with a vacuum creating means, means for entering the nozzle into the can and causing it to travel longitudinally thereof, a nozzle adapted to be connected with a supply of washing fluid, means for causing the washing nozzle to enter the hole in the head of the can, a third nozzle adapted to be connected with a vacuum creating means, means for actuating the third nozzle to cause it to enter the can and travel longitudinally thereof, and means for presenting the can successively in position to be acted upon by the three nozzles.

4. A machine for cleaning cylindrical tin cans comprising, means for removing the loose particles of dirt and dust from the interior of the cans, means for injecting washing fluid into the cans, means for removing the moisture from the interior of the cans, means for supporting the cans and rotating them on their longitudinal axes, and means for actuating the can supporting means to present the cans in a horizontal position to the dust removing and moisture removing devices and in an inverted position to the washing device.

5. A machine of the character described comprising, a can supporting carriage mounted to turn on its longitudinal axis, a plurality of can holding and rotating devices mounted on the periphery of the carriage and longitudinally thereof, means for feeding a plurality of cans into position to be engaged by the can holding and rotating devices, means for actuating the can holding and rotating devices to cause them to engage and rotate the cans on their longitudinal axes, means for removing the loose particles of dirt from the interior of the cans, means for injecting washing fluid into the cans, means for removing the moisture from the interior of the cans and means for actuating the carriage to present the cans step by step to the dirt removing, washing and drying devices.

6. A machine of the character described comprising, a can supporting carriage mounted to rotate on a substantially horizontal axis, a series of four can holding and rotating devices mounted on the periphery of the carriage and spaced equi-distant apart thereon, means operative when a can holding and rotating device is uppermost on the carriage to feed a plurality of cans into position to be engaged by said can holding and rotating device, means for actuating the carriage through a quarter rotation at a time, means operative while the carriage is beginning its first quarter rotation to cause the can holding and rotating devices to engage the cans and rotate them on their longitudinal axes, and means for performing a series of operations on the interior of the cans as the carriage pauses at the end of the quarter rotations.

7. A machine of the character described comprising, an elongated carriage mounted to turn on its longitudinal axis, a bar mounted longitudinally on the carriage and arranged to move transversely thereof, a series of rolls carried on the inner face of the bar, an endless belt supported on the carriage with its inner section arranged parallelly with the bar, means for moving the inner section of the belt laterally toward the bar, means for driving the belt, means for feeding a series of cans in upright position between the inner face of the bar and the inner section of the belt, means for moving the rolls and the inner section of the belt into engagement with the cans to rotate them upon their longitudinal axes, means for cleaning the interior of the cans, and means for actuating the carriage to present the cans to the cleaning means.

8. A machine of the character described comprising, an elongated carriage mounted to turn on its longitudinal axis, a bar mounted longitudinally on the carriage and arranged to be moved transversely thereof, a series of can engaging rolls carried on one edge of the bar, an endless belt mounted on the carriage with its inner section arranged parallelly with the bar, means for moving the inner section of the belt laterally toward the bar, a series of rolls for engaging the inner section of the belt and moving it toward the rolls on the bar, means for feeding a series of cans in upright position between the bar and the inner section of the belt, means for turning the carriage through a complete rotation, means operative as the carriage begins its rotation to actuate the bar and the belt rolls to close the can engaging rolls and the inner section of the belt upon the cans to cause the cans to rotate on their longitudinal axes and for moving the can engaging rolls and the belt rolls laterally away from the cans as the carriage is completing its rotation, and means for cleaning the interior of the cans.

9. A machine of the character described comprising, an elongated four-sided carriage rotatable on its longitudinal axis, a can holding and rotating device mounted on each of the four sides of the carriage, each can holding and rotating device consisting of a can run arranged longitudinally of the carriage, a bar mounted longitudinally on the carriage adjacent the can run and arranged to move toward and from the can run, can engaging rolls mounted on the inner face of the bar, an endless belt having an inner section adjacent with and parallel to the can run, belt engaging rolls arranged on the outer side of the inner section of the belt and mounted to move toward and from the inner section of the belt, a conveyor chain having can engaging fingers travelling over the can run, means for admitting cans in upright position within

range of the conveyor chain fingers to be carried thereby onto the can run, means for actuating the chain for a predetermined length of time to move a predetermined number of cans onto the can run while the carriage is stationary, means for causing the carriage to move through a complete rotation, means operative as the carriage is beginning its rotation to cause the bar for supporting the can engaging rolls and the belt engaging rolls to move toward the cans to cause the cans to be supported and rotated by the can engaging rolls and the inner section of the belt, said means being effective as the carriage is completing its rotation to cause the can engaging rolls and the belt engaging rolls to move away from the cans to permit the cans to be discharged from the machine by the conveyor chain when the carriage has come to a stop, and means for cleaning the interior of the cans while the cans are on the carriage.

10. A machine of the character described comprising, an elongated carriage mounted to turn on its longitudinal axis, means for turning the carriage through a complete rotation a quarter rotation at a time, means carried by the carriage for discharging cleaned cans therefrom and for feeding a series of uncleaned cans thereonto, means operative as the carriage begins its rotation to engage the cans on the carriage and rotate them in situ on their longitudinal axes, means operative during the first pause of the carriage to remove particles of dirt from the interior of the cans, means operative during the second pause of the carriage to inject washing fluid into the cans, and means operative during the third pause of the carriage to remove the moisture from the interior of the cans, the can rotating means being operative to release the cans as the carriage is completing its rotation.

11. A machine of the character described comprising, a can supporting carriage, means mounted on the carriage for feeding a plurality of cans onto the carriage, a plurality of sets of devices for performing cleaning operations upon the interiors of the cans, and means for actuating the carriage to present the cans as a whole to the sets of cleaning devices successively, said first mentioned means acting after the cans have been presented to the last set of cleaning devices to discharge the cans from the machine.

12. A machine of the character described comprising, a can supporting carriage, means mounted on the carriage for feeding a plurality of cans onto the carriage, said feeding means holding the cans so that they may be rotated on their longitudinal axes, means for rotating the cans on their longitudinal axes, a plurality of sets of devices for performing cleaning operations upon the interiors of the cans, and means for actuating the carriage to present the cans as a whole to the sets of cleaning devices successively, said first mentioned means then acting to discharge the cans from the machine.

13. A machine of the character described comprising, a carriage, means carried by the carriage for feeding a plurality of cylindrical cans onto the carriage, a series of rolls mounted on the carriage, an endless belt mounted on the carriage, means for causing the rolls and belt to engage and hold the cans, means for driving the belt to rotate the cans on their longitudinal axes, a device for removing the loose particles of dirt from the interior of the cans, a device for injecting washing fluid into the cans, a device for removing the moisture from the interior of the cans, and means for actuating the carriage to present the cans to the dirt removing device, washing device and moisture removing device successively.

14. A machine of the character described comprising, a carriage, means mounted on the carriage for feeding a plurality of cylindrical cans onto the carriage in upright position, said cans having a central hole in their top ends, means carried by the carriage for holding and rotating the cans on their longitudinal axes, means for actuating the carriage to move the cans to horizontal position, means operative during this movement of the carriage for actuating the can holding means to close upon and rotate the cans, means effective while the cans are rotating in horizontal position to remove the loose particles of dirt from the interior of the cans, said carriage actuating means being operative after the dirt removing operation to move the cans to an upside down position, means effective while the cans are in this position to inject washing fluid into the cans, said carriage actuating means being operative on the completion of the washing operation to move the cans into horizontal position again, and means effective while the cans are in horizontal position for removing the moisture from the interior of the cans, said carriage actuating means being operative on the completion of the moisture removing operation to return the cans to upright position, and said means for actuating the can holding and rotation means being operative as the cans return to upright position to release the cans.

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