

Feb. 6, 1945.

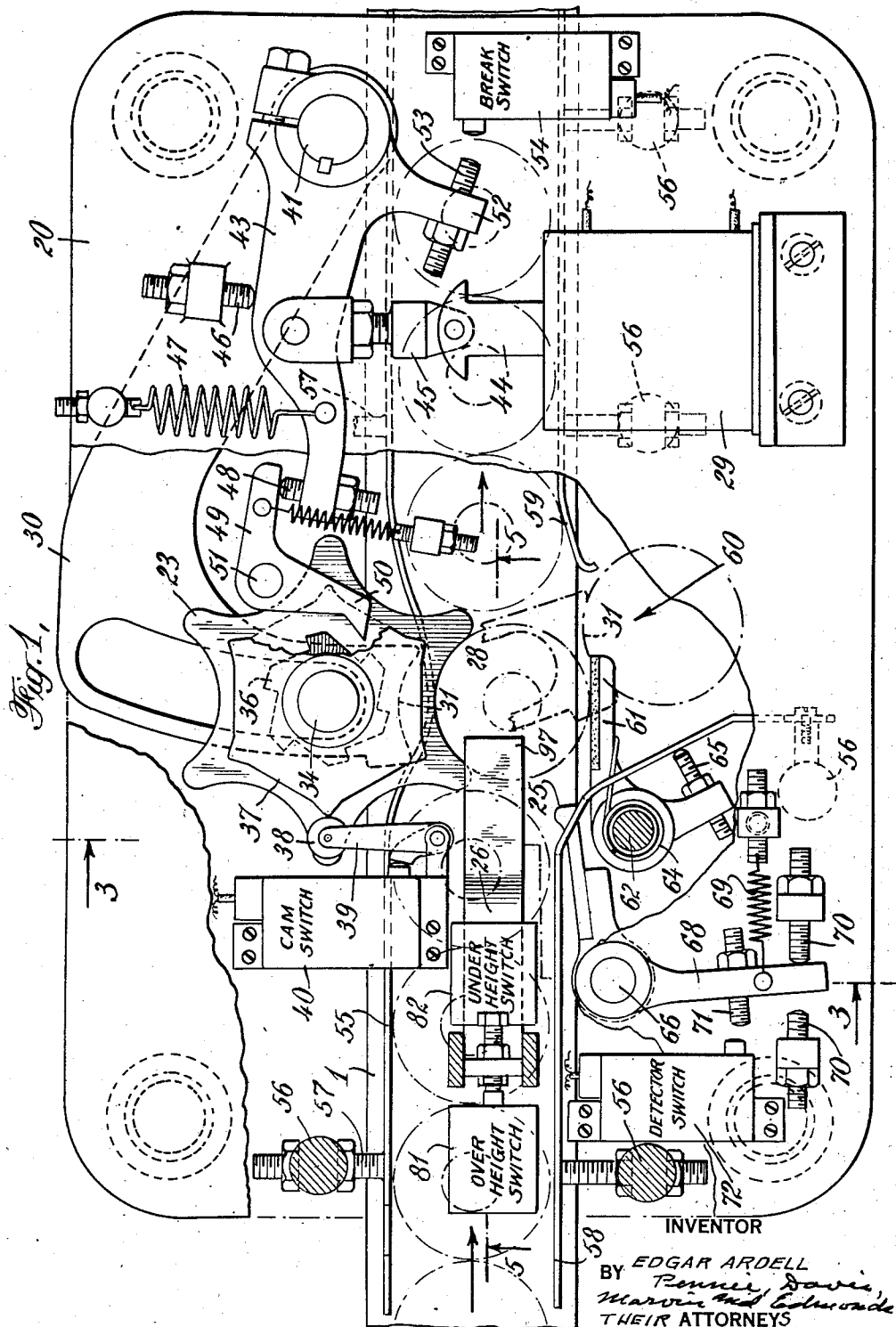
E. ARDELL

2,368,796

BOTTLE REMOVING APPARATUS

Filed April 22, 1942

4 Sheets-Sheet 1



Feb. 6, 1945.

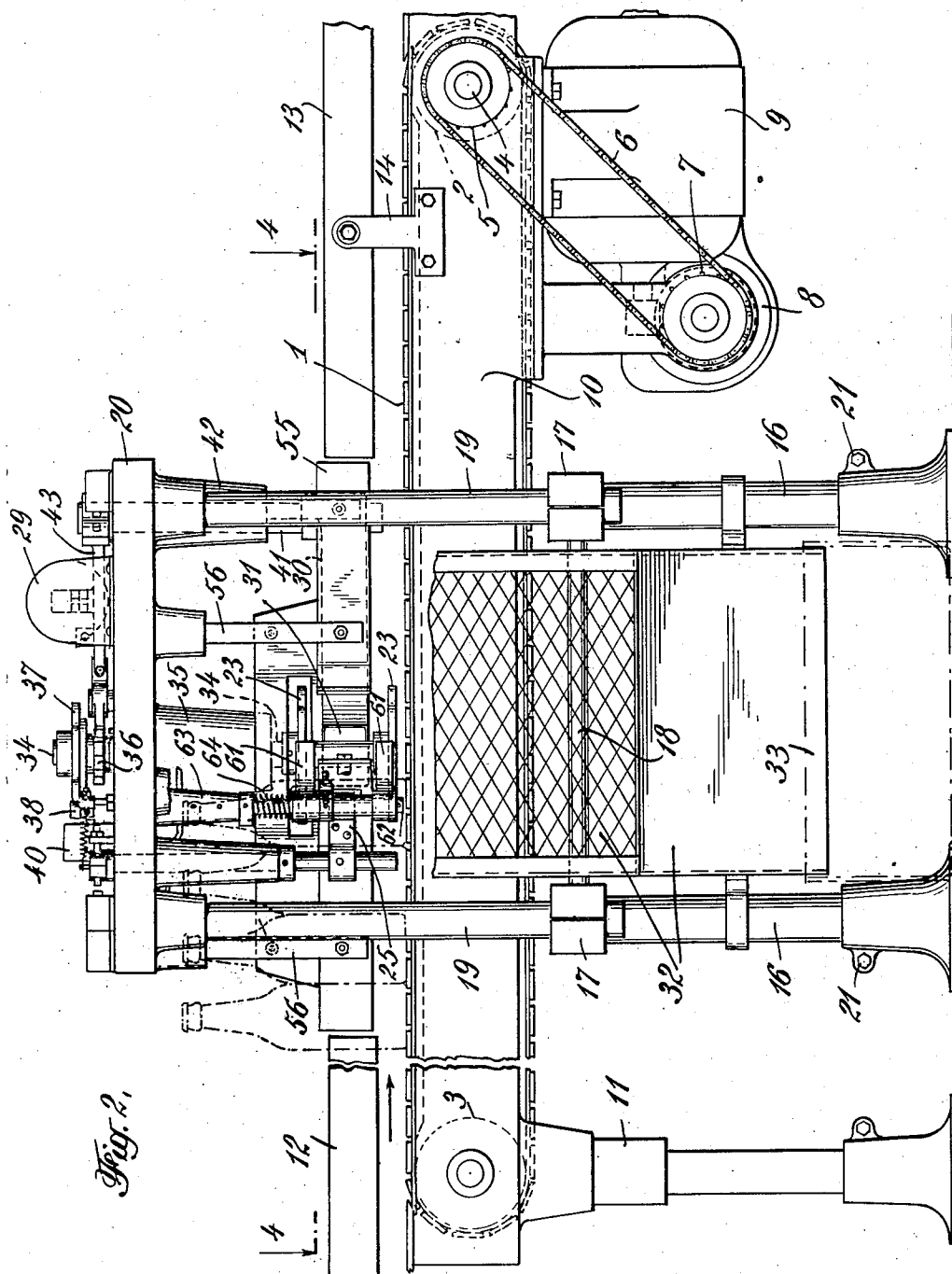
E. ARDELL

2,368,796

BOTTLE REMOVING APPARATUS

Filed April 22, 1942

4 Sheets-Sheet 2



INVENTOR

BY EDGAR ARDELL

Pennie, Davis, Marvin & Edwards
THEIR ATTORNEYS

Feb. 6, 1945.

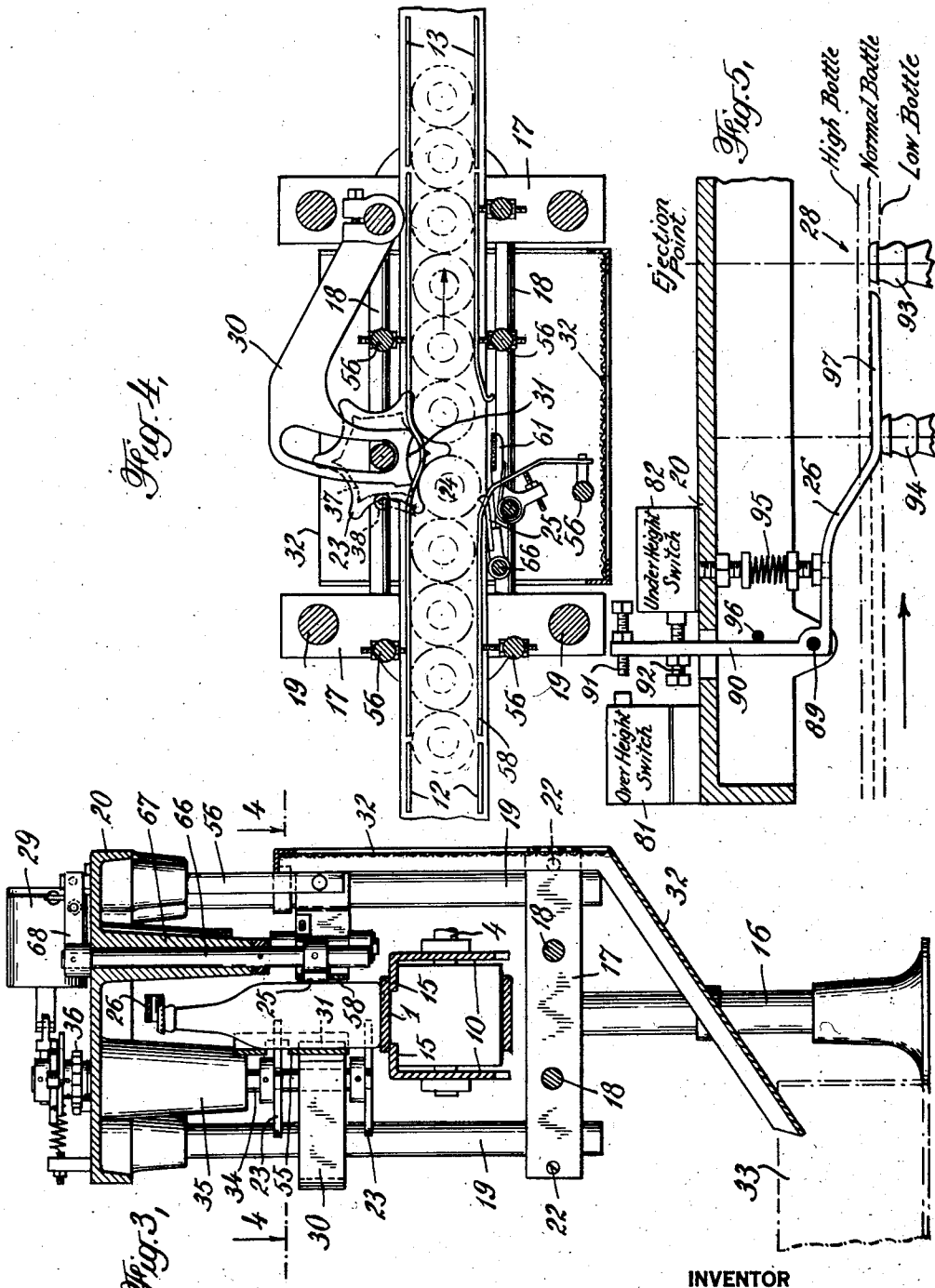
E. ARDELL

2,368,796

BOTTLE REMOVING APPARATUS

Filed April 22, 1942

4 Sheets-Sheet 3



INVENTOR

BY EDGAR ARDELL

Remmi, Davis, Martin & Edwards
THEIR ATTORNEYS

Feb. 6, 1945.

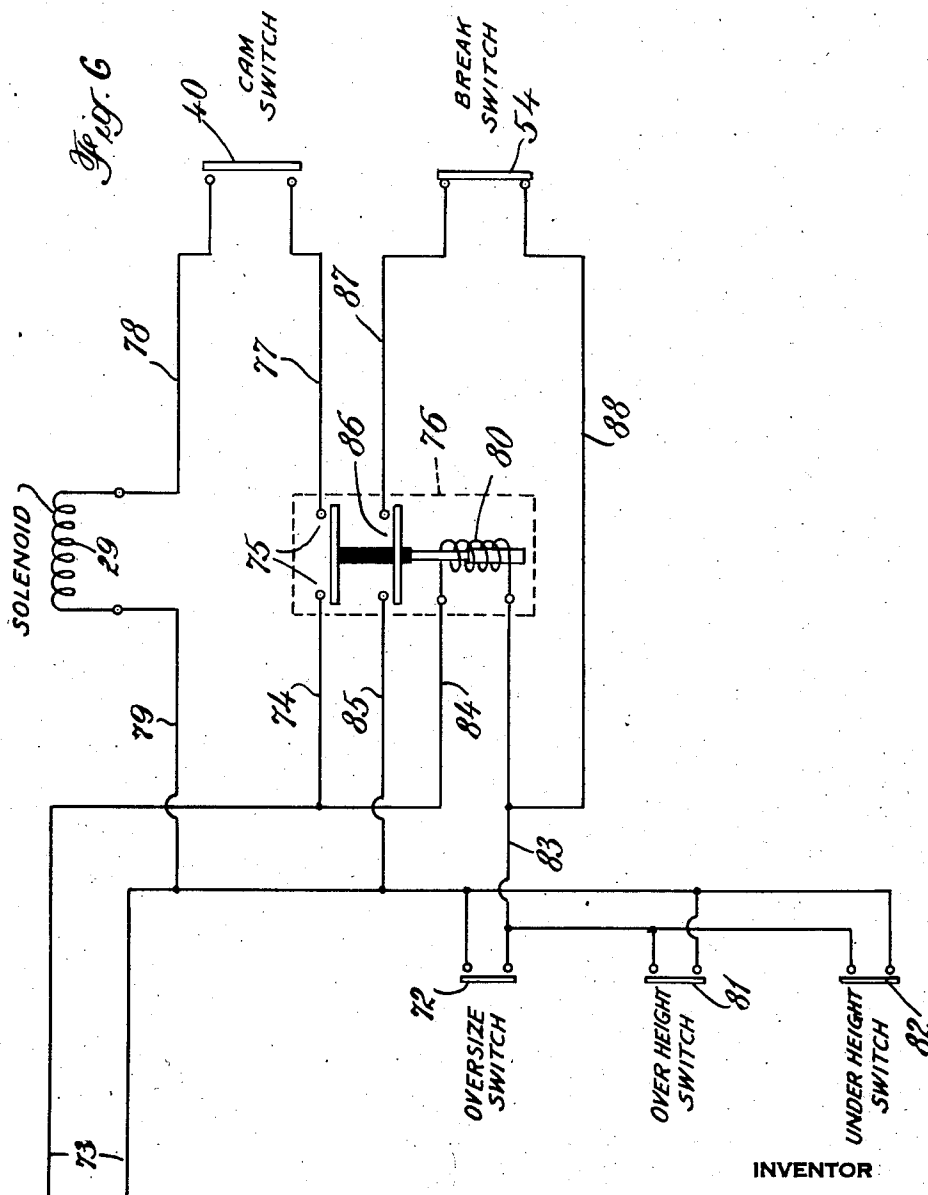
E. ARDELL

2,368,796

BOTTLE REMOVING APPARATUS

Filed April 22, 1942

4 Sheets-Sheet 4



INVENTOR

EDGAR ARDELL

BY

Pennie, Davis, Marvin & Edmunds
THEIR ATTORNEYS

UNITED STATES PATENT OFFICE

2,368,796

BOTTLE REMOVING APPARATUS

Edgar Ardell, Middletown, Conn., assignor to
Standard-Knapp Corporation, Portland, Conn.,
a corporation of New York

Application April 22, 1942, Serial No. 440,012

17 Claims. (Cl. 209—88)

This invention relates to apparatus for detecting and removing over- or under-size round articles, such as bottles, from a continuously advancing line. The general object of the invention is to provide an improved detecting and ejecting apparatus of this character.

In beverage plants the bottles to be filled are usually passed through a cleaning apparatus called a soaker and then filled in the filling apparatus. The caps are then applied by the capping machine and the bottles passed through a pasteurizer and a labeling apparatus and then delivered to the packing apparatus. These machines have more or less intricate mechanism and are adapted and adjusted to handle bottles of predetermined size, that is to say, of predetermined diameter and height. Although a certain variation in diameter and height is allowable, the permissible tolerance is not large, particularly in the case of the bottle-filling apparatus, the bottle pockets and bottle-holding fingers of which will be damaged if bottles which are either too large in diameter or too small are sent through the machine.

The bottles travel continuously through all of the various apparatus just mentioned, and at a high speed. Consequently the plugging or jamming of any of the machines or the breakage of parts, such as might be caused by bottles of improper size are apt to cause serious delays to production, and, in addition, increase the cost of maintenance and repair.

In the beverage industry most bottles are returnable by the consumer for refilling and it is impracticable for the store-keeper to check the size of bottles presented to him to be returned and to refuse to accept those which are either above or below the tolerance limits as to diameter and height. Consequently, although the great majority of the bottles passing through the soaker may appear to be of substantially the same size, a certain percentage of them is always beyond the tolerance limits. The aim of the present invention, therefore, is to provide an apparatus through which the bottles leaving the soaker can be passed and which will gauge the bottles both as to diameter and height, thereby detecting the unwanted bottles, and eject them from the line.

In existing beverage plants it is customary for the bottles to be carried from the soaker to the filling apparatus in upright position on a conveyor, such as a power driven endless belt, and an object of the invention also is to provide a bottle removing apparatus which can be installed to operate in conjunction with an existing con-

veyor without reconstructing or disturbing the conveyor installation.

Another object of the invention is to provide a bottle-detecting and removing apparatus which is operated solely by the movement imparted to the bottles by the conveyor.

It is also the aim of the invention to provide a bottle gauging and removing apparatus in which the forward motion of the line of bottles on the conveyor is not interfered with, unless the presence of an unwanted bottle is detected, whereupon the motion of the line is halted only for a sufficient length of time to permit the removal of the unwanted bottle.

My invention will be understood from a consideration of the accompanying drawings taken together with the following detailed description, it being understood that the embodiment of the invention shown in these drawings is illustrative of the apparatus of the invention and that the invention is not limited to that particular apparatus:

In these drawings:

Fig. 1 is a plan view of the bottle-detecting and removing apparatus corresponding to the central portion of Fig. 2, with certain parts shown broken away so as to illustrate other parts in section;

Fig. 2 is a side elevation of the apparatus as applied to an existing endless belt conveyor;

Fig. 3 is a transverse vertical sectional view taken on broken line 3—3 of Fig. 1;

Fig. 4 is a horizontal section taken on the plane indicated by line 4—4 of Fig. 3 and showing the parts in a different position from Fig. 1, a bottle here being shown in the detecting position;

Fig. 5 is a vertical longitudinal section taken on line 5—5 of Fig. 1 to illustrate the details of the over-height and under-height bottle-detecting mechanism; and

Fig. 6 is a diagram of electrical connections.

Referring now to these drawings, the bottles move forward from left to right in Figs. 1, 2 and 4 on an endless conveyor belt 1 which carries the bottles usually, as previously mentioned, from the soaker to the filler, neither of which apparatus is shown. Conveyor belt 1 may be of any suitable construction and as shown in Fig. 2 is composed of metal plates closely spaced together and carried upon one or more endless chains (not shown) which pass around driving sprockets 2 at the right hand end and idler sprockets 3 at the opposite end. Driving sprockets 2 are keyed to cross shaft 4 upon one end of which is also keyed a driving sprocket 5 to which motion is imparted by a driving chain 6 which cooperates with a sprocket 7 on

the output shaft of a reducing gear 8 which is in turn driven by an electric motor 9.

The motor 9 and reducing gear 8 are bolted beneath a pair of side supporting members 10 which, with suitable cross members (not shown) constitute the frame of the conveyor. To support this frame suitable standards, one of which is illustrated at 11, are provided. The bottles, as they are carried forward by the conveyor, are confined thereon by pairs of side guides 12 and 13 (Figs. 2 and 4) which are carried upon brackets 14 secured to the side members 10. The upper stretch of conveyor belt 1 which carries the bottles is supported in level condition by the in-turning horizontal flanges 15 along the top edges of side members 10, as shown in section in Fig. 3.

Although, if desired, my improved bottle-removing apparatus may be constructed as a part of the conveyor, such as the conveyor just described, one of the features of my invention is the arrangement of the bottle-removing apparatus in such a way that it is entirely independent of the conveying apparatus which enables it to be installed without removing or disturbing an existing conveyor, otherwise than to remove a short section of the guide rails 12 and 13, these being replaced by guides on the bottle-removing apparatus as will presently appear. For this reason the bottle-removing apparatus is mounted upon two upright supports 16 at the upper ends of which are two cross supporting bars 17. These two bars are tied together by a pair of longitudinal rods 18.

At the opposite ends of cross supporting bars 17 there are four upright supports 19 which at their upper ends carry a platform frame member 20. All of the mechanism of the bottle-removing apparatus is mounted either on the upper surface of this platform 20 or is secured to the same below. To enable the apparatus to be adjusted to the height of an existing conveyor the supports 16 are made vertically adjustable by means of clamps 21 in their base members, and uprights 19 are adjustably carried in the ends of the cross bar 17 by means of clamps 22.

Briefly describing the operation of the bottle-detecting and ejecting apparatus, as the bottles are carried forward by conveyor 1 from left to right, they are brought into engagement with a star wheel 23 (comprising upper and lower sections as shown in Figs. 2 and 3). The teeth of the star wheel project laterally over one side of the conveyor a sufficient distance to cause the star wheel to be rotated by the bottles, and as each bottle reaches the detecting position 24 shown in Fig. 4, it is engaged on one side by a pocket between two teeth of the star wheel and on the opposite side by the tip of a detecting or gauging finger 25. In this manner, each bottle is gauged or calipered. While the bottle is in this detecting position 24, it also is brought into operative position with height-gauging or detecting mechanism (see particularly Fig. 5).

So long as the bottles reaching detecting position 24 come within the permissible tolerances of diameter and height, the forward movement of the line of bottles continues in the same manner as though the bottle-removing apparatus were not present, the bottles moving continuously through the machine, rotating the star wheel 23 as they move.

Should, however, a bottle reach detecting position 24 which, either because it is too large, too tall or too short, is unwanted, the movement of one or both of gauging or detecting fingers 25 or

26 will close an electric circuit which causes the forcible ejection of the bottle from the line an instant later when the bottle reaches ejecting position 28 (Fig. 1) where the star wheel 23 has been rotated slightly beyond the position shown in Fig. 4. The ejection of the bottle is caused by the energization of a solenoid 29 which causes the actuation of an ejecting arm 30, the curved head 31 of which moves crosswise of the conveyor and pushes the bottle therefrom so that it falls, being guided by an apron 32 into a receptacle 33.

The bottles are fed forward into the star wheel by their frictional engagement with the conveyor belt 1 and usually the bottles are in close formation, one in contact with another, so that the line pressure on a bottle whose motion might be arrested for the purpose of removing it would be considerable. In order to remove this line pressure from the bottle to be ejected, the rotation of the star wheel 23 is stopped with the bottle to be ejected abreast of the star wheel in ejecting position 28. This causes the movement of the line of bottles ahead of the star wheel to be arrested by the star wheel tooth to the left of ejecting position 28. Also the thickness of this tooth separates the bottle to be ejected slightly from those bottles. The bottles which have already passed the star wheel are separated from this bottle being carried forward by the continuous movement of the conveyor 1. Hence the bottle to be ejected is completely separated from all of the bottles of the line, both those ahead of it and those behind it.

The star wheel 23 (both upper and lower sections) is pinned to the lower portion of a vertical shaft 34 which is mounted for rotation in an elongated boss 35 projecting downwardly from the bottom of frame member 20. This shaft has keyed to it at its upper end above frame 20 a toothed wheel 36 and a hexagonal cam 37, the purpose of the toothed wheel being to stop the rotation of the star wheel and arrest the movement of the oncoming bottles. Cam 37 cooperates with a roller 38 on the end of an actuating arm 39 of a circuit closing switch 40 whose function will also be described later.

The ejecting arm 30 is keyed to the lower end of another vertical shaft 41 journaled for rocking movement in an elongated boss 42 on the lower side of frame member 20. This shaft also extends above the upper side of frame 20 where an actuating arm 43 is keyed to it. This actuating arm is connected to plunger 44 of the operating solenoid 29 by means of an adjustable link 45. An adjustable stop 46 engages the arm on the opposite side from the solenoid (see Fig. 1) and a helical spring 47 which restores the parts to normal position after an ejecting operation normally holds the actuating arm 43 against this stop and consequently holds the ejecting arm 30 in withdrawn position as shown in Figs. 4 and 1.

The curved operating head 31 of the ejecting arm 30 is located between the upper and lower sections 23 of the star wheel as shown more particularly in Figs. 2 and 3 and consequently the head of this arm is slotted as shown in Fig. 1 so as to surround the star wheel shaft 34.

At the left hand end of actuating arm 43 there is an adjustable screw 48 which engages the tail 49 of a dog 50 pivoted at 51 on frame member 20, the head of this dog engaging toothed wheel 36 to stop the rotation of the star wheel. Also projecting from actuating arm 43 is a lug 52 into which is threaded an adjustable screw 53 which actuates a normally closed circuit breaking switch 54 as will be later described.

The bottles are guided in their passage through the machine and directed into engagement with the star wheel 23 by suitable guides adjacent either side of the conveyor belt 1. Thus a continuous guide plate 55 extends along the star wheel side of the belt and midway vertically between the two sections of the star wheel. It is supported at the lower ends of posts 56 which project downwardly from the bottom of frame member 20 and is adjustable laterally with respect to these posts by means of the threaded rod and nut construction 57 shown in Fig. 1.

On the opposite side of the conveyor two guides 58 and 59 are provided, these being spaced apart from one another opposite the star wheel to provide a discharge opening 60 for the rejected bottles. These guides are adjustably supported in the same manner as guide 55 on additional posts 56. The right hand end of guide 58 is curved outwardly as shown in Fig. 1 to suitably direct a rejected bottle as it is swept off from the conveyor and through the opening 60 by the ejecting arm 20. Guide 58 is also apertured to permit the free movement of detecting finger 25. In order to suitably direct the cans successively into the respective pockets between the teeth of the star wheel, guide 55 is bowed laterally as shown in Fig. 1 opposite the star wheel, thereby allowing the bottles to be seated in the star wheel pockets and follow an arcuate path from substantially the detecting position 24 (Fig. 4) until after the bottles have left position 28 (Fig. 1) from which position they are ejected if either too large or too small.

In order to guide the unrejected bottles back into their line of advance following along the conveyor belt 1, and also to permit unwanted bottles to be ejected through the opening 60, a pair of spring biased fingers 61, one opposite the lower and the other opposite the upper section of star wheel 23 is provided (Figs. 1 and 2). These fingers are fixed to a vertical rock shaft 62 which turns in an elongated boss 63 projecting beneath platform 20 and this shaft is biased by means of a helical spring 64 so as to normally hold fingers 61 in the position shown in Fig. 1. The fingers are stopped in this position by an adjustable stop screw 65 which engages the back of the outwardly turned portion of guide 58.

Detector finger 25 is pinned near the lower end of a vertical shaft 66 mounted for rocking movement in another elongated boss 67 depending from platform 20. At the upper end of this shaft on top of platform 20 an arm 68 is pinned and near the outer end of this arm a helical spring 69 is attached which is adjustably mounted in such a way as to rock shaft 66 in a direction to urge detector finger 25 against the surface of the bottles. Also at the outer end of arm 66 there are provided two adjustable stop screws 70 for limiting this rocking movement in both directions. Further, there is threaded through arm 68 an adjustable screw 71 which is arranged to actuate the operating button of a normally open oversize detector switch 72.

Referring now to the wiring diagram shown in Fig. 7, current from any suitable source is supplied through conductors 73, the main operating circuit of solenoid 29 being traced through conductor 74 to main contacts 75 of a relay 76, thence through conductor 77 to the contacts of cam switch 40, then through conductor 78 to the coil of solenoid 29, from which it returns to conductors 73 by conductor 79. The operating coil 80 of relay 76 is energized by the closing of any one

of the three detector switches, namely, over-size detector switch 72, over-height detector switch 81 or under-height detector switch 82, the last two switches being yet to be described. As shown in Fig. 7, these three detector switches are all connected in parallel so that the closure of any one of them will complete a circuit from one of conductors 73 through a conductor 83 which leads to operating coil 80, the opposite end of this coil being connected through a conductor 84 to the other source conductor 73. In order to permit the detector switches 72, 81 and 82 to be opened immediately after detecting the presence of an unwanted bottle, relay 76 is provided with a holding circuit so as to supply current to coil 80 after the detector switch has opened. This circuit may be traced from one of the source conductors 73 through conductor 85, holding contacts 86 on the relay, conductor 87, the contacts of circuit-breaking switch 54 and thence through conductors 88 and 83 to operating coil 80 and conductor 84 back to the opposite source conductor 73.

In operation, as previously mentioned, the bottles continue to advance through the detecting apparatus passing the star wheel continuously and maintaining the star wheel in rotation so long as no unwanted bottle reaches the star wheel. If, however, a bottle which is either too large in diameter, too tall or too short, arrives at detecting position 24, at least one of the three detecting switches 72, 81 or 82 will be closed during the fraction of a second in which the bottle is passing the detecting position. This causes the energization of operating coil 80 of relay 76 and the plunger of the relay to be lifted and contacts 75 and 86 to be closed. The closing of contacts 86 completes the holding circuit above described inasmuch as circuit breaking switch 54 is a normally closed switch and is not actuated until the end of a bottle ejecting movement of ejector arm 30. The closing of main contacts 75 of the relay, however, does not close the circuit through the operating coil of solenoid 29 but merely prepares this circuit to be closed by the cam switch 40 when the unwanted bottle advances to the ejecting position 28.

As soon as solenoid 29 is energized the operation of its plunger swings the actuating arm 43, the first movement of which is to release dog 50 and permit it to engage toothed wheel 36 and stop the rotation of star wheel 23, thereby holding back the line of bottles on the conveyor and relieving the bottle at position 28 from the line pressure. The continued movement of actuating arm 43 rocks shaft 41 and causes ejecting arm 30 to sweep across conveyor 1 and push the unwanted bottle through the opening 60, the bottle dropping into receptacle 33 as soon as it leaves the edge of the conveyor. At the end of the operating stroke of actuating arm 43 the end of screw 53 engages the operating button of the normally closed circuit breaking switch 54, thereby opening the contacts of this switch and breaking the holding circuit of relay 76. This opens the main contacts 75 of the relay and breaks the circuit through the operating coil of solenoid 29 so that spring 47 promptly swings actuating arm 43 and ejecting arm 30 back to their original positions. The completion of this cycle occupies only a small fraction of a second and the restoration of actuating arm 43 to its original position retracts dog 50 from toothed wheel 36 and permits star wheel 23 to resume rotation and the bottle line to resume its advance.

The bottle contacting end of finger 26 is formed

in a downwardly sweeping curve providing a gently sloping cam surface to be engaged by the bottle caps. When no bottles are passing through the machine, this finger drops to the lower dot-and-dash line position of Fig. 5 and is held there by means of a fixed stop 96 which engages arm 90. This arm is out of engagement with the operating button of switch 81 and this switch is therefore open.

In Fig. 5 the permissible variation of bottle height is indicated to an exaggerated degree by the two dot-and-dash lines designated "High bottle" and "Low bottle." Should a bottle reach detecting position 24 which is as high or higher than the "High bottle" line, finger 26 will be lifted sufficiently to close over-height switch 81, thereby causing the ejection of the bottle an instant later when it reaches the ejecting position 28.

Referring now to Fig. 5 the mechanism for detecting over-height and under-height bottles comprises finger 26 which is pivoted at 89 underneath platform 20. This finger is provided with a generally horizontal portion which extends in the direction of movement of the bottles and it also has a vertical portion 90 extending upwardly from the pivot and provided with adjustable screws 91 and 92 which actuate respectively the operating buttons of over-height switch 81 and under-height switch 82.

The bottles move in the direction of the arrow and raise or lower finger 26 in accordance with their height. On Fig. 5 the dot-and-dash lines with legends reading, respectively, "Low bottle" and "High bottle" indicate the height range which the machine will allow to pass. The dotted line indicates the path of movement of the top of a bottle 93 which is passing the ejection point or position 28. This bottle will pass ejection point 28 without being ejected because it has maintained finger 26 at an elevation which has prevented the closing of either over-height switch 81 or under-height switch 82. The next succeeding bottle 94, however, has permitted finger 26 to descend far enough to cause the closing of under-height switch 82. Hence an instant later when bottle 94 reaches ejection point 28 it will be kicked out of the line by the ejecting arm 30 as previously described. Bottles as high as, or higher than, the "High bottle" line will raise finger 26 high enough to cause over-height switch 81 to be closed, thereby causing the ejection of all such bottles as they reach the ejection point 28.

Finger 26 is urged downwardly against the bottle caps by means of a helical spring 95 which is adjustably mounted between the upper surface of finger 26 and platform 20. The purpose of this spring is to prevent fluttering of finger 26 which might be occasioned by the rapid forward movement of the bottles in striking the finger. Spring 95 urges finger 26 downwardly until its vertical portion 90 engages a stop pin 96, in which position screw 92 is adjusted to cause the closing of under-height switch 82.

The dropping of finger 26 between two successive bottles would cause the closing of under-height switch 82, and even instantaneous closing of this switch would cause the ejection of the next bottle to reach ejection point 28 regardless of size or height. To avoid this dropping of finger 26 it is provided at its right hand end with a horizontal portion 97 which is long enough to bridge the space between two adjacent bottle tops. It also extends close to the ejection point 28 as may

be seen in both Figs. 5 and 1 so that if a "low" bottle is approaching the detecting position and the bottle approaching the ejection point is not a "low" bottle, finger 26 will be released by the bottle top late enough to prevent the closing of the relay main contacts 75 until after the cam switch 40 has been opened by the star wheel cam 37.

So long as the bottles reaching ejection position 28 are "normal" height bottles, their motion from the diameter detection point 24 to and beyond the ejection point 28 along the conveyor is rapid and although the end of finger 26 is actually released from the top of the bottle just before but substantially as the bottle reaches the ejection point 28, the time required for the operation or pick-up of relay 76 is sufficient to prevent the closing of its contacts 75 until after cam switch 40 has been opened by the passage of one of the points of the star wheel cam 37 beyond actuating roller 38 (see Fig. 1). If desired, however, relay 76 may be provided with a friction control, dash pot or other means, for increasing or adjusting the time which elapses between the instant of energization of its operating coil 80 and the closing of its contact 75. As stated above, however, the normal operating friction of this relay is usually sufficient to provide the required time delay.

Should the supply of bottles approaching the ejection apparatus on conveyor 1 be interrupted, the first bottle to come along after an interruption will not be ejected, even though it is normal in height, because the apparatus never clears itself entirely of bottles when an interruption occurs. Hence there will always be a bottle at the detecting position to lift the height-detecting finger 26. The reason for this is that it requires a line pressure of at least three bottles on the conveyor ahead of the bottle at detecting position 24 to push the bottle past the detecting position. This amount of line pressure is required in order to overcome the frictional resistance of the star wheel and the friction of the diameter detecting finger 25. The amount of this resistance can be regulated by adjusting the tension of spring 69, the position of adjustable stop 70 being set to cause finger 25 to contact bottles of smallest diameter.

The apparatus of the present invention operates with a minimum of attention and maintenance expense and effectively eliminates the possibility of bottles which are either too large in diameter, too tall or too short from passing along the conveyor line to filling apparatus or other processing apparatus where the presence of over-size bottles might interfere with its proper operation.

It will be understood that changes may be made in the apparatus without departing from the spirit of the invention and that the scope of the invention is set forth in the appended claims and is intended to include such modifications as properly fall within the meaning of these claims.

I claim:

1. In an apparatus of the class described, means for carrying forward a line of bottles, a rotatable star wheel coacting with the line of bottles and having teeth adapted to space each bottle successively from the preceding bottles of the line, a bottle-gauging device, means controlled thereby for stopping the star wheel in the event an unwanted bottle is detected by the gauging device, the star wheel teeth arresting the movement of the oncoming bottles so as to relieve the

unwanted bottle from the pressure of the line and an ejecting device to remove said bottle from the line.

2. In an apparatus of the class described, means for carrying forward a line of bottles, a rotatable star wheel coacting with the line of bottles and having teeth acting to space the bottle which is abreast of the star wheel from the preceding bottles of the line, a bottle gauging device, means controlled thereby for stopping the star wheel in the event an unwanted bottle is detected by the gauging device, the star wheel teeth arresting the movement of the oncoming bottles so as to relieve the unwanted bottle from the pressure of the line and an ejecting device to remove said bottle from the line.

3. In an apparatus of the class described, means for advancing bottles in a continuous line in close formation, a rotatable star wheel coacting with the bottles to slightly deflect them laterally from the line and having teeth to space each bottle from the preceding bottles of the line as it passes the star wheel, a bottle gauging device, means controlled thereby for stopping the star wheel in the event an unwanted bottle is detected by the gauging device, the star wheel teeth arresting the movement of the oncoming bottles so as to relieve the unwanted bottle from bottle line pressure and an ejecting device to remove said bottle from the line.

4. In an apparatus of the class described, a continuously moving conveyor, a star wheel arranged to rotate on an axis disposed at one side of said conveyor, guides for directing the line of bottles to said star wheel, the star wheel coacting with the bottles to slightly deflect them laterally from the line to assist in spacing each bottle from the preceding bottles of the line as it passes the star wheel, guides beyond the star wheel for continuing the line of bottles, a deflector for redirecting into said line bottles deflected by the star wheel, a bottle-gauging device, means controlled thereby for stopping the star wheel in the event an unwanted bottle is detected by the gauging device, and an ejecting device to remove said bottle from the line.

5. In an apparatus of the class described, a conveyor for advancing a continuous line of bottles, a star wheel arranged at one side of the conveyor and adapted to be rotated by the bottles, guides cooperating with the conveyor for directing the bottles past the star wheel, one of said guides having an opening therein abreast of the star wheel, yielding gate means in said opening, a bottle gauging device, means controlled thereby for stopping the star wheel in the event an unwanted bottle is detected by the gauging device, and an ejecting device movable across the conveyor for forcing said bottle past the yielding gate means and through said opening.

6. In an apparatus of the class described, means for advancing a line of bottles, a star wheel rotated by the bottles, ejecting mechanism for stopping the star wheel and removing an unwanted bottle from the line, a bottle-gauging device, means controlled thereby for setting said mechanism to remove a bottle in the event an unwanted bottle is detected by the gauging device, said star wheel in one angular position coacting with said gauging device to effect the gauging of the bottle and in a succeeding angular position causing the operation of said ejecting mechanism.

7. In an apparatus of the class described, means for advancing a line of bottles, a star

wheel arranged to be rotated by the bottles, said star wheel having pockets to receive individual bottles and to cause them to move arcuately therewith, a bottle gauging device for gauging each bottle while it is within a pocket of the star wheel, ejecting mechanism operating to stop the star wheel in the event an unwanted bottle is detected by the gauging device and remove the bottle from the line, and means controlled in part by the gauging device and in part by the star wheel for causing the operation of said ejecting mechanism.

8. In an apparatus of the class described, means for advancing a line of bottles, a star wheel rotated by the bottles, an ejecting device for removing an unwanted bottle from the line, a locking device for interrupting the rotation of the star wheel, said locking device being actuated by said ejecting device, operating mechanism for the ejecting device, and a bottle-gauging device for controlling said operating mechanism.

9. In an apparatus of the class described, means for advancing a line of bottles, a star wheel rotated by the bottles, an ejecting device for removing an unwanted bottle from the line, a locking device for interrupting the rotation of the star wheel actuated by said ejecting device, operating mechanism for the ejecting device, a bottle-gauging device, and means for controlling said operating mechanism conjointly by the bottle-gauging device and the star wheel.

10. In an apparatus of the class described, means for advancing a line of bottles, a star wheel arranged to be rotated by the bottles, a rock shaft, an ejecting arm fixed to said shaft and positioned to move across the line of bottles to push a bottle which is opposite the star wheel out of the line, an actuating arm fixed to the rock shaft, operating mechanism connected to said actuating arm, a toothed wheel and a cam arranged to rotate with the star wheel, a dog biased to coact with the toothed wheel to stop the rotation of the star wheel, said dog being normally held out of engagement therewith by said actuating arm, a control device for said operating mechanism actuated by said cam, and a bottle-gauging device, said bottle-gauging device and control device being arranged conjointly to control said operating mechanism.

11. In an apparatus of the class described, a bottle conveyor having bottles resting thereon in upright position and in close formation, a rotatable star wheel coacting with the line of bottles and having teeth adapted to space each bottle as it passes the star wheel from the preceding bottles of the line over-height and under-height detecting mechanism arranged to coact with the tops of the bottles as they move forward on said conveyor, means actuated by said detecting mechanism for stopping the rotation of the star wheel in the event an unwanted bottle is detected by said mechanism, the teeth of said star wheel acting to arrest the forward movement on the conveyor both of said unwanted bottle and the preceding bottles of the line and maintaining the unwanted bottle in spaced relation to said preceding bottles, ejecting mechanism arranged to act upon the unwanted bottle while so positioned by the star wheel to remove the same from the line, and means for causing the operation of said ejecting mechanism by said detecting mechanism.

12. In an apparatus of the class described, a conveyor for advancing a continuous line of bottles, a rotary star wheel coacting with the line

of bottles, guides cooperating with the conveyor for directing the bottles past the star wheel, one of said guides having an opening therein abreast of the star wheel, yielding gate means in said opening, a bottle gauging device, means controlled thereby for stopping the star wheel in the event an unwanted bottle is detected by the gauging device, and an ejecting device movable to force said bottle past the yielding gate means and through said opening.

13. In apparatus of the class described, a continuously moving conveyor, a star wheel arranged to rotate on an axis disposed at one side of said conveyor, guides for directing the line of bottles to said star wheel, the star wheel coacting with the bottles to slightly deflect them laterally from the line to assist in spacing each bottle from the bottles of the line as it passes the star wheel, guides beyond the star wheel for continuing the line of bottles, a deflector for redirecting into said line bottles deflected by the star wheel, a bottle gauging device, means controlled thereby for stopping the star wheel in the event an unwanted bottle is detected by the gauging device, and an ejecting device to remove said bottle from line.

14. In an apparatus of the class described, a continuously movable conveyor, a star wheel arranged to rotate on an axis disposed at one side of said conveyor, guides for directing the line of bottles to said star wheel, the star wheel coacting with the bottles to slightly deflect them laterally from the line to assist in spacing each bottle from the preceding bottles of the line as it passes the star wheel, guides beyond the star wheel for continuing the line of bottles, one of said guides having an opening therein abreast of the star wheel, yielding gate means in said opening, a bottle gauging device, means controlled thereby for stopping the star wheel in the event an unwanted bottle is detected by the gauging device,

and an ejecting device to force said bottle past the yielding gate means and through said opening.

15. In an apparatus of the class described, a conveyor for advancing a line of bottles in upright position and in close formation, a rotatable star wheel coacting with the line of bottles, ejecting mechanism for stopping the star wheel and removing an unwanted bottle from the line, a bottle-gauging device, means controlled thereby for setting said mechanism to remove a bottle in the event an unwanted bottle is detected by the gauging device, said star wheel in one angular position coacting with said gauging device to effect the gauging of the bottle and in a succeeding angular position causing the operation of said ejecting mechanism.

16. In an apparatus of the class described, a conveyor for advancing a line of bottles in upright position and in close formation, a rotatable star wheel coacting with the line of bottles, said star wheel having pockets to receive individual bottles, a bottle-gauging device for gauging each bottle while it is within a pocket of the star wheel, ejecting means operating to stop the star wheel in the event an unwanted bottle is detected by the gauging device and removing the bottle from the line, and means controlled in part by the gauging device and in part by the star wheel for causing the operation of said ejecting means.

17. In an apparatus of the class described, means for advancing a line of bottles, a star wheel rotated by the bottles, an ejecting device for removing an unwanted bottle from the line and including means for interrupting the rotation of the star wheel, operating mechanism for the ejecting device, a bottle-gauging device and means for controlling said operating mechanism conjointly by the bottle-gauging device and the star wheel.

EDGAR ARDELL.