Sept. 8, 1936. W. D. KIMBALL ET AL 2,053,435

APPARATUS FOR PACKING ARTICLES IN BOXES

Filed Dec. 9, 1931 8 Sheets-Sheet 1

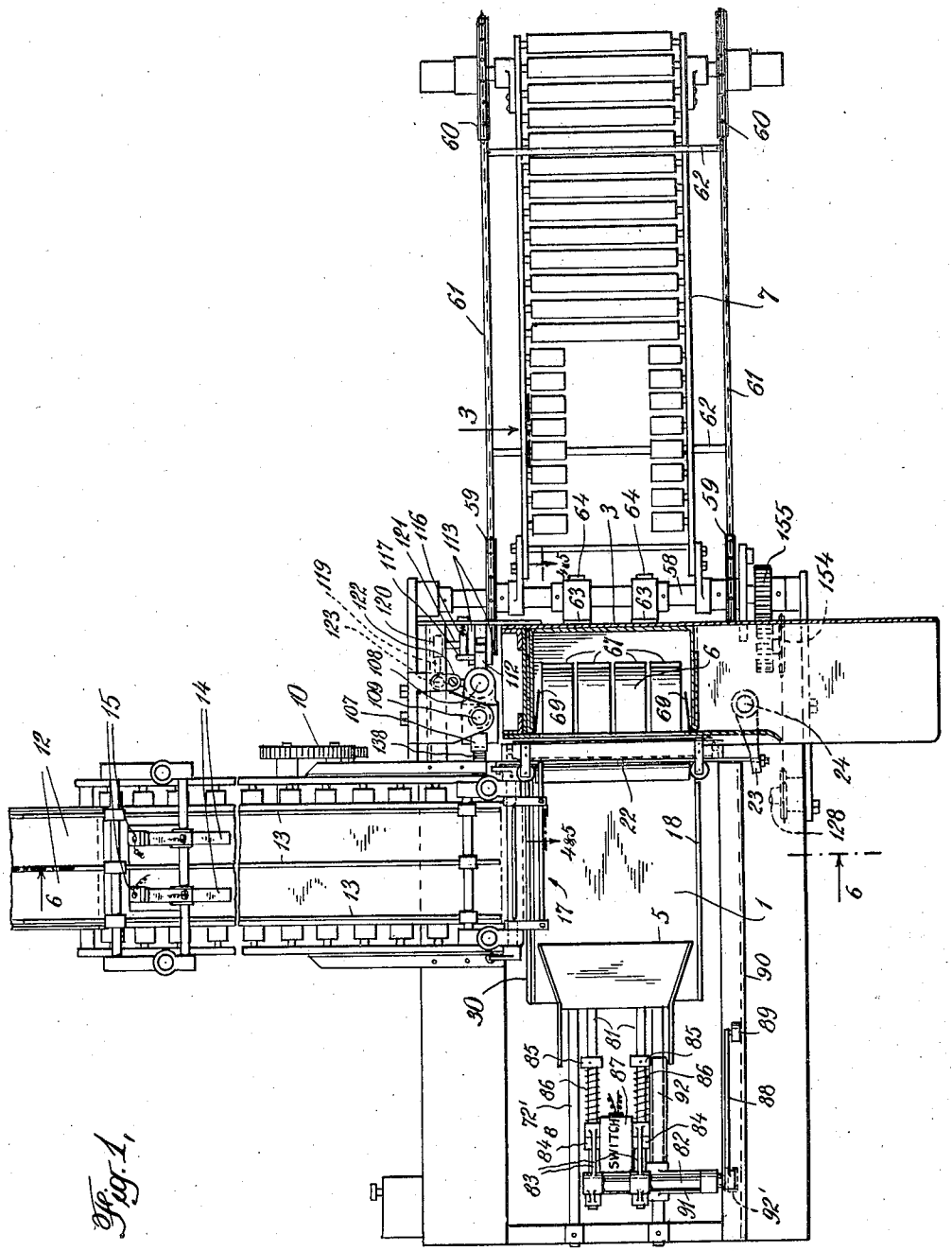

Fig. 1.

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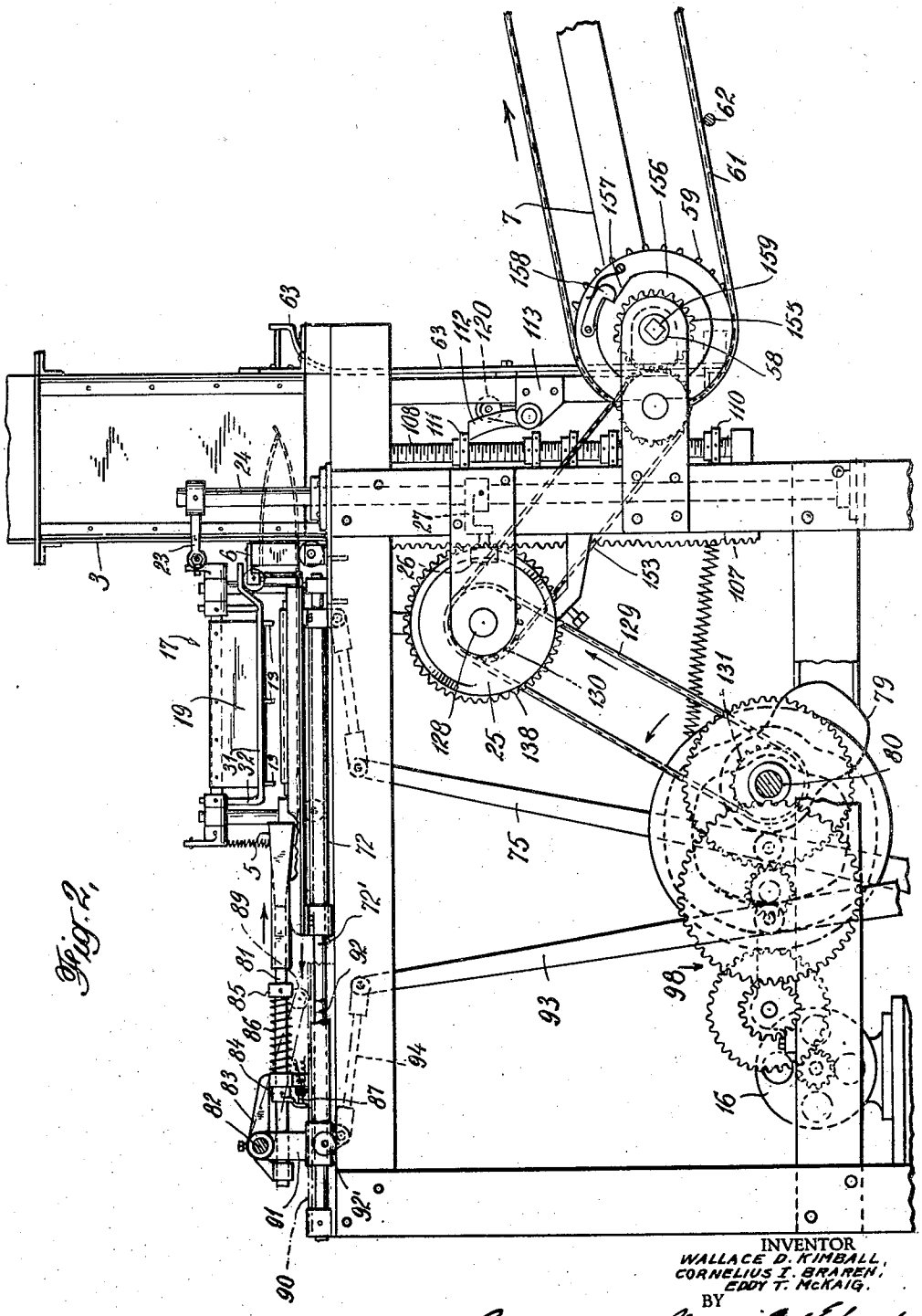

Fig. 2.

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APPARATUS FOR PACKING ARTICLES IN BOXES

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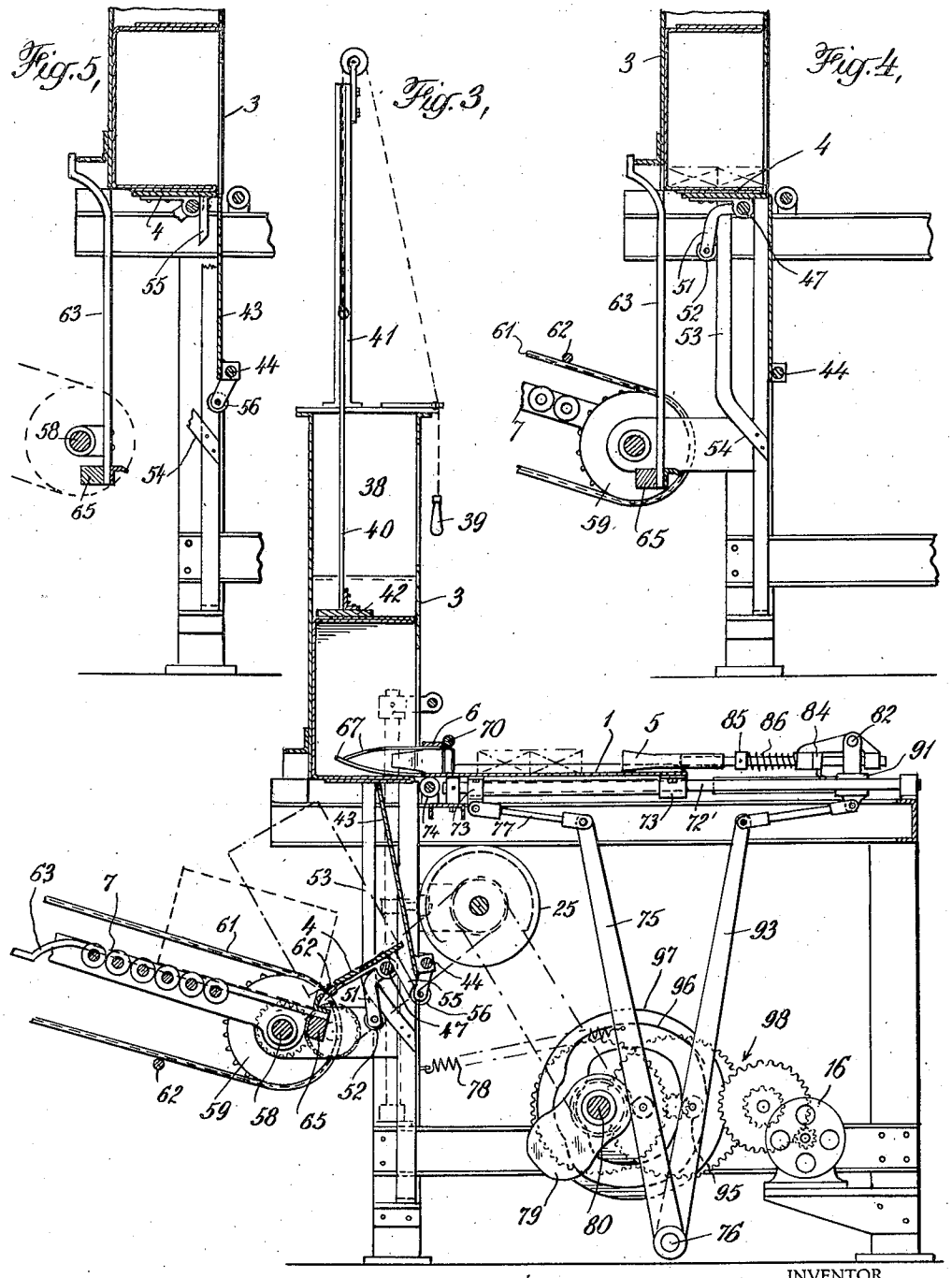

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APPARATUS FOR PACKING ARTICLES IN BOXES

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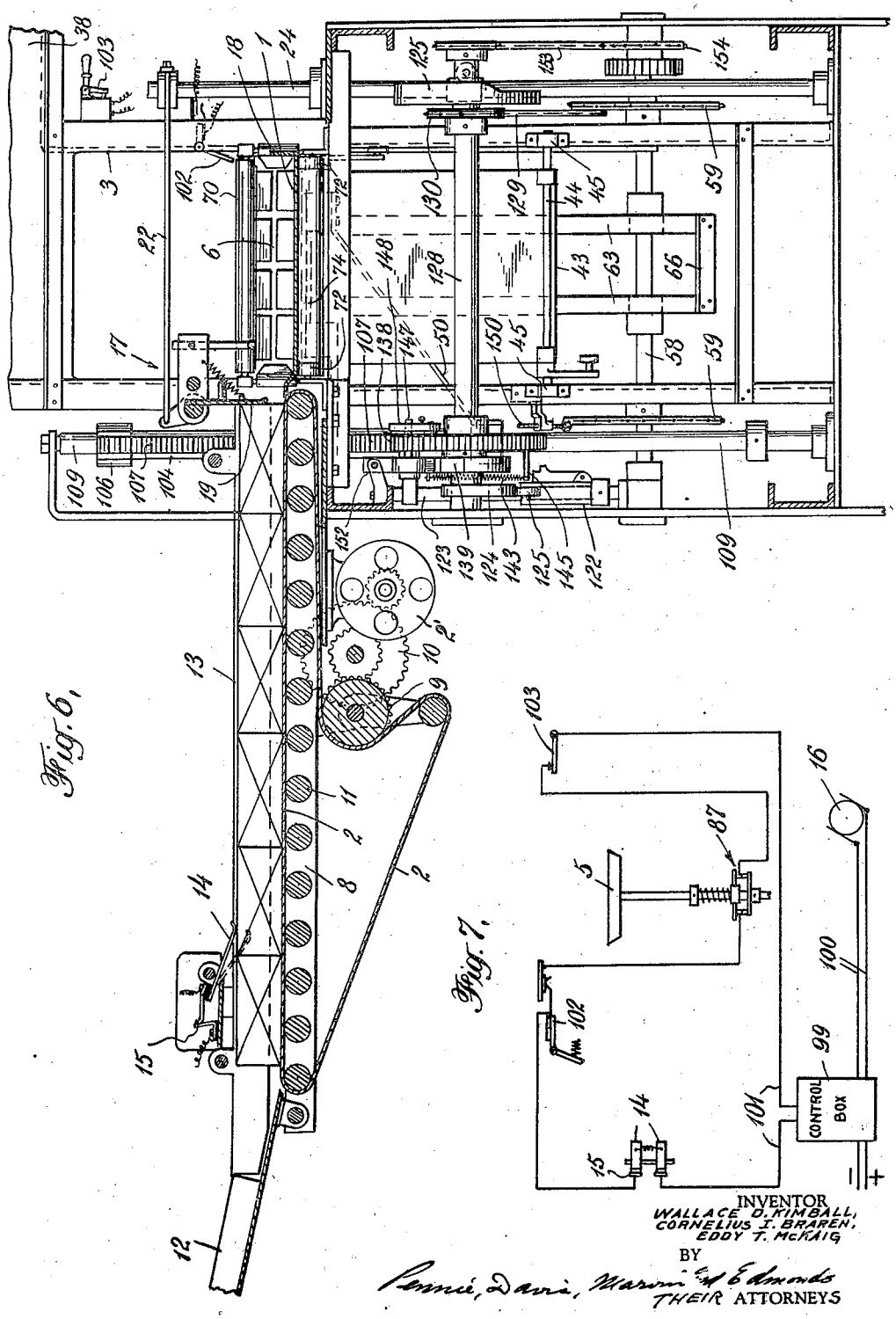

Fig. 6.

Fig. 7.

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Fig. 8.

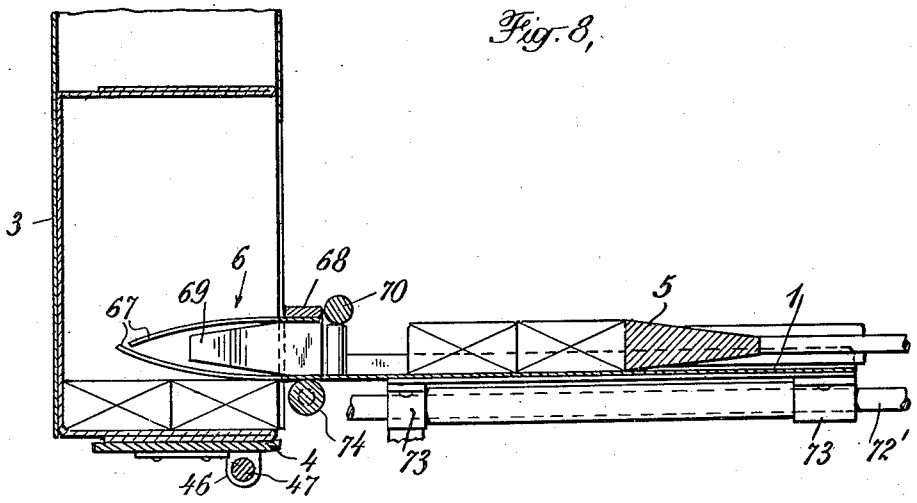


Fig. 9.

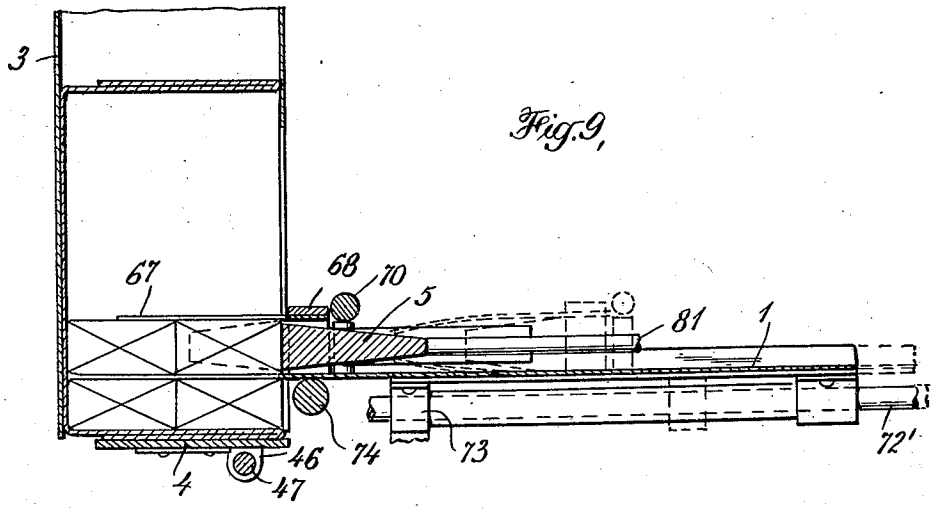
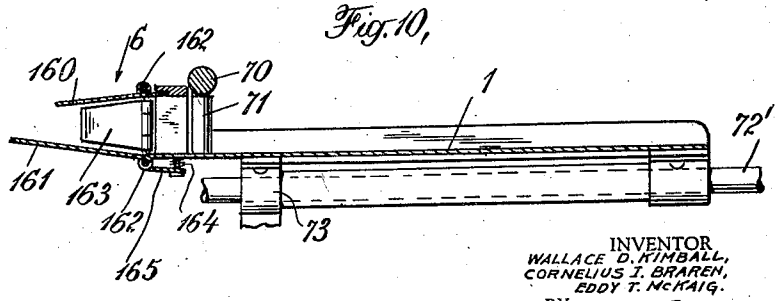


Fig. 10.



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APPARATUS FOR PACKING ARTICLES IN BOXES

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Fig. 11,

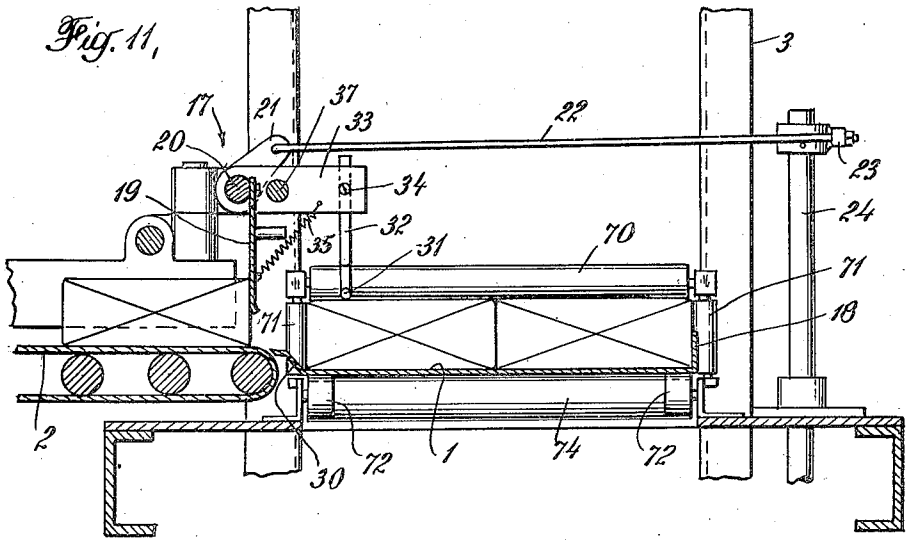


Fig. 12,

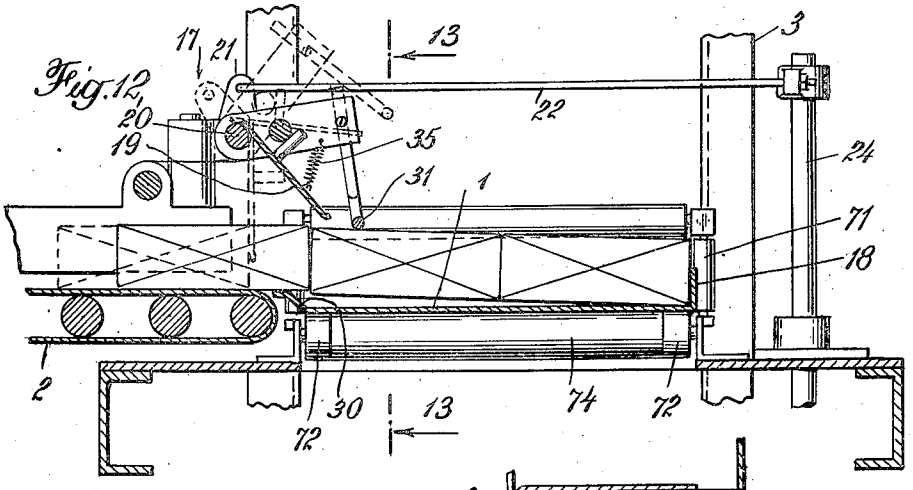
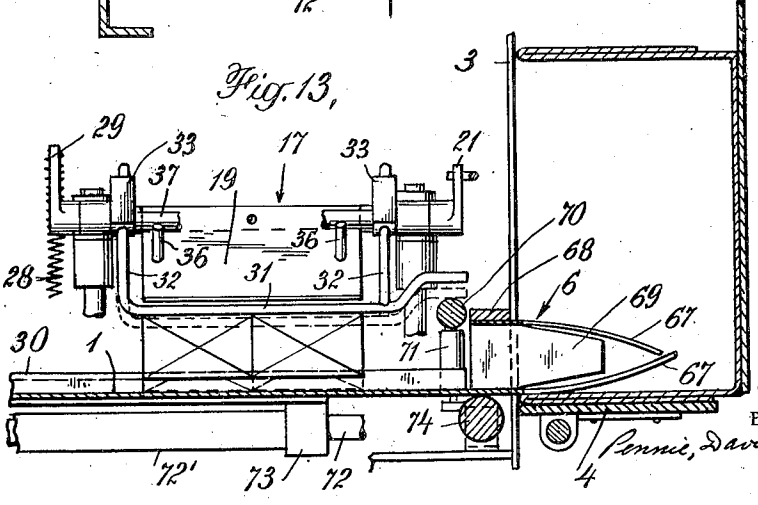


Fig. 13,



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APPARATUS FOR PACKING ARTICLES IN BOXES

Filed Dec. 9, 1931 8 Sheets-Sheet 7

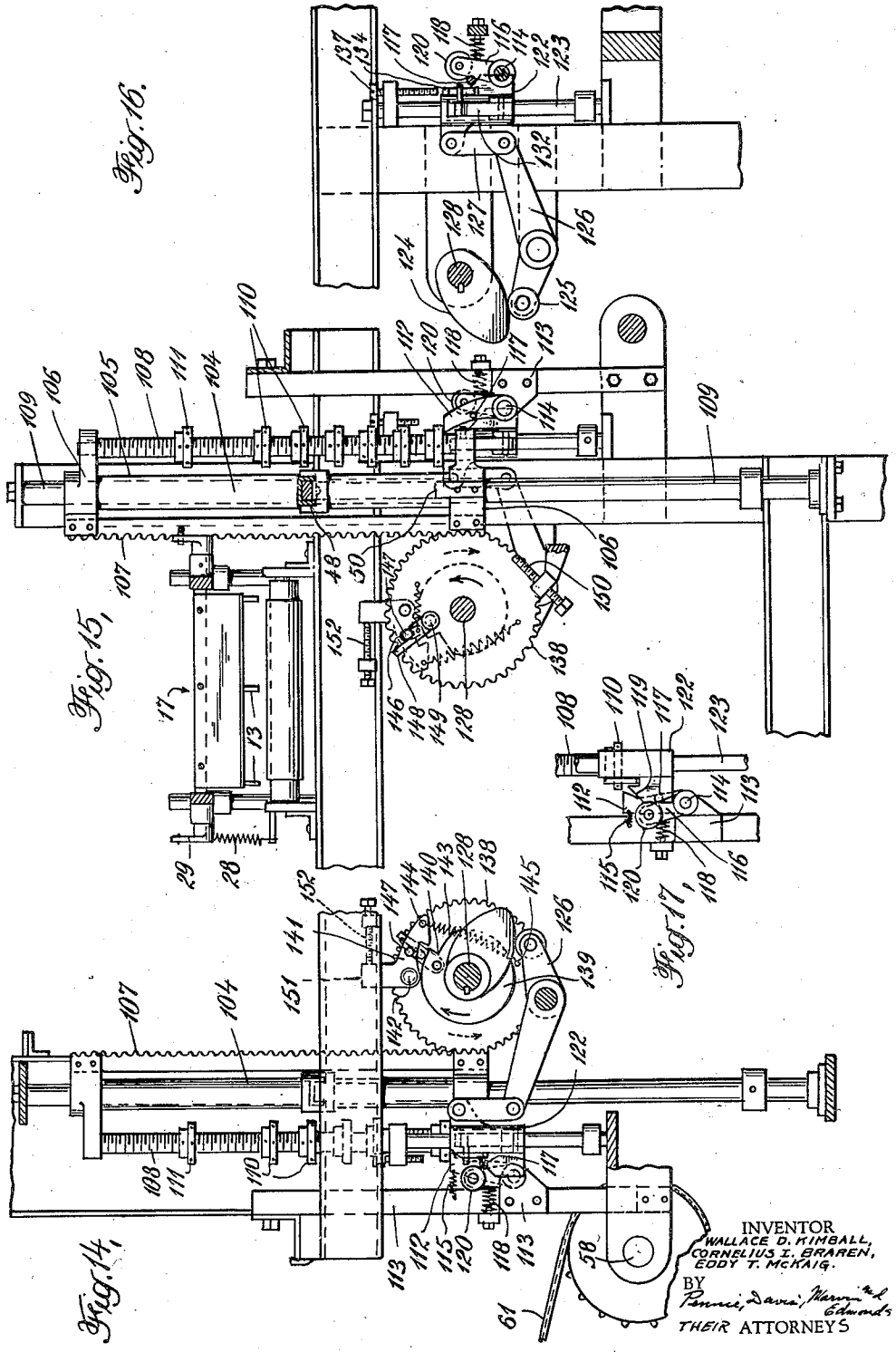

Fig. 16.

Fig. 15.

Fig. 17.

Fig. 14.

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APPARATUS FOR PACKING ARTICLES IN BOXES

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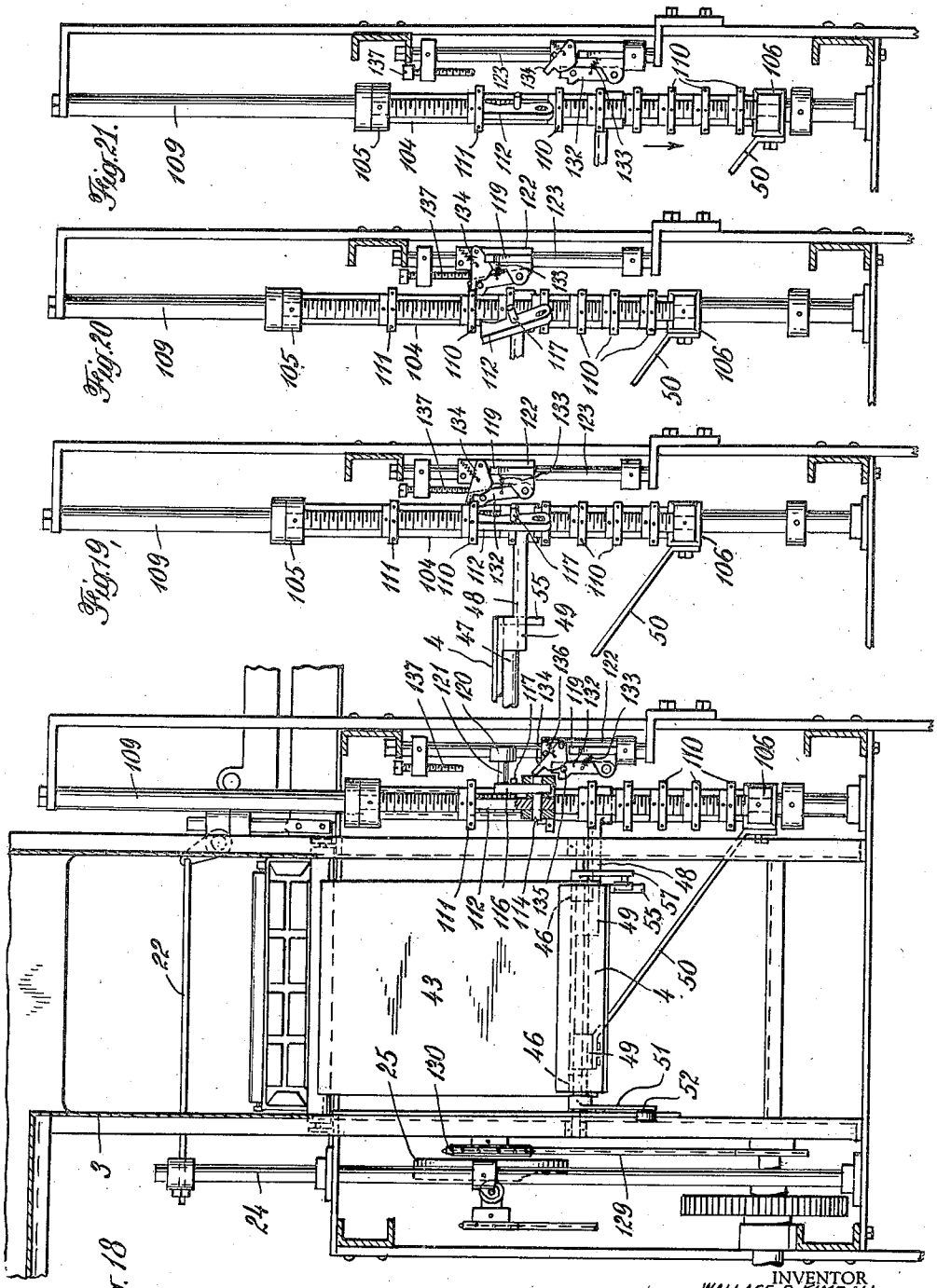

Fig. 21.

Fig. 20

Fig. 19.

Fig. 18

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Patented Sept. 8, 1936

2,053,435

UNITED STATES PATENT OFFICE

2,053,435

APPARATUS FOR PACKING ARTICLES IN BOXES

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Application December 9, 1931, Serial No. 579,864

17 Claims. (Cl. 226—16)

This invention relates to machines for packing articles in cartons and has for its object particularly to improve on the machines disclosed in the prior patents of B. H. Becker et al., Nos. 1,367,852 and 1,439,395, and prior patents of Eddy T. McKaig, Nos. 1,555,224, 1,555,225 and 1,611,928, which patents have been acquired by the assignee of this application.

The machine of this application operates on the same general principle as the machine disclosed in Patents Nos. 1,611,928 and 1,555,225 above referred to, and the purpose of the improvements herein disclosed is to increase the speed of said machine, to render it more foolproof, to better safeguard the articles against damage in their passage through the machine, to make the machine more compact and less liable to get out of order, as well as to considerably reduce the cost of manufacture of said machine.

In the accompanying drawings we have illustrated a preferred embodiment of our invention, and in said drawings:

Fig. 1 is a plan view of the machine;

Fig. 2 is a side elevation looking from the right of Fig. 1;

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

Figs. 4 and 5 are detail sectional views on the correspondingly numbered lines of Fig. 1;

Fig. 6 is a vertical sectional view at right angles to Fig. 3 and on line 6—6 of Fig. 1;

Fig. 7 is a diagrammatic view showing the electrical control circuit by means of which the machine is operated;

Figs. 8 and 9 are detail sectional views showing the operation of inserting the successive layers of articles into the carton;

Fig. 10 is a detail sectional view of a modification;

Figs. 11, 12 and 13 are detail sectional views showing the apparatus for separating the incoming articles into successive layers;

Figs. 14 to 21, inclusive, are detail views of different parts of the machine which will be later described, particularly the mechanism for lowering the carton carriage step by step to receive the successive layers of articles and returning the carriage to its original position.

Referring to the drawings (Figs. 6, 1, 2 and 3 more especially), 1 indicates a table to which the articles to be packaged are delivered by a belt conveyor indicated generally at 2, which advances the articles in end-to-end contact to a position adjacent the carton support 3. The carton support comprises vertical guides spaced from each other to provide a vertical chute in which the cartons are supported with their bottom flaps closed and with their top flaps folded back flat against the four adjacent sides of the carton. The cartons rest in the chute on one of their side faces and with the open side in a vertical plane parallel to the line of feed of the articles advanced by the feed belt 2. The cartons rest on a vertically movable platform 4 and the layers of articles are shifted from the table 1 into the carton. As the packing of the articles progresses, the platform is lowered step by step a distance equal to the thickness or height of the articles so that each successive charge of articles will be delivered into the carton on top of the previously delivered layer of articles.

A plunger 5 is provided for shifting the articles from the position on top of the table 1 to which they are delivered by the feed belt, into the carton. The plunger is operated in timed relation with the platform-lowering mechanism so that following each downward step in the movement of the platform the plunger will be shifted and the articles making up the next succeeding layer of the charge will be delivered in the carton. Between the carton and the plunger there is provided a movable guide or funnel 6 which is projected into the carton in advance of the plunger and serves to guide the articles in their movement into the carton so as to properly position the articles in the carton and also prevent scuffing of the articles one on the other as would be the case were the articles pushed across the face of the previously deposited articles.

After the carton has been filled with the articles in the manner described, the platform-lowering mechanism automatically ejects the filled carton from the machine onto a discharge conveyor 7 attached to the machine frame a proper distance beneath the top of the table 1 for the filled carton to be tilted outwardly and downwardly onto the conveyor so that the carton will leave the machine resting on its closed bottom flaps ready for delivery to a suitable carton-closing machine.

The empty cartons are fed into the machine by hand, the machine in this respect being similar to the machines disclosed in the prior patents to McKaig, above referred to.

The machine is entirely automatic in its operation and so long as the articles are continuously supplied to the feed conveyor and cartons

are placed in the chute by the attendant, the machine will operate to pack the predetermined number of articles in the cartons and deliver the filled cartons from the machine.

The machine is provided with an automatic control mechanism which operates to stop the machine on failure of the supply of articles and to start the machine when the supply of articles is replenished in such manner as to insure a full charge of articles, notwithstanding the interruption. This automatic control mechanism also operates to stop the machine if a carton is not in its proper position within the carton support, and to start the machine as soon as the carton is placed in position. The automatic control mechanism further operates to stop the machine if the pressure upon the plunger becomes too great, as would be caused, for example, by the jamming of an article on its way into the carton, the machine being automatically restarted as soon as this pressure is released. In accordance with the operation of this automatic control mechanism, in order for the machine to operate there must be a continual supply of articles to the machine, and a carton must be in position in the machine to receive the articles, also if any carton is over size or damaged so as to cause it to jam in the packing mechanism, the operation of the machine will automatically be stopped.

The belt conveyor 2 is driven continuously by means of an electric motor 2' suspended beneath the belt-supporting frame 8 and operating to drive the driving pulley 9 of the belt through a suitable reduction gear 10. The frame 8 is provided with the usual belt supporting rollers 11 which support the weight of the articles as they are advanced in the machine. The articles may be fed into the machine in any suitable manner, for example, by a feed chute 12 indicated in Fig. 6.

The articles are maintained in alignment with the feed belt 3 by the side guides 13, and overlying the paths of movement of the articles are gravity trip fingers 14 which serve when elevated by the underlying articles to close the control switches 15 in the circuit of the main driving motor 16 which actuates the other parts of the machine. This circuit is one of four in series in the control circuit of the main driving motor, all of which switches must be closed in order for the machine to be operated, as will be more fully described hereinafter.

The feed belt 2 serves to advance the articles against a movable stop mechanism 17 which is periodically actuated to release the articles and allow them to be projected by the movement of the belt across the top of the table 1 in front of the feed plunger 5 in a position to be projected through the article guides 6 into the carton. A fixed stop 18 is provided at the far edge of the table 1 to stop the articles fed past the movable stop as described, and after the articles are in engagement with the fixed stop the movable stop is actuated to press back the articles on the feed belt 2 and thus separate them from the articles on the table in front of the plunger so that the latter group of articles will be free to be delivered into the carton.

The mechanism for thus delivering the articles into position to be engaged by the plunger is disclosed in detail in Figs. 11, 12 and 13. The mechanism which I have referred to generally as the movable stop-mechanism comprises a plate 19 attached to a rock shaft 20 extending across the machine above the end of the conveyor 2 with the side of the plate projecting downwardly in position to be engaged by the article at the end of the conveyor.

In the machine illustrated each horizontal layer as viewed in Fig. 9 contains two rows of articles, and as shown in Figs. 11 and 12 each row contains two articles. In order to feed the two rows of articles, the feed belt 2 is divided into two sections by the three side guides 13 as may be seen in Fig. 1. The plate 19 of movable stop 17 extends across both rows.

Movable stop 17 is actuated by means of an arm 21 fixed to the inner end of rockshaft 20. A link 22 connects arm 21 with a horizontal arm 23 which is fixed to the upper end of a vertical shaft 24 mounted at one side of the machine. Shaft 24 is rocked (see Figs. 6 and 2) by means of a cam disc 25 having a cam surface on its outer face which coacts with a roller 26 carried by arm 27 fixed to shaft 24. Helical spring 28 (see Fig. 13) biases the movable stop mechanism 17 to its closed position, in which the plate 19 is vertical as shown in Figs. 13 and 11. This spring is attached between the frame of the machine and the end of an arm 29 which is mounted upon the outer end of rock shaft 20. It will be understood that cam 25 causes the movement of movable stop 17 from the closed or vertical position of plate 19 to the upward or open position as shown by dotted lines in Fig. 12.

As the articles move along the belt conveyor 2 in end-to-end contact, if partially dry adhesive is on the ends of the articles they may become glued together by the time they reach table 1. The surface of table 1 is somewhat below the surface of conveyor belt 2 so that an inclined flange may be provided which will serve as a guide for the left-hand edge of the layer of articles as it is slid forward by plunger 5 into the carton. The slight adhering together of the articles hence may cause the last article on the conveyor belt 2 to hold the article in front of it up from the surface of table 1 as shown in Fig. 12.

In order to sever these two articles, a striker bar 31, as shown in Figs. 13, 11 and 12 is provided. This striker bar consists of a light round bar somewhat greater in length than the plate 11 and having parallel portions 32 at its ends by which it is supported on a pair of arms 33 which are loosely carried on rock shaft 20 at the ends of plate 19. The parallel sides 32 of the striker bar pass through openings near the ends of arms 33, wherein they are adjustably mounted by means of set screws 34 so that the striker bar may be adjusted to suit the dimensions of the articles being packed.

In order to function properly striker bar 31 descends somewhat ahead of the lower edge of plate 19 as shown in Fig. 12 so as to contact with the last package of each row on table 1 and force them downwardly so that the plate 19 may engage the sides of the last two articles on conveyor belt 2 without wiping across the corners of the articles on table 1, which wiping action would be apt to scuff the wrappers of these articles. Plate 19 moves to the vertical position so as to slide back the articles on conveyor belt 2 and separate them from those on table 1, forming the layer to be packed. The movement of the lower edge of plate 19 after the striker bar has stopped is hence considerable and a yielding connection is provided between plate 19 and one of the arms 33 in the form of a helical spring 35.

Spring 35 is stretched, as shown in Fig. 11,

during the operation of movable stop mechanism 17, thereby resiliently urging the striker bar 31 against the surfaces of the articles on table 1. In order to raise the striker bar 31 when the gate mechanism 17 is opened, a pair of posts 36 are placed on the upper surface of plate 19 and a cross-rod 37 extends between the two arms 33 in such a position as to be engaged by posts 36 so as to lift arms 33 and the striker bar to the upper dotted position as shown in Fig. 12.

The manual insertion of the cartons into the machine is accomplished by folding back the carton flaps against its sides and then inserting a carton in a rectangular opening 38 at the top of the carton support 3 and at the right as shown in Fig. 6. The carton is then slid toward the left through the horizontal throat of opening 38 into the vertical chute which forms the carton support. During this movement the operator by pulling upon handle 39 (see Fig. 3) elevates a plate 40 which slides in a pair of guides 41 and which is provided with a foot 42. This raises the plate 40 so as to allow the carton to enter the vertical chute. Plate 40 is then allowed to descend under its own weight onto the top of the carton, thereby forcing the carton down the chute and holding down the upper carton flap until a second carton is slid part way into the vertical chute through the horizontal opening 38.

The weight of plate 40 carries the first carton down into the position shown in Fig. 3 where it rests temporarily on the upper edge of a swinging apron 43 which is pivoted on a rod 44 that is fixedly supported by means of brackets 45 on the frame of the machine (see Fig. 6). The carton is supported by this apron during the insertion of the first layer of articles, during which time the previously filled carton shown by the dot-and-dash lines in Fig. 3 is being thrown backward by the tipping of platform 4 on to the discharge conveyor 7.

By the time that the first layer of articles has been inserted within the carton, platform 4 has returned to the top of its stroke and in so doing forces apron 43 to the vertical position and replaces this apron as the support for the carton, as shown in Figs. 4, 8, 9 and 13. Platform 4 consists of a flat rectangular plate, somewhat narrower than the side of the carton, having a pair of downwardly projecting lugs, one at each end which are fixed to a pivoting shaft 47. Pivoting shaft 47 is mounted for oscillation (see Figs. 19 and 18) in a horizontal arm 48 having a pair of bearing lugs 49 in which the shaft 47 turns. A sloping brace member 50 is attached to the outer bearing lug 49. The carriage to which arm 48 and brace 50 are attached will be described further on.

Secured fast to the left-hand end of pivoting shaft 47 is a downwardly extending somewhat L-shaped arm 51 having a roller 52 at its lower end. Roller 52 operates upon a vertical rail 53 which is mounted on the frame of the machine. The lower portion 54 of this rail is bent at an angle of approximately 45 degrees as shown in Fig. 4. Pivoting shaft 47 is located towards the front edge of platform 4, so that the weight of the carton tends to cause the platform to turn backward about the pivoting shaft. The engagement of roller 52 with rail 53, however, maintains platform 4 in a horizontal position as the platform descends and until the last layer of articles has been placed in the carton.

Thereafter, as platform 4 is lowered still further, as will be described below, roller 53 passes onto the sloping portion 54 and allows the platform to tilt backward, as previously described, so as to pitch the carton onto conveyor 7. As platform 4 tilts, a projection 55 depending from the right-hand front corner of the platform (Figs. 18 and 3) engages a roller 56 which is mounted on the lower end of an arm 57 which projects below the pivot 44 of apron 43. This causes the apron, which during the descent of the carton has served as a protection for its contents, to tilt forward, as above described, so as to support the following carton.

The discharge conveyor 7 is of the usual type comprising a roller table along which the carton may slide with very little friction. At its lower end the side frames for supporting this table are attached to brackets which are loosely mounted upon a rotating shaft 58 which extends crosswise into the machine at the rear. This shaft is journaled in supports at each side of the machine, and is power driven as will be described more in detail below. Mounted near the opposite ends of this shaft are a pair of sprocket wheels 59, and at the outer end of the conveyor are a similar pair of sprocket wheels 60. Conveyor chains 61 pass over these sprocket wheels, these chains carrying cross-bars 62 at appropriately spaced intervals as indicated in Fig. 3.

Loosely mounted near the center of shaft 58 is a pair of flat bars 63 which are provided with suitable mounting hubs 64. These bars are connected together at their bottoms by a heavy cross-bar 65 which serves as a counterweight to normally cause the bars to stand upright, as shown in Figs. 2, 6 and 1. Joining the bars at the bottom at the inner side is an angle member 66. The upper web of this angle member is preferably curved somewhat, as shown in Fig. 3, and serves to support the outer corner of the carton as it swings backwardly from platform 4 onto the conveyor.

It will be noted that the lower corner of the carton approaches conveyor 7 opposite the pivot for these bars 63, namely shaft 58, and consequently counterweighting of the bars, even though of comparatively small mass, is sufficient to cause the bars to retard the tilting of the carton and prevent it from violently striking the conveyor bed (Fig. 1). The portion of the roller table of the discharge conveyor adjacent the machine is provided with short rollers on each side, leaving an open space in the center for the bar 63.

As previously mentioned, the mechanism for shifting the articles from the top of table 1 to which they are delivered by the feed belt 2 comprises the guide or funnel 6 and the plunger 5. Funnel 6 is mounted upon the forward end of table 1 and consists preferably of a plurality of thin flexible and highly resilient fingers 67. The lower row of these fingers is fixed directly to the plate which forms table 1 while the upper row of fingers is mounted upon a cross-member 68 which is secured to table 1 at its ends.

These members, as may be seen from the drawings, are curved towards one another so as to prevent them from engaging the carton itself or the layer of articles previously inserted in the carton. Preferably the lower fingers 67 are somewhat longer than the upper fingers so that the two sets will overlap one another as illustrated. Also, similar flexible fingers 69 are provided one at each side of table 1 and constitute the end members of funnel 6. These fingers are bent inwardly so as to avoid engagement with the

sides of the carton as the funnel passes into the same.

Mounted just in front of bar 68 on the forward end of table 1 is a roller 70 beneath which the articles pass in entering the carton. Also at each end of roller 70 are two short vertical rollers 71 which coact with the outside surfaces of the cartons. The purpose of these rollers is to smooth down any unevenness in the articles and also to gauge the articles to reasonably accurate size as they are shifted into the carton by plunger 5, thereby insuring that they do not occupy too much space in the carton and make difficult the insertion of the last layer.

Table 1 is slidably supported upon a pair of narrow rollers 72 (Figs. 2, 11 and 12) mounted on the machine frame at each side of table 1 and is guided by means of a horizontal bar 72' so as to carry the funnel 6 into and out of the carton. For this purpose brackets 73 joined by an elongated sleeve are provided on the under side of table 1 which encircle rod 72 with a loose sliding fit. In order to position the forward end of table 1 accurately with respect to the carton, it is supported by means of a horizontal roller 74 which is pivoted in brackets on each side of the machine, as shown in Figs. 11 and 12.

Table 1 is moved back and forth by means of a long vertical lever 75 which is pivoted at 76 near the bottom of the machine and the upper end of which is connected to the forward bracket 73 of table 1 by means of a link 77. Lever 75, and consequently table 1, is urged toward the carton by means of a helical spring 78, while the opposite movement is effected by means of an open cam 79 mounted on the main shaft of the machine 80.

The material of which fingers 67 are made is preferably thin spring steel, and because the motion of funnel 6 into the carton is effected by spring 78, should funnel 6 become jammed against any part of the carton or the articles previously inserted therein, the pressure of spring 78 is insufficient to damage the fingers 67. Because of their flexibility and resiliency, they will withstand considerable deformation without suffering a permanent change of shape. By actuating the return movement of funnel 6 by means of an open cam such as cam 79, the cam may continue to rotate after the motion of the funnel 6 has been stopped by the carton which is jammed.

The construction and mounting of plunger 5 is to be seen more specifically from Figs. 1, 2 and 3. The plunger itself has a narrow head flat on its front surface and of appropriate dimensions to engage the articles on table 1 and push them over the surface of the table and between the rollers 70 and 74 and into the carton. The timing of the movement of funnel 6, plunger 5, and movable stop 17 which controls the admission of articles onto table 1 is such that the chute reaches the inner end of its stroke at about the same time that the plunger reaches the outer end of the stroke, and as soon as these positions are reached, movable stop 17 opens. The gate or movable stop 17 closes almost immediately since the articles are projected onto table 1 very quickly. In fact, plunger 5 commences its in stroke as gate 17 starts to close, and by the time the gate is closed the plunger has engaged the articles and commenced to push them toward funnel 6.

As the cartons pass into the funnel the spring fingers 67 are opened flat as shown in Fig. 9. Just before the plunger reaches the end of its in stroke cam 79 begins to move table 1 and funnel 6 outwardly and completes its full outward stroke to the dotted position shown in Fig. 9 while plunger 5 remains at the end of its in stroke. The articles have now been deposited within the carton and plunger 5 commences its outward stroke. As soon as the fingers 67 clear the carton support 3, the lowering of the carton to the position to receive the next layer commences, as will be understood from the detailed description of the carton carriage lowering mechanism to be found below.

The mounting for plunger 5 and mechanism for actuating it are illustrated in Figs. 1, 2 and 3. The plunger is carried by two parallel rods 81 which are yieldingly and pivotally mounted upon a horizontal shaft 82 by means of a bracket 83. The rods 81 pass with sliding fits through apertures in the downwardly extending ends of bracket 83. They are held in position in brackets 83 by means of collars 84 and 85 and springs 86 surrounding the rods.

By means of this mounting plunger 5 yieldingly engages the articles on table 1. If there is any tendency to jam, or if, for example, a package is too large to pass between the sizing rollers 70 and 71, springs 86 will be compressed, allowing collars 84 to move back somewhat and open a double pair of switch contacts 87 shown diagrammatically in Fig. 7. This stops the main driving motor 16.

In order to clear the troublesome package from the machine, plunger 5 may be raised manually to a vertical position, shaft 82 to which brackets 83 are secured turning in its bearings to allow this movement. When the plunger is in its normal horizontal position, it is so held by an arm 88 which is fixed to one end of shaft 82. This arm is provided at its end with a roller 89 which rests upon a straight rail 90 provided along one side of the machine. Thus, when the plunger is raised arm 88 swings up away from rail 90 correspondingly.

All of the plunger mechanism just described is mounted for reciprocation along the horizontal bed of the machine by means of a bracket 91 in which shaft 82 is journaled. This bracket is slidably mounted on a rod 92 which is parallel with guide rod 72' for table 1. Bracket 91 is kept from rotating about rod 91 by means of a roller 92' (Fig. 1) which rolls beneath rail 90. Bracket 91 hence forms a carriage for plunger 5, and the carriage is reciprocated back and forth by means of a vertical lever 93 similar to lever 75 and also pivoted to shaft 76 at the bottom of the machine. The upper end of lever 93 is connected to carriage 91 by means of link 94, and lever 93 is actuated by a roller 95 which travels in the cam groove 96 of the closed cam disc 97 which is mounted on main shaft 80. Main shaft 80 is driven continuously by motor 16 through the train of reduction gearing indicated generally at 98. The direction of rotation of main shaft 80 is shown by the arrow in Fig. 2.

Referring now to Fig. 7, the control of motor 16 is here diagrammatically illustrated. Power from the supply enters the control box 99 which contains suitable mechanism for opening and closing the motor circuit 100 in accordance with the conditions existing in control circuit 101. Control circuit 101 contains in series connection the two switches 14, one controlled by each line of packages being fed to the machine by conveyor belt 2, switch 102, switch 87 which is opened

by plunger 5, and manually operated switch 103. Switch 102 has not yet been described and is mounted in the carton support 3, as shown in Fig. 6, in such position that when a carton is in position to receive a charge of articles the switch will be closed, but when a carton is not in this position the switch will be opened. Hand switch 103 is located at any convenient point on the machine.

It will be understood that control circuit 101 is closed only when all of the four switches 14, 102, 87 and 103 are closed, and that unless control circuit 101 is closed main circuit 100 of the motor 16 is open. With this arrangement, therefore, the main motor 16 may be stopped either manually by switch 103, or automatically in three different ways. First, if there is a failure of the supply of articles to feed conveyor 2, second, if there is a failure of the supply of cartons to receiving position in carton support 3, and third, by any condition which occurs during the shifting of the articles into the carton over the top of table 1, which causes an excessive pressure to be exerted upon plunger 5.

We now come to the description of the mechanism for lowering the cartons step by step in order to receive the article one layer at a time. The details of this mechanism are illustrated in Figs. 14 to 21, inclusive, with the plan view of this mechanism being shown as a part of Fig. 1. Portions of the mechanism are also shown in Figs. 2 and 6.

It will be remembered that during the insertion of the first layer of articles the carton is supported upon the upper edge of apron 43, and that thereafter the carton is supported upon platform 4 which is pivotally mounted upon horizontal arm 48 braced at its outer end by the sloping brace 50. The right-hand end of horizontal arm 48 and lower end of brace 50, as viewed in Figs. 18 and 19, are firmly secured to a carriage 104. Carriage 104 is best illustrated in Fig. 15 and comprises a vertical tubular member 105 having brackets 106 fixed thereto at each end. Secured to brackets 106 on one side of carriage 105 is a rack 107 and secured to the same brackets on the opposite side of the carriage is a massive threaded rod 108. This rod is firmly fixed against rotation in brackets 106. Carriage 104 is arranged to slide on a heavy vertical guide rod 109 which is anchored at top and bottom to the framework of the machine.

It will thus be understood that carriage 106 provides a means for giving firm support to platform 4 and for shifting the platform up and down as necessary to receive the articles step by step. In order to support the carriage at its several stations, a series of six collars 110 and a seventh collar 111 are threaded upon threaded rod 108. Each of these collars is provided with a lock-nut for locking the collars in their adjusted positions. These collars and lock-nuts are provided with apertures in their surfaces for the reception of spanner wrenches by which to turn them. The six collars 110 correspond with the number of layers of articles to be inserted in the carton, while the seventh collar 111, which is spaced above the uppermost collar 110 a greater distance than the spacing of the other collars, corresponds with the lowermost position of the carriage which it reaches at the discharge of the carton onto the discharge conveyor 7.

Carriage 105 is supported in its various positions by engagement of a dog 112 with the several collars. This dog is pivotally mounted in a bracket 113 attached to the frame of the machine. The mounting for this pawl 112 is shown in detail in Fig. 17 and also in Figs. 15, 14, 18 and 1. The pawl is arranged to turn freely on a short horizontal shaft 114, and is biased out of engagement with collars 110 and 111 by means of a small helical spring 115. Mounted on shaft 114 close to pawl 112 is a short rock arm 116. This rock arm engages a pin 117 which projects from one side of dog 112 and moves the dog into the path of the collars.

A second helical spring 118, acting in the opposite direction to spring 115 and stronger than spring 115, urges rock arm 116 against pin 117 so that normally dog 112 is held in the path of the collars 110 and 111, spring 115 hence being thereby normally under tension. By this construction, when one of the collars is resting upon dog 112 the friction between these two parts will maintain them in engagement against the tension of spring 115 after rock arm 116 has been withdrawn from engagement with pin 117. However, as soon as collar 110 is lifted slightly so as to release dog 112 the dog will be retracted out of the path of the collars by spring 115.

Arm 116 is pushed back so as to allow dog 112 to be released from the collars by the tension of spring 115, by means of a cam 119 which is a part of mechanism about to be described and which coacts with a roller 120 that is mounted upon a stud 12 which is fixed to the upper end of arm 116.

The mechanism for lifting the carriage 104 so as to release the collar 110 or 111 which happens to be resting on pawl 112 from the support of the pawl, and lowering the carriage step by step from one collar to another, is shown in particular in Figs. 16, 14, 6 and 1, with parts also shown in Figs. 2 and 15. This mechanism comprises a vertically reciprocating shifter 122 which is mounted to slide upon a short vertical rod 123. This rod is appropriately secured to the framework of the machine close to carriage 104 and at one side thereof, as may be seen from the plan view in Fig. 1.

Shifter 122 is reciprocated continuously by means of a cam 124 which is operatively connected therewith by means of a follower 125, a bell crank 126 and link 127. Cam 124 is keyed to shaft 128 which is rotated continuously (see Figs. 6 and 2) in the direction of the arrows shown in Figs. 14 and 15 by means of a chain 129 which passes over a sprocket 130 keyed to shaft 128 and a similar sprocket 131 of the same diameter which is keyed to shaft 80. Shaft 128 therefore rotates at the same speed as main shaft 80 and hence shifter 122 makes one complete reciprocation for each stroke of plunger 5, and hence for each insertion of a layer of articles within the carton.

For the purpose of engaging the collars 110 and 111 there is pivoted near the lower end of shifter 122 a pawl 132 which extends upwardly against the inner side of the shifter and is drawn toward the shifter out of the path of collars by means of a helical spring as shown. This pawl is forced into the path of the collars 110 and 111 each time the shifter approaches the upper end of its stroke. This is accomplished by cam 134 pivoted on one side of shifter 122 and arranged to coact with a pin 135 on one side of pawl 132. Cam 134 is biased upwardly by means of a helical spring 136 so that normally the cam is in the position shown in Figs. 18 and 21 thereby not interfering with the holding of pawl 132 out of the path of collars by

spring 133. Cam 134 is turned downwardly by its engagement with a stationary screw 137 which is positioned near the top of the stroke of the shifter 122.

The operation of the mechanism will be made clearer by an examination of Figs. 19 and 20. Cam 119 previously described is fixed to the lower side of shifter 122 so that each time the shifter approaches the upper end of its stroke this cam engages roller 120 and forces arm 116 back so that dog 112 which is supporting one of the collars 110 and 111 is free to be withdrawn as soon as the weight is lifted from the dog. At about the same time that cam 119 engages roller 120, cam 134 strikes the lower end of screw 137. Both of these operations take place after the pawl 132 on its upward stroke has passed the collar immediately preceding the one which is to be engaged by pawl 132. Pawl 132 being forced inwardly by cam 134 engages one of the collars. In Fig. 19 it is shown just in contact with the uppermost collar 110 and before the pressure of the collar on the upper end of dog 112 has been removed.

In Fig. 20 the shifter 122 has reached the extreme upper end of its stroke, thereby causing pawl 132 to take the weight of the carriage 104, raising the collar about ¼ inch above the upper end of dog 112. Dog 112 has been pulled out of the path of the collars by its biasing spring 115 so that on the downward stroke of shifter 122 the uppermost collar 110 will clear dog 112. As soon, however, as this takes place cam 119 releases collar 120 and spring 118 forces arm 116 against pin 117 and throws dog 112 back into the path of the collars.

The succeeding collar, which in this case happens to be collar 111, will therefore strike the upper end of dog 112 as the carriage continues to be lowered by the movement of shifter 122, and support the carriage 104 in this position. At the commencement of the downward stroke of the shifter, cam 134 descended free of the end of screw 137 and spring 136 retracted the cam out of engagement with pin 135 on pawl 132. Hence, during the remainder of the down stroke, pawl 132 was held in engagement with the collar by friction and as soon as the weight was removed from pawl 132 by the contact of collar 111 with dog 112, pawl 132 was again withdrawn out of the path of the collars by its biasing spring 133.

During the movement of the carriage 104 just described it will be remembered that the platform 4 has descended (the carton having received its last layer) sufficiently far to permit the roller 52 to pass onto the sloping portion 54 of rail 53 and cause the backward tilting of the filled carton so as to discharge it onto the conveyor 7. The next movement of the carriage is that of elevating it in a single movement from this position to the upper end of its stroke. The carriage is shown in its uppermost position in Figs. 14 and 15, the lowermost collar 110 resting upon dog 112 to support the carriage in this position. It will also be remembered that in order not to waste a stroke of plunger 105 the first layer is inserted in the carton while this return upward stroke of carriage 104 is being made, the carton being supported during this interval by the upper edge of apron 43.

The elevation of carriage 104 from its lowermost position shown in Figs. 3 and 21 to its uppermost position shown in Figs. 4, 14 and 15 is accomplished by means of a gear 138 which meshes with rack 107. This gear is loosely mounted on shaft 128 and is rotated by means of a clutch mechanism through that portion of a revolution necessary to raise carriage 104 from the bottom to the top of its stroke. This clutch mechanism is illustrated in Figs. 14, 15 and 6, and is constructed as follows: A disc 139 disposed at the side of gear 138, as shown in Fig. 6, is keyed to shaft 128 so as to rotate therewith. The disc has a single notch 140 in its outer periphery. A pawl 141 is pivoted at 142 to the face of the gear 138 and is adapted to engage notch 140. A helical spring 143 is attached at one end to the head of the pawl at 144 and at its other end to a pin 145 which projects outwardly from the face of gear 138.

The movement of pawl 141 into and out of engagement with the notch 140 to determine the extent to which gear 138 rotates, is controlled in the following way: A slotted opening 146 extends through gear 138 from one face to the other, and in this slot there is a pin 147 which is mounted on the inner side of pawl 141. This pin extends through the slot and projects a short distance beyond the inner face of the gear. A latch 148 which is pivoted to the inner face of the gear at 149 is provided with a shoulder for engaging pin 146, thereby to hold pawl 147 out of engagement with notch 140. Latch 148 is biased by means of a helical spring which tends to hold the latch against pin 146.

As carriage 104 descends step by step as previously described, gear 138 rotates step by step because of its engagement with rack 107 in the direction of the dotted arrow shown in Figs. 14 and 15. When the carriage reaches the bottom of its stroke, the outer end of latch 148 strikes the end of an adjustable screw 150 mounted on the frame of the machine. This trips latch 148 out of engagement with pin 146 and thus allows dog 141 to be drawn against the surface of disc 139 by spring 143. As stated, disc 139 rotates continuously, and as soon as notch 140 meets the head of pawl 141 the rotation of gear 138 and the continuous upward stroke of carriage 104 commences.

The rotation of gear 138 is stopped when the carriage reaches the top of its stroke by the engagement of the tail 151 of pawl 141 with a second screw 152 also adjustably mounted in the machine frame. This lifts the head of pawl 141 out of notch 140 and allows latch 148 to spring into engagement with pin 146 to hold the pawl in its outer or released position until the carriage 104 again descends step by step until it again reaches the bottom of its stroke.

The conveyor chains 61 of the discharge conveyor are driven from shaft 58 through their sprockets 59. The drive for shaft 58 comprises a chain 153 which is driven by means of a sprocket on the end of the continuously rotating shaft 128 and which drives shaft 58 through a sprocket 154, and a set of gears 155 included for the purpose of driving chains 61 in the right direction. The driven gear 155 is mounted loosely on shaft 58 and has fixed to its hub a disc 156. This disc has in its periphery a single notch 157 which engages a spring-pressed pawl 158 which is pivoted to the face of one of the sprockets 59.

This disc and ratchet constitute a one-way drive for chains 61 so that by placing an appropriate handle or crank upon the squared end 159 of shaft 58, the chain 61 may be moved by hand. If an article becomes jammed in the mechanism for inserting the articles into the carton it is convenient to operate the mechanism in a backwards direction in order to release the jammed article and clear the machine. In do-

ing this, the chains 61 carrying the cross driving bars 62 cannot be driven backwards for they would jam the last carton received by the conveyor 7. The one-way drive for shaft 58 just described obviates this difficulty and provides a means for adjusting the position of the driving bars 62 with respect to the cartons.

In Fig. 10 funnel 6 is illustrated in a somewhat modified form. Instead of providing flexible resilient fingers 67, as shown in Figs. 8 and 9, more or less rigid plates 160 and 161 are used, these plates being hinged at 162 to the end of table 1. The end fingers 163 are of similar construction. The bottom plates 161 and the end or side fingers 163 are provided with springs for urging them upwardly and inwardly respectively. One of these springs 164 coacts with a tail piece 165 of one of the bottom plates 161 as illustrated.

We claim:

1. In a machine of the class described the combination of means for supporting a carton on its side with its flaps open, a table upon which layers of articles are assembled one layer at a time, means acting periodically to lower the carton step by step to receive the layers one at a time, a funnel having its small end directed towards the carton, a plunger for pushing the layer on the table through the funnel into the carton, and means independent of said plunger for projecting the funnel into the carton in advance of the layer of articles and for withdrawing the funnel before the withdrawal of said plunger.

2. In a machine of the class described the combination of means for supporting a carton on its side with its flaps open, a table upon which layers of articles are assembled one layer at a time, means acting periodically to lower the carton step by step to receive the layers one at a time, a funnel, means for reciprocating the funnel to project it into the carton to assist in placing therein the layer on the table and to withdraw it from the carton to permit the deposited layer to descend with the carton, said funnel having top and bottom walls each consisting of a plurality of yieldable fingers adapted to be forced outwardly by the passage of the layer therethrough, a plunger, and means for actuating the plunger after the funnel has entered the carton to push the layer through the funnel into the carton.

3. In a machine of the class described the combination of means for supporting a carton on its side with its flaps open, a table upon which layers of articles are assembled one layer at a time, means acting periodically to lower the carton step by step to receive the layers one at a time, a funnel, means for reciprocating the funnel to project it into the carton to assist in placing therein the layer on the table and to withdraw it from the carton to permit the deposited layer to descend with the carton, a plunger, and means for actuating the plunger after the funnel has entered the carton to push the layer through the funnel into the carton.

4. In a machine of the class described, the combination of means for supporting a carton on its side with its flaps open, a table upon which layers of articles are assembled one layer at a time, a plunger for shifting the layer on the table into the carton, and a sizing device mounted in the path of said layer as it passes into the carton, whereby the articles are compressed to predetermined dimensions as they are packed into the carton, a funnel for guiding the layer into the carton, and means for moving said funnel into and out of the carton in timed relation to the operation of said plunger.

5. In a machine of the class described the combination of means for supporting a carton on its side with its flaps open, a table for receiving one at a time layers of articles to be packed in the carton, a sizing device mounted near the end of said table, a funnel mounted beyond said sizing device, and a plunger for pushing the layer on the table through said sizing device and funnel into the carton, an means for reciprocating said funnel in timed relation to the operation of said plunger.

6. In a machine of the class described, the combination of means for supporting a carton on its side with its flaps open, a table for receiving one at a time layers of articles to be packed in the carton, means acting periodically to lower the carton step by step as the layers are placed therein, said table having mounted at its discharge end a sizing device and a funnel, a plunger for pushing the layer on the table through said device and funnel into the carton, and means for reciprocating said table in timed relation to the operation of said plunger.

7. In a machine of the class described, the combination of means for supporting a carton on its side with its flaps open, a table for receiving one at a time layers of articles to be packed in the carton, means acting periodically to lower the carton step by step to receive the layers one at a time, a funnel mounted at the discharge end of said table, a plunger for pushing the layer of articles onto the table through said funnel and into the carton, means for assembling a layer of articles on said table, and means for moving said table forward so as to project said funnel into the carton after said package assembling means has operated to deliver a layer of articles to the table and to retract said table before the withdrawal of said plunger so as to disengage the funnel from a deposited layer and permit said layer to descend with the carton.

8. In a machine of the class described the combination of a table for supporting a layer of articles to be packed in a carton, a plunger for shifting the layer from the table into the carton, a continuously running conveyor for delivering articles in end-to-end contact to said table, a movable stop for engaging the articles on the conveyor, and means for actuating said stop to allow articles to be fed onto the table from the conveyor and thereafter to cause said stop to engage the articles on the conveyor to push them back in spaced relation to the articles fed onto the table so as to permit the plunger to shift said layer into the carton, and separating means actuated prior to the engagement of said stop with the last article on the conveyor to free the adjacent article on the table from the same should said articles tend to adhere to one another.

9. In a machine of the class described the combination of a table for supporting a layer of articles to be packed in a carton, a plunger for shifting the layer from the table into the carton, a continuously running conveyor for delivering articles in end-to-end contact to said table, a movable stop for engaging the articles on the conveyor, means for actuating said stop to allow articles to be fed onto the table from the conveyor and thereafter to cause said stop to engage the articles on the conveyor to push them back in spaced relation to the articles fed onto the table so as to permit the plunger to shift said layer

into the carton, and a striker mounted in proximity to said movable stop and actuated by a resilient connection thereto so as to permit said stop to push back the articles on the conveyor after the engagement of the striker with the adjacent article on the table to dislodge the same from the last article on the conveyor.

10. In a machine of the class described the combination of means for supporting a carton on its side with its flaps open, a table upon which articles are assembled to be packed in the carton, a plunger for pushing the articles on the table into the carton, a reciprocating carriage for said plunger, means for yieldingly connecting the plunger to the carriage, and means actuated by the plunger when the pressure thereon exceeds a predetermined amount for stopping the machine.

11. In a machine of the class described the combination of a vertically slidable carriage for supporting a carton, packing means for delivering articles into the carton one layer at a time, and means for lowering said carriage step by step to permit the carton to receive its several layers, said means comprising a vertically reciprocating shifter, means for reciprocating the same once for each operation of the packing mechanism to insert a layer in the carton, mechanically actuated means for connecting the shifter with said carriage near the upper portion of its stroke and for disconnecting the same near the lower portion of its stroke so as to lower the carriage from one level to the next for each reciprocation of said shifter, and means for supporting the carriage at the several levels.

12. In a machine of the class described the combination of a carriage for supporting a carton on its side, a packing mechanism for advancing articles horizontally one layer at a time into said carton, and means for lowering said carriage step by step to receive the several layers comprising a plurality of collars on said carriage corresponding in number to the several levels at which it is desired to support the carton, a stationary dog for engaging said collars to support the carriage, a vertically reciprocating member carrying a pawl to engage said collars and lower the carriage from one level to another, and means for controlling the operation of said dog and said pawl so as to cause the weight of the carriage to be shifted first from the dog to the pawl, and then back to the dog after the carriage has been lowered to the next level.

13. In a machine of the class described the combination of a vertically slidable carriage for supporting a carton at a plurality of levels, packing means for delivering articles into the carton one layer at a time, means for lowering said carriage step-by-step to permit the carton to receive its several layers, and means for elevating the carriage in a continuous movement from its lowermost position to its uppermost position, said means comprising a rack secured to said carriage, a gear coacting with said rack, a continuously rotating shaft, a clutch for connecting said gear with said shaft, means for throwing in said clutch when the carriage reaches its lowermost position, and means for throwing out the clutch when it reaches its uppermost position.

14. In a machine of the class described, the combination of means for supporting a carton on its side with its flaps open, a table upon which layers of articles are assembled one layer at a time, means acting periodically to lower the carton step by step to receive the layers one at a time, a funnel whose walls comprise a plurality of yieldable fingers, means for reciprocating said funnel to cause said fingers to be moved into the carton so that the lower wall of said funnel serves as a slide conveyor for the layer of articles to convey the same to position in the carton, a plunger, means for advancing said plunger to push the layer through the funnel into the carton, means for withdrawing the funnel from the carton, and means for subsequently withdrawing the plunger.

15. In a machine of the class described the combination of a table for supporting a layer of articles to be packed into a carton, a plunger for shifting the layer from the table into the carton, a continuously running conveyor for delivering articles in end-to-end contact to said table, a gate member disposed above said conveyor and swingable about a horizontal axis to arrest the movement of the articles on the conveyor by contact with their forward ends, and means for swinging said gate member upwardly to allow articles to be fed onto said table by the conveyor and thereafter to swing said gate member downwardly against the forward end of an article on the conveyor and push it back together with those behind it to space the articles on the conveyor from those on the table so as to permit the plunger to shift the layer thus assembled into the carton.

16. In a machine of the class described the combination of means for supporting a carton on its side with its flaps open, a table upon which layers of articles are assembled one layer at a time for insertion into the carton, means acting periodically to lower the carton step by step to receive the layers one at a time, a plunger, a funnel having its small end directed towards the carton, means independent of said plunger for projecting the funnel into the carton, means for actuating the plunger after the funnel has entered the carton to push the layer of articles through the funnel into the carton, and means for withdrawing the funnel in timed relation to the withdrawal of the plunger so as to cause the plunger to prevent the articles from being withdrawn by the funnel.

17. In a machine of the class described, the combination of means for supporting a carton on its side with its flaps open, a table adjacent said carton, means for assembling on the table a layer of articles to be packed, a plunger for shifting the layer of articles on the table into the carton, and a sizing device comprising a roll mounted in spaced parallel relation to said table to act upon the upper side of said layer of articles, and two spaced rolls mounted to act upon the ends of said layer as the layer is moved into the carton by the plunger.

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