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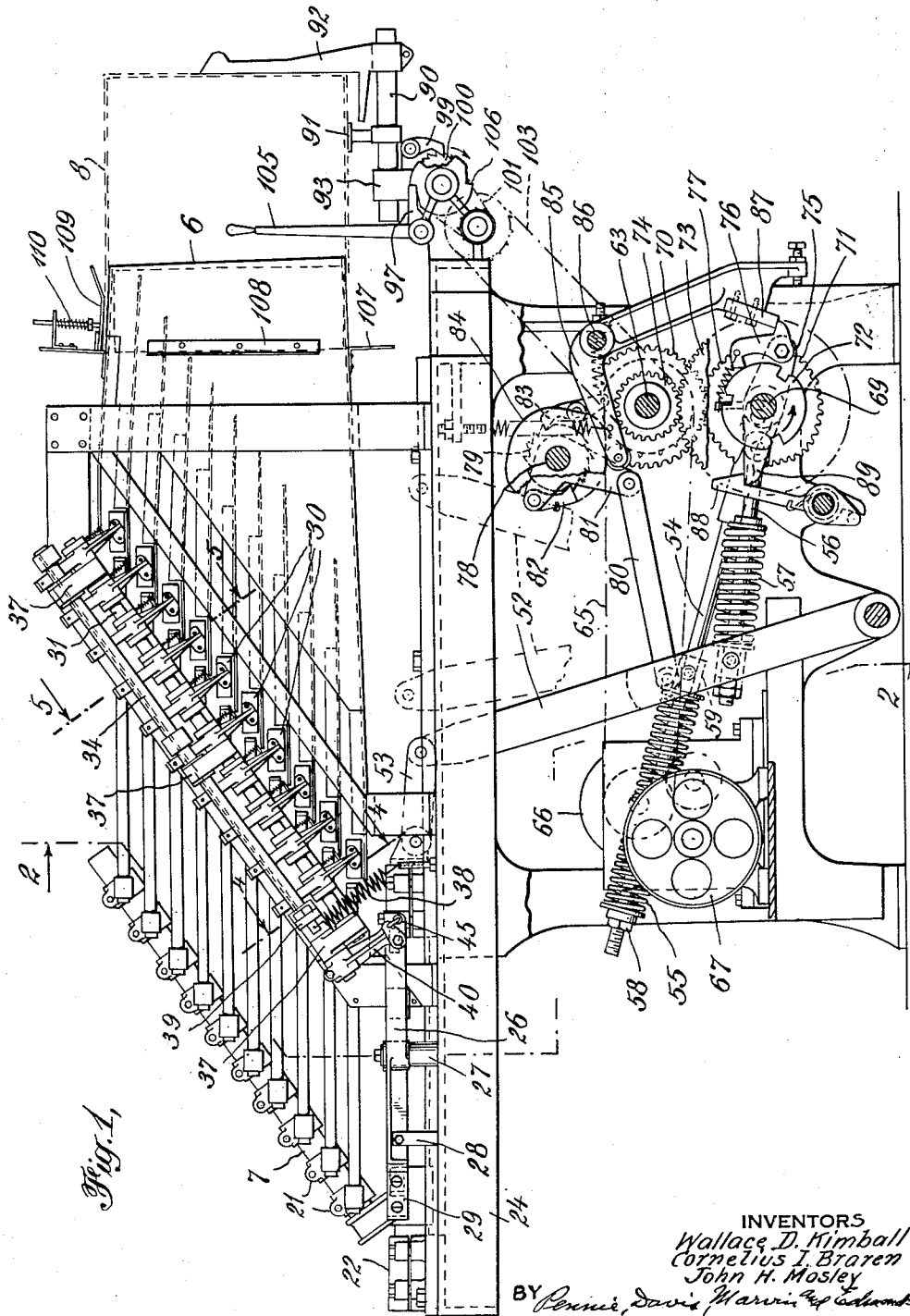
W. D. KIMBALL ET AL

2,148,820

CASE PACKING MACHINE

Filed Nov. 28, 1936

4 Sheets-Sheet 1



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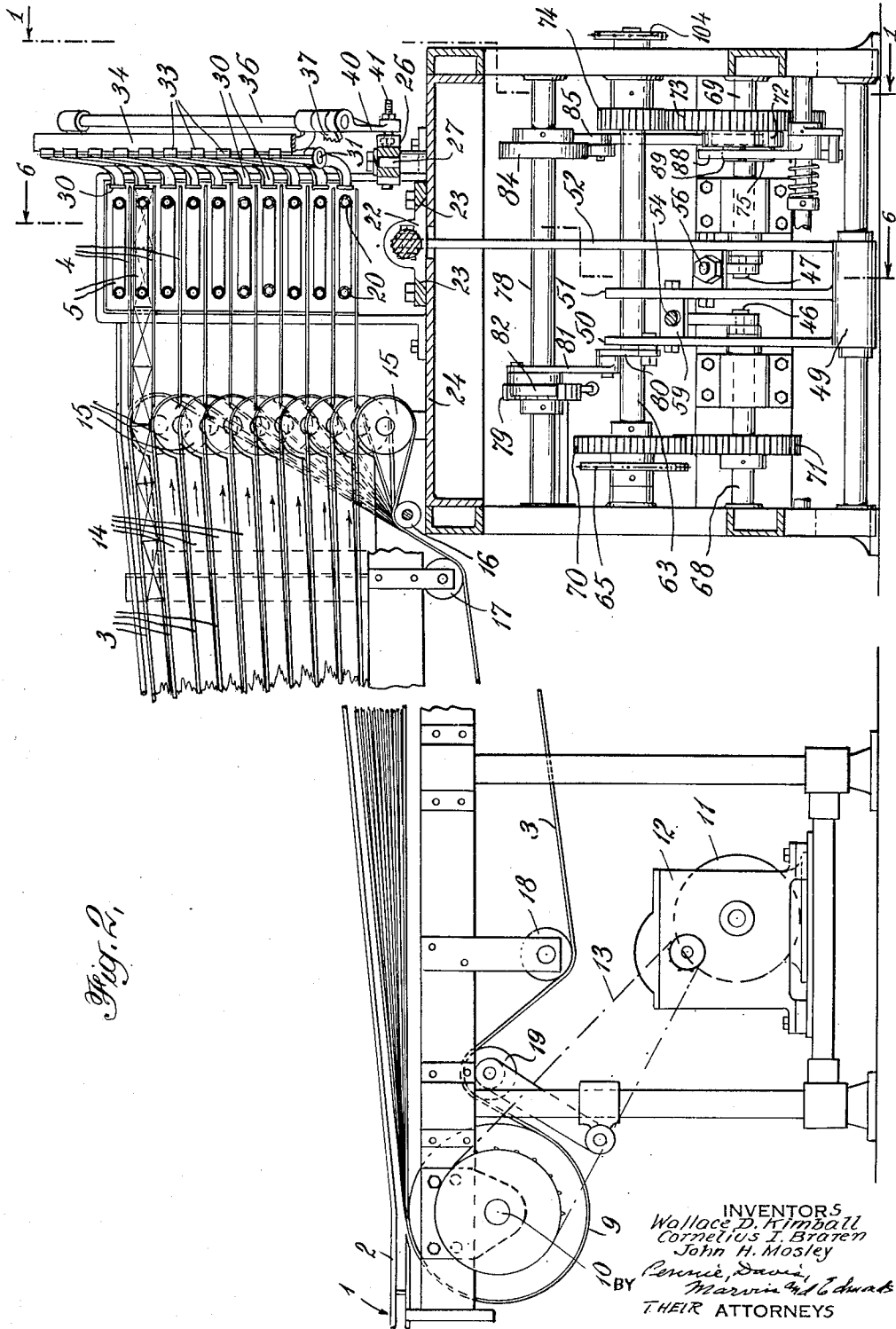
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Fig. 3,

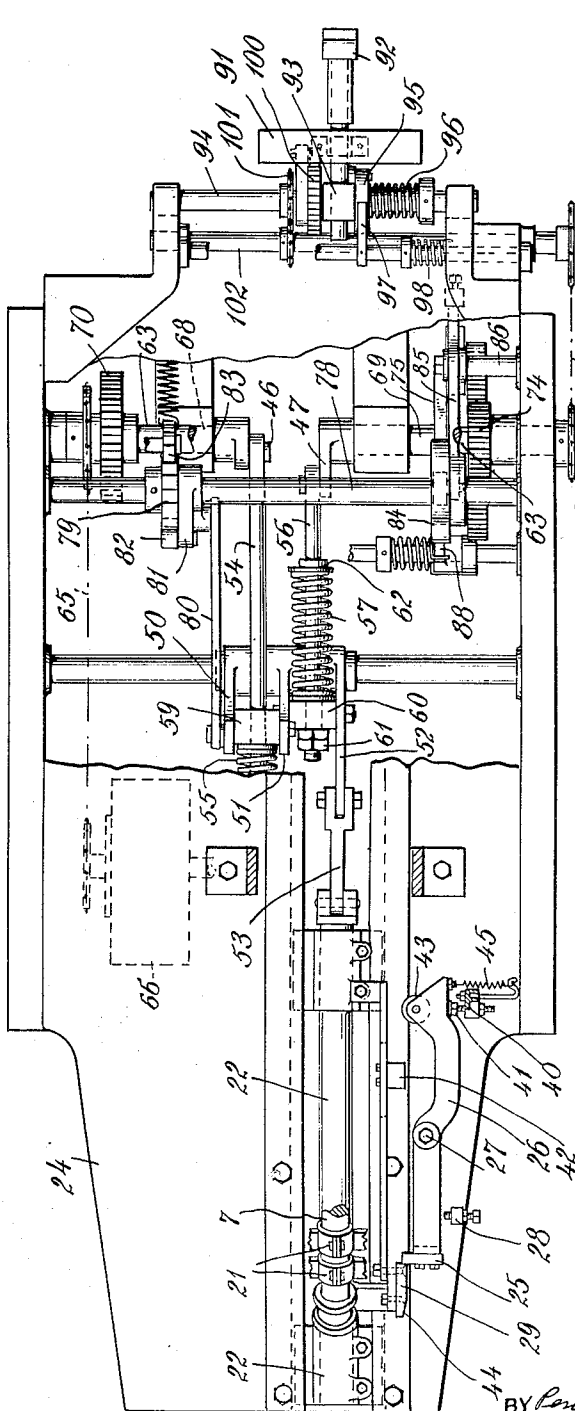


Fig. 5,

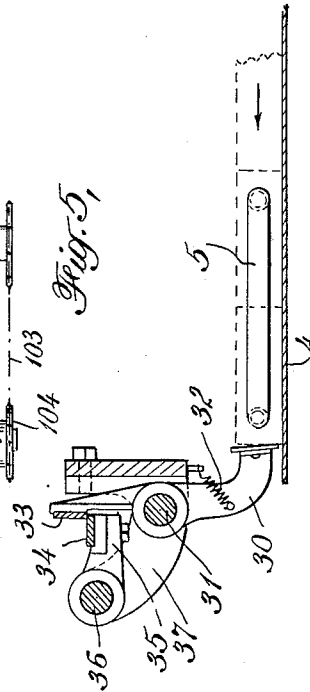
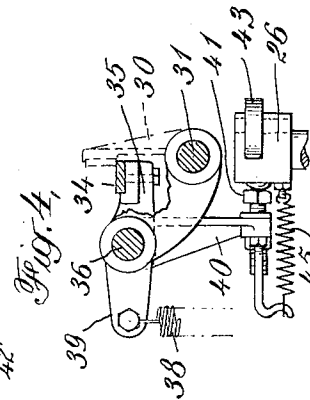


Fig. 4,



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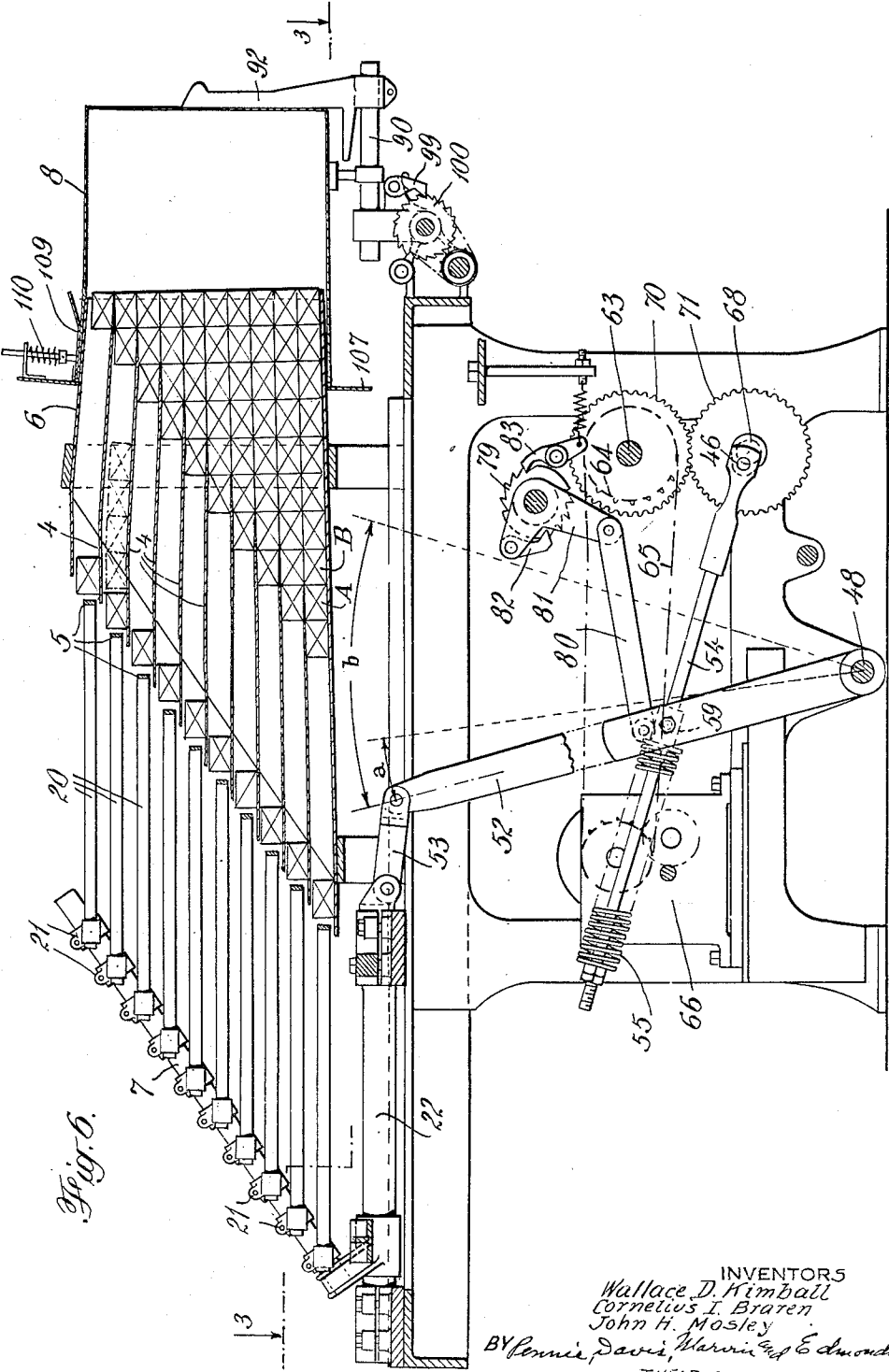
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CASE PACKING MACHINE

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## UNITED STATES PATENT OFFICE

2,148,820

## CASE PACKING MACHINE

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Application November 28, 1936, Serial No. 113,180

21 Claims. (Cl. 226—14)

This invention relates to machines for packing articles in cartons or other containers, and is intended particularly for the packing of rectangular articles such as cakes of soap, packages of flour, cereals and the like.

The object of the present invention is to provide a packing machine for packing such articles of improved construction, whereby a greater number of articles can be packed in a given period of time. It is also the aim of the invention to simplify the construction of packing machines, reducing the number of moving parts and providing an arrangement and construction of parts which is more economical to maintain and to manufacture than is the case with machines now in use for packing rectangular articles.

The invention will be understood from the consideration of the accompanying drawings which illustrate by way of example one embodiment of the invention.

In these drawings:

Fig. 1 is a view of the machine in front side elevation with the front frame members broken away and the parts shown in section on line 1—1 of Fig. 2 looking in the direction of the arrows;

Fig. 2 is a view partly in elevation and partly in transverse vertical section taken on the broken line 2—2 of Fig. 1;

Fig. 3 is a view partly in plan and partly in horizontal section taken on broken line 3—3 of Fig. 6, the table of the machine being broken away to show the packing pusher operating cranks below;

Figs. 4 and 5 are detailed sectional views taken on lines 4—4 and 5—5 respectively of Fig. 1 and showing the construction of the pusher releasing mechanism; and

Fig. 6 is a view in vertical longitudinal section taken on line 6—6 of Fig. 2.

Before describing the machine in detail, the general scheme of operation in placing the articles in the carton, or other shipping container, will be briefly set forth.

The articles are brought to the machine by a conveyor 1 which delivers them in rows separated by guide bars 2 to a plurality of differently inclined conveyor belts 3 which convey the articles to a plurality of superposed platforms 4 in front of packing plungers or pushers 5. In the machine shown for illustration, the shipping carton 6 is adapted to hold 100 articles arranged, when the carton is in its upright position, in five layers of 20 articles each. When the carton is on its side in packing position, as shown in Figs. 1 and 6, each of these layers comprises two vertical

rows of 10 articles each, the articles resting on their wide side faces and being placed end to end. Hence, the platforms 4 and the pushers 5 are of appropriate width to accommodate two articles lying end to end.

As may be seen in Figs. 1 and 6, the packing platforms 4 are all of equal length, but are arranged in staggered or stepped relation from the bottom to the top of a funnel 6 within which they are mounted. The conveyor belts 3 deliver the articles at the left hand ends of each of these stepped platforms directly in front of the pushers 5 which are also arranged in stepped formation and mounted upon a common supporting bar 7 by means of which they are reciprocated in unison.

The mechanism hereinafter to be described for operating the pushers 5 causes them to make a plurality of short pushes or strokes followed by one long push or stroke. Each short stroke of the pushers causes the articles in front of the pushers, and shown in full lines in Fig. 6, to be advanced to the dotted positions, or in other words, a little more than the width of one article so that they will clear the paths of the next articles advanced in front of the pushers by the belts 3. The following short strokes of the pushers position successive articles on each of the stepped platforms 4 until the platforms contain one oblique or stepped tier less than a full charge of articles.

The long stroke of the pushers now occurs and this serves to position the last oblique or stepped tier of articles on the platforms 4 and then to move the thus assembled articles off of the right hand ends of the platforms 4 into contact with the triangular mass of articles shown in full lines at the right hand portion of Fig. 6 and then moves the charge of articles thus formed into the carton 8. The machine is "primed" with the triangular mass of articles just referred to, or in other words, these articles are placed in the machine by hand before operation is commenced. The charge comprises the first five complete vertical tiers nearest the carton and thus is formed partly by the triangular mass of articles just referred to and partly by the five oblique tiers of articles advanced by the stepped plungers. When the charge is deposited in the carton a triangular mass of articles is left within the funnel 6 similar to the original priming charge. It will be understood that during the short strokes of the pushers the successive oblique tiers assembled on platforms 4 also form incomplete vertical tiers of articles, and when the

long stroke occurs these incomplete vertical tiers are consolidated with the incomplete vertical tiers of the priming charge to form complete tiers to be received in the carton.

5 In the machine illustrated, inasmuch as each tier contains 10 articles, there are 10 platforms 4, and as there are five tiers to be placed in each case to form a charge, the pushers 5 make four short strokes, assembling four articles on

10 each of the platforms 4, and follow these with the one long stroke which adds the fifth article to each of the platforms and then moves the articles forward and discharges five double tiers of articles into the carton.

15 The bottom of the funnel 6 is upwardly inclined somewhat in the direction of travel of the articles. As the articles move off the right hand ends of the stepped platforms 4 they drop the thickness of the platform into contact with the next lower

20 article in the tier. Although it is recognized that packing machines can be operated at far less expense than is involved in the employment of hand labor, nevertheless there are still articles of merchandise which are packed in their ship-

25 ping containers by hand where the articles are wrapped in ornamental wrappers, or wrappers printed with advertising matter, or otherwise finished in the manner such that too much handling, particularly the rubbing of one pack-

30 age on another, tends to deface the outer surface of the wrapper and render the package less salable. In the present machine the platforms 4 discharge their respective articles at a point to the right of the center line of each tier so that

35 all rubbing of one article upon its neighbor below is prevented. This is readily accomplished by staggering the right hand ends of the platforms 4 so that instead of bringing the articles in a given vertical tier into contact simultaneously,

40 the vertical tiers of articles in contact with one another are built up progressively.

Thus, for example, referring to the triangular mass of articles shown in full lines at the right hand portion of Fig. 6, the vertical tier commences to form at A where an article from the

45 lowermost platform 4 is being discharged upon the article below it which rests upon the bottom of funnel 6. At B a third article is added to the tier, and so on, until the complete full-height tier is formed just as it enters the carton.

50 The mechanism for carrying out the operation as above described is shown in the various figures of the drawings and will now be referred to in detail:

55 The cartons are fed by conveyor 1 from the previous operation, such for example, as a labeling machine or wrapping machine. Conveyor 1 is continuously driven, as are also the series of belts 3. Belts 3 are trained over a common pulley 9, or a plurality of pulleys, fixed upon a shaft 10

60 which is driven by means of a motor 11 through a reduction gearing 12 and a chain 13. The upper reaches or belts 3 are provided with supports 14 preferably made of wooden bars extending from the vicinity of driving pulleys 9 to the

65 pulleys 15 over which the belts are trained at their opposite ends. The belts leaving pulleys 15 pass over guide pulleys 16, 17 and 18 and an adjustable, or take up pulley 19, by means of which

70 the stretch of the belts may be taken up.

75 The pushers 5 each comprise a transverse bar at its front end to engage the packages, which is carried by two longitudinal bars or rods 20 secured at their rear ends to brackets 21 which are clamped upon the supporting bar 7. This

bar may conveniently be made sloping at the ends of the pushers 5 and at its lower end is securely fastened to a cross-head 22. This cross-head extends horizontally and is arranged to slide

5 in ways 23 which are mounted upon the bed or table 24 of the machine.

A short pusher stroke is produced by means of a continuously rotating crank which is resiliently connected to the cross-head by means of a spring. The cross-head and pushers do not, however, operate unless the required number of articles are

10 in position on the platforms 4 in front of the pushers, when a catch 25 which holds the cross-head against movement is released, allowing the pusher to move forward making a short pusher

15 stroke. So long as the catch holds the cross-head the rotation of the crank merely compresses the spring and the pusher remains stationary.

The catch 25 and its release mechanism is shown in Figs. 3, 1 and 2. The catch itself com-

20 prises a hardened steel plate mounted on the left-hand end of a catch lever 26 which is pivoted at 27 to the bed or table 24 of the machine. When the catch is released, lever 26 is rotated against an adjustable stop 28, thereby moving

25 catch plate 25 out of engagement with the end of hardened steel plate 29 mounted at the rear of cross-head 22, thus allowing the cross-head and pushers 5 to move toward the right and make a

30 short stroke.

The mechanism for releasing catch 25 is shown in Figs. 1 to 5, inclusive. Opposite the end of each of the belts 3 and at the right-hand side of each of the platforms 4 as viewed in Fig. 2,

35 is a latch member 30 which is arranged to be engaged by the articles delivered to the platforms by belts 3. These latch members 30 are pivoted upon a fixed sloping shaft 31 (Fig. 1). These latches are individually pivoted and held in position on shaft 31 by means of a pair of collars,

40 as shown in Fig. 1, and they are individually biased to the position shown in Fig. 5 by means of a small helical spring 32. In this position the latch plate 33 at the top of each latch member 30 engages a latch bar 34 which extends from

45 end to end of the latch assembly. This latch bar is supported on short arms 35 which are fixed to a latch rod 36 that is mounted for oscillation in brackets 37. The latch bar 34 is biased upwardly by means of a helical spring 38 which is attached at its lower end to the frame of the machine and

50 at its upper end to an arm 39 which is fixed to latch rod 36.

When the articles are delivered by belts 3 to the platforms 4 they engage the lower ends of the individual latch members 30, and when there are several articles extending back over the

55 platforms 4 onto the belts 3, as indicated for example on the second belt from the top in Fig. 2, to cause the friction between the articles on the belt to exert enough pressure against the articles on platform 4 to overcome the tension of spring

60 32, the latch 33 for that particular row of articles will be released from latch bar 34. When a similar condition obtains for each of the 10 rows of articles in front of the pushers 5, but not until then, all of the latches 33 will be released and

65 latch bar 34 will move upwardly under the tension of spring 38.

The oscillation of latch rod 36 which results causes an actuating arm 40 which is fixed to the lower end of latch rod 36 to move the right hand end of catch lever 26 (Fig. 3) inwardly by means of an adjustable contact 41 (Fig. 4) with this

70 lever. In this way, catch 25 is released allowing

75

the cross-head 22 and pushers 5 to move forward on a short stroke. As the cross-head nears the end of this short stroke, a projection 42 mounted on the cross-head engages a roller 43 at the right-hand end of catch lever 26, moving this lever outwardly and carrying with it the lower end of arm 40, thereby rocking latch rod 36 against spring 38 and resetting latch bar 34 beneath all of the 10 latches 33. This outward movement of the right-hand end of the catch lever 26 brings the left-hand end back into the path of catch plate 29 which has passed to the right of catch 25. In order to allow plate 29 to pass catch 25, on the return stroke of the cross-head, the rear end of plate 29 is provided with a cam surface 44 which forces the catch plate 25 outwardly, and to permit the consequent movement of catch lever 26, the right-hand end of this lever is connected to arm 40 by means of a spring 45.

The cranks for imparting the short and long strokes to the pushers are shown in several of the figures, particularly Fig. 3. The short crank is indicated by numeral 46 and the long crank by numeral 47. These cranks are connected to the cross-head 22 by a mechanism which may be described as follows:

Mounted on a fixed shaft 48 at the bottom of the machine and held in position thereon by a pair of collars is a hub member 49 to which are integrally secured three upwardly projecting parallel arms 50, 51, 52. Arm 52 extends upwardly into proximity to cross-head 22 and is connected thereto by means of a link 53. Arms 50 and 51 are of equal length and about half the length of arm 52 and they may, if desired, be tied together by a suitable rod at the top (not shown) in order to make a more rigid structure.

The short crank 46 is connected to the arm assembly between arms 50 and 51 by means of a long connecting rod 54 upon which is a long helical spring 55. The long crank 47 is connected between arms 51 and 52 to the arm assembly by means of a connecting rod 56 upon which is a shorter helical spring 57.

Connecting rod 54 of the short crank 46 transmits its motion to the arm assembly through the long helical spring 55, the outer or left-hand end of which, as viewed in Figs. 1 and 6, bears against a washer and nuts 58 which are threaded on the end of the rod. The inner or right-hand end of the spring bears against a block 59 which is pivotally mounted between arms 50 and 51 and which is provided with a bore by means of which connecting rod 54 is supported and through which it may slide, as spring 55 is compressed, and also during the long stroke of the pushers as will more clearly appear hereinafter.

The connecting rod 56 for the long crank 47 is connected to the arm assembly in a somewhat similar but slightly different manner. A block 60 similar to block 59 is pivotally mounted between arms 51 and 52. Connecting rod 56 passes through a bore in this block and is provided with a pair of nuts 61 threaded on the end of the rod and bearing directly against the outer face of the block. The drive of the arm assembly by rod 56 is thus a positive drive instead of driving the assembly through a spring, as does connecting rod 54. Spring 57 which is threaded on rod 56 bears at its left-hand end against block 60 and at its right-hand end against a collar 62 which is fixed to the rod. The purpose of this arrangement is to permit the arm assembly and

pushers to accomplish the short packing stroke, while crank 47 remains stationary.

It is important that the motion of the packing pushers both on the short and the long strokes be of such a nature as to avoid impact with the packages. If the motion of the pusher is such as to strike the packages a blow they are apt to rebound from the impact, and should this occur there is danger of the packages getting out of position and being damaged. The desired operation is to have the packages moved gently but speedily forward along the platforms and then in the carton. To accomplish this keeping the proper relation between the pusher and the packages at all times, and still cause the pushers to be moved by yielding pressure, the tripping mechanism is so arranged that the short stroke may be initiated at only one point in the cycle of operation of crank 46, namely, at the end of its back stroke, so that the pushers while driven forward by spring 55 are permitted to follow the motion of crank 46 which thereby controls the application of pressure to the pusher mechanism by spring 55 and controls the motion of the pushers and packages.

This is done by causing the continuously rotating short crank 46, at the extreme rear position of the crank (that is, its left-hand position, as viewed in Figs. 1, 3 and 6), to release the tension of spring 55 so that the pressure on latch 25 is reduced sufficiently for spring 38, acting through arm 40, to release latch 25 and permit the cross-head and pushers to move forward on a short stroke. In this way, although the packages in all of the 10 lines in front of the pushers may have tripped all their respective latches 30 so that latch bar 34 is released at some time before the short crank 46 reaches its extreme rear position, the stroke of the pushers cannot commence until such an extreme rear position is reached by the crank. In this way, the condition of the latch mechanism may be prepared to release the latch at any moment when there is a full charge of articles in front of each of the packing pushers, but the pusher stroke cannot commence until the crank 46 is in the right position to properly control the forward motion of the pusher.

The extent of the short stroke of the pushers is indicated by the arc *a* in Fig. 6 and the length of the long stroke of the pushers by the arc *b*. The first part of the long stroke of the pushers consists of a short stroke initiated in the manner previously described, the pushers being moved forward under the pressure of spring 55. The remainder of the long stroke, however, is caused by the positive drive of the arm assembly 50, 51, 52 by means of the long crank 47. The speeds and timing of the long and short stroke cranks are so coordinated that prior to the half way point of the last short stroke (the stroke which positions the last row of articles on the platforms and which constitutes the first portion of the long stroke), the long stroke mechanism is tripped and the connecting rod 56 of this mechanism travels sufficiently faster than the connecting rod 54 so that the one catches up with the other and causes the pusher to make a substantially continuous long stroke. For accomplishing this a one-revolution clutch and suitable timing mechanism is provided.

However, before describing this clutch and timing mechanism, the mechanism for driving both of the cranks will be briefly referred to. A shaft 63 is continuously driven so long as the machine is in operation by means of a sprocket 64 which is

connected by means of a chain 65 with a suitable speed reducing gear mechanism 66 to which is connected an electric motor 67.

Cranks 46 and 47 are carried by two short shafts 68 and 69, respectively, which are arranged substantially in alinement with one another below and parallel with shaft 63. Shaft 68 of short crank 46 is continuously driven from shaft 63 by means of gears 70 and 71. The one-revolution clutch above referred to is associated with shaft 69, and the continuously driven part of this clutch consists of a notched wheel 72 (Fig. 1) which is mounted alongside of and which rotates with a gear 73 which is driven by means of a pinion 74 on continuously rotating shaft 63.

Notched wheel 72 and gear 73 rotate loosely on shaft 69. In order to rotate shaft 69 and long crank 47, there is mounted adjacent notched wheel 72 a member 75 which is fixed to shaft 69. This member has a dog 76 pivoted to it at one end. This dog is biased by means of a spring 77 so as to be drawn into engagement with the notches of notched wheel 72 to cause member 75 and shaft 69 to be clutched to the continuously rotating notched wheel 72. The control of dog 76 by the timing mechanism about to be described causes shaft 69 to be rotated through a single complete revolution at the proper time to produce the latter and larger portion of the long stroke of the pushers.

The timing mechanism is carried by a shaft 78 mounted above shaft 63, and having toward one end, as viewed in Fig. 2, a ratchet wheel 79 which is fixed to the shaft. This ratchet wheel is actuated by the reciprocation of the arm assembly 50, 51, 52 which operates the pushers, and this actuating mechanism comprises a link 80 attached to arm 50 at one end and to a bell crank lever 81 at its opposite end. The bell crank lever oscillates loosely on shaft 78 and its upper arm carries driving dog 82 which is spring pressed into engagement with the teeth of ratchet 79. A spring biased holding dog 83 is also provided for preventing backward rotation of the ratchet.

For each short stroke of the pushers and arm assembly 50, 51, 52, ratchet wheel 79 is moved a distance equal to one of the short teeth shown in Fig. 1, whereas during a long stroke of the pushers, the ratchet is rotated a distance equal to one of the long teeth of the ratchet wheel. The ratchet wheel is rotated through a half revolution for each packing cycle. It will, therefore, be noted that on each half of the ratchet wheel 79 there are five teeth corresponding to the five columns of articles (as viewed in Fig. 6) which make up a full charge for each carton. The four short teeth correspond to the four short strokes of the plunger, and the one long tooth to the long stroke which accomplishes the positioning of the fifth row of articles on the platforms and then in a continuous uninterrupted movement forces the complete charge of five rows or columns resting on the platforms into the carton.

Near the opposite end of the shaft 63 is a two-lobe cam 84 which is rotated by the ratchet mechanism just described. This cam engages a roller carried by an L-shaped clutch control arm 85 and causes this arm to be oscillated about its pivot 86 at the proper time to cause the long stroke crank to commence rotation. The part of this arm which controls the one-revolution clutch is the lower right-hand end which is provided with a releasing and stopping bar which is adapted to engage the tail of the dog 76 of the one-revolution

clutch. The two lobes of the cam 84 correspond to the two sets of teeth on the ratchet 79, and these lobes are angularly positioned with respect to the fronts of the long teeth of the ratchet so that shortly after the fifth short stroke of the pushers has been initiated by the tripping mechanism above described including catch 25, one of the lobes of cam 84 actuates clutch control arm 85 so as to move bar 87 out of engagement with the tail of pawl 76. When the next notch in notched wheel 72 comes beneath the head of pawl 76, the head of the pawl drops into the notch and rotation of shaft 69 and long crank 47 commences. As indicated above, the angular position of the notches in wheel 72, the relative angular positions of the two cranks 46 and 47, and cam 84 and ratchet 79 and the speed of the two cranks are so coordinated that prior to the half way point of the fifth short stroke of the pushers, the dog 76 of the one-revolution clutch is released and the connecting rod 56 catches up with and picks up the arm assembly 50, 51, 52 at the point where the stroke has reached approximately its maximum velocity and continues the motion of the pushers to produce a long stroke and move the charge of articles into the carton.

Quickly after the tail of dog 76 is released by the bar 87 of the clutch control arm 85, this bar is returned into the path of the tail of the dog, and upon the completion of one revolution, reengagement of these two parts occurs, thereby pulling the head of the dog out of the notch of rotating wheel 72 and causing the rotation of the shaft 69 and crank 47 to cease. The forward rotation of shaft 69 is stopped abruptly by the engagement of bar 87 with the tail of the pawl, while rebound in the opposite direction is prevented by means of a second dog 88 which is always biased by means of a suitable spring into the path of a projection 89 on member 75 opposite the portion to which dog 76 is pivoted. As the revolution of shaft 69 is completed this second dog 88 is pushed outward by the forward cam surface of projection 89 and then springs into engagement with its rear surface at the very end of the revolution. In this way the long crank 47 is stopped in the same angular position at each revolution, thereby causing the motion of the pushers and cross-head 22 to cease at their extreme rearward position.

As indicated above, the short strokes of the pushers are made under the action of spring 55, the motion of which is controlled by the short crank 46. That is to say, the spring and not the crank furnishes the power for moving the pushers on their forward short strokes, but this motion is under the control of the crank. That is to say, in making their forward short strokes, the pushers act under the influence of the spring and follow the crank. Hence, the motion of the pushers during this stroke is substantially pure harmonic motion, and the articles are engaged smoothly and gently by the pushers in such a way as to prevent the articles from bounding off of the faces of the pushers and becoming dislodged from their proper position and possibly entangled with parts of the machine. This same thing is true of the first part of the long stroke of the pushers.

The cartons 8, after receiving the charge of articles in a horizontal position, as shown in Figs. 1 and 6, are returned to their horizontal position and placed upon a suitable conveyor by means of which they are taken to the sealing machine. The "drop off" mechanism for supporting



the cartons and returning them to the horizontal position comprises a bar 90 which is provided with a support 91 for the side of the carton and support 92 for the bottom of the carton. This bar is carried by member 93 which is mounted for rotation on shaft 94. Adjacent member 93 on one side is a disc 95 which is fixed to member 93 and to which one end of a torsional spring 96 is attached. The opposite end of this spring is fixed to the frame of the machine and the spring consequently tends to rotate the carton supports 90, 91, 92 into the upper or load receiving position which is determined by means of a dog 97 which engages a notch in disc 95. This dog is mounted on a horizontal shaft and biased against the disc by means of a suitable spring 98.

When a charge of articles is forced into the carton by the packing mechanism, the weight of these articles overbalances the torsion of spring 96 and tends to make the carton and its supporting mechanism rotate against the action of this spring toward the upright position. A too rapid movement or falling of the carton toward his position is prevented and its rate of downward movement is controlled by the engagement of a pawl 99 with one of the teeth of a continuously rotating ratchet 100 which is driven at a definite speed by a suitable connection with the driving mechanism of the machine. This ratchet is fixed to shaft 94 which is driven by means of a chain 101 from a sprocket on a parallel shaft 102. Shaft 102 in turn is driven by a chain connection 103 and a sprocket 104 on one end of the continuously driven shaft 63.

By means of our present invention, we have provided a packing machine which is capable of operation at unusually high speed so that a greater number of articles may be packaged per hour. At the same time the arrangement of the various parts of the machine is such that the machine is capable of continuous operation over long periods of time without being shut down, and substantially without attention aside from lubrication and the placing of the cartons upon the carton support. As the cartons are usually received "in the flat" from the carton manufacturer, it is necessary that they be unfolded and their flaps placed in proper position before the cartons are ready to receive their charge of articles. It is customary to do this unfolding of the cartons by hand, and the same operator which does that work can conveniently place the cartons upon the carton support. After this has been done with the support 91, 92 in the lower position, the operator then moves a handle 105 which releases pawl 97 from a shoulder 106 behind which the pawl dropped when the carton was lowered at the previous filling operation. The release of this pawl permits spring 96 to raise the new unfilled carton into position with its mouth over the end of funnel 6. The lower and side flaps of the carton may be received against stops 107 and 108, while the upper flap of the carton is preferably pushed beneath a friction flap holding plate 109 which is flared upwardly at its outer edge to facilitate the entrance of the flap beneath the plate. This plate is spring pressed downwardly by a pair of springs 110 located near the opposite ends of the plate, one of which is shown in the drawings.

Not only has a high packing speed been obtained without sacrificing ruggedness of construction, but in addition the present machine has fewer moving parts than the prior machines so that the machine is desirable from the stand-

point of the user as well as from the standpoint of the operator in enabling the machine to be made at lower manufacturing cost.

We claim:

1. In a machine for packing articles, the combination of a plurality of superposed shelves for receiving the articles, means for delivering articles thereto in echelon arrangement, a plurality of pushers mounted for simultaneous movement to advance the articles along said shelves in echelon arrangement towards the carton to be packed, means for imparting a plurality of short strokes to said pushers to collect packages on the shelves sufficient to form a charge for the carton, and means for thereafter imparting a long stroke to the pushers to fill the carton.

2. In a machine for packaging articles, supporting means upon which a charge of articles is adapted to be collected, means for feeding articles to said support, a pusher for advancing articles along said support toward the carton to be packed, mechanism for imparting to the pusher a plurality of successive short strokes to assemble articles upon the support, mechanism for imparting a long stroke to said pusher to advance articles from the support into a carton to be filled, means actuated by the operation of the short stroke mechanism for controlling the long stroke mechanism, and means actuated by the articles upon said support for controlling the short stroke mechanism.

3. In a machine for packaging articles, a plurality of shelves for receiving the articles and conveying them to a carton to be packed, pushers for advancing the articles along said shelves, means for actuating said pushers, a catch for holding said pushers against the action of the actuating means, conveying means for delivering articles onto said shelves in front of the pushers, and means controlled by the articles in front of said pushers for releasing said catch comprising a plurality of latch members adapted to be actuated by the articles in front of each pusher, a latch associated with each of said latch members, and a common latch bar adapted to be held by said latches, and means for actuating said latch bar and said catch upon the release of the latch bar by all of the latches.

4. In a machine for packaging articles, a support on which the articles are assembled, a plurality of conveyors for feeding the articles to the support, the conveyors being arranged to deliver the articles to the support at points staggered with respect to one another both vertically and horizontally, the number of conveyors corresponding to the number of horizontal layers of articles in the completed package, pushers for advancing the articles on the support in echelon arrangement, means for imparting a plurality of short strokes to the pushers to assemble articles on the support, and means for imparting a long stroke thereto to push a charge of articles into a carton.

5. In a machine for packaging articles, a support on which the articles are assembled, a plurality of conveyors for feeding the articles to the support, the conveyors being arranged to deliver the articles to the support at points displaced from each other both vertically and horizontally, the number of conveyors corresponding to the number of horizontal layers of articles in the completed package, pushers for advancing the articles on the support in echelon arrangement, means for imparting a plurality of short strokes to said pushers to assemble articles on the sup-

port, and means for imparting a long stroke thereto to push a charge of articles into a carton.

6. In a machine for packaging articles, a support on which the articles are assembled, a plurality of conveyors for feeding the articles to the support, the conveyors being arranged to deliver the articles to the support at points spaced from each other vertically and staggered with respect to each other horizontally, the number of conveyors corresponding to the number of horizontal layers of articles in the completed package, pushers for advancing the articles on the support in echelon arrangement, means for imparting a plurality of short strokes to the pushers to assemble articles on the support, and means for imparting a long stroke thereto to push a charge of articles into a carton.

7. In a machine for packaging articles, a support on which the articles are assembled, said support having a priming charge thereon, means for feeding articles to said support in successive oblique tiers, a plurality of pushers mounted upon a common carriage and arranged in stepped formation for engaging the articles on the support, means for imparting a plurality of short strokes to the pushers to cause the articles to be advanced step-by-step in echelon arrangement to assemble articles on the support, and means for imparting a long stroke thereto to consolidate the assembled articles with the priming charge to form a carton charge comprising a plurality of vertical tiers and push the charge into a carton.

8. In a machine for packaging articles, a support on which the articles are assembled, said support having a priming charge thereon, means for feeding the articles to the support in a plurality of horizontal lines arranged obliquely with respect to each other, a plurality of pushers mounted upon a common carriage and arranged in stepped formation for engaging the articles on the support, means for imparting a plurality of short strokes to the pushers to advance said horizontal lines of articles in echelon arrangement to assemble articles on the support, and means for imparting a long stroke to the pushers to consolidate the assembled articles with the priming charge to form a carton charge comprising a plurality of vertical tiers and push them into a carton.

9. In a machine for packaging articles, a support on which the articles are assembled, a plurality of conveyors for feeding the articles to the support, the conveyors being arranged to deliver the articles to the support at points staggered with respect to one another both vertically and horizontally, the number of conveyors corresponding to the number of horizontal layers of articles in the completed package, pushers for engaging the articles on the support and advancing them in echelon arrangement, a continuously reciprocating driving member for imparting short strokes to the pushers to assemble articles on the support, means operable on the presence of a predetermined number of articles at each of said points of delivery to the support for connecting the pushers with said driving member, mechanism for imparting a long stroke to the pushers including a one-revolution clutch and means for tripping the same upon the assembly of a predetermined number of articles to impart a long stroke to the pushers and move a charge of articles into the carton.

10. In a machine for packaging articles, supporting means upon which the articles are assembled, means for feeding articles to the sup-

porting means, a pusher for advancing articles on the support toward the carton to be packed, mechanism for imparting to the pusher a plurality of short strokes to assemble articles on the support, counting means for counting the number of strokes of the pusher, mechanism for imparting a long stroke to the pusher to advance articles from the support into a carton to be filled, and means actuated by the counting mechanism for initiating the operation of the long stroke mechanism.

11. In a machine for packaging articles, supporting means upon which the articles are assembled, means for feeding articles to the supporting means, a pusher for advancing articles on the support toward the carton to be packed, mechanism for imparting to the pusher a plurality of short strokes to assemble articles on the support, counting means for registering the number of strokes of the pusher, mechanism for imparting a long stroke to the pusher to advance articles from the support into a carton to be filled, said mechanism including a one-revolution clutch, and means actuated by the counting mechanism for tripping the one-revolution clutch and causing the long stroke to take place.

12. In a machine for packaging articles, a support upon which the articles are assembled, a plurality of pushers mounted upon a common carriage for advancing the articles on the support toward the cartons to be packed, continuously operated means for reciprocating the pushers, conveying means for delivering articles in front of each pusher, a catch for holding the pushers against the action of the reciprocating means, said catch being prepared for release by the presence of a predetermined number of articles in front of each of said pushers and said catch being held against release by means releasable only at one predetermined point in the cycle of operation of the pusher reciprocating means.

13. In a machine for packaging articles, a support on which the articles are assembled having a priming charge of articles thereon, a plurality of conveyors for feeding articles to the support, the conveyors being arranged to deliver the articles to the support at points staggered with respect to one another both vertically and horizontally, the number of conveyors corresponding to the number of horizontal layers of articles in the completed package, a plurality of pushers mounted upon a common carriage and arranged in stepped formation for engaging the articles on the support, means for imparting a plurality of short strokes to said pushers to advance the articles step-by-step in echelon arrangement on the support and collect thereon an assemblage of articles sufficient to form a charge for the carton to be packed, and means for imparting a long stroke to the pushers to bring said articles into contact with the articles of the priming charge on the support thereby forming a plurality of vertical tiers of articles and advancing into the carton a number of tiers equal to the total number of strokes imparted to the pusher, the length of said long stroke being greater than the width of the charge so as to leave a clearance between the priming charge remaining on the support and the assemblage of articles for the next charge.

14. In a machine for packaging articles, a support on which articles are assembled, means for delivering articles to the support in a plurality of rows, pushers for engaging the articles

on the support and moving them towards a carton to be packed, means for supporting said carton, a continuously reciprocating driving member for imparting short strokes to the pushers to assemble articles on the support, means operable on the presence of a predetermined number of articles at each of said points of delivery to the support for connecting the pushers with said driving member, mechanism for imparting a long stroke to the pushers including a one-revolution clutch and means for tripping the same upon the assembly of a predetermined number of articles on the support to impart a long stroke to the pushers and move a charge of articles into the carton.

15. In a machine for packaging articles, a support on which the articles are assembled, a plurality of conveyors for feeding the articles to the support, the conveyors being arranged to deliver the articles to the support at points staggered with respect to one another both vertically and horizontally, the number of conveyors corresponding to the number of horizontal layers of articles in the completed package, pushers for engaging the articles on the support and advancing them in echelon arrangement, a continuously reciprocating driving member for imparting short strokes to the pushers to assemble articles on the support, means operable on the presence of a predetermined number of articles at each of said points of delivery to the support for connecting the pushers with said driving member, mechanism for imparting a long stroke to the pushers, and means for setting said mechanism in operation upon the assembly of a predetermined number of articles on the support to impart a long stroke to the pusher, and moving a charge of articles into a carton.

16. In a machine for packaging articles, a support on which articles are assembled, means for delivering articles to the support in a plurality of rows, pushers for engaging the articles on the support and moving them towards a carton to be packed, means for supporting said carton, a continuously reciprocating driving member for imparting short strokes to the pushers to assemble articles on the support, means operable on the presence of a predetermined number of articles at each of said points of delivery to the support for connecting the pushers with said driving member, mechanism for imparting a long stroke to the pushers, and means for setting said mechanism in operation upon the assembly of a predetermined number of articles on the support to impart a long stroke to the pushers and move a charge of articles into the carton.

17. In a machine for packaging articles, a support on which the articles are assembled, a plurality of conveyors for feeding the articles to the support, the conveyors being arranged to deliver the articles to the support at points staggered with respect to one another both vertically and horizontally, the number of conveyors corresponding to the number of horizontal layers of articles in the completed package, pushers for engaging the articles on the support and advancing them in echelon arrangement, a continuously reciprocating driving member for imparting short strokes to the pushers to assemble articles on the support, mechanism for imparting a long stroke to the pushers, means actuated by the operation of the short stroke mechanism for controlling the long stroke mechanism, and means actuated by the articles upon said support for controlling the short stroke mechanism.

18. The method of packaging articles in cartons which comprises providing a priming charge of articles comprising a complete tier of articles at one side and at the opposite side stepped tiers of progressively fewer articles from the top to the bottom, advancing successive oblique rows of articles toward said priming charge in parallel relation to the stepped side of said charge to collect an assemblage of articles sufficient in number to form a charge for the carton to be packed, supporting a carton at the side of the priming charge which contains the complete tier of articles, and advancing the said assemblage of articles into contact with the articles of the priming charge thereby forming sufficient complete vertical tiers of articles to fill the carton and advancing said tiers into the carton leaving a second priming charge outside the carton, the movement of said assemblage of articles being greater in extent than the width of the charge so as to leave a clearance between the second priming charge and the assemblage of articles for the next carton charge.

19. In a machine for packaging articles a support on which the articles are assembled, means for feeding articles to the support in successive oblique rows, pushers for advancing the articles on the support in echelon arrangement, means for imparting a plurality of short strokes to the pushers to cause the articles to be advanced step by step in echelon arrangement to assemble articles on the support, means for imparting a long stroke to the pushers to push a charge of articles into a carton, and mechanically actuated means for causing said long stroke to follow as a continuation of a short stroke.

20. In a machine for packaging articles, a support upon which the articles are assembled, a plurality of pushers mounted upon a common carriage for advancing the articles along the support, yielding means for actuating the pushers in their article-advancing stroke, a catch for holding the pushers against the action of said yielding means, continuously operated reciprocating means for actuating the pushers on their return stroke, conveying means for delivering articles in front of each pusher, said catch being prepared for release by the presence of a predetermined number of articles in front of each of said pushers, and said catch being held against release by said yielding pusher actuating means and released at the end of the return stroke of said reciprocating means thereby permitting said yielding means to actuate the pushers on the next outward stroke of said reciprocating means.

21. In a machine for packaging articles, a support on which the articles are assembled, said support having a priming charge thereon, means for feeding articles to said support in successive oblique tiers, a plurality of pushers mounted upon a common carriage and arranged in stepped formation for engaging the articles on the support, means for imparting a plurality of short strokes to the pushers to cause the articles to be advanced step-by-step in echelon arrangement to form incomplete vertical tiers of articles, and means for imparting a long stroke to the pushers to consolidate the incomplete vertical tiers of articles with the priming charge to form a carton charge comprising a plurality of complete vertical tiers and push the charge into a carton.

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