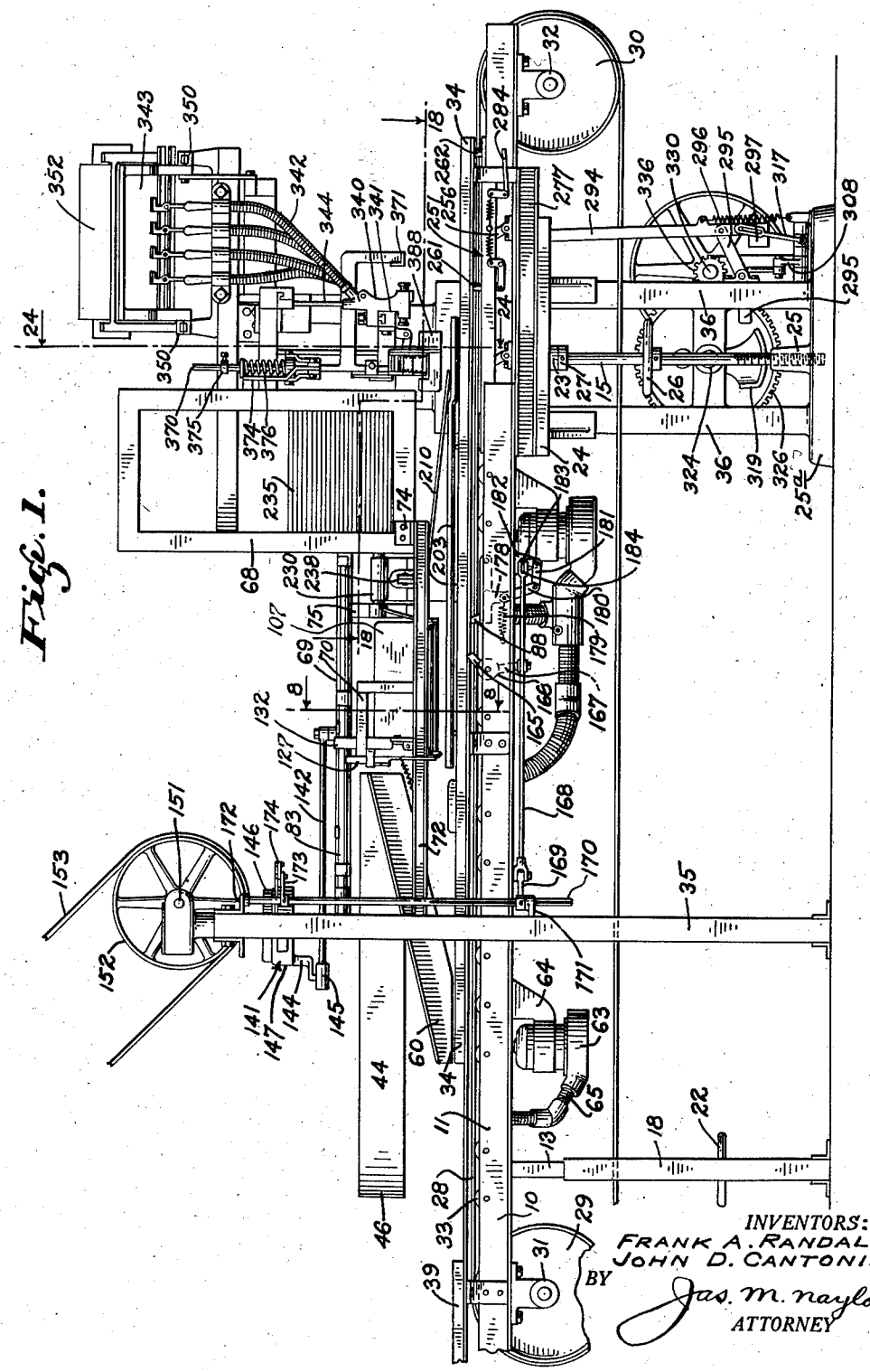
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PAPER FOLDING AND BOX LIDDING DEVICE

Filed Feb. 11, 1935 8 Sheets-Sheet 1

Fig. 1.



INVENTORS:
FRANK A. RANDALL.
JOHN D. CANTONI.
BY
Jas. M. Naylor
ATTORNEY

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PAPER FOLDING AND BOX LIDDING DEVICE

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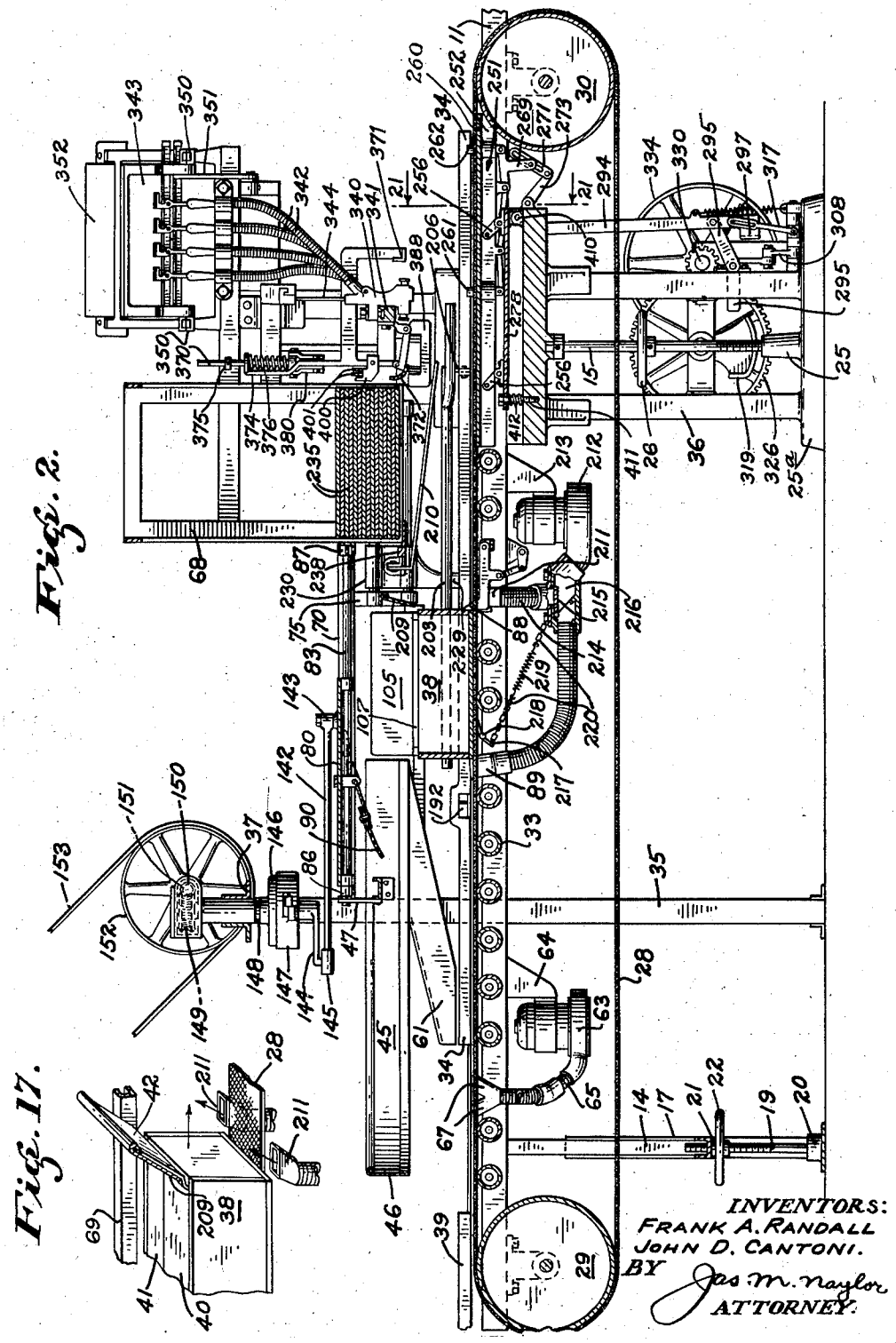


Fig. 2.

Fig. 17.

INVENTORS:
FRANK A. RANDALL
JOHN D. CANTONI.
BY Jas. M. Naylor
ATTORNEY.

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Filed Feb. 11, 1935 8 Sheets-Sheet 3

Fig. 3.

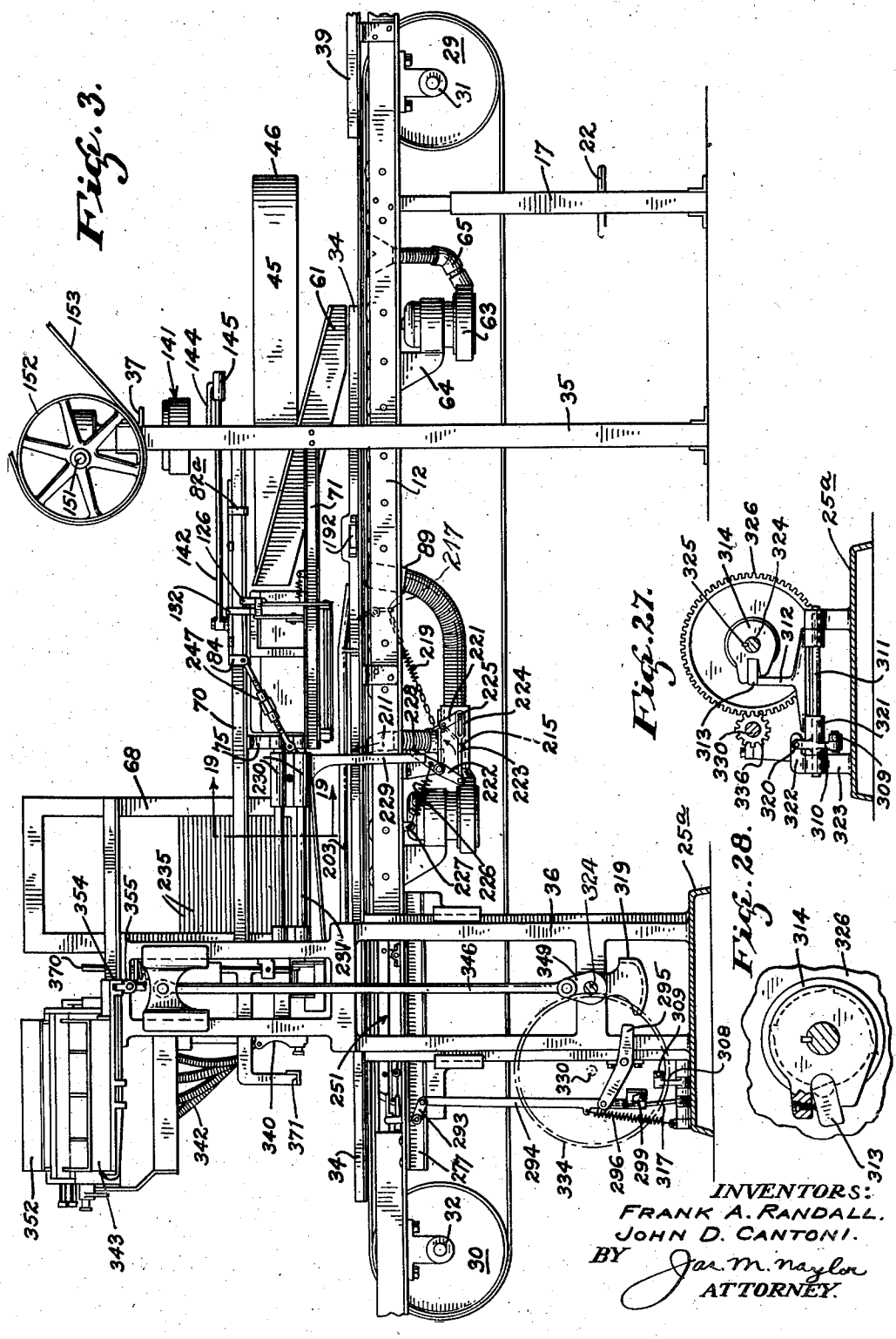


Fig. 27.

Fig. 28.

INVENTORS:
FRANK A. RANDALL.
JOHN D. CANTONI.
BY Jas. M. Naylor
ATTORNEY.

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PAPER FOLDING AND BOX LIDDING DEVICE

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Fig. 20.

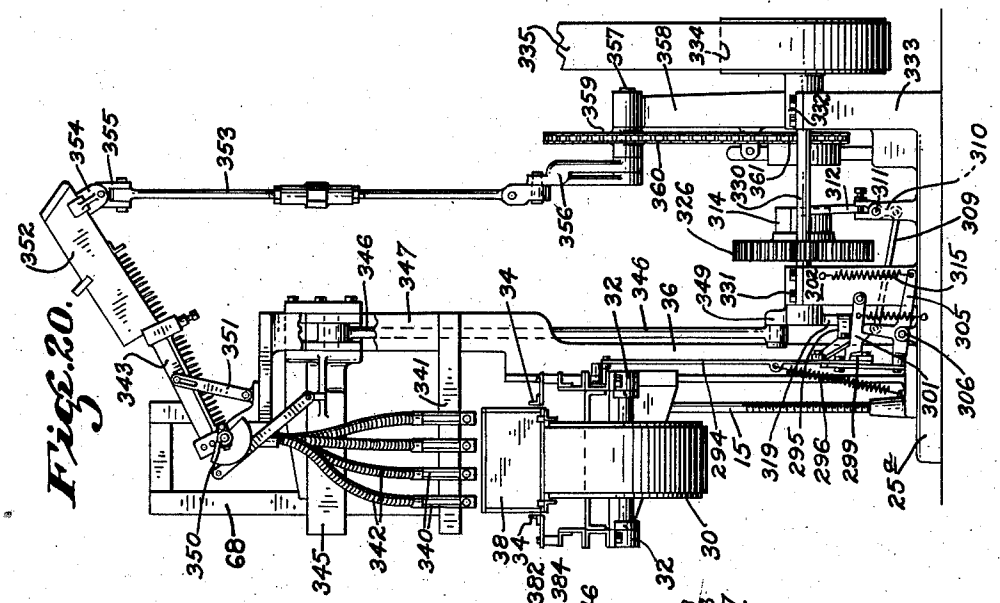


Fig. 24.

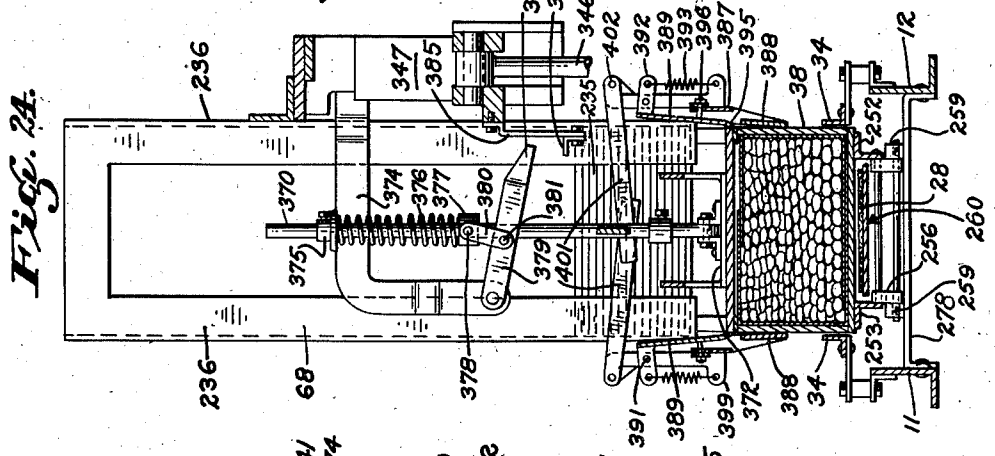
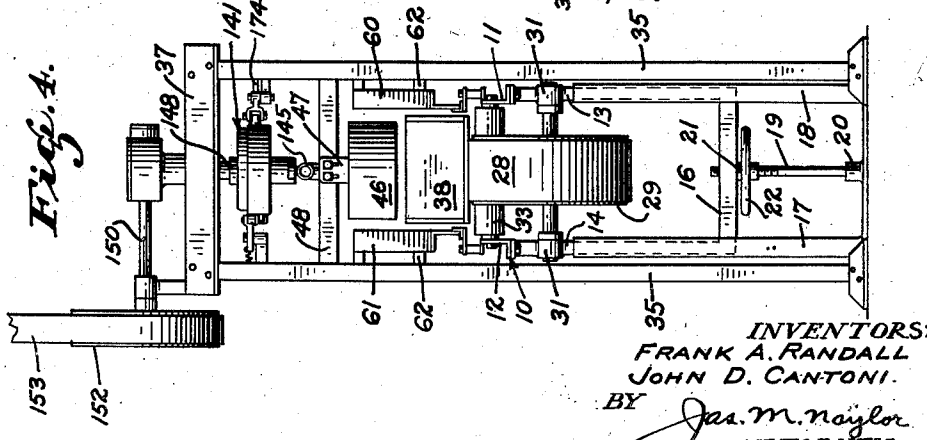


Fig. 4.



INVENTORS:
FRANK A. RANDALL
JOHN D. CANTONI.
BY Jas. M. Naylor
ATTORNEY.

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PAPER FOLDING AND BOX LIDDING DEVICE

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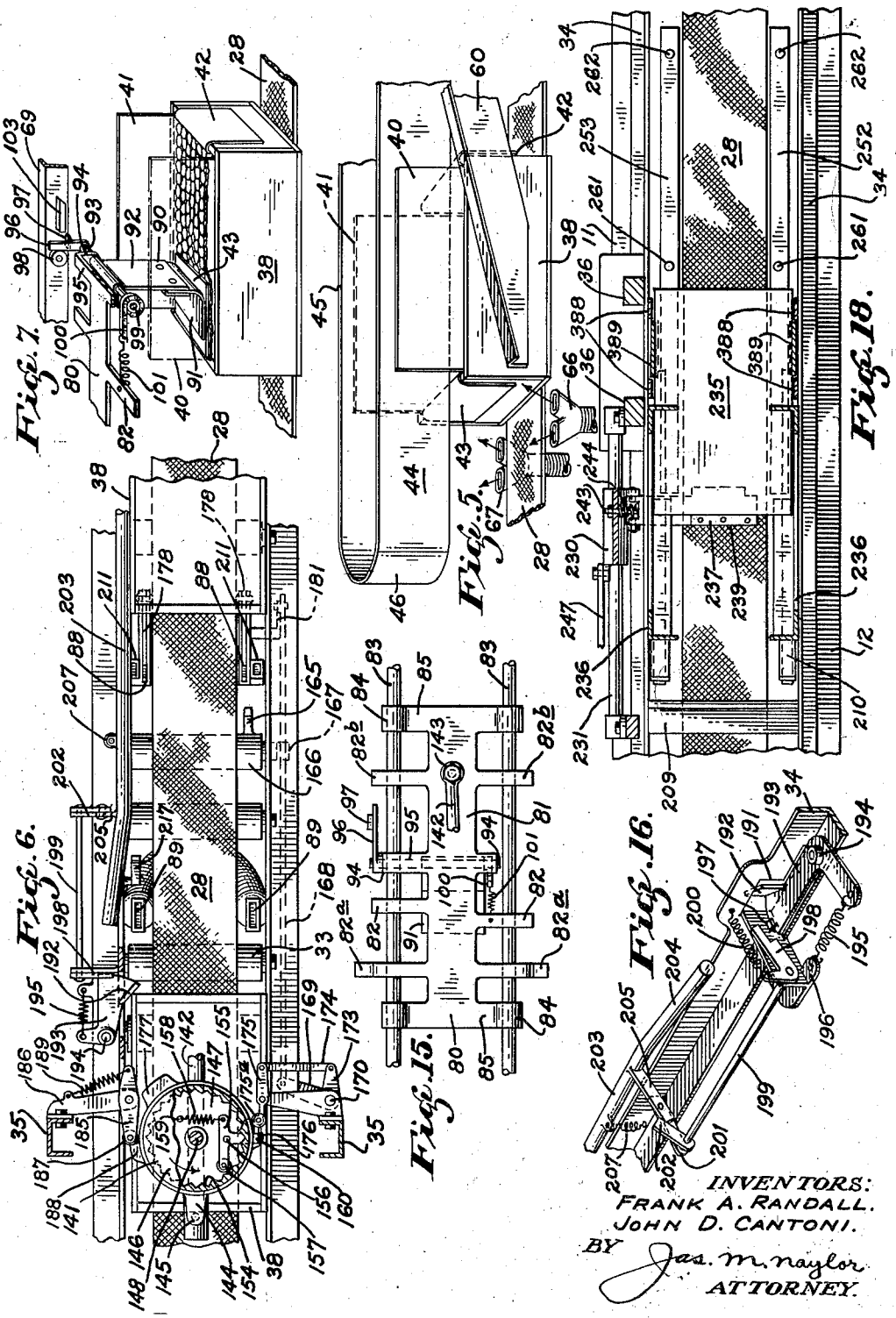


Fig. 7.

Fig. 5.

Fig. 18.

Fig. 6.

Fig. 15.

Fig. 16.

INVENTORS:
FRANK A. RANDALL.
JOHN D. CANTONI.
BY Jas. M. Naylor
ATTORNEY.

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PAPER FOLDING AND BOX LIDDING DEVICE

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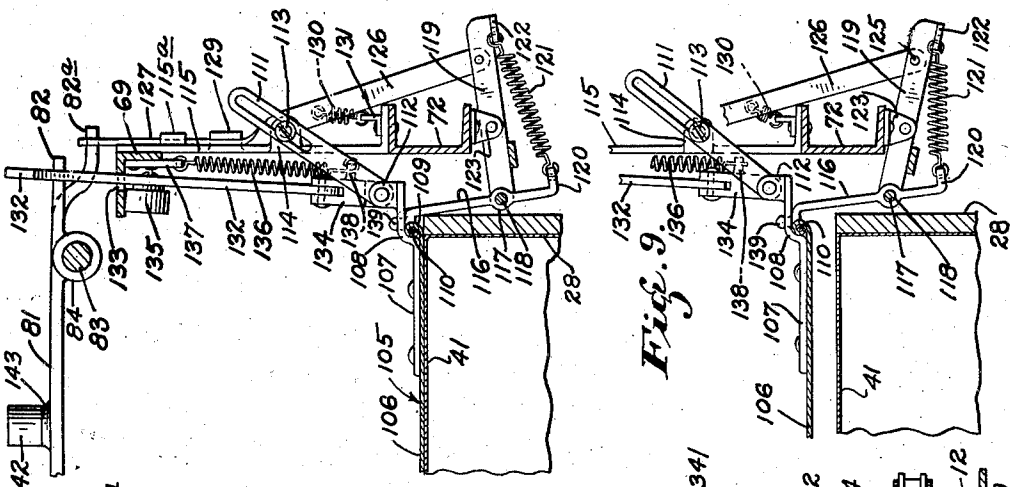


Fig. 9.

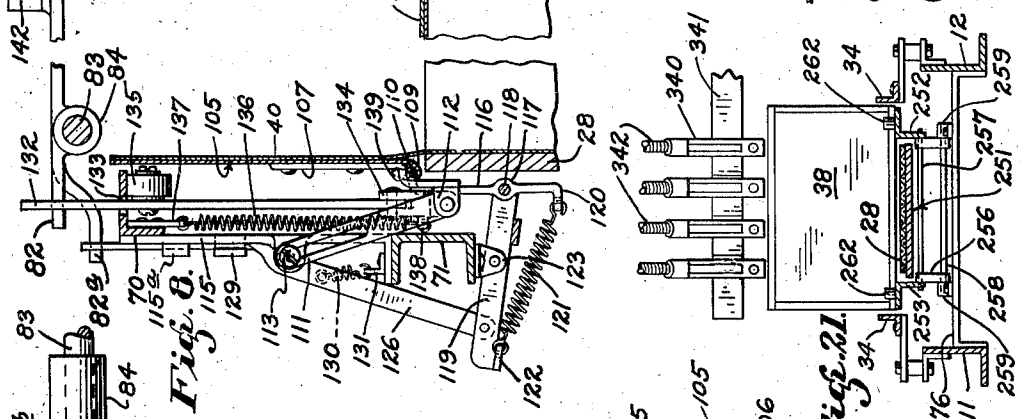


Fig. 8.

Fig. 21.

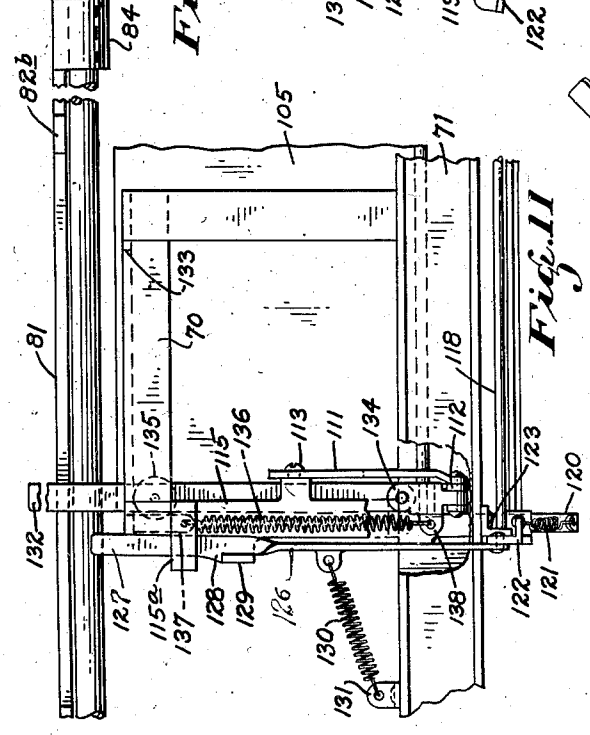


Fig. 11

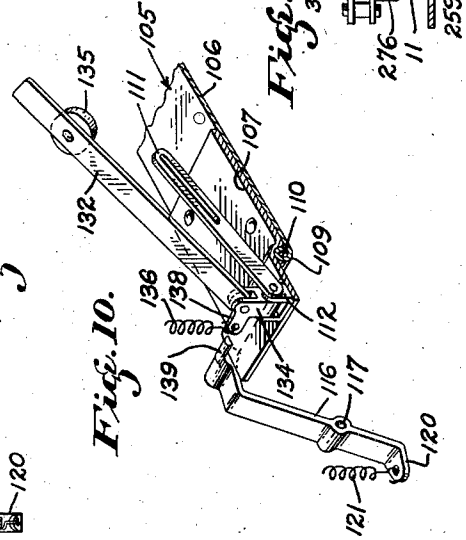


Fig. 10.

INVENTORS:
FRANK A. RANDALL.
JOHN D. CANTONI.
BY Jas. M. Naylor
ATTORNEY

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PAPER FOLDING AND BOX LIDDING DEVICE

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Fig. 12.

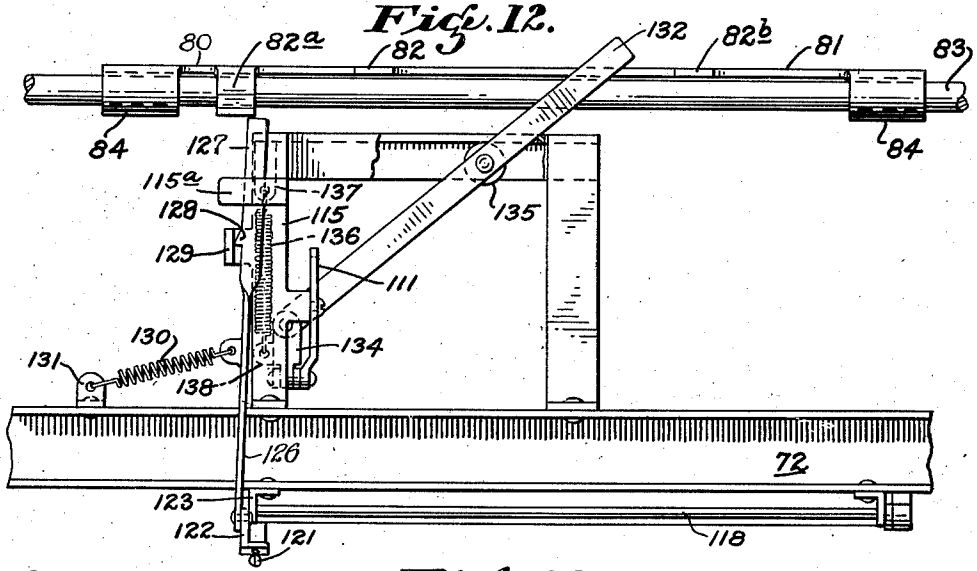


Fig. 26.

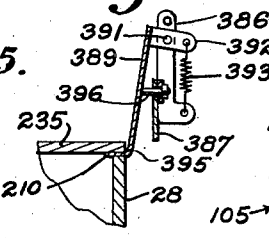


Fig. 25.

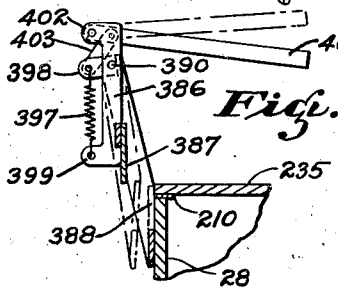


Fig. 14.

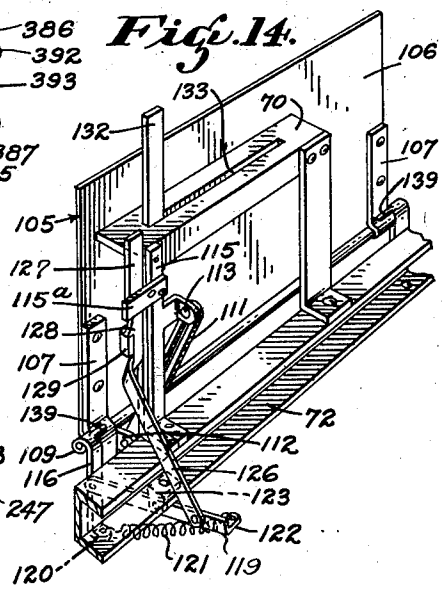
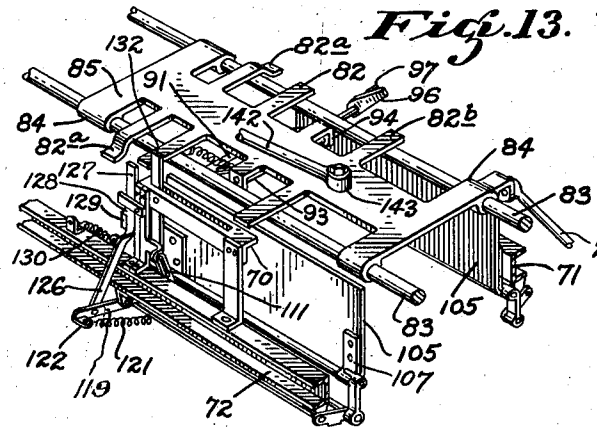


Fig. 13.



INVENTORS:
FRANK A. RANDALL
JOHN D. CANTONI.
BY Jas. M. Naylor
ATTORNEY

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PAPER FOLDING AND BOX LIDDING DEVICE

Filed Feb. 11, 1935 8 Sheets-Sheet 8

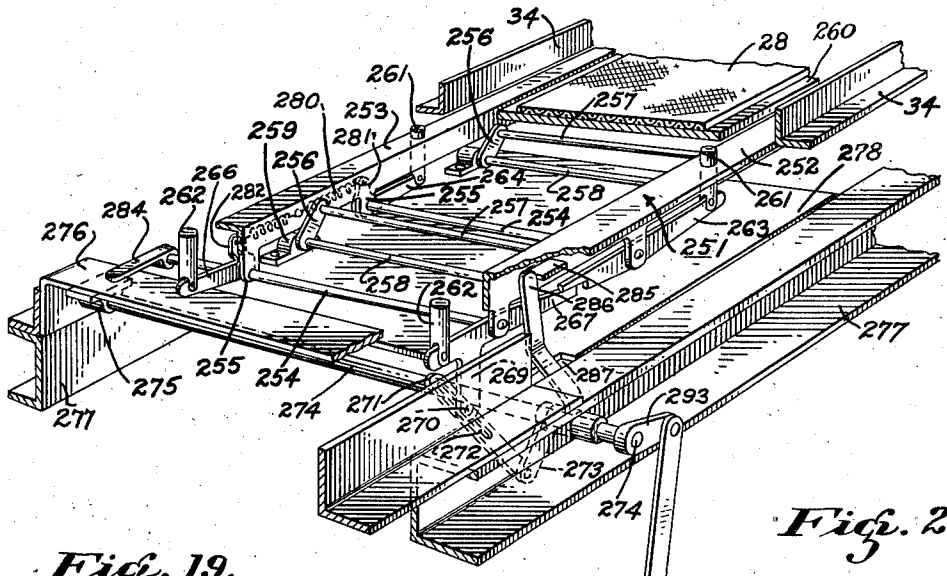
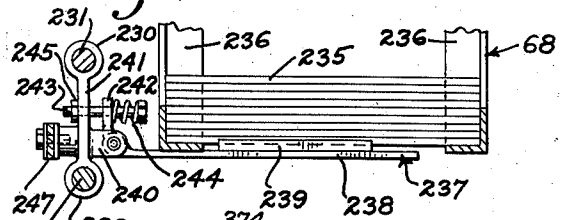


Fig. 22.

Fig. 19.



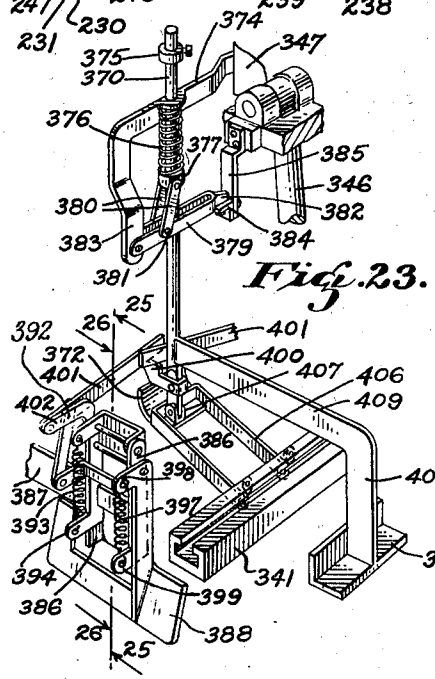
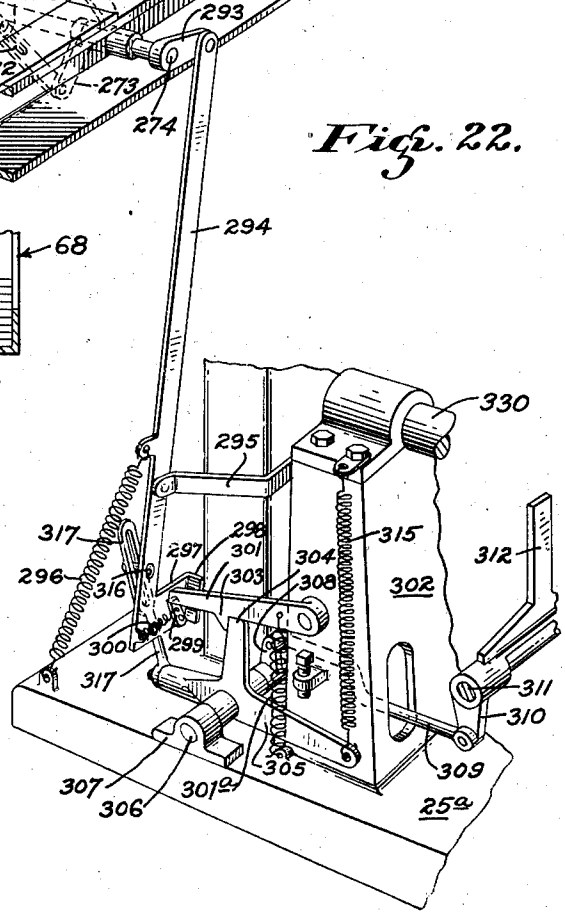


Fig. 23.



INVENTORS:
FRANK A. RANDALL
JOHN D. CANTONI.
BY
Jas. M. Naylor
ATTORNEY

Patented Feb. 21, 1939

2,148,037

UNITED STATES PATENT OFFICE

2,148,037

PAPER FOLDING AND BOX LIDDING DEVICE

Frank A. Randall and John D. Cantoni,
Napa, Calif.

Application February 11, 1935, Serial No. 6,012

29 Claims. (Cl. 1—10)

This invention relates to an apparatus for folding the paper liners of and the lidding of packing boxes and is adapted particularly to operate on boxes which have been filled with the commodity to be packed.

An object of the invention is to provide a device which will be capable of taking up a box which has been filled with a given commodity, and automatically folding the lining papers therefor in preparation for the application of the box lid.

Another object of the invention is the provision of a machine which will automatically complete the folding of the box interliners and, after so doing, apply a lid and secure the same to the box.

These and other objects will become more apparent as the specification progresses.

The apparatus illustrated in the drawings is particularly adapted to the completion of the packing of boxes of dried fruit, such as prunes. For purposes of illustration merely, reference will be made to the condition of the boxes of such fruit at the time they are received by this apparatus.

An empty, rectangular shaped wooden box is prepared to receive the fruit in the following manner: Four pieces of a light paper, impervious to water and fruit juices, are employed. Two such pieces, having the same length as the box, are laid transversely in the box, each extending substantially across three quarters of the width of the bottom, up the inner side walls and out over the opposing sides. The end interliners possess the same width as the box, and are laid along the bottom of the box and up over its ends. Thus the four interlining pieces cover the whole interior of the box and their ends are draped over substantially the whole of the four outer walls.

At this point the boxes are charged to overflowing with the fruit, either manually or mechanically, and then subjected to considerable pressure to level the contents with the top of the box and, at the same time, for the purpose of compressing the fruit and thereby increase its keeping qualities.

As the boxes progress from the pressing apparatus the four interliner papers are hanging over the sides and ends ready to be folded. Heretofore this folding step has been accomplished by hand and in plants where a sizeable quantity of fruit has been handled, it has been necessary to assign a number of operators to this task alone. Furthermore, it has been necessary to retrace some of the folding steps while actually applying the lids to the containers, due to the fact that no mechanical means had been devised to retain the papers in folded position while the boxes were being passed from one operation to another.

These short-comings in the conventional methods of completing the packing of the fruit have been overcome, it is believed, in the present invention in a manner which is wholly novel and comparatively inexpensive, while the actual operations have been speeded to such an extent that the time required to handle a given quantity of fruit has bene reduced by many hours.

Another object of our invention is the provision of means for feeding boxes of fruit in condition for application of the lid to a lidding device simultaneously with the lids, and the provision of mechanism associated therewith to retain and advance the boxes during the actual lidding operation.

The invention possesses other advantageous features, some of which with the foregoing, will be set forth at length in the following description wherein we shall outline in full that form of our invention which we have selected for illustration in the drawings accompanying and forming a part of the present application. In said drawings, we have shown one form of our invention, but it is to be understood that we do not limit ourselves to such form, since the invention as set forth in the claims, may be embodied in a plurality of forms.

Referring to the drawings:

Figure 1 is a side elevation of a box interliner folding and lidding device embodying the objects of our invention.

Figure 2 is a central longitudinal section of the machine.

Figure 3 is an elevation of the side of the device opposite to that shown in Figure 1, with certain parts removed.

Figure 4 is an elevation of the receiving end of the device.

Figure 5 is a fragmentary perspective view of the first element in the paper folding mechanism, showing a box following the operation in which the side papers are blown into vertical alignment with the sides of the box and about to enter the guides.

Figure 6 is a top plan view of a portion of the machine showing the clutch mechanism for the side folders in section and the box timing arrangement.

Figure 7 is a fragmentary perspective view of a box in the paper folding mechanism showing the swipe folding the rear end strip flush with the contents of the box.

Figure 8 is a section taken along lines 8—8 of Figure 1 showing the folders for the side inter-

liner papers and the actuating mechanism therefor, one folder (right) being in its down position.

Figure 9 is a fragmentary section taken through Figure 8, illustrating the means by which the folders are lifted clear of the box just before returning to their normal position.

Figure 10 is a fragmentary perspective rear view of one of the folders, illustrating means for checking downward movement of the same.

Figure 11 is a side elevation of the actuating mechanism for the side folders.

Figure 12 is a side elevation of the mechanism illustrated in Figure 11 showing the parts thereof in a different position.

Figure 13 is a perspective of the side paper folder elements with the timing carriage therefor in position.

Figure 14 is a perspective view of one of the side paper folding elements with the folder in upright position.

Figure 15 is a top plan view of the carriage device employed to operate the side folders.

Figure 16 is a fragmentary perspective view of the timing device illustrated in Figure 6, with particular emphasis on the control means therefor.

Figure 17 is a fragmentary perspective view of a box and a part of the mechanism which folds the last end paper.

Figure 18 is a sectional plan view of the lid feeding mechanism taken along line 18—18 of Figure 1.

Figure 19 is a cross-section of the lid magazine and feeding device taken along line 19—19 of Figure 3.

Figure 20 is an end elevation of the discharge end of the device, illustrating the detail of the lid nailing element and actuating mechanism therefor.

Figure 21 is a cross section of the machine taken along line 21—21 of Figure 2 showing a box lifted clear of the conveyor belt at the moment the nailing element is completing the lidding operation.

Figure 22 is a fragmentary perspective of the mechanism employed to temporarily stop, advance and lift the boxes clear of the belt during the nailing operation, and the actuating means therefor.

Figure 23 is a fragmentary perspective view of the mechanism used to align the lids with the boxes and retain the same in position during the nailing operations.

Figure 24 is a sectional view taken along the line 24—24 of Figure 1.

Figure 25 is a section taken along line 25—25 of Figure 23 showing the detail of the box aligning members.

Figure 26 is a sectional view of the lid aligning mechanism taken along line 26—26 of Figure 23.

Figure 27 is a side elevation of the clutch employed in the mechanism illustrated in Figure 22.

Figure 28 is an enlarged view showing the detail of the clutch shown in Figure 27.

To describe our invention briefly, so that its general characteristics may be borne in mind to aid in understanding the details of construction and operation hereinafter set forth, it is pointed out that we have provided a single conveyor belt turning over pulleys mounted at either end of a main frame, which, with the aid of associated timing mechanism, cause the boxes to advance and stop during the various operations. Adjacent to the receiving end of the device, we have placed air blast means for the purpose of raising the side interliner papers to a vertical position. With the side papers so raised, the box continues its progress and passes under guiding means adapted to retain the side interliners in upright position preparatory to the action thereon of the mechanical folders.

As the box progresses, a second blast of air is directed toward the overhanging rear end interliner paper, causing it to be raised to upright position. At this point the box is stopped, a swipe is swung forwardly, by means of an overhead mechanism, causing the said rear end interliner paper to be laid flat on top of the contents of the box. The swipe is then raised to its normal height, and the side paper folders move into position, alternately folding the side papers, at the completion of which the folders are lifted away, rendering the box free to resume its forward movement.

Before the box passes from the side folding mechanism a blast of air causes the front end interliner paper to be raised to a vertical position, ready to be folded down over the side papers. This folding step is accomplished by means of the paper striking against a pair of inclined guides as the box moves forward to the lidding mechanism.

When the paper folding operations have been completed, the box moves forwardly under a magazine of lids. Ejector means, timed with the movement of the box, feed a lid from the bottom of the magazine onto the box and alignment means position it for the nailing of its front and rear ends which completes the packing operation.

Progressing now to a more detailed description of the invention, the numeral 10 (Figs. 1 and 4) indicates a horizontally disposed main frame, comprising a pair of spaced angle irons 11 and 12 supported at the receiving end of the device by legs 13 and 14 and at the discharge end by the leg 15.

The heighth of the main frame is rendered adjustable through the following mechanism: The legs 13 and 14 terminate in the cross bar 16 (see Fig. 4) and slide vertically in the angles of the guide rods 17 and 18. A vertically disposed screw 19 threaded at its upper end, and anchored on the floor in a socket 20, is thrust through an aperture in the cross bar 16 and the latter rests on the hub 21 of the hand wheel 22 riding on the said screw. Thus rotation of the hand wheel 22 causes the receiving end of the main frame to be raised or lowered as the occasion demands.

The leg 15 (Fig. 1) consists of a single rod, the upper end of which is received by the socket 23 projecting from the understructure 24 of the main frame 10, and the lower end of which is threaded to engage the internal threads of the socket 25, this latter being an integral part of base 25A. A hand wheel 26 is keyed to the leg 15 and freedom of rotation of the upper end of the latter is secured by the use of a collar 27 keyed to the leg and turning on the surface of the projecting socket 23.

An endless conveyor belt 28 turns about a pair of pulleys 29 and 30, mounted on shafts journaled at opposite ends of the main frame, as at 31 and 32, respectively, and between said pulleys the belt passes over a series of idler rollers 33 mounted transversely between the angle irons of the main frame 10.

A pair of box guides 34 (Figs. 1, 2 and 4) are mounted longitudinally on the main frame and supported by the angle irons 11 and 12. These

guides, as will be noted in Figure 1, extend substantially throughout the length of the machine.

The upper section of the machine is supported in spaced relation to and above the main frame by the legs 35 and 36, the former carrying the weight of the forward end of paper folding elements and the latter the lidding mechanism. The legs 35 are disposed one on each side of the main frame and are capped by the cross beam 37, while the legs 36 are on the side opposite to that shown in Figure 1 of the drawings.

The boxes 38 are fed onto the belt 28 by a conveyor 39, partly shown in Figure 1, extending from the apparatus (not shown) which has performed the preceding step of packing the boxes. In Figure 7 of the drawings there is illustrated a box 38, having side interliner papers 40 and 41, and front and rear papers 42 and 43, respectively, and filled with fruit. When introduced into the machine forming the subject matter of this invention these interliner papers are draped over the sides and ends of the box.

The first element in the paper folding device comprises a pair of inner paper guides 44 and 45, formed of a single strip of sheet metal bent at the forward end of the machine, as at 46 (see Figure 5) and horizontally supported above the conveyor belt 28 by means of bracket 47 (Figs. 2 and 4) bolted to a cross bar 48 spanning the legs 35. These guides 44 and 45 are spaced sufficiently above the belt 28 to provide clearance for a box moving thereunder. The guides just described extend from the forward part of the machine to a point just short of the side paper folders to which reference will presently be made.

Outer paper guides 60 and 61 are longitudinally mounted on the machine by means of the brackets 62 connected to the legs 35 (see Figure 4). The latter guides are considerably shorter than the inner guides, and are so mounted that their rear ends are flush with the corresponding end of the inner guides while their forward ends are downwardly inclined to the level of the box guide 34. It will be understood that the space between the inner and outer guides is only enough to allow the side papers 40 and 41 to pass there between while standing in vertical alignment with the sides of the box 38.

A blower 63 (Fig. 2) is suspended beneath the main frame 10 by means of the bracket 64 attached thereto, and comprises a motor and fan. A conduit 65 carries the air blasts to a pair of jets 66 and 67, positioned inside the angle irons 11 and 12 of the main frame 10 and secured thereto. The jets 66 and 67 are Y-shaped and therefore impart two blasts each, at approximately 45° angles so as to provide a fan-like upward blast of air and cover a substantial area. The function of the jets 66 and 67 is to blow the side interliners 40 and 41 upwardly and in vertical alignment with the sides of the boxes, so that the said papers are received and guided by the guides 44 and 45 and 60 and 61 as the box 38 moves forward. The mouths of the jets are of a narrow oblong shape, to confine the air blasts to the immediate sides of the box to raise the side papers only.

The paper folding elements 107 (Figs. 1, 2, and 8) are mounted between the legs 35 and the lid magazine 68 and supported in that position by a pair of upper angle irons 69 and 70 and a pair of lower angle irons 71 and 72. The angle irons 69 and 70 are connected at their forward ends to the said legs 35, and while the iron 69 terminates at and is connected to the lid magazine 68, iron 70 extends clear across and is secured to the latter. Angle irons 71 and 72 are likewise connected at their forward ends to the legs, but iron 72 extends to the lid magazine 68 and is connected thereto by a bracket 74, while iron 71 extends short of the lid magazine 68, and is held in spaced relation to iron 70 by means of a bracket 75. (See Figure 3.)

A carriage 80 (see Figure 15) having a spine-like body portion 81 and ribs 82, 82A and 82B projecting therefrom, is slidably mounted on the rods 83 by means of the sleeves 84 disposed at the ends of the ribs 85. The rods 83 (Fig. 2) are supported and held in spaced relation to each other by means of the brackets 86 on the legs 35 and the brackets 87 on the ends of the lid magazine 68. This carriage is reciprocated lengthwise of the machine by a mechanism and for a purpose which will become apparent as the specification proceeds.

The first folding operation is in connection with the rear interliner paper 43. As the box 38 moves into the folding part of the machine and is stopped by a dog 88 (Fig. 2) its side papers 40 and 41 are in vertical alignment with the sides of the box, and the rear paper is draped over the end (as shown in Fig. 5). As the tail end of the box passes over a second set of air jets 89 (Fig. 2) the rear paper 43 (Fig. 3) is blown to a vertical position in readiness for the action of the swipe 90. The swipe 90 (Fig. 7) comprises a strip of rubber or like pliable material 91 riveted to a plate 92 dependent from and keyed to the shaft 93. The shaft 93 is journaled in the downwardly bent ends 94 of ribs 95 (Figs. 7 and 15) on the carriage 80. Keyed or otherwise secured to the outer end of the shaft 93 is the angular arm 96, which rides under the cam roller 98. The arm 96 has an upstanding projection 97, adapted to slide under the guide 103 fixed on the angle iron 69. At the opposite end of the shaft 93 we provide a sprocket 99 to which is attached one end of a chain 100. The other end of the chain 100 is secured, by the spring 101, attached to the rib 82.

The swiping effect of the mechanism just described is accomplished in the following manner: The box 38 moves to a definite position on the belt, is stopped by dog 88 (Fig. 2) and the carriage 80 follows it upon engagement of the clutch 141 (Fig. 1), hereinafter described. The arm 96 is in a horizontal plane under, and in contact with cam roller 98, and as the carriage 80 moves (left to right, Fig. 7) and the shaft 99 passes cam 98, arm 96 passes around cam roller 98 to be elevated to a vertical position by action of the force in the spring 101 thus turning the swipe 90 counter-clockwise to a vertical position. The spreading of the paper is completed as the projection 97 on the side of arm 96 (see Fig. 15) rides under the guide 103, during which the swipe drags over the surface of the paper. When the projection 97 passes beyond the end of the guide 103, the swipe 90 is raised into a horizontal position above the box under carriage 80. The swipe 90 stays in that position until the folding of the side papers has been effected and the carriage 80 starts its return movement upon completion by clutch 141 of its cycle, at which time the projection 97 once more moves under the stop 103 and the arm rotates around the cam roller 98, causing the shaft to rotate in a clockwise direction, and return the swipe to its normal position (Fig. 2).

The said paper folding elements consist of a pair of folders 105, as shown in Figure 8 of the

drawings. Since both of the elements and the operating mechanism associated therewith are identical in all respects, but one of them will be described, a single set of reference numerals being used to indicate corresponding parts throughout the description.

A piece of sheet metal 106 is riveted or otherwise secured to the angular plate 107 (Fig. 8), the latter having an outwardly extending jog 108, within which is fitted the end piece 109 of the flap 106, the latter being curled about the rod 110. The side folders 105 are partly guided by the slotted link 111, being connected thereto through the medium of U-shaped bracket 112, to which the link 111 is pinned. The slot in link 111 rides on the pin 113 turned in the ear 114 of the vertical post 115 connected between upper angle iron 69 and lower angle iron 72 (or 70 and 71, as the case might be) the lower end thereof being turned outwardly at right angles to rest upon said angle iron.

Support and further guidance of the side folders 105 is provided in the lever 116 (Figs. 8 and 9), which is attached thereto by having its upper angled end turned about the rod 110 to form a bearing therefor, the said lever 116 being apertured at its medial point, as at 117, to receive the rod 118 which pivotally connects it to the end lever 119. The lower end of lever 116 is angled, as at 120 (Figs 8, 13 and 14), and apertured to permit connection with the spring member 121, the latter being connected at its opposite end to ear 122 disposed at the outer end of lever 119.

Lever 119 is pivotally connected to the bracket 123, secured to the lower angle iron 72, by means of a conventional pin. Connected to lever 119, at a point proximate to its outer end, by means of a pin 125, we provide an arm 126 which is twisted upwardly and inwardly into lever 127 (Figs. 13 and 14).

Lever 127 (Figs. 8 and 11) is provided with an integral latch or shoulder 128 which is adapted to engage, when in its latched position, the projection or lug 129, disposed on the post 115. A spring member 130 connected to a bracket 131, on the foot of the post 115, and the lower portion 126 of lever 127, urges the same into the latched position illustrated in Fig. 8 (see left folder) and Fig. 11. A guide 115a connected to post 115, is provided for lever 127.

An upstanding arm 132 rides in the slot 133 of the angle iron 70 (Figs. 13 and 14) and is connected at its lower end to the end of plate 107 of the side folder 105 by means of the pivotal member 134 and U-shaped bracket 112 (Fig. 10). A roller 135 is carried by said arm 128 and is adapted to bear against the underside of the horizontal flange of angle iron 70 as said arm is caused to move along in the slot 133 (Fig. 8). A spring 136 hooked into the downwardly projecting piece 137, attached to angle iron 70, is connected at its other end to the projection 138 on the pivotal member 134 (Fig. 12).

In operation the side paper folders start from the position of the folders 105 shown in Fig. 8 (looking at the left-hand folder). The first operation is to move both folders inwardly toward the center of the box to insure complete folding within the inner margins thereof, avoiding interference therefrom with the lidding operation. When rib 82 of the carriage 80 in the forward thrust of its reciprocal movement, caused when clutch 141 is made to engage, strikes lever 132 and starts it in its forward movement in slot 133, the tensioning of spring 136 is partly relieved and folders 105 and the mounting therefor are freed from slight lateral movement. Contraction of spring 121 (Fig. 8) thereupon causes lever 116 to swing about its pivot 118 and because of attachment thereto move folders 105 laterally over the edge of the box 38. The folders are then ready to be actuated in the folding of the side papers.

Following this initial movement of the folders 105, the complete movement of the levers 132 to the end of slots 133 permits full functioning of the springs 136, the contraction of which pulls upwardly on projection 138 on pivotal member 134 and through connection of the latter with plate 107, by bracket 112, causes the folders 105 to snap into a horizontal position, contacting the side papers and complete this particular portion of the folding operation.

It will be noted that the ribs 82 on the carriage 80 bear a staggered or offset relationship to each other. The purpose of this is to cause one of the folders to be actuated in advance of the other and thus obviate any interference between the two elements.

To retain the folders 105 in horizontal position during the actual folding operation, projections 139 from the bearing at the upper end of lever 116, are provided, which are adapted to engage the tail piece of plate 107 and act as a stop therefor in its pivotal movement on rod 110.

In timing the movement of the box 38 with the several operations of the machine it is desired to raise the folders 105 therefrom just prior to release of the box for its forward movement. This action is brought about when ribs 82a, in the continued forward movement of carriage 80, contact levers 127 and unlatch them from the positions shown in Fig. 8 (see left folder) to the position shown in Fig. 12. Through the action of spring 130 and the linkage therebetween the arm 126 is snapped downwardly and its end piece causes lever 119 to swing about its pivot in its connection to bracket 123 permitting further contraction of spring 136 to pull lever 116 and the folders 105 clear of the box (see Fig. 9). The box then moves from under the folding mechanism.

The folders 105 are returned to their vertical position in the following way: Ribs 82b, on the return of the reciprocal movement of carriage 81, engage levers 132 and draw them rearwardly in slots 133. Rollers 135, bearing against the under side of angle irons 69 and 70 (see Fig. 12) cause the lower end of levers 132 to be moved downwardly, exerting pressure, through the pivotal member 134 and bracket 112, on the end of plate 107, swinging the latter around its pivot 110 into the vertical position shown in Fig. 8 (see left folder). The force of the downward movement of the lower end of lever 132 is likewise exerted on lever 116 which causes lever 119 to swing about its pivot in its connection to bracket 123 forcing lever 126 upwardly into its latched position (Fig. 13).

A clutch 141 (Fig. 1) mounted between the upper ends of the legs 35 causes the carriage 80 to be moved backwardly and forwardly through means of a rod 142 rotatably connected to the latter as at 143 (Fig. 2) and to the former by means of dependent leg or arm 144 disposed in the socket 145 at the end of said rod.

The said clutch consists of upper and lower drums 146 and 147, the former received by the latter. The upper drum 146 is keyed on to the

shaft 148, the uper end of which terminates in the gear 149 engaging the gear 150 disposed on a shaft 151 turned by the pulley 152 mounted on the outer end thereof. The pulley 152 is turned by the belt 153 connected to any suitable source of power (not shown).

The upper drum 146 (Fig. 1) is revolving constantly in a counter-clockwise direction (as will be noted in Fig. 6) and engagement between the two drums is accomplished through provision of the teeth 154 on the interior surface of the upper drum 146 and the bell crank 155 pivotably mounted within the lower drum 147 by means of the pin 156. The teeth engaging end of the bell crank 155 is provided with a roller 157 and the opposite end of the same is connected to a spring 158 pinned as at 159 to the lower drum 147. Thus it will be seen that the roller on the bell crank is normally urged into engagement with the teeth 154 by means of the said spring 158.

The leg 160 of the bell crank 155 projects outwardly through the side of the lower drum 147, as will be noted in Fig. 6, for a purpose about to be described.

A dog or lever 165 (Fig. 1), integral with the roller 166, and pitched at an angle in the path of the boxes, starts the operation of the mechanism which causes engagement of the clutch just described. Disposed on the underside of the roller 166 is an arm 167 which is connected to the longitudinally extending rod 168. The latter is attached, at its rear end, to the lever 169, keyed to the shaft 170, the latter being rotatably mounted on one of the legs 35, by means of the brackets 171 and 172.

Through this linkage the shaft 170 is rotated in a counterclockwise direction when the box strikes and thrusts the lever 165 forwardly and downwardly. This causes rod 168 to be pulled rearwardly rotating the shaft 170, and through the medium of the lever 173 and the link 174, the end of the lever 175 is swung about the pivotal point provided in its attachment to bracket 175b out of engagement with the protruding leg 160 of bell-crank 155 and the lug 176 on the drum 147, permitting engagement between the upper and lower drums of the clutch (Figs. 1 and 6).

It will be understood that the carriage 80 is reciprocated once to complete the operation of the paper folding mechanisms, necessitating one complete revolution of the clutch.

During the paper folding operation forward movement of the box 38 is checked by the stops 88 (Figs. 1, 2, 6 and 8) pivotally anchored or attached to the angle iron 18. These stops have downwardly projecting ears 178 to which are attached a spring member 179, the tension of which normally urges the dog above the level of the belt 28. A link 180, connects the stop 88 to a rocker arm 181 pivotally mounted on the bracket 182 dependent from the angle iron 11. The free end of the rocker arm 181 carries a pin 183, which rides in the slotted end portion 184 of the rod 168. Through the medium of this linkage the stops 88 are released, during rotation of the clutch drums 146 and 147, when the cam 177 (Fig. 6) on drum 147 engages the roller 175a, on lever 175, and moves it outwardly. This causes rotation of the shaft 170, and consequently pushes rod 168. The slotted end portion 184, of rod 168, permits the initial clutch engaging movement of the rod, without engaging the pin 183 and thereby causing premature release of the stops 88.

In order to prevent reverse motion of the clutch element 141 we provide the following mechanism: an arm 186 secured to post 35 projects inwardly and rocker arm 185 is pivotally mounted thereon. Rocker arm 185 carries a roller 187 which is urged into engagement with a cam 188, on drum 146, through the action of spring 189, this latter being disposed at the opposite end of said rocker arm and the outer end of arm 186.

In order to time the entry of boxes into the paper folding part of the machine and into the lidding device, about to be described, we have provided a stop 192 (Figs. 6 and 16) which protrudes through an aperture 191 in the vertical flange of box guide 34. This stop consists of an upstanding portion pitched at an oblique angle to the belt 28, and extends into an L-shaped portion 193 pivotally mounted as at 194 (Fig. 16). A spring 195, connected to the end of the stop 192 and to the bracket 196, urges the stop into its operating position (Fig. 16). Normally the momentum of the box would drive the stop 192 back through the aperture 191 and therefore we have provided, as a means of locking the stop in its box retaining position, a latch 198 pivotally mounted on the shaft 199 and normally urged into its latching position by means of a spring 200. A stop 197, on bracket 196, determines the drop of the latch 198 and also limits the outward movement of stop 192 when the latter is unlatched and moved through aperture 191 by the pressure of a box on conveyor 28. The shaft 199 is supported by the brackets 196 and 201 and at the end opposite that on which the latch 198 is mounted, carries the fixed lever 202.

When the box 38 passes into the position shown in Fig. 2, that is underneath the paper folding mechanism, it engages the pivotally mounted bar 203 (Figs. 6 and 16) extending parallel to and slightly above the box guides 34. This bar overhangs slightly in the path of the boxes 38 and the latter move it laterally and retain it in that position, while passing, to permit stop 192 to check the movement of the next box in the manner about to be described. The front end of the bar 203 is turned outwardly as at 204 (Figs. 6 and 16) so that engagement of the box with the said bar will be a gradual one and not mar or disfigure the sides of the box. Bar 203 is supported by means of the legs 205 and 206 pivotally secured to the bracket 201 and the box guide 34.

As the box causes the bar 203 to move laterally, the tip of the leg 205 is drawn away from the fixed lever 202; shaft 199 rotates and spring 200 urges the latch 198 into engagement with the L-shaped stop 192, retaining the latter in its box retaining position (Fig. 6). When struck by the next oncoming box on conveyor 28, the inner edges of the L-shaped portion 193 of stop 192 bears against latch 198 and forward movement of the box is checked.

Inasmuch as only one box is handled at a time in the folding and lidding operations, the bar 203 extends to a point just short of the nailing element, and thus the stop 192 is held in actuating position until the box moves into the last nailing operation and beyond the end of the said bar. At this point the bar drops downwardly, snap being given to the movement by the spring 207, connected to the bar and anchored to the guide 34, tilting lever 202 and raising latch 198 out of the path of stop 192, the latter being forced outwardly through the aperture by the box 38 as a result of the pull exerted thereon by belt 28.

At the moment the box 38 is released by the stop 88 the end paper 42 still remains to be folded backwardly over the contents of the box, having been previously blown upwardly and retained against the outer side of the plate 209 by blasts from the air jets 211 as the front end of the box is engaged by dogs 88. The plate 209 is disposed at a forward angle between angle irons 69 and 70 and its lower end is set to barely clear the tops of the boxes 38 (see Fig. 17). End paper 42 is retained outside the folding area proper to permit its employment as a cover for the forward part of the box during the lidding operation and thus prevent the edges of the side papers from being caught and pulled out of place or torn. As the box 38, with the end paper still in this upright position, due to the blasts from jets 211, moves forwardly the paper contacts the inclined guides 210 and is smoothed out on top the other folded papers.

It will be observed from Fig. 2 of the drawings that the air jets 89 and 211 are supplied by a single blower 212, suspended beneath the main frame by means of the bracket 213, through the conventional conduits 214. A valve 215, in a chamber 216, connecting the two conduits, controls and directs the air stream to the appropriate jet. Normally the valve is in the position shown in Fig. 3, that is, directing the air through the jets 211. To close the valve as to jets 211 and provide a short blast of air through the jets 89 and raise the rear end paper 43, we provide the pivotal lever or trigger 217, mounted on the rod 218, to one side of the belt 28. A spring 219 is disposed between the two chains 220, providing the flexible linkage which connects the trigger and the valve lever 221 to give the essential snap to the action of the valve, as the box 38 moves under the folders and actuates the trigger.

Since it is desired that the blast through the jets 89 be of short duration, to merely raise rear paper 43, we have provided the mechanism shown in Fig. 3 of the drawings to close the valve as to said jets even though the box 38 is still resting on the trigger 217. A pivotally mounted lever 222 is connected at its lower end to a rod 223, the opposite end of the latter being slotted as at 224 to loosely receive the pin 225 on the valve lever 221. A spring 226, hooked in the ear 227, dependent from the main frame, is connected to lever 222 adjacent its upper end. Lever 222 is actuated against the tension of spring 226 by the dependent member 229 which, through its connection with carriage 80, is reciprocated on rods 231 in the hereinafter described manner. When trigger 217 is not under the influence of a box, valve 215 is in the position indicated in Figure 3, that is, shutting off the air as to jets 89 and directing it to jets 211. As influenced by the next box fed forwardly trigger 217, through the medium of the chain 220 and spring 219, pulls valve lever 221 thereby moving valve 215 into the position illustrated in Figure 2, shutting off jets 211 and opening pets 89. In this movement of lever 221, pin 225 thereon rides free in the slot 224 of rod 223. The box then contacts stop 88 which causes clutch 141 to begin its cycle and consequent reciprocation of carriage 80 and the mechanisms associated therewith. Thus sleeve 230 is driven forwardly and dependent member 229 releases lever 222 to the action of spring 226. Spring 226 pulls lever 222 about its pivot and rod 223 is thrust rearwardly, the slot 224 engaging pin 225 on lever 221 to swing the latter about its pivot and return valve 215 to its original position (Fig. 3), against the tension of spring 219. As sleeve 230 returns on rods 231 in its reciprocal movement, dependent member 229 again engages lever 222 and, moving it about its pivot against the tension of spring 226, pulls rod 223 forwardly. In this movement pin 225 rides free in slot 224 and the valve 215 remains unaffected.

In our device box lids 235 are fed from a magazine 68 and fed forward simultaneously with the movement of the box into the lidding mechanism. It will be noted from Figs. 18 and 19 that the magazine provided comprises two side frames 236 joined at top and bottom to provide a skeleton framework to support the lids and being open throughout the length of its bottom to permit the feed member 237 to pass therethrough and move the lowermost lid out of the stack.

The feed member 237 is formed of the horizontal piece 238, having a lid engaging shoulder 239, pivotally connected to and carried by an extension 240 of the connection 241 of the sleeves 230. The feed member 237 is provided with perpendicular member 242 which is apertured to receive a bolt 243 carrying the spring 244 between its head and said member 242 the bolt passing through the connection 241 and being retained by a nut 245.

The feed member 237 is reciprocated through its connection to the reciprocal carriage 80 (see Fig. 3) by means of the adjustable link 247, the latter being joined at its forward end to the sleeves 230 and at its rear end with the rib 84 of the carriage 80. A single thrust of the carriage 80, moves the sleeves 230 for the full length of the rods 231 and pushes a lid out of the magazine.

It is readily understood that the nailing of the lid to the box cannot be accomplished while the box is being carried by the belt, hence we provide a mechanism which is adapted to raise the box clear of the belt. It is this mechanism and its attendant devices which put the nailing operation under way.

A cradle 251 (see Figs. 2 and 22) is placed inside the angle irons 11 and 12 beneath the nailing mechanism, and extends rearwardly for substantially the length of the box 38. It is composed of angle irons 252 and 253 held in spaced relation by means of the rods 254 passed through the dependent ears 255 and supported by the links 256, pivotally connected to said irons 252 and 253 the said links being carried by rods 257 and 258, the latter having suitable bearings 259 disposed on plate 278.

Projecting perpendicularly through apertures in the angle irons 252 and 253 are the primary and secondary dogs 261 and 262, respectively. The function of these dogs is to engage the front end of the box 38, the momentum of the latter causing the cradle 251 to be drawn upwardly and forwardly, due to the pivotal action of links 256, lifting the box clear of the belt 28, during the two nailing operations. A plate 260 (Figs. 22 and 24) supports belt 28 as it passes through cradle 251 to insure positive movement of the box when the cradle 251 is returned to its lowermost position.

The dogs 261 are supported by and pivotally connected to a pair of controlling levers 263 and 264 extending in longitudinal alignment with the angle irons 252 and 253 and pivotally mounted on one of the rods 254. The dogs 262 are likewise supported by a pair of levers 266 and 267 with

similar pivotal mounting on the other rod 254 retained by ears 255.

Operation of the dogs 261 and 262 is brought about through the following mechanism; the lever 267 has a dependent lug 269 carrying a pin 270, which connects said lever to the link 271, said pin riding in the slot 272 of the link 271. The link 271 is, in turn, pivotally connected to the stub link 273 fixed on the shaft 274, extending transversely of the cradle 251. The shaft 274 is journaled on one side of the frame (left, looking at Fig. 22) in a bearing 275, mounted on the underside of the connector bar 276 and the opposite end passes through the angle iron 277 to carry a link 293, connecting the same to the clutch for the nailing mechanism. Counterclockwise movement of the shaft 274 (again looking at Fig. 22) causes the outer end of the slot 272 in the links 271 to engage the pins 270, drawing the forward end of lever 267 downwardly and depressing dogs 262. At the same time the opposite end of lever 267 is raised into engagement with the notched end of the lever 263 and tips the latter upwardly to depress the dogs 261.

Unity of movement between levers 264 and 263, as will be readily understood, is afforded by means of the rods 254 connecting the two and on which both are fixed. Likewise levers 267 and 266 are connected by and fixed to a similar shaft 254.

The dogs 261 and 262 are normally urged upwardly through the angle irons of the cradle 251 through the tension exerted by a spring 280 connecting the upstanding projections 281 and 282 on levers 264 and 266, respectively.

Lever 284 (Fig. 22) fixed on an extension of shaft 254, permits manual release of a box from the cradle 251 before either of the two lid-nailing operations whenever desired for purpose of inspection or withdrawing a box the papers in which have been improperly folded. By downward movement of lever 284 shaft 274 is caused to rotate in counter-clockwise direction (looking at Fig. 22) and lever 273, through link 271, pulls the forward end of lever 267 downwardly to depress dogs 262. Simultaneously, the rear end of lever 267 contacts lever 263 and rocks it about its pivot to depress dogs 261. While dogs 261 and 262 are thus held down, conveyor 28 will carry box 38 on through the machine.

Counterclockwise movement of the shaft 274, to set the clutch and driving mechanism in motion, is accomplished in the following manner: when a box has engaged the primary dogs 261 and drawn the cradle upwardly and forwardly, a projection 285 on the angle iron 252 contacts the perpendicular lever 286, fixed on the shaft 274 and extending through the slot 287 in plate 260. The short forward movement of lever 286 imparts a partial rotation to shaft 274, without depressing dogs 261 and 262 due to the fact that the freedom of pin 270 in slot 272 of link 271 is greater than that aforesaid movement of lever 286.

A link 293 (Figs. 20 and 22) on the shaft 274 connects the latter to a rod 294 which trips the clutch control mechanism about to be described. The rod 294 is urged downwardly by a spring member 296 connected to it and the base 24. A foot 297 on the rod 294, having an outwardly bent toe 298, carries a trigger 299 normally urged to the left (Fig. 22) of its pivot by a spring 300. Pivotally connected to the support 302, there is a lever 301, the free end of which has a dependent latch 303 engaging an upstanding piece 304 of a rockable member 305 keyed to a shaft 306. The lever 303 is normally urged downwardly into its engaging position with 304 by spring 301a. The shaft 306, which turns in a bearing 307 located on the base 24, carries a lever 308, connected by a rod 309 to another lever 310 mounted on a shaft 311. Keyed to the shaft 311 (Figs. 27 and 28) we provide an upstanding member 312 which is adapted to engage a dog 313 on the clutch member 314.

Normally trigger 299 is in the position illustrated in Figure 22, that is, under the free end of latch 301. When a box engages primary dogs 261 or 262, and through the mechanism heretofore described has caused a counter-clockwise movement of shaft 274, rod 294 is drawn upwardly and latch 303 is lifted out of engagement with the rockable member 305 by trigger 299. When the nailing operation has been completed, cam 319 (see Fig. 1) strikes lever 295 causing it to swing about its pivot and push rod 294 upwardly. Inasmuch as lever 301 swings on a radius and rod 294 is raised vertically, it will be appreciated that the free end of lever 301 will disengage trigger 299. At the moment of disengagement lever 301 will be drawn downwardly by the force of spring 301a and rest on the tip of upstanding piece 304 on rockable member 305. At the completion of the cycle of the clutch, rockable member 305, through the mechanism about to be described will move counter-clockwise with shaft 306, against the urge of spring 315, and the tip of the upstanding portion 304 thereof will ride under latch 303 on lever 301 until the latter falls into engagement, rod 294 being then urged in its downmost position by spring 296, and trigger 299 will lie partially in the path of the free end of lever 301. The end of lever 301 will ride the left edge of trigger 299 (Fig. 22) and swing the same about its pivot from left to right (Fig. 22) until rod 294, in its downward movement, has carried trigger 299 below the end of lever 301 whereupon spring 300 will draw trigger 299 to the left of its pivot into its normal position beneath the end of lever 301.

Clutch 314 is a one-revolution clutch made operative when the action of spring 315 on rocker arm 305 rotates shaft 306 pulling arm 309 and member 312 connected thereto out from under latch 313 (Fig. 27).

Disengagement of the clutch 314 is brought about when the cam 319 carried by the rod 346, in its counterclockwise movement (looking at Fig. 3) strikes pivotal lever 295 and drives it downwardly causing it to swing about its pivot and push rod 294, to which it is connected, upwardly. By means of a pin 316, riding in slotted lever 317, rod 294 draws the end of rockable member 305 upwardly until its upright piece 304 snaps into engagement with latch 303 to lock the clutch member 314 in its disengaged position.

To limit the movement of member 312 we provide a stop 320 (see Fig. 27) affixed on the sleeve portion 321 of the member 312, and adapted to bear against the extension 322 of the support 323 for the shaft 311.

The clutch 314 is keyed to the shaft 324 as at 325 and is mounted on the face of a gear 326 also mounted on the shaft 324.

In causing clutch 314 to be engaged to actuate the lidding mechanisms the following operation takes place: A box 38 on conveyor 28 strikes primary dogs 261 and the momentum of the box causes the cradle 251 to swing upwardly and forwardly on its supports 256. In this forward

movement projection 285 engages lever 286 on shaft 274 and rotation of the latter, through its connection by link 293 pulls rod 294 upwardly. The upward movement of 294 raises latch 301 releasing lever 304 and the tension of spring 315 on the end of member 304 pulls it upwardly to turn shaft 306 (Fig. 22). The turning of shaft 306 in this manner pulls rod 309 causing element 312 to be swung outwardly on its axis and from engagement with the dog 313 whereupon the clutch member 314 engages and power is transmitted to shaft 324 to actuate the lidding mechanisms (Fig. 27).

A shaft 330 (Fig. 20) turning in the bearing members 331 and 332 mounted at the tops of the supports 302 and 333, carries a pulley 324 which, in turn, is driven by a belt 335 connected to a suitable source of power. A small gear 336 keyed on the shaft 330 meshes with gear 326 transmitting power therethrough to the lidding mechanisms when clutch 314 is made to engage.

The nailing mechanism of our machine (Figs. 1 and 20) comprises a series of nail chutes or guides 340, braced by an arm 341 extending from the guides or tracks 347, and communicable with a corresponding number of feed tubes 342 connected to a hopper 343. Nail driving rods 344 are driven by an arm 345 extending at right angles from a connecting rod 346 reciprocated in the tracks 347. Connecting rod 346 is reciprocated by means of the crank arm 349 on the end of the shaft 324.

The nail feed and nailing mechanism are conventional and form no part of this invention. Hence for purposes of illustration we have shown such means in simplified form suitable to carry out the purposes of our machine.

A constant supply of nails is insured by the following means: A nail box 352 is connected to a hopper 343, supported as at 351, and is tiltable with respect thereto through the medium of the rod 353 reciprocated by the crank arm 356 on shaft 357. The rod 353 is connected to the box 352 by means of the pivotal members 354 and 355. The said shaft 357 carries a sprocket 359 driven by a chain 360 engaging a gear 361 turned by the shaft 324. When the hopper 352 is raised to the charging position (Fig. 20) nails are fed one at a time from hopper 343 through transverse feed bar 350 into tubes 342, through which they drop to the guide members 340.

We provide a novel means for aligning the boxes prior to the lid nailing operation. (See Figs. 2, 23 and 24.) A plunger 370 supports the front clamp 371 and a lid ram 372. The plunger 370 passes through an apertured ear of the bracket 374, secured to one of the tracks 347 in which the nailing arm 345 reciprocates and has an adjustable collar 375 which determines its downward movement. A spring 376 encases the plunger 370, the upper end abutting the ear of the bracket 374 and the lower end resting upon a collar 377 fixed on the shaft by a pin 378.

The said spring 376, it will be understood, normally urges the plunger downwardly toward the box 38 to urge its dependent and co-acting members into operation. In order to lift the plunger we employ the following mechanism: A forked lever 379 is swingably connected to collar 377 fixed on plunger 37 by means of the links 380 held by the pin 381, the end of said lever 379 adjacent the tracks 347 tapering to a point 382 and the opposite ends being pinned to a downwardly bent extension 383 of the bracket 374.

Contraction of the spring 376 is brought about when the shoulder 384, carried by the lower end of the dependent member 385 fixed on connecting rod 346, on its upward movement with the latter, contacts the point 382 of the lever 379 pushing the plunger 370 into the position shown in Fig. 23.

The side clamps, the description of one of which will suffice (see Figs. 25 and 26) comprise a stationary member 386 supported by a bar 387 attached to magazine 68, on which are pivotally mounted the alignment member 388 and the lid contacting member 389 by means of pins 390 and 391, respectively.

The lid contacting member 389 has an outwardly extending arm 392 to which is attached a spring member 393 connected to the outwardly extending arm 394, of the stationary member 386, the said spring urging the lid contacting member 389 inwardly to permit its curved end 395, co-acting with the opposite lid contacting member, to engage and align the box lids. A bolt 396 through stationary member 386 tends to limit the outward movement of the said member 389 (Fig. 26).

The alignment members 388 are normally out of box engaging position, but are adapted to be urged into box engaging position by the spring 397 connected between the outwardly extending arm 398 of the former and the projection 399 of the stationary member 386 when the plunger 370 carrying projection 400 is lowered from contact with levers 401 which hold the aligning members away from the box. The aligning members 388 are moved outwardly from the box engaging position when plunger 370 is drawn upwardly, projection 400 carried thereby lifting levers 401 pivotally connected to the outwardly turned arms 402 fixed on the stationary member 386, links 403 being connected to levers 401 and an outward projection 404 on box engaging member 388 (Figs. 23, 24 and 25).

The box lid ram comprises an upwardly curved piece 372 (Figs. 2 and 23) integral with the rods 405, the latter being pivotally connected to plunger 370 by means of U-shaped bracket 407, and connected at their forward ends to bar 341. Thus when the action of spring 376 forces plunger downwardly, ram 372 is driven against the box lid and retains the same in a tight fitting position with the box 38.

Front clamp 371, the purpose of which is to press down on the lids and steady both box and lid during the second nailing operation, comprises an angular piece, having its vertical section inwardly disposed with respect to the box, carried by the downwardly extending portion 408 of arm 409, the latter being an integral part of plunger 370.

For the purpose of taking up the shock of the nailing operation, and thus to protect the boxes and the mechanisms comprising the box raising elements, we have provided plate 373 (Figs. 2 and 22) with the following type of supporting means: The forward end of the plate is hinged, as at 410, to the support 24, while the rear end is loosely retained by the bolts 411, turned in the said support 24, spring member 412, on said bolts between said plate and said support 24, normally urging the said plate upwardly against the heads of bolts 411 or into a horizontal position.

It will be apparent from the foregoing description that when the box raising element is in its raised position the flexibility of the supporting

means for plate 278 will take up the brunt of the nailing blows, relieving links 256, and the mechanism associated therewith, of the wear and tear.

The following is a detailed description of the operation of the machine forming the subject matter of our invention through one complete cycle:

A box 38 having previously been filled with fruit and with its interliner papers 40, 41, 42 and 43 draped over its sides and ends, respectively, passes from the conveyor 39 onto conveyor belt 28 in our machine. The side interliner papers are blown into vertical alignment with the sides of the box as the latter passes over the air jets 67 (Figs. 2 and 5) and the said papers are retained in that position, as the box progresses on conveyor 28, by guides 45, 60 and 61.

If the preceding box has not yet cleared the paper folding and lidding mechanisms, stop 192 (Figs. 2, 6 and 16) will hold the box from further movement into the machine by virtue of the lateral movement of bar 203 through contact with the sides of the preceding box and stop the box 38 just short of the paper folding elements. When the preceding box has passed through the lidding mechanisms and beyond the end of bar 203, the latter moves inwardly, through its own weight and the action of spring 207, and by means of its operative connection by member 202 and the rod 199 disengages latch 198, freeing stop 192 which is then swung out of its box retaining position through aperture 191 in guide 34 by the box 38 due to the pull of conveyor 28.

As box 38 moves into the zone of the first of the paper folding mechanisms it actuates trigger 217 (Fig. 2) which in turn opens valve 216 and a blast of air from fan 212 through jets 89 causes the rear end paper 43 to rise in vertical alignment with rear end of the box 38. Box 38 then travels a short distance and its movement is checked in the paper folding zone by contact of its front end with stop 88.

It will be understood that at this moment side papers 40 and 41 and end paper 43 are in vertical position ready to be folded over the contents of the box while the front end paper 42 is still draped over the front end of the box, hanging outside of the zone of the first paper folding mechanisms.

A split second before coming to a stop against the dog 88 the front end of the box has depressed lever 165 which has pulled rod 168 rearwardly to cause the one cycle clutch 141 to engage and reciprocate the carriage 80 (Fig. 1). When rod 168 (Fig. 6) is pulled rearwardly shaft 170 is revolved in a counterclockwise direction (looking at Fig. 6) and the latter through the linkage 173 and 174 has moved lever 175 about its pivotal point to disengage roller 175a from leg 160 of bellcrank 155. Spring 158 then swings roller 157 on bellcrank 155 into engagement with the teeth 154 causing engagement of the upper and lower drums 146 and 147 of the clutch and rotation of the latter in the direction indicated by the arrow in Fig. 6. Rod 142, through its eccentric connection with drum 147 (Fig. 1) and the connection with carriage 80 (Fig. 15), reciprocates the latter on the tracks 63 to actuate the paper folding mechanisms as power is transmitted in the rotation of shaft 148 by pulley 152. In the forward movement of carriage 80 the swipe 90 (Fig. 7) carried thereby, is caused to engage end paper 43 and fold the same over the contents of the box as arm 96 moves around roller 98 in a cam-like action. This swiping action is continued as projection 97 rides under guide 103. Having finished its operation in the folding of the end paper 43 swipe 90 is caused to rise to a horizontal position under the carriage 80, and out of the way of the side paper folders 105, when projection 97 on arm 96 rides out from under the stop 103, the further tensioning of spring 101 causing the unwinding of chain 100 and consequent rotation of shaft 99 in a counterclockwise direction (looking at Fig. 7).

Further forward movement of the carriage 80 brings ribs 82 into engagement with levers 132 and causes them to move forwardly in slots 133. Movement of levers 132 in slots 133 causes an inward movement of folders 105 from a position where the axes 110 of the folders are approximately in vertical planes defined by the outer sides of the box, (see Fig. 8 left side) to a position inwardly of the outerside as shown in Fig. 8 right side. By such inward movement a more complete folding of the side papers 40, 41 will result, when the folders in their pivotal movement, fold the papers over the top of the box. In this initial movement the tensioning of spring 136 is relieved as roller 135 traverses the underside of angle irons 69 and 70 and lever 132 is thrown out of the perpendicular and swings in an arc defined by its connection to folders 105 through members 134 and 112. Spring 121 (Fig. 8) causes lever 116 to swing about its pivot 118 and, through its connection therewith, move folders 105 laterally over the edge of the box 38. The folders 105 are then ready to be actuated in the folding of the side papers. The complete movement of the levers 132 to the end of slots 133 permits further tensioning of springs 136, the contraction of which causes the folders 105 to snap into a horizontal position, contacting side papers 40 and 41 and completing the folding operation. As hereinbefore pointed out the staggered relationship of ribs 82 on carriage 80 results in one of the folders 105 being actuated in advance of the other to obviate interference.

The further forward movement of carriage 80 causes engagement of ribs 82a (Fig. 13) with levers 127 which are pushed out of their latching position (Fig. 12) to raise the folders 105 from the boxes just prior to the release of the box 38 for further forward movement. This operation is brought about by the action of spring 130 which snaps arm 126 downwardly causing lever 119 to swing about its pivot in the connection to bracket 123, permitting further contraction of spring 136 to pull lever 116 and the folders 105 clear of the box (Fig. 9).

Still travelling forwardly carriage 80, through its connection 247 (Fig. 3), drives the dependent member 229 out of engagement with trigger 222 to close valve 216 as to jet 89 and permitting the escape of air through jet 211 which raises end paper 42 against the plate 209. Simultaneously the feed member 237 (Fig. 19) feeds the lower first lid out of the magazine 68 between the clamps 389 in readiness for the first of the nailing operations.

As clutch 141 completes its cycle the carriage 80 begins the return of its reciprocal movement to cause the return of the swipe 90 to its original position, the resetting of the side folders 105, and the release of the box from this zone.

As clutch 141 revolves cam 177 (Fig. 6) engages roller 175a, on lever 175, and moves it out-

wardly, which through the linkage 174 and 173 rotates the shaft 170 and the latter, through the connecting link 169 (Fig. 1), pushes rod 168 forwardly. This, through linkage 183, 181 and 180 pulls stop 88 downwardly releasing the box 38.

Further return movement of carriage 80 causes rib 82b to engage lever 132 and effect the resetting of folders 105 by drawing them rearwardly in slots 133 whereupon rollers 135, bearing against the underside of angle irons 69 and 70 (Fig. 12) cause the lower end of levers 132 to be moved downwardly, exerting pressure, through the pivotal member 134 (Fig. 9) and bracket 112, on the end plate 107, swinging the latter around its pivot 110 into the vertical position shown in Fig. 8 (see left folder). The force of the downward movement of the lower end of lever 132 is likewise exerted on lever 116 which causes lever 119 to swing about its pivot in its connection to bracket 123 forcing lever 126 upwardly into its latched position. (Fig. 13.)

Swipe 90 is returned to its original position as the further return movement of carriage 80 slides projection 97 on arm 96 under guide 103 and the arm 96 contacts roller 98 and moves around it in a cam-like action to revolve shaft 93, clockwise (looking at Fig. 7), and effect the rewinding of chain 100 on sprocket 99 with the aid of spring 101.

Disengagement of the clutch 141 (Fig. 1) is brought about when the leg 160 (Fig. 6) of bell-crank 155 strikes roller 175a on lever 175 pushing roller 157 out of engagement with teeth 154.

Upon the release of the box 38, by the dog 88, constantly moving conveyor 28 moves the box forwardly and the contact of end paper 42 with the guides 210 (Fig. 2) folds the same rearwardly over the side papers 40 and 41.

It will be appreciated that during the paper folding operation just described, and the nailing operations about to be mentioned, bar 203 is held outwardly by contact with the side of the box 38 causing stop 192 to hold the next succeeding box from being fed forwardly. The zone of the first folding operation is kept clear of the next succeeding box for the purpose of resetting the said folder elements 105 and the swipe 90 by return of the carriage 80.

Further movement of the box 38 on conveyor 28 brings the same over cradle 251 (Figs. 2 and 22) and the engagement of the primary dogs 261 by the front end of the box. The momentum of the box rocks cradle 251 upwardly on its pivotal supports 256 to lift the box 38 clear of belt 28 during the nailing operation. In the course of the upward and forward movement of cradle 251 projection 285 is brought into engagement with lever 286 on shaft 274 which through the connecting lever 293 pulls rod 294 upwardly to actuate the elements which cause engagement of clutch 314. The upward movement of rod 294 lifts the latch member 301 from engagement with the rockable member 304 on shaft 306 and the latter is partially turned upon contraction of spring 315. The turning of shaft 306, by virtue of the connecting member 308, pulls the rod 309 to swing element 312 out of engagement with the dog 313, whereupon the clutch member 314 engages and power is transmitted to shaft 324 to actuate the lidding and nailing mechanisms.

As shaft 324 (Figs. 1 and 3) is rotated crank arm 349 thereon reciprocates connecting rod 346 to begin the actuation of the lid aligning and nailing mechanisms. On the prior up stroke of connecting rod 346 in tracks 347 the shoulder 384, carried by the lower end of the dependent member 385 fixed on connecting rod 346, engaged lever 379 to compress spring 376 thereby raising lid ram 372 clear of the lid about to be nailed. At the same time levers 401 are engaged by the projection 400 on plunger 370 and drawn upwardly whereupon the lid and box aligning members 388 and 395, respectively, are drawn out of engaging position (Fig. 23).

While the connecting rod 346 is on its up stroke on tracks 347 the nail feed element 352 is being raised into the feeding position shown in Fig. 20 by the rotation of crank arm 356 on shaft 357, through the medium of connecting rod 353, shaft 357 having a driving connection with shaft 324 through chain 360 and the gears 359 and 361. The action of connecting rod 353 is to tilt nail hopper 352 into the position shown in Fig. 20, permitting nails to be fed into the feed tubes 342 to the guides 340 in readiness for the nailing operation.

Further rotation of shaft 324 lowers the nail hopper 352 and the chute 343 and connecting rod 346 begins its down stroke. Lever 379 is released and spring 376 on plunger 370 forces the lid ram 372 downwardly toward the box lid. Likewise levers 401 are released and through the action of springs 397 and 393 the alignment members 389 and 388 engage the lid and the box. This latter action is just prior to the striking of the lid by ram 372 and the clamping effect thereof, together with member 371, in preparation for the nailing operation. Nail driving rods 344, are driven downwardly by virtue of their connection to connecting rod 346 by the arm 345, nailing the front end of the box.

As shaft 324 continues its rotation cam 319 (Fig. 3) is brought into engagement with lever 295, having an operative connection to rod 294, which effects disengagement of the clutch 314, the return of cradle 251 to its lowermost position and the release of box 38 from the first of the nailing operations. The upward thrust of rod 294 rotates shaft 274 counter-clockwise (looking at Fig. 22) and through the connection of the levers 273 and 272 and the pin 270 dogs 262 and 261 are depressed, releasing the box from the position in which it was held during the primary nailing operation. Upon disengagement of cam 319 and lever 295, the tension of spring 296 pulls rod 294 downwardly, and lever 293, with which it is connected, causes shaft 274 to rotate in a clock-wise direction. Lever 286 on shaft 274, being in engagement with projection 285 on cradle 251 forces the latter rearwardly and downwardly into its lowermost position. Thereupon box 38 again rests upon conveyor 28 and the latter moves it forwardly into the second nailing operation commenced upon engagement of the box by secondary dogs 262.

As rod 294 is thrust upwardly through the action of cam 319 on lever 295 it effects disengagement of the clutch 314 in the following manner: Pin 316 on rod 294 rides to the end of the slot in lever 317 affixed on the end of rockable member 305 and upon exerting a pull rocks member 305 against the tensioning of spring 315 and into the latched position shown in Fig. 22. Through the connecting members hereinbefore described upstanding member 312 is brought into engagement with dog 313 and the clutch 314 is disengaged.

In the second nailing operation, in which the

rear end of the lid is nailed to the box, the identical operation takes place upon the front end of the box engaging secondary dogs 252 to raise the cradle 251, lifting the box clear of the conveyor 28 and the beginning of another cycle of operation of the lid aligning and nailing mechanisms when clutch 314 is once more engaged.

It will be appreciated that our machine is subject to many modifications and variations without departing from the spirit of the invention and therefore having thus described our invention, what we claim and desire to secure by grant of Letters Patent is:

1. A device of the character described comprising means for raising the side lining papers of a box in vertical alignment with the walls of the box, paper folding means, means for advancing a box to said paper folding means, and means for retaining said papers in such position as the box advances to said folding mechanisms.

2. A device of the character described comprising means for folding the lining papers of the box over the contents thereof, a lid magazine, means for feeding lids therefrom, reciprocal means for actuating said folding means and said lid feeding means, means for aligning said lid with said box, and means for securing said lid to said box.

3. In a device of the character described, means for folding the rear liner paper over the contents of a box comprising, an overhead reciprocal member, a folder carried thereby, means for driving said overhead member, and means actuated by reciprocation of said overhead member causing oscillation of said folder.

4. In a device of the character described, means for folding the rear liner paper over the contents of a box comprising, an overhead reciprocal member, a folder carried thereby, means for driving said overhead member, and means actuated by reciprocation of said overhead member causing said folder to engage said paper and spread the same over the contents of a box.

5. In a device of the character described, means for folding the side liner papers over the contents of a box comprising, a pair of folders, means for preliminarily moving the folders inwardly over the edges of the box, and means for actuating said folders.

6. In a device of the character described, means for folding the side liner papers over the contents of a box comprising, a pair of folders, means for preliminarily moving the folders inwardly over the edges of the box, and means for actuating and then setting said folders outwardly from the edges of said box.

7. In a device of the character described, means for folding the side liner papers over the contents of a box comprising, a pair of folders, means for preliminarily moving the folders inwardly over the edges of the box, means for actuating said folders, means for raising the folders clear of the box and its contents, and means for setting said folders outwardly from the edges of said box.

8. In a device of the character described, means for raising the side and end papers into folding position comprising, a box conveyor, a constant blower adapted to raise the side papers as the box advances on said conveyor, a second blower adapted to raise the rear and front end papers, respectively, a valve therefor, box actuated control means for said valve directing the blast to said rear paper, an overhead reciprocal member, driving means therefor, box actuated control means for said driving means, and means actuated by said reciprocal member on its outstroke for closing the valve on said second blower as to said rear end paper and re-directing the blast to said front end paper.

9. In a device of the character described, means for folding the front end paper rearwardly over the contents of a box comprising, a moving conveyor, means for arresting movement of said box with said conveyor, a plate disposed at a forward angle above the forward end of the box when the latter is so stopped from movement with said conveyor, means for raising the front end paper against said plate, and means for folding said paper over the box upon release and further movement of said box on said conveyor.

10. In a device of the character described, a conveyor, means for moving a box on said conveyor, a cradle normally resting below the level of said conveyor but adapted when actuated to swing upwardly and forwardly to raise a box clear of said conveyor for application of a lid, and actuating means for said cradle comprising depressible dogs normally projecting upwardly above the level of said conveyor to engage the front end of a box.

11. In a device of the character described, a conveyor, means for raising a box clear of said conveyor actuated under impact of a box advancing on said conveyor, means for applying a lid to a box while on said raising means, driving means for said lidding means, a clutch normally disengaged for said driving means, said clutch being engaged upon the actuation of said box raising means.

12. In a device of the character described, a conveyor, means for raising a box clear of said conveyor actuated under impact of a box advancing on said conveyor, means for applying a lid to a box while on said raising means, driving means for said lidding means, a clutch for said driving means, said clutch normally disengaged being engaged upon actuation of said box raising means, and means cooperating with said driving means to cause disengagement of said clutch.

13. In a device of the character described, a conveyor, means for raising a box clear of said conveyor actuated under impact of a box advancing on said conveyor, means for applying a lid to a box while on said raising means, driving means for said lidding means, a clutch for said driving means, said clutch normally disengaged being engaged upon the actuation of said box raising means, and means cooperating with said driving means for disengaging said clutch and to return the box to the conveyor at the completion of the lidding operation.

14. In a device of the character described, a moving conveyor, means for arresting movement of a box relative to said conveyor, means for folding the side and rear end liner papers over the contents of the box while the latter is so stopped from movement with said conveyor, means for releasing the box from said stopping means at the completion of the aforementioned folding operation, means for folding the front end liner paper over the box as it resumes its movement with said conveyor, means for supplying a lid for said box, means for raising the box clear of the conveyor, and means for aligning and applying the lid when the box is raised by said last named means.

15. In a device of the character described, a conveyor, means for arresting movement of a box relative to said conveyor, means for folding the side and rear end liner papers over the contents of the box while the latter is stopped from move-

ment with said conveyor, means for releasing the box from said stopping means at the completion of the aforementioned folding operation, means for folding the front end liner paper over the box as it resumes its movement with said conveyor, means for supplying a lid for said box, means for raising the box clear of the conveyor, means for aligning the lid with the box as the latter is raised clear of the conveyor, and means for nailing an end of the box each time it is raised clear of the conveyor.

16. In a device of the character described, means for folding the rear end liner paper, the side liner papers and the front end liner paper successively over the contents of the box, means for supplying a lid for the box, means for aligning the lid with the box, and means for securing the lid to the box.

17. In a device of the character described, means for successively folding the rear end liner paper, the side liner papers and the front end liner paper over the contents of the box, means for supplying a lid to the box, alignment means therefor, and means for successively securing the opposing ends of the lid to the box.

18. In a device of the character described adapted to act upon a filled box having liner papers draped over the sides and ends thereof, comprising, means for raising the side and rear end liner papers into vertical alignment with the walls of the box, means for successively folding the rear end, side and front end liner papers over the contents of the box, means for supplying a lid to the box, means for aligning the lid with the box, and means for securing said lid to said box.

19. In a device of the character described, a moving conveyor, paper folding means, lidding means, means for arresting movement of a box relative to said conveyor for the action of said folding means, and means for raising the box clear of said conveyor for the action of said lidding means.

20. In a device of the character described, a moving conveyor, means for folding the side and rear end liner papers over the contents of a box, means for arresting movement of said box relative to said conveyor for the action of said folding means, means for folding the front end liner paper when the box has been released from said stopping means and resumed its movement with the conveyor, lidding means, and means for raising the box clear of said conveyor for the action of said lidding means.

21. In a device of the character described, a moving conveyor, means for folding the side and rear end liner papers over the contents of a box, means for arresting movement of said box relative to said conveyor for the action of said folding means, means for folding the front end liner paper over the contents of said box when the latter has been released from said stopping means and resumed its movement with said conveyor, lidding means, and means for successively raising said box clear of said conveyor for the action of said lidding means on the two ends of the box.

22. A device of the character described comprising, a conveyor, means for moving a box with said conveyor, means for arresting movement of said box relative to said conveyor, folding elements adapted to fold the side and rear lining papers of the box over the contents thereof while movement of the box is arrested, means for effecting movement of the box with the conveyor upon completion of the aforementioned folding operation, and means for folding the front lining paper over the contents of the box as the forward movement of the box is resumed.

23. In a device of the character described, means for aligning a lid and a box, a lid nailing member, control means for said aligning means and said nailing member, means for conveying boxes under said alignment means and said nailing member, and means for raising a box clear of said box conveying means for the alignment and nailing operations, said box raising means actuating the control for said alignment means and said nailing member.

24. In a device of the character described, a moving box conveyor, means for moving a box with said conveyor, means for arresting movement of the box relative to said conveyor, means for folding the liner papers over the contents of a box while movement thereof is arrested, an overhead reciprocal member actuating said folding means, driving means for said reciprocal member, and a clutch for said driving means, said box stopping means causing engagement of said clutch under impact of the moving box.

25. In a device of the character described, a moving box conveyor, means for moving a box with said conveyor, means for arresting movement of the box relative to said conveyor, means for folding the liner papers over the contents of the box, an overhead reciprocal member actuating said folding means on its out stroke and resetting the same on its in stroke, driving means for said reciprocal member, and a clutch for said driving means, said box stopping means causing engagement of said clutch under impact of the moving box.

26. In a device of the character described, a moving box conveyor, means for moving a box with said conveyor, means for arresting movement of said box relative to said conveyor, means for folding the liner papers over the contents of a box when the movement of said box relative to said conveyor has been arrested, an overhead reciprocal member to actuate said folding means, driving means for said reciprocal member, and a clutch for said driving means, said box arresting means causing engagement of said clutch under the impact of the moving box.

27. In a device of the character described, a moving box conveyor, means for moving a box with said conveyor, means for arresting movement of said box relative to said conveyor, means for folding the liner papers over the contents of the box when the movement of said box relative to said conveyor has been arrested, an overhead reciprocal member to actuate said folding means, driving means for said reciprocal member, a clutch for said driving means, said box arresting means causing engagement of said clutch under the impact of a moving box, and means for releasing the box from said arresting means upon completion of the folding operation.

28. In a device of the character described, a moving box conveyor, means for moving a box with said conveyor, means for arresting movement of said box relative to said conveyor, means for folding the liner papers over the contents of the box when the movement of said box relative to said conveyor has been arrested, an overhead reciprocal member to actuate said folding means, driving means for said reciprocal member, a clutch for said driving means, said box arresting means causing engagement of said clutch under the impact of a moving box, and means causing release of the box from said arresting means and

disengagement of said clutch upon completion of the folding operation.

29. In a device of the character described, a moving box conveyor, means for moving a box with said conveyor, means for arresting movement of said box relative to said conveyor, means for folding the liner papers over the contents of the box when the movement of said box relative to said conveyor has been arrested, an overhead reciprocal member to actuate said folding means on its out stroke and set the same on its in stroke, driving means for said reciprocal member, a clutch for said driving means, said box arresting means causing engagement of said clutch under the impact of a moving box, and means causing release of the box from said arresting means and disengagement of said clutch upon completion of the folding operation and the setting of said folding means.

FRANK A. RANDALL.
JOHN D. CANTONI.