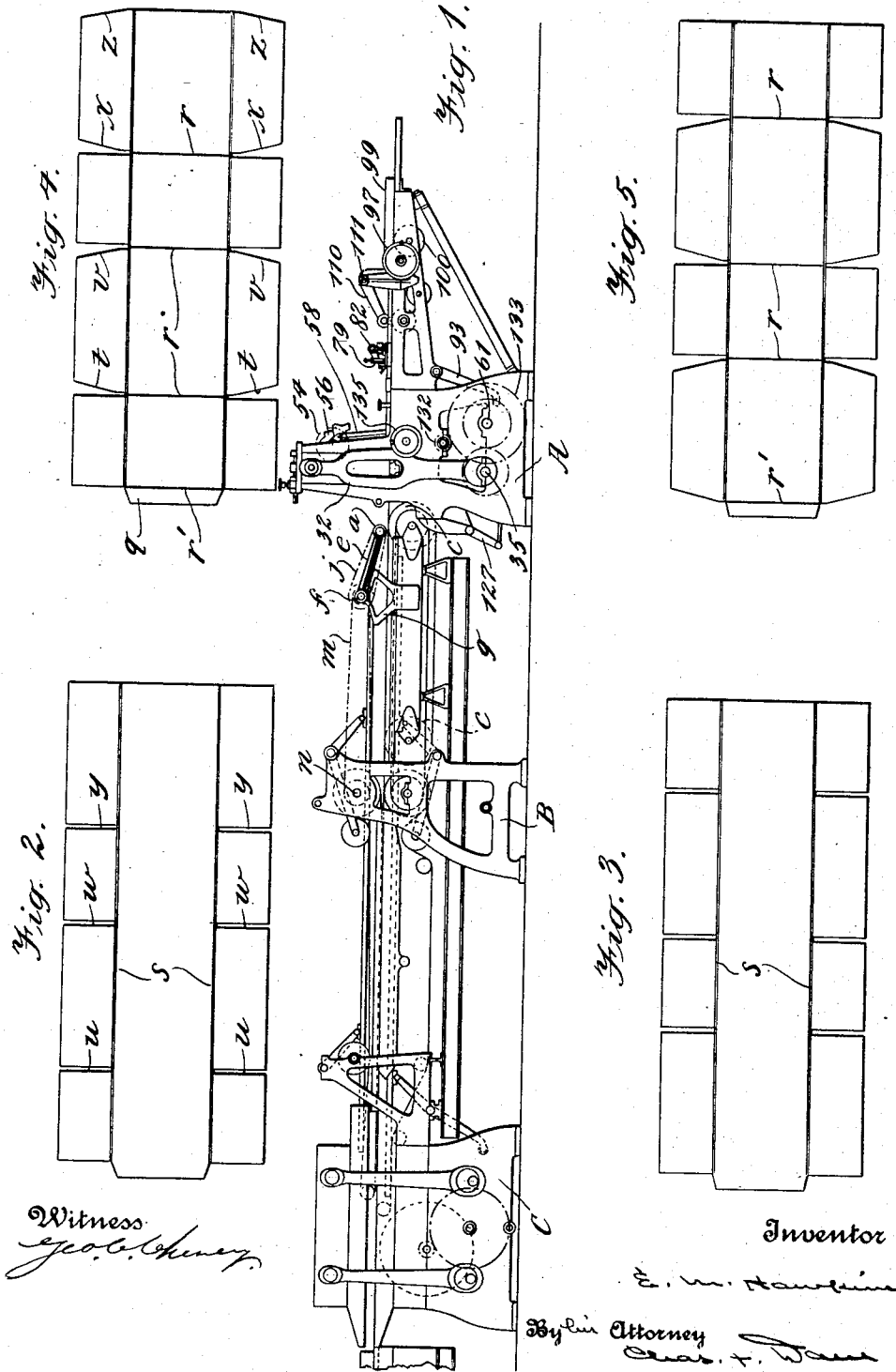


E. M. HAWKINS.
 CARTON BLANK FORMING MACHINE.
 APPLICATION FILED APR. 3, 1915.

1,189,945.

Patented July 4, 1916.

10 SHEETS—SHEET 1.

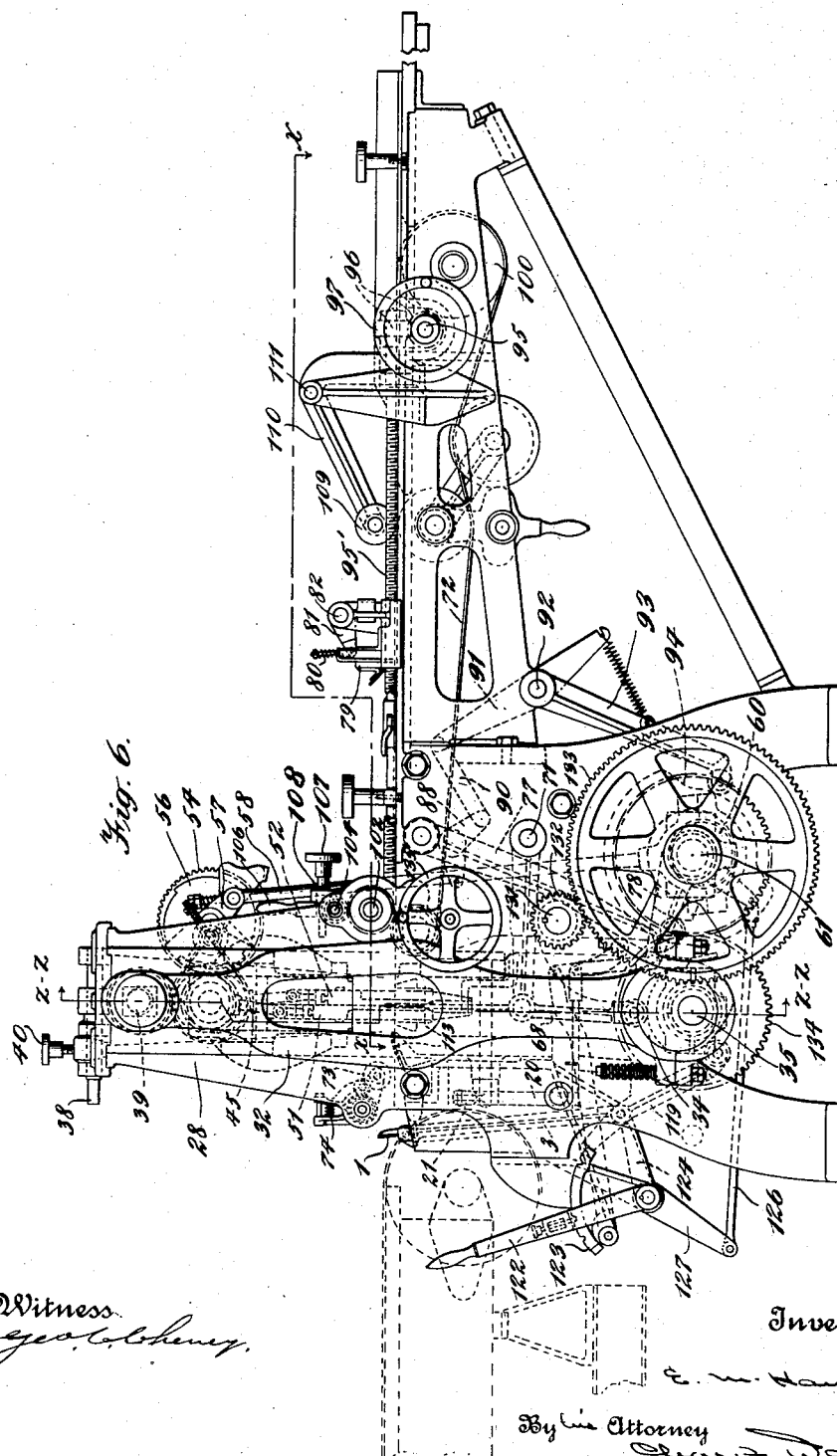


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10 SHEETS—SHEET 2.



Witn.
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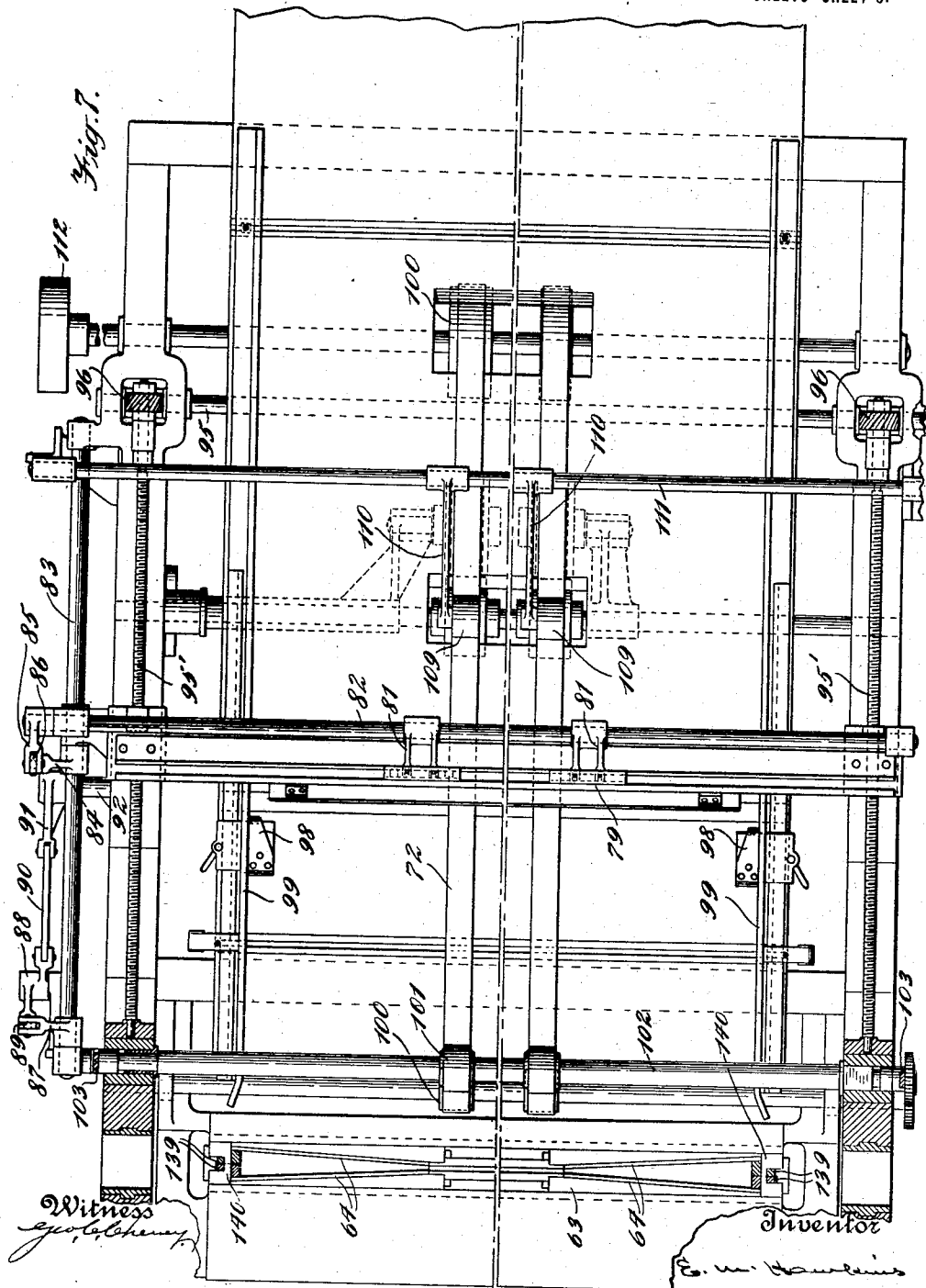
Chas. F. Daw

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10 SHEETS—SHEET 3.



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10 SHEETS—SHEET 4.

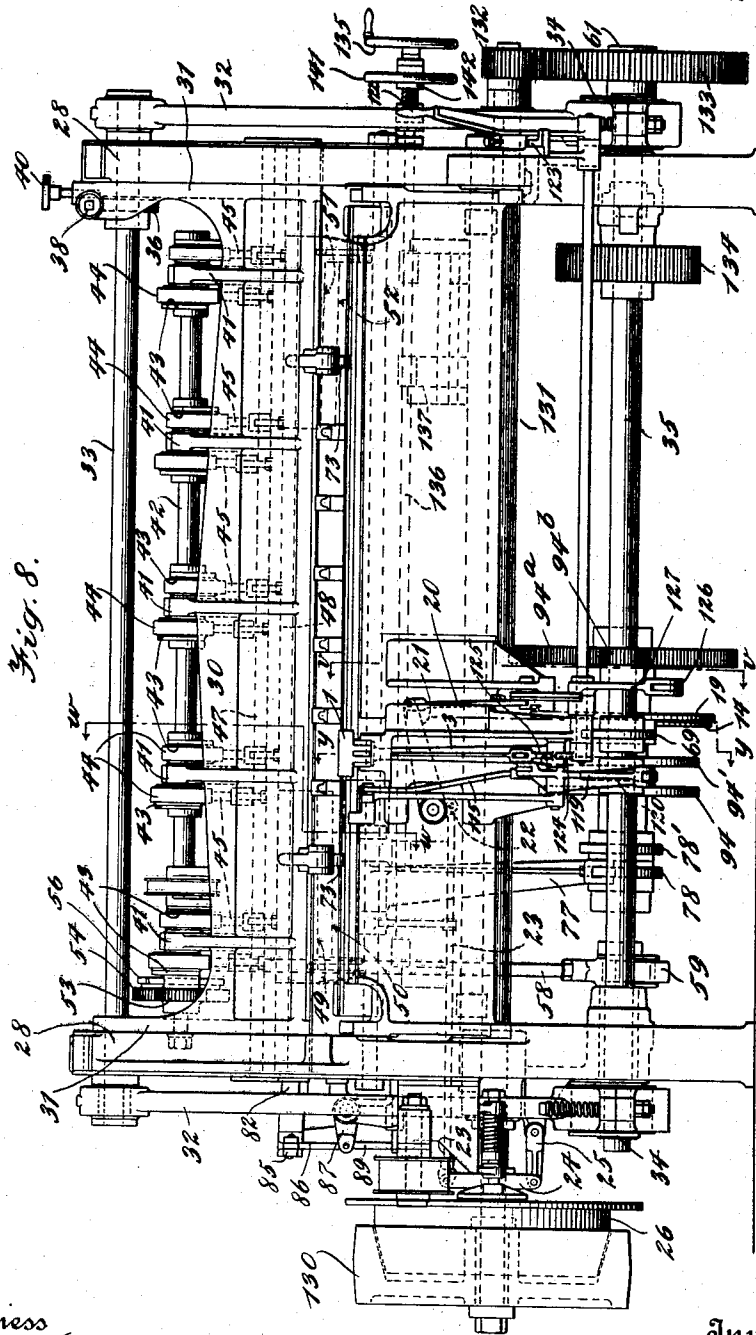


Fig. 8.

Witness
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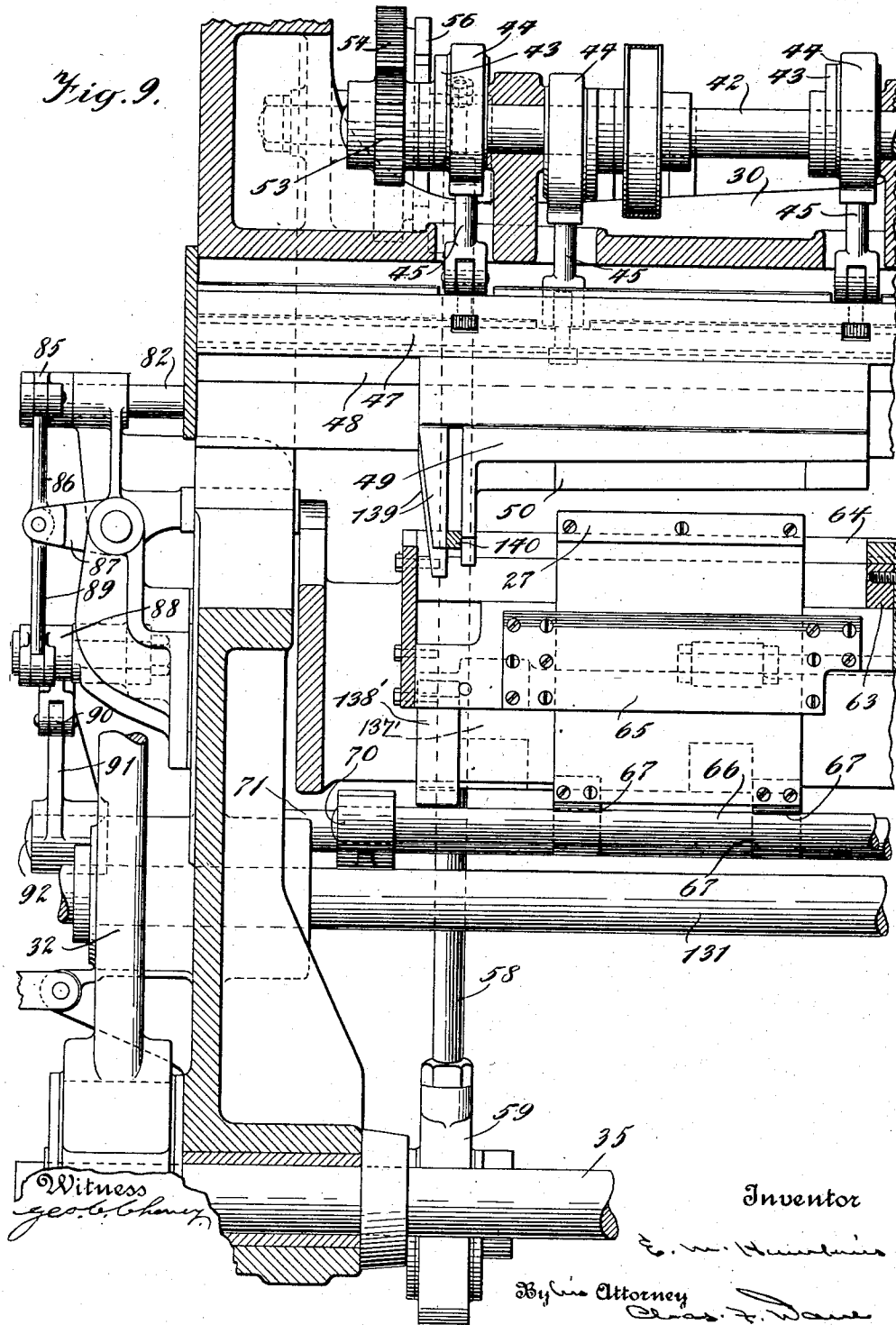
By *his Attorney*
Chas. H. Wane

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10 SHEETS—SHEET 5.

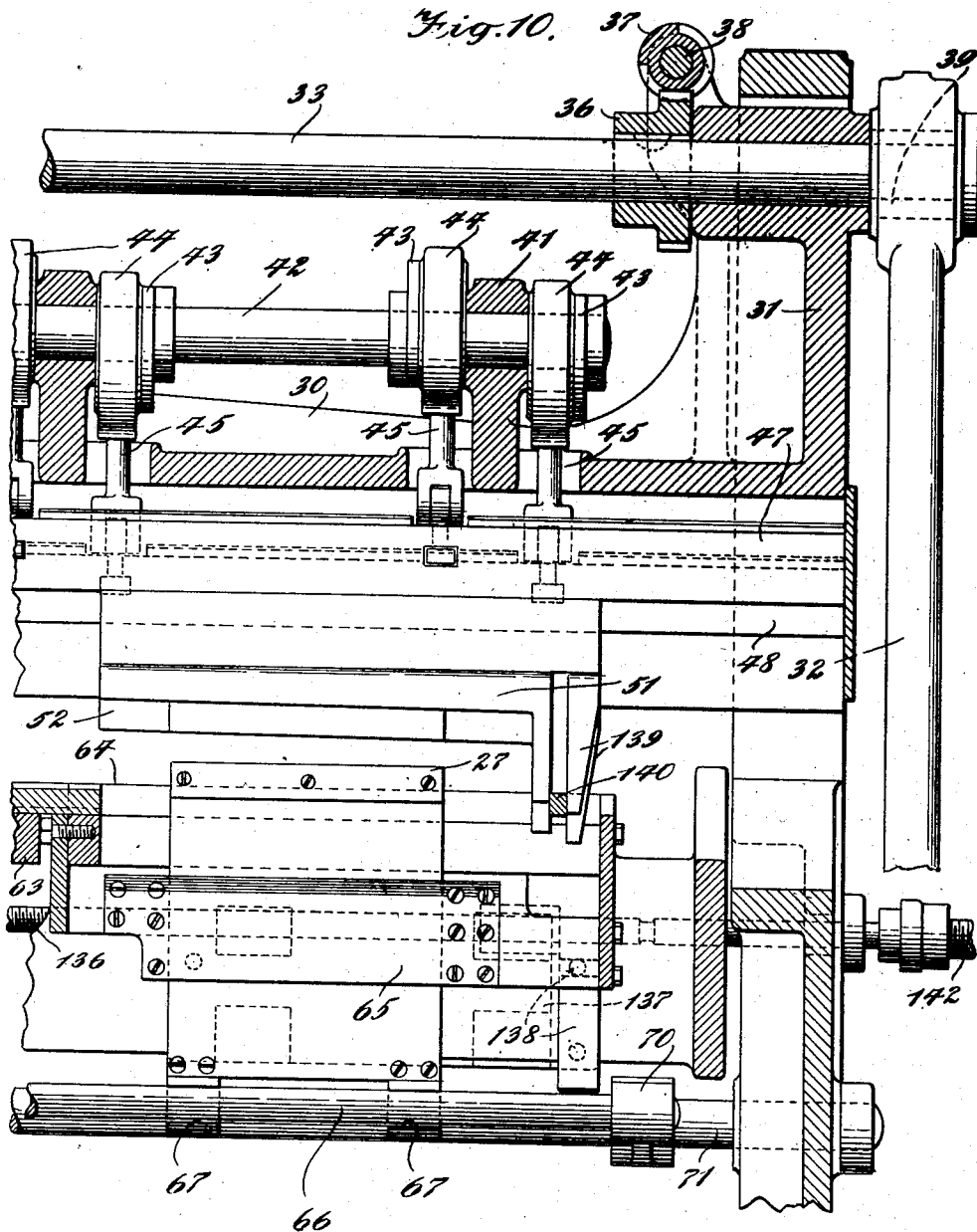


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10 SHEETS—SHEET 6.



Witness,
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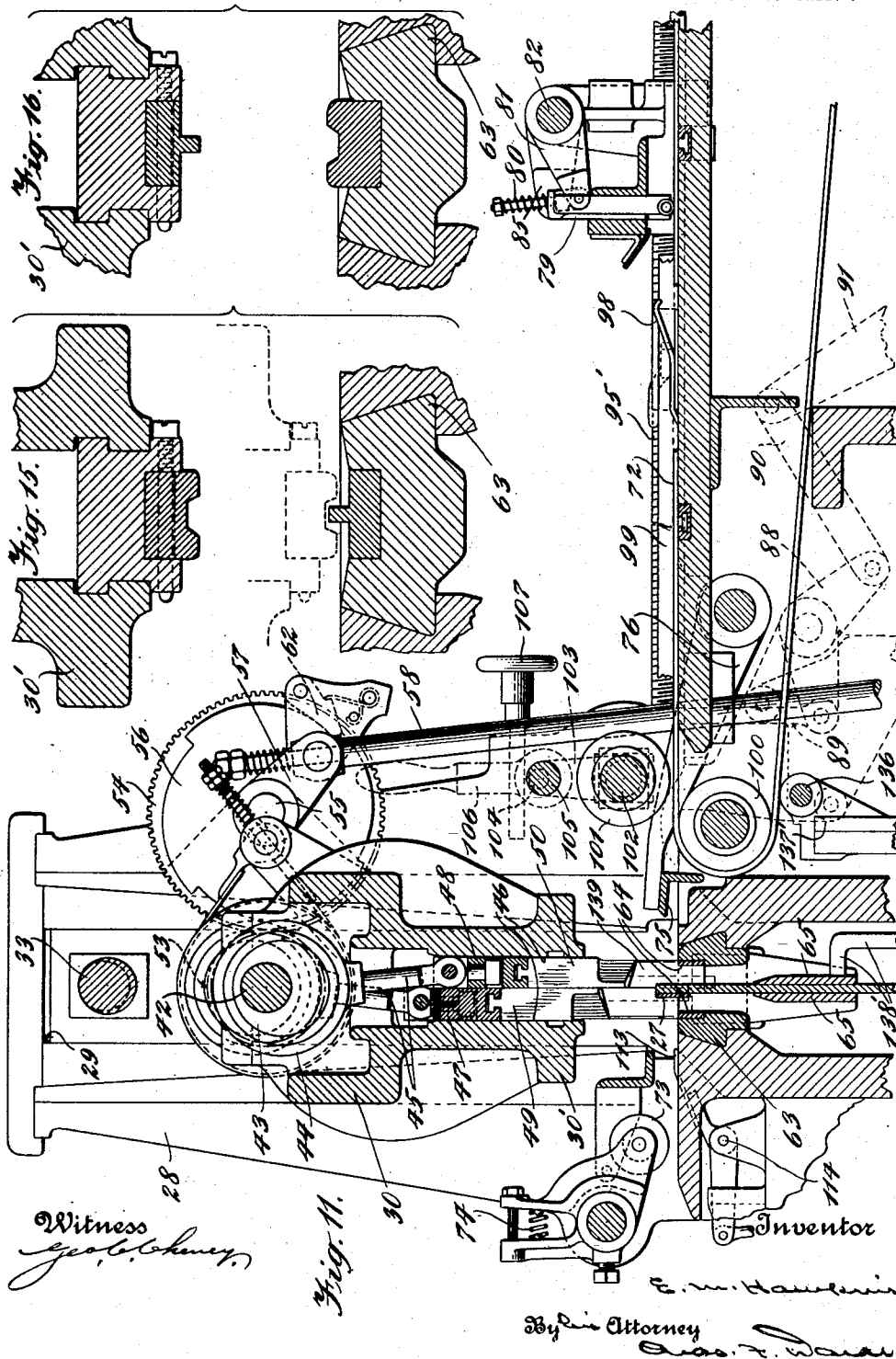
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Oliver F. Wane

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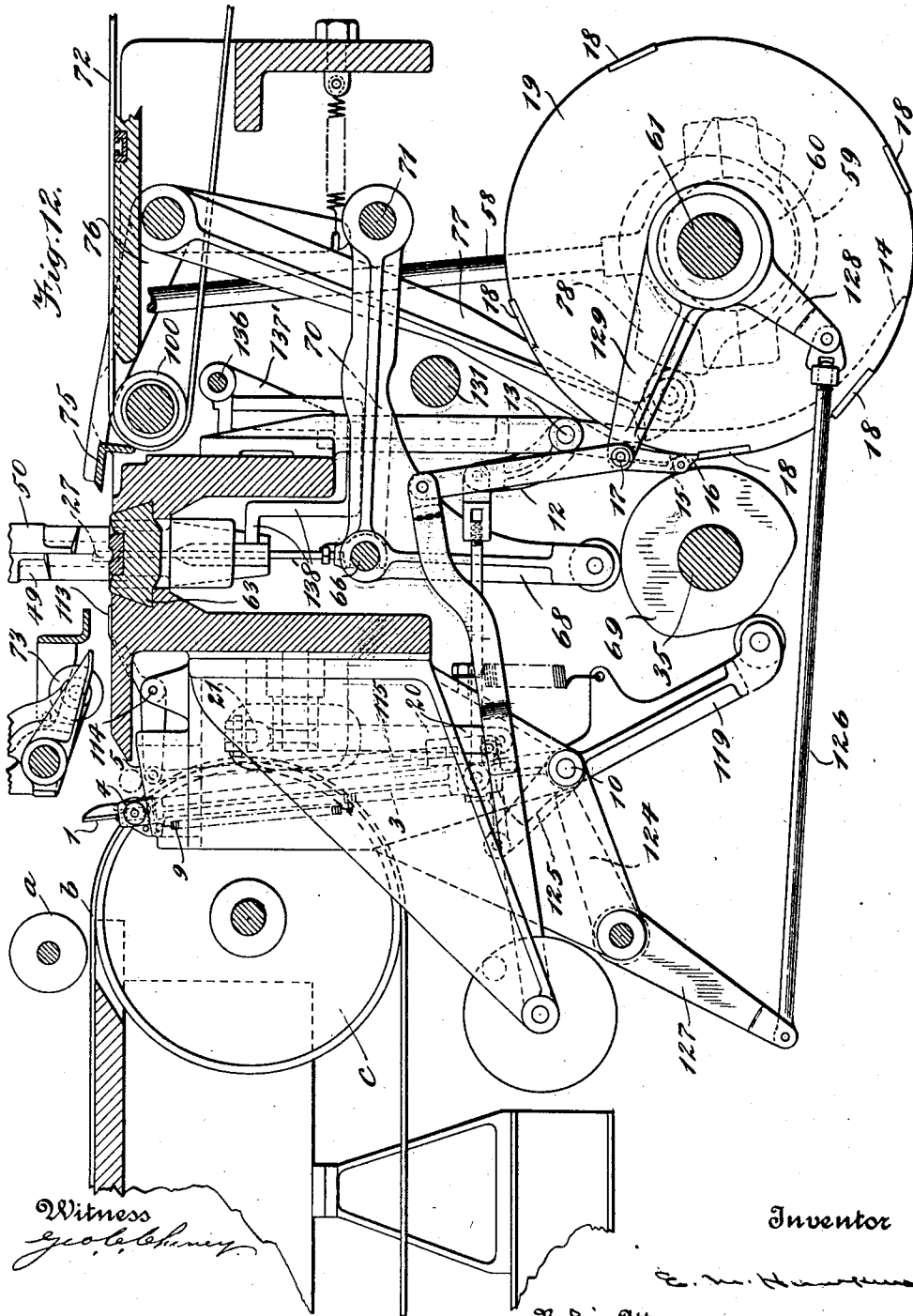
Patented July 4, 1916.
 10 SHEETS—SHEET 7.



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1,189,945.

Patented July 4, 1916.
 10 SHEETS—SHEET 8.



Witness
Geo. C. Channing

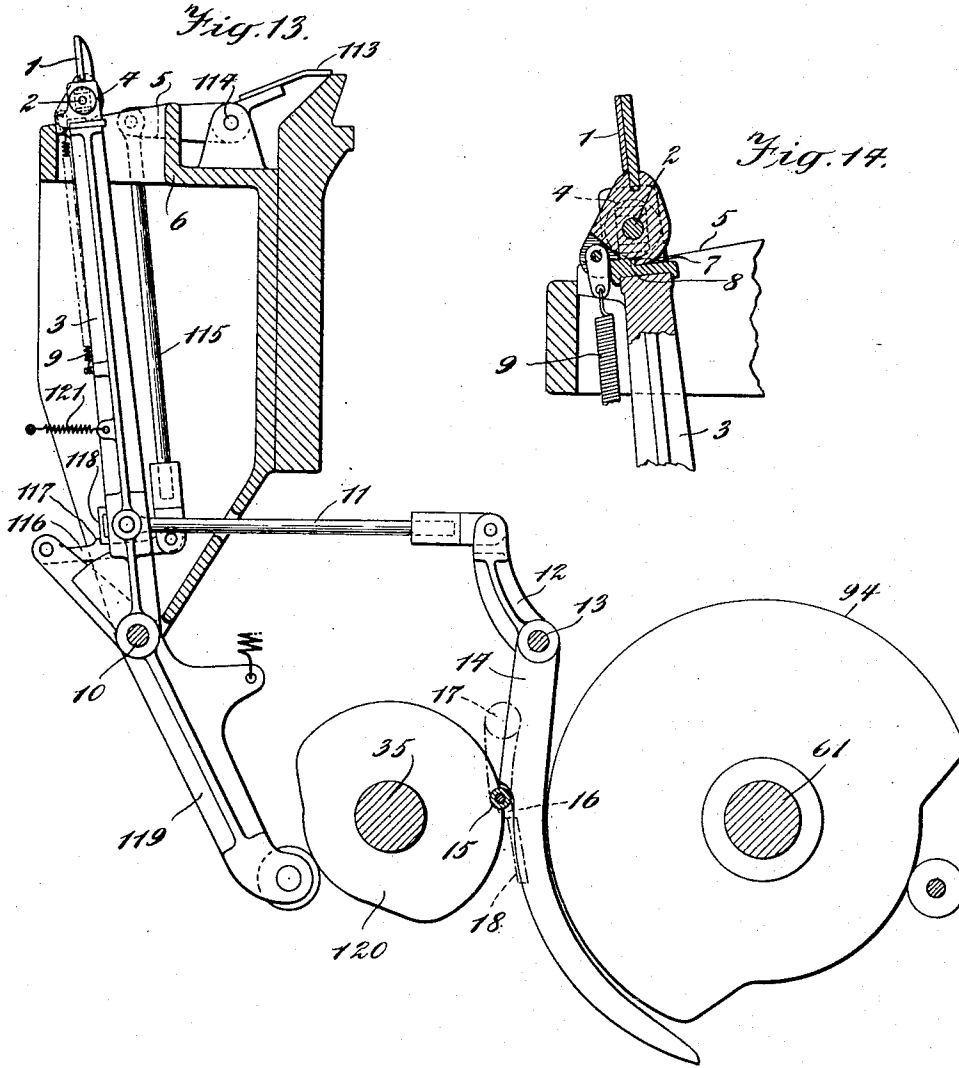
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 10 SHEETS—SHEET 9.



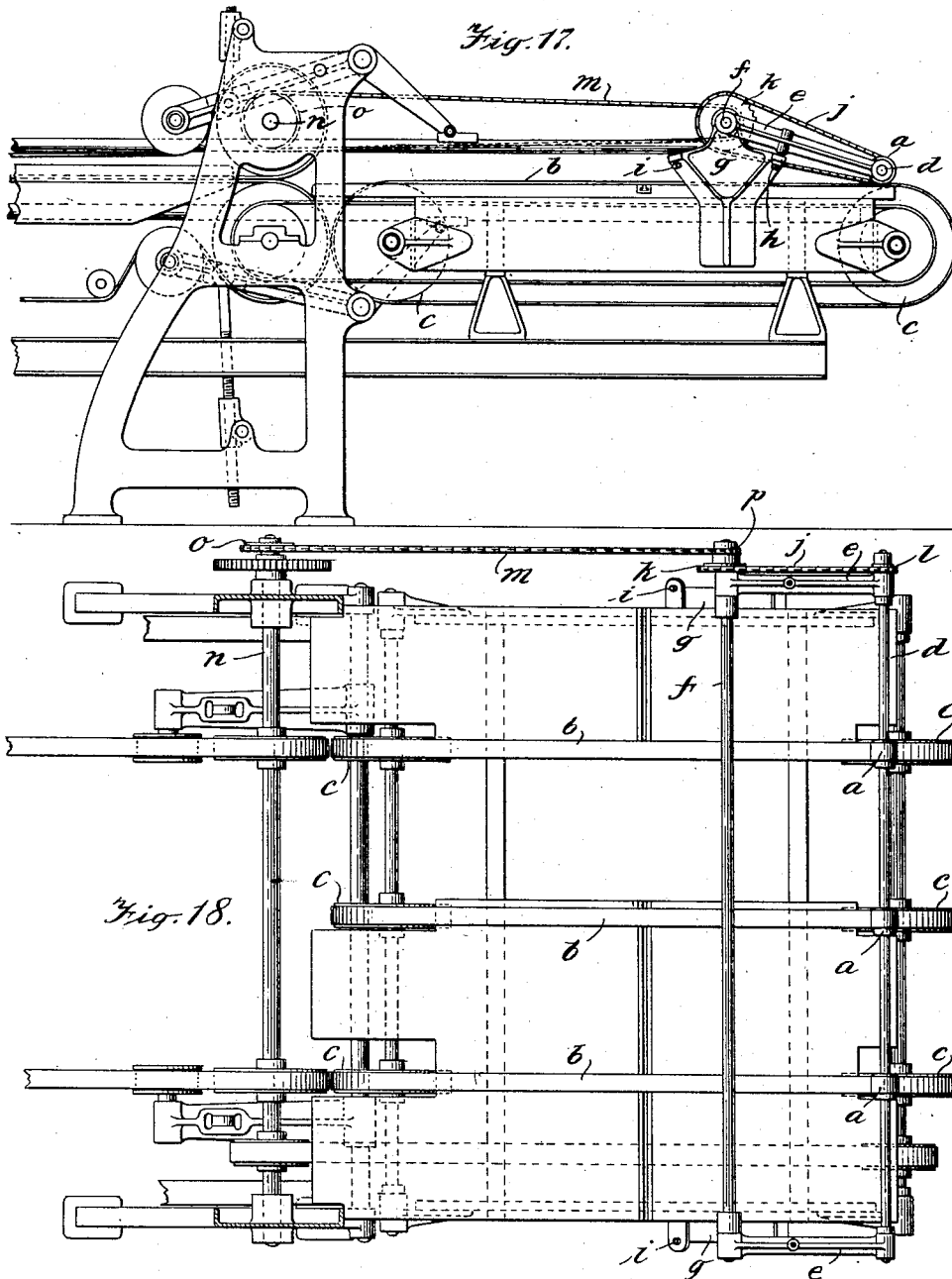
Witness
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 10 SHEETS—SHEET 10.



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UNITED STATES PATENT OFFICE.

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CARTON-BLANK-FORMING MACHINE.

1,189,945.

Specification of Letters Patent.

Patented July 4, 1916.

Application filed April 3, 1915. Serial No. 18,940.

To all whom it may concern:

Be it known that I, EDGAR M. HAWKINS, a citizen of the United States, and resident of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Carton-Blank-Forming Machines, of which the following is a specification.

This invention relates to machines for making box blanks, and has for its object to provide a machine having means for providing a box blank with creases disposed at an angle to other creases previously formed by other means, and also having means associated in a novel manner with said crease forming means for trimming and tapering the flaps of the blank, in the manner to be hereinafter described.

So far as the operation of the crease forming and trimming means is concerned, it is immaterial whether the creases already in the blank at the time of the operation of said crease forming means are formed in the same machine as that constituting the subject matter of the present application, or in a separate machine. In the present instance, the above-named means for forming a second set of creases at an angle to a first set previously formed in the blank, and the trimming means are associated with a separate machine, and the first set of creases is formed in a machine which acts upon the blank prior to its delivery to the machine of the present application.

The present application is especially designed to receive blanks from a machine such as that disclosed in my co-pending application, Serial No. 671,176, filed January 15, 1912, and entitled "Carton blank forming machine". In this machine, the first set of creases is provided and the blank is then delivered to the present machine to provide the blank with the second set of creases disposed at an angle to the first set. The machine disclosed in said co-pending application was designed to provide a box blank with flap creases and simultaneously form panel creases and slots in the blank. It has been found in practice, however, that when the panel creases and slots are made simultaneously with the flap creases, the blank is subjected to stresses which tend to stretch the material at the junction of the slots and creases, and when the blank is folded along the creases, cracks sometimes develop where

the material has been overstrained. In order to avoid this, the operation of forming the panel creases in the machine disclosed in said co-pending application may be omitted, and such panel creases provided in the blank in a separate machine, such as that disclosed herein. The present machine, which I preferably term an auxiliary machine, is placed at the rear of the machine disclosed in the above-named co-pending application, or the "creasing and slotting machine", as it is designated in practice, to receive the blanks as they are discharged from the creasing and slotting machine. The blank is then provided in the auxiliary machine with the panel creases, and the slots previously formed in the creasing and slotting machine are trimmed to produce a taper on the flaps, as will hereinafter appear. In its preferred form, this auxiliary machine comprises means for feeding a blank through the machine and intermittently arresting its motion, so as to allow it to be acted upon by the creasing and trimming means. The machine is designed to make a predetermined number of strokes, and at each stroke, to operate upon the blank to form a crease therein and to trim a certain portion thereof, as will later appear.

The invention further consists in providing certain other novel features, which will be hereinafter described in detail, and which cooperate with the above-named creasing and trimming means to produce a compact and efficient machine, all of whose parts are automatically actuated in timed relation to perform the desired operations upon the blank.

The invention is illustrated in the accompanying drawings, in which:—

Figure 1 is a side elevation, showing more or less diagrammatically the main creasing and slotting machine and the auxiliary machine with intermediate feeding means for feeding the blanks from the main creasing and slotting machine to the auxiliary machine; Figs. 2 and 3 illustrate the types of blank formed in the main creasing and slotting machine when the operation of forming the panel creases is omitted in this machine; Figs. 4 and 5 illustrate blanks corresponding to the blanks shown in Figs. 2 and 3, respectively, after treatment in the auxiliary machine; Fig. 6 is a side elevation of the auxiliary machine; Fig. 7 is a horizontal

section taken on the line $x-x$ of Fig. 6, certain parts being omitted for the sake of clearness; Fig. 8 is an end elevation of the machine looking in the direction of the feed from the feed end thereof; Figs. 9 and 10, in combination, represent a broken vertical section taken on the line $z-z$ of Fig. 6; Fig. 11 is a vertical section taken on the line $w-w$ of Fig. 8; Fig. 12 is a vertical section taken on the line $v-v$ of Fig. 8; Fig. 13 is a vertical section taken on the line $y-y$ of Fig. 8, and illustrating the trip mechanism for setting the machine in operation automatically by the introduction of a blank; Fig. 14 is a detail view, partly in section, of a portion of the trip mechanism illustrated in Fig. 13; Figs. 15 and 16 illustrate the type of creasing dies which may be employed to form the panel crease; Fig. 17 is a broken side elevation of the intermediate conveying means employed to feed the blank to the auxiliary machine; and Fig. 18 is a plan view of the construction shown in Fig. 17.

Referring to the drawings, and particularly to Figs. 1 to 3, the auxiliary machine, constituting the subject matter of the present application is shown at A, to which the blanks are fed from the main machine by means of any appropriate feeding means, such as shown at B. The main machine, constituting the subject matter of the co-pending application referred to above, is shown at C, and when used in combination with the auxiliary machine, A, is constructed to produce a blank such as that shown in either Fig. 2 or Fig. 3. The blank discharged from the main machine C is conducted by the feeding means B and introduced to the auxiliary machine A.

The specific construction of the feeding means B is immaterial, so far as the present invention is concerned, but it will be desirable to note the feed rolls a , (Figs. 1, 17 and 18), under which the blanks pass before being introduced to the auxiliary machine. The blanks are fed under the rolls a by means of the feed belts b passing over suitably mounted pulleys c . The rolls a are mounted on a shaft d , which, in turn, is mounted in the bracket arms e adapted to swing about the axis of the shaft f . The shaft f is mounted at either end in a suitable bracket g having a set screw h , by means of which, the position of the bracket arm e may be adjusted to thereby vary the distance between the rolls a and the feed belts b . The bracket arms e are preferably so adjusted that the blanks may pass under the rolls a without the latter having to "climb" over the blanks, but so that the blanks will receive the weight of the rolls when the blanks are passing thereunder. Each of the brackets g has a second set screw i associated therewith, and so positioned that the

bracket arms e may be swung backwardly around the axis of the shaft f , so as to reverse the position of the bracket arms e . In this reverse position thereof, they will rest upon the set screws i . The rolls a are preferably power-driven, and for this purpose, a sprocket chain j passes over sprockets k and l provided on the shafts f and d , respectively. The sprocket k is driven by means of a sprocket chain m from one of the shafts n of the feeding means, the sprocket chain m passing over sprocket wheels o and p on the shafts n and f , respectively. The shaft n may be power-driven in any suitable manner.

The blanks introduced to the auxiliary machine by the feeding means B first strike a trip plate 1, (Figs. 6, 13 and 14), which is mounted to oscillate about a shaft 2, which is carried by the trip lever 3. The shaft 2 is so mounted that it is capable of vertical movements with respect to the trip lever 3, and is moved vertically when the trip plate 1 is actuated by the blank, due to the rollers 4 carried by the shaft 2, which ride up in inclines 5 provided on the bracket 6. The stop plate 1 is normally prevented from oscillating about the shaft 2 by means of a shoulder 7 associated with the stop plate and which normally engages a corresponding shoulder 8 on the trip lever 3. These two shoulders constitute a latch device, so that as the trip plate 1 is being moved forwardly by the blank, it will be held against oscillation about the shaft 2 and will cause the trip lever 3 to partake of its movement with the blank. The rollers 4, in riding up the incline 5, will, however, shift the shaft 2 vertically and, therefore, raise the trip plate 1, so that at a predetermined point during the movement of the trip plate by the incline 5, the shoulders 7 and 8 will become disengaged and the blank will then be permitted to move the trip plate 1 about the shaft 2 until the trip plate assumes substantially a horizontal position beneath the blank. The blank is then free to pass over the trip plate and on into the machine. A spring 9, interconnecting the trip plate 1 and the lever 3, serves to return the trip plate to its normal position.

The movement of the trip lever 3 sets the machine in operation, as its movement about the axis of the shaft 10 serves to actuate a link 11, which, in turn, moves the arm 12, to which it is connected, about the axis of the shaft 13, and this movement of the arm 12 causes a depending member 14 to swing to the left in Fig. 13 about the axis of the shaft 13. The depending member 14, when so actuated, engages a portion 15 of a pawl 16 and swings the same about the axis 17. In the normal position of the pawl 16, it lies in the path of movement of a plurality of blocks 18, (Fig. 12), carried by a rotating

disk 19. In the normal position of the pawl, one of the blocks 18 will, therefore, contact therewith and move the same upwardly, thereby throwing out the main clutch of the machine through the intermediary of the link 20, (Fig. 8), serving through the arms 21 and 22 to shift the link 23 longitudinally to the right in the drawing, thereby oscillating the arm 24 about its pivotal connection with the bracket 25, and throwing out the clutch 26, which is operatively connected with the arm 24. A spring acting upon the clutch 26 tends to retain the same to its engaged position, and yieldingly resists the movement of the parts as just described. Therefore, when the pawl 16 is shifted by the depending member 14, (Fig. 13), the operation of the trip mechanism as above described is reversed, as the spring is permitted to act on the arm 24, (Fig. 8), and throw in the clutch, since this action is not resisted by the pawl 16 being held in its raised position. The construction of the trip mechanism, as above described, is substantially the same as that disclosed in the application covering the main machine C, except that in the main machine, only one block 18 is provided on the disk 19, (Fig. 12), whereas in the present construction, a number of such blocks are employed. After the machine has been thus set in operation, the blank continues its travel until the front edge thereof contacts with a stop plate 27, one of which is disposed at either side of the machine, (Figs. 6, 11 and 12). The blank is held in such position until the reciprocating head, described below, descends to operate upon the blank. The stop plate is then lowered and subsequently raised to stop the blank in its second position, as will be hereinafter described.

The reciprocating head referred to, is provided with one member of the cooperating dies which produce the panel creases in the blank, and also with trimming knives for trimming the slots of the blank produced in the main machine. The creasing and trimming mechanism involving the use of the reciprocating head is preferably constructed as follows: Upstanding side portions 28 of the main frame of the machine have formed therein, suitable guideways 29, in which is mounted the reciprocating head, see particularly Figs. 6, 8, 9, 10 and 11. The reciprocating head comprises a main casting 30, which extends transversely of the machine, and is provided at either end with an upstanding portion 31, which engages in the guideways 29. The casting so guided is reciprocated by means of two connecting rods 32, one of which is located at each side of the machine, and each engaging at its upper extremity a shaft 33 passing through the upper part of the upstanding portion 31 of the casting 30, and engaging

at its lower end an eccentric 34 mounted upon an eccentric shaft 35, which will be hereinafter referred to more in detail. As a result of this construction, it is obvious that the rotation of the eccentric shaft 35 will cause a reciprocation of the transverse casting 30 in the vertical guideways 29. Means is preferably provided for vertically adjusting the casting 30 to obtain the proper amount of pressure in creasing different thicknesses of the stock. This means preferably takes the form of a worm-wheel 36 keyed to the shaft 33 and meshing with a worm 37 adapted to be actuated by means of a crank which may be applied to the shaft 38 of the worm (see Fig. 8). The rotation of the worm 37 and the worm-wheel 36 causes the shaft 33 to rotate, thereby shifting the position of the eccentric 34, which the upper end of the connecting rod 32 encircles, thus changing the position of the transverse casting 30. The parts may be locked in their adjusted position by any suitable means, such as a hand-wheel 40 (Fig. 8), which, when turned, serves to lock the shaft 38 against rotation.

The transverse casting 30 is provided at several points with upwardly projecting bearing portions 41, through which an eccentric shaft 42 passes, said shaft being provided with a plurality of eccentrics 43 encircled by eccentric straps 44, which have connected thereto, depending pitmen 45. The transverse casting 30 is provided at its lower portion with vertical guideways 46, as best shown in Fig. 11. Two transverse bars 47 and 48 are mounted in these guideways 46 and are adapted to move vertically therein. Each of said transverse bars is provided in its lower face with a T-shaped slot adapted to engage a corresponding T-shaped projection provided on the upper edge of a trimming knife. The transverse bars 47 and 48, carry two trimming knives at each side of the machine, the knife carried by the bar 47 at the left side of the machine being indicated at 49, and the knife carried by the bar 48 at the same side of the machine being indicated at 50. Knives 51 and 52 (Fig. 6) are mounted in a similar manner at the opposite side of the machine. The outer faces of the knives 49, 50 and 51, 52 contact directly with the vertical faces of the guideways 46 and the inner faces of the knives contact and slide directly upon each other. One series of the pitmen 45 are all connected with the transverse bar 47 and another series of pitmen 45 are all connected with the transverse bar 48. The eccentrics 43 on the eccentric shaft 42 are so set that in the lowermost position of the head, either the bar 47 or 48, and consequently the knives which it carries, are in their lowermost position, while the other transverse bar with its associated knives is

in its raised or inoperative position. As the head descends, the knives which are in the lowermost position, will, therefore, be the operative knives and will serve to trim the slots in the blank, whereas the other knives will have no effect in acting upon the blank. The eccentric shaft 42 is automatically actuated during reciprocation of the head, and for this purpose, said shaft is provided with a pinion 53 at one end thereof, (Figs. 8 and 11), which meshes with a gear 54 mounted upon a rock shaft 55. The gear 54 is actuated by means of a ratchet 56 with which the gear is mounted to turn. During descent of the reciprocating head, an arm 57 is caused to oscillate about the rock shaft 55 by means of a link 58 pivotally connected to the arm 57 and connecting at its lower end with an eccentric strap 59 encircling an eccentric bushing 60 mounted upon the intermediate shaft 61, to be hereinafter referred to; see particularly Fig. 6. A pawl 62 swings with the oscillating arm 57 and serves to engage in one of the notches of the ratchet 56 to actuate the gear 54. By this construction, it is obvious that as the head reciprocates, the arm 57 will be oscillated about the shaft 55 and the pawl 62 will engage in a new notch of the ratchet 56 each time the reciprocating head is in its lowermost position. As the reciprocating head rises, the ratchet 56 will, therefore, be actuated through 90°, the construction being such that each upstroke of the reciprocating head will rotate the ratchet through 90°. The ratio of the gears 54 and 53 is 2 to 1, so that 90° rotation of the gear 54, or a quarter revolution thereof, will cause gear 53 to rotate through 180°. Such rotation of the gear 53, and hence the eccentric shaft, will cause all those eccentrics connected with one pair of knives to raise or lower such knives as the case may be, and all the eccentrics connected with the other set of knives to move the same in the opposite direction to the movement of the first set of knives. This shifting movement of the knives is accentuated by the eccentric 60, which the strap at the lower end of the link 58 encircles.

The cutting edges of the knives at each side of the machine form an angle with each other, or in other words, the cutting edge of each knife is adapted to cut the blank at an angle to the longitudinal axis of the blank. This is for the purpose of trimming the slots and tapering the flaps of the blanks shown in Figs. 2 and 3, to produce the blanks shown in Figs. 4 and 5. In case a blank, such as that shown in Figs. 2 and 4, is to be produced, the eccentrics on the shaft 42 are so set that the knife, at each side of the machine adjacent the feed end thereof, will be in its lowermost position when the reciprocating head descends. These knives with

the aid of the cooperating stationary knives, to be hereinafter described, will, therefore, trim the front edges of the first flaps of the blank shown in Fig. 2, as shown at *z* in Fig. 4. If the other pair of knives is in the lowermost position, they will have no effect upon the front end of the blank, as the knives will diverge away from the blank.

The transverse casting 30, in which the pair of knives is mounted at either end, also serves as a holder for one of the die members which extends transversely of the machine, and at either end of which, the trimming knives above described, are located. The lower end of the casting 30 is represented at 30', in Figs. 15 and 16, and from these views, it will be noted that either member of the cooperating dies may be supported in said lower portion 30' of the casting, while the other cooperating member of the dies is carried by the stationary bed of the machine. The stationary die members may be mounted in the holders 63 disposed transversely of the bed of the machine. It is immaterial which member of the cooperating dies is carried by the movable head, and which is carried by the stationary holder 63. However, Figs. 15 and 16 illustrate the mounting of the die members in either case. The transverse die holders 63 also have associated therewith, the stationary knives 64 intended to cooperate with the movable knives above described. The cutting edges of the stationary knives are, of course, obliquely disposed to properly cooperate with the oblique cutting edges of the movable knives. Due to this disposition of the transverse creasing dies with a pair of trimming knives disposed at either end of the creasing dies, it is obvious that the reciprocation of the head which carries the movable dies and the movable knives, will operate upon the blank to produce a transverse crease and to trim the slots of the blank shown in either Figs. 2 and 3 to produce the blank shown in Figs. 4 and 5.

The double set of knives may be used to produce different kinds of blanks. For instance, if a blank, such as that shown in Figs. 2 and 4, is to be produced, the pair of knives adjacent the feed end of the machine must be in their operative position on the first down stroke of the reciprocating head. On the next stroke, the positions of the knives will be changed by the eccentric shaft above described, and the pair of knives adjacent the discharge end of the machine will be in operative position. Therefore, on the second stroke of the machine, at which time the slots *y* (Fig. 2) lie under the knives, the slots *y* will be trimmed by the knives adjacent the discharge end of the machine, as shown at *z*, Fig. 4, to taper the first pair of flaps. When the reciprocating head descends for the third time, the knives will be

in their original position and will, therefore, act upon the slots *w*, (Fig. 2), to trim the same, as shown at *v* in Fig. 4. This reversing action of the knives will be repeated on the fourth stroke of the machine, thereby trimming slots *u*, (Fig. 2), as shown at *t* (Fig. 4). During this time, the blank is fed through the machine and held stationary in its proper position to be acted upon by the creasing dies and trimming knives, by the means to be hereinafter described.

If a blank, such as that shown in Figs. 3 and 5, is to be produced, the eccentrics on the shaft 42 are so set that the pair of knives adjacent the discharge end of the machine will be in operative position on the first down stroke of the reciprocating head, and the pair of knives adjacent the feed end will, therefore, be in operative position on the second down stroke of the reciprocating head. The result is that the flaps are tapered in the manner shown in Fig. 5, the second and fourth pair of flaps being the ones tapered instead of the first and third pair, as in Fig. 4.

As above stated, when the blank is fed to the machine, the panel creases are lacking, as shown in Figs. 2 and 3, the blank being complete in all other respects, except for the tapering of the flaps, the longitudinal or flap creases *s* and the slots *u*, *w* and *y* having been formed in the main machine. At each down stroke of the reciprocating head, the cooperating dies, therefore, act to produce one of the panel creases *r*, as shown in Figs. 4 and 5.

The blank is fed through the machine and intermittently arrested in its feeding movement to permit the reciprocating head to act thereon by the following mechanism: As stated above, when the blank is first introduced to the machine, its front edge contacts with the stop plate 27, which, at that time, is in its raised position shown in the drawings. One of these stop plates is mounted at each side of the machine to reciprocate in a vertical direction in the space between the stationary knives, as best shown in Figs. 9, 10 and 11. The stop plates 27 may be mounted in any suitable manner, but preferably, they slide between adjacent faces of two transversely extending guide plates 65, which may be mounted in the lower die holders 63. The lower end of each stop plate 27 is connected to and supported by a transverse shaft 66 by means of suitably formed clips 67 secured to the stop plate and engaging with said shaft 66. The shaft 66 has imparted thereto, a bodily up and down movement by means of the depending cam arm 68 connected with the shaft 66 and actuated by means of a cam 69 on the eccentric shaft 35. In order to properly guide the shaft 66 in its movement, a bracket arm 70 is provided at each end of the shaft 66

which serves to space the shaft 66 from a fixed rock shaft 71. The stop plate 27 is held in its raised position by the cam 69 until the creasing dies have taken hold of the blank, and then they are lowered by means of the cam 69 and remain down until the trimming knives have withdrawn. As soon as the stop plate is lowered, the blank is carried forward by means of the feed belts 72. Soon after the blank starts its forward movement, the stop plates 27 begin to rise and engage the under side of the first pair of flaps of the blank attached to the first panel. Therefore, when the first pair of slots *y* in the blank come in alignment with the creasing dies, the stop plates will engage in said slots and arrest the motion of the blank as a result of the engagement between the stop plates and the forward edge of the second pair of flaps. The first pair of flaps being hingedly associated with the blank by means of the flap creases, offer no resistance to the rising movement of the plates 27, and merely ride over the stop plate. The succeeding pair of flaps, however, are held down by means of presser rollers 73, one of which is mounted at each side of the machine and is yieldingly held in engagement with the blank by means of a spring 74, (Fig. 11). The blank thus arrested in its motion is again subjected to the action of the trimming knives, and the creasing dies, and when the dies take hold of the sheet, the stop plates 27 are lowered, and subsequently raised to engage the forward edges of the third pair of flaps to arrest the motion of the blank for the third operation of the reciprocating head thereon. This operation is repeated until the reciprocating head makes four complete strokes. It will be noted, however, that the fourth stroke of the reciprocating head produces the third panel crease, as the front edge of the blank registered with the creasing dies on the first stroke of the reciprocating head. There is, therefore, one more crease to be made in the blank, to wit, that shown at *r'* between the stitching flap *q* and the fourth panel. This crease, however, is made on the first stroke of the reciprocating head during the cycle of operations upon a succeeding blank. It is, therefore, obvious, that the adjacent end portions of the successive blanks must be made to overlap, so that the line where the crease *r'* is to be formed will register with the front edge of the succeeding blank. As it is desirable to have the rear end of the first blank overlie the front end of the succeeding blank, means is provided for lifting the rear end of the first blank to permit the front portion of the succeeding blank to be fed thereunder, and such means preferably takes the form of a lifting bar 75, which is actuated by means of the arms 76 and 77 and a cam 78 mounted

upon the intermediate shaft 61. The lifting bar 75 is actuated just before the machine comes to a stop after the fourth stroke of the reciprocating head. It will be noted, however, that after the motion of the blank has been arrested four times by the engagement of the stop plates 27 with the forward edges of the four pairs of flaps, the stop plates will be ineffective for arresting the motion of the blank to enable the creasing dies to form the crease r' of the stitching flap, as when the line on which the crease r' is to be formed registers with the creasing dies, there is no flap with which the stop plates 27 can engage. Additional means is, therefore, provided for stopping the blank when the rear end thereof reaches the creasing dies, and such means preferably take the form of a rear stop gage 79 yieldingly held by means of the spring 80, so as not to offer too much resistance to the passage of the blank (Fig. 11) and lowered at the proper time to arrest the motion of the blank thereunder. The actuation of the gage may be effected through arms 81, a rock shaft 82, which, in turn, is actuated from a rock shaft 83, (Fig. 7) running longitudinally of the machine at one side thereof. The connection between the shafts 82 and 83 may comprise the arms 84 and 85 connected to the shafts 82 and 83, respectively, which arms may be interconnected by means of a suitable link 86. The rock shaft 83 may be actuated through a second arm 87 connected thereto, a bell-crank lever 88, and a link 89 connecting said arm 87 and one arm of the bell-crank lever 88. The other arm of said bell-crank lever is connected by means of a link 90 with an arm 91 mounted to swing about the axis of a shaft 92 (see particularly Figs. 6 and 7). The arm 91 is in turn actuated by means of the cam arm 93 carrying a roller which engages a cam 94 mounted on the intermediate shaft 61.

The cam 94 is not secured to the shaft 61, but is mounted upon a sleeve which is free to rotate on said shaft 61. The sleeve is driven by means of a gear 94^a secured to said sleeve, and a pinion 94^b mounted upon the eccentric shaft 35. The ratio of the gears 94^b and 94^a is 1 to 4, whereby the cam 94 makes one revolution for four reciprocations of the head. By this mechanism, the rear stop gage is lowered at the proper time to arrest the motion of the blank. The position of this gage may be adjusted by means of the worm shafts 95', one of which is located at each side of the machine and runs longitudinally thereof. These worm shafts pass through the base of the stop gage and are simultaneously actuated from a transverse shaft 95 geared to the worm shafts 95' by means of the gears 96 and actuated by a suitable hand wheel 97 located

at one side of the machine. The flaps are successively raised from the bed of the machine, so that they may engage with the stop gage 79 by means of the spring fingers 98, one of which is located at each side of the machine, and each of which has an upwardly inclined portion, as shown, so as to lift the flaps of the blank in an obvious manner. These spring fingers are preferably carried by the side gages 99, to be hereinafter referred to.

The feeding belts 72, mentioned above for feeding the blanks, are preferably mounted upon the pulleys 100. The blanks upon being introduced to the feed belts 72 are caused to pass beneath rollers 101 mounted upon a transverse shaft 102, which may be adjusted in a vertical direction to vary the space between the rollers 101 and the feed belts 72. This may be accomplished by means of the links 103, which connect the shaft 102 with a superposed shaft 104. An eccentric 105 associated with the shaft 104 serves to raise or lower the links 103 when a handle 106 is actuated, all as best shown in Fig. 11. The shaft 104 may be locked in its adjusted position by means of a clamp wheel 107, the actuation of which forces a wedge sleeve 108 (Fig. 6) into engagement with the shaft 104, thereby locking the same against rotation. The blanks are also caused to pass under rollers 109 positioned over the belts near the rear end thereof, which rollers are mounted upon swinging bracket arms 110 carried by a transversely extending shaft 111. These bracket arms 110 may be swung around the shaft 111 to reverse their positions and cause the rollers 109 to lie over the rear pulleys 100, if the position of the rear stop gage 79 interferes with the position of the rollers 109, shown in the drawings. The feed belts may be actuated in any suitable manner, such as by means of a pulley 112 secured to the shaft on which the rear belt pulleys 100 are mounted.

In addition to the trip plate 1, with which the blank engages when first introduced to the machine, means is provided for maintaining the machine in operation after the trip plate 1 trips the machine and sets the parts in motion. This means is so constructed that if the blanks are not in proper position to be acted upon, the trip lever 3, having returned to its normal position, will be permitted to remain there, allowing the machine to stop. The means referred to comprises a trip plate 113, (Figs. 6 and 13), which is located to the rear of the trip plate 1, and is pivotally mounted at 114, so that it may be depressed by a blank passing thereover. When the plate 113 is depressed, it raises a link 115, which, in turn, lifts a latch device 116 having a shoulder 117 engaging a corresponding shoulder 118, carried by the main trip lever 3. The latch device 116 is

moved back and forth by means of a cam arm 119, actuated by a cam 120, mounted upon the eccentric shaft 35. It is obvious that when the latch device 116 is held in its raised position by the plate 113, the came 120 will shift the trip lever 3, and hence the link 11, arm 12, depending member 14, and thus throw the pawl 16 out of the path of movement of the oncoming block 18. As long as the plate 113 is depressed, the machine will, therefore, continue in operation, but if said plate is permitted to rise to its normal position, the main trip lever 3 is pulled back by the spring 121, and the oncoming block 18, therefore, engages with the pawl 16 to lift the same and throw the machine out of operation. Before the blank comes to a stop, and while one pair of flaps is riding over the main stop plates 27, the trip plate 113 is free to remain in its raised position, but when the succeeding pairs of flaps approach the stop plate, they will be held down by the rollers 73, thereby causing the trip plate 113 to be depressed. Therefore, if the blank, for some reason, should not move to its proper position, the trip plate 113 would remain in its raised position and the machine would stop.

The controlling means for the machine are similar to that used in the main machine C, and consists of a hand lever 122, cooperating with a quadrant bracket 123, (Fig. 6). The quadrant 123 is provided with three notches, the first of which represents the "starting" or "continuous" position, the second, the "sheet trip" position, and the third, the "locked" or "safety" position. In the "starting" or "continuous" position, an arm 124 engages a projection 125 on the main trip lever 3, and, therefore, holds the pawl 16 out of the path of movement of the blocks 18. In this position of the hand-lever 122, the machine will, therefore, operate continuously. In the second or "sheet trip" position of the lever 122, the trip mechanism is free to be tripped by the successive blanks, and the machine will, therefore, operate until four strokes of the reciprocating head are effected, and then the machine will stop until again tripped by a succeeding blank. In the third or "locked" position of the lever 122, a link 126 actuated by means of an arm 127, serves to swing arms 128 and 129 about the axis of the shaft 61, and this movement of the arm 129, which is connected to the pawl 16, serves to raise said pawl and hold it in its raised position. It is, therefore, safe in this position of the hand lever, for the operator to work around the machine to make repairs, etc., without danger of accidentally setting the machine in operation by tripping the trip mechanism.

The machine is driven from a pulley 130 (Fig. 8), and when the clutch 26 is thrown in, the pulley 130 rotates the main actuating

shaft 131. This shaft carries a pinion 132, which meshes with a gear 133, carried by the intermediate shaft 61, hereinbefore referred to. The eccentric shaft which carries the eccentrics for actuating the reciprocating head is driven from said intermediate shaft by means of intermeshing gears 134.

It may sometimes be desirable to produce a blank having only two panels and a stitching flap instead of four panels and a stitching flap. Two of said blanks would then be required to make up a container. To produce such a blank, the parts must, therefore, be set to do two-stroke work. The following changes are then made in the position of certain of the parts. The cam lever 77 for actuating the lift bar 75 is moved along its supporting shaft until it is in position to be actuated by a second cam 78' located adjacent the cam 78, which is employed for actuating the arm 77, during four-stroke work. Likewise, cam lever 93, for actuating the rear stop gages, is moved along shaft 92 until it engages a cam 94' (Fig. 8) adjacent the cam 94, which is normally employed for actuating the arm 93 during four-stroke work. Under these conditions, the lift bar would rise on alternate strokes of the machine instead of once for every four strokes of the machine. The rear stop gages would also act on alternate strokes instead of once for every four strokes.

The bed or supporting table of the machine shown in Fig. 7 may have mounted thereon, suitable side gages 99, one of which, preferably that on the right-hand side of the machine, being adjustable toward and away from the other in the usual manner. The opposite or left-hand side gage also has a limited movement to care for the varying widths of flaps.

In order that blanks of different widths may be properly acted upon, all the operating devices on one side of the machine, preferably the right-hand side, are adjustably mounted, and may be moved toward and from the corresponding operating devices on the opposite side. For this purpose, a hand-wheel 135 is provided, the rotation of which causes the movable knives, the stationary knives, and the stop plate 27, at one side of the machine, to be simultaneously moved toward or away from the corresponding devices on the other side of the machine. This is effected by means of a worm shaft 136 connected to the hand-wheel 135, the rotation of which causes a bracket 137 to move transversely of the machine (Fig. 10), which bracket carries a finger 138 engaging the plates 65, in which the stop plate is mounted. The holder for the stationary knives, the stop plate 27, and the stationary knives are, therefore, shifted simultaneously by movement of the bracket 137. The mov-

able knives are provided with depending fingers 139 (Fig. 10), which engage a cross piece 140 associated with the stationary knife holder, and, therefore, the movement of the parts just described also causes a corresponding movement of the movable knives. This movement of the movable knives is permitted by the T-slot connection between the transverse knife holding bars and the knives themselves. A similar and simultaneous adjustment of the corresponding parts at the opposite side of the machine may also be provided for to properly center the two sets of devices with respect to an oncoming blank, but this adjustment need be only very slight, and may be effected by means of a second hand-wheel 141, actuating a sleeve 142, which, in turn, actuates a bracket 137' at the opposite side of the machine similar to 137, and having a finger 138', (Fig. 9), similar to that shown at 138. As the connection between the parts at this side of the machine is similar to that of the parts at the so-called adjustable side, the movement of the finger 138' effects an adjustment of the stationary knives, movable knives and stop plate, in the same manner as above described with respect to the corresponding parts at the right-hand side of the machine.

Reviewing briefly the operation of the machine, it will be noted that the front edge of the blank sets the machine in operation by contacting with the trip mechanism. The reciprocating head then descends to operate upon the front edge of the blank and upon the rear end of the preceding blank, which is not yet completed and which overlaps the front end of the blank which has just tripped the machine. On the first stroke of the reciprocating head, the crease r' between the stitching flap g and the last panel of the preceding blank, (Figs. 4 and 5) will be formed, and either the front edges of the flaps of the succeeding blank will be trimmed, as shown at z in Fig. 4, or else the rear edges of the last pair of flaps on the preceding blank will be trimmed, as shown in Fig. 5, this depending upon which pair of knives is in its lowermost or operative position on the first stroke of the machine, and depending upon whether it is desired to produce a blank like that shown in Fig. 4, or that shown in Fig. 5. By the combined action of the feeding belts, the trip plate 113, which maintains the machine in operation, and the vertical reciprocating stop plate, the blank is fed through the machine and intermittently arrested in its motion, in order that the panel creases may be successively formed in the blank and the slots trimmed, as shown in Fig. 4, or in Fig. 5. The lifting device will then act to raise the rear end of the first blank before the machine comes to a stop, and the rear stop gage will stop the blank in proper position

to have the last crease r' formed on the first stroke of the machine during the next cycle of operations. The first blank is, therefore, not discharged from the machine until a succeeding blank trips the machine and causes the first stroke of the reciprocating head, during the cycle of operations upon the succeeding blank, to produce the crease r' upon the first blank, and properly trim the rear edges of the last pair of flaps, if a blank like that shown in Fig. 5 is to be produced. If such is the case, it is obvious that the first stroke of the reciprocating head will have no effect on the front end of the succeeding blank, as a blank, such as that shown in Fig. 5, has its front edge perfectly straight. If a blank, like that shown in Fig. 4, is to be produced, the first stroke of the reciprocating head, during each cycle of operations produces the crease r' on the preceding sheet, and trims the front edges of the first pair of flaps on the succeeding blank, as will be readily understood from Figs. 2 and 4. It is obvious that if desired, the trimming knives for trimming the front and rear edges of the flaps may be thrown out of operation and the machine used for providing the blank with the panel creases without trimming the flaps. A blank like that shown in Fig. 2 or Fig. 3 would then be produced, except that it would be provided with the transverse panel creases.

Obviously, numerous changes may be made in the details of the construction, without departing from the spirit or scope of the invention, as defined in the accompanying claims.

What I claim is:—

1. The combination with means for providing a box blank with slots and creases disposed in one direction, of means operative on the blank subsequent to the operation of said first-named means to trim the slots and provide the blank with creases disposed at an angle to said first-named creases.
2. The combination with means for providing a box blank with flap creases and slots, of means operative on the blank subsequent to the operation of said first-named means for tapering the flaps and providing the blank with panel creases.
3. The combination with a machine for providing a box blank with slots, and creases disposed in one direction, of an auxiliary machine having means for trimming said slots, and means for providing the blank with creases disposed at an angle to said first-named creases.
4. The combination with a machine for providing a box blank with flap creases and slots, of an auxiliary machine having means for tapering the flaps, and means for providing the blank with panel creases.
5. In a machine for operating on box

blanks upon which the flaps have been provided, the combination of means for feeding the blank through the machine, and means for interrupting the feeding movement of the blank comprising means for engaging the successive flaps of the blank during its movement through the machine.

6. In a machine for operating on box blanks which have been previously provided with slots, means for feeding the blank to the machine, and vertically reciprocating means adapted to engage in said slots for interrupting the movement of the blank through the machine.

7. In a machine for making box blanks, the combination with means tending to move the blank continuously through the machine, of a single stop member adapted to engage successive parts of the blank during its movement through the machine to intermittently arrest the feed movement thereof, and means to actuate said member.

8. In a machine for making box blanks, the combination with means tending to continuously move the blank through the machine, of a vertically reciprocating stop member adapted to engage successive parts of the blank during its movement through the machine to intermittently arrest the feeding movement of the blank.

9. In a machine for finishing previously slotted box blanks, the combination with means tending to continuously move the blank through the machine, of means adapted to successively engage the slots of the blank to intermittently interrupt the feeding movement thereof, and means operated in timed relation with said slot engaging means to provide the blank with a crease each time the blank is arrested in its motion.

10. The combination with means for providing a box blank with slots, of means for providing the slotted blank with creases, means for feeding the blank in operative relation with said creasing means, and means to engage in the successive slots of the blank to arrest the feeding movement of the blank prior to each operation of said creasing means.

11. In a machine for making box blanks, the combination with means for operating upon a slotted blank, of means tending to continuously feed the blank through the machine, means adapted to engage the successive slots in the blank to arrest the feed movement thereof, and means for stopping the feed movement of the blank when the end of the blank has reached the means for engaging the successive slots.

12. In a machine for making box blanks, the combination with means for operating upon a slotted blank, of means tending to continuously feed the blank through the machine, means adapted to engage the successive slots in the blank to arrest the feed

movement thereof, means for stopping the feed movement of the blank when the end of the blank has reached the means for engaging the successive slots, and means to lift the rear end of the blank to permit a portion of a succeeding blank to be fed under the rear end of the first blank.

13. In a machine for making box blanks, the combination of means for intermittently feeding the blanks through the machine, means for causing the extremities of the blanks to overlap and means adapted to simultaneously operate upon the end portion of each of such blanks.

14. In a machine for making box blanks, the combination with means for creasing the blank, of means for trimming the blank adjacent said crease, and means to automatically shift the position of said trimming means during the operation of the creasing means.

15. In a machine for making box blanks, the combination with a reciprocating head, of a die associated therewith for creasing the box blank, a trimming knife adjacent said die, and means automatically operable during the reciprocation of the said head to shift the position of said knife.

16. In a machine for making box blanks, the combination with a reciprocating head, of a die associated therewith for creasing the box blank, two knives whose cutting edges are disposed at an angle to each other arranged at the extremity of said die, and means automatically operable during the reciprocation of said head to shift the positions of said knives.

17. In a machine for making box blanks, the combination of a reciprocating head, a die associated therewith for creasing the blank, two knives arranged at the end of said die and whose cutting edges are disposed at an angle to each other, and means automatically operable during the reciprocation of said head to simultaneously raise one of the knives and lower the other, for the purpose described.

18. In a machine for making box blanks, the combination of a reciprocating head having means to crease the box blank, two knives mounted to reciprocate with said head and having their cutting edges disposed at an angle to each other, and means to automatically throw one of the knives into operation and the other out of operation on each stroke of said reciprocating head.

19. In a machine for making box blanks, the combination of a reciprocating head, two knives mounted to reciprocate with said head and whose cutting edges are disposed at an angle to each other, and means to automatically shift one of said knives to operative position and the other to inoperative position during reciprocation of said head.

20. In a machine for making box blanks, the combination of a reciprocating head, a die associated with said head for creasing the blank, two pairs of trimming knives mounted to reciprocate with the head, one pair being disposed at each end of said die and the cutting edges of each pair being disposed at an angle to each other, and means automatically operable during the reciprocation of said head to shift the corresponding knife of each pair to operative position and the other knife of each pair to inoperative position.
21. In a machine of the kind described, the combination of a reciprocating head, a pair of trimming knives mounted at each end of said head to reciprocate therewith, the cutting edges of the knives of each pair being disposed at an angle to each other, and means automatically operable during the reciprocation of said head to shift one knife of each pair to operative position and the other knife of each pair to inoperative position.
22. In a machine of the kind described, a reciprocating head, a plurality of knives mounted to reciprocate with said head, an eccentric shaft also mounted to reciprocate with said head, connections between said shaft and said knives whereby each knife may be shifted to operative and inoperative positions during reciprocation of the head, and means for automatically actuating the eccentric shaft during the reciprocation of the head.
23. In a machine for making box blanks, the combination with a reciprocating head for creasing the blank, of means for cutting the blank adjacent the crease, and means for shifting said last-named means into and out of operative position during the reciprocation of said head.
24. In a machine for making box blanks, the combination of a reciprocating head, two knives mounted in the head to reciprocate therewith each having a cutting edge adapted to cut the blank at a different angle with respect to the axis of the blank, and means for shifting either of said knives into operative position for cutting the blank and the other into inoperative position.
25. In a machine for making box blanks, the combination of a reciprocating head, two knives mounted in the head to reciprocate therewith each having a cutting edge adapted to cut the blank at a different angle with respect to the axis of the blanks, and means for automatically shifting one of said knives into operative position for cutting the blank and the other into inoperative position during reciprocation of the head.
26. In a machine for making box blanks, the combination of a reciprocating head, vertically movable knives mounted to reciprocate with said head and having cutting edges disposed at an angle to each other, an eccentric shaft mounted in said head, connections between each of said knives and said eccentric shaft whereby said knives may be shifted in a vertical direction by actuation of said eccentric shaft, and means to actuate said eccentric shaft during reciprocation of said head.
27. In a machine for making box blanks, the combination of a reciprocating head, vertically movable knives mounted to reciprocate with said head, an eccentric shaft also mounted to reciprocate with said head, eccentrics associated with said shaft, connections between each eccentric and one of the knives, and means to actuate said eccentric shaft during the reciprocation of the head, the eccentrics being so set that at least one of the knives will be lowered and at least one of the knives raised when the eccentric shaft is so actuated.
28. In a machine for making box blanks, the combination of operating mechanism, means for feeding flap-equipped blanks through the machine, trip mechanism actuated by the blank for controlling the operating mechanism, and means controlled by the flaps of the blank for maintaining the operating mechanism operative.
29. In a machine for making box blanks, the combination of creasing means, operating means therefor, means for feeding flap-equipped blanks through the machine, and means controlled by the flaps of the blank for maintaining the operating means operative when the blank is in proper position to be acted upon by the creasing means and to render the operating means inoperative when the blank is not in proper position to be acted upon by the creasing means.
30. In a machine for making box blanks, the combination of operating mechanism, means for feeding flap-equipped blanks through the machine, trip mechanism actuated by the blank for controlling the operating mechanism, and means controlled by the flaps of the blank and operative on said tripping mechanism for maintaining the operating mechanism operative in certain positions of said flaps.
31. In a machine for making box blanks, the combination of operating mechanism, means for feeding flap-equipped blanks through the machine, trip mechanism actuated by the blank for controlling the operating mechanism, and means controlled by the flaps of the blank for holding the trip mechanism in its tripped condition or for permitting the tripping mechanism to return to its normal condition.
32. In a machine for making box blanks, the combination of creasing means, operating means therefor, means for feeding flap-equipped blanks through the machine, means to exert pressure on the flaps when in certain

relation with the creasing means, and means for controlling the operating means, said means adapted to be actuated by those flaps upon which pressure is exerted but not those upon which no pressure is exerted.

33. In a machine for making box blanks, the combination of creasing means, operating means therefor, means for feeding flap-equipped blanks through the machine, means controlled by the flaps of the blank and adapted when depressed to maintain the operating means operative, but when in normal position to render the operating means inoperative, and means to exert pressure on certain flaps to depress said means when the blank is in proper relation to the creasing means, said means not being depressible by those flaps upon which no pressure is exerted.

34. In a machine for making box blanks, a reciprocating head, means to lift the rear end of a blank after said head has made a predetermined number of reciprocations, a rear stop gage adapted to be actuated after the head has made a predetermined number of reciprocations, and means to change the timing of the operation of said gage and lifting means.

35. In a machine for making box blanks, a reciprocating head, means to lift the rear end of a blank after said head has made a predetermined number of reciprocations, two adjacent cams, one of which is effective to actuate said lifting means, and means whereby the other of said cams may be rendered effective to change the timing of the operation of said lifting means.

36. In a machine for making box blanks, a reciprocating head, a rear stop gage, means to actuate the same after a predetermined number of reciprocations of said head, two adjacent cams, one of which is effective for actuating said gage, and means whereby the other of said cams may be rendered effective for actuating the gage to change the timing of the operation thereof.

37. In a machine for making box blanks, a reciprocating head, means to lift the rear end of a blank after said head has made a predetermined number of reciprocations, two adjacent cams, one of which is effective to actuate said lifting means, means whereby the other of said cams may be rendered effective to change the timing of the operation of said lifting means, a rear stop gage, means to actuate the same after a predetermined number of reciprocations of the head,

two adjacent cams, one of which is effective for actuating said gage, and means whereby the other of said cams may be rendered effective for actuating the gage to change the timing of the operation thereof.

38. In a machine for making box blanks, the combination of crease forming means, movable and stationary knives disposed at one end thereof, a stop gage adjacent the knives, and means to simultaneously adjust the positions of said knives and the stop gage.

39. In a machine for making box blanks, the combination of a pair of spaced stationary knives, a pair of movable knives cooperating therewith, a stop plate positioned in the space between the stationary knives, and means to simultaneously adjust the positions of all of said knives and the stop plate.

40. In a machine for making box blanks, the combination of a pair of stationary knives having cutting edges diverging from the center of the machine, a pair of movable knives having correspondingly diverging cutting edges, a stop plate disposed in the space between the diverging edges of the stationary knives, and means to simultaneously adjust the positions of all of said knives and the stop plate.

41. In a machine for making box blanks, the combination of means for feeding the blanks through the machine, means for operating upon the blanks, and means for controlling the feed and position of the blanks as they pass through the machine so as to cause said last-named means to operate upon the end of each blank and simultaneously upon the adjacent end of the succeeding blank.

42. In a machine for making box blanks, the combination of operating mechanism, means for feeding flap-equipped blanks through the machine, means to exert pressure on the flaps when the blank is in a certain position in the machine, and means for controlling the operating means, said means adapted to be actuated by those flaps upon which pressure is exerted but not by those upon which no pressure is exerted.

Signed at Rochester in the county of Monroe and State of New York this 30th day of March A. D. 1915.

EDGAR MARION HAWKINS.

Witnesses:

THOS. D. PATTON,

CHESTER B. PEARSALL.