July 4, 1939. M. A. WATERS 2,164,436

BOX BLANKING MACHINE

Filed March 31, 1938 4 Sheets-Sheet 1

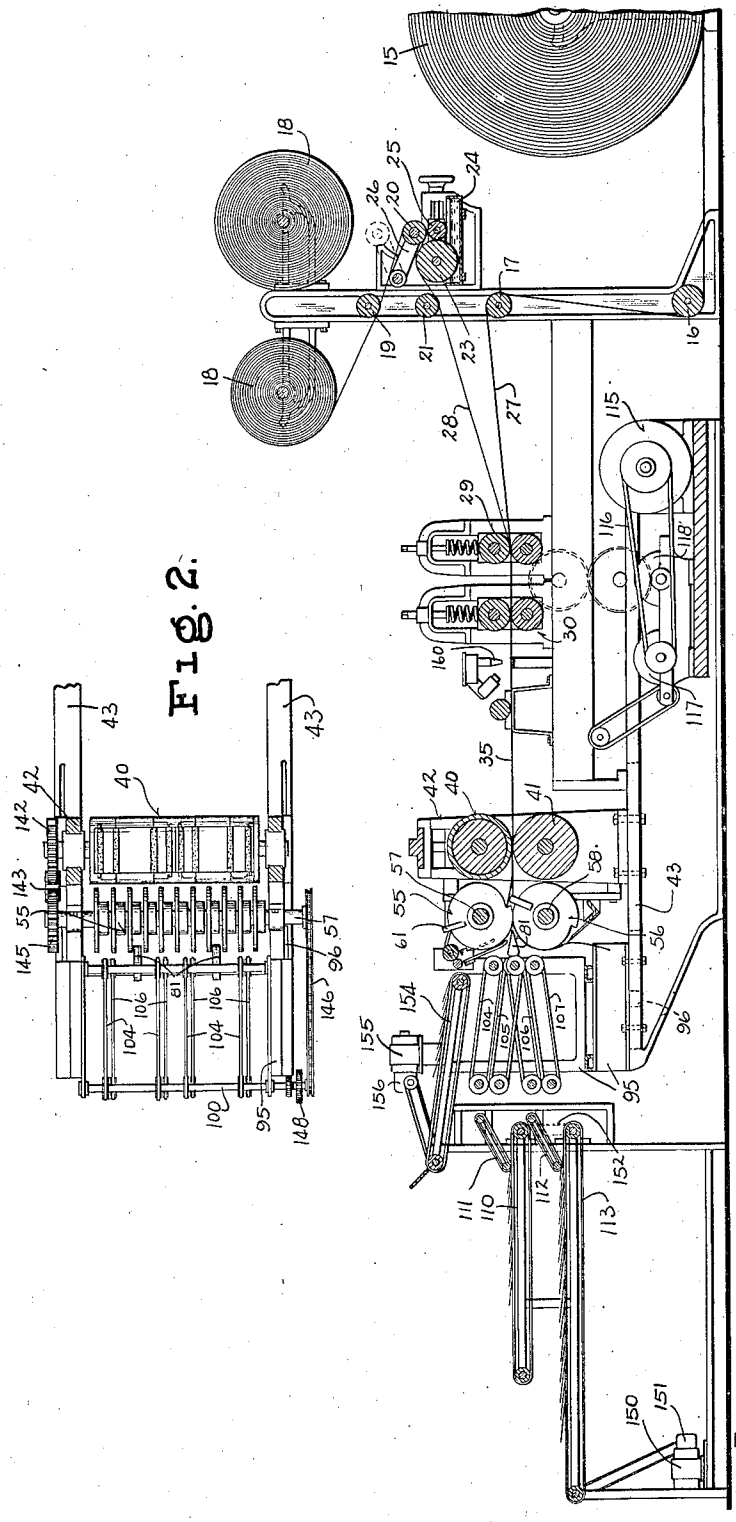


Fig. 2.

Fig. 1.

INVENTOR
MARSHALL A. WATERS
BY
Wheeler, Wheeler & Wheeler
ATTORNEYS

July 4, 1939. M. A. WATERS 2,164,436

BOX BLANKING MACHINE

Filed March 31, 1938 4 Sheets-Sheet 2

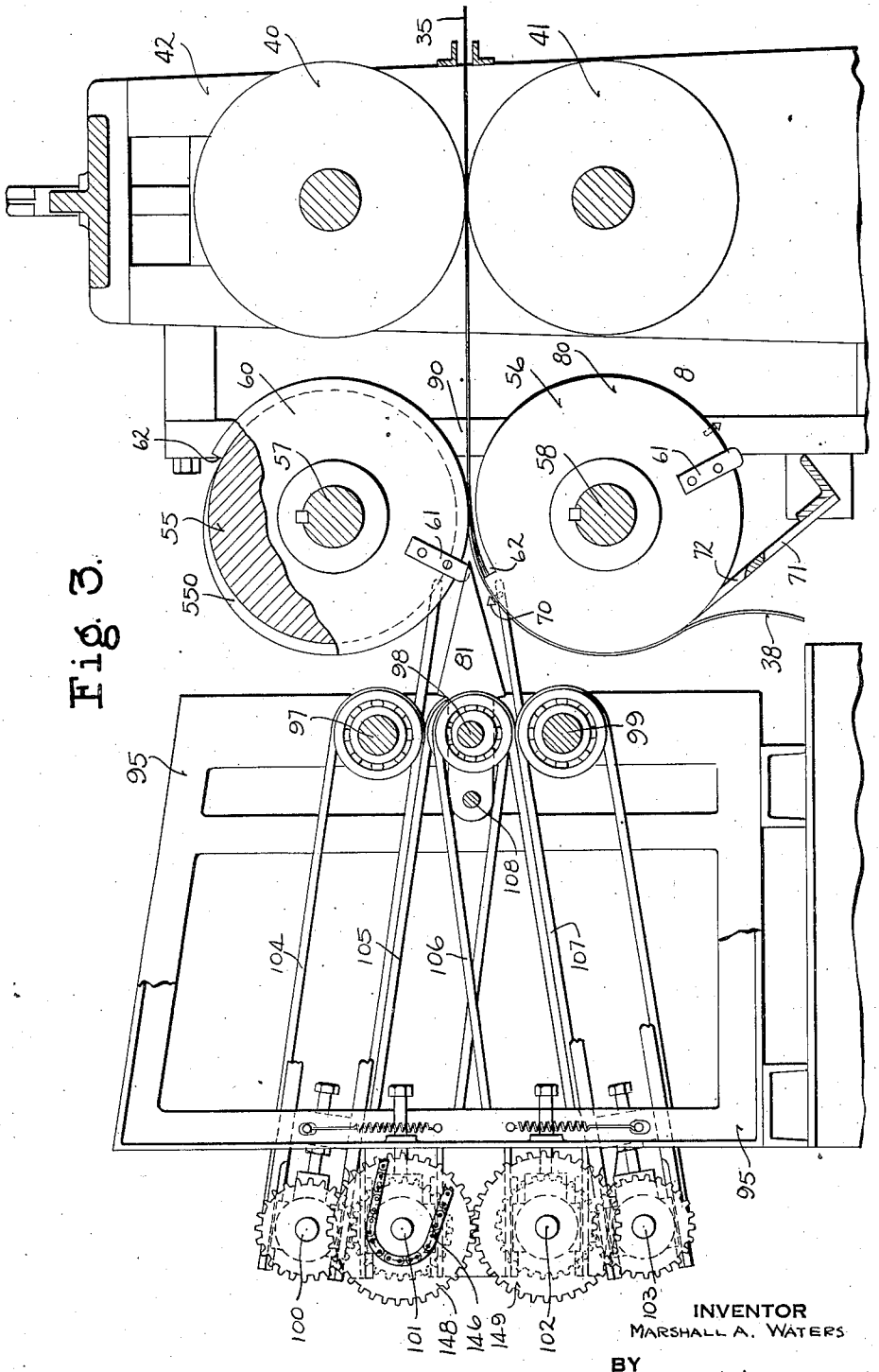


Fig. 3.

INVENTOR
MARSHALL A. WATERS

BY
Wheeler, Wheeler & Wheeler
ATTORNEYS

July 4, 1939. M. A. WATERS 2,164,436

BOX BLANKING MACHINE

Filed March 31, 1938 4 Sheets-Sheet 3

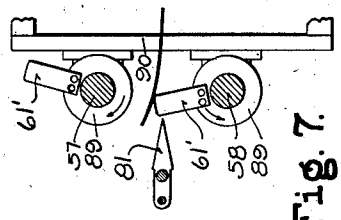


Fig. 7.

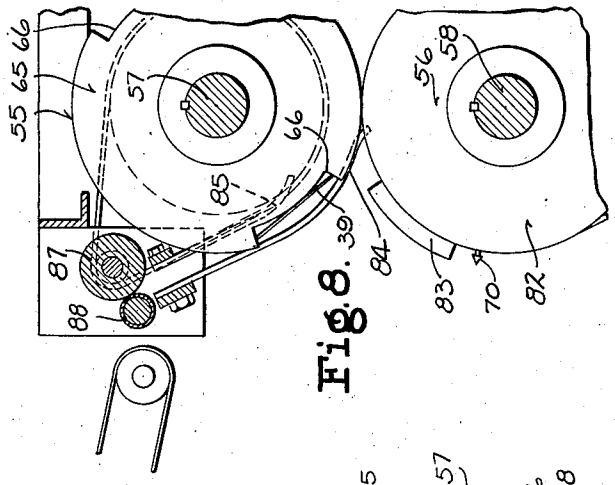


Fig. 8.

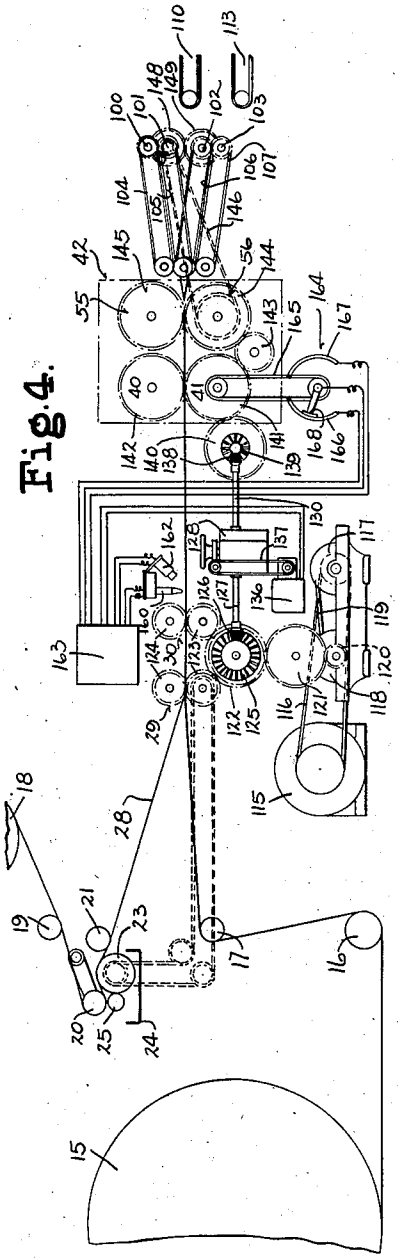


Fig. 4.

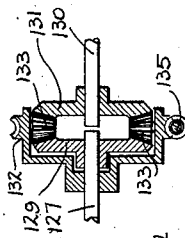


Fig. 5.

Fig. 6.

INVENTOR
MARSHALL A. WATERS

BY
Wheeler, Wheeler & Wheeler
ATTORNEYS

July 4, 1939. M. A. WATERS 2,164,436

BOX BLANKING MACHINE

Filed March 31, 1938 4 Sheets-Sheet 4

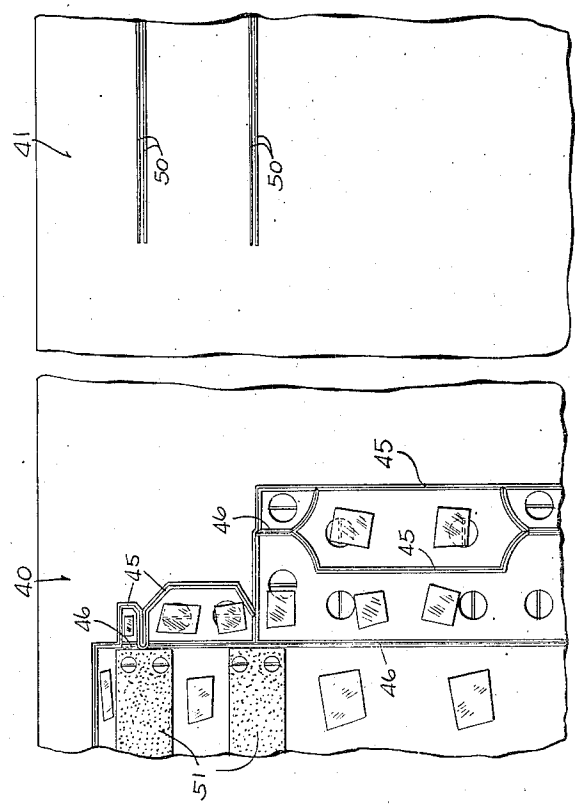


Fig. 10.

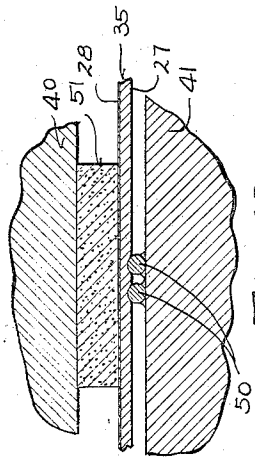


Fig. 12.

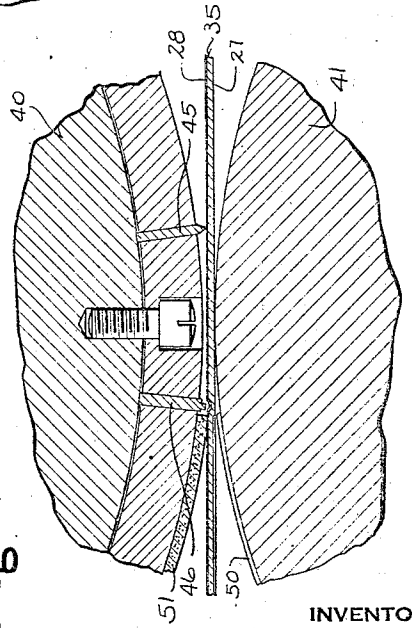


Fig. 11.

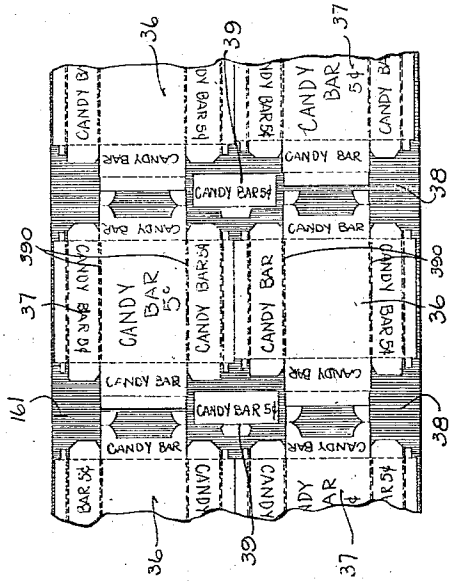


Fig. 9.

INVENTOR
MARSHALL A. WATERS

BY
Wheeler, Wheeler & Wheeler
ATTORNEYS

Patented July 4, 1939

2,164,436

UNITED STATES PATENT OFFICE

2,164,436

BOX BLANKING MACHINE

Marshall A. Waters, Chicago, Ill.

Application March 31, 1938, Serial No. 199,128

23 Claims. (Cl. 93—58.2)

This invention relates to improvements in box blanking machines.

It is the primary object of the invention, broadly stated, to provide a machine by which box blanks can be manufactured with greater speed and at less expense than has heretofore been possible.

More specifically, the objects of the invention include the provision of means whereby inexpensive material may be scored longitudinally of the grain without any danger of cracking; the provision of an improved distributing means having a purely rotative motion whereby it functions more smoothly than the reciprocating or oscillatory deflectors heretofore used; and the provision of a machine in which the cutting and scoring die rolls and distributing rolls are unitarily assembled on a single sub-frame mounted on the machine bed for unitary interchange with other sub-frames, whereby the time and labor required to convert the machine for manufacturing boxes of different sizes and shapes is reduced to a minimum. In this latter connection it is important that the present machine takes into consideration the relation of the interchangeable units to the delivery belts and to the electric eye mechanism by which the functioning of the die and distributing rolls carried by the aforesaid units is made to synchronize with the printed matter carried by the web stock from which the box blanks are scored.

Other objects will appear in more detail from the following disclosure wherein my invention is exemplified.

In the drawings:

Figure 1 is a view partially in longitudinal section and partially in side elevation showing an assembled machine embodying this invention.

Figure 2 is a fragmentary view in plan showing the die and distributing rolls and portions of the discharge conveyor systems.

Figure 3 is an enlarged detail view in longitudinal section through the die and distributing roll unit and the immediately associated discharge conveyor set.

Figure 4 is a diagrammatic view, partially in section and partially in side elevation, showing the driving connections for the machine.

Figure 5 is a detail view in section showing diagrammatically a portion of the differential type synchronizing control.

Figure 6 is a view in perspective showing a distributing roll set.

Figure 7 is a view in longitudinal section showing a modified embodiment of the distributing roll set.

Figure 8 is a view in longitudinal section showing a fragmentary detail of the machine which includes that portion of the distributing roll set which handles the cards cut from between the box blanks.

Figure 9 is a fragmentary detail view in plan of the web as it appears when cut and scored but prior to the separation of the waste stock therefrom.

Figure 10 is a fragmentary detail view diagrammatically showing in developed form certain associated portions of the cutting and blanking die rolls.

Figure 11 is a fragmentary detail view in longitudinal section showing complementary portions of the cutting and blanking die rolls.

Figure 12 is a fragmentary detail view in axial section showing complementary portions of the cutting and blanking die rolls.

Like parts are identified by the same reference characters throughout the several views.

While the particular source of web stock is broadly immaterial to the present invention, it has a certain significance from an environmental standpoint in determining some specific details hereinafter to be disclosed. Consequently the preferred arrangement for feeding the web is disclosed in full.

It is preferred to use a two ply web made up of relatively heavy box board drawn from a parent roll at 15 about guide rolls 16 and 17, to which is glued a relatively lighter calendered and printed paper ply drawn from a parent roll 18 about guide rolls 19, 20 and 21 and the gluing roll 23. The glue roll rotates in a glue receptacle 24. The conventional distributing roll 25 assures that the face of the glue roll 23 is uniformly coated with adhesive. The guide roll 20 is mounted on arm 26 by means of which it can be adjusted between the full and dotted line position shown in Fig. 1. When raised to its dotted line position it lifts the paper web clear of the glue roll 23, thus preventing the web from sticking to the glue roll if the machine is at rest.

When the guide roll 20 is lowered to a full line position it brings the paper web partially behind the glue roll so that the web has a partial wrap about the glue roll. This gives a relatively prolonged contact of the web with the glue roll and promotes a perfect coating of the paper with adhesive.

The web 27 of box board and the printed and calendered web 28 of paper are brought together

by the pressure roll sets 29 and 30 to form the composite two ply web 35 from which the box blanks are cut and scored.

In accordance with the preferred practice of this invention, the die roll set hereinafter to be described cuts and scores at least two distinctly different blanks during each rotation. If the machine is making boxes without covers it is possible to make two box blanks per rotation of the rolls, and these may be alike or different, as desired, the die rolls and distributing rolls being made accordingly. In the usual operation the machine will manufacture two tray-like boxes each having a bottom and four sides, one such tray-like box being slightly larger than the other to constitute a cover therefor. In such case the machine is made up to produce a box and its cover in each rotation of the die roll set. The particular arrangement herein disclosed contains a further development in that the die roll length is adequate so that from one web width a box and cover can be cut side by side. In this arrangement the positions of a box and cover are made to alternate to avoid waste. This has been indicated in Fig. 9 wherein a box blank is indicated at 36 and a cover blank is indicated at 37. From the waste stock indicated by shade line at 38 I cut price display cards 39 to be packed in the boxes when filled.

It will be noted from Fig. 9 that the top or printed paper ply of the stock is uppermost. The cuts which have been made in the web by the cutting dies are represented by solid lines in Fig. 9, while the scoring is shown by dotted lines in Fig. 9. The transverse scoring is made on the printed surface of the composite web, but I have found that any attempt to use similar scoring longitudinally of the composite web parallel with the grain thereof will result in cracking. This is overcome by double scoring the box board on the under surface of the web along closely adjacent parallel lines as indicated in Fig. 9 by the double dotted lines which appear whenever the scoring extends longitudinally of the web, as at 390.

This cutting and scoring is done by the die rolls 40 and 41. These are mounted in a subframe 42 longitudinally adjustable and freely interchangeable upon the bed 43 of the main frame. Details of the cutting and scoring dies are shown in Figs. 10, 11 and 12, the cutting dies being illustrated at 45, the transverse scoring die at 46, and the longitudinal scoring dies at 50.

The cutting dies and transverse scoring dies 45 and 46 work against the solid face of roll 41 which supports the box board ply 27 of the composite web 35. The longitudinal scoring dies 50 are mounted on the lower die roll 41 in pairs, as clearly shown in Figs. 10 and 12. They can conveniently be made by soldering or otherwise securing piano wire to the face of the die roll. The opposed surface of die roll 40 preferably comprises a strip of leather as indicated at 51. The pairs of scoring dies operate on the relatively soft box board ply 27 of the composite web 35.

The box board ply is sufficiently soft so that when the box blank is folded upon the double score line which results from the use of this mechanism, the portion of the box board between the two score lines wrinkles up like the fold formed between two adjacent creases in the palm of a person's hand, thus resulting in a slightly rounded rather than a perfectly square corner for the box. No cracking or breaking occurs where this construction is employed.

The cutting dies 45 have substantially completely severed the composite web 35 so that the resulting blanks 36 and 37 can be very readily separated from the waste stock 38. This separation is achieved by means of rolls 55 and 56 which, instead of being cut from solid stock, are preferably assembled by mounting a series of disks or other deflecting means on the shafts 57 and 58 respectively. An example of the use of disks is best shown in Figs. 3 and 6. An example of other deflecting means in which no disks contact the web appears in Fig. 7.

The disks will not necessarily be uniformly spaced upon their supporting shafts in the manner shown in Fig. 6. On the contrary, one of the advantages of this arrangement consists in the fact that the disks may be positioned on the shaft wherever any portion of the work needs support. It so happens that the sets of blanks shown in Fig. 9 have their support-requiring portions so uniformly distributed as to result in the uniform spacing of the disks as illustrated in Fig. 6.

Each of the various disks hereinafter to be described as constituting the upper roll 55, is preferably provided with a peripheral groove at 550. The two disks 59 at each end of the series are of circular outline and not otherwise noteworthy. They support the flat portions of the box blanks.

Immediately within the disks 59 at the ends of the series are the disks 60 positioned to engage the leading and trailing flaps of the successive blanks. Each of these disks has at one point of its periphery a projecting cam finger 61, diametrically opposite which such disk is notched at 62. The cam fingers push the blanks downwardly for delivery by one conveyor while the notches receive the next successive blanks for upward deflection for delivery from another conveyor, as will hereinafter be explained.

Between the two sets of deflecting disks 60 are the three remaining disks 64 and 65, the disk 65 being in the center. The disk 65 has at diametrically opposite points square cut notches 66 (Figs. 6 and 8), while disks 64 have notches 67 (Fig. 6) which are similar except that they need not open completely through to the far sides of the disks, being merely shouldered into one face thereof. The aligned notches 66 and 67 are made to receive the cards 39 which are thrust therein for delivery along a separate path, as will hereinafter be explained.

Whereas each of the disks constituting the upper roll 55 is peripherally grooved at 550, each of the disks constituting the lower roll 56 is provided peripherally with a slightly barbed point 70 in registry with the groove 550. These points are so located on the peripheries of the disks constituting the lower roll as to register with and impale the waste stock, thereby causing such waste stock to cling to the lower roll and thus to be segregated from the blanks for separate discharge. Stripping fingers at 71 notched at 72 to pass the points 70 (Fig. 3) remove the waste material 38 from the points.

The outer pair of disks 75 at each end of the series which constitutes the lower roll 56 are of plain circular form. They coact with the plain disks 59 of the upper roll to support the laterally projecting flat portions of the box blanks and they have no distributing function.

Next within the outer disks 75 are the disks 80 which coact with disks 60 and are identical therewith except that they are provided with the waste impaling points 70 instead of with the co-

acting grooves 58. Each of the disks 80 carries the cam finger 61 and is eccentrically notched or shouldered at 62, as above described. The arrangement is such that in the rotation of the distributing rolls 55 and 56 the cam finger 61 of one roll will always be presented to the notch 62 of the opposing roll, thus deflecting successive blanks first upwardly and then downwardly, as the case may be, from the horizontal plane of the line of bite between the rolls. The upward or downward course thus initiated is maintained by the wedge-shaped deflectors 81 which are stationary and have their apices directed into the bight between the two rolls so that the downwardly deflected blank must pass beneath the wedge 81 while the upwardly deflected blank must pass thereabove.

At the center of the lower roll are the three disks 82, each of which is provided with a score displacement cam at 83 (Fig. 8) which thrusts the card blank 39 bodily into the score recess 66 provided by the opposing disk 65 of the upper roll 55. The blank 39, thus segregated from the path of the remaining portions of the web, is engaged by a stationary arcuately curved guide bar 84 which defines an upward path of travel for the card in coaction with the spaced stationary stripping finger 85 which forced the card out of its recess 66 and between the feed rolls 87 and 88 by means of which it is ejected from the mechanism.

By using disks as shown in Figs. 3, 6 and 8, I am able to provide full support even for relatively light stock pending the deflection of such stock upwardly or downwardly as the case may be. Where the stock is sufficiently heavy and is fed in a substantially horizontal plane by the cutting and scoring rolls 40 and 41, I do not need the complete disks as above described, and in lieu thereof I may provide the cam fingers 61' with just enough of a hub 89 to enable the cam fingers to be mounted on the respective shafts 57 and 58 as shown in Fig. 7. In this instance there is no opposing disk and consequently there is no occasion for any recess, the space opposite each successive cam finger being wide open to permit of the deflection of the blank to one side of the wedge 81 or the other. Nevertheless these skeletonized devices may be regarded as rolls within the contemplation of this disclosure.

In any case the distributing rolls 55 and 56, however constituted, are preferably mounted, together with the stripping fingers 71, 84 and 85, upon a bracket 90 which carries these parts from the sub-frame 42. In any change of design of the cartons a new set of die and scoring rolls is required, and a new set of distributing rolls 55 and 56 is required, and these changes likewise necessitate changes in the various stripping fingers aforesaid. Consequently all of these parts are unitarily mounted on the sub-frame 42 to be interchangeable as a unit on the machine bed 43.

The conveyors by which the blanks are carried away and stacked do not require alteration to meet every change of box blank design. However, the set of conveyors which initially receive the box blanks does require a certain change of position compensatory for varying sizes of die and distributing rolls which may be required. Accordingly the first discharge conveyor set is preferably mounted to be adjustable as a unit on a subframe 95 longitudinally of the machine bed 43. While any desired means of adjustment is permissible, I prefer to slot the overhanging rail of bed 43 as indicated at 96. This mode of adjustment, being well known, requires no further explanation.

The conveyor set mounted on sub-frame 95 comprises three sets of idler pulleys on the shafts 97, 98 and 99 respectively, and four sets of driving pulleys mounted on the shafts 100, 101, 102 and 103, at the discharge end of the conveyor set. The pulleys on shaft 97 are connected by upwardly inclined belts 104 with the pulleys on shaft 100. Some of the pulleys on shaft 98 are connected by coacting upwardly inclined belts 105 with the pulleys on shaft 101, while other pulleys on shaft 98 are connected by downwardly inclined belts 106 with the pulleys on shaft 102. Coacting with belt 106 is belt 107 connecting the pulleys on shaft 99 with the pulleys on shaft 103. Thus shaft 98 serves in common an upwardly inclined conveyor and a downwardly inclined conveyor. Shaft 98 also serves as a convenient means of supporting the weight of the wedges 81, the wedges being fixed against rotation with such shaft by means of the cross rod 108.

The blanks delivered between belts 104 and 105 are received on the stacking conveyor 110 to be removed and packaged as desired. The conveyor 111 is merely an idler which receives its motion by resting on the work on conveyor 110 and serves to direct on to conveyor 110 the work ejected from the relatively high speed conveyor which includes belts 104 and 105.

Similarly, an idling conveyor 112 directs on to the stacking conveyor 113 the work ejected between belts 106 and 107. The belts 104 and 105 preferably comprise narrow belts and may constitute ordinary V belts. They operate at high speed so as to pull the blanks free of the waste stock. The conveyors 110 and 113, on the other hand, move very slowly so that the work is stacked thereon in successively overlapping piles as indicated in Fig. 1.

The drive of the machine is as follows:

The motor 115 is connected by a belt 116 with a variable speed drive such as the "Reeves" pulleys 117 and 118 and the interconnecting belt 119.

A pinion 120 on the driven pulley 118 meshes with an intermediate gear 121 which drives the gear 122. This gear meshes with gears 123 on the lower pressure rolls 29 and 30 of the sets, and gears 123, in turn, mesh with gears 124 on the upper rolls of such sets.

A bevel gear 125 on the face of gear 122 drives a pinion 126 on the shaft 127 which leads into the differential type speed regulating set 128. As diagrammatically illustrated in Fig. 5, shaft 127 carries a differential gear 129. The opposing shaft 130 carries differential gear 131. The ring gear 132 which is preferably a worm gear, carries the differential pinions 133. When the ring gear is stationary the motion of shaft 127 is uniformly transmitted to drive shaft 130 in the opposite direction of rotation. The ring gear may, however, be driven by the worm 135 from motor 136 by means of a chain 137. Motor 136 is reversible and if it rotates in one direction or the other its motion is transmitted at a reduced speed to add or subtract an increment of rotation to or from shaft 130 as compared with the motion of the shaft 127, thus accelerating or decelerating slightly the drive of the dies with respect to the feed of the web through the pressure roll sets 29 and 30.

The motion of shaft 139 reaches the die and distributing roll units as follows:

The pinion 138 meshes with bevel gear 139 which is formed on the side of the driving gear 140 meshing with gear 141 on the lower die roll 41. Gear 141 in turn meshes with gear 142 on the upper die roll 42 and with the intermediate gear 143 which drives gear 144 on the lower distributing roll 56. Gear 145 on the upper distributing roll 55 receives motion from gear 144 on the lower distributing roll.

A belt or chain 146 driven by gear 144 transmits motion to shaft 101 on which gear 148 meshes with gear 149 on shaft 102. Gears on shafts 101 and 102 respectively mesh with gears on shaft 100 and shaft 103.

The stacking conveyors 110 and 113 are separately driven by a motor 150 and speed reducer 151, the motion of conveyor 115 being transmitted by a chain or belt at 152 to conveyor 110.

The conveyor 154 upon which the cards are stacked is likewise separately driven by the motor 155 and speed reducer 156.

To control the functioning of the reversible speed regulating motor 136 there is an electric eye or photoelectric cell at 160 which responds to a registration mark printed at 161 on the face ply of the web. The face of the web is illuminated by a lamp 162 and each passage of one of the marks 161 beneath the photoelectric cell 160 energizes the conventional relay (not shown) in the amplifying and relay box 163 to close the circuit of motor 136.

To determine whether the motor shall be energized in the forward or rearward direction or not at all, a rotary switch generically designated by reference character 164 is connected by chain 165 with the die roll gear 141 to turn in unison therewith in a synchronized relation to the die roll. There are two arcuately elongated stationary contacts 166 and 167 spaced for approximately the arcuate extent of the movable contact 168. If the movable contact is exactly centered beneath the stationary contacts 166 and 167, the closing of the motor circuit by the photoelectric cell will produce no rotative effect in the motor. If the switch contactor 168 registers with stationary contact 166, however, the closing of the circuit by the electric eye will rotate motor 136 in a direction to operate the differential gearing to accelerate slightly the speed of the die rolls. If the moving contactor 168 engages contact 167 at the moment the motor circuit is closed by the electric eye, then the motor 136 will operate in a reverse direction to retard slightly (by means of the differential gearing) the rotation of the die rolls with respect to the rotation of the pressure roll sets. Thus, once the necessary synchronism is established between the pre-printed web and the die rolls, such synchronism would automatically be maintained by the cooperation of the rotary switch and the electric eye and the regulating mechanism which includes motor 136 and the differential gear set 138.

In operation a composite web is assembled on the machine by gluing a previously printed paper on to the surface of a ply of relatively coarse box board. The composite web is fed in closely controlled synchronism between the die rolls 40 and 41 which cut box blanks and cards from the waste portions of the web and provide the box blanks with the necessary transverse and longitudinal scoring. It is again to be noted that relatively sharp scoring blades, as well as the cutting dies, are carried by the upper roll to engage primarily the paper ply of the composite web, while the longitudinal scoring is done by double and very dull piano wire scoring elements carried by the lower roll and coacting primarily with the box board ply of the composite web.

The distributing rolls must likewise operate in synchronism with the die rolls and the printed pattern on the web and the blanks cut therefrom. The distributing rolls lift or depress alternate portions of the severed blanks from the normal path of movement of the web, thereby guiding such blanks to the ejecting conveyors. At the same time the distributing rolls are removing and ejecting the waste and removing and ejecting any cards which may have been blanked, for purposes of economy, from what might otherwise have been waste between the box blanks.

The ejecting conveyors deliver the box blanks on to stacking conveyors which are carried by a separate sub-frame as clearly shown in Fig. 1. The ejecting conveyors are mounted on their own sub-frame adjustable on the bed of the machine. The dies and distributing rolls likewise have their own sub-frame, and in this instance the sub-frame is not only adjustable on the bed but may readily be lifted by a crane from the bed to permit an entirely different sub-frame and sets of die and distributing rolls to be substituted therefor.

In order to interchange the sub-frame 42 with another sub-frame carrying a different set of rolls, it is only necessary to make a very few mechanical connections. The drive from the differential regulator must be connected to one of the die rolls. The drive to the control switch 164 must be connected and the drive to the ejecting conveyor set must be connected. Naturally these several driving connections are made to facilitate the interchange of the die and distributing roll units.

I claim:

1. In a device of the character described, the combination with web supplying means, of a longitudinal web scoring device comprising a closely adjacent pair of blunt compression scorers and platen means of substantially rectilinear cross section coacting therewith and disposed on the opposite side of the path of web advance from said scoring device.

2. In a device of the character described, the combination with means for assembling a composite web comprising a ply of box board and a surfacing ply of paper, of smooth platen means upon which said paper ply is supported, and a coacting scoring die disposed longitudinally of the web and comprising a pair of blunt compression scoring elements so closely related as to provide scoring for a single corner of the blank, and means for pressing said elements toward said platen into the box board ply of the composite web.

3. In a device of the character described, the combination with web supply means, of a pair of scoring rolls at opposite sides of the path of web advance, a transversely disposed scoring blade carried by one of said rolls, and a longitudinal scoring means extending peripherally of the other roll, said last mentioned scoring means comprising a pair of blunt scoring elements in sufficiently close proximity to form a single scored corner, the first roll being provided opposite such scoring elements with a smooth supporting surface of such radius as to require the scoring compression of that portion of the web contacted by said scoring elements.

4. In a device of the character described, the combination with means for assembling a com-

posite web constituting at least one box board ply and one paper ply, of a pair of coacting die rolls disposed at opposite sides of the path of web advance, a transverse scoring blade disposed axially of one of said die rolls and for engagement with the paper ply of the composite web, and a pair of bluntly rounded longitudinal scoring elements disposed peripherally of the other of said die rolls for contact with the box board ply of said composite web and in sufficiently close proximity to provide scoring therein for a single corner, the first roll being provided opposite such scoring elements with a smooth supporting surface of such radius as to require the scoring compression of that portion of the web contacted by said scoring elements.

5. In a device of the character described, the combination with means for supplying a box board ply, means for supplying a paper ply, means for treating at least one of said plies with adhesive, and means for pressing said plies together to constitute a single composite web, of a pair of die rolls positioned at opposite sides of the path of advance of said web, blanking die means carried by one of said rolls and arranged to act on said web, the other of said rolls being provided with web supporting surfaces opposed to said blanking die means, scoring means carried by one of said rolls and disposed to act transversely of the grain of said web and primarily upon the paper ply thereof, and scoring means carried by the other of said rolls and arranged to act longitudinally of the grain of said web and primarily upon the box board ply thereof.

6. In a device of the character described, the combination with means for suppying a box board ply, means for supplying a paper ply, means for treating at least one of said plies with adhesive, and means for pressing said plies together to constitute a single composite web, of a pair of die rolls positioned at opposite sides of the path of advance of said web, blanking die means carried by one of said rolls and arranged to act on said web, the other of said rolls being provided with web supporting surfaces opposed to said blanking die means, scoring means carried by one of said rolls and disposed to act transversely of the grain of said web and primarily upon the paper ply thereof, and scoring means carried by the other of said rolls and arranged to act longitudinally of the grain of said web and primarily upon the box board ply thereof, said last mentioned scoring means comprising for each longitudinal score line a closely adjacent pair of rounded scoring elements between which said box board is adapted to wrinkle in the folding of the resulting blank with the box board inwardly disposed in the corner of the fold.

7. In a device of the character described, the combination with means for supplying a web, of die means for successively cutting a series of blanks from said web, separate ejecting means for the successively cut blanks, a deflector for guiding successively cut blanks to the respective ejecting means, and a rotary distributing mechanism between said die means and said deflector and comprising coacting rotors alternately provided with positively acting displacement portions of increased radius for directing the respective blanks to the one side or the other of the deflector.

8. In a device of the character described, the combination with web supply means and a plurality of ejecting conveyors in operatively spaced relation thereto, means for adjusting said conveyors longitudinally of the direction of web travel to and from said web supply means, a deflector along opposite faces of which the blanks are guidable to and from said ejecting means, a subframe interchangeably positioned between said web supply means and said ejecting means, blanking dies operatively mounted in said subframe, and rotary means operatively mounted in said sub-frame to receive blanks from said dies and to determine at which side of the deflector each such die will pass.

9. In a device of the character described, the combination with web supply means and a plurality of ejecting conveyors in operatively spaced relation thereto, means for adjusting said conveyors longitudinally of the direction of web travel to and from said web supply means, a deflector along opposite faces of which the blanks are guidable to and from said ejecting means, a sub-frame interchangeably positioned between said web supply means and said ejecting means, blanking dies operatively mounted in said subframe for blanking successively differing pieces of work from said web, and rotary means operatively mounted in said sub-frame to receive blanks from said dies and to determine at which side of the deflector each such blank will pass, said last mentioned means comprising cam fingers and mechanism upon which said cam fingers are rotatably mounted at opposite sides of the path of web advance, said fingers having a radial projection beyond said path whereby to force from said path blanks engaged thereby.

10. In a device of the character described, the combination with blanking means from which successive blanks are discharged, said blanking means being adapted to produce a series of differing blanks, of blank distributing means comprising a pair of skeletonized rolls at opposite sides of the path of blank delivery, each of said rolls including cam fingers projecting across said path, and the cam fingers of the respective rolls being respectively offset from each other angularly for distances approximately equaling the extent of the successive blanks, whereby different cam fingers will operate upon alternating blanks.

11. In a device of the character described, the combination with means for cutting and discharging blanks, of blank ejecting conveyors, relatively stationary means for guiding blanks to the respective conveyors, and rotary distributing means for deflecting the blanks respectively to differing stationary guides, said distributing means comprising coacting rotors positioned at opposite sides of the path of all blanks approaching said stationary guide means and alternately provided with positively acting deflecting portions of increased radius whereby to displace successive blanks alternately to different guide means.

12. In a device of the character described, the combination with means for cutting and feeding blanks, of a series of blank-receiving conveyors, relatively stationary guide means for delivering blanks to the respective conveyors, and a pair of rotary distributing rolls between said blank feeding means and said conveyors including blank deflectors disposed on said rolls to act successively upon the blanks as fed, whereby to determine the guide means to which the respective blanks are delivered and the conveyors by which the respective blanks are received.

13. In a device of the character described, the combination with means for cutting and feeding blanks, of a series of blank-receiving conveyors, relatively stationary guide means for delivering

blanks to the respective conveyors, and a pair of rotary distributing rolls between said blank feeding means and said conveyors including blank deflectors disposed on said rolls to act successively upon the blanks as fed, whereby to determine the guide means to which the respective blanks are delivered and the conveyors by which the respective blanks are received, each of said distributing rolls comprising a shaft, a series of rotors on the shaft, and a series of cams projecting radially from respective rotors.

14. In a device of the character described, the combination with means for cutting and feeding blanks, of a series of blank-receiving conveyors, relatively stationary guide means for delivering blanks to the respective conveyors, and a pair of rotary distributing rolls between said blank feeding means and said conveyors including blank deflectors disposed on said rolls to act successively upon the blanks as fed, whereby to determine the guide means to which the respective blanks are delivered and the conveyors by which the respective blanks are received, each of said distributing rolls comprising a shaft, a series of rotors on the shaft, and a series of cams projecting radially from respective rotors, the opposing roll being relieved opposite each cam to provide clearance for the deflection of a blank acted on by the cam.

15. In a device of the character described, a set of distributing rolls comprising rotary supports, disks spaced axially of the respective supports, and cam means projecting radially from selected disks, the opposing rolls having in each instance recessed portions opposite said cam means to accommodate blanks deflected by said cam means.

16. In a device of the character described, the combination with a sub-frame and means upon which the sub-frame is interchangeably mounted, of a unitary assembly in the sub-frame of a pair of blanking rolls and a pair of distributing rolls, the distributing rolls having coacting cam and recess portions so disposed axially thereof as to engage blanks delivered thereto by the blanking rolls for the deflection of such blanks, each of said distributing rolls comprising a rotary support and a series of disks spaced axially thereof having blank engaging peripheral portions in which said recesses are formed and from which said cams project.

17. In a device of the character described, a pair of distributing rolls comprising spaced rotary supports, disks in spaced relation on said supports and provided with coacting peripheral portions for confining work fed thereto, certain of said disks having portions peripherally relieved and certain of said disks having radially projecting cam fingers coacting with the relieved portions of the first mentioned rolls to bodily displace portions of said work into the relieved portions aforesaid.

18. In a device of the character described, the combination with web feeding means, of a blanking and distributing unit, a frame upon which said unit is assembled for adjustment, a bed to which said frame is releasably and adjustably connected, a pair of divergent ejecting conveyors provided with a relatively stationary deflector to opposite sides of which said distributing means is adapted to press successive blanks for delivery to the respective conveyors, a sub-frame upon which said conveyors and deflector are unitarily mounted for adjustment on said bed, and a relatively fixed pair of stacking conveyors arranged in all adjustments of said last mentioned sub-frame to receive blanks from the respective ejecting conveyors.

19. The combination with means for supplying a printed web, of means for cutting blanks from said web in adjusted synchronism with the printing thereon, said blank cutting means and printing being adapted for the formation of differing blanks successively from said web, a plurality of ejecting conveyors adapted to receive the differing blanks respectively, and rotary distributing means between said blanking means and said conveyors including mechanism whereby said distributing means is operated in synchronism with said blanking means for positively pressing the successive blanks alternately in opposite directions toward their respective conveyors.

20. In a device of the character described, the combination with means providing a bed, of means for feeding over said bed a web printed for the production of successively differing blanks, die rolls provided peripherally with dies for cutting successively differing blanks from said web, means for cutting said die rolls in synchronism with the printing on said web, a sub-frame carrying said die rolls unitarily for adjustment and replacement on said bed, a second sub-frame spaced from said die rolls and provided with blank-receiving conveyors individual to the respective types of blanks cut from said web, means whereby said second sub-frame is adjustably connected with said bed for movement toward and from said web supply means, a stationary wedge deflecting means connected with the second sub-frame, and distributing means operatively mounted on the first sub-frame and including mechanism for alternately pressing successive blanks from the path of said web to one side or the other of said wedge deflector means, whereby different blanks are delivered to their respective conveyors, said conveyors being adapted to receive such differing blanks from any substituted die roll and distributing unit.

21. In a device of the character described, an ejection conveyor system comprising receiving pulleys on at least three different axes, ejecting pulleys on at least four different axes, belts connecting receiving pulleys on the first and third axes with ejecting pulleys on the first and fourth axes, and belts connecting pulleys on the intermediate receiving axis with ejecting pulleys on the second and third axes.

22. An ejecting conveyor system comprising a series of three receiving shafts having pulleys spaced axially thereof and a series of four delivering shafts having correspondingly spaced pulleys, of a series of narrow belts connecting pulleys on the first receiving shaft with pulleys of the first delivering shaft and pulleys of the third receiving shaft with pulleys of the fourth delivering shaft, and belts coacting with the belts first mentioned leading from certain pulleys on the second receiving shaft to pulleys on the second delivering shaft and from certain pulleys on the second receiving shaft to pulleys on the third delivering shaft, whereby to provide divergent conveyors each constituted of a plurality of narrow belts.

23. An ejecting conveyor system comprising a series of three receiving shafts having pulleys spaced axially thereof and a series of four delivering shafts having correspondingly spaced pulleys, of a series of narrow belts connecting pulleys on the first receiving shaft with pulleys of the first delivering shaft and pulleys of the third receiving shaft with pulleys of the fourth delivering shaft, and belts coacting with the belts just mentioned leading from certain pulleys on

the second receiving shaft to pulleys on the second delivering shaft and from certain pulleys on the second receiving shaft to pulleys on the third delivering shaft, whereby to provide divergent conveyors each constituted of a plurality of narrow belts, together with means for cutting differing lengths from successive portions of a common web, a stationary deflector positioned adjacent the second receiving shaft, and rotary distributing means for delivering said blanks alternately over and under said deflector to the respective conveyors.

MARSHALL A. WATERS.