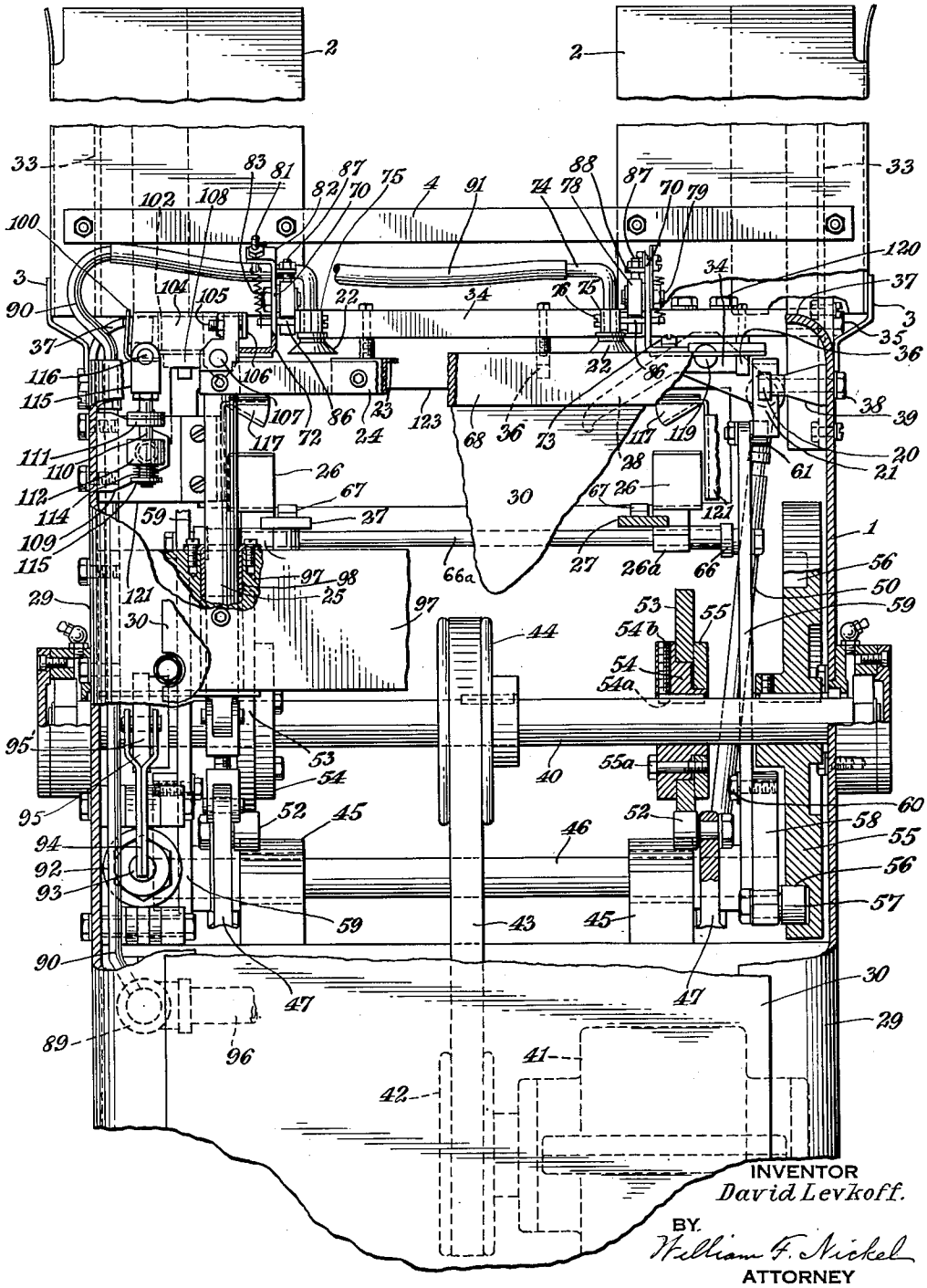
Feb. 26, 1952 D. LEVKOFF 2,587,050

APPARATUS FOR SETTING-UP BOX BLANKS

Filed July 3, 1947 4 Sheets-Sheet 1

Fig. 1.



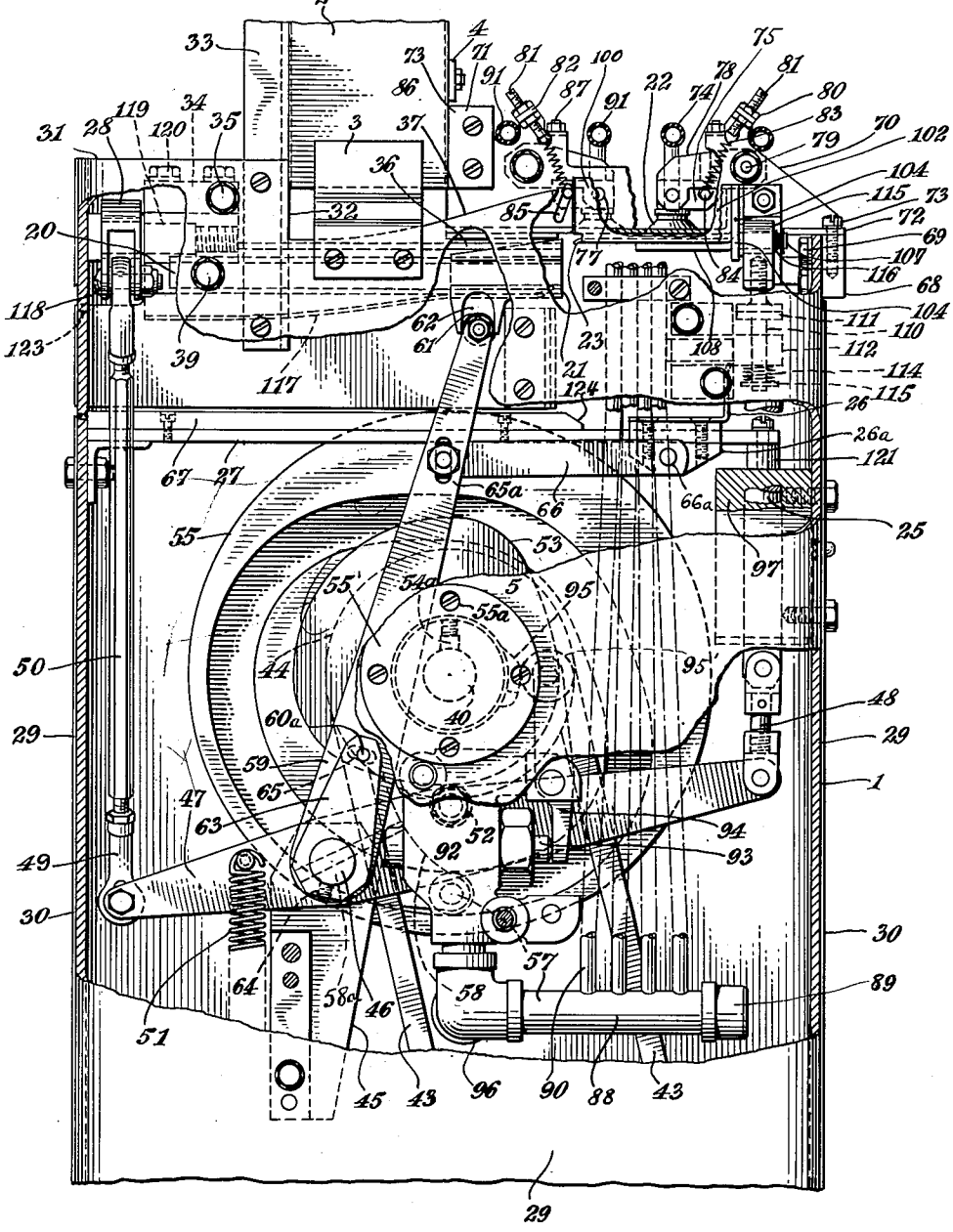
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APPARATUS FOR SETTING-UP BOX BLANKS

Filed July 3, 1947 4 Sheets-Sheet 2

Fig. 2.



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APPARATUS FOR SETTING-UP BOX BLANKS

Filed July 3, 1947 4 Sheets-Sheet 3

Fig. 3.

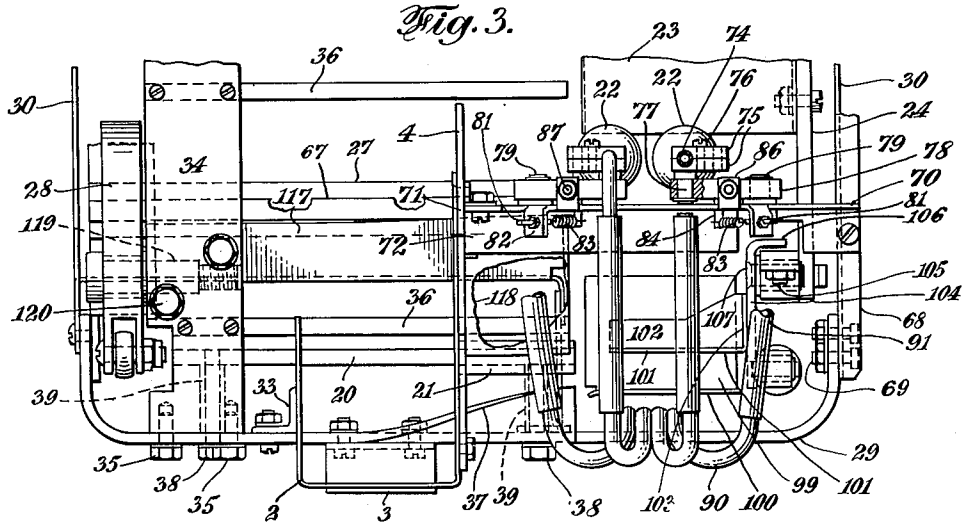


Fig. 4.

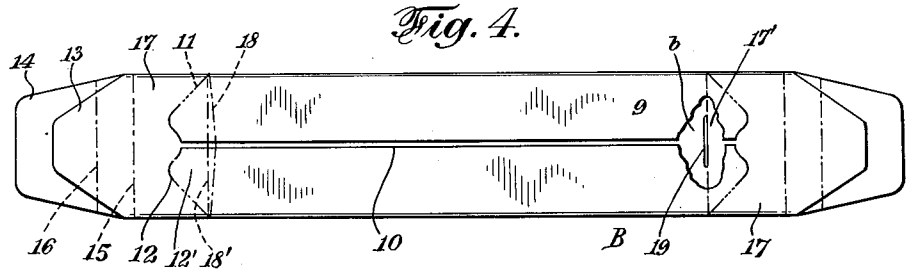


Fig. 5.

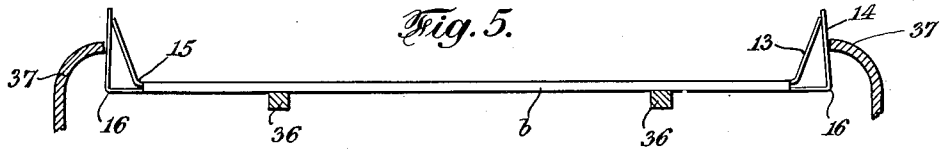
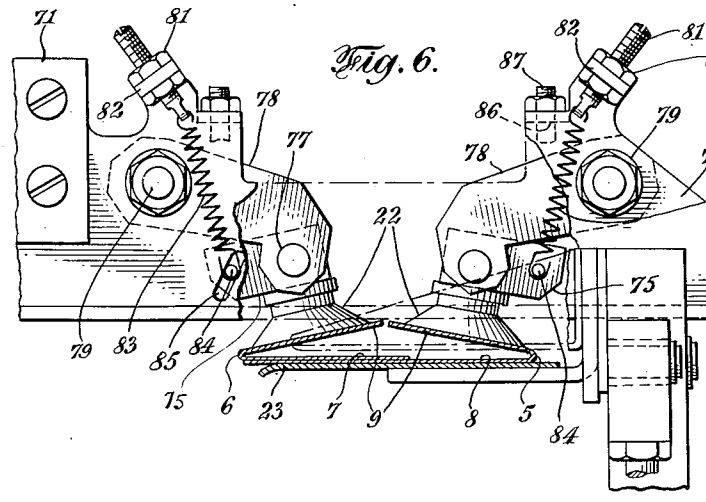


Fig. 6.



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APPARATUS FOR SETTING-UP BOX BLANKS

Filed July 3, 1947 4 Sheets-Sheet 4

Fig. 7.

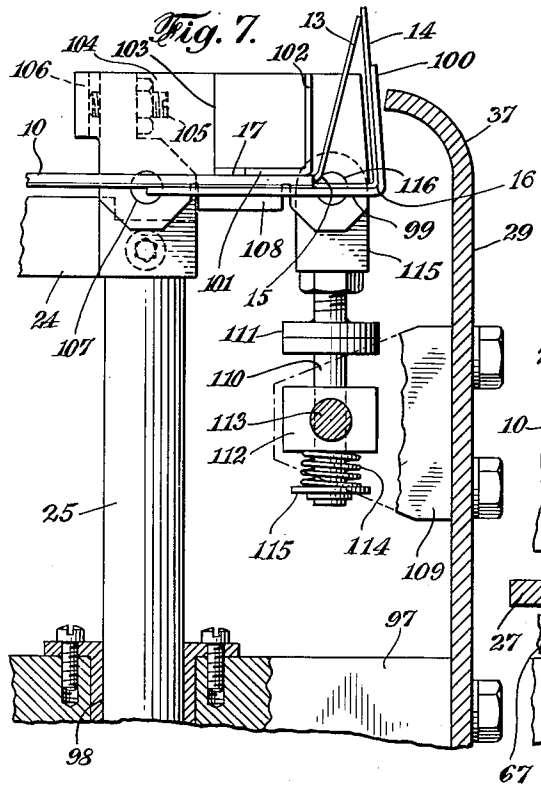


Fig. 8.

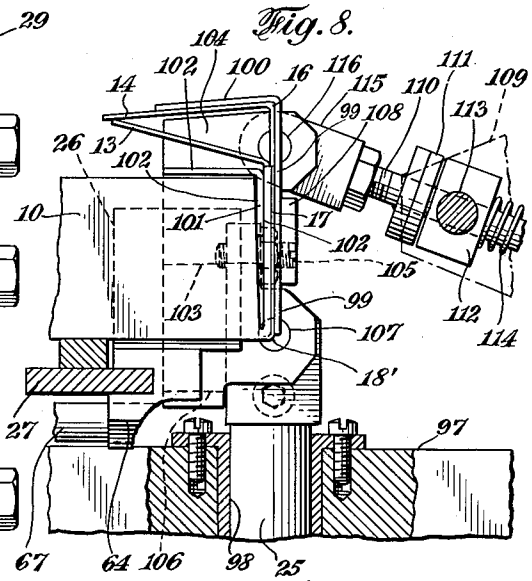


Fig. 10.

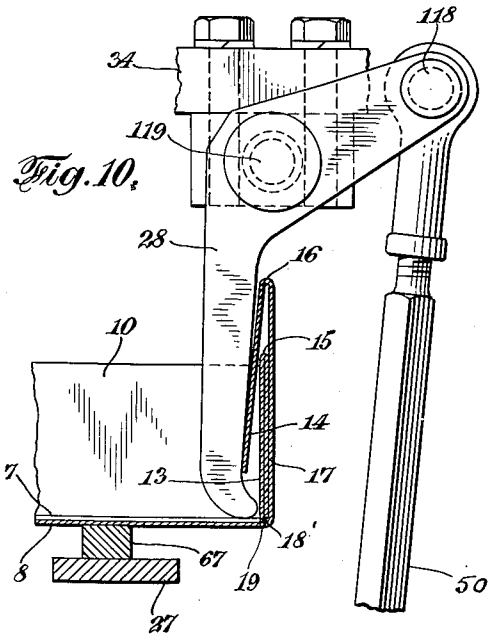


Fig. 9.

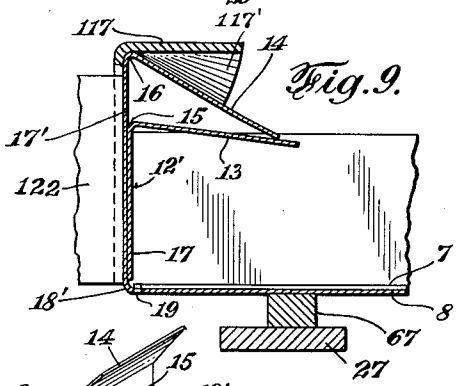
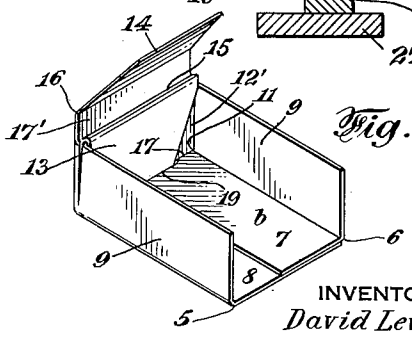


Fig. 11.



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Patented Feb. 26, 1952

2,587,050

UNITED STATES PATENT OFFICE

2,587,050

APPARATUS FOR SETTING-UP BOX BLANKS

David Levkoff, Great Neck, N. Y.

Application July 3, 1947, Serial No. 758,814

16 Claims. (Cl. 93—53)

1

This invention is an improvement in machines for processing boxes or cartons; especially boxes or cartons fashioned out of sheets of cardboard or other material, with parts that must be moved into their respective positions to give the box or carton its final shape.

The machine or apparatus of this invention is designed especially for operating upon boxes made up originally in the form of flat, scored and folded blanks of cardboard or the like; and has for its chief object the easy and rapid adjustment of all parts of such boxes or cartons, so as to set up the boxes or cartons in readiness to serve the intended purpose.

In my Patent No. 2,342,551, granted February 22, 1944, I have shown and described a folded cardboard box that is inexpensive, compact, efficient, and serviceable for packaging articles of various kinds. However, many packers, shopkeepers and merchants often find this type of box a little troublesome to manage when unfolding; largely because such persons are unfamiliar with the design thereof and unskillful in handling it. With the machine of this invention, boxes constructed as disclosed in my aforesaid patent can be delivered quickly in great quantities, with the sides, ends and other members so disposed that very little if any further manipulation is necessary; and all possible difficulty in opening and filling the box is eliminated. The folded blanks can therefore be shipped in stacks to a packing establishment where the machine will quickly open the blanks and make the boxes ready to receive the merchandise.

A further object of the invention is to provide a machine of relatively small compass, certain in operation, to be built at moderate cost, and capable of large output for commercial use.

Another object is to provide a machine which is adapted to exert a force at the outset on the ends of the folded boxes having the construction set forth in my above-mentioned patent, to bend up the ends and thus simultaneously turn up to some extent the hinged sides that are connected to said ends; and then to act further on the sides to complete the lifting thereof; without inserting any mechanical elements beneath them, while also turning over the flaps attached at the ends of the boxes into position to hold the ends and sides as required; and finally to actuate the retaining flaps or extensions into secure engagement with the bottom of the boxes, to prevent any subsequent unfolding; and then discharging the boxes in finished condition.

Other objects and the nature and advantages of the invention are set forth in the ensuing description; and the novel features are defined in the appended claims. But the machine as illustrated is only one embodiment of the invention, and changes not included herein may be adopted in practice, without departure from the main scheme, or omitting any of the essential characteristics of the invention.

2

On the drawings:

Figure 1 is a front view of the machine of this invention, some of the parts being in section.

Figure 2 is a side view thereof, partly in section.

Figure 3 is a top view presenting one side or half of the machine.

Figure 4 illustrates a folded box to be worked to produce a set-up box of the kind set forth in my said patent.

Figure 5 shows such a folded box in the initial stage of its processing by said machine.

Figure 6 shows the next stage in the operation and the parts of the machine to perform the same.

Figures 7 and 8 are details showing the parts of the machine to accomplish the succeeding operation.

Figure 9 shows one-half of the box with its ends and sides in position for the final operation before delivery.

Figure 10 shows the carrying out of this final operation and the members in the machine actuated to perform it, and

Figure 11 shows one-half of the box with all parts in place and the box in its finished state.

The number **1** indicates as a whole the supporting framework or casing of the machine, which supports at the top thereof adjacent one end a hopper, large enough to receive a large stack of folded boxes to be processed as required. The hopper comprises a pair of opposed upright channel-shaped members **2**, each of which is fastened to a plate **3**, affixed to one side of the framework **1** at one edge and to the lower end of one of the channels **2** of the hopper at the opposite edge. The open sides of the channels face each other, so that the horizontal blanks in the hopper can be seen while the operation of the machine is in progress; and the plates **3** engage the outer faces of the bottoms of the channels **2**. Each channel is made of a bent plate of metal, the front side being wider than the other; and bridging the channel **2** at the front sides is a fixed bar **4**, mounted near the lower end of the hopper. The lower edges of the front sides of these channels are high enough to permit the blanks in the

hopper to be moved out of the lower end thereof one by one as each reaches the lowermost position therein. In general the folded boxes are carried from the hopper 2 towards the front end of the machine at the right in Figure 2, being then partly unfolded; and are set up in the course of such movement; next they are lowered a short distance into the framework or casing and moved toward the opposite or rear end at the left, being processed further and finally delivered at said opposite end in finished condition.

The boxes intended to be set up by this machine are in general of the same construction as set forth in my prior Patent No. 2,342,551 aforesaid. The design thereof is illustrated separately in Figures 4, 5, 9 and 11. A folded box having parts which, when they are moved into position, give the completed box, is indicated as a whole by the letter B. Each folded box is made of two layers of cardboard, for example, which is first folded along two score lines 5 and 6 to bring the opposite longitudinal edges into overlapping position to make the bottom layer *b*; the overlapping edge portions being indicated by numerals 7 and 8. The parts of the box overlying the bottom *b* indicated at 9 are made by cutting the top layer longitudinally along the middle as indicated at 10. This provides two long sections which can be bent upward to make the sides of the box. The top layer is also provided with diagonal score lines 11 adjacent both ends of the cut 10; these score lines terminating in curved cuts 12 which unite with the extremities of both edges along the cut 10. The top layer beyond the ends of the cut 10 is extended to form a flap 13 of full width which has tapered sides, and the lower overlapped part 8 of the bottom layer is also extended to form another tapered end flap 14 of full width, which lies under the flap 13 when the parts are in the position shown in Figure 4.

Each flap 13 can be folded about the transverse score line 15, and the adjacent flap 14 has an adjacent transverse score line 16. Between the score line 15 and the extremities of the score lines 11 at the outer lateral edges of the folded box are sections 17 also of full width, in the top layer; and both the bottom layers and the top layers of the folded box have transverse score lines 18′ and 18 respectively connecting with said outer ends of the score lines 11. The bottom part terminates at the score lines 18′ but could extend to the score lines 15; and between these lines 18′ the bottom layer comprises only the lower overlapped part 8. The extremities of this part make the flaps 14, and contain sections 17′ between the flaps 14 and lines 18′.

Between each score line 18 running from the outer lateral edge of the folded box to the cut 10, and the adjacent score line 11 in the sections 17, are corner flaps 12′ in said sections. When the sides 9 are raised and the ends of the box are bent up around the score lines 18′, the flaps 12′ at the end of the sides turn upward about the score lines 11 and make contact with adjacent portions of the sections 17. When the flaps 13 are turned down over the sections 17 and turned up flaps 12′, and pushed into slots 19 in the bottom of the box, the sides are held in set-up position, as indicated in Figure 11. The operation of bending of the folded box in this way is accomplished in the machine as the operation proceeds.

Beneath the hopper and extending in a direction indicated as from left to right in Figures 2 and 3 are supporting rails 20 just below the extremity of each channel 2 of the hopper. These rails are at the two sides of the machine, and on each is mounted a sliding shoe 21; by which the lowermost folded box in the hopper is engaged at its rear edge and pushed away from under the hopper. Each folded box is thus carried beneath vacuum cup members 22, below which is a supporting plate or rest 23. The vacuum cup members are four in number, only two of which are shown in Figure 2, but there are two more at the opposite side as indicated in Figure 1, to engage the opposite end of the folded box. These vacuum cup members are forced down into contact with the folded sides 9 of the blanks adjacent the ends thereof; and at the right moment the air is exhausted therefrom; so that, when the box blank is pulled downward, the cups 22 will tend to raise or lift the sides 9 of the box.

The rest 23 is secured to a depressible, horizontal crossbar 24 adjacent the top of the framework 1, in front; and at each side of the machine beneath this rest 23 is a plunger 25 which is actuated to pull the plate 23 and folded box down at the right moment as fully described later herein. Only one of the plungers is shown in Figure 1 because the inner parts of this machine are shown in section, some parts being omitted at the right hand side to reveal the parts behind them. The plungers 25 are connected at the tops by the bar 24 aforesaid; so that when the plungers move down, the bar 24 and the supporting rest 23 descend with them. This rest 23 is located centrally of the framework 1, and it is of such length that it engages the box blank at the middle and short of the score lines 18′. It can therefore be lowered, and during its descent the opposite ends thereof clear a pair of rearward facing seats 26 which are movably supported to slide along rails 27 in a direction towards the rear of the machine, opposite to that of the original motion of the blank. The folded box is bent further at this stage (see Figure 9) and finally passes into position at the extreme left of Figures 2 and 3, for example, where the ends thereof will be directly beneath a pair of levers 28 which are so mounted and operated that they press down upon the end flaps 13 and 14 and cause the extremity of the flaps 13 to enter the slot 19. See Figure 10.

The framework of the machine is shown as comprising cover plates 29 at the sides, the edges of which are bent at the corners to be overlapped by other cover plates 30 at the ends. Those plates enclose the operating parts of the machine within them. The upper edges of the side plates 29 at the rear end of the framework behind the hopper are higher as shown at 31, and these higher portions present vertical shoulders 32 adjacent the rear faces of the channels 2. Affixed to the inside faces of the plates 29 at the top are angle bars 33 which are also attached to the backs of the channels 2 of the hopper and are flush with the shoulders 32, to support the hopper more securely.

Extending across the top of the machine adjacent the rear end is a supporting bar 34 affixed to the high parts 31 of the plates 29 by bolts 35, and the levers 28 are supported by said bar 34. Made fast to the underside of said bar and extending beneath the hopper toward the vacuum cups 22 are rails 36 along which the box blanks slide out from under the hopper; and at each side of the framework, beginning at the shoulders 32 which are flush with the rear of the hopper the top edge of each plate 29 has the shape of a cam strip 37 with one edge sloping

upward and inward and terminating in a vertical shoulder adjacent the front ends of the rails 20 and 36. The function of this cam strip is to bend up the end flaps 13 and 14 as the shoes 21 force the box blank along the rails 36 toward the plate 23. By the time the folded box reaches this plate, said end flaps are bent upward into the positions shown in Figure 5, but the remainder of the box, including the sides 9 and portions 17 are still flat and in collapsed position. See also Figure 7. The bars 20 along which the shoes 21 move are all secured to the sides of the frame by bolts 38 and spacers 39, at the front and rear ends thereof.

The mechanism for actuating the various members to move and form the boxes comprises a transverse main shaft 40 mounted in the framework of the machine below the rails 27, by means of suitable bearings on the plates 29. This shaft is revolved by an electric motor 41 having a pulley 42 on the shaft thereof, connected by a belt 43 with a pulley 44 on the shaft 40; but obviously any suitable type of gear connections between the motor and shaft 40 can be used. Below the shaft 40 the framework supports bearings 45 which carry a parallel shaft or axle 46. The latter shaft has both ends separated from the inside of the framework and cooperates with the shaft 40 in a manner to be described later.

On the two ends of the shaft 46 between the bearings 45 and side plates 29 are rockers or levers 47, the arms of which are of unequal length. The long arms of the levers 47 are joined by adjustable links 48 to the lower ends of the plungers 25, and the shorter arms are joined by similar links or connecting levers 49 to rods 50 which are pinned at the upper ends to the levers 28. The shorter arm of each lever 47 is attached to a tension spring 51 affixed at its opposite end within the framework, and this spring tends to pull the rods 50 downward so as to keep the levers 28 in lifted position, as indicated at 51.

The shaft 46 is mounted to oscillate in the bearings 45 and the levers 47 are rocked by means of studs 52 adjacent the mid points of the levers 47 and engaged by cams 53 on the shaft 40. These cams 53 have openings which receive hubs 54 both held rigid by keys 54a and screws 54b to the shaft 40. The hubs have rims on one side forming shoulders on which the cams 53 are mounted, and face plates 55' on the opposite side which overlap the openings through the cams 53 and are engaged by screws 55a to hold these face plates 55' in position. By loosening these screws the cams 53 can be adjusted as desired around the shaft 40. When the shaft rotates the cams 53 will force the lever down against the tension of the spring 51.

The shaft 40 also carries at one end adjacent the side plate 29 a rigidly mounted cam disk 55 having a cam groove 56 on its inner face. This cam is at the right of the machine when viewed from the front end thereof. The cam groove receives the end of a stud or pin 57 which is rigidly carried by an arm 58 at one end, the stud bearing an anti-friction roller if desired. The arm 58 is joined to a swinging arm or lever 59, which is made fast to the other end of the arm 58 by a screw 60, which enters the ends of the arms 58 and 59 so as to bind the arms 58 and 59 together and permit adjustment. The arm 58 is rigidly connected to the shaft 46 by a short rod 58a, affixed to this arm and to the shaft 46 by fitting it into a transverse hole in the shaft to receive it tightly. At the opposite end of the shaft is a similar arm 59 mounted on the shaft 46, and operated in unison with the first named arm 59 near the cam 55, as the shaft 46 is oscillated or rocked by the cam 55 and arm 58. As the cam 55 rotates, the eccentric groove 56 thereof swings the short arms 58 up and down, closer to and away from the shaft 46, and this causes oscillating movement of the arm 59. The upper end of the arms 59 engage the shoes 21 by means of rollers 61 on screws or studs in the said ends entering deep notches 62 in the lower sides of said shoes 21. Hence, as the arms 59 are swung from side to side the shoes are moved back under the hopper and forward towards the vacuum cups 22.

The rockers 47 are freely mounted on the shaft or axle 46, but the arms 59 are made rigid with the shaft 46, one as above described by connection to the arm 58; and the other to an arm 63, affixed on the end of the shaft or axle 46 remote from the cam 55 by a screw or key 64. See Figure 2. The swinging arm 59 at the right in Figure 1 is secured to the arm 58 by the screw 60 and the other arm 59 to the arm 63 by the screw 60a, binding the arms 58 and 59, 63 and 59 at each end of the axle 46 together. For adjustment each long arm 59 has a short transverse slot 65 receiving the screw 60 or 60a.

The swinging arms 59 also have slots 65a near their upper ends to enable them to be adjustably bolted or pinned to the links 66 joining the arms 59 to the sliding members or heads 26a which engage and move upon the rails 27. The members 26a support the seats 26 and on the rails 27 are bars 67 to support the partly set up boxes. Each retractive movement of the shoes or heads 21 is accompanied by a forward movement of the members 26a and the seats which hold the boxes after they have been pulled down by the rods 25. The links are attached to the ends of a cross rod 66a, uniting the seats 26a.

To assist in mounting the vacuum cups 22 a bar 68 is attached at the front of the sides 29 of the machine at the top, by bolts 69. To each of the channel-shaped upright members 2 I affix a vertical supporting plate 70 secured at one end by connection with a projection 71, which can be cut and bent from the front of the channel member, the plate being affixed thereto by screws, the lower edge at the front of each channel 2 being just above the lower edge of the plate 70. The plates 70 are angle-shaped, and the horizontal lower parts 72 are made fast in front by bolts 73 engaging the top of the bar 68.

Each of the vacuum cups has the form of a hollow cone-shaped member open at the bottom, with a hollow gooseneck or pipe 74 at the top to which the air tubes or hoses are connected. These necks 74 are gripped at the upper parts of the cone-shaped bodies of the cups 22 by two plates 75, clamped upon the neck 74 by screws 76, and one of each pair of plates 75 has a pivot stud 77 extending therefrom, so that the cup can be movably mounted at one end of a movable arm 78 pivoted at 79 to the plate 70. As before stated there is a pair of cup members at each side of the apparatus adjacent the ends of the plate 23, the cups of each pair being in line with respect to the direction of movement of the folded boxes. Thus one pivot 79 will be mounted in each plate 70 near the end thereof attached to the bar 68 and the other will be near the hopper 2.

Adjacent each pivot 79 and adjustably held by

nuts 80 are anchor screws 81 which pass through the overturned ends 82 of projections at the top of the plates 70; and the lower ends of the screws 81 are connected by tension springs 83 to studs 84 projecting from one of the aforesaid gripping plates 75. The plates 70 will be slotted as indicated at 85 to permit some movement to the studs 84. Usually the planes of the lower ends of the vacuum cups will be horizontal and the studs 84 will be at the tops of the slots 85, but these cups can be tilted slightly around the pivots 77, moving the studs 84 down to the bottom of the slots 85 as indicated in Figure 6. At the top of the plates 70 adjacent the overturned projections 82 are additional projections 86 on the opposite sides. These projections carry adjustable stop screws 87 which limit the upward movement of the pivoted arms 78.

All the vacuum cups are connected with an air header 88, closed at one end by a cap 89, through tubes 90, the bent upper ends of which are coupled by means of flexible tubing 91 to the goosenecks 74 at the tops of the vacuum cups 22. This header communicates with a hollow casing 92 in which is a controlling valve with one end of its stem projecting as indicated at 93. This valve is normally closed but is opened by a pivoted lever 94 mounted on the casing, the other end of the lever being engaged by a cam 95 on the shaft 40, engaging a roller 95', on the lever 94.

The header 88 communicates with a suction pump through a connection 96, and when the cam 95 opens the valve in the casing 92 a vacuum is created in the vacuum cups 22. The cam 95 is timed to operate the lever 94 just as each folded box is forced by the shoes 21 over upon the plate 23 and under the two vacuum cups at each end of the plate 23. At this time the cups are down in the position shown in Figure 2 on the sides 9 of the folded box at the two ends thereof. A vacuum now being created in the cups, the sides 9 of the folded box adhere to the cups, and when the rods 25 start to pull the folded box downward at this instant, the cups pull up the sides 9 as indicated in Figure 6. The position of the cups is determined by their own weight and the weight of the arms 78, and by the action of the springs 83 on the plates 75, these springs pulling upward on the free ends of plates 75 as indicated in Figure 6. The advanced edge of the plate 23 curves downward slightly as illustrated in Figure 6, to facilitate the passage of the front edge of each folded box upon the plate 23 and under the cups. The springs 83 have sufficient lifting effect to keep the cups in operative relation with respect to the folded boxes.

At the time when the vacuum cups become effective the apparatus begins to bring about the downward movement of the box blanks and simultaneously the turning up of the ends 13 and 14 thereof. As the folded boxes are moved from the hopper towards the plate 23 the whole length of the folded boxes between the creases 15 as seen in Figure 4, remains flat, but the end flaps encounter the cam edges of the parts 37 and are turned upward as indicated in Figure 5. When the vacuum cups become active to engage the sides 9 and the rods 25 begin to move the folded boxes downward, the blanks are then bent around the transverse creases 18—18' so that the flaps 12' at the ends of the sides between the creases 18 and the creases 11 are folded upward and around the creases 11 towards the inner layers 17 at the ends of the box. This result is brought about by the rods 25 and parts cooperating therewith.

The rods 25 are mounted in bearing blocks 97 having bushings 98 secured to the plates 29 under the vacuum cups 22, and are joined at the top by the cross bar 24 above mentioned. See Figures 7 and 8, the bar 24 being omitted from the latter, for the sake of convenience. Upon the tops of the sliding rods 25 are pivoted seats 99 to receive the end portions 17—17' of the folded box, these seats 99 being flat horizontal plates with the ends adjacent the cam members 37 turned upward as indicated at 100. Cooperating with these plates and above them are additional plates 101 each turned up along one edge to have a side 102 substantially parallel to the side 100 of the plate 99, and spaced therefrom; and said side 102 is extended and bent over to provide an end 103. The plates 99 and 101 are rigid with respect to each other and mounted chiefly by means of plate or a bar 104 which is pivotally secured to the upper end of the adjacent rod 25. The ends 103 of the plates 101 lie against the bars 104. The upper extremity of each rod 25 carries an adjusting screw 105 passing through it to limit the position of the adjacent bar 104 by engaging the bent over end 106 thereof and holding this bar with the two bending plates 99 and 101 in horizontal position when the ends of the folded box go between them. The pivotal connection of each bar 104 with the upper part of the adjacent rod 25 is indicated at 107, and the horizontal part of each plate 101 which is separated from the horizontal part of each plate 99, leaving a space open at the edges of the plates 99 and 101 remote from each plate or bar 104 for the blanks to enter. A plate indicated at 108 goes under each plate 99 and is secured thereto and to the plate 104 to support the plates 99 below the plates 101.

The plates 29 of the framework also carry adjacent the rods 25 bearing lugs 109 supporting sliding pins 110 each having a collar 111 adjacent the middle thereof. Below the collars the pins project through bearing apertures in block 112. The blocks 112 are supported to turn on studs 113 on the lugs 109, and below the blocks, pins 110 are encircled by springs 114 kept in place by collars 114' secured on the pins 110 in any suitable way. These springs tend to force the pins 110 downward. At the upper ends the pins 110 have heads 115 with pivotal connections at 116 with one end of the bars 104.

When the rods 25 are pulled down, the bars 104 of course go down also because they are pivotally attached to the upper ends of these rods by the pins 107. But as the bars 104 are also pivotally attached at 116 to the pins 110, these bars in their downward movement are swung upward towards the axes of the rods 25, as shown in Figures 7 and 8. The plates 99 and 101 are rigid with the bars 104 and the collapsed boxes lie between these plates with the creases 18' adjacent the pivots 107 and the flaps 13 and 14 between the upturned ends 101 and 102 respectively of plates 99 and 100. As the plates 99 and 100 descend with the bars 104 and revolve with these bars about the pivots 107, the ends 17, 17' of the boxes are bent up, but of course descend with the plates 99 and 101 because these ends lie between said plates; and the bottom and sides of the box, to which the ends 17 and 17' are attached along the lines 18' are necessarily pulled down also with the ends 17, 17' and flaps 13 and 14 by the plates 99 and 101. Hence the

downward movement of the rods 25 not only causes the unfolding and setting up of the boxes, but also depresses them and delivers them to the seats 26. The bars 99 and 101 both bend and help to lower the boxes to the seats 26.

From the foregoing description the mode of operation of the apparatus will be clear. When the machine is running the cam groove 56 causes the rocker arms 58 and 63 to swing the arms 59 back and forth on the axle 46 to move the shoes 21 to pick up and feed the folded boxes over upon the fixed plate 23 and the bending plates 99 and 101. As soon as the sides 9 of the boxes come under the vacuum cups the cam 95 opens the valve in the casing 92 and the cams 53 actuate the rockers 47 so as to begin to depress the rods 25. The suction in the cups 22 lifts the sides 9 of the folded boxes and simultaneously the rods 25 pull down on the ends of the bars or plates 104 pivotally connected thereto at 107. As said ends are lowered the other ends of the bars 104 swing upward because they are pivotally united to the pins 110 at 116 and carry up with them the plates 99 and 101, as indicated in Figures 7 and 8. At this time the pins 110 swing over towards the tops of the rods 25 and the plates 99 and 101 complete the bending up of the end parts 17—17' into the position shown in Figure 8. The valve in the casing 92 closes quickly and when the rods 25 are at the lower ends of their movement, the box blanks rest upon the seats 26.

Further rotation of the shaft 40 and cams thereon swings the levers 59 to retract the shoes 21, so as to engage the next folded box in the hopper to move it forward under the cups 22. This retraction pulls the members 26a supporting the seats 26, which now carry the open set-up boxes, towards the opposite end of the machine along the rails 27. They now pass under cam strips 117, the edges of which turn down the two flaps 13 and 14. See Figure 9. Finally the set-up boxes at the end of these cam strips come with their ends under the levers 28 and the rockers 47 are now moved so as to raise the rods 50. The levers 28 at the upper ends of the rods 50 are now swung into the position shown in Figure 10, and the ends of the levers 28 press the tapered extremities of the flaps 13 into the slits 19 in the bottom of the blanks. The rods 50 are pinned as shown at 118 to the levers 28 and the levers 28 are mounted on journals 119 secured in the cross bar 34 behind the hopper 2. They are made fast in this cross bar by tightening bolts 120. Whenever the rods 50 are lifted the rods 25 are pulled down to unfold and set up the next box.

The cams 117 are provided by strips 117' attached at one end of the side cover plates 29 by supporting angles or brackets 121 and the cam edges are at the tops. At the other end the strips are bent, as at 122 and secured to the casing. The rear end plate 30 has an opening 123 at the rear ends of the rails 67 through which the completely formed boxes are discharged. The front ends of these rails can be bevelled as indicated at 124 in Figure 2 so that as the seats 26 are drawn towards the rear, each box on the seats easily slips up on the rail 67.

Having described my invention, what I believe to be new is:

1. Apparatus for unfolding blanks of sheet material having parts to form the sides and ends of a box, comprising a hopper, means for delivering the blanks successively from the hopper, elongated parts having cam edges adjacent said hopper to engage said end parts, pneumatic means comprising members at the ends of said cam edges remote from the hopper to engage and lift said side parts of said blanks coming from said hopper, means for bending up said end parts, and means for finally bending said end parts further into final position, said members having tubes connected thereto for withdrawing air from said means, valve means for said tubes, and means for opening and closing the valve means when the final bending is in progress.

2. The apparatus according to claim 1, wherein said final actuating means comprises a pair of levers, one for each end of the blank, and mechanical connections whereby said levers are caused to press the extremities of said end parts between the side parts.

3. The apparatus according to claim 1, wherein said pneumatic means comprises suction cups in position to engage each side part adjacent said end parts, and means to withdraw air from said cups.

4. The apparatus according to claim 1, wherein said means for bending up said end parts comprises pivoted plates in position to overlie the upper and lower faces of said end parts, and mechanical connections for displacing said blanks downward from said pneumatic means and simultaneously rotating said plates against said parts to bend said end parts away from the plane of the blank.

5. The apparatus according to claim 1, which comprises additional elongated parts having cam edges in position to engage said end parts after said side parts and end parts are lifted, and means for carrying said blanks into engagement with said additional cam edges.

6. Apparatus for unfolding blanks having parts to form the ends and sides of a box, comprising cam means for initially bending said end parts, pneumatic means for engaging and lifting the side parts, means for displacing said blanks from said pneumatic means and bending said end parts, and controlling members comprising tubes and a valve for controlling said tubes to withdraw air from said members when said displacing means is operated for said pneumatic means, and rods pivotally coupled at one end to said displacing means for operating said displacing means.

7. The apparatus according to claim 6, wherein said displacing means also include a pair of rockers, a supporting axle therefor, said rods being connected one to each rocker, a cam and spring to control the movement of each rocker, a valve for said connections to said pneumatic means, and a cam to actuate the valve.

8. Apparatus for unfolding blanks of sheet material having parts to form the sides and ends of a box, comprising a hopper, means for delivering the blanks successively from the hopper, pneumatic means comprising suction members to engage and lift said side parts of said blanks coming from said hopper, means for bending up said end parts, valve controlled tubes for withdrawing air from said members when said bending is in progress, means for displacing said blanks from pneumatic lifting means and bending means, and mechanical connections for operating said delivering means, said bending means and said displacing means.

9. The apparatus according to claim 8, wherein said mechanical connections comprise swinging levers and shoes actuated thereby to move said delivery means, seats to receive the blanks after

the side parts have been lifted and the end parts bent, and links joining said seats to said levers.

10. Apparatus for unfolding blanks of sheet material having parts to form the ends and sides of a blank, comprising suction cups, means for moving said blanks successively into position for the side parts to be engaged by said cups, and means for bending said end parts while the side parts are engaged by said cups, said bending means including sets of plates in position to receive said end parts between them, rods pivotally united to each set of said plates, members also pivotally joined to each set of said plates and to separate fixed points on said apparatus, connections for operating said rods to pull upon said plates, to cause them to be tilted by said members, to bring about the bending of said end parts.

11. The apparatus according to claim 10 which has displacing means in the form of sliding shoes, and said apparatus has swinging levers connected to said shoes, in combination with sliding seats to receive said blanks, after said members have been tilted, and links uniting said seats to said levers.

12. Apparatus of the kind described comprising a pair of rockers, a supporting axle therefor, an operating shaft, cam and spring means associated with said shaft and rockers for effecting and controlling the operation of the rockers, suction operated lifting means and bending means for unfolding blanks of sheet material, the bending means being connected to said rockers and controlled by the shaft, sliding shoes movable towards said lifting and bending means, to deliver said blanks to said means, sliding seats movable away from said lifting and bending means for subsequently receiving said blanks, and swinging levers on said axle connected to said shoes and seats and actuated by said shaft.

13. The apparatus according to claim 12, which also comprises a grooved cam on said shaft and an arm affixed to one of said levers and being engaged by said cam.

14. The apparatus according to claim 12 which also has levers for bending the end parts of said blanks after the blanks have been engaged by said bending means and are disposed on said seats, said levers being connected to said rockers.

15. Apparatus for unfolding blanks of sheet material having side and end parts to form boxes, comprising a hopper, sliding shoes for delivering said blanks successively from said hopper, pneumatic means for then engaging the side parts, and lifting same, means for bending the end parts, sliding seats to receive said blanks after lifting and bending, a pair of rockers, rods connected to said rockers at one end and to said bending means at the other, swinging levers connected to said shoes and said seats to displace said shoes and seats, a pair of levers to engage the end parts after said blanks are disposed on said seats and after the seats are displaced, rods connecting said levers to the other ends of said rockers, and means for operating said rockers.

16. The apparatus according to claim 1, wherein said pneumatic means comprises suction cups in position to engage each side to pull such sides up into position.

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