C. C. DAVIS.

PAPER BOX MACHINE.

APPLICATION FILED FEB. 19, 1920.

1,383,697.

Patented July 5, 1921.

4 SHEETS—SHEET 1.

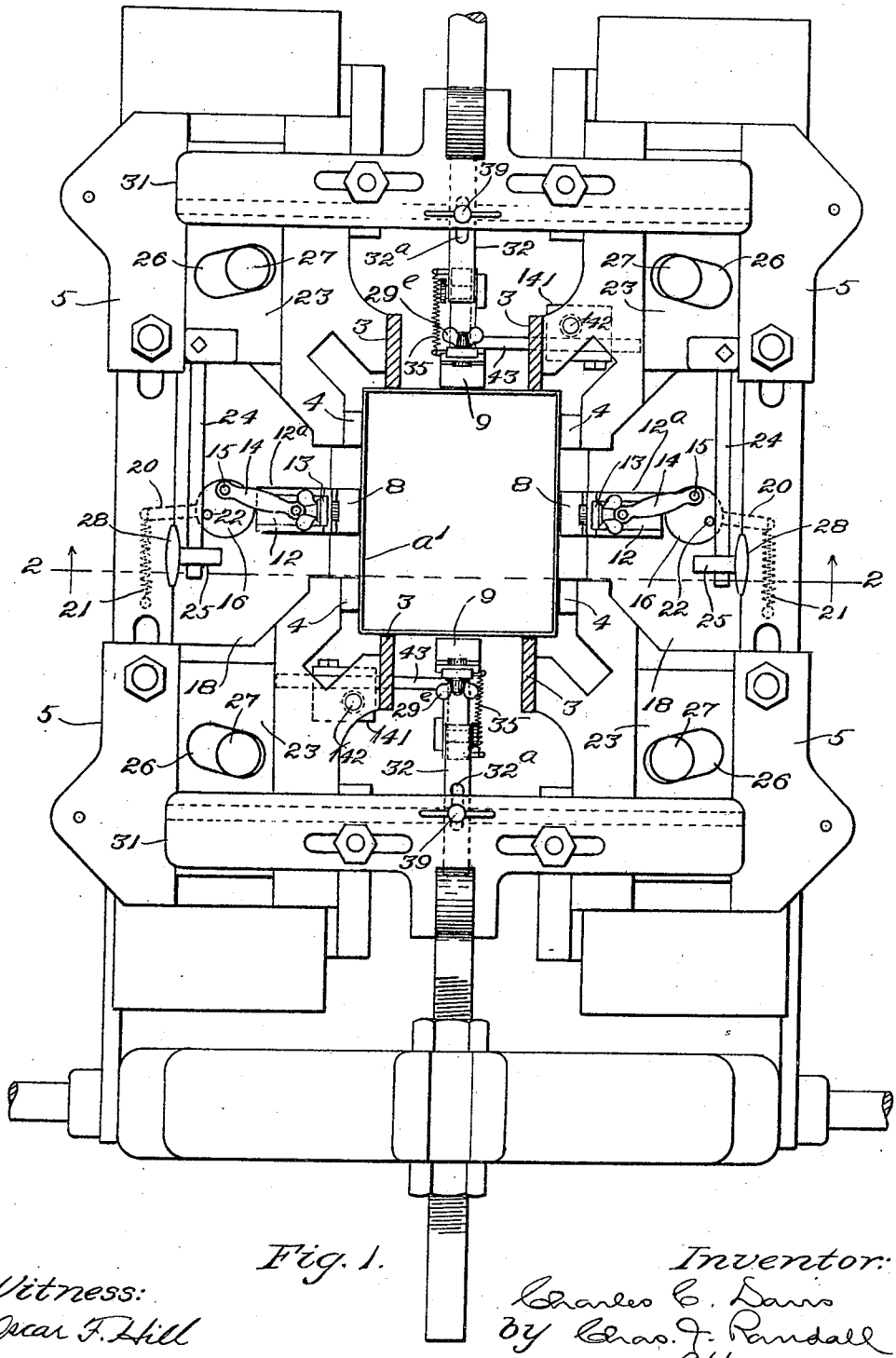


Fig. 1.

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Fig. 2.

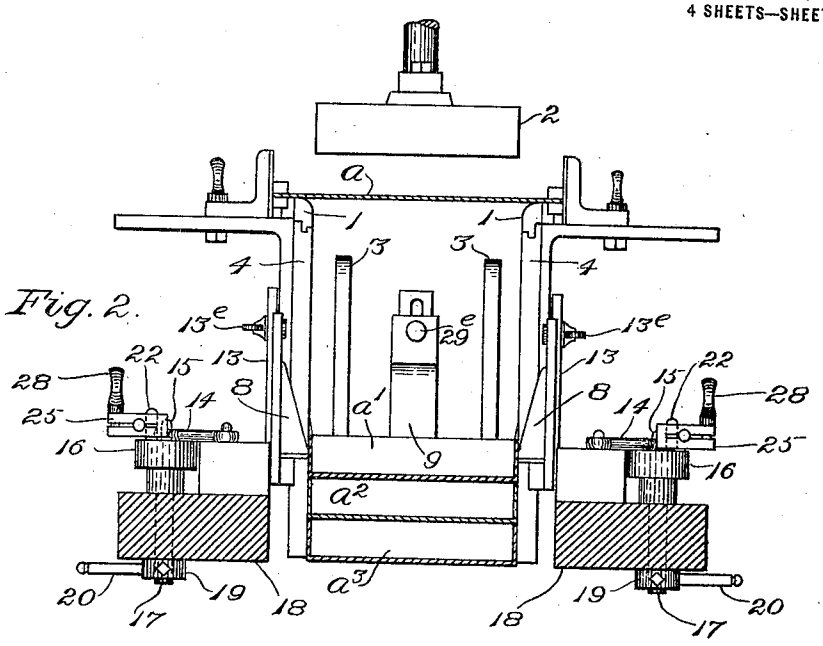
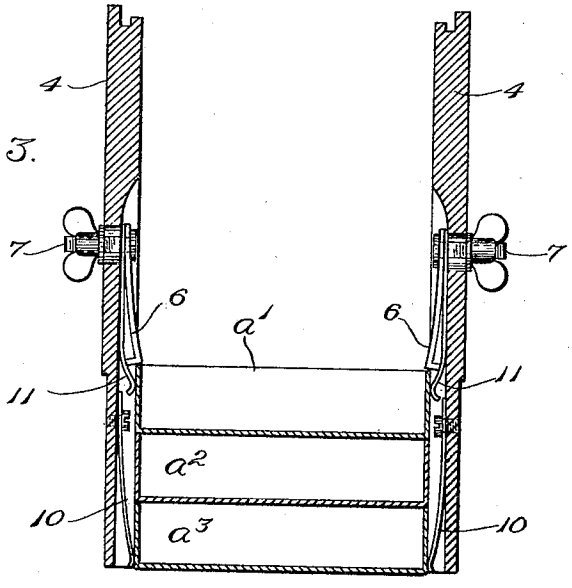


Fig. 3.



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Fig. 6.

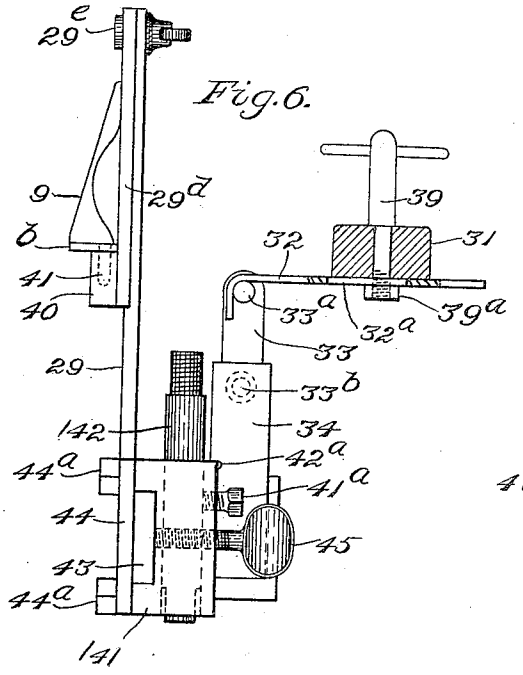


Fig. 7.

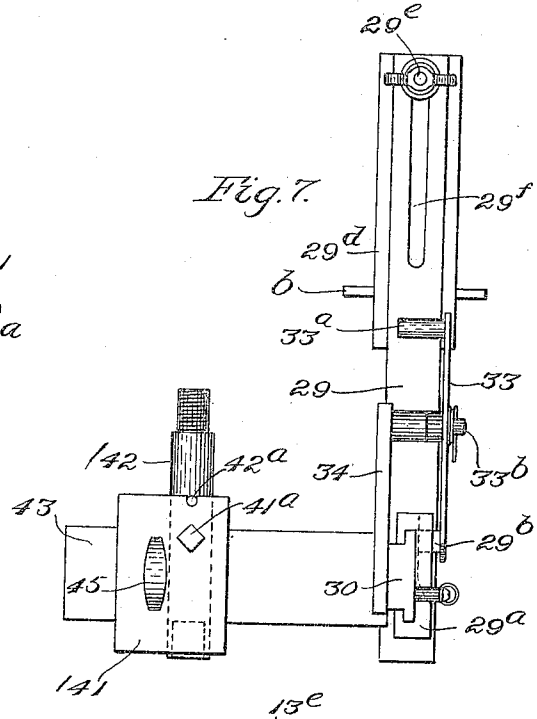


Fig. 4.

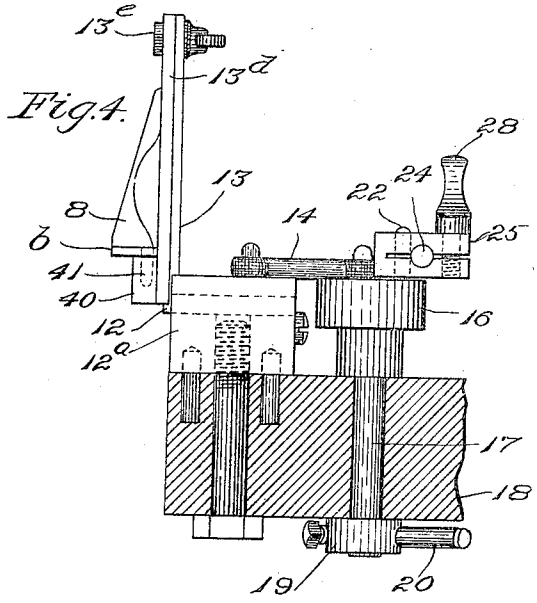
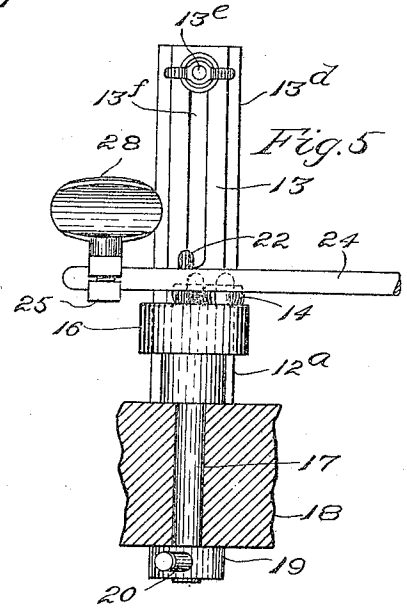


Fig. 5.



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4 SHEETS—SHEET 4.

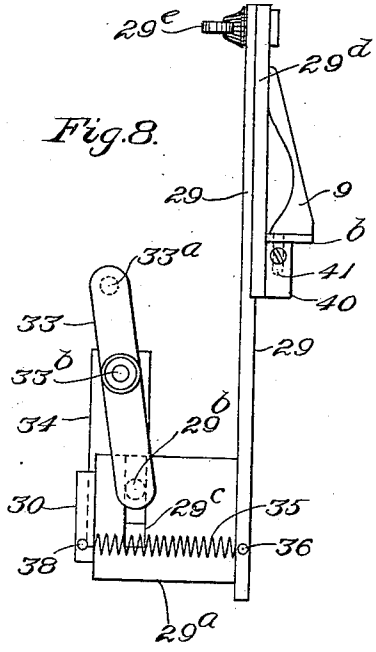


Fig. 8.

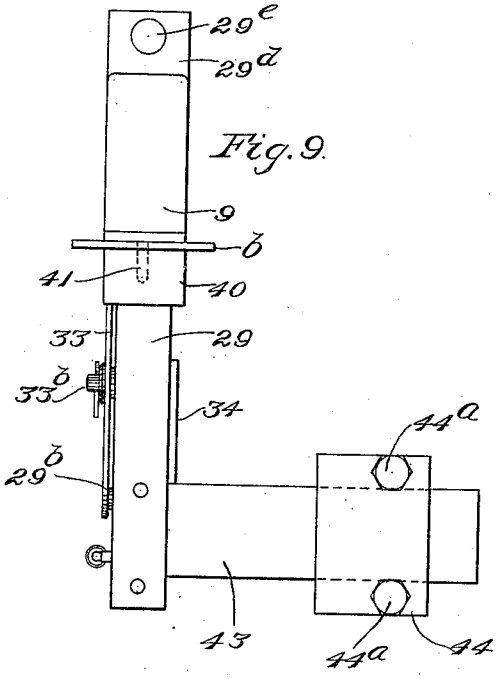


Fig. 9.

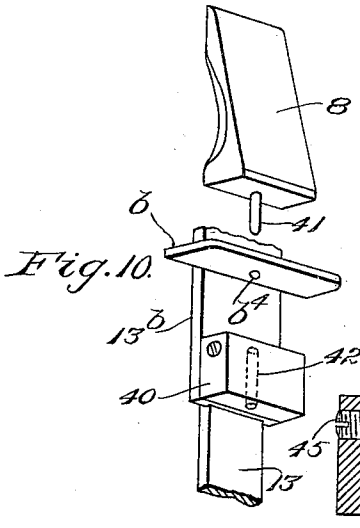


Fig. 10.

Fig. 11.

Fig. 12.

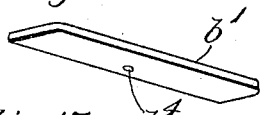


Fig. 13.

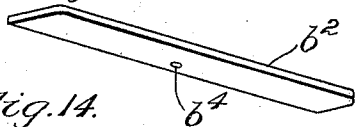
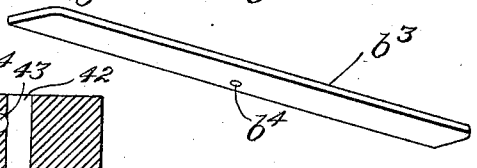


Fig. 14.



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UNITED STATES PATENT OFFICE.

CHARLES C. DAVIS, OF CONTOOCOOK, NEW HAMPSHIRE, ASSIGNOR TO KINGSBURY & DAVIS MACHINE COMPANY, OF SOUTH COVENTRY, CONNECTICUT, A CORPORATION OF NEW HAMPSHIRE.

PAPER-BOX MACHINE.

1,383,697. Specification of Letters Patent. Patented July 5, 1921.

Application filed February 19, 1920. Serial No. 359,860.

To all whom it may concern:

Be it known that I, CHARLES C. DAVIS, a citizen of the United States, residing at Contoocook, in the county of Merrimack, State of New Hampshire, have invented a certain new and useful Improvement in Paper-Box Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

The invention relates to machines for making paper boxes, as for instance machines on the order of that shown and described in the patent granted under date of May 12, 1903, upon the application of Chas. C. Davis and Elmer W. Webster, No. 728,086. More particularly, it relates to the means of performing, in the working of such machines, what is sometimes called "crimping."

The operation known as "crimping" consists in bending the box sides and ends inwardly at an acute angle to the box bottom, so as to "break" the box-blank sharply along the lines of the bends and thereby produce a well-defined angular shaping of the box and insure that in the completed state thereof its side and end-flanges shall stand squarely with relation to the box-bottom.

In the machine of Letters Patent No. 728,086, the crimping operation is provided for by the employment of horizontally-reciprocating crimping members which by movement inward press opposite sides of the box inward; and by making the so-called "former" with beveled sides which incline upwardly and inwardly, and timing the inward movement of the crimpers so that they press the sides of the box toward the said beveled sides of said former, bending the box-sides sharply around the acute-angled bottom edges of the former.

The invention provides simplified crimper-actuating means taking the place of the means shown and described in the Letters Patent aforesaid. One part of the invention consists in crimper-actuating means utilizing the movements of the parts which are employed for making application of corner-stays, and dispensing with the employment of a separate organization for crimper-actuation. The invention provides also novel means of actuating end-crimpers. It provides also for effecting the crimping operation after the former has withdrawn from the just-formed box, and has been or is being moved upward, thereby rendering it unnecessary to bevel the sides of the former for coöperation with the crimpers; and what is of great importance, through the improvement in the timing of the movements of the parts enabling the rate of production of boxes to be increased materially.

The drawings show the features of the invention combined with certain of the parts of the corner-staying paper-box machine shown and described in the Letters Patent aforesaid.

In the drawings,—

Figure 1 shows in plan, partly in section, certain of the parts of the machine of such Letters Patent, together with crimping mechanism in accordance with the invention.

Fig. 2 is a view in vertical cross-section on line 2—2 of Fig. 1, including certain parts which in the machine are located above those shown in Fig. 1.

Fig. 3 shows in vertical section on a larger scale than Figs. 1 and 2, two of the side-stands between which the box-blanks successively are carried down by the downward strokes of the so-called "former," and the detents and springs which are attached to the said side-stands.

Fig. 4 shows in elevation the side-crimper devices at the right-hand side of the machine, with the support therefor in vertical section.

Fig. 5 shows the same parts as Fig. 4, representing them as viewed from the right-hand side of the machine.

Fig. 6 shows in side elevation one of the end-crimpers and the parts which are more immediately associated therewith, the adjacent cross-head being shown in vertical cross-section.

Fig. 7 shows certain of the parts of Fig. 4, but viewed from the front of the machine.

Fig. 8 shows certain of the parts of Figs. 6 and 7, viewed from the side opposite from that of Fig. 6.

Fig. 9 shows the same parts as Fig. 8, viewed from the center of the machine.

Fig. 10 is an isometric view of a crimper and crimper-blade, and their support, disassembled from one another.

Fig. 11 is a sectional view, on a larger scale than the preceding views, of the block on which a crimper is mounted in the machine.

Figs. 12, 13, and 14 are isometric views of crimper-blades of different lengths.

The machine in connection with which the invention is employed in practice may be similar in its general character and construction to that of Letters Patent No. 728,086. The action in bending a box-blank into the form of a box-body or cover (hereinafter called "box") is as heretofore and will be apparent from Fig. 2, in which a box-blank a is shown supported upon the breaking-rods 1, 1, by means of its side-portions resting upon the said rods. The descent of the former 2 will force the blank down within the inclosure formed by the end breaker-posts 3, 3, and the side-stands 4, 4, supporting said breaking-rods 1, 1, the said breaking-rods and breaker-posts operating during the descent of the blank with the former to fold the side and end flanges of the blank upward against the sides of the former. The said descent of the former 2 carries the blank, now shaped like an open-topped box a', down into position to be operated upon by the corner-staying devices. The corner-staying devices (not shown) may be on the order of those of the said Letters Patent, mounted upon the corner-blocks, herein designated 5, 5. As in such Letters Patent, the former 2 remains in its lowest position inside the box, while the corner-staying operations are performed, and then rises out of the box. As former 2 rises, the box a', Figs. 1, 2 and 3, is held from rising by catches, as 6, 6, Fig. 3. The catches 6, 6, shown are of well-known character and arrangement, and they operate as heretofore. They are made of slightly bowed spring-strips which occupy grooves in the inner sides of side-stands 4, 4, the said strips being fastened at their upper ends to the side-stands by means of bolts 7, 7, and having their lower ends bent at right angles to produce shoulders suitable for engaging with the top edges of the side-flanges of the box a' so as to prevent the box from rising with the former 2. The lower portions of the catches 6, 6, normally project inward out of the said grooves into the path of the descending former and the box which is carried down thereby. They are deflected outward into the grooves by the former and box, but as soon as the top edges of the side-flanges of the box pass below the engaging shoulders of the catches the lower ends of the catches spring inward sufficiently to enable the said shoulders to engage with the said top edges, so as to prevent the box from rising with the former 2. The mode of operation thus far referred to, and that of the corner-stay mechanism, are as heretofore.

In accordance with one part of the present invention the actuating devices of the crimpers are constructed, combined, and timed to operate to cause the crimpers to act against the upstanding flanges of the just-formed and stayed box immediately following the withdrawal of the former 2 from inside the same.

The drawings show four crimpers, namely, two side-crimpers 8, 8, and two end-crimpers 9, 9. In the operation of the machine, the said crimpers are moved inward radially toward the center of the space containing the box which is to be crimped so as by this inward movement to perform the crimping operation, after which they are moved outward radially to their original positions. The means of actuating the crimpers, and the construction of these latter, are described hereinafter.

The manner and means of supporting the empty box in position for the crimping operation may vary in practice. In the present instance, the box a' to be crimped is supported for the said operation by means of a previously formed and crimped box a^2, Figs. 2 and 3, which is detained temporarily in position to afford such support, in this instance through being supported by a preceding box a^3, that is sustained, as in Fig. 3, by means of spring-strips 10, 10, that are attached by their upper ends to the side-stands 4, 4, these strips being bent so that their lower ends project inward sufficiently to engage with the opposite sides of boxes passing down between them. Following the crimping action upon box a' and the withdrawal of the crimpers, the follower in its next descent pushes down the three boxes a', a^2, a^3, expelling the box a^3 from the grasp of the holding-springs 10, 10, moving down box a^2 into such grasp, and placing another newly-formed box in the place that is occupied by box a' in Figs. 1 and 3.

In order to keep the flanges of box a' pressed inward so that the descending former and box shall act squarely against the top edges of said flanges, presser-springs 11, 11, Fig. 3, are secured to the side-stands 4, 4, by the bolts 7, 7, as shown in Fig. 3, in position to enable their inwardly bent lower ends to bear against the said flanges and hold them inward. Thereby telescoping and nesting of the succeeding box within the box a' is avoided and proper feeding of the stack a', a^2, a^3, downward is insured.

As in the Letters Patent aforesaid the feet 12, 12, Figs. 1 and 4, of the carriers 13, 13, of the side-crimpers 8, 8, mounted in guideways in blocks 12^a, 12^a, upon supporting rails 18, 18, are connected by pitmen 14, 14, to crank-pins 15, 15, upon crank-disks 16, 16, to which at the proper times a movement of oscillation is given for the purpose of pushing the said side-crimpers inward to perform the crimping of the side-flanges of the box and then retract them into their outward, idle position. The oscillating crank-disks constitute, essentially, actuating rockers for the side-crimpers. When

rocked in one direction, they actuate the side-crimpers to cause the working strokes of the latter; when rocked in the opposite direction, they actuate the side-crimpers to cause the withdrawing strokes thereof.

Referring now to that part of the invention which relates to the improved means for actuating the said side-crimpers: As shown in Figs. 2, 4 and 5, the crank-disks 16, 16, are fixed upon the upper ends of upright rockshafts 17, 17, carrying at their lower ends, below the side-plates 18, 18, in which the said rockshafts 17, 17, are journaled, collars 19, 19, furnished with outwardly-projecting pins 20, 20, Figs. 1, 2, 3 and 4, with which are engaged contracting spiral springs 21, 21, shown in dotted lines in Fig. 1. By the action of the said springs, the parts are held normally with the side-crimpers 8, 8, in outwardly-retracted positions. The side-crimpers are actuated to produce the working, *i. e.*, inward, strokes thereof by means of certain elements of the stay-applying mechanism; thus, the crank-disks 16, 16, are furnished with upwardly-projecting pins 22, 22, and for coöperation with the said pins 22, 22, the cam-slotted plates 23, 23, of the rear sets of corner-staying devices have attached thereto rods 24, 24, carrying adjustable collars 25, 25, arranged to engage with such pins. The illustrated embodiment of the invention is arranged to cause such engagement to take place in the outgoing movement of the slides 23, 23. As in said Letters Patent the slides 23, 23, have formed therein the cam-slots 26, 26, receiving the rolls 27, 27, of the radially-movable presser and cutter members of the rear sets of corner-stay devices. The outgoing movement of the cam-plates 23, 23, at the completion of the corner-staying operations causes the collars 25, 25, to engage the pins 22, 22, and turn the crank-disks 16, 16, so as to occasion inward movement of the side-crimpers and the crimping of the side-flanges of the box. As the slotted cam-plates are moved inward to produce the corner-staying operations in connection with the box next-formed, the springs 21, 21, turn the crank-disks 16, 16, reversely so as to withdraw the side-crimpers outwardly. The collars 25, 25, are made adjustable along the carrying-rods 24, 24, therefor, so that through engaging with the pins 22, 22, earlier or later in the outgoing movements of the cam-plates 23, 23, they may produce inward movements of the side-crimpers of the required extent. In the present instance, the collars 25, 25, are split collars or blocks which are clamped upon the rods 24, 24, by means of thumb-screws 28, 28. By actuating the side-crimpers through simple connections with the slotted cam-plates of the corner-staying mechanisms at one end of the machine, I am enabled to dispense with the employment of a separate organized train of actuating mechanism on the order of that shown and described in the former Letters Patent.

Referring now to the end-crimpers 9, 9, and the means for actuating the same: These are shown separately in Figs. 6, 7, 8 and 9. A supporting block 29^a, Figs. 7 and 8, in connection with the upright carrier 29 of an end-crimper is mounted to slide in a direction lengthwise of the machine upon a guide-bar 30 supported from one of the corner-blocks 5 at the corresponding end of the machine. The inward or working stroke of the end-crimper is derived from the reciprocating cross-head 31 at such end of the machine through the employment of what for the purposes of this specification may be termed a rocker, which is actuated by the said cross-head in the outgoing movement of the latter. This rocker consists in the present instance of a lever 33 which is pivoted upon a pin 33^b projecting from an upstanding arm 34 in connection with the said guide-bar 30, the lower arm of the lever 33 being engaged with the block 29^a of the end-crimper carrier by means of a pin 29^b on said lower arm working in a vertical groove 29^c, Fig. 8, in the said block, as indicated in Figs. 7 and 8. In the said outgoing movement of the cross-head, a hook 32, Figs. 1 and 6, carried by the cross-head engages with a pin 33^a projecting from the upper arm of such lever, and rocks the latter so as to produce movement of the end-crimper inward. The outward or retracting movement of an end-crimper after the crimping operation is caused by means of a contracting spiral spring 35 which is engaged with a pin 36 carried by the end-crimper carrier 29 and with a pin 38 carried by the outer end of guide-bar 30.

This organization provides simply and conveniently for the required actuation of the respective end-crimpers.

The extent of the working stroke of either end-crimper may be adjusted by longitudinal adjustment of the hook 32, such longitudinal adjustment being provided for by means of the slot 32^a, Figs. 1 and 6, in the shank of said hook, such slot receiving the stem of the clamping screw 39 which coöperates with the nut 39^a, Fig. 6, in clamping said hook 2 at the under side of the cross-head 31. For the connection of an end-crimper with an adjacent corner block 5 a small block 141 is mounted upon a stud 142 projecting downward from the said corner-block. The small block 141 is fixed upon the stud by means of a clamping-screw 41^a. The block is held from turning around the stud by means of a pin 42^a projecting from the stud and entering a notch in the upper portion of the block. It is grooved horizontally at one side thereof, as shown best in Fig. 6, to

receive a horizontally extending flat arm 43 projecting outward from the guide-bar 30. A cap-plate 44 held to block 141 by bolts 44^a, 44^a, keeps the arm 43 in the groove of the block 141 and a thumb-screw 45 applied to block 141 engages with the said arm 43 to hold the supporting guide-bar 30, and the end-crimper which is mounted thereon, in the required position of adjustment transversely of the machine.

The lower portions of the crimpers 8, 9, engage with the box-flanges in the crimping operation to effect the crimping. The inner faces of the crimpers above the said acting portions incline upwardly and outwardly, as shown in Figs. 2, 4, 6, 8 and 10. These inclined faces insure against breakage in case one of the crimpers should stick in an inward position. In such event the former 2 in descending will act upon the inclined face of the misplaced crimper in a manner causing it to move outward, out of the way of the former.

The crimpers are mounted upon their carriers 13, 29, with capacity for vertical adjustment to place them in proper relationship with the box-flanges upon which they are to operate, and also are detachably combined with said carriers. The vertical adjustment is provided for by connecting each crimper 8 and 9 with a carrier-piece 13^d or 29^d which is fixed to the carrier 13 or 29 by means of a bolt and wing-nut 13^e or 29^e, with a longitudinal slot 13^f, Fig. 5, or 29^f, Fig. 7, in the upstanding portion of the carrier receiving the stem of the bolt and permitting the carrier-piece to be shifted up or down as desired. The detachability is provided for by furnishing the upstanding portion of each carrier with a projection or block 40, Figs. 6 to 10, adapted to serve as a rest or support for a crimper. To provide against displacement of the crimper, its base is furnished with a projecting dowel or pin 41, shown best in Fig. 10, and the projection or block 40 is formed with a hole 42 into which said dowel or pin is entered in mounting the crimper upon the stand. Accidental rise of the crimper is provided against by combining with the projection or block 40 a ball 43, Fig. 11, backed up by a spring 44 and screw 45. The screw, spring, and ball occupy a transverse hole in the projection or block, and the ball projects partly into the vertical hole 42 so as to bear against dowel or pin 41 when the latter is inserted into hole 42. The pressure of the ball against the dowel or pin tends to hold the crimper against accidental rise from its seat, but does not interfere with application or removal of the crimper.

Preferably the crimpers 8 and 9 are of a width suitable for the smallest size of box intended to be made upon the machine, and for use in crimping larger boxes I provide extension crimper-blades b, b', etc. These blades are of varied length, as indicated most clearly by Figs. 10 and 12 to 14. A blade of the length required for any given size of box is applied to a crimper stand by being inserted between projection or block 40 and the base of the crimper, as shown in the drawings. Each crimper-blade has a hole b^4 through which dowel or pin 41 of the crimper passes into the hole 42 in the projection or block to keep the blade from displacement.

The feature of mounting the end-crimpers upon supports attached to corner-blocks of the corner-stay mechanism has the advantage that it simplifies the adjustments that are necessary in adapting the machine for different sizes of boxes. That is to say, adjustment of the corner-blocks to suit boxes of different lengths from end to end effects at the same time the shift of the end-crimpers that is required to accommodate the said difference in length. Differences in the width of the boxes entailing adjustment of the corner-blocks of one side of the machine toward or from those of the other side thereof is compensated for by transverse shift of the end-crimpers relative to the particular corner-blocks by which they are supported, in order to position the end-crimpers equidistant between the two sides of a box. This compensating adjustment is accomplished by manipulation of the thumb-screws 45, 45, and shift of the arms 43, 43, endwise relative to the blocks 41, 41. As in the former Letters Patent, the mounting of the side-crimpers upon supports in connection with the transversely-adjustable side-rails of the machine renders independent adjustment of the side-crimpers unnecessary when the machine parts are adjusted for a different width of box.

Crimper devices of the construction described with reference to Figs. 4 to 14 may be combined in some cases in practice with other constructions and arrangements of operating connections. In some cases, crimper-devices constructed and actuated as herein shown and described may be employed for crimping the boxes at a level below that at which the corner-stay operations are performed and the last-formed box is stripped from the former.

What is claimed as the invention is,—

1. In a paper-box machine, the combination with box-forming devices and corner-stay applying mechanism, of means providing for supporting the last-formed box at the level at which the corner-staying is effected after withdrawal of the former therefrom, and crimper devices which perform the crimping operation upon the sides of the empty box while the same remains at such level.

2. In a paper-box machine, the combination with box-forming devices, and yielding holding means for the formed boxes through

which the formed boxes are pushed by the action of the former in forming subsequent boxes, of crimpers, and means for actuating them against the flanges of an empty box sustained by said holding means.

3. In a paper-box machine, the combination with box-forming devices, and crimper mechanism, of means for supporting an empty formed box while being crimped, separate from the box-forming devices and crimper mechanism.

4. In a paper-box machine, the combination with box-forming devices, and corner-stay applying mechanism, of crimpers actuated by said corner-stay mechanism to act upon the box-flanges.

5. In a paper-box machine, the combination with box-forming devices, and corner-stay applying mechanism including an actuating reciprocating cross-head, of crimpers for opposite sides of a box and means for actuating said crimpers from said cross-head.

6. In a paper-box machine, the combination with box-forming devices, corner-stay applying mechanism including opposite actuating reciprocating cross-heads, box-flange crimpers, and means for actuating the respective crimpers from the respective cross-heads.

7. In a paper-box machine, the combination with box-forming devices, corner-stay applying mechanism including opposite actuating reciprocating cross-heads, box-flange crimpers for the ends and sides of the box, means for actuating opposite crimpers from the respective cross-heads, and means for actuating the remaining crimpers from one of the said cross-heads.

8. In a paper-box machine, the combination with box-forming devices, and corner-stay applying mechanism including a reciprocating cross-head serving to actuate such mechanism, of crimpers at opposite sides of a box, rockers connected with said crimpers, and means actuated by said cross-head for actuating said rockers.

9. In a paper-box machine, the combination with box-forming devices, and corner-stay applying devices, of crimpers at opposite sides of a box, rockers connected with said crimpers, and a common actuator for said corner-stay devices and crimpers.

10. In a paper-box machine, the combination with box-forming devices, corner-stay applying devices for adjacent corners of a box, and a crimper which acts upon the box-flange between such corners, of a common actuator for the said corner-stay devices and crimpers.

11. In a paper-box machine, the combination with box-forming devices, and corner-stay applying mechanism including an actuating reciprocating cross-head, of crimpers at opposite sides of a box, rockers connected with said crimpers, and rods actuated by said cross-head and provided with means for actuating said rockers.

12. In a paper-box machine, the combination with box-forming devices, and corner-stay applying mechanism including an actuating reciprocating cross-head, of crimpers at opposite sides of a box, rockers connected with said crimpers, and rods actuated by said cross-head and provided with rocker-actuators adjustable in the direction of the length of the rods.

13. In a paper-box machine, the combination with a box-flange crimper mounted for reciprocating movement, of an operating rocker provided with a crank which is connected to said crimper, a spring acting to hold the crimper normally in retracted position, and an adjustable reciprocating actuator by which said rocker is rocked to operate the crimper against a box-flange.

14. In a paper-box machine, the combination with box-forming devices, and corner-stay mechanism including a cam-slotted reciprocating plate, of a box-flange crimper, a rocker connected with said crimper and spring-actuated to keep the crimper normally in retracted position, and a rocker-actuator connected with said cam-slotted plate.

15. In a paper-box machine, the combination with box-forming devices, and corner-stay mechanism including a cam-slotted reciprocating plate, of a box-flange crimper, a rocker connected with said crimper and spring-actuated to keep the crimper normally in retracted position, a rod connected with said cam-slotted plate, and a rocker-actuator adjustable lengthwise of said rod.

16. In a paper-box machine, the combination with a box-flange crimper mounted for reciprocating movement, of an operating lever which is connected to said crimper, a spring acting to hold the crimper normally in retracted position, and a reciprocating actuator by which said lever is rocked to operate the crimper against a box-flange.

17. In a paper-box machine, the combination with box-forming devices, and corner-stay devices including corner-blocks adjustable to suit different sizes of boxes, of a box-flange crimper mounted upon one of said corner-blocks, and means for actuating the same.

18. In a paper-box machine, in combination, box-flange crimpers, radially-movable carriers for said crimpers, means for adjusting the crimpers vertically on said carriers, and actuating means for the carriers.

19. In a paper-box machine, the combination with box-forming devices including a reciprocating former, of box-flange crimping devices including a crimper having an upwardly and outwardly inclined surface against which the descending former may

act to effect outward shift of the crimper if inwardly misplaced.

20. In a paper-box machine, in combination, a radially-movable crimper-carrier, a crimper-rest thereon having a socket, and a crimper adapted to be detachably applied to said rest and having a dowel-pin which enters the said socket.

21. In a paper-box machine, in combination, a radially-movable crimper-carrier, a crimper-rest thereon having a socket, and a crimper adapted to be detachably applied to said rest and having a dowel-pin which enters the said socket, with a detent for removably holding said dowel-pin in said socket.

22. In a paper-box machine, in combination, a radially-movable crimper-carrier, a crimper, and a crimper-extension adapted to be applied detachably to said carrier.

23. In a paper-box machine, in combination, a radially-movable crimper-carrier, a crimper-rest, a crimper mounted upon said rest, and a crimper-extension adapted to be mounted detachably between the crimper and the crimper-rest.

24. In a paper-box machine, in combination, a radially-movable crimper-carrier, a crimper-rest thereon having a socket, a crimper adapted to be applied detachably to said rest and having a dowel-pin which enters the said socket, and a crimper-extension adapted to be placed between the crimper and the crimper-rest and having a hole in which the dowel-pin engages to hold the crimper-extension in place.

25. In a paper-box machine, in combination, box-forming devices including a reciprocating former and a guideway within which the boxes are stacked as formed, one succeeding another, and through which the stack is moved by the action of the former, and presser-members by which the flanges of the last preceding box are pressed inward to prevent the newly-formed box from telescoping and nesting therein.

26. In a paper-box machine, in combination, box-forming devices including a reciprocating former and a guideway within which the boxes are stacked as formed, one succeeding another, detents for holding the last-formed box from accompanying the former in its withdrawing movement, and pressers by which the flanges of such box are pressed inward to prevent the next box from telescoping and nesting therein.

In testimony whereof I affix my signature.

CHARLES C. DAVIS.