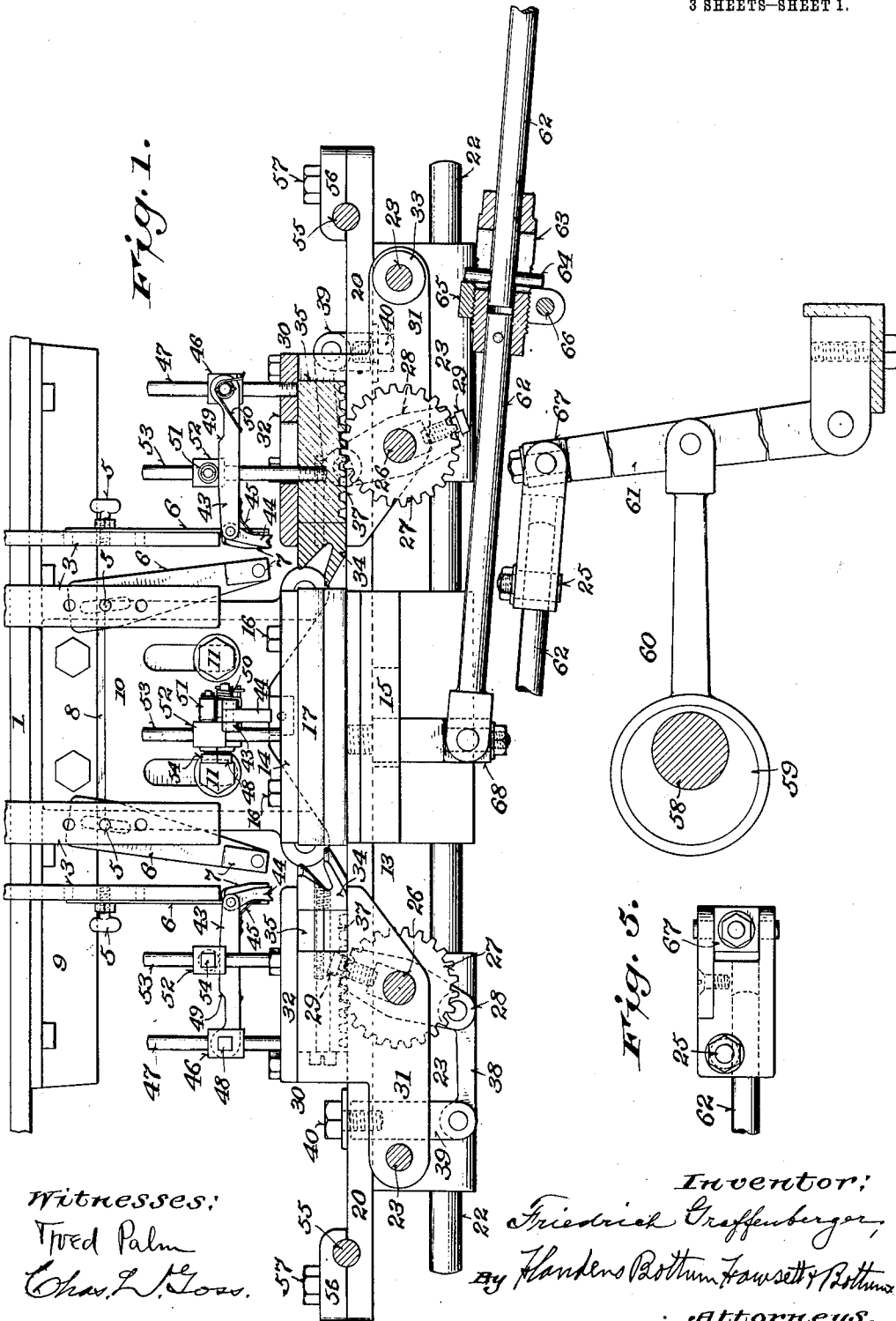


F. GRAFFENBERGER.  
PAPER BOX MACHINE.  
APPLICATION FILED DEC. 21, 1912.

1,058,858.

Patented Apr. 15, 1913.

3 SHEETS—SHEET 1.



Witnesses:  
Fred Palm  
Chas. L. Hoss.

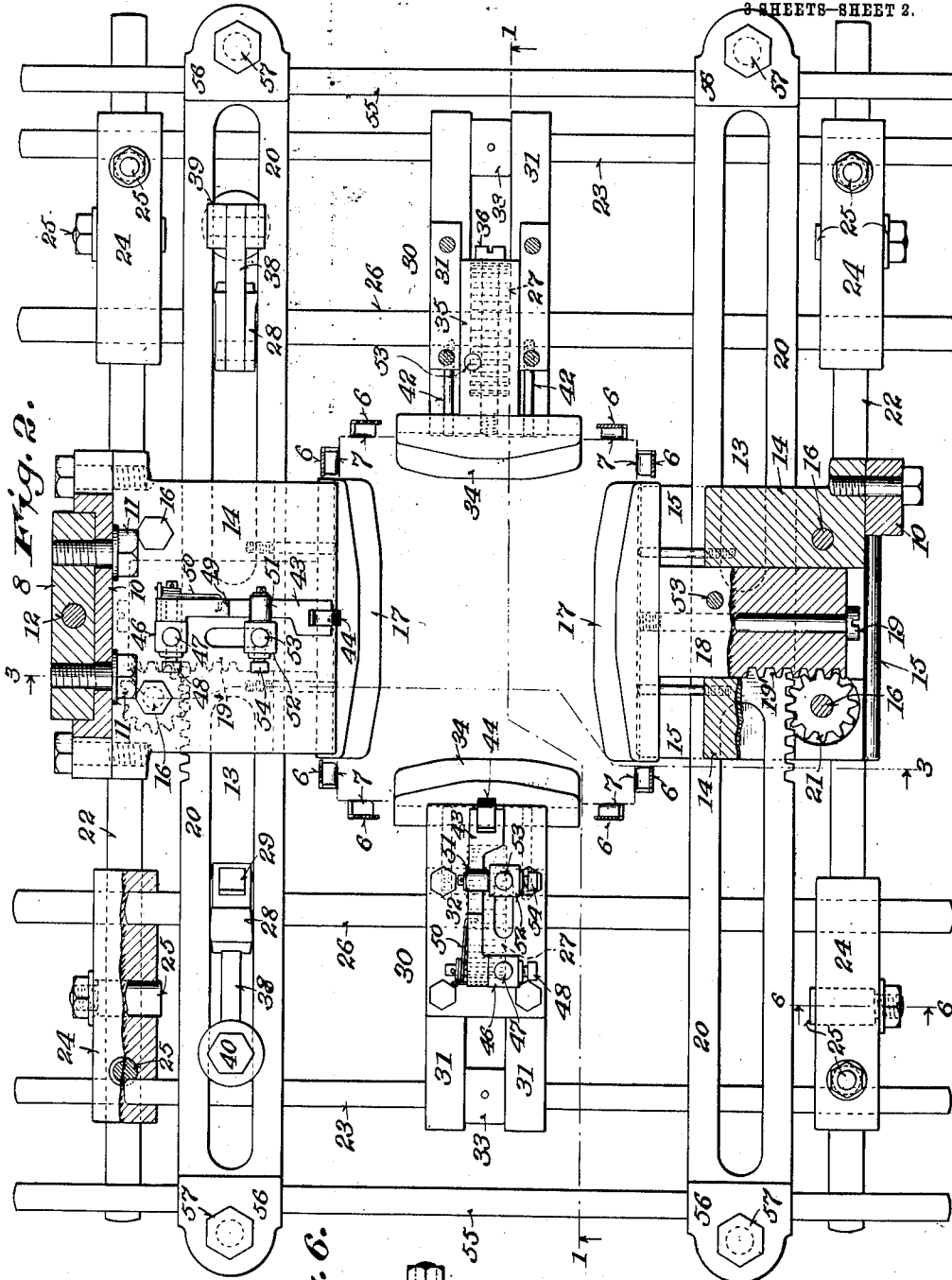
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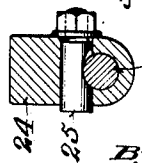


Witnesses:

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Fig. 6.



Inventor:

Friedrich Graffenberger,

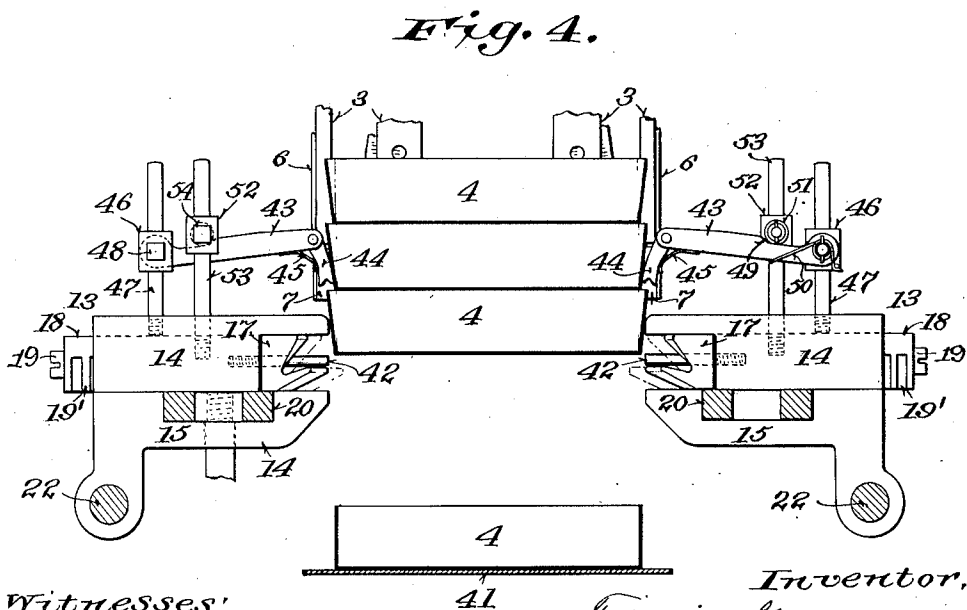
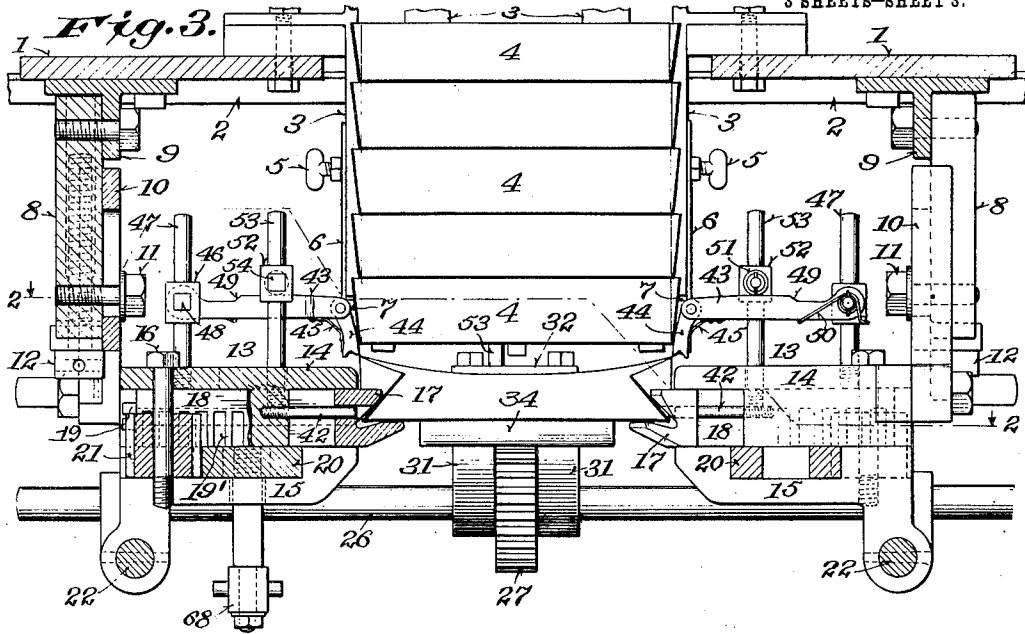
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3 SHEETS-SHEET 3.



Witnesses:  
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# UNITED STATES PATENT OFFICE.

FRIEDRICH GRAFFENBERGER, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO A. GEO. SCHULZ CO., OF MILWAUKEE, WISCONSIN, A CORPORATION OF WISCONSIN.

## PAPER-BOX MACHINE.

1,058,858.

Specification of Letters Patent.

Patented Apr. 15, 1913.

Application filed December 21, 1912. Serial No. 737,943.

*To all whom it may concern:*

Be it known that I, FRIEDRICH GRAFFENBERGER, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Paper-Box Machines, of which the following is a specification, reference being had to the accompanying drawing, forming a part thereof.

This invention relates to that class of paper box machines known as staying machines, by which the cut and scored box blanks are bent into the desired form and stays are applied to the corners.

The main objects of the invention are to bend the box sides inwardly at an acute angle to the bottom between the corners after the corner stays have been applied and the paste or glue has set sufficiently to hold them securely in place, thereby effectively avoiding the tendency of the sides to bulge outwardly when the boxes are finished, and generally to improve the construction and operation of devices for this purpose.

It consists in the construction, arrangement and combination of parts as hereinafter particularly described and defined in the appended claims.

In the accompanying drawing like characters designate the same parts in the several figures.

Figure 1 is a vertical longitudinal section on the line 1—1, Fig. 2, of a portion of the bed of a quadruple staying machine to which the present invention is applied; Fig. 2 is a plan view of the folding, squaring or truing mechanism, the bed of the staying machine being removed and certain parts broken away and shown in section; Fig. 3 is a vertical cross section on the line 3—3, Fig. 2, showing the jaws closed or advanced in the operation of bending the flanges of a box inward at an acute angle to the bottom; Fig. 4 is a similar section showing the jaws open or retracted; Fig. 5 is a plan view of one of the universal joints in the actuating connections of the folding, squaring or truing jaws; and Fig. 6 is a section on the line 6—6, Fig. 2, showing one of the keys for adjustably connecting the frame or supporting members of the end jaws.

Referring to Figs. 1 and 3, the bed or framework of the staying machine to which the mechanism constituting the present in-

vention is applied, comprises two plates 1, which are adjustable for boxes of different sizes toward and from each other on cross rails 2 of the frame. Upon these plates 1 are adjustably mounted vertical guide bars 3, between which the boxes 4 are delivered from the vertically reciprocating form or plunger (not shown) of the staying machine. To the outer sides of the guide bars 3 are adjustably fastened by thumb screws 5, slotted springs 6, which are provided at their lower ends and on their inner sides with blocks 7 adapted by frictional engagement with the sides or flanges of a box adjacent to its corners to support a stack of boxes, as shown in Fig. 3, above and in position to be fed to the folding jaws, as hereinafter explained.

The folding jaws for overcoming the tendency of the box flanges or sides to bulge outwardly, and the mechanism for feeding the boxes one at a time from the bottom of the stack to the jaws, constituting with the yielding supports above mentioned for sustaining a stack of boxes above the jaws, the present invention, are suspended from the bed of the staying machine by hangers 8, bolted at their upper ends to the flanges of T-bars 9, which are bolted to the under sides of the plates 1. Vertically adjustable slides 10 are fastened to the hangers 8 by bolts 11 passing through slots in the slides and threaded in the hangers. The slides are adjusted vertically with ease and accuracy when the bolts 11 are loosened, by screws 12 threaded in the hangers 8 and having bearings on the slides next to the heads at the lower ends of the screws. To the lower ends of the slides 10 are bolted inwardly projecting and horizontally disposed jaws supporting and guiding heads 13, composed of two sections 14 and 15, fastened together by bolts 16. These heads are adjustable toward and from each other with the bed plates 1, from which they are suspended, and are also adjustable vertically with the slides 10 relative to the plates 1. A pair of opposing side folding, squaring or truing jaws 17 are provided on their outer sides with shanks 18, secured thereto by bolts 19 and fitted to slide in recesses formed in the upper sections 14 of said heads. The shanks 18 are formed as shown in Figs. 2 and 3, with gear teeth or racks 19'. Rack bars 20 are fitted to slide lengthwise in recesses formed in the lower

sections 15 of the heads transversely to the shanks 18 and racks 19 of the jaws. A pinion 21, journaled on one of the connecting bolts 16 of each head between the upper and lower sections 14 and 15, meshes with the associated racks 19 and 20. Longitudinal rods 22 are secured in sleeves depending from the lower members 15 of the side jaw supporting heads parallel with the rack bars 20. Cross rods 23 are adjustably connected by sleeves or coupling members 24 with the rods 22 on opposite sides of the heads 13. The rods 22 and 23 are secured in their adjusted positions in the sleeves or coupling members 24 by keys 25, one of which is shown in detail in Fig. 6. Rocker shafts 26 are journaled in the sleeves or coupling members 24 parallel with the rods 23, and are each provided with a pinion or gear 27 and with an arm 28 adjustably fastened thereon by a set screw 29, one of these arms extending upwardly and the other downwardly, as shown in Fig. 1.

On the rods 23 and shafts 26 are mounted midway between and parallel with the rack bars 20, a pair of jaw supporting and guiding heads 30. These heads 30 are each preferably composed of two spaced parallel sections 31, between which the pinion 27 of the associated rocker shaft 26 is confined, and of a cap plate 32 bolted to the sections 31. The heads 30 are held centrally on the rods 23 by collars 33, pinned or otherwise fastened to said rods between the sections 31. Opposing end folding, squaring or truing jaws 34 are provided on their outer sides with shanks 35, which are secured thereto by bolts 36 and are fitted to slide between the sections 31 of the heads 30. The shanks 35 are formed or provided on the under side with racks 37 meshing with the pinions 27. The jaws 34 are movable toward and from each other at right angles to the movement of the side jaws 17. Both the side and end jaws 17 and 34 are formed on their inner sides with outwardly and downwardly converging folding or working faces, as shown in Figs. 1, 3 and 4, and these faces are beveled, rounded or inclined outwardly toward their ends, as shown in Fig. 2, so as to gradually bend the box flanges with which they engage inwardly from the corners of the box toward the middle of the flanges. The lower members of the several jaws project inwardly beyond the upper members so as to catch and support a box thereon, as it is fed thereto from the bottom of the stack above them into position to be operated upon when the jaws are partially closed or advanced, as indicated by dotted lines in Fig. 4. The arms 28 of the rocker shafts 26 are connected by links 38 with pivot blocks 39, which are adjustably fastened by screws and washers 40 in longitudinal slots of one of the rack bars 20.

To disengage the boxes from the jaws when they are withdrawn and to permit the boxes to drop between the jaws upon a conveyor belt 41, with which the staying machine is usually provided, as shown in Fig. 4, strippers, consisting of pins 42, passing loosely through openings in the jaws and secured at their outer ends in or to the jaw supporting heads, are provided, these pins or strippers projecting inwardly when the jaws are withdrawn slightly beyond or flush with the lower members of the jaws, as shown in Fig. 4.

To feed the boxes one at a time to the jaws from the bottom of the stack above them, a vertically swinging arm 43 is mounted on each of the jaw supporting heads, and to the inner end of this arm is pivoted a downwardly projecting and outwardly yielding dog 44, which is pressed toward the center of the machine by a light spring 45. At its outer end each arm 43 is pivoted to a block 46, adjustable vertically on a post 47, extending upwardly from the associated jaw supporting head. The pivot block 46 is fastened in adjusted position on the post 47 by a set screw 48. The upper side of the arm 43 which is formed with an incline or cam face 49, is held by a spring 50 in engagement with a roller 51, which is journaled on a block 52, adjustable vertically on a post 53, secured to and extending upwardly from the shank of the associated jaw through a slot in the top of the jaw supporting and guiding block, as shown in Figs. 1 and 2. The roller block 52 is fastened in adjusted position on the post 53 by a set screw 54, and the roller 51 is movable with the jaw back and forth along the arm 43. The rack bars 20 are connected with each other adjacent to their ends by cross rods 55, which are rigidly and adjustably fastened to the rack bars by clamps 56 and screws 57, so that while said bars will work in unison they may be readily adjusted with the heads 13 toward and from each other for boxes of different widths.

The jaws and the devices for feeding boxes thereto are operated from a single shaft 58, as shown in Fig. 1. This shaft, which may be a part of the staying machine, is provided with an eccentric 59 connected by a strap and rod 60 with a rocker arm 61. The arm 61 is connected by a rod composed of two sections 62 with one of the rack bars 20. The rod sections 62 are connected with each other by an adjustable slip coupling consisting of an externally threaded and longitudinally slotted sleeve 63, in which the proximate ends of the rod sections are fitted. One of these sections is pinned or otherwise rigidly fastened in said sleeve, while the other has a sliding fit therein, and is provided with a cross pin 64, working in the slot of the sleeve. A split collar 65, threaded

and adjustably clamped on the sleeve 63 by a screw 66, limits the independent movement of the pin 64 in the slot of said sleeve toward the driven section 62 of the rod, and affords means for varying the advance or closing movement of the jaws for boxes of different sizes or kinds. The free movement of the pin 64 in the sleeve 63 away from the driven section of the rod, is limited by the engagement of the pin with the end of the slot in the sleeve opposite the collar 65. The outer or opposite ends of the rod sections 62 are connected with the rocker arm 61 and with one of the rack bars 20 by universal joints 67 and 68, to permit of the lateral adjustment of the rack bars without causing their driving connections to bind. To compensate for any horizontal or vertical adjustment of the rack bars 20 by which the distance of the point of attachment of the driving connection to one of said bars from the rocker arm 61 is changed, one of the rod sections 62 is adjustable lengthwise in one member of the joint 67 and is secured in adjusted position therein by a key 25 like that shown in Fig. 6, or by other suitable means.

In the operation of the machine, the boxes after they are formed and corner stays are applied thereto, are delivered one after another from the vertically reciprocating form or plunger of the staying machine between the vertical guide bars 3, and are stacked one upon another, as shown in Figs. 3 and 4, the stack being supported by engagement of the outwardly yielding blocks 7 with the sides and ends of the lowermost box. With each advance movement of the rocker arm 61 to the left, as shown in Fig. 1, the pin 64 by engagement with the collar 65, moves the rack bars 20 simultaneously in the same direction. This movement of the rack bars 20 through the pinions 21 working with them and with the racks 19, simultaneously advances the jaws 17, and through the connections of one of the rack bars 20 with the arms 28, rocks the shafts 26 and turning the pinions 27 in opposite directions in engagement with the racks 37, simultaneously advances the jaws 34. The rollers 51 advancing with the jaws, engage with the inclines or cam faces 49 on the arms 43, as the lower members of the jaws are brought into position, as indicated by dotted lines in Fig. 4, underneath the lowermost box, which in the meantime has been thrust downward by the action of the form or plunger of the staying machine on the stack into the position shown in Fig. 4, and swinging said arms with the dogs 44 downward, cause the dogs by engagement with the flanges of said lowermost box midway between its corners to thrust it downward off from the blocks 7 upon the lower members of the jaws. The continued advance movement of the jaws causes them to bend both

the side and end flanges of the box inward at an acute angle to the bottom, as shown in Fig. 3. This action of the jaws imparts a set to the box flanges which when they are released by the withdrawal of the jaws, causes them to assume and retain their proper rectilinear form at right angles throughout their length to the bottom of the box, counteracting the tendency which they have to bulge outwardly when they leave the form or plunger of the staying machine. As the rocker arm 61, shown in Fig. 1, swings to the right, the jaws 17 and 34 by the reversal of the movement of the rack bars 20, are withdrawn outwardly to their initial positions, and the box resting on their lower members, is released and allowed to drop upon the conveyer belt 41 below, as shown in Fig. 4, the strippers 42 holding the box during the withdrawal of the jaws in its central position until it is cleared by the lower members of the jaws. In the meantime, the stack of boxes is thrust downward an interval by the action of the form or plunger of the staying machine, the lowermost box assuming the position illustrated in Fig. 4, and the operations above enumerated are repeated.

For operating on boxes of different depths or having flanges of different widths, the folding jaws 17 and 34 with their supporting and guiding heads 13 and 30, are adjusted bodily by slackening the screws 11 and moving the slides 10 up or down as required on the hangers 8. The arms 43 and dogs 44 are also adjusted vertically so that the dogs will properly engage with the flanges of the lowermost box of the stack by loosening the set screws 48 and 54 and setting the blocks 46 and 52 correspondingly up or down on the posts 47 and 53.

For boxes of different sizes and shapes, the jaw supporting and guiding heads 13 and 30 are adjusted horizontally toward or from each other. The heads 13 with the jaws 17 are adjusted toward or from each other by slackening the nuts on the keys 25 which fasten the cross rods 23 in the coupling sleeves 24, slackening the set screws 29 in the arms 28 and then shifting the side rods 22 with the racks 20, slides 10, hangers 8 and plates 1, toward or from each other as required. The heads 30 with the jaws 34 are adjusted toward or from each other by slackening the nuts on the keys 25, which fasten the coupling sleeves 24 to the rods 22, slackening the nuts 40 on the pivot blocks 39 and shifting the coupling sleeves 24 on the rods 22 toward or from each other, as required.

The advance movement of the jaws to bend the box flanges inward more or less may be varied by the adjustment of the collar 65 on the coupling sleeve 63. Shifting the collar 65 toward the pin 64 increases the

inward movement of the jaws and causes them to bend the box flanges inward at a sharper angle to the bottom.

- The term "box" as herein used is intended to include box covers as well as box bodies, and the term "bottom" is intended to include the top of the cover as well as the bottom of a box body, covers and box bodies being essentially the same in construction.
- Various changes in details of construction and arrangement of parts of the mechanism herein shown and described may be made without departure from the principle and scope of the invention as defined in the following claims.

I claim:

1. In a paper box machine the combination of folding jaws movable toward and from each other and having outwardly converging folding faces, the lower members of the jaws extending inwardly beyond the upper members and adapted to support a box when the jaws are partially closed, means for moving said jaws simultaneously toward and from each other, means for supporting a stack of boxes above said jaws and means for feeding boxes from the bottom of the stack between the jaws upon the lower box supporting members thereof.

2. In a paper box machine the combination of folding jaws movable toward and from each other and having outwardly converging folding faces, means for moving said jaws simultaneously toward and from each other, means for supporting a stack of boxes above said jaws, and means for feeding boxes one at a time from the bottom of the stack between the jaws.

3. In a paper box machine the combination of folding jaws movable toward and from each other and having outwardly converging folding faces, means for moving said jaws simultaneously toward and from each other, means for supporting a stack of boxes above the jaws, means for feeding boxes one at a time from the bottom of the stack between the jaws, and strippers adapted to prevent the boxes from sticking to the jaws when they are withdrawn outwardly.

4. In a paper box machine the combination of folding jaws having outwardly converging folding faces, means for moving said jaws simultaneously toward and from each other, and outwardly yielding external supports adapted to sustain a stack of boxes above the jaws by engagement with the lower box in the stack, and means for feeding boxes one at a time from the bottom of the stack between the jaws.

5. In a paper box machine the combination of folding jaws movable toward and from each other and adapted to press the sides of a box inwardly between the corners, means for moving said jaws toward and from each other, means for supporting

a stack of boxes above the jaws, and outwardly yielding and vertically reciprocating dogs adapted to engage with the bottom box in the stack and to carry it between the jaws into position to be operated upon thereby.

6. In a paper box machine the combination of folding jaws movable toward and from each other and having lower members extending inwardly beyond their upper members and serving, when the jaws are partially closed, to support a box in position to be operated upon thereby, means for moving said jaws toward and from each other, means for supporting a stack of boxes above said jaws, and dogs movable up and down and operated by said jaws to feed boxes one at a time from the bottom of the stack between the jaws as they are moved toward each other.

7. In a paper box machine the combination of horizontally reciprocating jaws having outwardly converging folding faces and lower members extending inwardly beyond the upper members into position to support a box when the jaws are partially closed, means for moving said jaws simultaneously toward and from each other, and outwardly yielding, vertically and laterally adjustable supports adapted to sustain a stack of boxes above the jaws by frictional engagement with the bottom box in the stack adjacent to its corners.

8. In a paper box machine the combination of two pairs of opposing horizontally reciprocating jaws having outwardly converging working faces, the jaws of each pair being movable transversely to the jaws of the other pair, means for simultaneously moving said jaws toward and from each other, means for supporting a stack of boxes above said jaws, and means for feeding boxes one at a time from the bottom of the stack between the jaws.

9. In a paper box machine the combination of opposing jaws movable toward and from each other and having outwardly and downwardly converging working faces adapted to engage with the bottom and opposite flanges of a box and to bend the flanges inwardly at acute angles to the bottom between the corners of the box, and means for simultaneously moving said jaws toward and from each other.

10. In a paper box machine the combination of opposing jaws movable toward and from each other and having outwardly and downwardly converging working faces outwardly inclined toward the ends and adapted when moved toward each other to engage with the bottom and opposite flanges of a box and to bend the flanges gradually inward at angles to the bottom of increasing acuteness from the corners toward the middle of the box, and means for simultaneously

moving said jaws toward and from each other.

11. In a paper box machine the combination of opposing folding jaws movable toward and from each other and provided transversely to their working faces with gear teeth, jaw supporting and guiding heads, racks guided in said heads transversely to said jaws, pinions journaled in said heads in mesh with said racks and the gear teeth of the jaws, and means for simultaneously reciprocating said racks lengthwise in said heads.

12. In a paper box machine the combination of opposing folding jaws, movable toward and from each other and provided transversely to their working faces with gear teeth, jaw supporting and guiding heads, racks guided in said heads transversely to the jaws, pinions journaled in the heads and meshing with said racks and the gear teeth of the jaws, means for supporting a stack of boxes above the jaws, vertically movable arms pivoted at their outer ends on said heads, outwardly yielding dogs pivoted to the inner ends of said arms, springs tending to elevate said arms, and projections on the jaws adapted by engagement with said arms as the jaws are advanced to depress the dogs and cause them to feed boxes one at a time from the bottom of the stack between the jaws.

13. In a paper box machine the combination of opposing folding jaws movable toward and from each other, stationary supports in which said jaws are guided, means for moving said jaws simultaneously toward and from each other, means for supporting a stack of boxes above the jaws, vertically swinging arms pivoted at their outer ends on the jaw supports, springs tending to elevate said arms, outwardly yielding dogs pivoted to the inner ends of said arms, and parts on the jaws engaging said arms and adapted as the jaws are advanced to depress the dogs and cause them to feed boxes one at a time from the bottom of the stack between the jaws.

14. In a paper box machine the combination of a pair of opposing folding jaws movable toward and from each other and provided transversely to their working faces with racks, jaw supporting and guiding heads, rack bars guided in said heads transversely to said jaws, pinions journaled in said heads and meshing with said racks and rack bars, a second pair of folding jaws movable toward and from each other transversely to the first pair and provided transversely to their working faces with racks, supporting and guiding heads for the second pair of jaws, rocker shafts journaled in the second pair of heads transversely to said rack bars and provided with pinions engaging the racks of the second pair of

jaws and with arms each linked to one of the rack bars, and means for reciprocating the rack bars.

15. In a paper box machine the combination of a pair of opposing folding jaws movable toward and from each other and provided transversely to their working faces with racks, jaw supporting and guiding heads, rocker shafts provided with oppositely arranged arms and having pinions meshing with said racks, and a reciprocating bar arranged transversely to said shafts and connected with said arms by links.

16. In a paper box machine the combination of opposing folding jaws movable toward and from each other, stationary jaw supporting and guiding heads, means for supporting a stack of boxes above said jaws, vertically swinging arms pivotally mounted on said heads and provided at their inner ends with outwardly yielding dogs and parts on the jaws arranged to depress said arms and dogs as the jaws advance and to feed boxes one at a time from the bottom of the stack between the jaws.

17. In a paper box machine the combination of opposing folding jaws provided transversely to their working faces with racks, vertically adjustable jaw supporting and guiding heads adjustable horizontally toward and from each other, rack bars guided in said heads transversely to the racks on the jaws, pinions journaled in said heads and meshing with said racks and rack bars, means for reciprocating said rack bars in said heads, means for supporting a stack of boxes above the jaws and means for feeding boxes one at a time from the bottom of the stack between the jaws.

18. In a paper box machine the combination of a pair of jaws provided transversely to their working faces with racks, jaw supporting and guiding heads adjustable horizontally toward and from each other, rack bars guided in said heads transversely to the racks on the jaws, pinions journaled in the heads and meshing with the racks on the jaws and with the rack bars, supporting rods carried by said heads parallel with said rack bars, transverse rods adjustably secured on said supporting rods by coupling members, rocker shafts journaled in said coupling members parallel with said transverse rods and provided with pinions and with oppositely arranged arms, a second pair of jaw supporting and guiding heads mounted on said transverse rods and rocker shafts and adjustable therewith toward and from each other, a second pair of jaws guided in said heads and provided with racks meshing with the pinions on the rocker shafts, links adjustably connecting the arms on the rocker shafts with one of the rack bars, and means for reciprocating the rack bars lengthwise in the first pair of heads.



19. In a paper box machine the combination of two pairs of jaw supporting and guiding heads adjustable toward and from each other, opposing jaws carried by each pair of heads and movable relative thereto toward and from each other, the jaws of each pair being arranged and movable transversely to the jaws of the other pair, a reciprocating bar carried by one of said heads and having connections with the several jaws adapted to simultaneously advance and withdraw the same, an eccentric for actuating said bar, and a connecting rod having universal joint connections with said bar and eccentric and composed of sections which are connected with each other by an adjustable slip coupling permitting a limited movement of one relative to the other.

20. In a paper box machine the combina-

tion of two pairs of jaw supporting and guiding heads adjustable horizontally toward and from each other, opposing jaws carried by each pair of heads and movable relative thereto toward and from each other, the jaws of each pair being arranged and movable transversely to the jaws of the other pair, means for simultaneously advancing and withdrawing the several jaws, means for supporting a stack of boxes above said jaws, and means for feeding the boxes one at a time from the bottom of the stack between the jaws.

In witness whereof I hereto affix my signature in presence of two witnesses.

FRIEDRICH GRAFFENBERGER.

Witnesses:

CHAS. L. GOSS,

CHAS. EGGERSE.