Jan. 10, 1933. C. D. KNOWLTON 1,893,554

BOX MAKING MACHINE

Filed Aug. 20, 1928 4 Sheets-Sheet 1

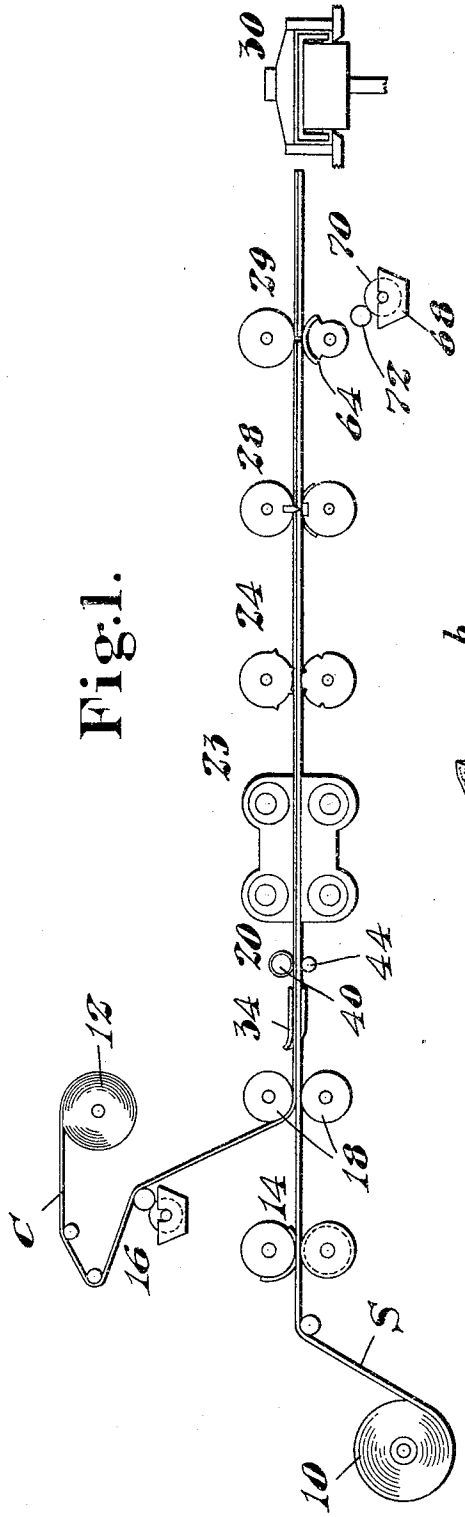


Fig. 1.

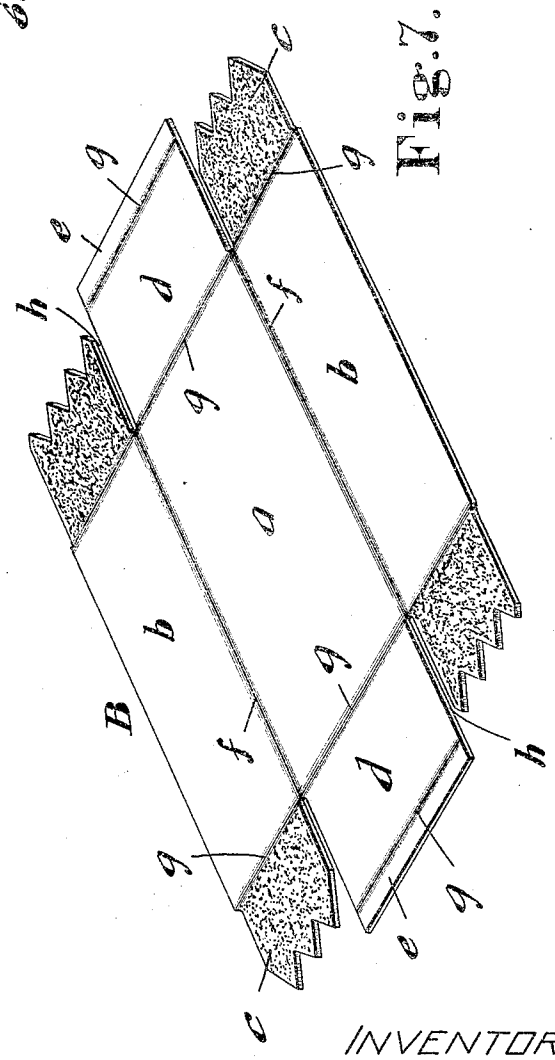


Fig. 7.

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BOX MAKING MACHINE

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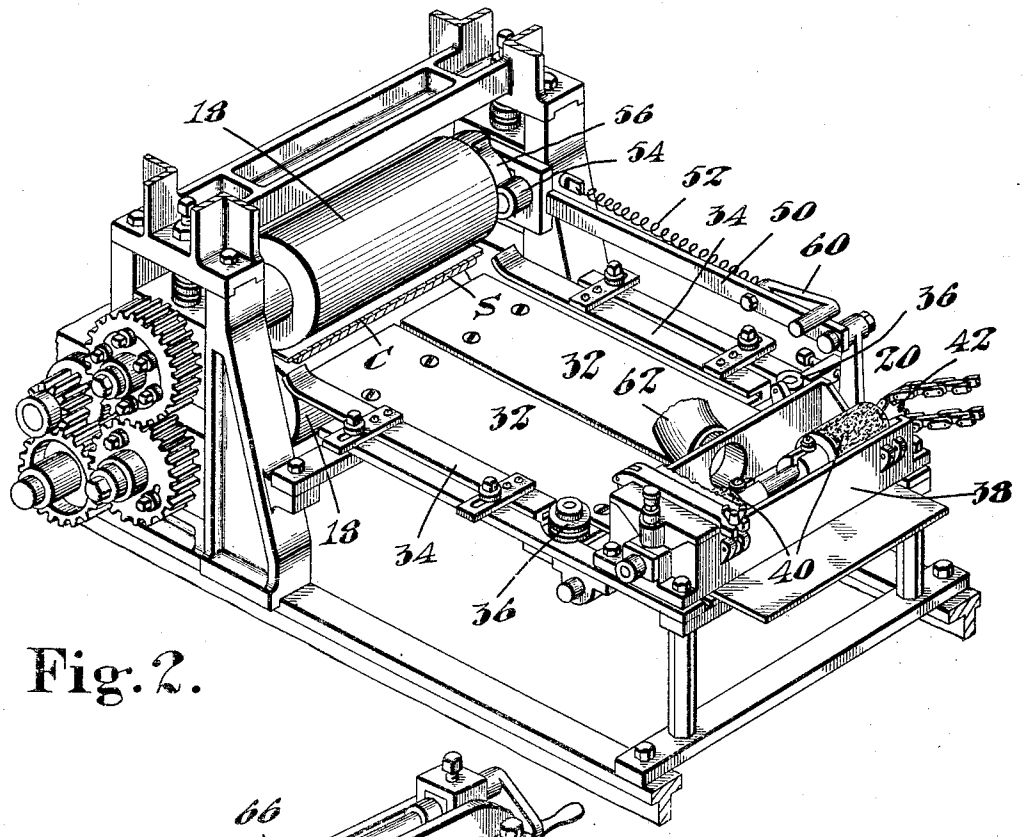


Fig. 2.

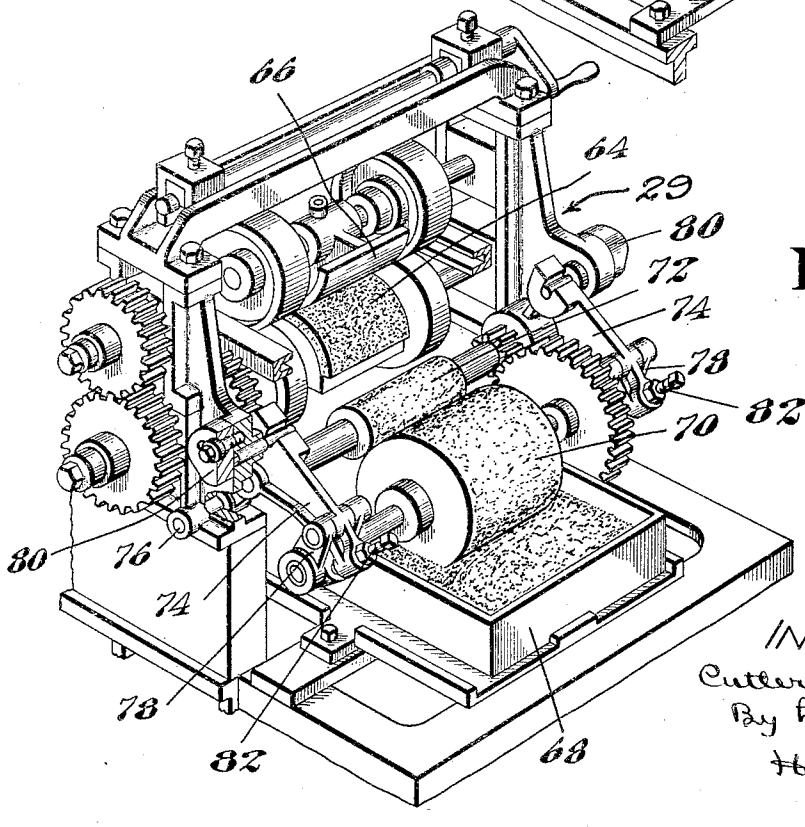


Fig. 3.

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BOX MAKING MACHINE

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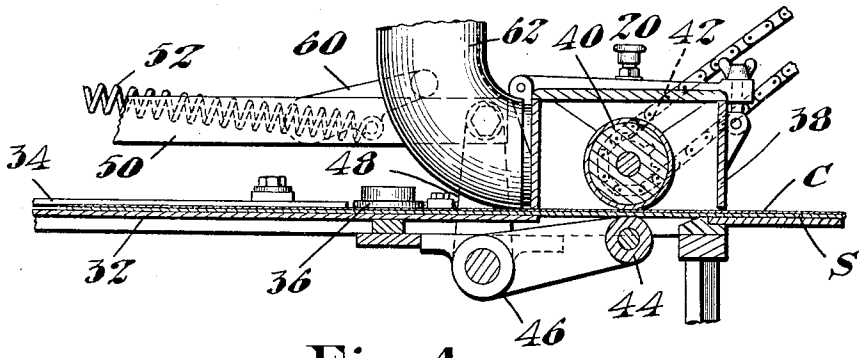
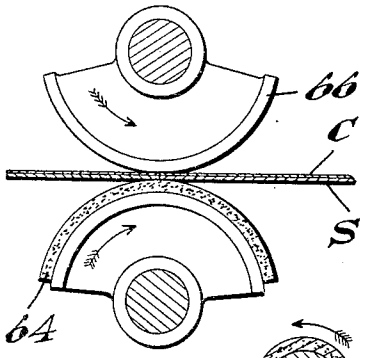


Fig. 4.



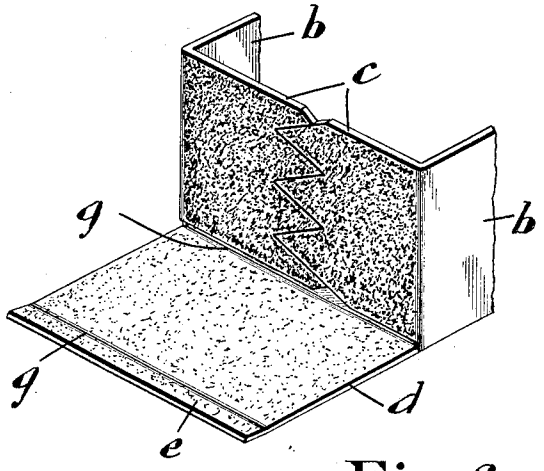


Fig. 6.

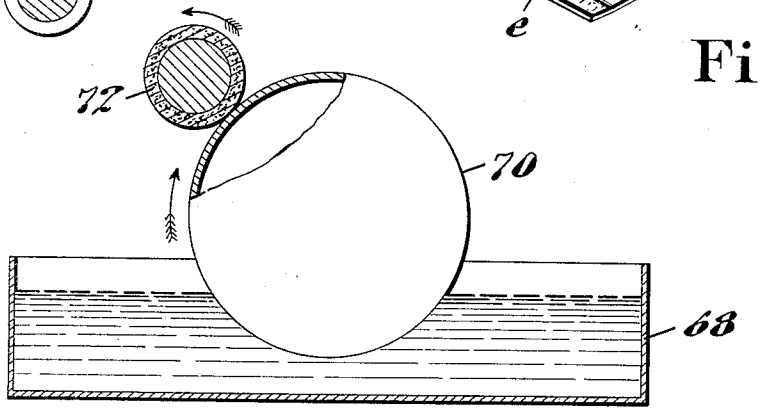


Fig. 5.

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BOX MAKING MACHINE

Filed Aug. 20, 1928 4 Sheets-Sheet 4

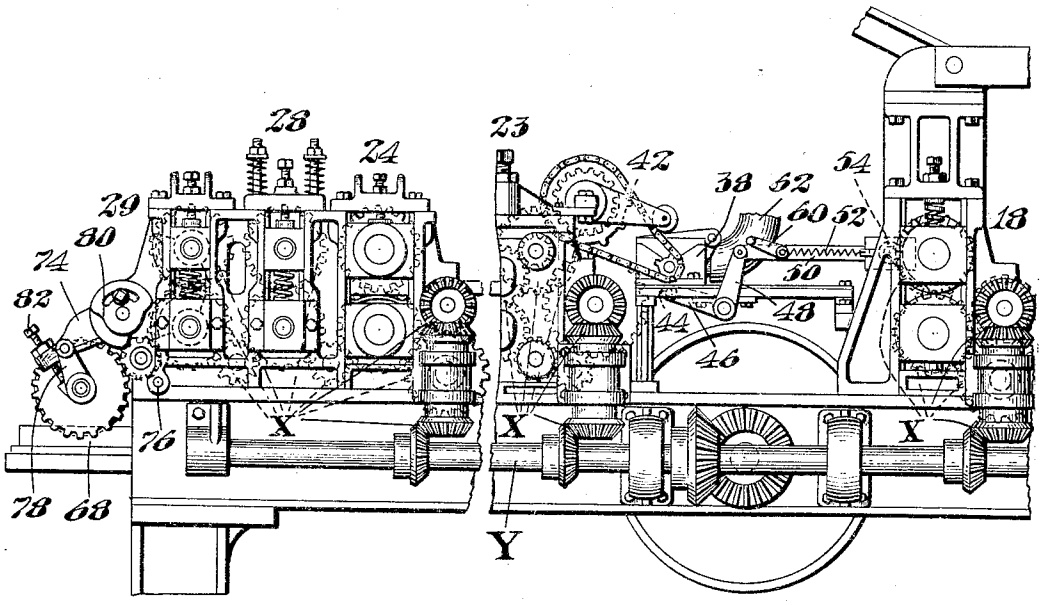


Fig.8.

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UNITED STATES PATENT OFFICE

CUTLER D. KNOWLTON, OF BEVERLY, MASSACHUSETTS, ASSIGNOR TO HOAGUE-SPRAGUE CORPORATION, OF LYNN, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS

BOX-MAKING MACHINE

Application filed August 20, 1928. Serial No. 300,821.

The present invention relates to machines for making boxes, and particularly boxes of the set-up type, in which portions of an end or side formation are secured by an adhesive to hold the elements in the desired relation.

In the application filed in my name in the United States Patent Office on February 25, 1926, bearing the Serial No. 90,569, is disclosed such a box as this machine is adapted to produce. This has an end formation which includes inner, meeting corner-laps projecting from side wings, and an end wing at each extremity secured by glue or other adhesive to the outside of said corner-laps. To produce an attractive appearance, the shell of the box, usually of pasteboard, is covered upon at least the exterior with paper, the surface of which is often highly glazed, or in other ways so finished that it is moisture-resisting. This cover-material comes upon the outside of the corner-laps to which the end wings are glued, and it is found difficult to obtain a dependable connection to the finished surface. It is an object of my invention to effect a secure union of the box-elements, regardless of the condition of the surface. This object I attain by any improved machine, in which I combine with means for advancing the box-material, means for treating surfaces thereof to be joined, as by roughing one of them which is resistive to moisture, usually the cover-paper, so that adhesion with the co-operating surface will be facilitated, together with means for applying a coating of adhesive to one of the surfaces to be joined, and means for pressing the treated surfaces together, there acting upon the material, between the treating and coating means, means for preparing said material for box-formation. In this way, the adhesive-repelling finish is destroyed, and firm adhesion assured. To effect the desired treatment of the surface, I have shown herein an abrading mechanism, including a rotatable member having abrading sections spaced from each other, and means, as a bed-roll, for creating contact between the box-material and abrading member which are normally separated. Since it is desired that only that portion of the finished surface which comes beneath the end wings be roughened or treated, the abrading mechanism is arranged to contact only upon such limited areas, it acting intermittently. A customary step in the preparation of box-material for folding is to crease it at the fold-lines. Creasing produces projections upon the outer or cover-paper side, and if these creases were to receive the action of the abrading member, as at the line of connection between the corner-laps and side wings, the fold-lines would be weakened by the grinding away of the projections, and the cover-paper might be torn from the shell-material. I therefore arrange the creasing mechanism of my improved machine to act after the abrading mechanism, the mechanism which applies the glue to the inside of the end wings operating after the creasing mechanism. The creases are consequently not disturbed by the adhesion-facilitating treatment, and the gluing is accomplished just before the setting-up operation. I have employed operating connections for the bed-roll, whereby it may be thrown out of action if it is desired that the abrasion shall not take place, and the illustrated abrading mechanism is so arranged that the ground-off material is effectively removed from the machine, as by a suction-conduit.

A preferred embodiment of my improved machine is illustrated in the accompanying drawings, in which

Fig. 1 shows diagrammatically its successive mechanisms;

Fig. 2 is a perspective view of the assembling and abrading mechanisms;

Fig. 3 is a similar view of the end-wing-gluing mechanism;

Fig. 4, a vertical longitudinal section through the abrading mechanism;

Fig. 5, an enlarged sectional diagrammatic representation of the gluing mechanism;

Fig. 6, a perspective view of one extremity of a box produced by the machine, this box being partially formed;

Fig. 7, a similar view of the blank from which the box is produced; while

Fig. 8 is a broken side elevation particularly illustrating the connecting gear.

Considering, in Fig. 7, a blank B formed by the illustrated machine, this has a body-portion *a*, side wings *b*, *b*, from the opposite ends of each of which project corner-laps *c*, *c*, and end wings *d*, *d* having extensions *e*, *e*. Longitudinal creases *f*, *f* define the meeting lines between the body and side wings, and transverse creases *g*, *g* similarly separate the body and end wings, the side wings and corner-laps, and the end wings from their extensions, longitudinal slots *h*, *h* lying between the end wings and corner-laps. The upper side of this blank is at the outside of the box when this is set up, and receives a layer of cover-paper. An inspection of the partly formed box-end of Fig. 6 will make it clear that the outsides of the corner-laps which are adhesively connected to the adjacent end wings will have this paper upon them.

Referring to the diagrammatic showing of the machine in Fig. 1, we have a web of shell-material S, which may be of pasteboard, delivered from a reel 10, and a web of glazed paper or other finished cover-material C, taken from a reel 12. The shell-material is operated upon by a mechanism 14 to produce the slots *h*, *h*, while the cover-material receives upon its face next to the shell-material a coating of adhesive from gluing mechanism 16. Then the two webs are drawn between a pair of assembling rolls, 18, by which they are advanced and pressed together. Abrading mechanism 20 acts upon the paper over the corner-laps, as will later be described in detail, and the longitudinal creases *f*, *f* and transverse creases *g*, *g* are made by the mechanisms 23 and 24, respectively. After this, the finished blank is severed from the web through the agency of a mechanism 28; and to the faces of the end wings which are to co-operate with the abraded corner-laps glue is applied by a mechanism 29. The blank finally enters a setting-up mechanism 30, in which it is formed, and the glued surfaces of the end wings are forced against the roughened corner-laps and the end-wing extensions against the inside of said corner-laps to secure the end formations. Throughout the machine, guide and feed-rolls are introduced wherever necessary. Except as hereinafter described, the various mechanisms may be of any desired form, their particular structure playing no part in this invention. The general organization may be similar to that illustrated in United States Letters Patent No. 1,402,259, Smith, January 3, 1922.

As shown in Fig. 2, the composite web, with the paper layer C up, is advanced from the assembling rolls over a table 32. The overhanging edges of said paper may be turned under the edges of the shell-material by stationary folders 34 situated at opposite sides of the table, and then may be pressed into contact with said shell by idle rolls 36, between grooved portions of which the edges of the web travel.

At the opposite extremity of the table 32 from the assembling mechanism is the abrading mechanism 20. This includes a casing 38 having top and side walls, but open at the bottom, save as it is closed by the moving web. Rotatable in the ends of the casing is a roll 40 of abrading material or having an abrasive coating, this roll being in two sections, which correspond in their location transversely of the web to the position of the corner-laps therein. The roll 40 is shown as constantly driven by gearing 42. Situated across the open bottom of the casing, with its axis parallel to that of the roll 40, is an idle supporting or bed-roll 44 journaled in the spaced arms of a lever 46. An upstanding arm 48 of this lever has pivotally connected to it a link 50, and extending from the link to some relatively fixed point, as a frame-standard in which the assembling rolls are mounted, is a tension-spring 52. The spring draws a roll 54, turning upon the link, against a cam 56 upon the shaft of the upper assembling roll. The design of the cam is such that the bed-roll 44 is held depressed by the link, except when the corner-laps are passing beneath the abrading sections of the roll 40. Then it is elevated to force the cover-paper upon the corner-laps against the operating surfaces, which roughen it sufficiently to remove the finish and open the fibers for penetration by a liquid-adhesive. Since it may be desired at times to discontinue the action of the abrading mechanism, I have connected the spring 52 to the link 50 through a controlling lever 60 fulcrumed upon the link. When the lever is at its extreme position to the right, as viewed in Figs. 2 and 4, the spring is under tension to draw the roll 54 against the cam. When, however, the lever is swung in the opposite direction, the spring is relaxed, and the bed-roll allowed to fall, permitting the web to move free of the abrading roll. The roll 54 is now out of contact with the cam, so that it is unaffected in all angular positions thereof. The dust produced by the grinding operation may be removed through a suction-conduit 62 opening at the rear of the casing 38.

As the abrading mechanism has acted, the creasing of the material may be performed without danger of injuring the crease-projections by the grinding action of the roll 40. The mechanism 23 effects the longitudinal creasing, and the mechanism 24 the transverse, producing the fold-lines *f* and *g*, respectively. By the mechanism 28, the completed blank B is severed from the web, S, C, and enters the gluing mechanism 29.

A desirable gluing organization is illustrated in Fig. 3. The web here passes between a lower applying segment 64 and an upper pressure-segment 66, driven by gear-

ing X from a counter-shaft Y (Fig. 8) in timed relation with the travel of the web and the other operating mechanisms. In this connection, it should be borne in mind that the timing between the abrading mechanism 20, the gluing mechanism 29 and the material-travel is such that the mechanism 20 roughens only the corner-laps, while the mechanism 29 coats only the end wings and their extensions. Below the applying segment is a glue-receptacle 68, in which dips a rotatable supplying roll 70 delivering to an intermediate rotatable roll 72. From the latter, the applying member takes the glue. The rolls 70 and 72 turn together upon levers 74, 74 fulcrumed at 76 upon the machine-frame. The roll 72 is journaled above the fulcrum, while the roll 70 is hung upon the forward extremities of the levers by links 78. The relation of the intermediate roll 72 to the applying segment 64, to provide for the desired contact between them, may be adjusted by swinging the levers by means of eccentric devices 80, 80. Screws 82, 82, threaded through projections from the ends of the levers 74 and contacting with bosses upon the links 78, determine the relation of the supplying roll to the intermediate roll independently of the adjusment of the latter by the devices 80.

Finally, the blank is delivered to the setting-up mechanism 30, and is thereby folded with the side and end wings *b* and *d* perpendicular to the body-portion *a*, the end wings overlying the corner-laps *c*. The end-wing-extensions *e* are turned in against the corner-laps. The mechanism 30 presses the glued inner faces of the end wings firmly against the treated surfaces of the cover-paper upon the corner-laps, and, since the adhesive can readily penetrate the areas, a very secure union is attained. The end-wing-extensions are secured at the same time. This completes the formation of the box.

Having described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a box-making machine, means for advancing box-material having surfaces to be adhesively joined, one of said surfaces having a moisture-resisting covering, means for treating the moisture-resisting surface to facilitate adhesion, means for applying an adhesive coating to one of the surfaces to be joined, means situated between said treating and applying means for preparing the material for box-formation, and means for pressing the treated and coated surfaces together.

2. In a box-making machine, means for advancing box-material having surfaces to be adhesively joined, one of said surfaces having a moisture-resisting covering, means for roughening the moisture-resisting surface, means for applying an adhesive coating to the surface to which the roughened surface is to be joined, means situated between the roughening and applying means for preparing the material for box-formation, and means for pressing the roughened and coated surfaces together.

3. In a box-making machine, means for assembling and advancing shell- and cover-material, means for treating the cover-layer of the assembled material to facilitate its adhesion to a contacting surface, means for applying an adhesive coating to one of the surfaces which are to contact, and means for forming the box and pressing the treated and coated surfaces together.

4. In a box-making machine, means for assembling and advancing shell- and cover-material, means for grinding away the surface of the cover-material over an area which is to contact with another surface, means for applying an adhesive coating to one of the surfaces, and means for forming the box and pressing the ground and coated surfaces together.

5. In a box-making machine, feeding mechanism for shell-material and cover-paper, abrading mechanism arranged to act only upon limited portions of the cover-paper, creasing mechanism acting upon the combined material after its abrasion, gluing mechanism operating upon the creased material over areas which are to contact with the abraded portions of the cover-paper, and setting-up mechanism to which the abraded, glued and creased material is delivered.

6. In a machine for making boxes having contacting corner-laps and end wings, mechanism arranged to assemble and advance shell-material and cover-material, means for producing the end-wing and corner-lap formation in the assembled material, abrading mechanism acting upon the outer surfaces of the corner-laps, and gluing mechanism acting upon the surfaces of the end-wings which are to contact with the abraded surfaces.

7. In a machine for making boxes having contacting corner-laps and end wings, mechanism arranged to assemble and advance shell-material and cover-material, means for producing the end-wing and corner-lap formation in the assembled material, abrading mechanism acting upon surfaces of the end-wing and corner-lap formation, creasing mechanism operating upon the material after its abrasion, gluing mechanism acting upon the surfaces which are to contact with the abraded surfaces, and setting-up mechanism to which the abraded, creased and glued material is delivered.

8. In a machine for making boxes having contacting corner-laps and end wings, mechanism arranged to assemble and advance shell-material and cover-material, means for producing the end-wing and corner-lap formation in the assembled material, abrading

mechanism acting upon the surface of the cover-material over the corner-laps, and gluing mechanism acting upon the surfaces of the end wings which are to be opposite the abraded surface.

9. In a machine for making boxes, a plurality of web-feeding mechanisms, means for combining the webs, a rotatable abrading member, means for intermittently producing contact between the abrading member and one only of the combined webs, an adhesive-applying member, and means for moving the adhesive-applying member into contact with the web in timed relation with the contact of the abrading member and web.

10. In a machine for making boxes having contacting corner-laps and end wings, mechanism for feeding box-material, a rotatable member having abrading sections spaced to correspond to the corner-laps, a bed-roll beneath the abrading member and over which the material is fed out of normal contact with the abrading sections, and means arranged to lift the bed-roll intermittently and produce contact of the material with the abrading member only over the corner-laps.

11. In a machine for making boxes having contacting corner-laps and end wings, web-feeding mechanism, a rotatable member having abrading sections spaced to correspond to the corner-laps, a bed-roll beneath the abrading member and over which the web is fed out of normal contact with the abrading sections, intermittently actuated means arranged to lift the bed-roll and produce contact of the web with the abrading member over the corner-laps only, a rotatable gluing segment arranged for contact with the end wing, and means arranged to rotate the segment in timed relation with the movement of the bed-roll.

12. In a machine for making boxes, mechanism for feeding box-material, a rotatable abrading member, a bed-roll beneath the abrading member over which the material is fed, a lever supporting the roll, a link connected to the lever, means for moving the link, a spring connecting the link and a relatively fixed point, and means arranged to vary the tension of the spring.

13. In a machine for making boxes, mechanism for feeding box-material, a rotatable abrading member, a bed-roll beneath the abrading member over which the web is fed, a lever supporting the roll, connections for moving the supporting lever, a lever fulcrumed upon the connections, and a spring connecting the last-mentioned lever and a relatively fixed point.

14. In a machine for making boxes, web-feeding mechanism, a rotatable abrading member, a bed-roll beneath the abrading member over which the web is fed, a lever supporting the roll, a link connected to the lever, a cam acting upon the link, a lever fulcrumed upon the link, and a spring connected to the last-mentioned lever and arranged to be positioned to produce contact between the link and cam and active co-operation between the bed-roll and abrading member and in another position to permit the bed-roll to retreat from the abrading member and the link to separate from the cam.

In testimony whereof I have signed my name to this specification.

CUTLER D. KNOWLTON.