L. J. NELSON.

BOX ASSEMBLING MACHINE.

APPLICATION FILED JUNE 20, 1917.

1,297,392.

Patented Mar. 18, 1919.

3 SHEETS—SHEET 1.

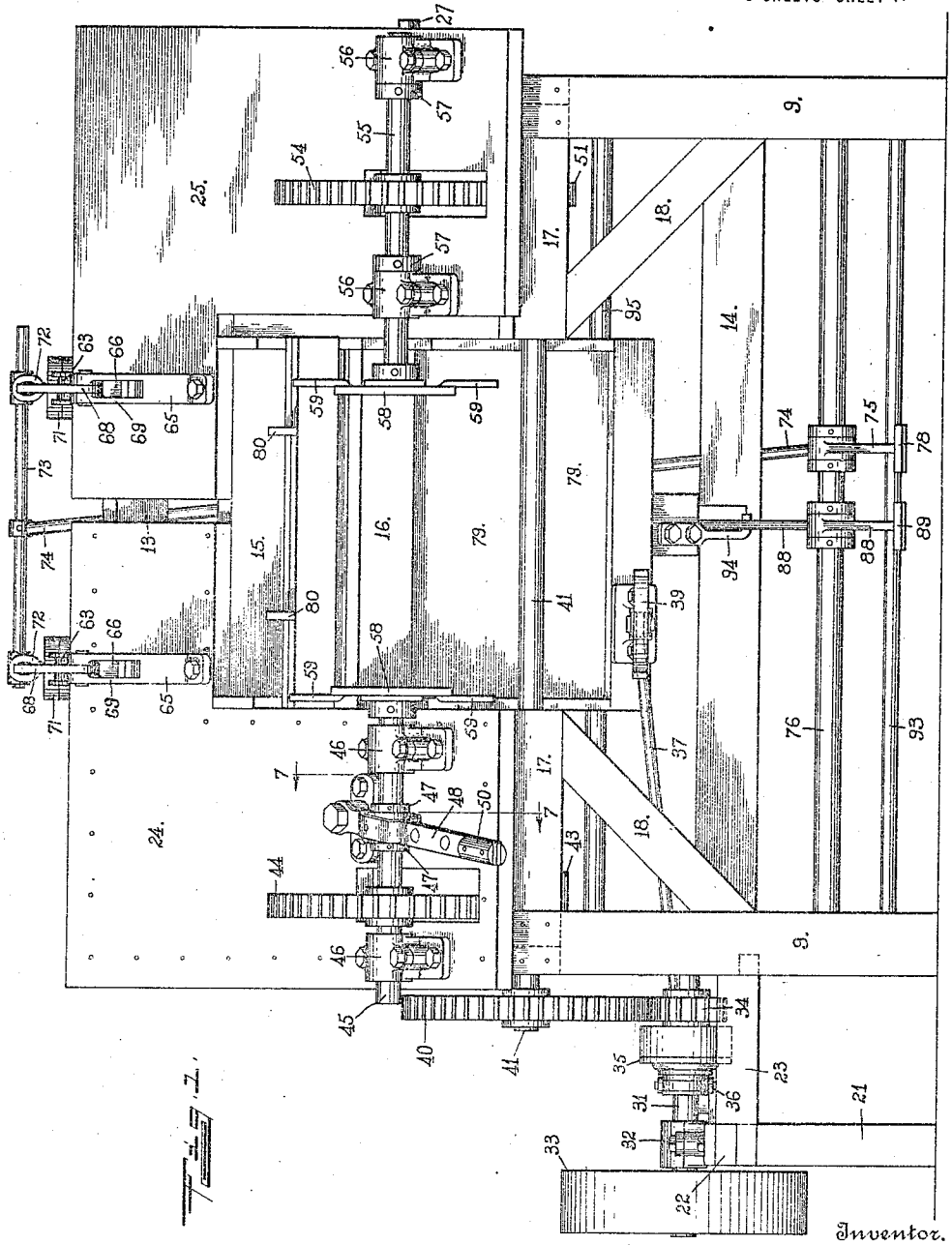


Fig. 1.

Witness:

Inventor.

L. J. Nelson,

By David O. Barnell.

Attorney.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

L. J. NELSON.

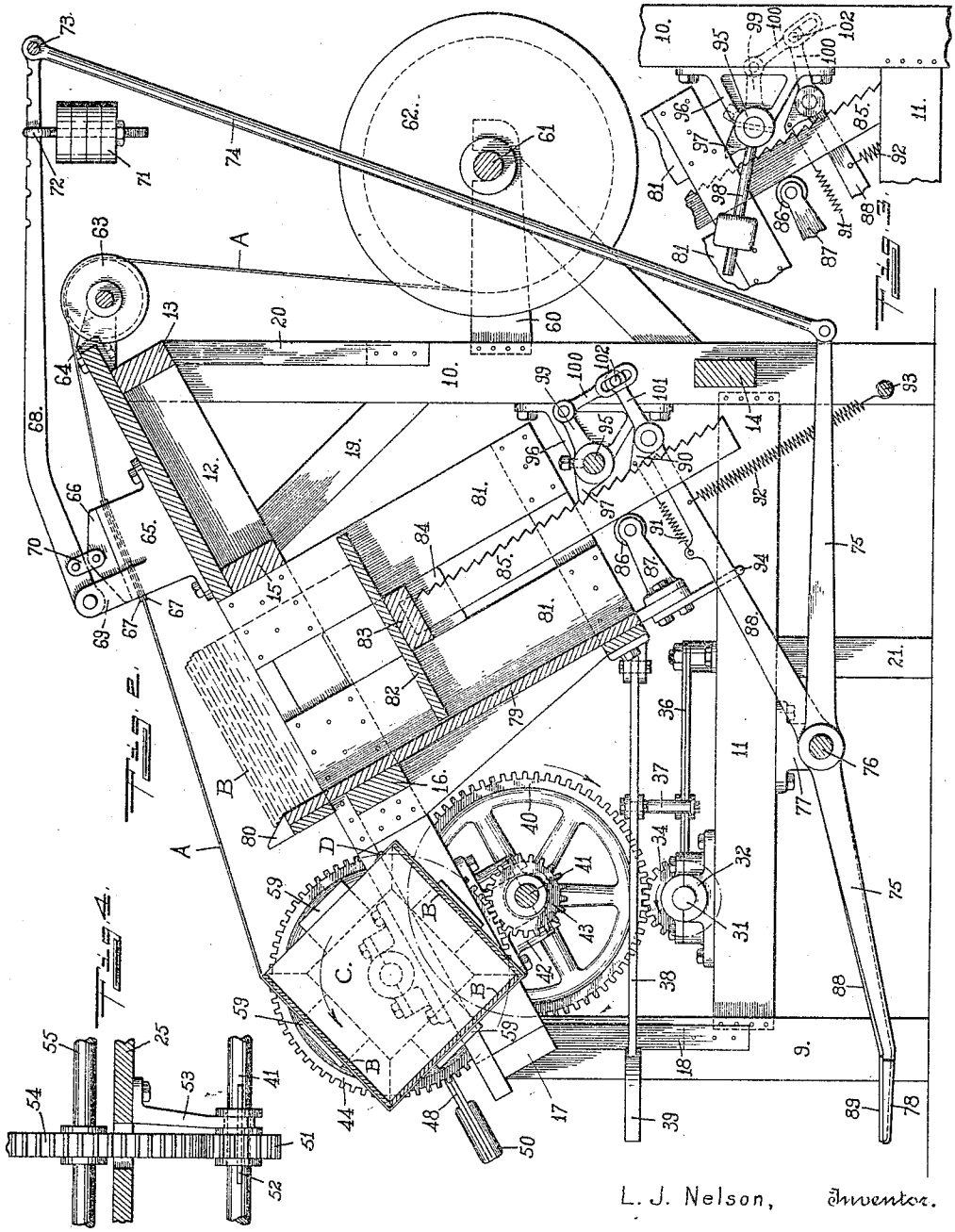
BOX ASSEMBLING MACHINE.

APPLICATION FILED JUNE 20, 1917.

1,297,392.

Patented Mar. 18, 1919.

3 SHEETS—SHEET 2.



L. J. Nelson, Inventor.

Witness:

A. W. Jamieson.

By David O. Parnell,

Attorney.

J. HARRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

L. J. NELSON.

BOX ASSEMBLING MACHINE.

APPLICATION FILED JUNE 20, 1917.

1,297,392.

Patented Mar. 18, 1919.

3 SHEETS—SHEET 3.

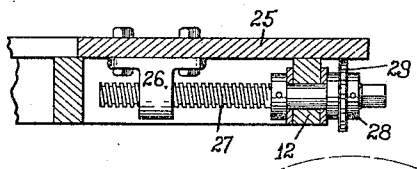


Fig. 6.

Fig. 5.

Fig. 7.

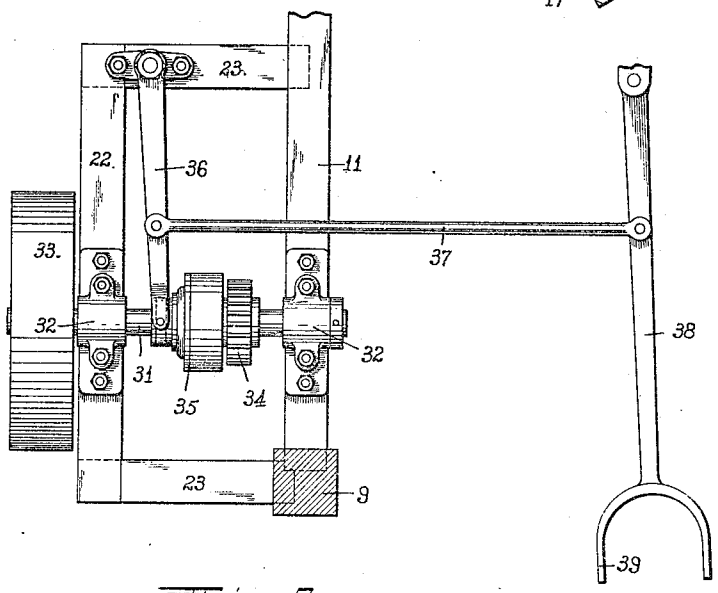


Fig. 8.

L.J.Nelson, Inventor.

Witness:

A. W. Jamieson.

By David O. Barnell,

Attorney.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

LEON J. NELSON, OF OMAHA, NEBRASKA.

BOX-ASSEMBLING MACHINE.

1,297,392. Specification of Letters Patent. Patented Mar. 18, 1919.

Application filed June 20, 1917. Serial No. 175,833.

To all whom it may concern:

Be it known that I, LEON J. NELSON, a citizen of the United States, and a resident of Omaha, in the county of Douglas and State of Nebraska, have invented certain new and useful Improvements in Box-Assembling Machines, of which the following is a specification.

My invention relates to machines for assembling the parts of wooden boxes, and is especially intended for expediting and reducing the cost of construction of boxes having sides of thin material such as wood veneer, and paneled ends consisting of a rectangular frame of relatively heavy pieces and a covering of thinner material such as veneer. It is the object of my invention to provide a relatively simple and inexpensive machine for quickly assembling the sides and ends of such boxes, preparatory to final nailing of the sides to the ends, the sides being held in place temporarily by band-iron straps applied and held under tension, and said straps, by the subsequent nailing, becoming permanent reinforcing members for the box. For attaining the foregoing objects I provide mechanism for holding and rotating the box-ends, for feeding the band-iron or metal straps thereto under tension, for holding the side-pieces of the boxes and feeding the same to a convenient position for the operator to place them between the metal straps and the edges of the box-ends, for varying the tension upon and entirely releasing the metal straps, and for otherwise controlling and adjusting the various operating parts. The mechanism further includes means of adjustment by which the different sizes of boxes, within determined limits, may be accommodated thereby.

Mechanism embodying my invention is illustrated in the accompanying drawings, in which Figure 1 is a front view of the machine, Fig. 2 is a longitudinal vertical section thereof, Fig. 3 is a detail side view of the controlling means for the magazine-follower, Fig. 4 is a detail transverse section showing the drive-gearing for one of the rotary heads, Fig. 5 is a detail side view showing the means for adjusting a portion of the table laterally, Fig. 6 is a detail section on the plane of the line 6—6 of Fig. 5, Fig. 7 is a detail vertical section on the line 7—7 of Fig. 1, and Fig. 8 is a detail plan view of the main clutch and control-lever therefor.

In the illustrated structure there is provided a main frame consisting of front legs 9, rear legs 10, horizontal lower side-pieces 11 between the front and rear legs, diagonal upper side-pieces 12 between the front and rear legs, upper and lower cross-pieces 13 and 14 between the rear legs, intermediate cross-pieces 15 and 16 between the members 12, transverse front-pieces 17 extending in from the upper ends of the front legs 9, diagonal brace-members 18 for said front-pieces 17, and diagonal brace-members 19 and 20 between the rear legs and the members 12 and 13, respectively, all of said parts being permanently secured together by suitable means and arranged substantially as shown. At one side of the main frame there is a supplemental frame comprising short legs 21, a member 22 connecting the upper ends thereof, and connecting pieces 23 extending from the legs 21 to the main frame at the level of the adjacent lower side-piece 11. On the inclined upper side of the main frame, at the side adjoining the supplemental frame, there is permanently secured a table or top-member 24 of which the rearward portion extends in to the center-line of the frame, while the inner edge of the front portion terminates in line with the end of the frame-member 17. A similar table or top-member 25 is disposed upon the other side of the frame, but is not fixedly secured thereto. For moving the member 25 transversely and holding the same in adjusted positions upon the frame, there are secured on the lower side of said member boxes 26 having transverse threaded openings through which are passed threaded rods 27 having plain end-portions held rotatably in one of the diagonal side-pieces 12, as shown in Fig. 6. On the outer ends of the rods 27 are carried sprocket-wheels 28 which are connected by a chain 29 as shown in Fig. 5. One of the rods is squared at the end to receive a crank 30 by which the rod may be turned, and the other rod is turned simultaneously by means of the sprocket and chain connection thereto from the first rod.

The main drive-shaft 31 is journaled in bearings 32 secured on the member 22 of the supplemental frame and the adjoining side-piece 11 of the main frame. At the outer end of the shaft 31 is carried a pulley 33 which is connected by belt with a suitable source of power. On the intermediate portion of the shaft, between the bearings 32, a

pinion 34 is mounted revolubly upon the shaft, and adjoining said pinion there is a friction clutch 35 of which one portion is connected with the pinion while the other is secured to the shaft, so that by means of said clutch the pinion may be driven by the shaft when desired. The clutch is thrown in and out of operation by a lever 36 pivoted on the rear cross-piece 23, as shown in Fig. 8, and said lever is connected by means of a rod 37 with a controlling lever 38 having a forked end-portion 39 which may be engaged and moved laterally by the knee or leg of the machine operator as hereinafter described. The pinion 34 meshes with a gear 40 carried at the end of a transverse shaft 41 journaled in bearings 42 secured on the lower sides of the diagonal frame-members 12. Beneath the table 24 a pinion 43 is secured on said shaft 41, and said pinion meshes with a gear 44 carried on a shaft 45 which is rotatably and slidably mounted in bearings 46 on the upper side of the table. The gear 44 extends down through an opening therefor in the table, and the pinion 43 is of such length as to permit a certain axial movement of the gear and shaft without causing the gear to pass out of mesh with the pinion. On the shaft 45 adjacent to the gear there are secured two collars 47, and a shifting-lever 48 is provided having an oval intermediate portion passing around the shaft at said collars and carrying pins 49 which extend between the collars as shown in Fig. 7. The upper or rearward end of the shifting-lever is pivotally connected with the table, and at its front end there is a handle 50 which may be grasped by the operator to move the lever and actuate the shaft 45 axially. Beneath the table 25 a pinion 51 is mounted slidably on the shaft 41, being held in fixed rotational relation to the shaft by a spline 52. At one side said pinion has an extended hub with an annular groove therein, and into said groove is extended the forked end of a bracket 53 which is secured to the lower side of the table 25 as shown in Fig. 4. By means of said bracket, the pinion is shifted longitudinally of the shaft in accordance with transverse adjustments of the table. The pinion 51 meshes with a gear 54 carried on a shaft 55 journaled in bearings 56 on the upper side of the table 25, the gear extending down through an opening in the table, and the shaft being alined axially with the shaft 45 on the table 24. Axial movement of the shaft 55 relatively to the bearings 56 is prevented by collars 57 secured to the shaft at the adjacent ends of said bearings. On the inner or adjacent ends of the shafts 45 and 55 are secured heads comprising rectangular plates 58 extending perpendicularly to the shaft-axes and centered therewith. On the backs of the heads 58, that is on the sides thereof respectively adjacent to the bearings 46 and 56, there are gage-plates 59 which project beyond each of the straight edges of the heads, as shown.

On each of the legs 10 of the frame there is a rearwardly extending bracket 60, and on said brackets there is supported the ends of a transverse shaft 61. On the intermediate portion of said shaft are revolubly mounted spools or reels 62 for band-iron or metal straps A which extend from the reels up over idler-pulleys 63 revolubly mounted on brackets 64 secured to the rear edges of the tables 24 and 25. From the idlers 63 the straps A extend forwardly and pass through the tension-devices arranged on the rearward portions of the tables 24 and 25 in alinement with the rotary heads 58. Each of the tension-devices comprises a base-portion 65 having a longitudinal rectangular groove or channel in the upper side thereof, a shoe 66 fitting loosely in said channel, lining-pieces 67 of leather or the like on the lower edge of the shoe and the bottom of the channel, a lever 68 pivoted on lugs 69 extending up from the front part of the base 65, links 70 connecting the lever with the shoe, and pendent weights 71 suspended on an eye-bolt 72 resting in one of a series of notches in the upper edge of the horizontal portion of the lever 68. The strap A passes between the lining-pieces 67, which are pressed into frictional engagement therewith by the shoe, and the pressure of the latter is variable as desired by changing the position or size of the pendent weights on the lever. Through the rear ends of the levers 68 there is passed a transverse rod 73, and a connecting-rod 74 is pivotally attached to the central part of said rod, said connecting-rod extending downwardly and its lower end being pivotally connected with the rear end of a foot-lever 75. Said foot-lever is pivoted on a transverse shaft 76 carried by boxes 77 secured on the lower sides of the lower side-pieces 11 of the main frame. A part of the lever extends forward from said shaft 76 to the front side of the machine, and carries at its end a pedal-plate 78 which is positioned so as to be conveniently reached by the operator standing in front of the machine. By depressing the pedal 78 the rear end of the lever is raised, its movement is communicated by the connecting-rod 74 to the rear ends of the levers 68, and the upward movement of the latter relieves the frictional pressure upon the straps A so that the latter may then be drawn freely through the tension-devices.

Between the cross-pieces 15 and 16, and positioned laterally between the adjacent edges of the front portions of the tables 24 and 25, there is arranged a magazine consisting of an open chute or casing extending perpendicularly to the surface of the tables,

and a movable follower disposed slidably in said chute to support the material therein. The front portion 79 of the magazine-chute extends slightly above the surface of the tables, and a further upward extension thereof is formed by fingers 80 of which the rear edges are beveled as shown in Fig. 2. The sides of the magazine-chute are each formed by two flat pieces 81 which are spaced to form between them a guideway for the follower 82. The follower has a cross-piece 83 on the lower side thereof and at the ends of said cross-piece are blocks 84 which fit slidably in the guideway between the side-pieces 81. A ratchet-bar 85 extends downwardly from the center of the cross-piece 83, the rear edge of said bar being toothed as shown, and the front edge thereof resting against a roller 86 carried at the end of a bracket 87 which extends back from the lower part of the chute-portion 79. On the shaft 76 is pivoted a foot-lever 88 having a pedal 89 at the front end thereof alongside the pedal 78 of the lever 75. The rear portion of the lever 88 extends up diagonally past the ratchet-bar 85 and has pivoted thereon a pawl 90 which is normally held in engagement with the teeth of the ratchet-bar by means of a spring 91 arranged as shown. A spring 92 is connected with the lever 88 and a cross-rod 93 on the frame, said spring normally holding the rear portion of the lever down against a stop-hook 94 which extends down from the lower end of the chute-portion 79. Above the rear end of the lever 88 there is a small transverse shaft 95 of which the ends are held in bearings 96 secured to the frame-legs 10. On the central portion of said shaft 95 is secured a pawl 97 which is normally held in engagement with the teeth of the ratchet-bar 85 by means of a weighted rod 98 carried at one end of the shaft 95, as shown in Fig. 3. The pawl 97 has a tail-piece 99 extending rearwardly therefrom, and to the end of said part 99 there is pivotally connected a link 100 having a slotted lower end-portion. The pawl 90 also has a rearwardly extending tail-portion 101, provided with a pin 102 which extends laterally through the slot of the link 100, being normally in an intermediate portion of said slot as shown in Fig. 2. By depressing the pedal 89 the rear end of the lever 88 is raised and said movement is communicated by the pawl 90 to the follower. When the latter is raised an amount equal to the length of one of the teeth of the ratchet-bar 85, the pawl 97 engages another tooth of said bar to retain the same in the raised position, and by repetitions of the described action the follower may be successively moved up to and retained at any desired elevation. The length of the slot in the link 100 is sufficient to permit normal movements of the foot-lever and pawls without the link interfering with such movements. When it is desired to lower the follower, as when refilling the magazine, the weighted rod 98 is lifted as shown in Fig. 3, the shaft 95 being thereby turned to disengage the pawl 97 from the ratchet-bar, the tail-piece 99 and link 100 being pushed down until the upper end of the slot in the link engages the pin 102, and the tail-piece 101 of the pawl 90 being then depressed sufficiently to disengage the latter pawl from the ratchet-bar. The latter is thereby freed so that the follower may descend by gravity to the lower end of the chute, and upon lowering the rod 98 the pawls are reëngaged with the ratchet-bar and the normal relation of the parts restored.

In the use of the described mechanism, a pile of the box side-pieces B is placed in the magazine, resting upon the follower 82 and against the front side 79 of the chute, and the follower is placed at such an elevation that the front edges of the uppermost pieces B rest against the beveled rear edges of the fingers 80, as indicated by dotted lines in Fig. 2. Owing to the inclination of said fingers relatively to the sides of the pile of pieces B, the uppermost of said pieces will extend slightly in front of the next one beneath it, and said upper piece may always be readily grasped and removed from the pile by the operator, who stands in front of the machine at the center thereof. As the successive pieces are removed from the magazine, the follower is intermittently raised, by depressing the pedal of the foot-lever 88 as before described, thus keeping the top of the pile in a substantially uniform position. The heads 58 at the inner ends of the shafts 45 and 55, are so shaped as to fit within the rectangular recesses formed by the frames of the paneled box-ends C, and said portions of the boxes are made up previously to their use in the assembling machine. In assembling a box, the operator first places one of the box-ends C, upon each of the heads 58, with the outer side of the panel-frame resting against the gage-plates 59, which extend slightly beyond the edges of the panel-frame, as represented in Fig. 2. The handle 50 of the shifting-lever 48 is moved to the right from the position shown in Fig. 1, to bring the box-end and head carried by the shaft 45 into alinement with the metal strap A passing through the tension-device carried on the table 24. The other head and box-end, carried by the shaft 55, are constantly alined with the metal strap which passes through the tension-device on the table 25, since the shaft 55 is not axially movable with respect to said table. Both of the heads 58 are so arranged upon the respective shafts, and the shafts are so connected by the driving mechanism therefor, that the corresponding edges of the

heads lie in uniform planes parallel with the shaft-axes. After the box-ends are in place upon the heads 58, the ends of the straps A are secured to the edges of the respective box-ends near one corner thereof, preferably by nailing the same thereto as shown at D in Fig. 2, it being understood that said nailing of the strap is done when the adjacent corner is at a position such as that of the uppermost corner of the box-end shown in said Fig. 2. When drawing the straps through the tension-devices, preparatory to attaching the ends of the straps to the box-ends, the pressure of the shoes 66 may be released by depressing the pedal 78 of the lever 75, as before described. After the ends of the straps A have been attached to the box-ends, the clutch-control lever 38 is moved to throw in the clutch 35, and the heads 58 and box-ends are then rotated equally in the direction of the arrow in Fig. 2, by the connecting driving mechanism comprising the pinion 34, gear 40, shaft 41, pinions 43 and 51, gears 44 and 54, and shafts 45 and 55. During the rotation of the heads the straps A are wrapped around the edges of the box-ends, and, as each edge of the box-ends becomes the uppermost, one of the side-pieces B is removed from the pile in the magazine and slipped into place between said edge and the strap, the side-piece being centered longitudinally by the projecting end-portions of the gage-plates 59, and being firmly held in place as the straps are drawn across the ends thereof by continued rotation of the parts. The straps A are constantly held taut by the tension-devices, and after the last of the side-pieces B has been placed in position upon the ends of C and the straps drawn over the same, the clutch 35 is thrown out to stop the rotation of the box-supporting heads 58. Should the friction of the driving mechanism be insufficient to prevent reverse movement of the heads and consequent slackening of the straps A when the clutch is entirely thrown out, the clutch may be only partly thrown out and so controlled as to slip or drag and thus maintain the tension upon the straps without being thrown in far enough to actually move the heads and draw further portions of the straps through the tension-devices. After the movement of the supporting-heads 58 has been stopped, and while the straps are held under tension, the rearward ends of the portions of the straps which are to remain upon the boxes are secured thereto by nails driven through the straps into the panel-frame. The straps are then cut off, and the handle 50 of the shifting-lever moved to the left as shown in Fig. 1, thereby disengaging from the box the head carried by the shaft 45, and enabling the assembled box to be removed from the machine. After removal from the machine, the box is completed by nailing the sides to the ends, the nails being driven through the straps and sides into the panel-frames of the ends.

If so desired, the nailing of the box may be done while the same is in the assembling machine, by stopping the rotation of the heads as the successively-placed side-pieces B reach a convenient position for the operator to drive the nails therein. It is preferable and more economical, however, to carry out the operation as first described; the machine operator nailing only the ends of the reinforcing straps to maintain the tension thereof and hold the side-pieces B temporarily in place upon the ends C, while other workmen complete the nailing after removal of the assembled box from the machine; as in this case the nailing may be accomplished very expeditiously by the use of ordinary nailing machines, while the assembling machine by operating almost continuously will have a maximum output.

It will be obvious that adjustment of the machine for use on boxes of different lengths may be made very easily, and merely requires the moving of the table 25 transversely upon the main frame, which is effected by applying the crank 30 to turn the threaded rods 27, as described. As the table 25 is moved, it carries with it all of the working parts for the one side of the machine, which are thus constantly in operative relation to each other. Boxes of varying widths and heights require the substitution of different heads 58 on the ends of the shafts 45 and 55.

Now, having described my invention, what I claim and desire to secure by Letters Patent is:

1. In a box-assembling machine, rotary box-end-holding heads axially alined and spaced and adapted to hold box-ends independently in position for receiving side-pieces thereon, means for rotating said heads simultaneously, and strap-tensioning and supporting means alined in the planes of rotation of said heads.

2. In a box-assembling machine, rotary heads axially alined and adapted to separately support free paneled box-ends in parallel spaced relation, means for actuating said heads, strap feeding and tensioning means alined in the respective plane of rotation of each head, and means for controlling said tensioning means.

3. In a box-assembling machine, rotary heads axially alined and adapted to fit within paneled box-ends to support the same independently in parallel spaced relation suitable for the attachment of box-sides thereto, controlled actuating means for rotating said heads simultaneously, a reel and strap-tensioning means alined in the respective plane of rotation of each head, and a magazine for

containing and feeding box side-pieces into proximity to the rotary heads at a position intermediate the same and the strap-tensioning means.

4. In a box-assembling machine, rotary heads axially alined and adapted to fit within paneled box-ends to support the same in parallel spaced relation, actuating means for rotating said heads similarly, means for delivering metal straps under controlled tension to the peripheral edges of box-ends on said heads whereby said straps may be drawn around said edges during rotation of said heads, and means for varying the spacing of the heads longitudinally of the axis of rotation.

5. In a box-assembling machine, rotary heads axially spaced and alined and adapted to support box-ends in spaced parallel planes, actuating means connecting said heads laterally of their axis and adapted to drive the same synchronously, means for delivering a flexible binding element under controlled tension in the plane of each box-end carried by the rotary heads, a magazine-chute for containing box side-pieces, a follower movable in said chute to eject the side-pieces therefrom at a position substantially intermediate the rotary heads and adjoining the tensioned binding elements, and controlled means for actuating said follower.

6. In a box-assembling machine, rotary heads axially spaced and alined and adapted to support paneled box-ends in spaced parallel relation, actuating means connecting said heads and adapted to drive the same synchronously, a clutch controlling said actuating means, supporting and tensioning means for a flexible binding element arranged in the plane of rotation of the box-end carried by each head, means for varying the spacing of the heads longitudinally of the axis of rotation thereof, a magazine-chute for containing box side-pieces, a follower movable in said chute to eject the side-pieces therefrom at a position substantially intermediate the rotary heads and adjoining the tensioned binding elements, and levers for controlling said clutch and actuating said follower.

LEON J. NELSON.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."