Jan. 25, 1938. H. B. GREENWOOD 2,106,500

DUPLEX SINGLE FACER

Filed Dec. 20, 1935 7 Sheets-Sheet 1

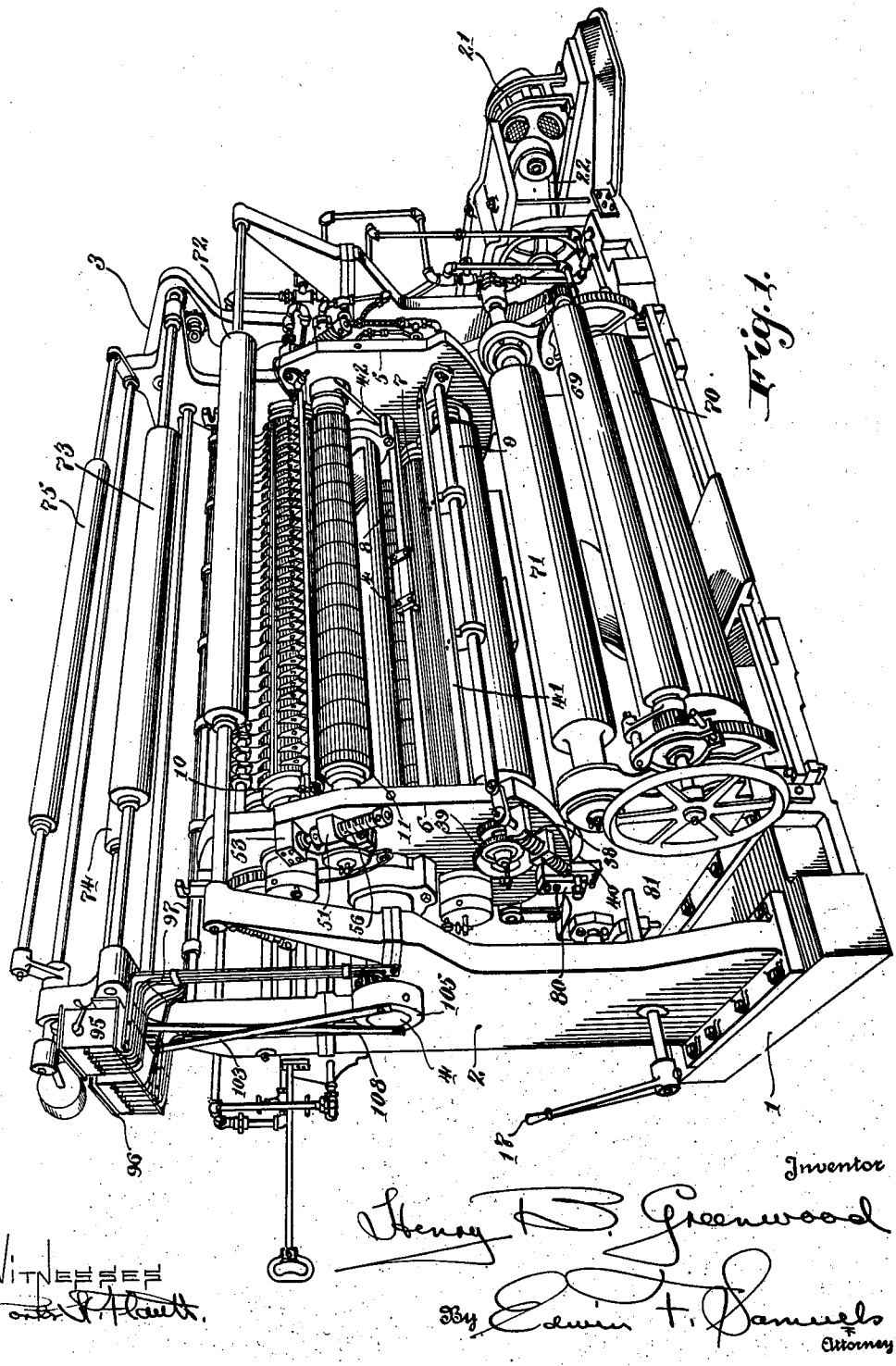


Fig. 1.

Witnesses:

Inventor

Henry B. Greenwood

By Edwin T. Samuels

Attorney

Jan. 25, 1938. H. B. GREENWOOD 2,106,500

DUPLEX SINGLE FACER

Filed Dec. 20, 1935 7 Sheets-Sheet 2

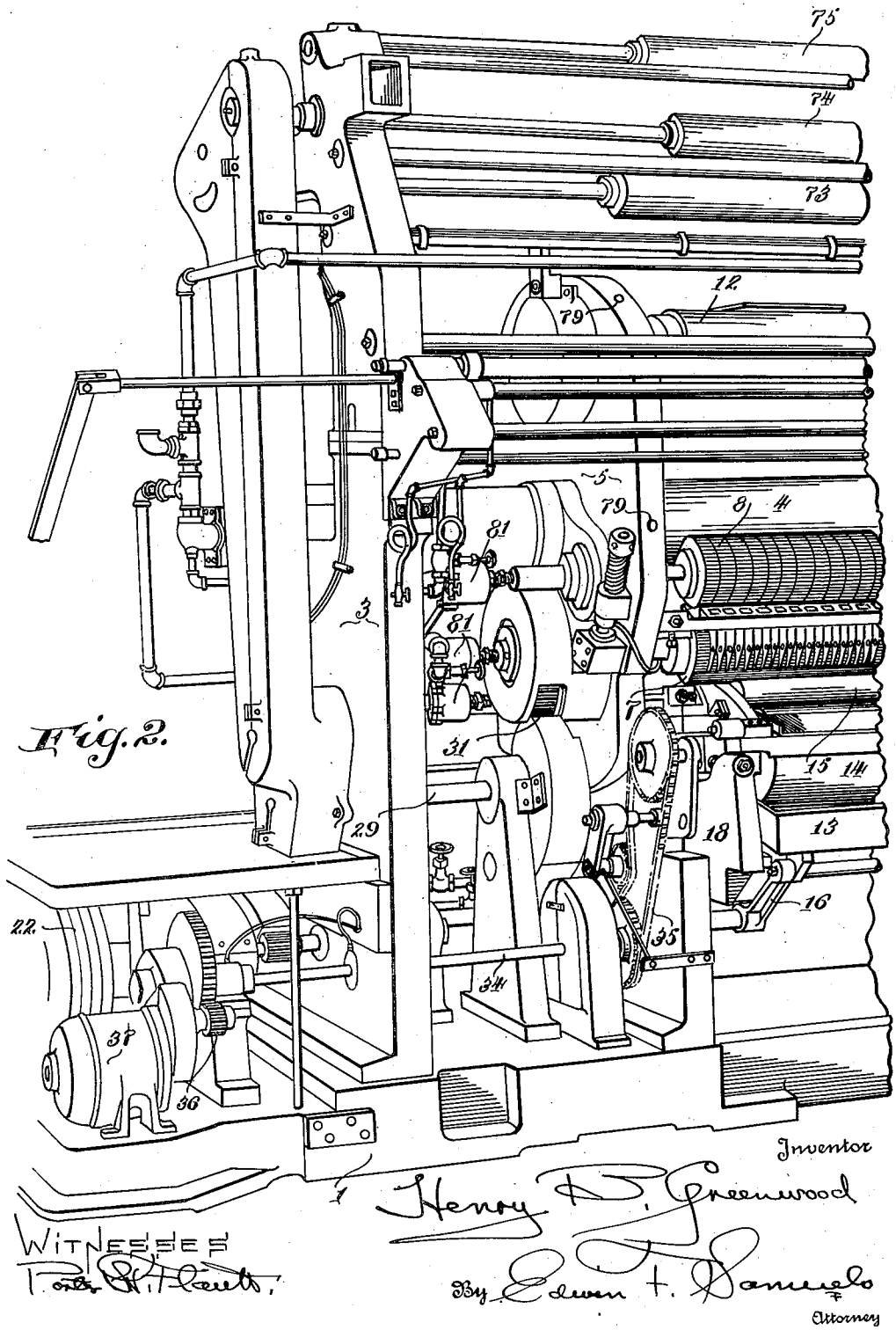


Fig. 2.

Inventor

Henry B. Greenwood

WITNESSES

By Edwin T. Sanders

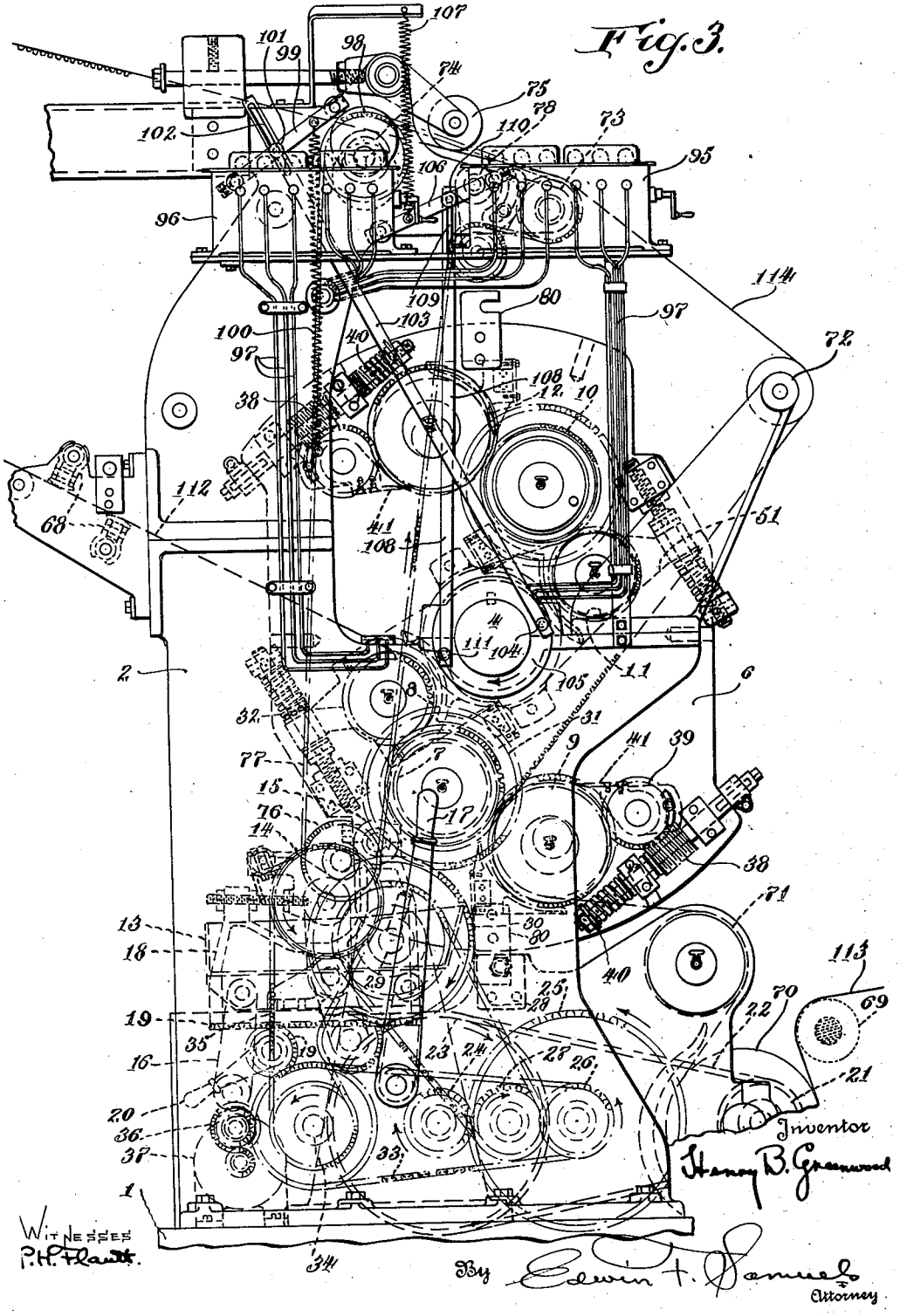
Attorney

Jan. 25, 1938. H. B. GREENWOOD 2,106,500

DUPLEX SINGLE FACER

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Fig. 3.

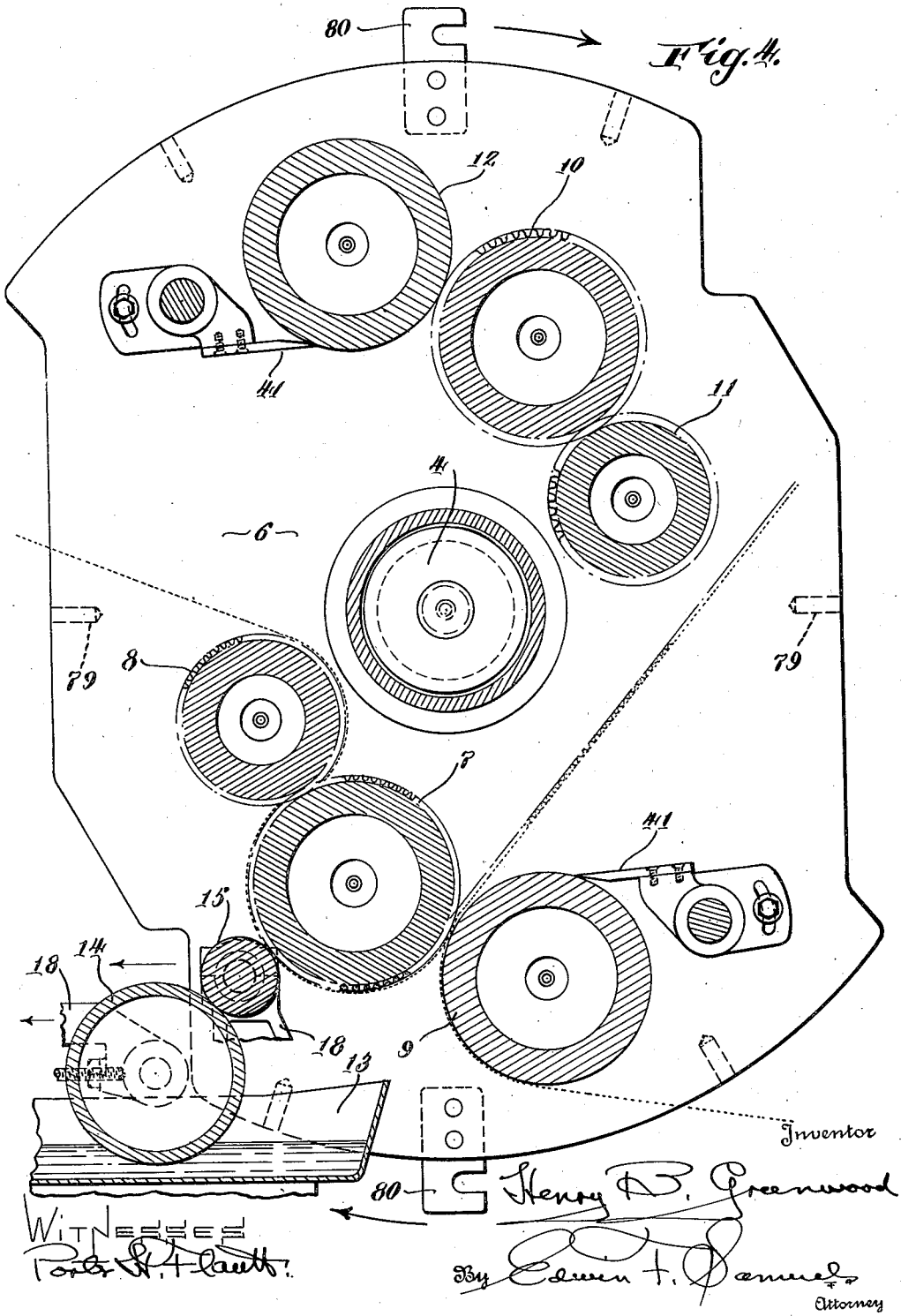


Jan. 25, 1938. H. B. GREENWOOD 2,106,500

DUPLEX SINGLE FACER

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Fig. 4.



Inventor

Henry B. Greenwood

By Edwin T. Sammel

Attorney

Witnesses

Jan. 25, 1938. H. B. GREENWOOD 2,106,500

DUPLEX SINGLE FACER

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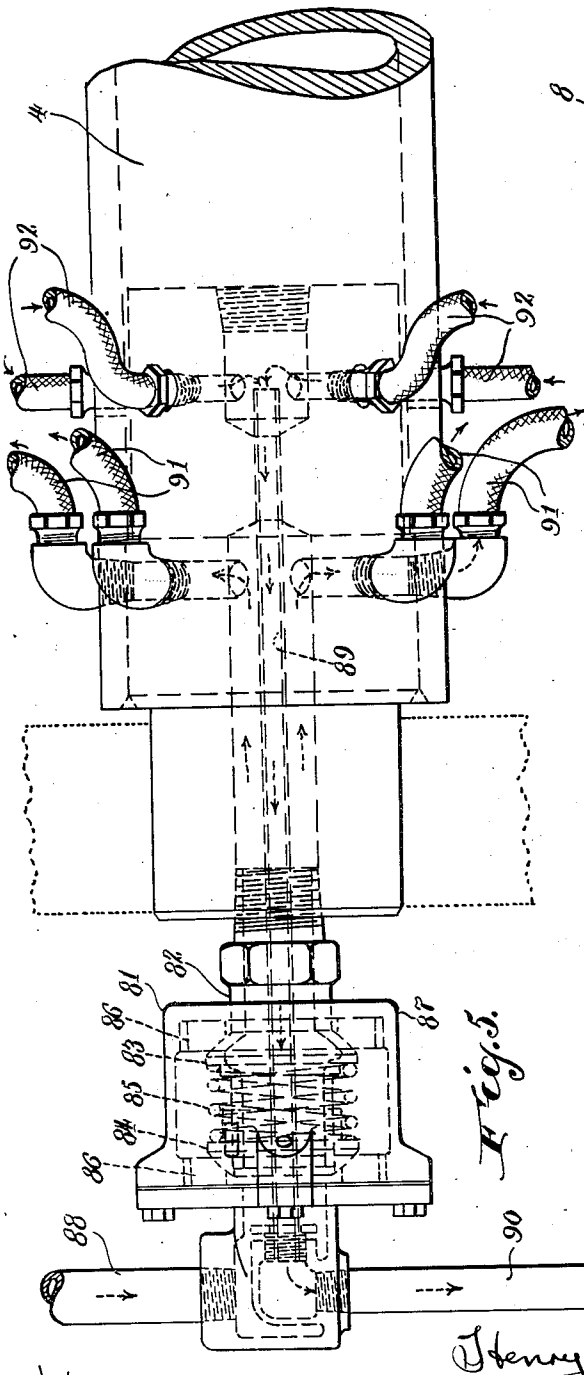


Fig. 5.

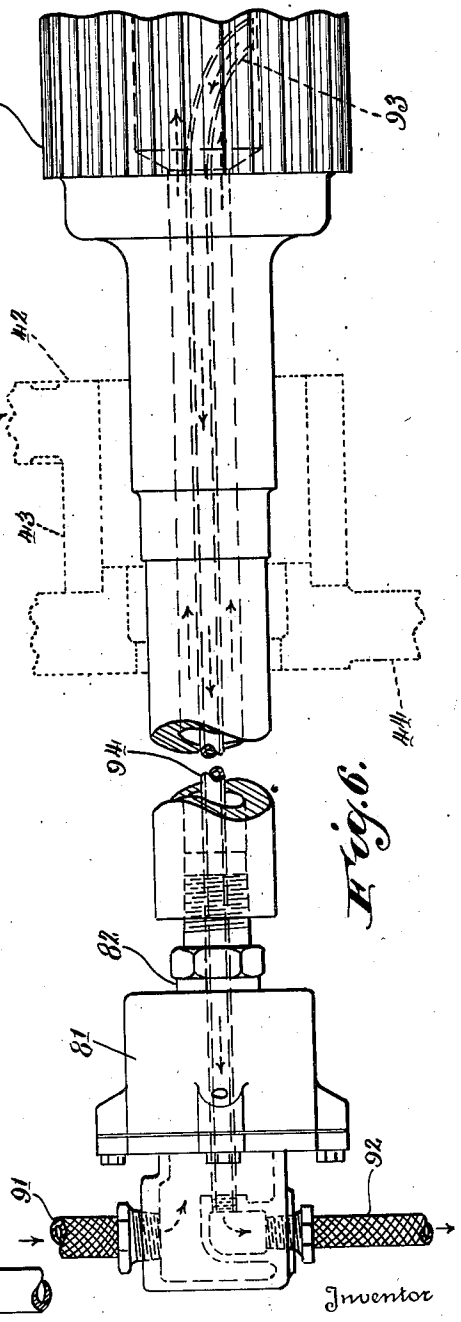


Fig. 6.

Witnesses:

Inventor

Henry B. Greenwood

By Edwin T. Samuels

Attorney

Jan. 25, 1938. H. B. GREENWOOD 2,106,500

DUPLEX SINGLE FACER

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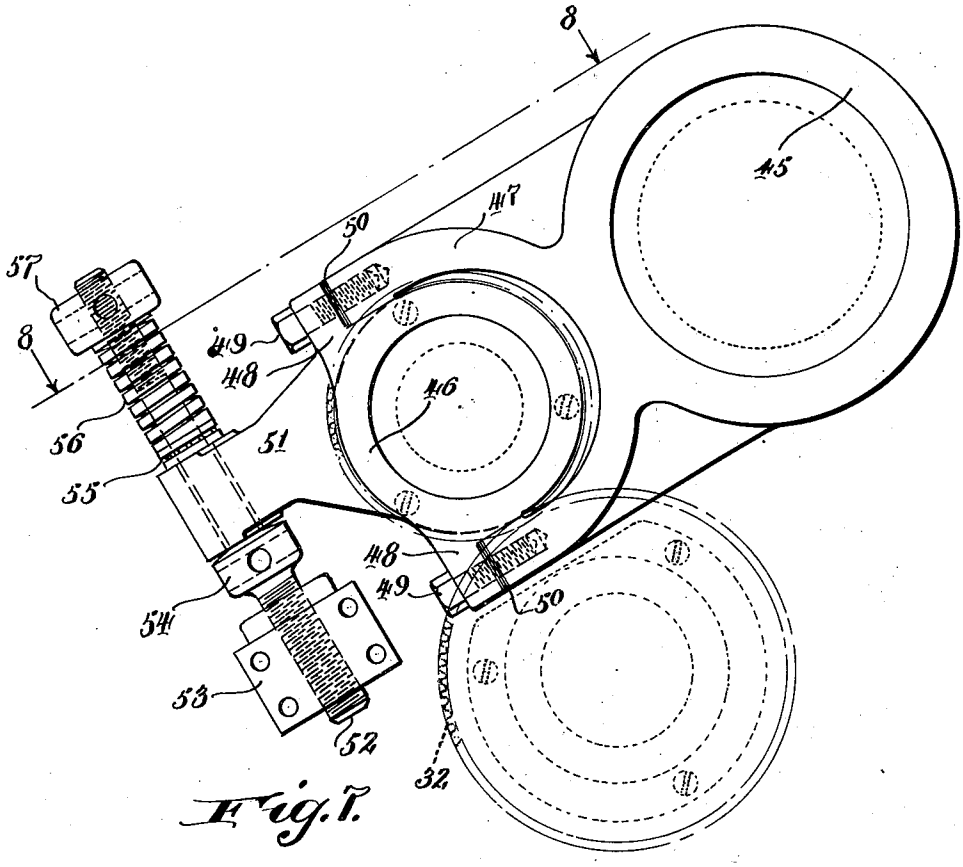


Fig. 7.

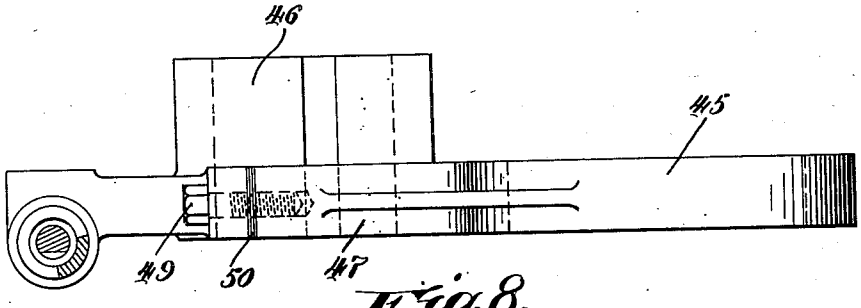


Fig. 8.

Inventor

Henry B. Greenwood

Witnesses

Edwin T. Samuels

By

Attorney

Jan. 25, 1938. H. B. GREENWOOD 2,106,500

DUPLEX SINGLE FACER

Filed Dec. 20, 1935 7 Sheets-Sheet 7

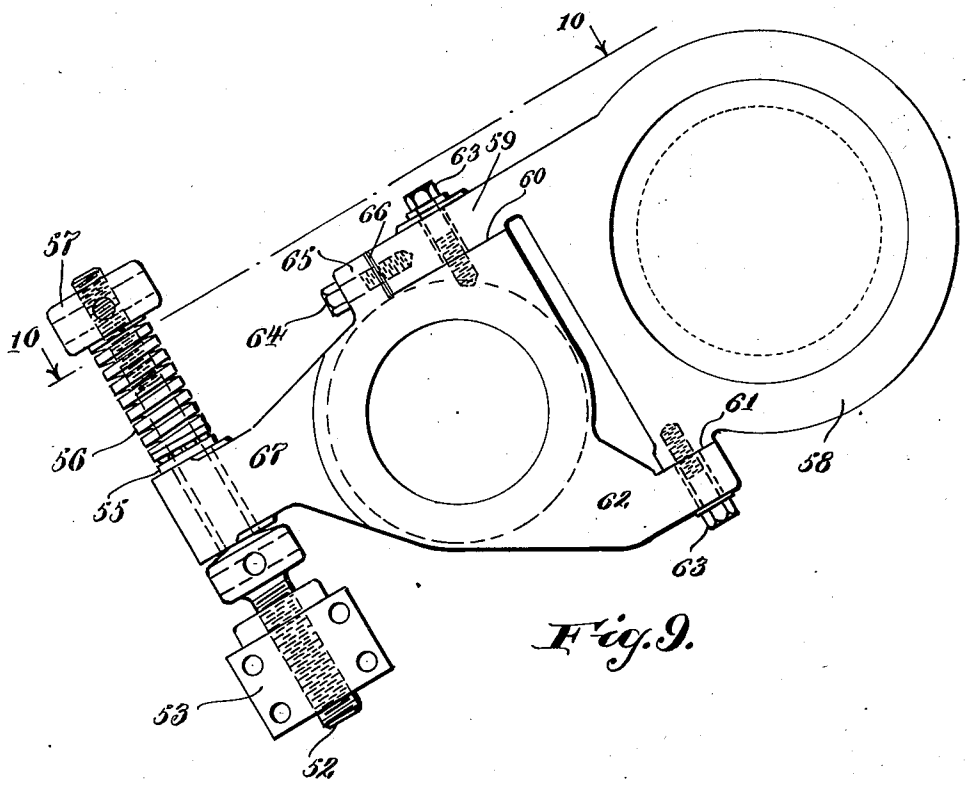


Fig. 9.

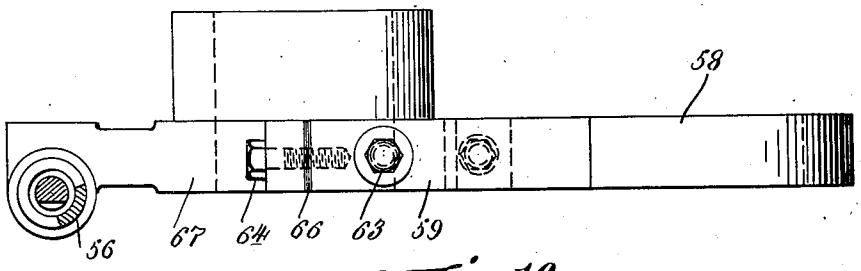


Fig. 10.

Witnesses:

Inventor

Henry B. Greenwood

By Edwin T. Samuels

Attorney

Patented Jan. 25, 1938 2,106,500

UNITED STATES PATENT OFFICE

2,106,500

DUPLEX SINGLE FACER

Henry B. Greenwood, Glen Arm, Md., assignor to F. X. Hooper Company, Inc., Glen Arm, Md., a corporation of Maryland

Application December 20, 1935, Serial No. 55,406

19 Claims. (Cl. 154—31)

My invention relates to a machine for making corrugated board, and has particular reference to one for corrugating one strip of material and fastening another strip, or liner, thereto, and it is often referred to as a single facer.

The corrugations in such board are made by passing the web between two corrugating rolls, having intermeshing longitudinally extending ridges thereon. These rolls are quite heavy and are heated in practice, and the web is moistened previously to aid in bending. Adhesive is also applied to the corrugated web before the liner is brought in contact therewith and pressed thereon and the presser roll is also heated.

It is often necessary in a plant to make two kinds of board, one with large flutes or corrugations called A flute, and another with smaller flutes or corrugations called B flute, and when this is necessary, it has been customary to use two of these single facers. When two have been used one has either been placed in line back of the other or one has been placed in line on top of the other. They have always been placed in line to avoid duplication of other necessary machinery in the manufacture and use of the board. When one is back of the other, considerably more floor space is required, and when one is on top of the other, the upper one is quite inaccessible.

One object of this invention is to make a single machine which will operate on a single level and that the working level, and in approximately the same space as a single machine and which will make either of two sizes of flutes or corrugations.

Another object of this invention is to make a duplex machine which will duplicate only the necessary elements of its dual operations and thereby save considerable in its manufacture, as compared to two machines.

Another object is to make a duplex machine that can be readily cleaned, and one in which one set of mechanism will not have material dropped upon it by another, upper set. Another feature of the invention is that there is only one adhesive pan, which is on a level with the operator and readily available for cleaning.

Other objects of this invention are to utilize a single driving mechanism for either group of rolls being used, and to lubricate and heat only the group being used.

Another object of this invention is to improve the mounting for the floating corrugating roll, to enable it to be adjusted so that the corrugations on intermeshing rolls exactly intermesh with each other.

Other objects and advantages of the invention will be apparent in the following description and accompanying drawings, in which:

Figure 1 is a perspective view of the back of the machine.

Figure 2 is a perspective view of the left end of the machine showing particularly the driving mechanism.

Figure 3 is an elevation of the right end of the machine.

Figure 4 is an elevation of the right end of the oscillable carrier.

Figure 5 is a detail view of the central rotating shaft for the carrier showing the arrangement for passing the steam to the central shaft.

Figure 6 is a detail view of one of the corrugating rolls showing the method of introducing steam to it from the central shaft.

Figure 7 is a side view of the supporting bracket for the adjustable corrugating roll.

Figure 8 is a view on line 8, 8 of Figure 7.

Figure 9 is a side view of a modified form of adjustable corrugating roll bracket.

Figure 10 is a view on line 10, 10 of Figure 9.

Similar numerals refer to similar parts throughout the several views.

The machine is shown as having a base 1, and bolted thereto right hand frame member 2 and left hand frame member 3.

A central shaft 4 is rotatable in the frame members. Keyed to this shaft are the respective end plates on the left 5 and on the right 6. Rotatable in suitable bearings in these respective plates are two sets of corrugating rolls. The lower set shown in position for operation are designed to make larger corrugations sometimes referred to as A flute. The upper set of rolls are designed to make a smaller corrugation in the board, sometimes referred to as B flute. It will be apparent that the rolls may be made to make any two types of corrugations that may be desired. The main corrugating roll 7 in the A flute group has corrugations thereon which mesh exactly with those in the floating corrugating roll 8. Presser roll 9 presses the liner against the corrugated strip. The main B flute corrugating roll 10 likewise meshes exactly with the floating B flute corrugating roll 11, and there is in this set a corresponding presser roll 12.

An adhesive pan 13 has therein a pickup roll 14 contacting with a transfer roll 15 which applies the adhesive to the corrugated strip. The

pan is mounted on rocking arms 16 and may be rocked out of position with the pick up roll by means of lever 17. The transfer and pick up rolls are mounted on brackets 18 which may be moved horizontally by the rack and pinion mechanism 19 by the use of lever 20.

The rolls may be driven from a motor 21 by means of a belt 22 passing around large pulley 23 which may be connected by clutch mechanism to its shaft and keyed to this shaft is a smaller gear 24 which in turn drives large gear 25 and keyed to the shaft thereof is another small gear 26 which drives gear 27 to the shaft of which is keyed a sprocket carrying a chain 28. This chain 28 passes around a sprocket on shaft 29 which passes through the left end of the main frame of the machine. Keyed to this shaft is a gear 30 meshing with gear 31 which drives the main corrugating roll 7. Corrugating roll 8 is driven by the intermeshing of the corrugations on it and roll 7.

The shaft bearing gear 26 also has thereon a sprocket, driving chain 33 which in turn through sprocket and clutch mechanism may be made to drive shaft 34. Shaft 34 has thereon a sprocket, driving chain 35 which in turn drives a sprocket on the shaft of pickup roll 14, which is geared to and drives the transfer roll 15. Shaft 34 may likewise be driven through gear 36 driven from motor 37. This additional motor is useful to drive the pickup roll when the rest of the machine may be stopped, in order to keep the adhesive from hardening.

The presser rolls 9 and 12 are mounted in eccentric bearings whose eccentricities may be varied by means of a worm 38 and worm gear mechanism 39 and the worm shaft has a spring 40 which is compressed when an obstacle comes between the main corrugating roll 7 and its corresponding presser roll 9. Adjustable scrapers 41 keep the presser roll clean.

The floating corrugating rolls 8 and 11 are mounted on brackets having collars surrounding the central shaft 4. At one end of each floating corrugating roll is a collar the extending bracket 42 of which is shown in Figure 6, the collar passing around the central shaft 4 inside the end plate and integral with bracket 42 is a cylinder 43 carrying the bearing cage and passing through the end plate and having attached rigidly thereto an arm 44 on the outside of the end plate. At the other end the corrugating roll is supported in the end plate through means of a collar 45 surrounding central shaft 4 and the collar has fixed thereon a cylinder 46 passing part way into an enlarged opening in the end plate and this cylinder 46 carries the other end of the floating corrugating roll. This cylinder 46 may be adjusted in its distance from the central shaft by means of its being supported in the yoke member 47 projecting from the collar 45. The cylinder 46 is carried by a collar having extending wings 48 which are held against the ends of the yoke 47 by means of bolts 49. Shims 50 may be placed between the respective bearing surfaces of the wings 48 and yoke 47, and more or fewer shims may be placed between the members as may be desired. Integral with the collar bearing the wings 48 is the arm 51. A bracket which may be adjusted to or from the central shaft is required only at one end of each floating corrugating roll to maintain the corrugations on it exactly parallel with those on the corresponding main corrugating roll, and it is so shown. The arms 44 and 51 are held toward the main corrugating rolls by means of threaded rods 52 passing into threaded blocks 53, and these rods 52 may be screwed in or out of the blocks 53 by means of sections 54. Extending beyond these sections 54 the rod passes through a sleeve in arms 51 and 44, and on the other side of these sleeves, around the rods, are bearings 55. Beyond these are compression springs 56 which are held down by nuts 57. Spring mechanisms of this same type are on both ends of both floating corrugating rolls to hold both ends similarly and resiliently against their respective corrugating rolls. Figure 7 shows how part of the bearing cylinder of the adjacent main corrugating roll may be cut away to make room for the yoke 47.

Another modification of a bracket is shown in Figure 9 in which the collar 58 has an extension 59 having thereon a machined surface 60 parallel with the line joining the axes of the central shaft 4 and of the floating corrugating roll. Another parallel machined surface 61 is on the other end of the L shaped bracket. The member 62 carrying bearings for supporting the floating corrugating roll has corresponding machined surfaces for contact with surfaces 60 and 61. Bolts 63 passing through enlarged openings in their respective members hold the member 62 in its desired position on the L shaped bracket. Extension 59, at its end, has bolted to it by bolt 64, lug 65 on member 62, and between the extension and lug are shims 66. When it is desired to vary the distance between the axes, first, bolts 63 are loosened and then the bolt 64 which holds the member 62 against extension 59. After making the proper adjustment through the insertion or removal of shims 66 and tightening the bolt 64, the bolts 63 may be tightened to rigidly hold the member 62 in the adjusted position. Member 62 has an arm 67 thereon corresponding to the arm 51 on the other form of adjustable bracket.

In entering the machine, the strip to be corrugated passes between steam showers 68 and the liner to be applied to the corrugated strip passes behind roller 69 and under roller 70 and in front of roller 71 before passing around the presser roll 9.

After the strip to be corrugated has passed between rolls 7 and 8 and had applied thereto adhesive and had pressed thereagainst by roll 9 the liner, the single faced corrugated strip passes from the machine around roller 72 over rollers 73 and 74, and under counterbalanced roller 75. Shaft 29 through means of gears drives sprocket 76 which in turn drives chain 77 passing around sprockets on the shafts of rolls 73 and 74, and the chain may be maintained tight by chain tightener sprocket 78.

The carrier may be turned over by first withdrawing the adhesive pan 13 and pick up and transfer rolls 14 and 15, by inserting rods in openings 79 variously arranged around each of the plates. The gears on shaft 29 and driving roll 7 are simply removed from their meshing position by such turning of the carrier and the corresponding gears on roll 10 when the rotation is complete are meshed with the gears 30 on shaft 29. Thus, either set of corrugating presser rolls may be driven from the one driven gear 30. Plates 5 and 6 have thereon ears 80 which may be bolted to uprights 81 in which the rolls 69, 70, and 71 are mounted. When it is desired to reverse the carrier, the bolts are sim-

ply loosened and the carrier turned over through an angle of 180 degrees.

To make the adhesive most effective, the webs prior to bringing them together are heated and this heating is effected by heating the rolls around which the webs pass. Rolls 70 and 71 are heated in the usual manner. In heating the corrugating rolls and presser rolls, it is desirable not to heat the rolls not in use. Heat in the form of steam is therefore led into the central shaft 4 by means of the Johnson rotary pressure joint 81 illustrated in Figure 5. The nipple 82 is secured in the central shaft 4, and it has thereon the expanded shoulder 83 and the longitudinally sliding keyed shoulder 84 which is pressed from the shoulder 83 by spring 85. These two shoulders rotate against the seal rings 86 which are held in the stationary box 87. Steam is admitted through pipe 88 and passing through box 87 and nipple 82 passes on into the end of the central shaft 4. Condensation is collected and returned through small tube 89 passing through the larger opening in the central shaft 4 through the nipple 82 and out through pipe 90. Leading from the central shaft are twelve flexible pipes, the six carrying steam being designated by numeral 91. The six carrying the water of condensation are designated by numeral 92. One pipe 91 carries steam to each of the four corrugating rolls and to the two presser rolls, and one pipe 92 returns the water of condensation from each of the four corrugating rolls and the presser rolls. These flexible pipes are shown in Figure 6 as they enter and leave one of the floating corrugating rolls. The steam enters at 91 and passes through a similar rotary joint 81 into the corrugating roll 8. The water of condensation is picked up by the downwardly directed end 93 of tube 94 and passes out through flexible pipe 92. Valves of ordinary design, not shown, are placed in the flexible pipes 91 to cut off the entrance of steam into the three rolls not in use.

Such machines are usually lubricated by forcibly fed lubricating mechanism and the Madison Kipp lubricator has often been used and is here shown, and it is used in this instance to lubricate the bearings of the rolls on the oscillating carriage. Two such lubricating devices are shown in Figures 1 and 3. Lubricator 95 is used to lubricate the B flute rolls and lubricator 96 is used to lubricate the A flute rolls. Tubes 97 lead from the respective lubricators to the bearings on both sides of the machine. These tubes terminate in long flexible tubes to allow for the oscillating of the oscillable carrier. A single lubricator is usually operated by a pumping lever rolling on a cam surface. In this invention one such cam surface is used and the pumping levers operate on opposite sides of that cam. In Figure 3 the cam 98 is shown with pumping lever 99 being operated up and down by the cam and being held in contact therewith by the spring 100. The pumping lever has thereon a stud sliding in slot 102 on one end of the bar 103 which is pivoted at its lower end by stud 104 on the collar 105 keyed to central shaft 4. In the position shown in Figure 3, the stud operates freely in its slot. When the central shaft 4 is rotated 180 degrees in the direction shown by the arrow in Figure 3, the bar 103 lifts the pumping lever 99 from the cam 98 and such lifting stops the operation of the lubricator 96.

Lubricator 95 likewise has a pumping lever 106, which is held against the under side of the cam surface 98 by spring 107 and in Figure 3 the pumping lever 106 is shown drawn from contact with the cam surface by means of bar 108, which likewise has a slot 109 therein, in which slides stud 110 on the pumping lever 106. This bar 108 is likewise pivoted to collar 105 by stud 111. When the oscillating shaft 104 is turned through an angle of 180 degrees in the direction of the arrow shown in Figure 3, the bar 108 will be pushed upwardly and will then allow the pumping lever 106 to be operated by the rotating cam 98.

The strip to be corrugated 112 is shown on Figure 3 as entering the front of the machine and passing back of corrugating roll 8 and in front of corrugating roll 7 and in front of presser roll 109 where it receives the liner 113 which is passed around rolls 69, 70, 71, and 9, and then the single faced corrugated web 114 passes out over the top of the machine for the next operation to be performed upon it. Various threading and finger devices are shown on the drawings, but they form no part of this invention.

While certain novel features of the invention have been shown and described and are pointed out in the annexed claims, it will be understood that many changes in forms and details of the device illustrated may be made without departing from the spirit of the invention.

I claim:

1. A corrugating machine comprising a main frame, a movable carrier therein, a pair of corrugating rolls in said carrier on an operative level with the main frame, means to drive said rolls, another pair of corrugating rolls in said carrier, means to move said carrier to interchange the position of one pair of rolls for that of the other and to connect the pair on the operative level with the main frame with the driving means.

2. A corrugating machine comprising a main frame, an oscillatable carrier therein, two pairs of corrugating rolls in said carrier, one above the other, means to drive the lower pair of said rolls and means to interchange the position of said pairs of rolls by oscillating said carrier to disconnect the driving means from the rolls previously driven and to connect them to those previously idle.

3. A corrugating machine comprising a main frame, a pivotally mounted carrier therein, two pairs of corrugating rolls in said carrier, means to drive one roll of one of said pairs of rolls, means to pivotally move said carrier to place either pair of said corrugating rolls in operative relation with said driving means, and means to heat the driven roll.

4. A corrugating machine comprising a main frame, a movable carrier therein, two pairs of corrugating rolls in said carrier, means to drive one pair of said rolls, bearing for the rolls of both pairs, means to move said carrier to place either pair of said corrugating rolls in operative relation with said driving means and means to forcibly lubricate the bearings of the driven rolls.

5. A corrugating machine comprising a main frame, a carrier pivotally mounted therein, two pairs of corrugating rolls in said carrier, means to drive one roll of one of said pairs of rolls, bearings for the rolls of both pairs, means to turn said carrier on its pivot to place either pair of said corrugating rolls in operative relation with said driving means, means to forcibly lubricate the bearings of the driven roll only and to change the lubricating means to lubricate the bearings

of the other roll then driven, upon turning said carrier.

6. A corrugating machine comprising a main frame, a movable carrier therein, two pairs of corrugating rolls in said carrier, means to drive one pair of said rolls, means to apply adhesive to a corrugated strip passing through the driven pair of rolls and means to move said carrier to place either pair of said corrugating rolls in operative relation with said driving means and adhesive applying means.

7. A corrugating machine comprising a main frame, a movable carrier therein a pair of corrugating rolls in said carrier, means to drive said rolls, means to apply adhesive to a corrugated strip passing through said rolls, said rolls, driving means and adhesive applying means being on the operative level with the main frame, another pair of corrugating rolls in said carrier and means to move said carrier to interchange said last named pair for said first named pair whereby after interchanging, they are driven from said driving means and adhesive is applied to a corrugated strip passing therethrough from said adhesive applying means.

8. A corrugating machine comprising a main frame, an oscillable carrier therein, two pairs of corrugating rolls in said carrier, means to drive one pair of said rolls, bodily movable means to apply adhesive to a corrugated strip passing through the driven pair of rolls, means to oscillate said carrier to place the other pair of corrugating rolls into position to be driven by said driving means, means to move said adhesive applying means from operative relation with respect to one pair of rolls and to return them to operative relation with the other pair of rolls.

9. A corrugating machine comprising a main frame, a carrier having trunnions extending therefrom to pivotally support the same on said main frame, two pairs of corrugating rolls in said carrier, one roll of each pair being adapted to be driven, means to drive one of said rolls adapted to be driven, said carrier being adapted to be turned on its trunnions to place either of said rolls adapted to be driven into operative relation with said driving means.

10. A corrugating machine comprising a main frame, a carrier having trunnions extending therefrom to pivotally support the same on said main frame, two pairs of corrugating rolls in said carrier, one roll of each pair being adapted to be driven, means to drive one of said rolls adapted to be driven, said carrier being adapted to be turned on its trunnions to place either of said rolls adapted to be driven into operative relation with said driving means, steam inlets leading into one trunnion and steam outlets therefrom leading separately into said pairs of rolls.

11. A corrugating machine comprising a main frame, a carrier having trunnions extending therefrom to pivotally support the same on said frame, two pairs of corrugating rolls in said carrier, one roll of each pair being adapted to be driven, means to drive one of said rolls adapted to be driven, said carrier being adapted to be turned on its trunnions to place either of said rolls adapted to be driven into operative relation with said driving means, means for admitting steam to either pair of said rolls and preventing its admission to the other.

12. A corrugating machine comprising a main frame, a carrier having trunnions extending therefrom to pivotally support the same on said main frame, two pairs of corrugating rolls in said carrier, one roll of each pair being adapted to be driven, means to drive one of said rolls adapted to be driven, said carrier being adapted to be turned on its trunnions to place either of said rolls adapted to be driven into operative relation with said driving means, means for forcibly lubricating either pair of said rolls and for cutting off the supply of lubricant to the other pair.

13. A corrugating machine comprising a main frame, a rotatable shaft extending therethrough, a carrier supported on said shaft, two pairs of corrugating rolls in said carrier, one roll of each pair being adapted to be driven and the other roll of each pair being mounted on brackets pivoted on said shaft and adjustably and resiliently held against the respective roll adapted to be driven and means to drive one of said rolls adapted to be driven, said carrier being adapted to be turned in said frame to place either of said rolls adapted to be driven in operative connection with said driving means.

14. A corrugating machine comprising a main frame, a movable carrier therein, two pairs of corrugating rolls in said carrier, means to drive one of said corrugating rolls of one pair, a driven presser roll resiliently held toward said driven roll and a similarly held presser roll for the corresponding roll of the other pair of corrugating rolls in said carrier, means to adjustably vary the distance between the driven corrugating roll and its corresponding presser roll and means to move said carrier to place either pair of said corrugating rolls and the corresponding presser roll in operative relation with said driving means.

15. A corrugating machine comprising a main frame, a movable carrier therein, two pairs of corrugating rolls in said carrier, means to drive one of said corrugating rolls of one pair, a driven presser roll resiliently held toward said driven roll and a similarly held presser roll for the corresponding roll of the other pair of corrugating rolls in said carrier, and means to move said carrier to place either pair of said corrugating rolls and the corresponding presser roll in operative relation with said driving means, and means to heat the active pair of said corrugating rolls and its corresponding presser roll independently of the other idle rolls.

16. A corrugating machine comprising a main frame, a movable carrier therein, two pairs of corrugating rolls in said carrier, one roll of each pair being adapted to be driven and the other roll of each pair rotating freely in its bearings, means to adjustably vary the distance between the rolls of each pair, a single driving means to drive the roll adapted to be driven of either pair at the election of the operator, means to move said carrier to place the selected roll in operative relation with the driving means.

17. A corrugating machine comprising a driven corrugating roll and a freely rotating corrugating roll, pivoted brackets supporting said last named roll at each end, one of said brackets having a section at its fulcrum end and a separable roll bearing section at its swinging end, means to adjust the distance between said fulcrum end section and said roll bearing section, and means to rigidly fasten said two sections together in their adjusted positions, and means to hold said last named roll toward said driven roll.

18. A corrugating machine including a pair of corrugating rolls, a pair of pivoted arms carrying one of said rolls, one of said arms having a fulcrum bearing section and a roll bearing section,

and means to adjust the distance between the bearing centers of said sections, and means to hold said roll carried by the pivoted arms adjacent the other roll.

19. A corrugating machine including a pair of corrugating rolls, a pair of pivoted arms carrying one of said rolls, one of said arms having a fulcrum bearing section and a roll bearing section, the axes through the fulcrum bearing and the roll bearing being parallel, means to adjust the distance between the axes through the fulcrum bearing and the roll bearing, respectively of said arm, means on both sides of the plane determined by said axes to hold said sections in adjusted position, and means to hold said roll carried by the pivoted arms adjacent the other roll.

HENRY B. GREENWOOD.