

June 27, 1933.

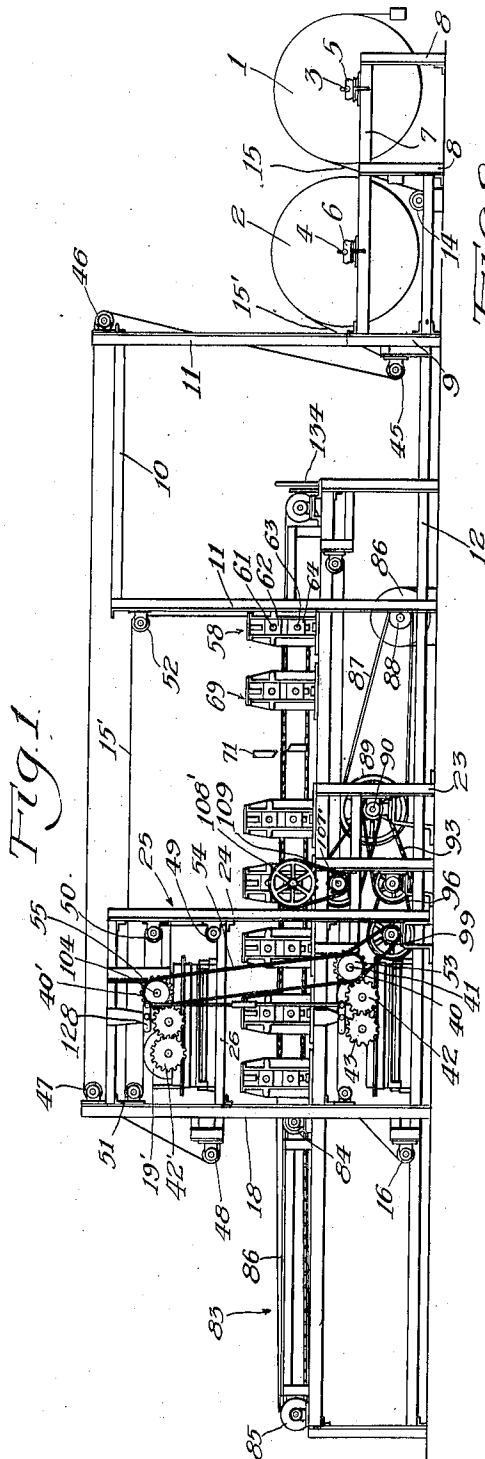
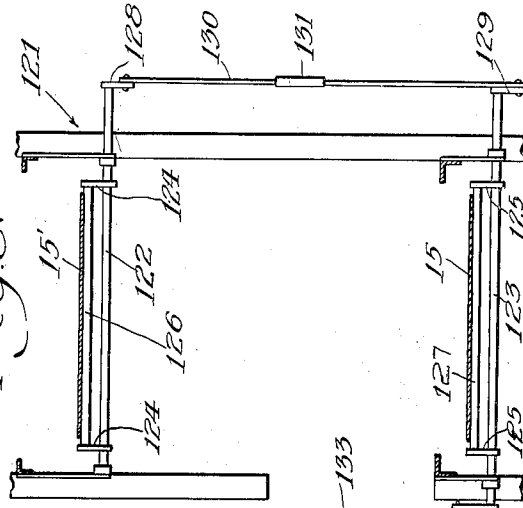
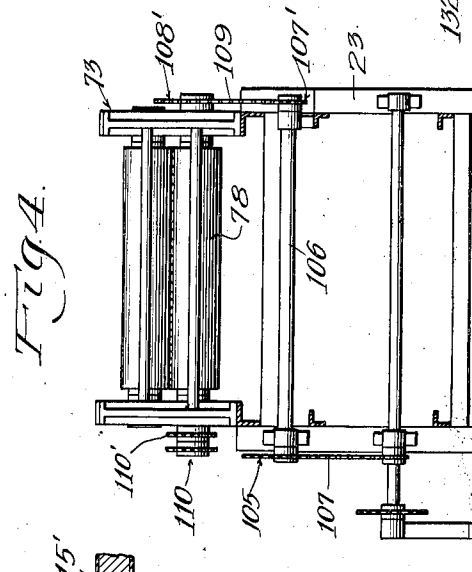
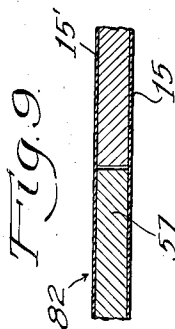
J. C. NICHOLS

1,915,690

APPARATUS FOR MAKING MULTIPLY BOARD

Filed Jan. 25, 1932

4 Sheets-Sheet 1



Inventor:
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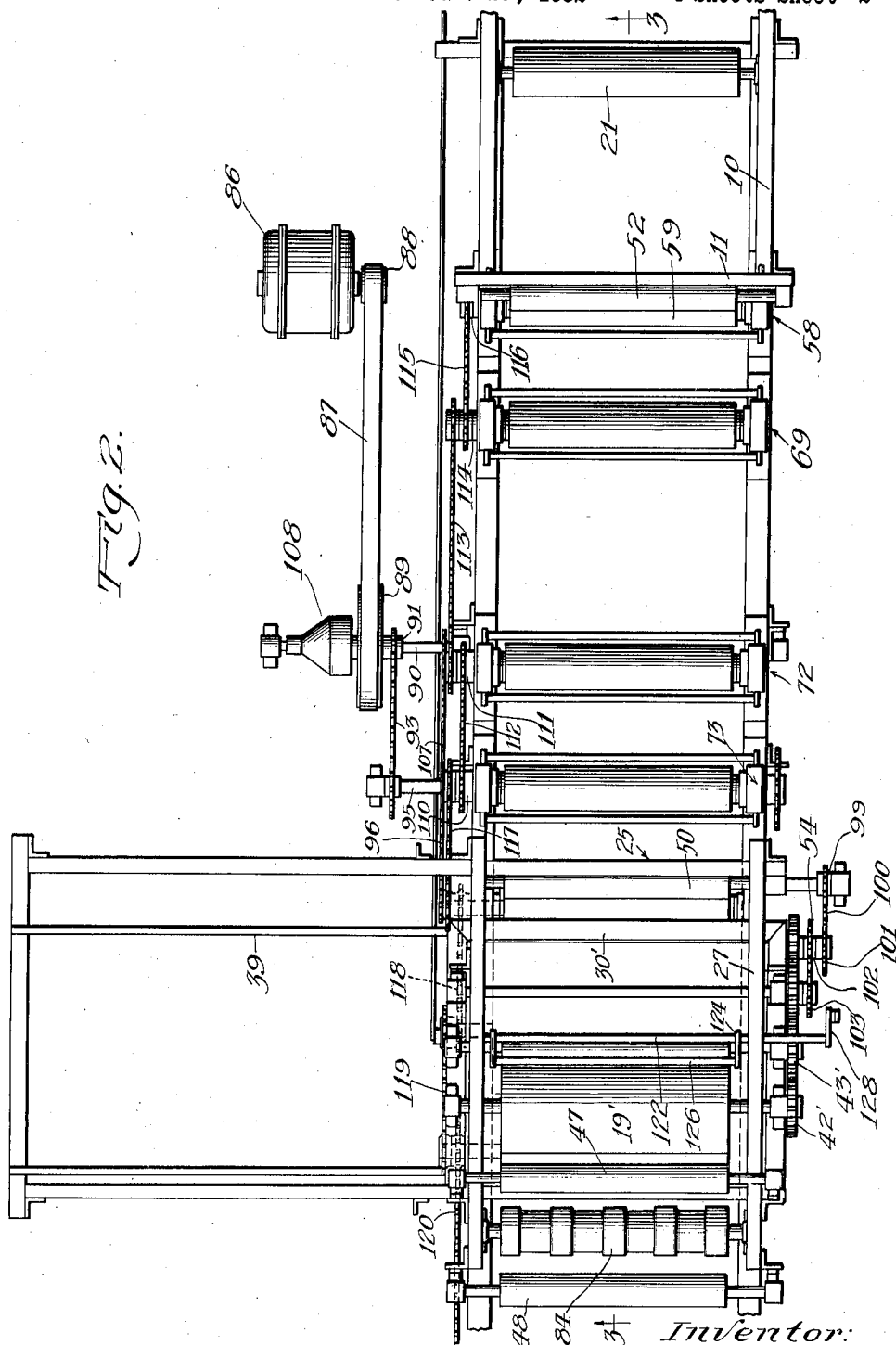
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4 Sheets-Sheet 2



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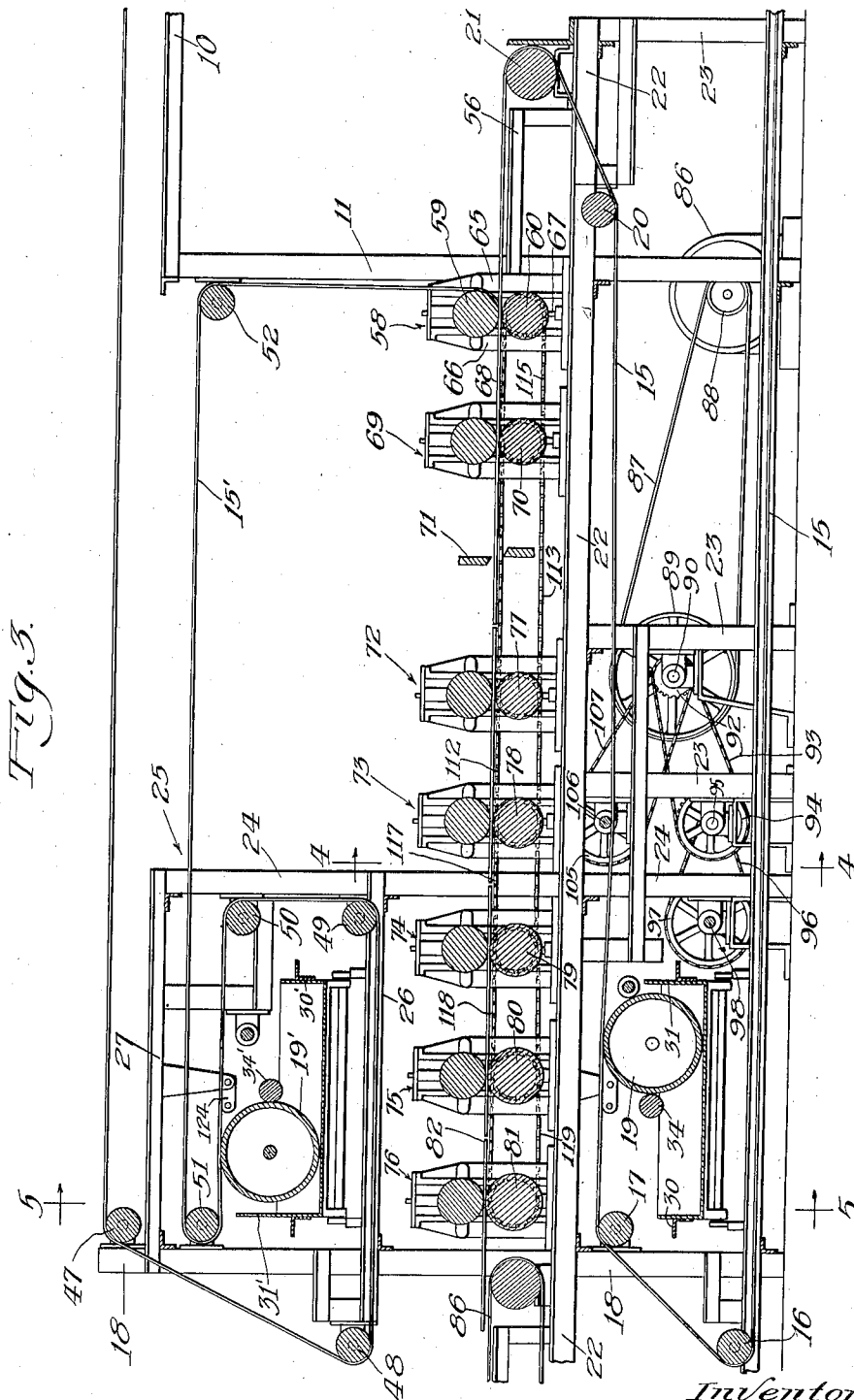
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4 Sheets-Sheet 4

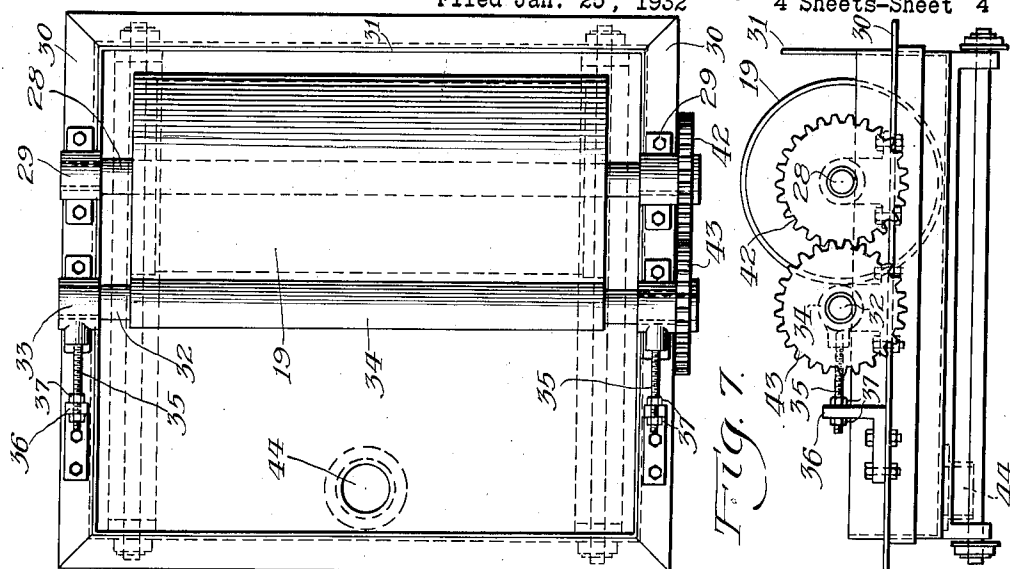
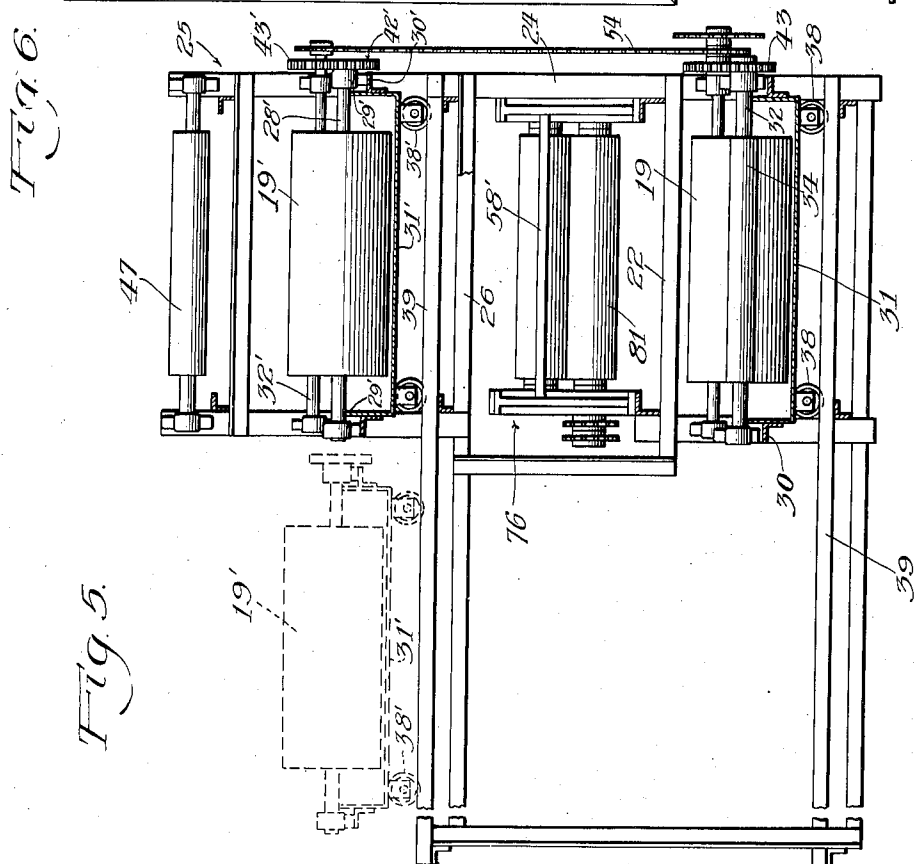


Fig. 7.



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Fig. 5.

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UNITED STATES PATENT OFFICE

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APPARATUS FOR MAKING MULTIPLY BOARD

Application filed January 25, 1932. Serial No. 588,605.

This invention relates to improvements in machines for making multi-ply board and refers specifically to apparatus for continuously adhesively uniting a flexible fibrous or fabric web to one or both sides of a plurality of relatively rigid cores or slabs of wood or the like.

The utility, objects and advantages of my invention will be apparent from the accompanying drawings and following detail description.

In the drawings, Fig. 1 is a side elevational view of a machine embodying the conception of my invention.

Fig. 2 is a fragmentary top plan view of the device shown in Fig. 1.

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 2.

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 3.

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 3.

Fig. 6 is a detail top plan view of one set of adhesive and doctor rolls.

Fig. 7 is a side elevational view of the adhesive unit shown in Fig. 6.

Fig. 8 is a detail elevational view of the web raising mechanism.

Fig. 9 is a sectional view of the product made by my machine.

Referring in detail to the drawings, 1 and 2 indicate rolls of paper, fabric or the like which may be mounted upon rods 3 and 4 respectively which, in turn, are supported by bearings 5 and 6. The bearings 5 and 6 may be mounted upon beams 7 which may be positioned upon each side of the rolls 1 and 2, said beams being supported by uprights 8—8 and 9. The upright 9 may comprise one unit of a skeleton frame structure provided with co-operating units 10 and 11. A base beam 12 may traverse substantially the entire length of the machine proper and a transversely disposed guide roll 14 may be mounted upon said beam adjacent one end thereof.

A web 15 of paper, fabric or the like, may be taken from the roll 1 and may be passed beneath the guide roll 14. Said web may be carried forwardly to a second guide roll 16 which may be mounted at the opposite end of

the machine proper with its axis in the same horizontal plane as the roll 14. The travel of the web 15 may be reversed in its passage over the roll 16 and may be carried upwardly over guide roll 17 which may be mounted upon upright 18. The web 15, after its passage over the roll 17, accomplishes a complete reversal in direction and passes toward the front end of the machine. During this latter passage the lower face or surface of said web comes into contact with the peripheral surface of adhesive roll 19 which will be hereinafter more fully described. Said web may then be carried over guide roll 20 with its adhesive surface facing downwardly. After passage over the roll 20 the direction of travel of the web may be changed and said web may be carried over reversing roll 21 mounted upon platform 22.

The platform 22 may be supported by columns 23, 24 and 18, the columns 18 and 24 constituting portions of the skeleton frame work 25, said columns being spanned intermediate their length by platform 22, upper glue unit platform 26 and a beam 27.

The glue 19 may be mounted upon shaft 28 which, in turn, may be journaled at each of its ends in bearings 29. The bearings 29 may be mounted in any suitable manner upon flanges 30 which, in turn, are positioned upon the sides of vat 31. The flanges 30 may take the form of angle irons as shown best in Fig. 5. A shaft 32 mounted in bearings 33 may be disposed parallel to the shaft 28 and may carry a doctor roll 34, the surface of which is positioned adjacent the surface of the glue roll 19. The bearings 33 are mounted upon the flanges or angle iron 30 in such a manner as to permit limited slidable movement of the roll 34 towards or away from roll 19. The bearings 33 may be so moved by means of screws 35 threadedly positioned through lugs 36 which, in turn, are mounted upon flanges 30. The bearings 33 may be locked at a desired position with respect to the bearings 29 by means of nuts 37 positioned upon screws 35.

In utilizing this portion of the apparatus a quantity of liquid adhesive material such as asphalt, sodium silicate or the like, may be

introduced into the vat 31. Upon rotation of the glue roll 19 the surface thereof may carry a film of said adhesive material and by the provision of the doctor roll 34 the thickness of said film may be controlled by adjusting the position of the roll 34 with respect to the roll 19. In this manner the web 15, coming into contact with the surface of the glue roll 19, will receive a film of adhesive from said glue roll of a desired thickness.

The vat 31 may be mounted upon wheels 38 which may be adapted to travel upon tracks 39 positioned at the lower portion of the frame work 25, said tracks extending outwardly in a transverse direction with respect to said frame work a distance substantially equal to the width of the vat 31. A gear 40 carried by shaft 41 may be mounted within the frame 25, said gear being adapted to mesh with gear 42 mounted at one end of the shaft 28. The gear 42, in turn, meshes with gear 43 which is mounted upon the doctor shaft 32. It is to be noted that the driving gear 40 is mounted rigid with respect to the frame 25 whereas the gears 42 and 43 are carried as integral portions of the glue unit. Consequently, when it is desired to replenish the supply of adhesive within the vat 31, said vat may be rolled along tracks 39 to its outermost position upon said tracks. In this position the various units comprising the gluing mechanism may be readily accessible for purposes of cleaning or minor repairs. If desired the adhesive material may be drained from the vat 31 through the drain opening 44. To return the vat 31 to its normal position within the frame work 25, the same is rolled inwardly toward said frame work and the gear 42 is brought into mesh with the gear 40. As will be hereinafter more fully brought out, the machine proper is provided with two adhesive applying mechanisms, both of which are of similar construction and operate in a similar manner.

A web 15' of paper or fabric may be drawn from the roll 2 and may be carried over guide roll 45 mounted adjacent the lower portion of the upright 9. Said web may thence be carried over guide roll 46 mounted upon the upper end of the upright 9. The web may thence be carried forwardly to guide roll 47 mounted upon the upper end of the upright 18. Upon passing over the roll 47 said web is carried downwardly over roll 48 whence its direction of travel is reversed, the web passing from the roll 48 to roll 49 mounted upon upright 24. From the roll 49 the web is carried over roll 50 and the direction of travel of said web is again reversed upon its passage over roll 50. The web then travels to roll 51 mounted upon the inner side portion of the upright 18 and during its passage from roll 50 to roll 51, the lower surface of said web comes into contact with the rotating glue roll 19'. In this manner a quantity of ad-

hesive is deposited upon the lower surface of the web 15. Said web is then trained over roll 51 and its direction of travel is again reversed, the adhesive side of the roll at this period facing upwardly. The adhesive coated web is then passed over guide roll 52 mounted upon upright 11.

The glue roll 19' is mounted upon shaft 28' which, in turn, is journaled in bearings 29' mounted upon flanges 30' which in turn, are positioned upon the sides of vat 31'. A gear 40' is journaled in the frame work 25 and meshes with gear 43' which, in turn, meshes with gear 42' mounted upon the end of shaft 28'. The gear 43' is mounted upon one end of shaft 32' which may carry a doctor roll similar in construction to the doctor roll 34 carried by the shaft 32 in the lower glue unit. Sprocket wheel 53 may be mounted upon shaft 41 of the lower glue unit, said sprocket being adapted to drive sprocket chain 54 which, in turn, drives sprocket wheel 55 rigidly connected to the same shaft as that upon which gear 40' is mounted. In this manner both glue units may be operated in timed relationship and may be driven from the same source.

The vat 31' may be mounted upon track 39 which, in turn, may be positioned upon platform 26 and the arrangement is such that the vat 31' may be moved to the position shown in dotted lines in Fig. 5. In this manner the adhesive contained within the vat 31' may be changed or removed and the upper glue unit may be rendered more accessible for minor repairs, cleaning and oiling.

It can readily be seen that the upper and lower glue units are of substantially identical construction. However, it will be noted that glue rolls revolve in opposite directions inasmuch as at the period of gluing, the web 15 and web 15' travel in opposite directions. However, the essential features of both glue units are similar.

A table 56 may be mounted upon the platform 22 adjacent the reversing roll 21 and the arrangement is such that the adhesively coated web 15 carried over the roll 21 passes over the surface of the table 56 with its adhesively coated face upwardly. During the passage of the web 15 over the table 56, a plurality of cores, panels or slabs of relatively thin wood 57 are positioned upon the moving web in abutting relationship. The cores or panels 57 may be disposed upon the moving web 15 either by hand or by suitably designed mechanism (not shown). The web may thence be carried forwardly to the first press unit 58 and simultaneously with the passage of the web 15 and the cores 57 through a press unit 58, the web 15' trained over the roll 52 may also be passed to the press unit 58. In this manner the cores or slabs 57 confined between the adhesively coated surfaces of the

webs 15 and 15' are subjected to a pressing action.

The press unit 58 may comprise an upper press roll 59 and a lower press roll 60, said latter roll being positioned immediately beneath the roll 59. The roll 59 may be mounted upon shaft 61 which, in turn, is journaled in block 64. Both of the blocks 62 and 64 may be slidably positioned between guides 65 and 66, a pair of said guides being mounted upon the platform 22 at each end of the rolls 59 and 60. The space between the surfaces of the rolls 59 and 60 may be varied by moving the blocks 62 and 64 upwardly or downwardly by means of screws 66 and 67 which may be operatively connected respectively to the blocks 62 and 64. The cores 57 confined between the webs 15 and 15' may be carried between the rolls 59 and 60 and, as can readily be seen, the pressure of the rolls upon the composite unit, hereinafter designated 68, may be controlled.

After passing through the press unit 58 the composite product may be carried to a second press unit 69 which is similar in construction to the unit 58 with the one exception that the lower roll 70 corresponding to the roll 60 in the unit 58 is of greater diameter. Upon passing through the second press unit 69 said composite product is again subjected to pressure which tends to firmly unite the webs 15 and 15' and the cores or slabs 57.

After passing through the press unit 69 the composite product may be cut transversely by knives 71 which are shown diagrammatically in Fig. 3, said knives being either mechanically operated or operated by hand.

After severance the units severed from the continuously moving composite product 68 may be passed in seriatum through press units 72, 73, 74, 75 and 76 which are similar in construction to the units 58 and 69. However, as a feature of my invention, the lower rolls 77, 78, 79, 80 and 81 of the respective presses 72, 73, 74, 75, and 76 may be of progressively increasing diameters. The purpose of providing progressively increasing diameters will be hereinafter more fully described.

The units hereinafter designated 82, after leaving the last press unit 76, may be carried to a conveyor 83 which may be of conventional construction having the usual rolls 84 and 85 over which conveyor belt 86 may travel. The units 82 may be carried by said conveyor to any desired portion of the plant where the same may be bundled, packed and made ready for shipment.

The lower rolls of each of the press units may be driven rolls whereas the upper rolls may run idle. Further, as will be hereinafter more fully described, the lower rolls all rotate at the same angular velocity. However, inasmuch as the diameters of the lower rolls progressively increase in the direction of

travel of the product, the peripheral speeds of said rolls progressively increase in the same proportion. The action which results from this arrangement is that a degree of slippage takes place as the product passes between each of the rolls of the press unit since the product moves at a speed substantially equal to the peripheral speed of the roll through which it has previously passed. Hence, it can be seen that the lower web 15 will be stretched and will be firmly united to the lower surfaces of the slabs 57, all wrinkles and creases which would otherwise be present in said lower web being removed by this stretching action. Inasmuch as the lower web 15 tends to move at a speed equal to the peripheral speed of the lower roll with which it is in contact, it also tends to carry the interposed slabs 57 at the same speed. However, this increase in speed is opposed by the slower moving upper web 15' which moves at a speed equal to the peripheral speed of the lower roll of the last preceding press unit, and consequently this stretching action takes place in the upper web, the force of the stretch being exerted in the opposite direction to that force exerted upon the lower web. In this manner the wrinkles and creases are removed from the upper web 15' and said upper web is firmly united to the upper surfaces of the slabs 57. The action which has been hereinbefore described in general simulates a rubbing or ironing action and tends to more firmly unite the respective webs to the sides or faces of the slabs. In order to utilize this action the units 82 may be cut by the knives 71 in such dimensions that the length of one unit 82 is greater than the distance between the center lines of two adjacent presses. In other words, the two webs confining the interposed slabs of each unit will be simultaneously acted upon by at least two presses.

It is to be understood, of course, that the composite product 68 may be carried as a unit through the entire series of presses and said product may be subsequently cut into unit blocks or slabs as it passes from the last press unit 76. However, inasmuch as the slabs 57 are of relatively reduced thickness, said slabs warp very easily. After warping has taken place, difficulty is encountered in properly adhesively uniting the webs 15 and 15' to the surfaces of the slabs, the action which takes place being that the webs and slabs are brought into intimate contact with each other during their passage through a press, but immediately upon leaving said press, the warping tendencies of the slab reassert themselves and contact is broken between the webs and the surfaces of the slabs inasmuch as both webs being continuous are maintained in tension and tend to straighten themselves into a true plane instead of following the surface contour of the slabs

57. By cutting the composite product 68 into unit products 82 previous to its passage through all of the presses and preferably before the adhesive tends to set, the warping tendencies of the slabs 57 do not present these difficulties and the webs 15 and 15' more easily conform themselves to the contour of the surface of the slabs.

It is to be understood, of course, that the number of presses utilized is dependent upon the dimensions of the slabs 57, the thickness of the webs 15 and 15', the nature of said web and the characteristics of the adhesive applied thereto, particularly its characteristics as to setting. It is to be understood that the step of cutting the composite product 68 may take place after the pressing operations or between any of the presses. Further, the resulting product instead of comprising wooden slabs confined between two webs of paper or fabric may comprise a plurality of wooden slabs disposed in abutting relationship and adhesively united to but one web of paper or fabric. In the manufacture of this latter product upon my machine it can readily be seen that but one web may be fed to the presses, either the upper web 15' or the lower web 15.

The entire machine may be actuated by an electric motor 86 or other suitable prime mover. If a motor is used the same may be connected by belt 87 which may pass over pulley 88 of the motor and around pulley 89 which may be loosely mounted upon shaft 90. The pulley 89 may carry sleeve 91 upon which may be positioned a sprocket wheel 92. A sprocket chain 93 may operatively connect sprocket wheel 92 and sprocket wheel 94 which may be mounted upon shaft 95. Another sprocket wheel (not shown) may be mounted upon shaft 95 and may drive sprocket chain 96 which, in turn, drives sprocket wheel 97 mounted upon shaft 98. The shaft 98 may pass transversely across the machine proper and may terminate in sprocket wheel 99 which, in turn, drives sprocket chain 100 and operatively connects the wheel 99 and sprocket wheel 101. Sprocket wheel 101 may be mounted upon shaft 41 which also carries gear 40, the arrangement being such that said gear when rotated, rotates respectively gears 42 and 43 which drive the glue roll 19 and doctor roll 34. A second sprocket wheel 102 may be mounted upon the shaft 41 and is operatively connected to sprocket wheel 103 mounted upon shaft 104 which incidently is the same shaft which carries the gear 40'. As has been hereinbefore described, the chain 54 operatively connects sprocket wheel 102 and 103. In this manner both of the gluing units comprising the glue rolls 19 and 19' are operated simultaneously from the same source of power.

To drive the press units which in turn

serve as the actuating means for the movement of the webs 15 and 15' and also the movement of the composite product 68 and unit products 82, a sprocket wheel (not shown) may be rigidly mounted upon shaft 90 and may be operatively connected to a sprocket wheel 105 which may be mounted upon shaft 106 by means of sprocket chain 107. A clutch mechanism 108 may be operatively mounted upon shaft 90 and is so constructed that upon suitable movement of clutch 108, pulley 89 may be mechanically connected to shaft 90, and, hence, both shaft 90 and pulley 89 will revolve as a unit. The clutch 108 is shown diagrammatically and is intended to indicate any type of sliding clutch mechanism.

Shaft 106 passes transversely across the machine proper and carries at its opposite end sprocket wheel 107', said sprocket wheel being operatively connected to sprocket wheel 108' by sprocket chain 109. The latter sprocket wheel, namely wheel 108', is mounted upon the lower roller shaft of press 73 as shown best at 110 in Fig. 4. At the opposite end of shaft 110 a sprocket wheel 110' is carried which connects with a similar sprocket upon shaft 111 by means of sprocket chain 112. Shaft 111 also carries lower roll 77 of the press unit 72. A second sprocket wheel is mounted upon shaft 111 and a sprocket chain 113 passes over said sprocket wheel and operatively connects the same with a sprocket wheel mounted upon shaft 114 upon which lower roll 70 of press 69 is mounted. A second sprocket wheel is mounted upon shaft 114 and is operatively connected by means of sprocket chain 115 with shaft 116 upon which lower roll 60 of press unit 58 is mounted. In a similar manner the lower rolls 79, 80 and 81 are driven respectively by sprocket chains 117, 118 and 119, it being understood, of course, that all of the sprocket wheels with which chains 112, 113, 115, 117, 118 and 119 are connected are of equal diameters so that all of the lower rolls 60, 70, 77, 78, 79, 80 and 81 will rotate at equal angular velocities.

It is to be understood of course, that the lower rolls of each of the present units may have equal diameters and the drive comprising the various sprocket wheels and chains may be so arranged as to impart to the lower rolls progressively increasing angular velocities in the direction of travel of the product 68. In this way the same result would be accomplished since said lower rolls would then each have progressively increasing peripheral speeds. It is also to be understood that the rolls instead of being operatively connected through means of sprocket wheels and chains, may be geared together in an obvious manner and in addition, if desired, both rolls of each of the presses may be driven at equal or differential peripheral or angular velocities.

A sprocket chain 120 may operatively connect the lower roll 81 of the press unit 76 with the conveyor roll 84. In this manner the conveyor belt 86 will be driven at a peripheral speed equal to the speed of the unit products 82 which leave the last press unit 76.

It will be observed that the glue rolls 19 and 19' are connected directly to the motor 86, that is, whenever said motor is in operation the glue rolls will rotate but it will also be observed that the driving rolls of the press units are connected to the motor 86 through the medium of a clutch. By this arrangement the press units may be operated independently of the glue roll drive. The advantage of this arrangement is that during the operation of the device it may become desirable to stop the travel of the webs 15 and 15' whereas an adhesive material may be contained in the vats 31 and 31' which may quickly set. It can readily be seen that if the glue rolls were stopped each time that the press units were stopped, that portion of each of the glue rolls upon which a quantity of glue may be carried and immersed in the glue within the vat would have a film of hardened glue upon their peripheries when operations were again commenced. Hence it is desirable during operation of the machine to maintain the glue rolls 19 and 19' in constant operation even though the press units may be rendered inoperative.

It may be necessary during the operation of the device to stop the press units which, in turn, stops movement of the webs 15 and 15'. However, as has been hereinbefore described, the glue rolls 19 and 19' continue to rotate and inasmuch as web 15 will be in contact with the periphery of glue roll 19 and web 15' will be in contact with glue roll 19', an undesirable quantity of glue may be transferred from the moving glue rolls to the stationary webs. Hence, when operations again commence, a possibility exists of the glue rolls carrying the webs upon their surfaces thereby tearing the web and in general balling up the entire machine. To obviate this difficulty I provide a web lifting apparatus designated 121 which may comprise shafts 122 and 123 mounted, respectively, adjacent the point of contact of the webs 15' and 15 with the glue rolls 19' and 19. Arms 124 and 125 may be respectively mounted upon each of the shafts 122 and 123, said arms respectively carrying rods 126 and 127. Cranks 128 and 129 may be respectively mounted upon the ends of the shafts 122 and 123, said cranks being interconnected by tie rod 130 provided with turnbuckle 131. Bell crank lever 132 may be mounted upon the opposite end of the shaft 123 and may be connected to link 133 which, in turn, may be connected to lever 134. The arrangement is such that when the movement of webs 15 and 15' has been stopped, lever 134 may be shifted thereby rocking shaft 123

and 122 until rods 127 and 126, normally positioned between the webs 15 and 15', are raised into contact with the lower surfaces of said webs thereby carrying said webs upwardly above their normal position and breaking contact between said webs and the glue rolls. Hence, an undesirable accumulation of adhesive may be prevented from being deposited upon the stationary webs 15 and 15' when the press units are stopped and the glue units are in operation.

I claim as my invention:

1. A device for making multi-ply board which comprises in combination, means for feeding a continuous web of fibrous material, means for applying coating to said web, means for uniting laterally spaced wooden cores to said adhesively coated web, means for severing said united web and cores into units, and means for pressing said units in seriatum.

2. A device for making multi-ply board which comprises in combination, means for feeding a continuous web of fibrous material, means for applying adhesive to a surface of said web, means for uniting said adhesively coated web to laterally spaced wooden cores and simultaneously pressing said web into intimate contact with said cores comprising a plurality of pairs of rotating press rolls, means for driving a roll of each pair, means for driving said driven rolls at progressively increasing peripheral speeds, said web and cores being passed successively between each pair of rolls.

3. A device for making multi-ply board which comprises in combination, means for feeding a continuous web of fibrous material, an adhesive carrying roll, means for applying adhesive to the surface of said roll, means for transferring said adhesive to the continuously moving fibrous web, means for uniting and pressing said web into contact with laterally spaced wooden cores, and means for independently actuating said adhesive carrying roll and pressing means.

4. A device for making multi-ply board which comprises in combination, means for feeding a plurality of continuous webs of fibrous material, means for applying adhesive to a surface of each of said webs, means for uniting said adhesively coated webs to laterally spaced wooden cores and simultaneously pressing said webs into intimate contact with said cores, and means for independently driving said adhesive applying means and said uniting and pressing means.

5. In combination, a frame for supporting a roll of fibrous material, a vat for liquid adhesive, a roll continuously rotating in said vat, means for carrying a fibrous web from said first mentioned roll into contact with said continuously rotating roll thereby transferring a film of adhesive to a surface of said web, a plurality of press units compris-

ing pairs of cooperating press rolls, means for uniting said adhesively coated web with laterally spaced wooden cores, means for passing the same between said press rolls, and means for independently driving said continuously rotating adhesive roll and said press rolls.

6. In combination, a frame for supporting a roll of fibrous material, a vat for liquid adhesive, a roll continuously rotating in said vat, means for carrying a fibrous web from said first mentioned roll into contact with said continuously rotating roll thereby transferring a film of adhesive material to a surface of said web, a plurality of press units comprising pairs of cooperating press rolls, means for uniting said adhesively coated web with laterally spaced cores, means for passing the same between said press rolls, means for independently driving said continuously rotating adhesive roll and said press rolls, and means for removing said web from contact with said adhesive roll.

7. A press unit for adhesively uniting laterally spaced wooden cores with a continuously moving fibrous web which comprises in combination, a plurality of pairs of juxtaposed press rolls disposed in series between each pair of which the web and cores are passed, means for driving one roll of each pair of rolls, and means for driving the driving rolls of each of the pairs at progressively increasing peripheral speeds.

8. A press unit for adhesively uniting wooden cores and a continuously moving fibrous web which comprises in combination, a plurality of pairs of juxtaposed press rolls disposed in series between each pair of which the web and cores are passed, means for driving one roll of each pair of rolls, means for driving all of said rolls at equal angular velocities, each of said driving rolls in said series having progressively increasing diameters.

In testimony whereof I affix my signature.
JAMES C. NICHOLS.

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