June 17, 1924. 1,497,818

G. X. WENDLING

WOOD CORE WALL BOARD MACHINE

Filed July 5, 1922 9 Sheets-Sheet 1

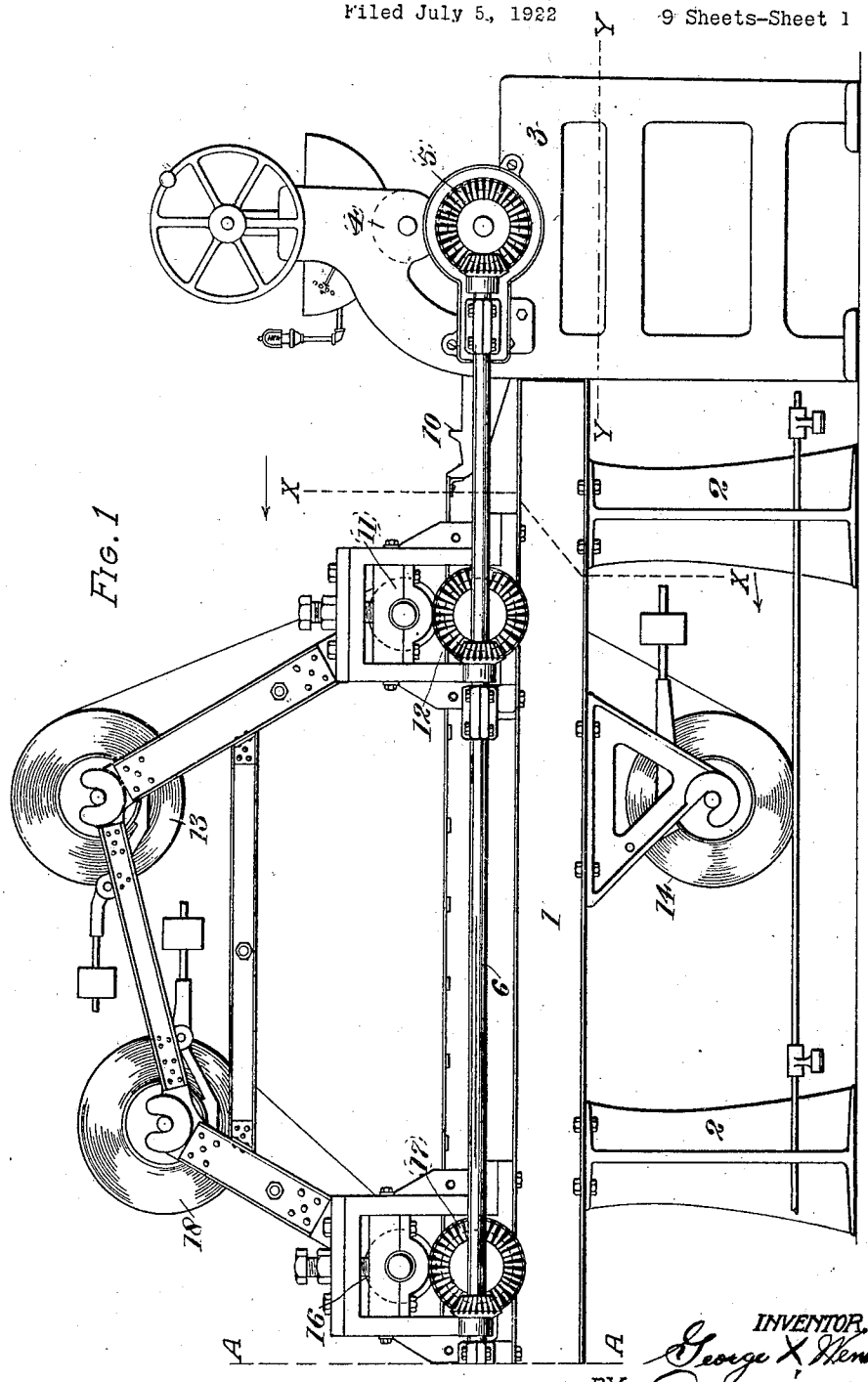



FIG. 1

INVENTOR.
George X. Wendling
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June 17, 1924.

1,497,818

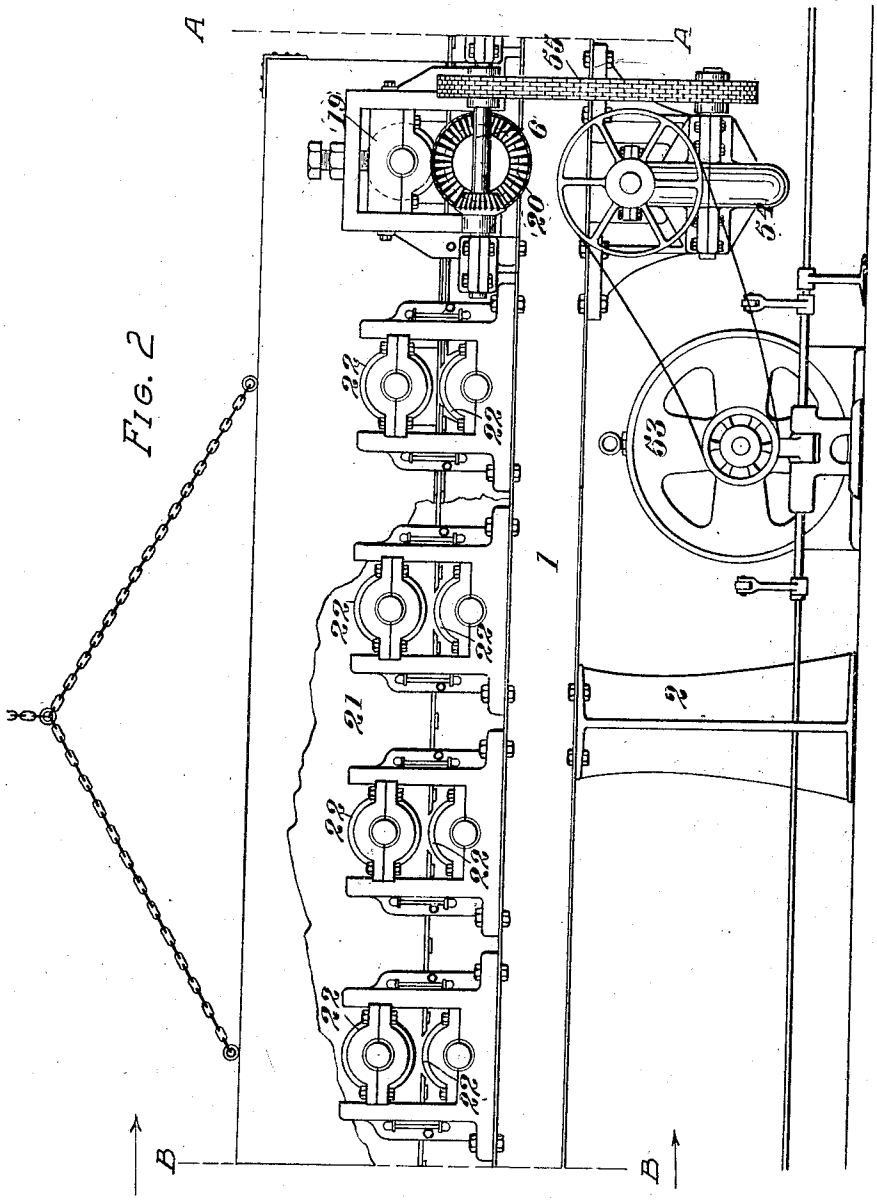
G. X. WENDLING

WOOD CORE WALL BOARD MACHINE

Filed July 5, 1922

9 Sheets-Sheet 2

FIG. 2




INVENTOR.
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June 17, 1924.

1,497,818

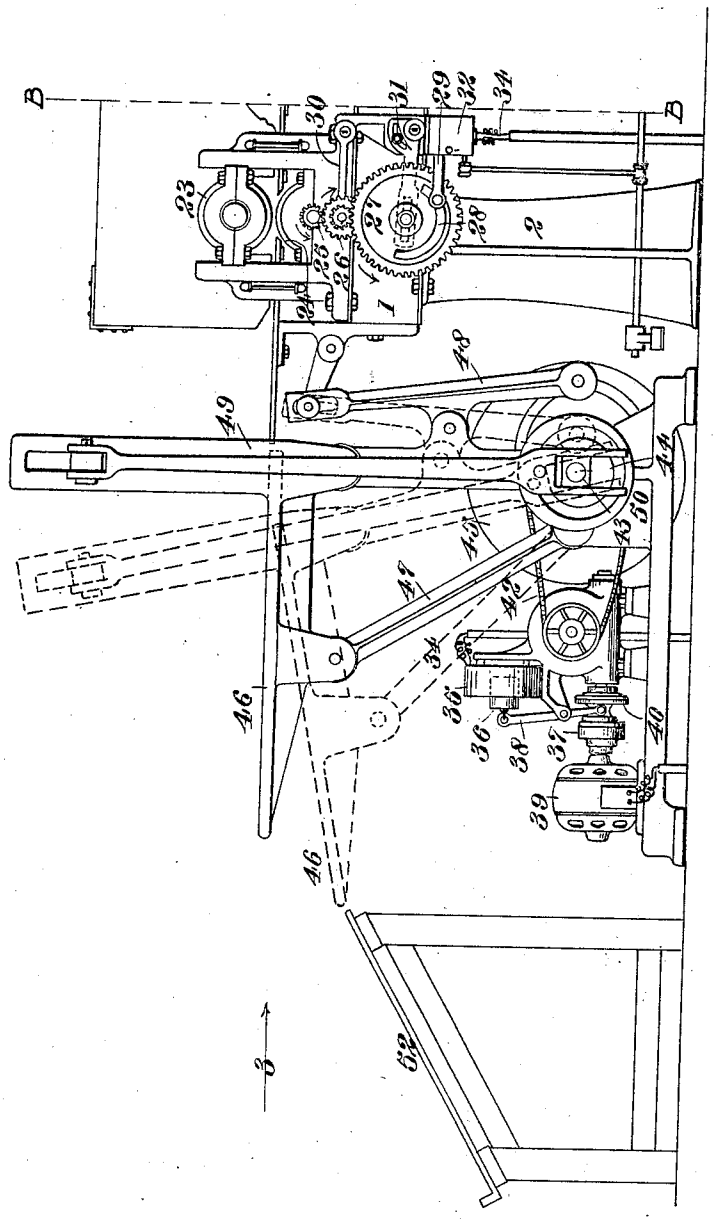
G. X. WENDLING

WOOD CORE WALL BOARD MACHINE

Filed July 5, 1922

9 Sheets-Sheet 3

FIG. 3




INVENTOR.
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1,497,818

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WOOD CORE WALL BOARD MACHINE

Filed July 5, 1922

9 Sheets-Sheet 4

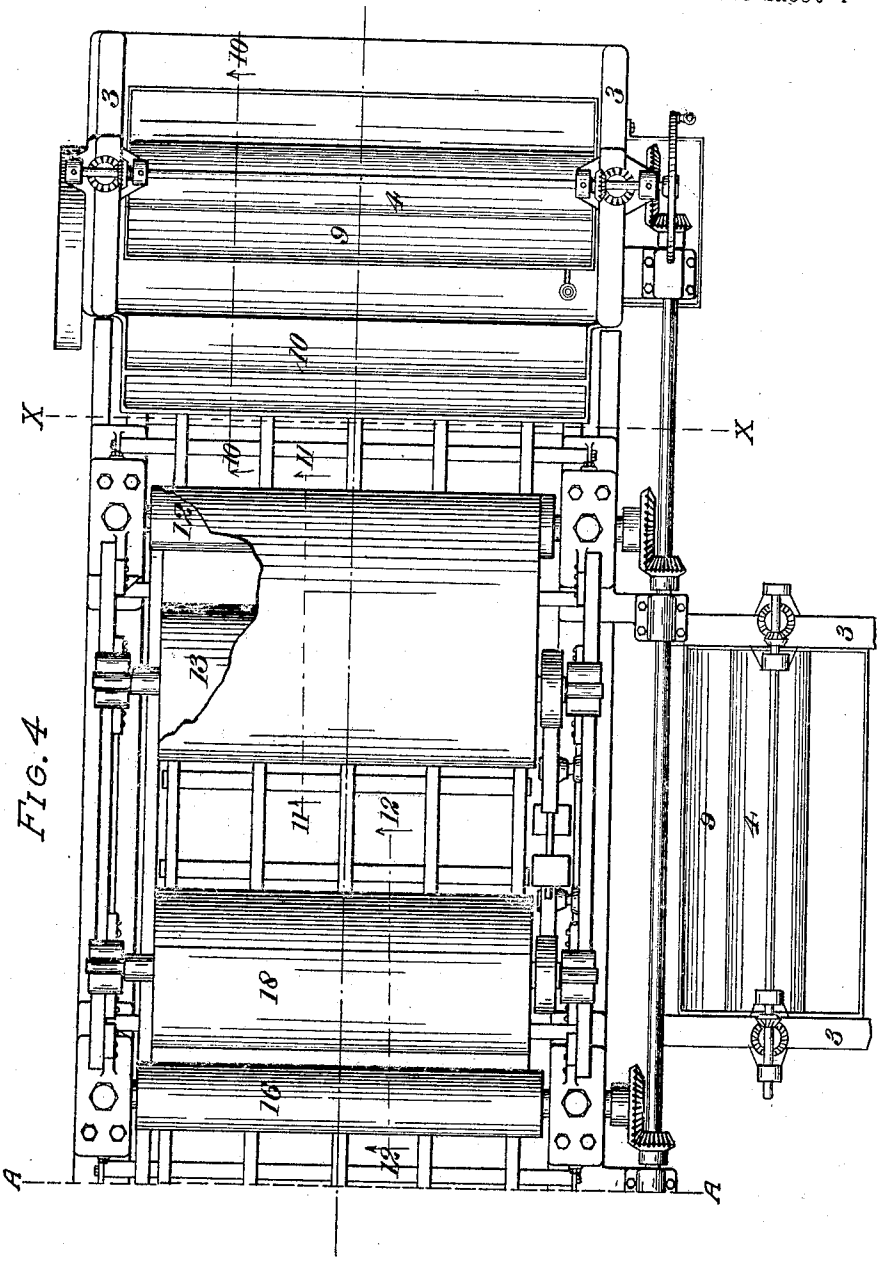



FIG. 4

INVENTOR
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June 17, 1924.

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WOOD CORE WALL BOARD MACHINE

Filed July 5, 1922

9 Sheets-Sheet 5

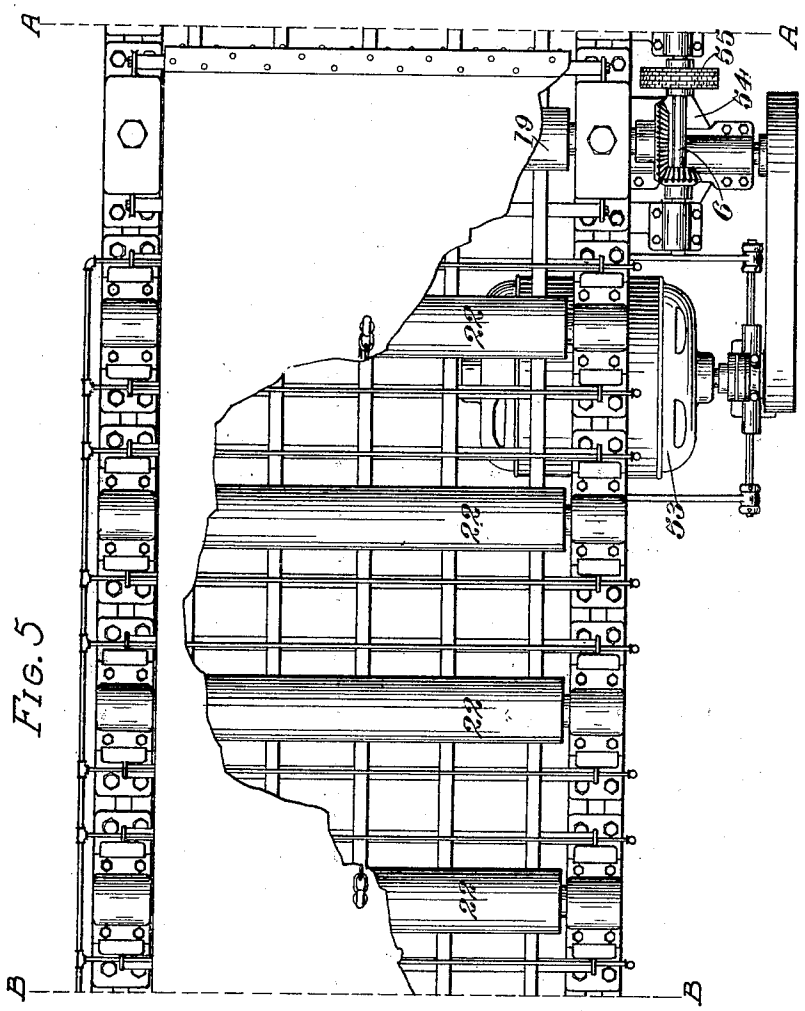



FIG. 5

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June 17, 1924. 1,497,818

G. X. WENDLING

WOOD CORE WALL BOARD MACHINE

Filed July 5, 1922 9 Sheets-Sheet 6

FIG. 6.

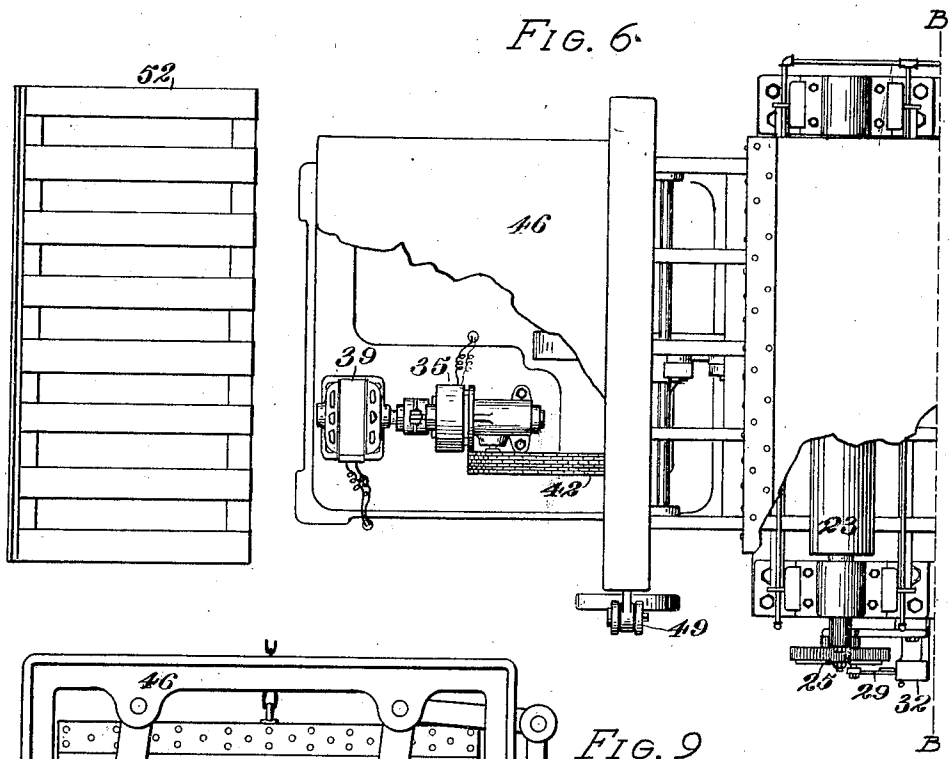
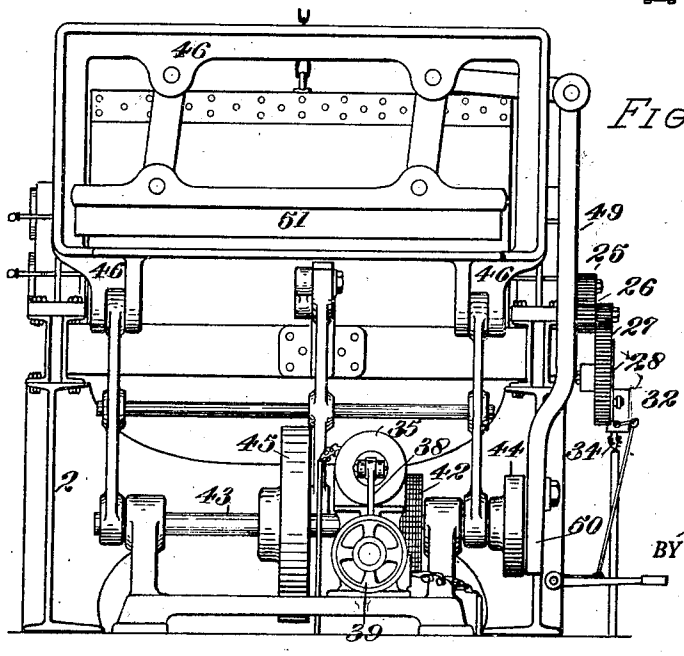



FIG. 9.




INVENTOR.
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June 17, 1924.

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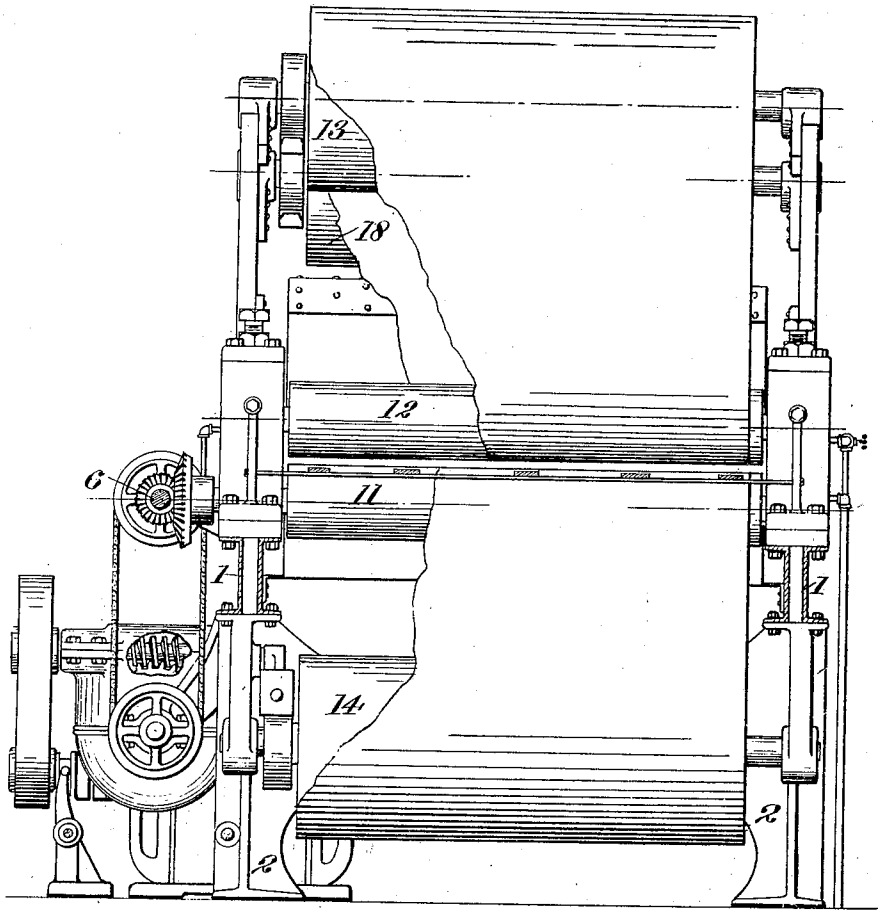
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WOOD CORE WALL BOARD MACHINE

Filed July 5, 1922

9 Sheets-Sheet 7

FIG. 7




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June 17, 1924.

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G. X. WENDLING

WOOD CORE WALL BOARD MACHINE

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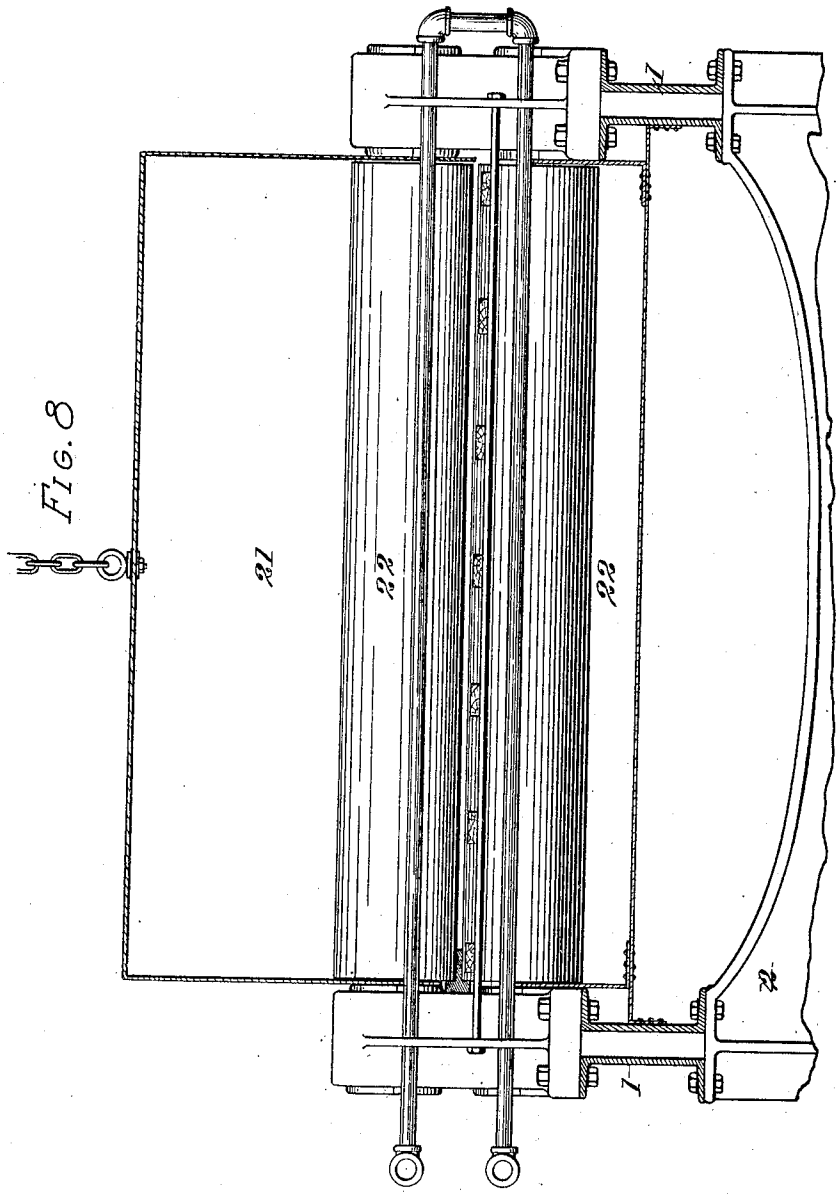



Fig. 8

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June 17, 1924.

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G. X. WENDLING

WOOD CORE WALL BOARD MACHINE

Filed July 5, 1922

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FIG. 10

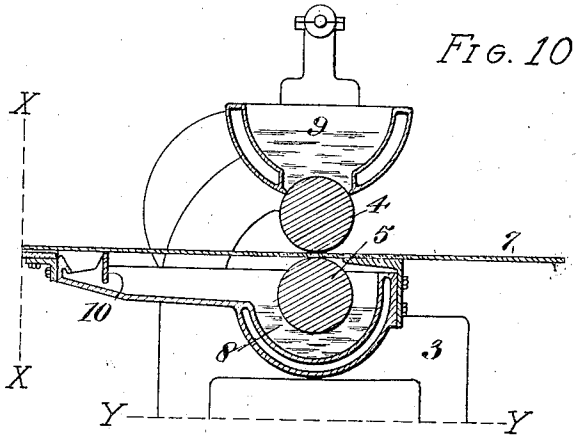



FIG. 12

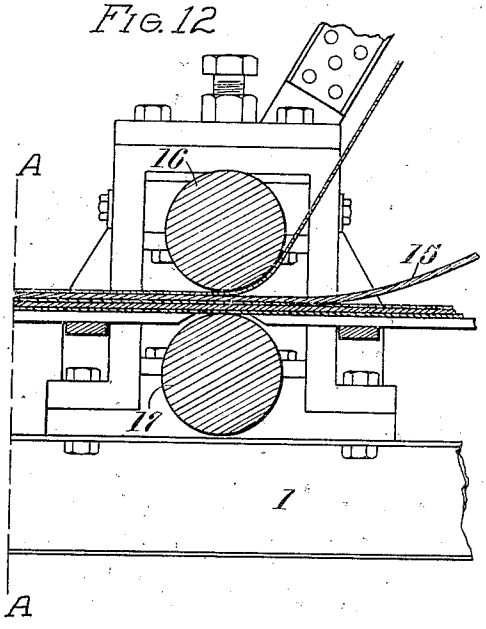
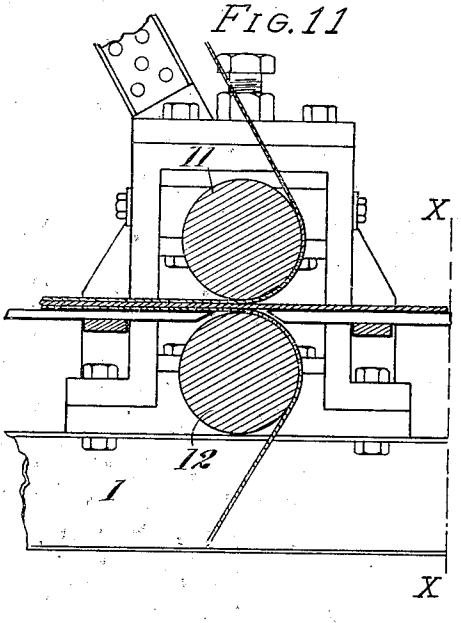



FIG. 11




INVENTOR.
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Patented June 17, 1924. 1,497,818

# UNITED STATES PATENT OFFICE.

GEORGE X. WENDLING, OF SAN FRANCISCO, CALIFORNIA.

## WOOD-CORE WALL-BOARD MACHINE.

Application filed July 5, 1922. Serial No. 572,930.

*To all whom it may concern:*

Be it known that I, GEORGE X. WENDLING, a citizen of the United States, residing in the city and county of San Francisco and State of California, have invented certain new and useful Improvements in Wood-Core Wall-Board Machines, of which the following is a specification.

This invention relates to a machine for making a multi-ply composite board composed of wood veneer and paper which I have termed woodpaper veneer.

An object being to provide a material in sheet form having a very high degree of tensile strength and of a minimum weight and also being more or less flexible.

I have discovered that by superposing alternate layers of a thin wood veneer and a suitable paper stock and cement them together with a suitable adhesive I obtain a product of exceptional tensile strength and a high degree of flexibility.

The alternate layers of veneer and paper may be multiplied until there is produced a board of any desired thickness suitable for any purpose to which an article of this kind may be applied in the arts and industries.

I have found that a five-ply board or sheet has sufficient strength and flexibility to serve many purposes and in the machine illustrated herewith embodying my invention is shown such a combination and arrangement of elements as will produce a five-ply article. It being understood that a simple addition of certain operating units will adapt the machine to the making of a board of seven, nine or more plies as may be desired.

In the making of what I call a five-ply board, I use three sheets of paper with thin sheets of wood veneer interposed between the paper sheets, preferably with the grain of one sheet of veneer disposed at right angles to the other or at least some angle other than in parallel relation, in order to impart the degree of rigidity or resistance to flexure as may be desirable or necessary for the purpose to which the board is to be put.

Broadly speaking, the machine embodying my invention comprises automatic feed means for engaging and advancing thin sheets of wood veneer; cement or adhesive applying means for applying an even and uniform coating of adhesive to each side of the thin wood veneer sheet as it enters the machine; paper feeding means so arranged that continuous sheets of paper are moved into the path of the advancing wood veneer sheet from above and below; the paper strips being guided onto the upper and lower sides of the wood veneer sheets by means of suitable rolls over which the paper strips are trained, and which are so adjusted that they engage the wood sheet with considerable pressure, and act as feeding means at the same time that they press the paper strips into adhesive contact with the wood veneer.

This first operation produces a three-ply product, that is, two strips of paper with a thin wood veneer sheet interposed therebetween and securely cemented together.

As this three-ply sheet passes the first rolls just described it enters within the zone of a station where a second wood veneer strip is fed from a lateral position and is superposed on top of the three-ply sheet.

This is effected through the medium of a feed device and adhesive applying unit exactly like the one arranged at the front end of the machine; this second unit being placed at the side of the machine where it automatically engages and advances sheets of thin wood veneer and applies adhesive thereto in the same manner as described for the one at the front end of the machine.

This cement coated sheet is advanced over the top of the traveling three-ply sheet and is so timed in its movement as to reach its destination when in just the right position to properly register with other wood veneer sheets that may have gone before.

Immediately it reaches its proper location it is released from the lateral feed device, and, resting on the three-ply sheet begins to move longitudinally therewith.

Arranged just ahead of the position where the second wood veneer sheet begins to take motion from the three-ply sheet there is arranged another pair of feed rolls, the upper roll of the pair guiding a paper strip similar to the ones previously described.

The three-ply composite sheet with the cement coated wood veneer sheet entering these latter feed rolls, are advanced in a uniform manner and with sufficient pressure to thoroughly compress and unite the top strip of paper and the wood veneer sheet to the three-ply sheet wherewith is produced the five-ply sheet referred to.

As soon as the five-ply sheet passes

through the last mentioned rolls it immeately enters a drying chamber wherein is arranged a series of guiding and drying rolls. This chamber and rolls are heated by suitably arranged steam coils by means of which sufficient of the volatile elements of the adhesive uniting the several plies of paper and wood are dissipated, so that when the composite sheet emerges from the drying chamber the adhesive is sufficiently dried out to permit of cutting the sheet into individual sheets of any suitable size.

It might be mentioned here that the applying of a wet adhesive to the wood and paper sheets causes a stretching of the paper as the composite sheet is built up, so that the various feed rolls along the machine are made of slightly increasing size to thus stretch the sheet as it moves forward to keep the various layers flat and free of wrinkles.

As the composite sheet advances through the drying chamber and the volatile elements of the adhesive are driven out, the sheet begins to harden and becomes more rigid so that its natural resistance to flexure and its slight frictional contact with the rolls is sufficient to turn the rolls in the chamber and to operate the rolls and circuit controlling devices at the end of the drying chamber.

As the dried and hardened sheet emerges from the drying chamber it passes within the zone of action of a guillotine type of cutter that is mounted on a swinging frame work which in turn carries a table extension for supporting the end of the sheet before cutting a section therefrom and after cutting, swings with the framework and deposits the cut sheet on a receiving table.

The composite sheet moves through the machine with a continuous straight ahead movement, while the device for cutting sheet sections or boards from the continuously traveling sheet is intermittent in its action. It is therefore necessary that a reciprocating or oscillatory movement be imparted to the whole of the cutting off mechanism, whereby it will move forward in unison with the forward movement of the sheet while the guillotine is actually severing the sheet and then move back to meet the oncoming continuously moving sheet to sever the next section therefrom.

It might be mentioned here that the invention embodied in the machine illustrated in the accompanying drawings could be utilized in its entirety in a vastly differently constructed mechanism, and while I have illustrated a combination of elements and arrangement of parts that will perform the necessary functions to produce a composite sheet such as I have described, I wish it understood that I may vary the mechanical details very materially and yet perform all of the steps necessary to produce a composite board such as I have described.

I do not consider my invention as limited to a five-ply board, but do intend it to include a multi-ply board of any desired thickness and of any number of separate sheets of paper and wood, whether arranged in alternate layers or otherwise.

If I produce a board of more than five plies of material, I must of necessity change the construction of the machine, by adding more feed units for feeding and cement coating the laterally supplied sheets.

I have therefore shown a combination of elements to produce a five-ply board as being illustrative of the type of mechanism desirable to produce a sheet of composite form having any number of plies, and with this illustration any one skilled in the art should be able to design and construct a machine varying considerably in detail and arrangement from that shown, that would produce a sheet of the type described.

As a better understanding of the invention is made manifest by a study of the drawings accompanying this specification various objects and advantages will become apparent and thus aid those skilled in the art to a better intelligence in the practice of the invention.

Referring now to a description of the drawings, it will be noted that like figures of reference apply to like parts on the various views.

Figure 1 is a side elevation of the front end of the machine, omitting, however, the duplicate feed unit set at the side of the machine for feeding the lateral wood sheet.

Figure 2 is a continuation of the machine following from Figure 1, with a section of the drying chamber broken away to better show the interior.

Figure 3 is a continuation of the machine following Figure 2, comprising the end of the drying chamber and the cut off mechanism for severing individual sheets or boards from the continuously moving composite sheet.

Figure 4 is a plan of that portion of the machine included in Figure 1, with the addition of a portion of a duplicate feed and cement coating unit similar to the unit at the beginning of the machine in Figure 1.

Figure 5 is a plan of that portion of the machine shown in Figure 2, with the top of the drying chamber broken away to better show the interior structure of the drying oven in plan.

Figure 6 is a plan of that portion of the machine shown in Figure 3, with part of the table broken away to bettter show the motor drive mechanism.

Figure 7 is a vertical sectional elevation taken on line X—X of Figure 1 looking in direction of the arrows.

Figure 8 is a vertical sectional elevation on line B—B of Figure 2 looking in the direction of the arrows but omitting all parts of the machine beyond the immediate plane of the section.

Figure 9 is a rear elevation of the machine looking in the direction of the arrow 3 of Figure 3.

Figure 10 is a sectional elevation on line 10—10 of Figure 4 looking in the direction of the arrows and extending as far as line X—X.

Figure 11 is a sectional elevation on line 11—11 of Figure 4 looking in the direction of the arrows.

Figure 12 is a sectional elevation taken on line 12—12 of Figure 4 looking in the direction of the arrows.

In describing this machine in further detail I will make my description conform only to the general construction of the various elements as they perform the necessary steps to produce a five-ply composite sheet.

The main part of the machine is mounted on a longitudinal bed that I will designate by the numeral 1. This bed is in turn carried by floor legs 2.

Arranged at the extreme front of the machine Figure 1, is a unit device mounted on an upright frame member 3, comprising a pair of feed rolls 4 and 5, mounted for rotation transversely of the frame member 3. The lower roll 5 is driven through suitable gearing by means of a general drive shaft 6 extending longitudinally along the side of the machine.

A sheet of thin wood veneer 7, Figure 10, is manually fed between the rolls 4 and 5.

While the said rolls act as feed rolls they also function as adhesive applying rolls. The lower side of roll 5 immerses in a body of adhesive 8 and the roll 4 forms the bottom of a vessel containing a body of adhesive 9.

The top roll 4 is not mechanically driven but is equipped with a hand wheel for starting the flow of adhesive when the first wood veneer sheet is fed between the rolls, the friction with the sheet, thereafter serving to turn the roll and maintain the flow of adhesive.

As the sheet 7 passes beyond the rolls 4 and 5 the under side scrapes over a ledge 10 which serves to remove any excess adhesive.

The wood sheet continuing on its way passes between rolls 11 and 12, Figures 1 and 11. By reference particularly to Figure 1 it will be seen that I provide rolls of paper 13 and 14, the ends of which are trained over the rolls 11 and 12 and come into adhesive contact with the oncoming wood sheet, and due to the pressure exerted by the rolls 11 and 12 are caused to firmly adhere and become cemented to the top and under side of the wood sheet, thus forming a three-ply sheet.

Referring again to Figure 1 it will be noted that there is a space provided between the rolls 11 and 12 and the next series of rolls along the machine. This space is provided to accommodate a feed station for placing the second wood veneer to build up the five-ply structure.

Placed directly in front of this space referred to is placed a unit feed and cement applying device similar to that shown and described at the front of the machine and designated by numeral 3. A plan of the inner portion of this device is shown in Figure 4.

An operator times the feeding of this second wood veneer sheet which I will designate by numeral 15 Figure 12, so that it overlies and meets the three-ply sheet as it advances—it being understood that the wood veneer sheets are fed through the rolls of both units with edges in contact, so that each sheet feeds the one ahead that has passed beyond the action of the feed rolls— and deposits it in register on the paper sheet forming the top layer of the three-ply composite sheet.

As soon as the wood sheet 15 has reached proper position from the lateral feed unit it immediately drops onto the advancing three-ply sheet and moves in unison therewith, all of the sheets then entering between rolls 16 and 17.

By reference to Figure 1, it will be observed that I provide a roll of paper 18, the end of which is trained over the roll 16 and adhesively engages the top surface of the wood sheet 15, whereby the pressure of the rolls 16 and 17 cause the paper 18 and the wood sheet 15 to firmly adhere to the three-ply sheet thus producing the five-ply sheet.

Continuing from rolls 16 and 17 the now five-ply sheet passes into the influence of another pair of feed and pressure rolls 19 and 20, Figures 2 and 5, the rolls of the successive pairs being of increasing diameter from the feed end of the apparatus thus stretching the paper as it is applied and precluding the forming of wrinkles.

The purpose of these rolls is to give a final squeezing pressure to the five-ply sheet and thoroughly iron out any wrinkles and to exude any surplus adhesive and to also act as a feed means to carry the continuous five-ply sheet into and through the drying chamber.

This drying chamber being designated by numeral 21 is simply an enclosed portion of the machine having a series of free running rolls 22 whose function is only to hold the composite sheet in a comparatively flat plane as it is passed along.

There are other details connected with

this drying chamber that are self explanatory and therefore need no specific mention.

As the five-ply sheet emerges from the drying chamber it encounters the last set of rolls 23 and 24, which are adjusted to give a somewhat close frictional contact with the five-ply sheet, so that the electrical control mechanism operated by the roll 24 will be caused to function.

I have illustrated and described a drying chamber to be used in connection with the manufacture of a multi-ply sheet. I wish to point out here that a drying chamber is only necessary when an adhesive carrying a volatile solvent is used. When such an adhesive is used it is usully desirable, but not always necessary to dry it in the process of formation or immediately thereafter as would be the case as I have illustrated and described herewith.

There are many cements in the asphaltic group that are applicable to use in this art in their natural state without being dissolved by a volatile solvent and for many purposes are preferable to the solvent cement.

These are usually applied at a temperature sufficient to cause them to become fluid, in which condition they are readily applied to the sheets to be united and by the addition of well known means of supplying heat under such circumstances, they could be used in making the composite sheet I have described and with practically the same machine I have illustrated.

I have also shown and am describing a cutting off mechanism in connection with the making of this composite article. I want also to point out in this connection that it may not always be desirable or required that the composite sheet be cut up into sheets as has been described. There may be instances where a continuous sheet of considerable length is desired, in which case the sheet would be made flexible enough to permit of forming it into a roll. If such a sheet were being made I would simply disconnect the cutting off device and place at the end of the machine any of the well known and widely used means for winding the product onto a core to form a roll.

The cutting off mechanism that has been briefly alluded to I will now describe in more detail.

As the dried composite sheet enters the rolls 23 and 24, it acts, through the mechanism to be described, as its own measuring device, determining through the rolls 24 and its attendant devices, the exact moment that the end portion is severed from the main sheet.

By reference to Figure 3 it will be seen that a pinion 25 is mounted on the end of the shaft carrying the roll 24. This pinion meshes with a compound idler gear 26 which in turn drives the control gear 27.

The control gear 27 carries an electrical contact strip 28 which serves to complete an electrical circuit between two separated contact points on the under side of the contact arm 29.

It will also be observed that the idler gear 26 and the control gear 27 are mounted on swinging arms 30 and 31, the purpose of which will be referred to later in the description.

An electric circuit passes from the arm 29 through the switch box 32, wires 34 to the solenoid magnet 35. As long as the contact strip 28 is in contact with the contact points on the arm 29 the magnetic field of the solenoid magnet 35 is energized and the plunger 36 is magnetically held within the field against the tension of a compression spring enclosed in the housing 37 acting through the fulcrumed lever 38.

The motor 39 from which power is derived for driving and operating the entire cutting off mechanism is running continuously and has driving contact with the cutting off mechanism through a friction plate clutch 40 which is normally held inactive through the solenoid magnet 35 and lever 38 and only comes into driving contact during the period the circuit through the solenoid magnet is broken, this occurring when the contact strip 28 breaks contact with the contact points on the under side of the arm 29.

A worm and worm wheel reduction gear 41 and chain 42 transmit rotative motion to the cross shaft 43 on which shaft is mounted cams 44 and 45. The cam 44 controlling the motion of the guillotine for severing a portion from the composite sheet and the cam 45 controlling the oscillatory movement of the entire cutting mechanism to move in unison with the composite sheet while a portion is being cut therefrom.

The guillotine framework and table are designated by the numeral 46, this framework is pivoted on the shaft 43 and the table is supported by the member 47.

The full lines of the guillotine framework represent it in its normal idle position. As soon as the clutch 40 is permitted to engage, the shaft 43 begins to rotate, thus through the action of the cam 45 the lever 48 is moved into the dotted line position, which in turn swings the entire guillotine framework forward into its dotted line position.

During the said forward swing of the framework 46 the guillotine control lever 49, having the forked lower end 50, is lifted by the cam 44 whereby it operates to move the guillotine knife 51 into contact and through the composite sheet, thus severing

a portion therefrom, which immediately slides down the table 46 onto the receiving platform 52.

As soon as the sheet is severed the guillotine mechanism returns to its normal position as indicated in full lines.

During this cutting period and replacement of the mechanism, the control gear 27 has turned until the contact strip 28 again contacts with the contact points on the under side of the arm 29, immediately the field of the solenoid magnet becomes active and draws the plunger 36 into the magnet, thereby disengaging the clutch 40 and leaving the cutting mechanism in its normal position.

As soon as the gear 27 turns far enough to again carry the strip 28 from contact with the arm 29, the cutting operation as just described is repeated.

The gear train 25, 26 and 27 will cut a strip or board from the continuously moving composite sheet, of a given dimension. If a portion of some other dimension is required the idler compound gear 26 is replaced with another of differing proportion.

This change of gears will slightly alter the center distances of the new train. To accommodate this the gears 26 and 27 are mounted on swinging arms 30 and 31, which are easily adjusted to bring the new train of gears into proper mesh.

The main part of the machine is driven by a motor 53 through a worm and worm wheel reduction gear 54, a chain 55 and the longitudinal shaft 6 in the manner clearly illustrated in the various views.

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

1. A machine for making a multi-ply composite article composed of sheets of paper and wood superimposed in alternate layers, comprising adhesive applying means for engaging sheets of wood veneer and applying adhesive to both sides thereof, a source of paper supply, means for guiding sheets of paper into adhesive contact with said cement coated sheets of wood, veneer and advancing said superposed sheets into and through drying means by continuous motion, article driven compression rolls arranged in pairs within the drying means, electrically operated means for severing a portion from said composite sheet as it emerges from said drying means, and electrically operated means associated with one of said pairs of rolls for automatically controlling by the travel of the sheet intermittent operation of said severing means.

2. A machine for making a multi-ply composite article comprising sheets of paper and wood veneer arranged in superposed relation, comprising continuously moving means for feeding sheets of wood veneer and applying adhesive to both sides thereof, a source of paper supply, means for continuously guiding sheets of wood veneer and applying adhesive to both sides thereof, a source of paper supply, means for continuously guiding sheets of paper into adhesive contact with sheets of cement coated wood veneer and continuously advancing said assembled sheets into and through a drying chamber, electrical means controlled by the continuously advancing composite sheet, cutting means operated by said electrical means for severing a portion from said advancing composite sheet.

3. A machine for making a multi-ply article composed of superposed layers of flexible sheet material cemented together, comprising means for cement coating and assembling into a continuous integral strip, two or more sheets of flexible material, passing said continuous integral strip continuously within the zone of cutting mechanism, control means for said cutting mechanism, means including a pair of rolls actuated by the passage of said integral strip therebetween for throwing said cutting mechanism into and out of operation, said cutting means comprising an oscillatory member carrying severing means for separating a portion from the end of said continuously moving strip in timed intervals, said separating or cutting taking place while said continuously moving strip and said oscillatory member are moving in the same direction.

4. A machine for making a multi-ply article composed of superposed layers of flexible material cemented together, comprising means for cement coating and assembling into a continuous integral strip, two or more sheets of flexible material, passing said continuous integral strip continuously within the zone of cutting mechanism, control means including in part a pair of fixed rolls actuated by the passage between them of said integral strip for directing the movement of said cutting means, said cutting means comprising an oscillatory member carrying severing means for separating a portion from the end of said continuously moving strip in timed intervals, said separating or cutting taking place while said continuously moving strip is moving at a uniform speed and said oscillatory member is moving in unison therewith and in the same direction, and means operated by the rotation of said rolls for controlling the operation of said cutting means.

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

GEORGE X. WENDLING.