J. E. DAVIDSON.

MACHINE FOR FORMING CORNER BINDING.

APPLICATION FILED JAN. 9, 1913.

1,175,133.

Patented Mar. 14, 1916.

2 SHEETS—SHEET 1.

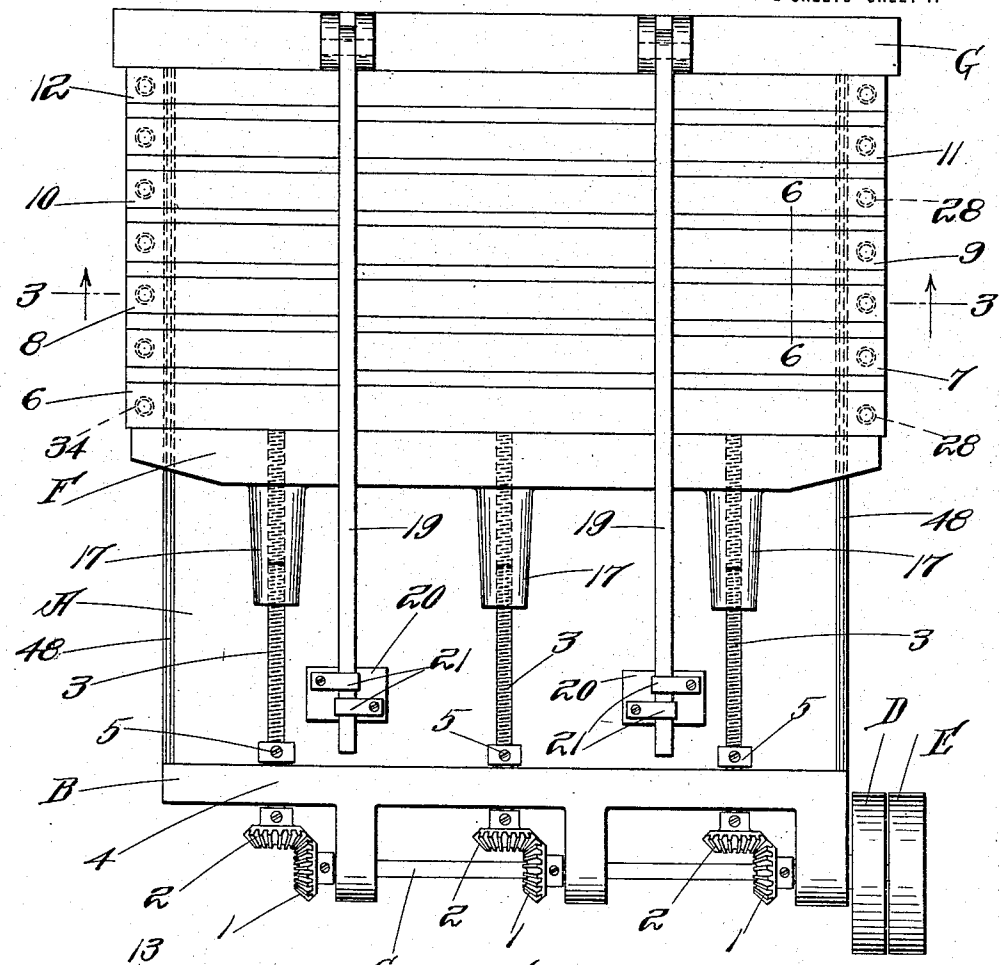


Fig. 1.

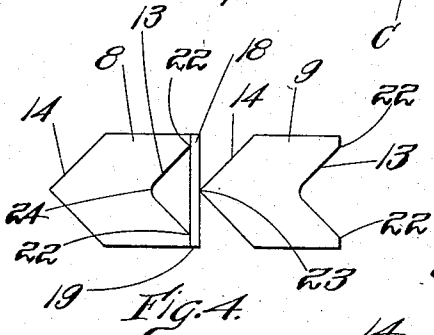


Fig. 4.

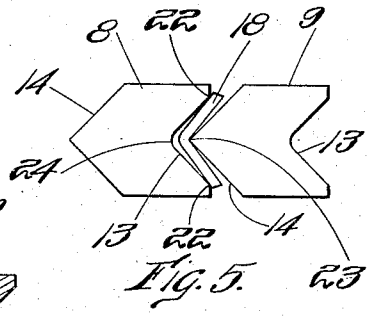


Fig. 5.

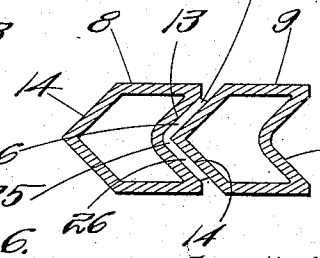


Fig. 6.

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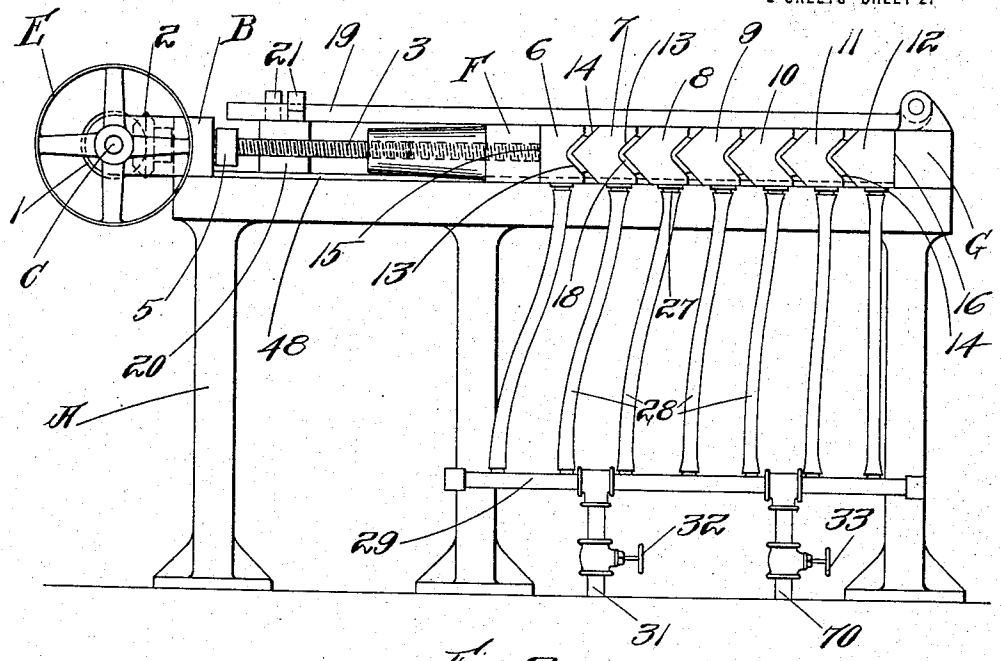


Fig. 2.

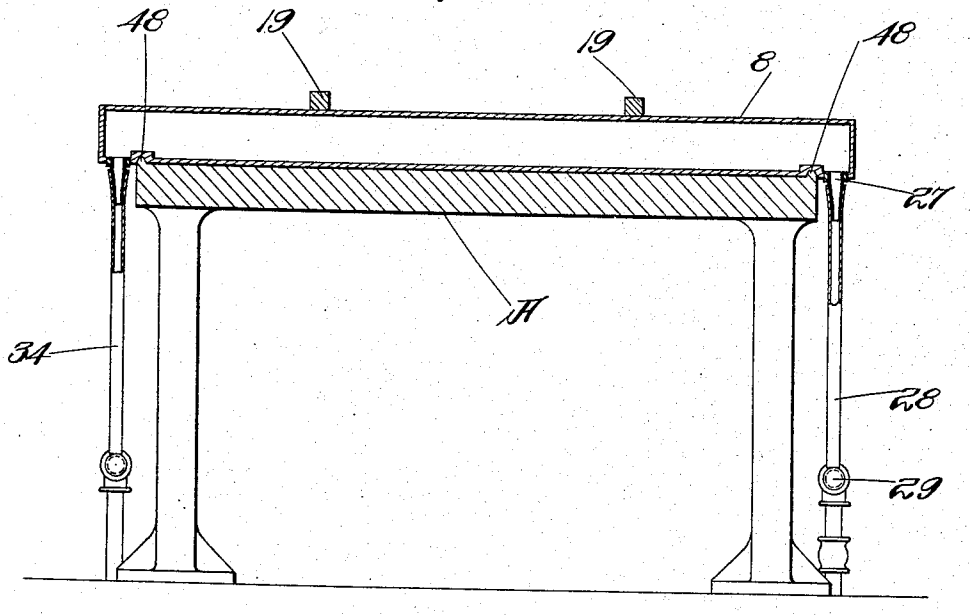


Fig. 3.

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UNITED STATES PATENT OFFICE.

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MACHINE FOR FORMING CORNER-BINDING.

1,175,133. Specification of Letters Patent. Patented Mar. 14, 1916.

Application filed January 9, 1913. Serial No. 741,042.

To all whom it may concern:

Be it known that I, JOHN E. DAVIDSON, a citizen of the United States, residing at Boston, county of Suffolk, State of Massachusetts, have invented a certain new and useful Improvement in Machines for Forming Corner-Binding, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to a machine for forming corner binding, preferably composed of a plurality of laminæ of wood secured together by cement, said binding to be used at the corners of boxes and the like for staying or securing the side surfaces of the box strongly together.

It is particularly designed for bending wood to which cement may be applied while wet and to subject the same to heat and pressure to cause it to be thoroughly permeated by the cement so that it will take a given angle or set and strictly adhere to the same.

The particular form of machine shown in the drawings is especially adapted for the manufacture simultaneously of a considerable number of the strips of binding.

My invention also consists in certain novel features of construction or arrangement, all as hereinafter more fully set forth in the following description of a machine embodying my invention and illustrated in the accompanying drawings forming a part hereof.

The novel features of my invention are pointed out and clearly defined in the claims at the close of the specification.

In the drawings: Figure 1 is a plan view of a machine embodying my invention. Fig. 2 is a side elevation of a machine embodying my invention, showing particularly the means for supplying steam or cold water to heat or cool the forms. Fig. 3 is a section on line 3—3 of Fig. 1 looking in the direction of the arrows. Fig. 4 is an end view in detail of two forms showing the end of a strip of cross ply wood in position between the convex and concave portions of said forms before being placed under compression. Fig. 5 is a view similar to Fig. 4 showing the position of cross ply wood when the two forms are partly closed together. Fig. 6 is a section in detail on line 6—6 of Fig. 1, showing a strip of cross ply wood under compression between two forms.

Having reference to the drawings, the frame of the machine is shown at A. This consists of a horizontal table and supporting means therefor. Parallel to the front edge of the table A and secured thereto in any well known manner is a cross block B which operates both as a support for the compressing mechanism and as a surface against which it may act. The compressing mechanism comprises a main shaft C having the usual fast and loose pulleys D and E thereon. At intervals along said shaft are the bevel gears 1 which coöperate with the bevel gears 2, secured to the free ends of the screw shaft 3 and thereby operating to revolve the same. These screw shafts are supported near the front end in bearings 4 in which they may freely revolve, being positioned in said bearings between the collars 5, secured to the shafts in any well known manner, and the bevel gears 2, (hereinabove described). The other end of each of the screw shafts 3 is threaded into a horizontal platen F which rests on the table A and operates to bring pressure to bear on the material to be put under compression as hereinafter to be described.

On the table A are a series of long forms lying parallel to each other, numbered for convenience from 6 to 12 respectively, (see particularly Fig. 2). These forms are each relatively long and narrow, are flat on their upper and lower surfaces, and with the exception of the two forms at the front and rear, numbered 6 and 12 respectively, each have a concave surface 13 and a convex surface 14. The front form 6 has a concave rear surface 13 and a flat front surface 15, the latter surface being parallel to the rear side of the platen F, as shown in Fig. 2, and the rear form 12 has a convex front surface 14 and a flat rear surface 16 which is parallel to and abuts the front side of the resistance block G which is securely attached to the table A in any well known manner,

All the forms are located so that the concave and convex surfaces 13 and 14 lie proximate each other and so that by moving the forms together into the position shown in Fig. 2 they will coöperate with each other.

When the machine is made ready for operation the platen F is withdrawn from the resistance block G sufficiently so that each form may be separated from the next form adjoining, to permit a flat strip of corner binding material 18 of the thickness desired to be placed between them, as shown in Fig. 4. In order that the platen F may be moved enough,—that is, may have throw enough—to give the required space I provide extensions or collars 17 which are secured to the platen and into which the screw shafts 3 are threaded, as shown in Fig. 1. A strip of corner binding material 18 is then placed or dropped between each form, its lower edge 191 lying in contact with the supporting surface of the table on which the forms rest. This brings the lower edge 19 of the strip exactly level with the lower surface of the form and insures the proper positioning of the strip. It will be noted that by placing these forms on a flat, horizontal surface, such as is afforded by the table A, the corner binding strips will themselves drop into the proper positions and remain there ready to be put under compression. I regard this as very important, as it does away with all skill in positioning the strips, and enables the machine to be operated by a cheap grade of labor which reduces one of the chief expenses of operation to a minimum.

When the corner binding strips have been placed in the forms in the manner above described the forms are forced together by means of the platen F operated by the compressing mechanism. In order that the ends of the forms cannot get out of alinement laterally I provide a track 48 which is placed from front to rear on each side of the table A, as shown in Fig. 1, which fits shallow transverse grooves in the forms near each of their ends. Again, to prevent all possibility of buckling when great pressure is brought to bear by the platen, I provide two stay rods 19 extending from front to rear on top of the forms which rods may be secured by any well known means. I prefer to secure them pivotally to the resistance block G at the rear of the machine, so that they may be raised to enable the strips to be taken out of or placed in the machine, the forward ends of the stay rods being, when the machine is in operation, secured to locking blocks 20 by means of locking arms 21, as shown in Figs. 1 and 2.

As the extreme edge 23 of the convex portion of a form comes in contact with a binding strip the latter will bend at this point, the machine being especially designed for bending strips which have been cemented in a wet and pliable condition and which are still moist or in proper temper. When pressure is brought to bear on the strip great difficulty has been found in keeping it centrally of the concave portion of a form, that is, so that the angle in the wood will be formed along the median line of the strip, for the reason that when pressure is brought to bear on the strip the natural resiliency of the wood will cause one edge of the strip to enter the concave form before the other edge, which would result in an irregularly formed binding. To prevent this I terminate the concave surface of the concave form at an edge 22 which is at a distance from the top or bottom surface of the form, as shown in Figs. 4, 5, and 6. This edge 22 forms a shoulder against which the binding strip rests until it is bent over the edge 23 of the convex form, as shown in Fig. 5 sufficiently so that it cannot spring out of position but will fit evenly into the concave portion of the form throughout its whole length.

After full compression has been brought to bear on the forms by the platen F the strip will be tightly compressed in the particular shape desired. as shown in Fig. 6. It will be noted that the extreme edge 23 of the convex portion 14 is relatively sharp, while the coöperating portion 24 of the concave form 13 is rounded. This I regard as an important feature of my machine. It is essential to the strength of a box that the inner faces of the binding lie contiguous to the two adjacent sides of the box throughout. To effect this the internal angle of the binding must be sharp, as shown in Fig. 6. I have, however, found that if the coöperating portion 24 of the concave form is shaped into a sharp angle to correspond to the sharp edge 23 of the convex portion the latter will cut through the wood. Furthermore if the pressure exerted on the cross ply strip is not the same at every point between the forms the laminæ will not be properly united at the points where the less pressure is brought to bear. To avoid this I so shape the part 24 of the concave portion that the same pressure is exerted at all points adjacent the angle 25 of the binding, as is exerted throughout the sides 26 thereof. This is important as it makes it possible to form said flat binding strips by heat and pressure without cutting or splitting the same. and at the same time to give to the external surface of the corner binding a smooth and rounded appearance. The layers of the binding so formed are uniformly secured together throughout their contact surfaces and evenly permeated by the cement so as to be in large measure homogeneous throughout.

While the binding is under compression

it is subjected to heat. This is accomplished by means of steam which passes through the forms 6 to 12 which are hollow. At a point near the end of the lower side of each form I provide an opening into which a pipe connection 27 is screwed. On these connections 27 I secure, as shown in Figs. 1 and 2, pipes of rubber or flexible material so as not to interfere with the free movement of the forms on the track 48. These flexible pipes 28 connect at their lower ends with a horizontal pipe 29, as shown in Fig. 2. The horizontal pipe 29 is attached in turn by means of T-head connections to the vertical inlet steam pipe 31 and the vertical inlet water pipe 70 having thereon the shut off valves 32 and 33 respectively. The other side of the machine has a similar arrangement of pipes for carrying off the exhaust water and steam, as shown at 34 in Fig. 3.

In use, the operator places the strips in the machine, puts them under compression by means of the operating mechanism and opens the inlet steam pipe shut-off valve 32. This allows the steam to pass through the inlet pipes into the forms to heat them and out through the exhaust pipes, so that the strips are subjected to the predetermined degree of heat. After a sufficient length of compression the steam is shut off and the inlet water pipe valve 33 is opened up and the system flushed out with cold water, thereby at once cooling it off so that the operator may freely handle the forms in order to take out the finished corner bindings and refill the machine.

Of course it will be understood that while I have described at length the heating means employed, I do not limit myself to the particular form shown.

I have referred to the edge or shoulder 22 of the concave form, see Figs. 4, 5 and 6, as being at a distance from the top or bottom surface of the form. This is true in the forms as shown and as they have been constructed by me. In this construction I have placed the forms on a flat table and have used forms having a vertical thickness equal to the width of the strip which was to be compressed and molded, see Fig. 4. The essential characteristics however of the concave form are that the mouth of the concavity directly across from one shoulder 22 to the opposite shoulder 22 must be less than the width of the strip to be molded while the area of the concavity must be such as to take in completely the bent strip, that is when the strip is in the position shown Fig. 6 it must lie within the concavity so that all parts of its surface will be subjected to pressure between the convex and concave forms. In the construction shown the surface of the table acts as a gage or guide for the lower edge of the strip so that the strips may be quickly and properly dropped into position ready for the molding operation, and it is essential that the lower shoulder or edge 22 of the concave form should be located a short distance above the gage, or guide or table which supports and positions the strip when it is put between the forms. It will also be obvious that the operative face of the convex form need not be any larger or of any greater area than the operative face of the coöperating concave form. By constructing the forms as shown however the construction is somewhat simplified since their lower faces may rest directly on the supporting table and afford substantial supporting surfaces on which the forms may slide.

What I claim is:

1. A machine for forming corner binding comprising a series of coöperating forms each having an angular salient face on one side and a coöperating reëntrant angular face on the opposite side, the salient face of one form being of the same angle as the reëntrant face of the adjacent form and adapted to coöperate therewith, said salient face being formed with a sharp angle and said coöperating reëntrant face being curved at its apex, and means for moving the forms toward each other to mold and compress the material for the binding, the outside angle of the binding being molded by the said reëntrant curved apex of one mold and the inner angle of the binding being molded by the salient sharp corner of the coöperating mold.

2. A machine for forming corner binding comprising a series of coöperating forms each having an angular salient face on one side and a coöperating reëntrant angular face on the opposite side, the salient face of one form being of the same angle as and adapted to coöperate with the reëntrant face of the adjacent form, said salient face being formed with a sharp angle and said coöperating reëntrant face being curved at its apex.

3. A machine for forming corner binding comprising a pair of coöperating forms, one of said forms having an angular salient face on one side and the other form having a coöperating reëntrant angular face, said salient face being formed with a sharp angle and said coöperating reëntrant face being curved at its apex, the flat portions of the salient face being parallel with the flat portions of the reëntrant face, the curved portion of the reëntrant face being at all points equally distant from the apex of the salient face and means for moving the forms toward each other to mold and compress the material for the binding between them.

4. A machine for forming corner binding, comprising a series of forms each having an angular salient face on one side, and a reentrant angular face on the opposite side, the salient face of one side being of the

same angle as the adjacent reëntrant face and adapted to coöperate therewith, said salient face being formed with a sharp angle and said coöperating reëntrant face being curved at its apex, said curve having a radius about said sharp angle as a center, equal to the thickness of the material under compression, and means for moving the forms toward each other to mold and compress the material between them.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN E. DAVIDSON.

Witnesses:

WILLIAM A. MACLEOD,

ALICE H. MORRISON.

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