April 11, 1944. G. G. FRATER 2,346,131

METHOD OF SURFACING WOOD

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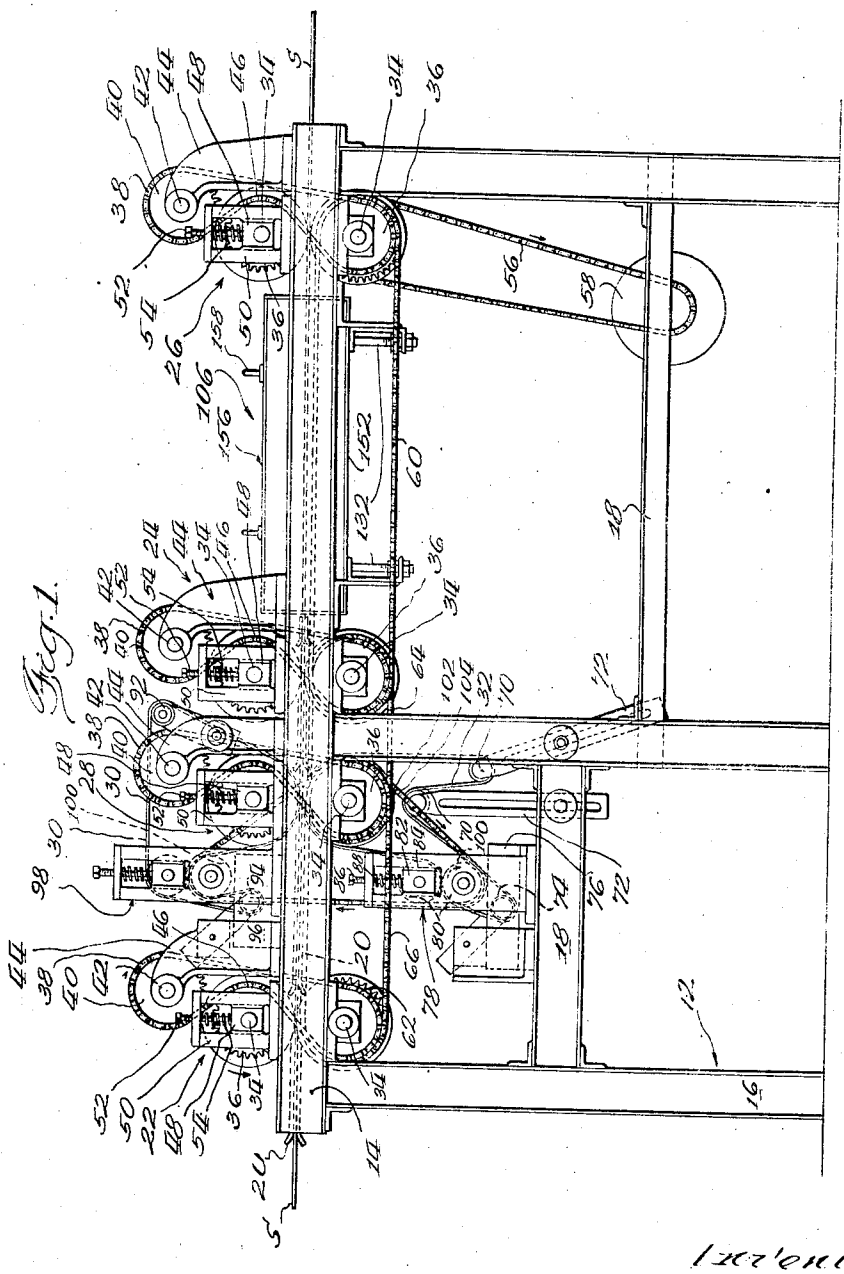


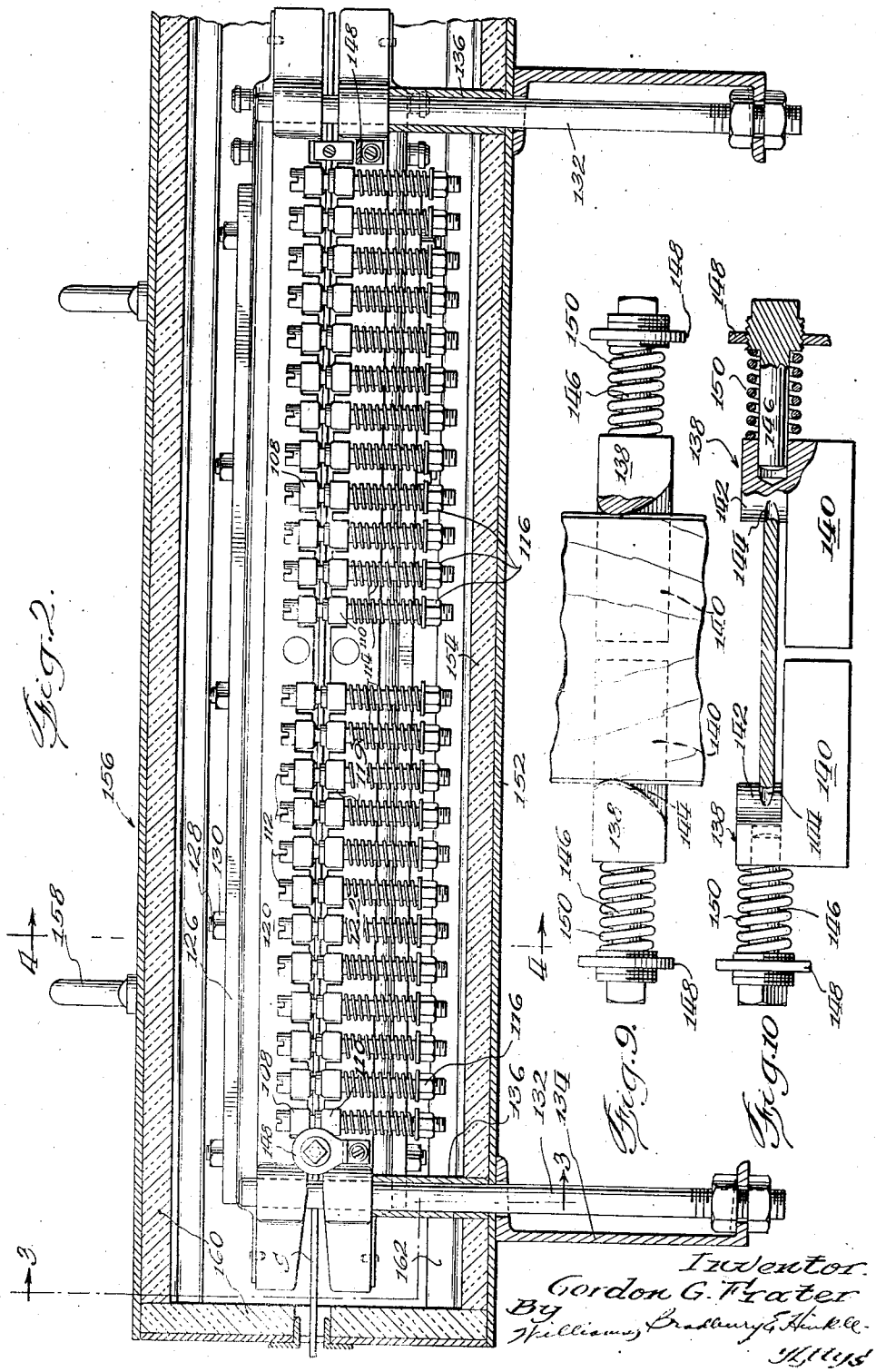
Fig. 1.

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Fig. 3.

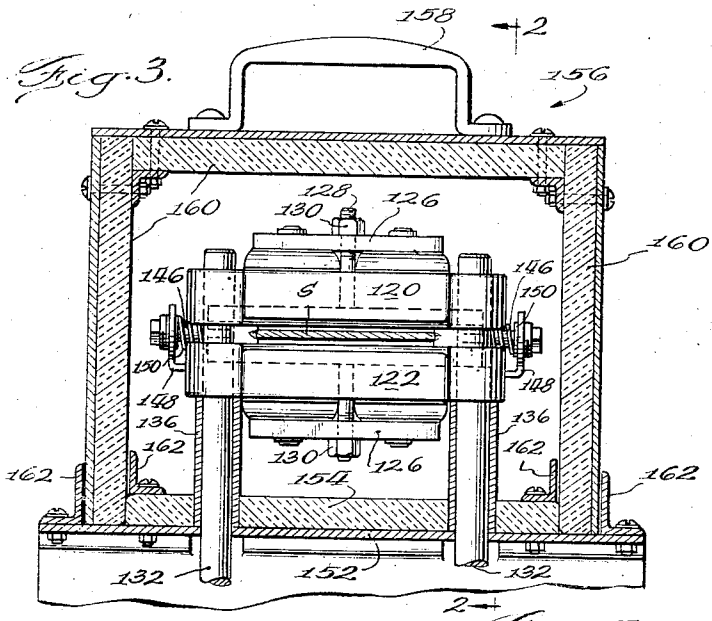



Fig. 11.

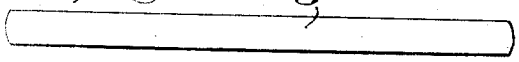



Fig. 5.

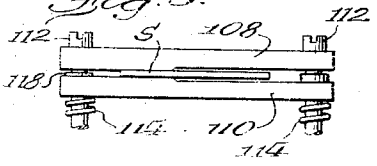



Fig. 12.

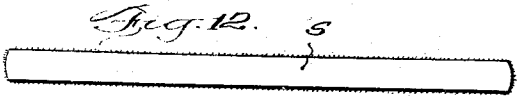



Fig. 6.

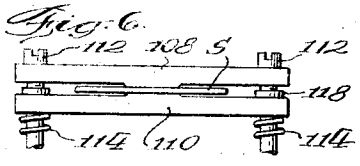



Fig. 4.

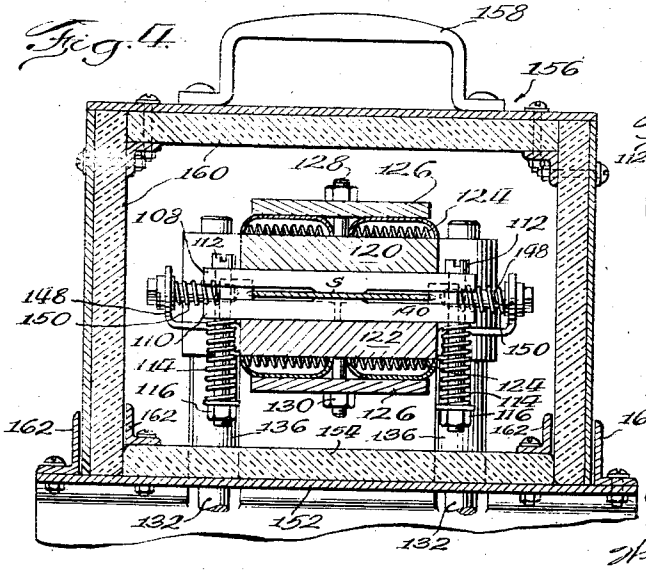



Fig. 7.

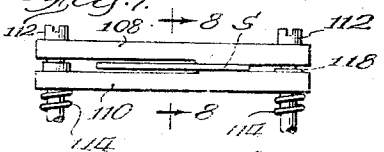
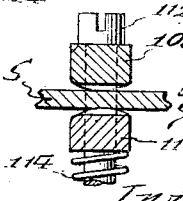



Fig. 8.




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Patented Apr. 11, 1944 2,346,131

# UNITED STATES PATENT OFFICE

2,346,131

## METHOD OF SURFACING WOOD

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Application December 28, 1940, Serial No. 372,056

4 Claims. (Cl. 144—309)

The present application is a continuation-in-part of my co-pending application, Serial No. 247,848, filed December 27, 1938, for Method of and apparatus for treating wood.

This invention relates to the woodworking art and is concerned particularly with the preparation of smooth surfaces upon wooden articles intended subsequently to be coated. Although the present method is adaptable for the preparation of such surfaces upon a variety of wooden articles and shapes, it is particularly advantageous in surfacing flat strips such as Venetian blind slats and hardwood flooring, for instance. The method of my invention will, therefore, be described in conjunction with a machine for surfacing Venetian blind slats and similar flat strips.

It is desirable, of course, that the surface of Venetian blind slats and like wood products be smooth. Two methods have commonly been used in the past for approximating such a surface, but both of these methods have objectionable features.

One of these methods consists in scraping the surface of the wood so as to remove the upstanding surface fibers. By past standards, this scraping treatment gives a comparatively smooth surface to hard woods, although much of an initial surface coating later applied to a scraped surface penetrates into the interstices of the wood because of the rather open grain structure of the wood. This scraping process is satisfactory even by past standards only with hard woods such as maple, birch, mahogany, walnut and the like. Such soft woods as fir, cypress and soft pine, or soft hardwoods such as basswood, cottonwood and poplar have never given satisfactory results when treated by this process.

The other and more widely used method of finishing wood surfaces is to apply a priming coat to a sanded surface so that the priming coat upon solidifying around the minute wood particles or fibers which project from the surface will stiffen these fibers. The primed surface is subsequently lightly rubbed with sand paper or steel wool to remove the upstanding portions of these stiffened fibers. As one of these methods entails the removal of the small particles or fibers which project from the surface of the wood without altering the porous nature of the surface, while the other method requires the use of a priming coat, it will be seen that with the use of either of these processes, at least two coats of coating material must be used to provide a satisfactorily finished article.

The present invention has as its object the provision of an improved method for treating wooden surfaces, and particularly the surfaces of such wooden articles as Venetian blind slats and the like, that renders the wood exceptionally smooth and entirely free from the objectionable particles or fibers projecting from the surface, and which additionally somewhat increases the surface density of the wood and has the effect of closing the normally porous surface. The surface of a wooden article thus treated has a polished appearance and low paint absorbing characteristics, and can, therefore, satisfactorily be finished with a single coat of coating material. I attain this objective by a new method which consists briefly in first applying a slight amount of moisture evenly over the surface to be treated. The amount of moisture applied should be sufficient to dampen the upstanding fibers and the surface of the wood slightly, but preferably should not be sufficient to cause any substantial wetting of the wood beneath its surface layer. The moisture thus applied softens the upstanding fibers and the surface of the wood, and this softened surface is then ironed or calendered in the presence of heat and light pressure.

The maximum pressure used should be below that which causes substantial distortion of the surface fibers, as otherwise an objectionable raised grain effect will result, that is, the spring wood and summer wood in the piece, although compressed to substantially the same degree, will present an uneven surface when the pressure is released, since the summer wood, which has a higher elastic limit than the spring wood, will return more nearly to its original level than will the spring wood. The minimum advisable pressure is that which is necessary to insure good contact between the wood and the pressing devices. The maximum usable pressure range will vary with the characteristics of the particular wood being treated, but I have found that from 10 to 35 pounds per square inch pressure is satisfactory for most woods.

In general it has been found that the temperature should be higher during the latter portion than at the commencement of the pressing treatment. I have found, for instance, that at the beginning of the pressing treatment, a temperature of about 350° F. is proper and should be maintained for a sufficient length of time to remove excess moisture. Thereafter, the temperature should be raised to about 650° F. to 700° F. for the polishing portion of the surfacing operation.

Different means, of course, may be devised for

the practice of this method, and in the accompanying drawings one apparatus found desirable and satisfactory for this purpose is illustrated.

Similar characteristics of reference refer to similar parts throughout the several views of the drawings, in which

Fig. 1 is a somewhat diagrammatic side elevation of a machine for practicing the method of the present invention;

Fig. 2 is a side elevation of the polishing poriton of the apparatus with its casing shown in longitudinal vertical section. This view may be considered as taken in the direction of the arrows along the line 2—2 of Fig. 3;

Fig. 3 is an end view of the mechanism shown in Fig. 2 with the casing shown in transverse section;

Fig. 4 is a transverse sectional view taken in the direction of the arrows substantially along the line 4—4 of Fig. 2;

Figs. 5, 6 and 7 are front elevational views of representative pressing shoes showing in general the shape of these shoes and the manner in which they differ from one another;

Fig. 8 is a transverse sectional view through a pair of the pressing shoes and may be considered as taken in the direction of the arrows substantially along the line 8—8 of Fig. 7;

Fig. 9 is a fractional view showing the edge pressing slides in plan with a portion of a slat therebetween;

Fig. 10 is an end elevation of the side pressing shoes shown in Fig. 9, with a portion thereof broken away to show a detail of the construction;

Figs. 11 and 12 are enlarged transverse sectional views through a Venetian blind slat showing, respectively, the appearance of the slat before and after treatment by the method of the present invention.

The operating mechanisms of the machine illustrated for practicing the method of the present invention are secured to a frame 12 comprised generally of structural steel members bolted or riveted together to provide a horizontal bed 14. This bed is supported upon legs 16 braced by horizontal members 18.

Within the bed of the machine, guides 20 arranged in end to end succession define a fixed path along which the slats S are progressed by forward, intermediate and rearward sets of feed rolls 22, 24 and 26, respectively. Between the forward and intermediate feed rolls, a set of moistening rolls 28 bring upper and lower moistening belts 30 and 32, respectively, against slats to be processed.

As may be seen in Fig. 1, these rolls are mounted upon shafts 34 journaled in bearing members secured to the machine frame. The shafts of each pair of rolls are provided with identical sprockets 36 connected in turn by chains 38. These chains pass around the lower sprockets in each set and around idler sprockets 40 positioned above and slightly to the rear of each of the upper sprockets 36. The idler sprockets 40 are secured upon transverse shafts 42 journaled in brackets 44 bolted to the machine frame and are so positioned that the branches of the chains 38 toward the forward end of the machine form bights 46 around the rearward sides of the upper sprockets 36. Thus, the upper sprockets and the upper rolls are revolved in a direction opposite to the lower rolls.

In each instance, the upper roll shaft supports comprise bearing blocks 48 slidable vertically in yokes 50 secured to the machine frame. The yokes 50 are provided in their upper central portions with adjustment screws 52 that urge coil springs 54 against the tops of the bearing blocks.

The pressure urging the upper rolls against the lower rolls, therefore, can be adjusted by turning the screws 52.

The rearward lower roll shaft 34 is connected by a chain and sprocket drive 56 to a motor driven speed reducing gear box 58. The other rolls are in turn driven from the roll shaft by a chain 60 passed between similar sprockets 62 on the rearward and intermediate lower feed rolls shafts and by a similar chain 64 which connects other similar sprockets on the lower intermediate roll shaft and the lower moistening roll shaft. Likewise, other sprockets on the lower moistening roll shaft and the forward lower roll shaft are connected by a chain 66. Thus the lower rolls of the roll sets 26, 24, 28 and 22 are driven in succession from the geared drive 58 through chains 56, 60, 64 and 66, while the upper roll in each set is driven from its lower roll by one of the chains 38.

The lower moistening belt 32 passes over the lower moistening roll and thence generally downwardly around a pair of slack takeup idling rolls 70 carried upon adjustable arms 72. From these rolls 70 the belt passes around another idling roll 74 a portion of which extends beneath the liquid surface in a water tank 76. In its movement through this tank, the belt imbibes a portion of the water therein and in its wetted condition, passes upwardly through a wringer 78 and thence over the moistening roll where a portion of the moisture is evenly transferred to the lower surface of a slat passing through the machine.

The wringer 78 consists essentially of a pair of rotatable rubber wringing rolls 80 in mutual contact against the belt 32 and supported above the tank 76 so that excess water removed from the belt will return to the tank. These rolls are geared to revolve together and are arranged with the upper roll shaft journaled in bearing blocks 82 slidable vertically in yokes 84. The force pressing the rolls together can be adjusted by turning screws 86 threaded through the upper portions of the yokes, inasmuch as the lower ends of these screws urge coil springs 88 against the tops of the bearing blocks 82.

Above the bed of the machine, the similar bibulous belt 30 passes around the upper moistening roll, over an adjustable slack takeup idler 92 and around an idler 94 in a water tank 96. From the tank 96, the belt passes upwardly through a wringer 98, similar to wringer 78 and thence generally downwardly and around the upper moistening roll. This arrangement enables the upper surface of a slat passing through the machine to be moistened in the same manner that the lower surface is moistened by the previously described similar mechanism.

The lower roll shafts of both wringers carry sprockets 100 and are driven by a chain 102 passed around these sprockets and around a similar sprocket 104 secured to the lower moistening roll shaft 34. The wringers, therefore, do not subject the belts 30 and 32 to any substantial tensionally applied stresses during operation of the machine.

Between feed roll sets 24 and 26, the previously moistened slats pass through the pressing portion of the apparatus, indicated generally at 106 in Fig. 1. This pressing apparatus consists of a plurality of upper and lower pressing shoes 108 and

110, respectively, arranged in pairs in succession along the path followed by the slat. The pressing shoes in general comprise rectangular bars extending transversely of the line of travel of the bars. These bars are connected together in pairs loosely by bolts 112 passed downwardly through aligned apertures positioned near their ends. Coil springs 114 surround the portions of the bolts below the lower pressing shoe 110 and are urged against the lower surface of the lower shoe by nuts 116 threaded to the lower ends of the bolts.

By tightening or loosening these nuts, the springs 114 may be compressed to the desired extent so that the springs will urge the shoes toward each other with the proper degree of pressure. The adjacent surfaces of the shoes 108 and 110 are rounded, as shown in Figs. 5, 6, 7 and 8, so that there will be no sharp edges to catch in or scratch the surfaces of the slats passed through the machine. Preferably these shoes are made of a non-corrodible material that takes a high polish, such as stainless steel for instance.

The bolts 112 pass through washer-like spacing elements 118 positioned between the shoes 108 and 110. These washers are of a thickness somewhat less than the slats to be processed and prevent the shoes being urged completely together when no slats are passing through the machine.

The shoes, as described above, would serve adequately to polish perfectly flat slats. However, slats frequently are slightly bowed transversely and consequently might not be polished completely to the edges on one side or completely to the center on the other side by such shoes. For this reason, none of these shoes has the polishing surface thereon extending its full length. The shoes are arranged, as shown in Figs. 5 to 7, so that some of the shoes, as shown in Fig. 5, will polish the left-hand portion only of a slat, whereas the adjacent faces of another group of these shoes will be relieved at both sides so that the polishing portions of the shoes extend over the central portion only of a slat. Other shoes, like the pair shown in Fig. 7, similarly polish only the right-hand portion of the slats passing therebetween. Thus, no single pair of shoes polishes the entire surface of a slat, but the polishing surfaces of the several shoes being staggered with respect to each other, a slat will be polished over its entire area before emerging from the polishing portion of the apparatus.

These shoes are positioned in rectangular transverse slots 119 formed in the adjacent surfaces of upper and lower platens 120 and 122, respectively. The shoes are not attached rigidly to the platens but are free to float slightly with respect thereto. Thus, the several sets of shoes are enabled to locate themselves properly with respect to a slat passed through the machine so that there is no tendency of the shoes to place the slat under twisting or bending stresses.

A plurality of electric heating elements 124 are placed in contact with the platens 120 and 122 on the faces away from the shoes 108 and 110, and are covered by plates 126 which extend substantially the length of the platens. Studs 128 threaded into the platens pass through apertures in the plates 126 and are provided at their outward ends with nuts 130, by means of which the plates 126 are held in place against the heating elements. The heating elements 124 are connected in an electrical circuit so that when energized, they will heat the platens 120 and 122 to a comparatively high temperature. This heat is transferred by conduction to the pressing shoes 108 and 110 and heats the shoes to the temperatures previously indicated. That is, several of these shoes toward the entering end of the polishing apparatus are heated to a temperature of approximatley 350°, while the remainder of the shoes are heated to a temperature of approximately 650° F. to 700° F.

The platens are maintained in alignment by four vertical rods 132 which extend through aligned openings near the ends of the platens and are secured to channel iron members 134 attached to the machine frame. The lower platen 122 rests upon the upper ends of sleeves 136 that surround the rods 132, while the upper platen rests upon the pressing shoes. The weight of the upper platen together with its freedom of movement vertically maintain this platen in contact with the upper surface of the pressing shoes, even though the slats move toward and away from each other slightly depending upon whether or not a slat is passing through this portion of the machine.

At the ends of the platens, the machine has a pair of edge pressing shoes 138, as shown in Figs. 9 and 10. These edge pressing shoes have a comparatively massive base portion 140 in contact with the lower platen 122 so that they may be adequately heated by conduction from this platen. Above this base 140 an extension 142 is provided with a groove 144 shaped complementary to the curve of the slat edges. The face in which this groove is formed is also curved somewhat in the direction of travel of the slats so that no sharp edges will dig into or otherwise roughen the slats passed therethrough. The side pressing shoes 138 are freely movable upon horizontal pins 146 which project into cylindrical recesses formed therein. These pins are supported at their outward ends in brackets 148 which, in turn, are secured to the side faces of the lower platens 122. Coil springs 150 surround the pins 146 and urge the shoes 138 inwardly against the edges of a slat being processed, the edges of the slats being closely embraced in the complementarily formed grooves 144. In the absence of a slat between these shoes, the shoes are urged inwardly somewhat farther until the contiguous ends of the base portions 140 are brought into mutual contact. That is, the adjacent ends of these portions 140 serve as stops to limit the inward movement of these shoes.

Inasmuch as the polishing portion of the apparatus is heated to a comparatively high temperature, it is advisable to enclose this mechanism in a casing having good heat insulating properties. The casing shown includes a base 152 which extends beneath the lower platen and serves as a floor to support a sheet of heat insulating material 154. A rectangular box-like cover 156 provided with handles 158 is formed of any suitable material, such as pressed wood, for instance, and is lined with a layer of heat insulating material 160 of the same nature as the material 154 supported by the base 152. Guide members 162, which may be lengths of angle iron, are clamped to the base to guide the vertical movement of the cover portion 156. This arrangement provides a casing of adequate heat insulating properties which may be quickly and easily removed if it is desired to inspect or make adjustments to the polishing mechanism.

In operating, the pressing shoes are brought to the proper operating temperature and the motor started. The operator then pushes the end of a slat into the space between the guide members 20 at the forward end of the machine. The for-

ward set of feed rolls 22 passes the slat rearwardly of the machine between the moistening rolls 28, where, as has been previously described, a controlled amount of moisture is applied to the upper and lower surfaces of the slat by a belt of bibulous material such as felt. Since a belt formed of such material is comparatively compressible, the slat will be pressed into the felt sufficiently so that the portion of the felt immediately adjacent the slat edges will apply moisture to the sides of the slat.

After being moistened by the belts 30 and 32, the slats are passed rearwardly to the intermediate set of feed rolls 24. These rolls pass the slat into the polishing portion of the apparatus where the heated polishing shoes 108 and 110 press lightly against the upper and lower surfaces of the slats to remove excess moisture therefrom and subsequently provide a polished surface. The same polish is given to the edges of the slat by the shoes 138. After leaving the polishing portion of the apparatus, the slat is picked up by the rearward set of feed rolls 26 and conveyed beyond the end of the machine.

The slats fed to the machine are preferably finished as smoothly as practicable by fine sanding, but a wood surface finished in this manner has small fibers projecting from the surface, and may have other very minor irregularities. When these fibers are moistened they become soft and flexible, so that as the slats are fed past the shoes, they are bent over and forced against and into, or partially into, the surface. The operation differs from the mere application pressure perpendicularly to the surface of the wood as might be accomplished in a press.

From the foregoing description of my process and a machine for carrying out the same, it will be readily apparent to those skilled in the art that this invention greatly expedites the manufacture of wooden articles in which a smooth surface is desirable, and that it likewise effects a substantial saving in the amount of surface coating material required by virtue of the fact that the surface provided by my process is comparatively dense and thus prevents the coating material from striking into the wood beyond the surface layer.

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

1. The method of treating a piece of wood, the surface of which has minute fibrous projections as is characteristic of wood after having been sanded, which comprises wetting said surface, applying heat and pressure thereto at the same time, said heat and pressure being obtained by passing the piece of wood past a smooth heated metal surface with the wood pressing against said metal surface with sufficient pressure to maintain the surface of the wood in firm contact with the metal surface without substantially increasing the density of the wood so that the fibrous projections will be bent over and flattened against the wood surface.

2. The method of treating a piece of wood, the surface of which has minute fibrous projections characteristic of wood after a sanding operation, which comprises wetting said surface and smoothing the surface by causing relative sliding movement between the surface and a polished heated smoothing surface, applying only sufficient pressure to maintain the surface of the wood in firm contact with the smoothing surface without substantially increasing the density of the wood so that the fibrous projections will be bent over and flattened against the wood surface.

3. The method of treating a piece of wood, the surface of which has minute fibrous projections characteristic of wood after a sanding operation, which comprises wetting said surface, and smoothing the surface by causing relative sliding movement between the surface and a polished heated smoothing surface while applying a pressure between said surfaces of the order of from ten to thirty-five pounds per square inch to maintain the surface of the wood in firm contact with the smoothing surface so that the fibrous projections will be bent over and flattened against the wood surface.

4. The method of treating a piece of wood, the surface of which has minute fibrous projections characteristic of wood after a sanding operation, which comprises moistening said surface, and smoothing the surface by causing relative sliding movement between the surface and a number of polished heated smoothing surfaces of which the first to contact the wood are at a temperature of about 350° F. and those contacting the wood later are at a temperature of about 650° to 700° F. while applying only sufficient pressure to the surface of the wood to maintain it in firm contact with the smoothing surfaces without substantially increasing the density of the wood, thereby to bend over and flatten the minute fibrous projections against the wood surface.

GORDON G. FRATER.