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PROCESS OF TREATING WOOD.

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The present invention is based upon my discovery that if wood is impregnated with a material which will cause a substantially solid resinous reaction product to be formed when the wood is subjected to heat and pressure, and the wood is then subjected, while hot, to sufficient pressure substantially to reduce the volume of the wood and maintained under this pressure while the reaction product sets, the wood will remain in the form into which it has been compressed, and its qualities will be substantially modified.

The simplest embodiment of my invention is to take wood having a substantial amount of natural resin in it and impregnate the wood with an aldehyde, preferably formaldehyde, though other aldehydes such as acid aldehyde or furfurol may give beneficial results for particular purposes or two or more aldehydes may be combined. The wood is soaked in a solution of the aldehyde until it is thoroughly impregnated, which may take from one to three days or longer, depending on the size of the piece of wood. The moisture is then dried out and the wood is compressed. The amount of pressure will depend upon the type of wood and the nature of the product desired, but should be sufficient to reduce the thickness of the wood in the direction of pressure by at least 20% of its previous thickness with a corresponding reduction of volume. The amount of pressure may vary, for example, from 50 pounds to upward of 2000 pounds per square inch. In the case of soft wood, such as pine, a heavy pressure of approximately 2000 pounds to the square inch will result in reducing the wood to a thickness only about ⅓ of that of the original block.

The resulting product will be found to be hard and very dense and useful for many purposes. It may be used for panelling and will be found to have very little tendency to shrink or warp. If desired, the mold may be shaped to show a pattern or special configuration on the surface, as in making furniture, door panels and the like. The product will also be found useful for electrical purposes due to the fact that it is a good insulator and has great dielectric strength.

For the foregoing purposes it will ordinarily be advantageous to cut the wood in the form of planks, the grain running in the usual direction and press them on the flat. Where great strength in all directions is desired, as for example in making mechanical parts such as gears, I have under some circumstances found it advantageous to cut the wood across the grain and apply the pressure on the ends of the grain. Apparently when this is done, the grain is distorted and the fibres become very closely interlocked, increasing the strength across the grain.

In addition to the simple aldehyde impregnation, the wood may be impregnated either thoroughly or on the surfaces with phenol or similar material which is known to react with aldehyde to form a resin. Ordinarily it will not be necessary to have this type of impregnation go throughout the wood but the aldehyde impregnation may go throughout and the phenol can be applied on the surfaces and one of the well-known catalysts may be added; or after impregnation with the aldehyde and drying, the surface may be painted with a phenolic lacquer. It is my opinion that when the wood is thoroughly impregnated with an aldehyde, such as formaldehyde, and then dried, a part of the formaldehyde may react with the exposed resins of the wood at once, but additional quantities of the aldehyde may remain in the wood as free aldehyde probably in the polymerized form. When the wood is pressed, there appears to be a flow of resins in the wood which may be squeezed out of the cellular structure of the wood and thereby brought into contact with the free aldehyde referred to and caused to react with it. If the amount of aldehyde available for combination with the resin is so small that an insufficient quantity is supplied for all the resin of the wood, then when the wood is pressed, the **natural** resins may ooze out, spoiling the surface and gumming up the mold. For this reason, care should be taken to provide sufficient free aldehyde to combine with substantially all of the resins of the wood in addition to any that may be added with the intention that it will combine with the phenol. This will be taken care of if the wood is first thoroughly impregnated with the aldehyde as already stated. If desired, a number of pieces of wood may be joined together during the process; for example, if boards are to be joined edge to edge, the usual tongue and groove can be cut and then after the wood is impregnated and dried, a coating of phenol formaldehyde lacquer can be applied on the surfaces to be

joined. When pressure is applied the two members will be found to be united together almost as if they were one. In the same way, laminated structures can be built up by applying coats of lacquer to the contacting surfaces of the planks or veneers. The lacquer will combine with the resins formed in the wood so that the whole will be united closely together. If very thin veneers are used, the core alone may be impregnated with the aldehyde and coated with lacquer and the veneer coated with lacquer only on the contacting side. Structures made by uniting two or more pieces will be found useful where large surfaces are to be covered, or where heavy weights are to be borne, as, for example, in making table tops or making panel boards for electrical instruments or where a particular grain of wood is to cover the surface.

Where a highly developed configuration is desired, this may be molded from one of the standard molding compounds combined with wood treated by my process, by impregnating the wood as described, and then covering one or more faces of the wood with the molding compound and subjecting both to pressure and heat simultaneously.

The temperature to which the wood need be heated will depend upon the nature of the impregnating material, but when a wood containing resin is impregnated with formaldehyde or when the impregnating ingredients comprise phenol and formaldehyde, a temperature of about 240° F. on the platens of the press will be found to give satisfactory results, though higher temperatures may be used. The time of pressing will depend somewhat on the thickness of the wood but I have found that a piece of pine 3 inches thick can be pressed to a thickness of about one inch using 2000 pounds pressure per square inch, for about fifteen minutes including the heating and cooling periods.

This application contains matter derived from my earlier applications, Serial No. 89,782, filed February 20, 1926, and Serial No. 215,755, filed August 26, 1927.

What I claim is:

1. The process of treating wood which comprises the steps of impregnating wood with a liquid comprising an aldehyde, and subjecting the impregnated material to the simultaneous action of heat and pressure sufficient substantially to reduce the volume of the wood.

2. A process as defined in claim 1, in which the pressure is applied on the ends of the grain of the wood.

3. The process of treating wood, which comprises the steps of impregnating wood with formaldehyde and subjecting the impregnated material to the simultaneous action of heat and pressure sufficient substantially to reduce the volume of the wood.

4. The process of treating wood, which comprises the steps of impregnating wood with formaldehyde and thereafter causing a reaction to take place between the natural resins of the wood and the formaldehyde by the application of heat while subjecting the wood to a pressure sufficient substantially to reduce the volume of the wood.

5. The method of treating wood which comprises the steps of impregnating wood with a liquid comprising an aldehyde, adding a phenolic body to the surface portions and subjecting the impregnated material to the simultaneous action of heat and pressure sufficient substantially to reduce the volume of the wood.

6. A process as defined in claim 5, which is further characterized by the fact that a plurality of pieces of impregnated wood are compressed together and thereby united.

7. The process of treating wood which comprises the steps of impregnating a solid piece of wood so that the same will contain bodies adapted to react to form substantial solids of a resinous nature when subjected to the combined influence of heat and pressure and subjecting the impregnated wood simultaneously to heat and sufficient pressure substantially to reduce the volume of the wood.

8. A new product consisting of wood compressed to the point where its volume is substantially reduced and comprising a portion impregnated with the reaction product of the natural resins of the wood and formaldehyde, such reaction product being distributed through such portion of the wood proportionately to the distribution of the natural resins through the wood.

9. A new product comprising a solid piece of wood compressed to the point where its volume is not more than 80% of its original volume, impregnated with a substantially solid reaction product of a resinous nature, said reaction product comprising reaction products of natural resins of the wood and an aldehyde.

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