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METHOD OF TREATING TREES

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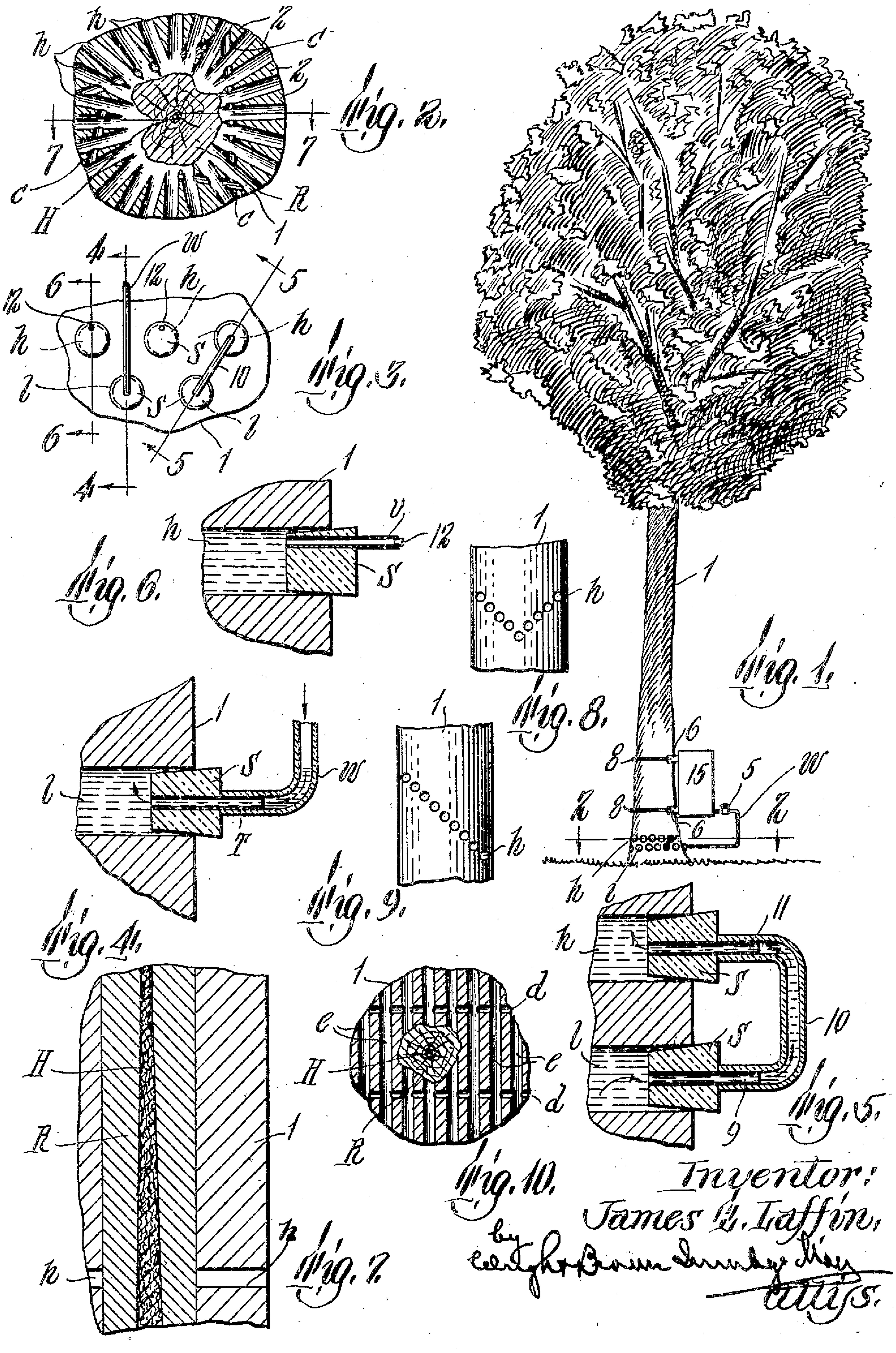

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METHOD OF TREATING TREES.

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This invention, in its broadest aspects, relates to the treatment of the wood cells of a living tree with an impregnating material adapted to pass into and be taken up by the capillary system of the tree. The main object of this invention is to provide a method of treating living trees in an effective and economical manner. By such treatment, the wood cells of the tree may be colored by the use of a dye, preservative, or other treating material. After a dyeing treatment, for example, the trees may be chopped down and sawed into timber, as usual. Such colored or dyed timber is especially adapted for use in interior house finishing, flooring, and furniture; or, it may be employed for any other desired purpose.

Before proceeding to a detailed description of the present invention, however, in order to more fully appreciate the results achieved thereby, it is desirable to preliminarily discuss certain known treatments to which wood may be subjected. A common treatment, for instance, is to surface interior house finishing, furniture, or floors by the application of one or more coats of such agents as varnishes or lacquers. Because of the relative impenetrability of the wood and its inability to absorb these agents, the wood is essentially only surface-coated, and the interior of the wood thus retains its original color and structure. Moreover, by such practice, in order to produce a certain colored wood as in the simulation or duplication of the color of certain relatively expensive woods such as mahogany and ebony, a coloring pigment is frequently added to and mixed in with the lacquer or varnish to be employed. When wood is surface-colored with such pigment-treated agents in sufficient amount to cover the color of the original wood, the natural grain of the wood is in great measure concealed, and the appearance of the wood is thereby impaired; whereas, on the other hand, if an insufficient amount of agent is employed, the color of the original wood persists or "shows through." Another general wood treatment is the application of a dye or stain to the surface of the wood. followed by coating the stained surface with a varnish. In such cases, the dye or stain as applied is usually absorbed in a liquid vehicle or solvent, but here, too, the stain does not penetrate the wood to any considerable depth, so that usually only a relatively thin surface of wood is colored. In any of the usual treatments, however, if the wood is inadvertently scratched or scarred, that is, where the varnish or stain and varnish is removed, the color of the original wood shows through, and its appearance is thus impaired.

In accordance with the present invention, however, it is possible to permeate and saturate the fibers of the wood with a dye or other like treating material, by treating the living or growing tree therewith. In so doing, the dye is absorbed or taken up by the wood cells in the usual circulatory or capillary action exercised by the tree. While the tree may be treated by any one of a number of methods, it should be borne in mind that in any event, in order to dye the tree, provision must be made to establish communication between the active intercellular or capillary glands of the tree and a dye. In other words, if a tree is to be dyed uniformly throughout, provision must be made to feed substantially the entire capillary system of the tree with a dye; and if only certain sections of the tree are to be dyed, only that portion of the capillary system connecting with these sections should be furnished with the dye.

This invention particularly relates to a method of efficiently dyeing the entire tree or only certain sections of the tree, if desired, without so weakening its structure as to render it liable to be blown down. Briefly stated, this object is attained by forming separate spaced chambers or compartments for containing dye within the tree, without, however, impairing the integrity of the heartwood, so that the tree is supported during treatment by said heartwood, as well as by the sections left between the spaced chambers.

In the practice of the present invention, staggered, transversely extending chambers are formed in the sapwood portion of the trunk of a tree so as to establish communication with substantially the entire capillary

system thereof. One preferred method of arrangement comprises two series of spaced substantially horizontal chambers extending radially inward from the exterior of the tree into substantial junction with the heart or central portion thereof, the chambers of one series being staggered in reference to those of the other series, and together therewith covering the entire cross-sectional area of the sapwood. The chambers of each series are preferably interconnected with each other and with the chambers of the other series, so that in feeding one chamber with dye, the dye is circulated into and floods all the remaining chambers. The dye thus applied and maintained in the chambers is taken up by the capillary ducts or glands of the tree, and is fed or circulated through the wood cells, which absorb it and become impregnated or saturated therewith, so that at the end of a certain period of time the sapwood portion of the tree is entirely dyed. As indicated, in place of a dye, any other impregnating material adapted to be taken up into the capillary system of the tree may be supplied thereto. For example, an aqueous solution of a wood preservative such as sodium fluoride (Na_2F_2) or zinc chloride ($ZnCl_2$) may be supplied to the tree or mixed with the dye applied thereto.

The manner in which this invention is practised and further objects and advantageous details incident thereto will be readily understood from the following more complete description thereof, when taken in conjunction with the accompanying drawings, in which

Figure 1 illustrates diagrammatically and conventionally a tree undergoing treatment in accordance with the present invention and shows a preferred arrangement of the chambers within the tree.

Figure 2 represents an enlarged section through the trunk of the tree on the line 2—2 of Figure 1, and shows a series or tier of intercommunicating chambers.

Figure 3 represents in front elevation an enlarged detail of a portion of the tree, and shows the means for feeding the treating material into the chambers.

Figures 4, 5, and 6 show enlarged detail sections, respectively, on the lines 4—4, 5—5 and 6—6 of Figure 3.

Figure 7 is a section on the line 7—7 of Figure 2.

Figure 8 shows another arrangement of the chambers.

Figure 9 shows a further arrangement of the chambers; and

Figure 10 shows a still further chamber arrangement.

While any tree may be dyed in accordance with the present invention, hard wood trees, such as birch, beech, maple, etc., are preferably dyed, since these woods are more suited for interior house finishing, flooring and furniture. It will be understood, however, that soft woods, such as spruce, hemlock and fir, may be similarly treated, if desired, as for instance, with an aqueous solution or preservative, especially where the tree is to be utilized for telegraph poles. Prior to treatment, the tree may be examined to observe its characteristics, such as age, quality of the wood, and the size and color of the heart. This may be accomplished by a cored gimlet, termed an "increment borer," by means of which a cylindrical blank of wood may be extracted from the trunk of the tree. The blank is then examined and the various characteristics to be observed are then noted.

Referring to the drawings, 1 indicates as a whole a living tree which is undergoing the impregnating treatment. As previously indicated, in order to saturate or impregnate substantially all the wood cells of the tree 1, provision must be made to establish communication between substantially all the capillary glands or ducts in the tree, and said impregnating material, without, however, sufficiently impairing the structure so that it is liable to be broken by swaying caused by the wind. To this end, a series of approximately horizontal and coplanar spaced holes *h* (Figure 2) are bored inwardly with an auger or any other suitable boring instrument, preferably along radial lines, into the trunk of the tree 1, around its entire circumference. These holes *h* constitute chambers or compartments, with which a portion of the capillary or sap glands of the tree 1 communicate. The holes or chambers *h* are preferably formed as near the roots or butt end of the tree 1 as possible. By such practice the central portion or heart of the trunk is left intact, so that long boards may be cut from the tree 1.

In order that the tree 1 may be able to withstand the action of the wind, the holes *h* extend only to the heart R of said tree. Thus the tree 1 is not only supported by the sections 2 remaining between the spaced chambers *h*, but by the dense and hard wood cells of which the heart R is composed and through which capillary action does not take place. During the dyeing treatment, moreover, in boring only up to the heart R, the heart rot H, shown as being located in the center of the tree 1, is not reached, so that in supplying and maintaining dye in the chambers *h*, there is no loss by leakage or seepage through the heart rot H into the ground. Since the heart rot H is present in approximately 30% of all New England hardwood trees suitable for sawing into good timber, it is quite important that the heartwood be not pierced.

In order to ensure the interconnection of the chambers *h*, even though they should not intersect at the inner ends, said chambers

may be cross-connected by channels or ducts *c*, extending from the outer extremity of one chamber crosswise through one or more other chambers, at an angle, so as to connect as many holes or chambers *h* as possible without penetrating the heartwood R. Thus, by connecting one chamber of the entire series to a supply of treating material, all the chambers *h* may be flooded, because of their interconnections.

After one series or tier of holes has been formed, a similar series of interconnected holes *l* is formed in staggered relationship to those of the other series, and at a different elevation, said second series connecting with the remaining circulatory or capillary glands in the tree 1. The outer extremities of all the chambers *h* are now obstructed by stoppers S and provision is made for feeding or supplying dye or other treating agent into both series of said chambers. For this purpose, a tube T connected through a tube W to the outlet pipe 5 of a reservoir 15 containing the dye is inserted through an opening extending through one of the stoppers S into the corresponding chamber *h*. The stoppers S employed are preferably made of rubber or an equivalent resilient material, so as to maintain a tight fit in the chambers *h* when the tree 1 is swayed by the wind. The upper series or tier of chambers *h* may be supplied with dye by establishing communication with the lower chamber. For example, one of the lower chambers *h* may be provided with an outlet tube 9 passing through one of the stoppers S and connected by a tube 10 to an inlet tube 11 extending into an upper chamber through its stopper S. Thus, after the lower chambers *h* are flooded by the dye, it rises through the tube 10 and enters into and floods the upper chambers *h*; or, if desired, said upper chambers may be connected directly. To permit the escape of air from the chambers *h* and the displacement thereof by the dye when said chambers are initially being flooded, certain stoppers S in the upper tier are provided with air vents or tubes *v* extending into the upper portion of the chambers and having small stoppers 12 at their outer extremities, which may be removed to allow the escape of air and then reinserted after the chambers *h* have been flooded. The reservoir 15 may be supported by any suitable means above the level of the upper tier of chambers *h*, so that a supply of dye may be maintained in said chambers by a gravity flow. For this purpose, the reservoir or container 15 is shown as provided with brackets 6, 6, to which are attached straps or wires 8, 8, which may be fastened to the tree 1.

In place of the arrangement of chambers *h* described in connection with Figures 1 to 7, inclusive, I may produce and use the arrangement of chambers shown in Figures 8, 9, and 10. In the arrangement shown in Figure 8, the holes *h* extend transversely of the tree 1, but without penetrating or cutting into the heartwood, and are staggered in V-formation or configuration, so as to cover substantially all of the cross-sectional area of the sapwood, and thereby effect communication with all the sap glands of the tree 1. The holes may be cross-connected by boring through each of the sides of the superposed chambers *h*, and they may be stoppered and connected to a dye supply, as described in connection with the arrangement hereinbefore set forth. Or the holes may be staggered in inclined form, as shown in Figure 9, so as to require only one row of chambers *h* to communicate with all the capillary glands of the tree. The holes should be formed so as not to pierce through the heartwood, and they may be interconnected by transverse passages, so that all may be supplied with dye solution, as previously indicated herein.

Another method of forming the holes may be that shown in Figure 10, where the holes *e* are arranged in parallelism, and extend horizontally transversely of the tree 1 without intersecting the heartwood, and they are cross-connected by the ducts *d*. Another series of chambers *h* similar to that described is arranged in staggered relationship thereto, on a plane spaced above or below the first mentioned series. The two series may be connected with one another and to a dye supply, as described in connection with the first described arrangement.

The dye selected may be of a shade to color the sapwood to match the color of the heart R, which is considered the most valuable portion of the tree 1 for woodwork. The exact color of dye to effect this result, or any other coloration, is somewhat different, and must be determined by practice, the dye being doubtless modified by reaction with the chemical constituents of the sapwood or undergoing other change which is difficult to ascertain.

Assuming the tree 1 undergoing treatment to be about 20 inches in diameter and the dye container to have a capacity of about 25 gallons, about 12 hours is required by said tree in consuming this first supply of dye. After the exhaustion of the initial supply, however, the rate of dye consumption decreases, and the entire dyeing operation may consume from three to seven days. The amount of dye consumed may vary from 200 to 300 gallons, depending on the particular characteristics of the tree 1 undergoing treatment. The discoloration of the leaves at the top of the tree 1 furnishes an indication as to the completeness of the dyeing operation. The dye employed for this treatment may be a water-soluble dye, or, if desired, an indigo or vat dye may be supplied to the tree in reduced or soluble state, the colora-

tion or precipitation of the dye occurring thereafter in the cells by oxidation, due to the action of the atmosphere. Any other dye capable of being taken up by the capillary system of the tree 1 may be employed.

It is obvious that, the larger the tree 1, the longer the time necessary for a complete dyeing operation. For example, a small, young tree 1 may be colored in a relatively short time, because of the rapid circulatory or capillary action of said tree and the relatively short distance which must be traversed; whereas in the case of large, old trees, the dyeing action may consume a considerably longer time.

While I have described a procedure wherein substantially the entire tree 1 is uniformly dyed throughout, it will be understood that only certain sections of said tree may be dyed, as by supplying dye to only one tier of chambers *h*. Such procedure would result in a striped effect in the tree 1, and in certain cases this effect may be desirable. Or the chambers *h* may be shaped in any desired form so as to produce a non-uniform dyeing of the tree 1. This might in certain cases impart a very artistic and pleasing appearance to the wood.

By dyeing wood as described herein, I have found that such dyed wood may be steamed and soaked in water for days and weeks without destroying the color produced in the interior of the wood. Even when allowed to weather for weeks, the color tends to remain in the fiber, because of the complete saturation afforded by the capillary feeding system in the living tree 1. I have further observed that the grain of the wood is accentuated or made more pronounced, perhaps owing to the fact of the relatively dense and porous woods which represent respectively winter and summer growth of the tree 1, and the difference in saturation accomplished in the case of woods of different density. Wood cut from trees 1 dyed as herein described is especially adapted for furniture manufacture and for use in flooring and interior house finishing. The wood may be colored uniformly throughout, and hence when worked or cut presents the same color. Thus an article manufactured from such wood, when scarred or scratched, may be worked down and refinished, since the color permeates the fiber, rather than being in the nature of a surface coating or thickness only. Moreover, expensive woods, such as mahogany, ebony, rosewood, walnut, etc., may be duplicated in color very easily by dyeing the growing or living tree 1 with a dye effecting a coloring corresponding to these respective woods, and in fact wood of unusual colors, such as lavender, green, orange, or blue, may be produced by the process herein described.

Having thus described the nature of this invention and a method of practising the same, but without attempting to set forth all the different ways in which it may be practised; what I claim is:

1. A method of treating living trees, which comprises forming in the trunk staggered chambers extending transversely thereof and terminating substantially at the edge of the heartwood, and supplying such chambers with an impregnating material adapted to be taken into the capillary system of the tree.

2. A method of treating live trees, which comprises forming two series of coplanar chambers in the trunk which terminate substantially at the junction of the heartwood and sapwood thereof, the chambers of one series being staggered in reference to those of the other series, and supplying said chambers with an impregnating material adapted to pass into the capillary system of the tree.

3. A method of treating living trees, which comprises forming in the trunk thereof a series of spaced transverse radial chambers which terminate substantially at the edge of the heartwood and are connected by cross channels, and supplying said chambers with an impregnating material adapted to pass into the capillary system of the tree.

4. A method of treating living trees, which comprises forming in the trunk thereof two series of substantially horizontal radial chambers which terminate substantially at the edge of the heartwood arranged in staggered relation, forming cross channels for connecting the chambers of each series, and supplying such chambers with an impregnating material adapted to be taken into the capillary system of the tree.

5. A method of treating living trees, which comprises forming in the trunk thereof a series of separate specially arranged radial chambers transversely of the trunk and which terminate substantially at the edge of the heartwood, with each chamber opening outwardly from said trunk, forming cross channels to afford communication between said chambers, closing the open ends of the chambers, and introducing into certain of said chambers an impregnating material adapted to be taken into the capillary system of the tree.

6. A method of treating living trees, which comprises forming a plurality of individual transverse specially-arranged radial chambers connected by cross channels within the butt portion thereof, said chambers and channels terminating substantially at the edge of the heartwood of said tree, and supplying said chambers with an impregnating material adapted to pass into the capillary system of the tree.

7. A method of treating living trees, which comprises forming a plurality of spaced radial chambers and interconnecting coplanar channels in said tree so arranged

as to cover substantially all the cross-sectional area of the sapwood and terminating substantially at the junction of said sapwood with the heartwood, and supplying said chambers with an impregnating material adapted to pass into the capillary system of the tree.

8. A method of treating living trees, which comprises forming a plurality of tiers of coplanar chambers within the butt portion thereof, each of said tiers embodying a plurality of radial chambers interconnected by cross channels arranged about the tree and in staggered relation to the chambers of an adjacent tier, said chambers terminating substantially at the junction of the sapwood with the heartwood and communicating with substantially all the active capillary glands of said tree, and supplying said chambers with an impregnating material adapted to be taken into the capillary system of the tree until substantially all the living wood cells of said tree are permeated thereby.

9. A method of treating living trees, which comprises forming in the trunk thereof staggered radial chambers extending transversely thereof and inter-connected by cross channels, said chambers terminating substantially at the junction of the sapwood with the heartwood, plugging the open ends of the chambers, introducing into certain of said chambers an impregnating material adapted to be taken into the capillary system of the tree, venting the air from said chambers while initially supplying material thereinto, and maintaining a supply of such material in said chambers until the tree has been treated.

10. A method of treating living trees, which comprises forming in the trunk thereof a plurality of tiers of chambers covering substantially all the cross-sectional area of the sapwood and terminating substantially at the junction of said sapwood with the heartwood, each of said tiers embodying a plurality of separate, substantially radial and coplanar circular chambers arranged about said tree and in staggered relation to the chambers of an adjacent tier, forming cross channels for connecting the chambers of each series, each of said cross channels extending from the outer extremity of one chamber crosswise through one or more other chambers, plugging the open ends of the chambers, introducing into certain of said chambers an impregnating material adapted to be taken into the capillary system of the tree, venting the air from said chambers while initially feeding material thereinto, and maintaining a supply of such material in said chambers until the tree has been treated.

In testimony whereof I have affixed my signature.

JAMES E. LAFFIN.