

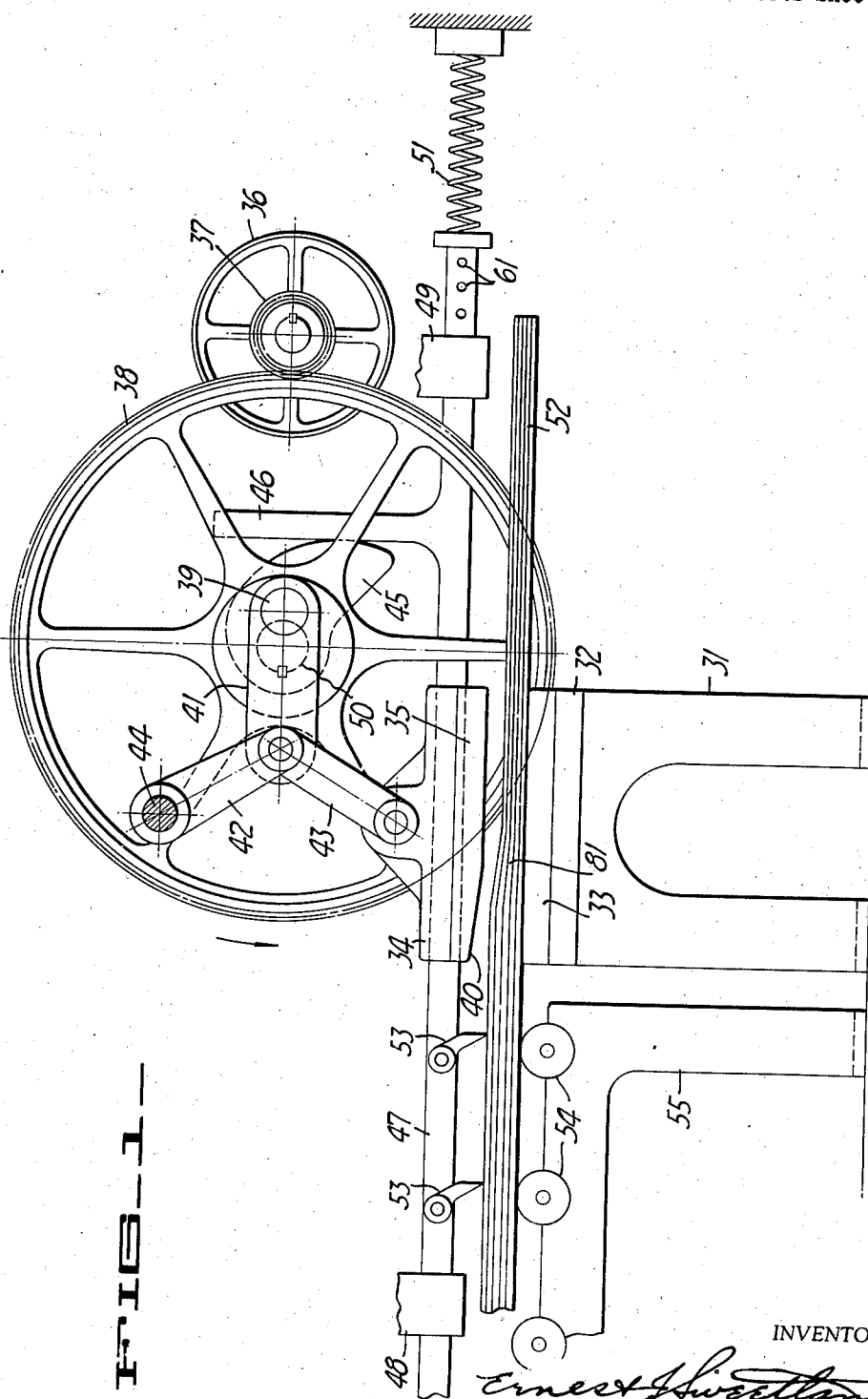
Nov. 15, 1938.

E. J. SWEETLAND
METHOD OF TREATING LUMBER

2,136,730

Filed Nov. 13, 1935

2 Sheets-Sheet 1



INVENTOR.

Ernest Sweetland

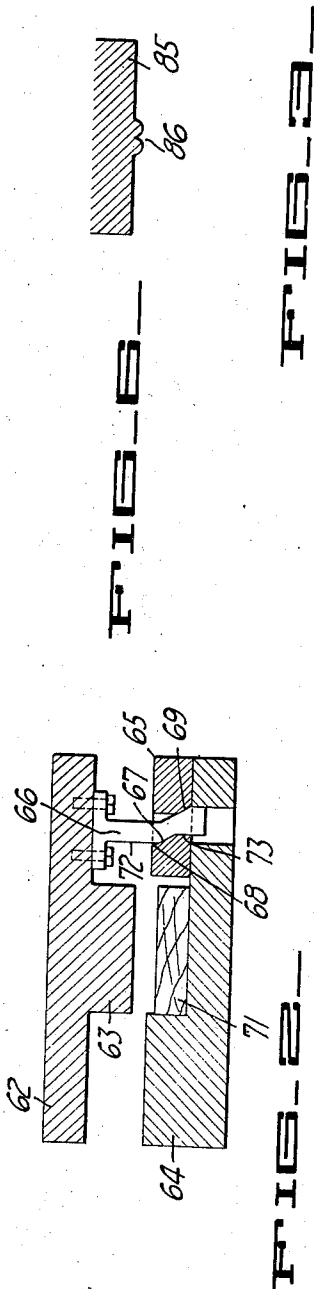
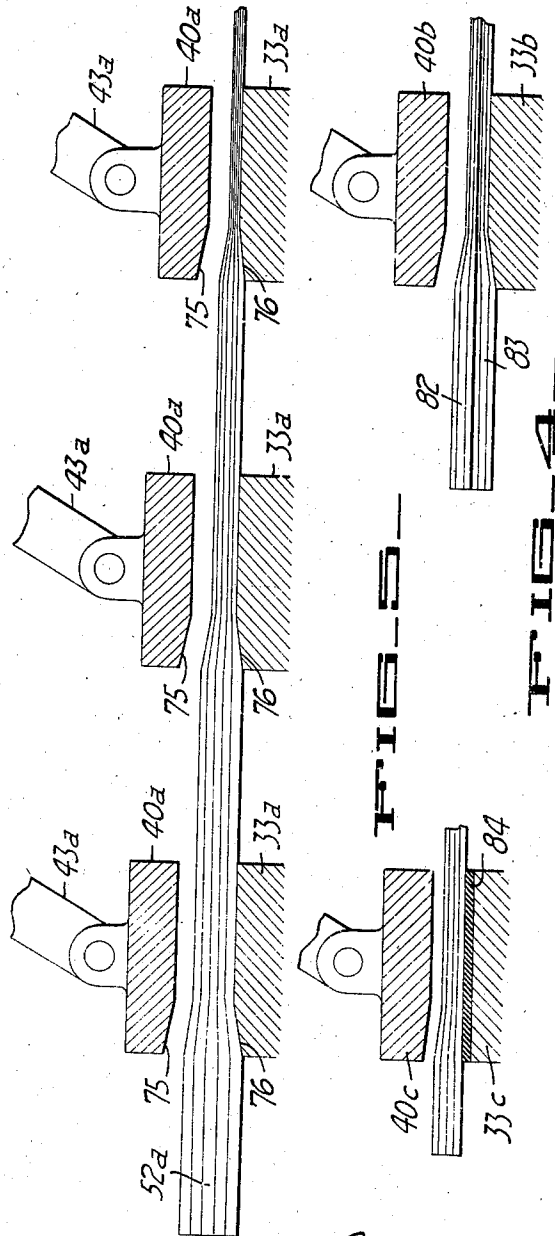
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METHOD OF TREATING LUMBER

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8 Claims. (Cl. 41-24)

This invention relates to a specially surfaced and hardened lumber and method of preparing the same.

5 An object of my invention is to harden lumber such as is used in building construction, cabinet work, furniture manufacture and the like.

A further object is to harden lumber and simultaneously provide it with a smooth and irregular surface which has an artistic value for use as interior trim, paneling, cabinet work and the like, particularly where rustic effects are desired.

10 A further object is to harden lumber and simultaneously raise certain of the grains therein.

A further object is to provide lumber of substantially equal hardness throughout as an improvement for certain purposes over lumber which is composed of alternate hard and soft layers.

20 A further object is to provide a method for simultaneously straightening and hardening lumber.

A further object is to provide a method for filling the pores of lumber, especially those adjacent the surface thereof, with a sealing agent such as linseed oil, varnish or shellac, then subjecting the boards to compression whereby the sealing agent which penetrates beneath the surface of the boards is permanently enclosed within the board structure.

A further object is to preserve lumber from attack by insects by compression which tends to destroy insects or larvae that may be concealed within the structure of the board and also tends to prevent the further invasion of the board by insects; the use of chemical agents such as creosote either prior or subsequent to compression may be employed if desired.

40 A further object is to harden lumber by compression in a manner which makes it especially amenable to the action of liquids for raising the grain thereof and thus adapting it to certain decorative purposes.

45 The invention possesses other advantageous features, some of which with the foregoing, will be set forth at length in the following description where that form of the invention which has been selected for illustration in the drawings accompanying and forming a part of the present specification is outlined in full. In said drawings, one form of the invention is shown, but it is to be understood that it is not limited to such form, since the invention as set forth in the claims may be embodied in a plurality of forms.

The term "lumber" as used herein is a general term to define wood which has been sawn into boards, planks, timbers, etc. regardless of the nature of the wood from which the lumber is made.

I am aware that the art of compressing wood in the form of small blocks for various purposes is old, and also that railroad ties have been subjected to compression for purposes of hardening etc. The present application is not concerned with the compression of blocks of wood that may be completely enclosed in a mold and compressed in a single operation, but rather to the treatment of commercial lumber of various sizes and lengths by a method which is believed to be entirely novel and which accomplishes a new and useful purpose which cannot be achieved by the methods of the prior art.

All woods are irregular in hardness and density particularly the softer woods most commonly used for making commercial lumber such as pine, fir, spruce etc. The irregularity is due to the fact that the growth of the tree is more rapid in the spring than at any other time of the year. The spring growth is therefore an open cellular structure which is quite soft by comparison with the denser wood which grows later in the season. The result is that the tree is built up of alternate hard and soft annular layers. When the tree is cut into lumber the boards are composed of alternate hard and soft layers which lie in planes approximately parallel to the flat surface of the board in lumber known as "slash grain"; whereas the boards are known as vertical grain when the alternating hard and soft layers lie approximately at right angles to the flat surface of the board. Naturally the soft grain of the wood is not as durable as the harder grain as may be frequently observed in flooring, where the soft grain wears away leaving an uneven surface which eventually becomes splintered and has to be replaced. One of the objects of my invention is to increase the density and hardness of the soft grain without materially affecting the hard grain, thereby producing a lumber of fine texture which is greatly increased in strength and will wear uniformly.

Boards used in building construction frequently range from 10 to 20 feet in length and may be 12 inches or more in width. In carrying out my process of hardening lumber the pressure required may vary from one to five tons per square inch, and it is obvious that the cost of equipment would in most cases be prohibitive if it were necessary to provide a press and dies or

molds capable of subjecting long, wide boards to a pressure of, say, three tons per square inch, if the entire board were to be treated at one time. For instance, a board 12 feet long and 12 inches wide would require a pressure of 5184 tons which not only would call for exceedingly expensive equipment but on account of the slowness of operation, the cost of treatment would be prohibitive. On the other hand, by the step by step method herein set forth a reciprocating press, such as an ordinary punch press, may be used, and very satisfactory results produced where the maximum capacity of the press is from 100 to 500 tons and automatic feeding methods may be used to reduce the cost of labor to a minimum. Furthermore, by my method dies of adjustable width and depth may be used, so that the cost of equipment to handle the entire range of commercial sizes of lumber represents but a comparatively small investment. The same press may be used on the entire range of sizes.

My invention will be understood by reference to the accompanying drawings wherein:

Figure 1 illustrates a toggle press and feeding mechanism in side elevation.

Figure 2 represents a front elevation of a die that may be used in connection with the press shown in Figure 1.

Figure 3 is a side elevation which diagrammatically represents a modification of the invention wherein a plurality of presses may be used in series to compress lumber in successive stages.

Figure 4 represents a method of compressing two or more boards simultaneously.

Figure 5 represents means of compressing boards against a resilient surface, such as rubber, to accentuate the grain of the wood.

Figure 6 shows a die for use in giving a decorative design to boards being compressed.

Referring particularly to Figure 1 the numeral 31 indicates the base of the toggle press which supports the bolster plate 32 and the die 33. The upper portion of the press 34, which may be called the ram, carries the upper die 35. The ram 34 is mounted in guides (not shown) which maintain the lower surface of the ram 34 and the horizontal surface of die 35 in parallel relation to the die 33. A vertical reciprocating motion is imparted to 34 and 35 by means of pulley 36 which drives the gear wheel 38 through the pinion 37. 39 is a crank pin which is eccentrically mounted with relation to the center of the gear wheel 38 and is carried thereby, and 41 is a link journaled to pin 39 which transmits the motion of crank pin 39 to the toggles 42 and 43. The upper end of toggle 42 is journaled to the stationary shaft 44 which is supported in the housing of the press (not shown). Upon rotation of the gear wheel 38, the toggles 42 and 43 are straightened to a vertical position thus imparting a powerful downward stroke to the upper die 35.

It will be noted that the forward end of the upper die 35 departs from a horizontal line as indicated at 40 to form a gradual sloping entrance between the dies, thereby making the distance between the lower die 33 and the upper die 35 somewhat wider at the entrance than it is throughout the body of the die. The object of this graduated entrance to the die is to avoid a sudden disturbance of the fibers of the board at the forward edge of the die. Generally speaking, it is advisable to have the amount of slope at the forward end of the die equivalent to the amount of reduction in thickness it is desired to give the lumber as each piece of lumber passes

through the die. For instance, if a board one inch thick is to be reduced to a thickness of $\frac{7}{8}$ inch in one pass through the die then the forward edge of the upper die 35 is made at least $\frac{1}{8}$ inch higher than the horizontal face of the die and the slope continues for a distance of several inches. By this arrangement a sudden step in the thickness of the board which would tend to disrupt the fibers is avoided. The lower die 33 may be graduated in thickness at its forward end as is represented in Figure 3, if desired.

To provide automatic feed of lumber through the press the cam 45 is keyed to the central shaft 50. The follower 46 which is integral with the feed rod 47 imparts a reciprocating motion to the rod 47 which is slidably mounted in the guides 48 and 49 and the follower is kept in contact with the surface of the cam by the compression spring 51.

55 represents a table which is supplied with a plurality of rollers 54 which serve as a support for the boards 52 which are fed through the press in a step by step motion by the dogs 53 which are carried by the rod 47. The length of stroke of the rod 47 and consequently the amount of feed imparted to the boards may be adjusted by pins inserted in the holes 61 which regulate the length of the return stroke of the rod 47. The dogs 53 are pivotally mounted and are sharpened at the point. The weight of the dogs keeps their sharp points in contact with the board 52 and the angle at which they rest on the board permits them to slide freely over the board during the return stroke of rod 47. Thus the dogs "bite" into the board surface to feed it into the press while cam 45 is acting upon follower 46 and rod 47 during the forward stroke, and the dogs slide over the surface of the board with a ratchet-like action during the return stroke.

Figure 2 represents a front vertical section of a die which may be used in the press illustrated in Figure 1. The die here illustrated supports the sides of the boards to prevent them from bulging during compression. This arrangement consists of the upper die 62 which is provided with a projection 63 which corresponds in width to the width of board desired. The lower die 64 is firmly secured to the bolster plate by any convenient means and is provided with the movable slide plate 65, which is given a horizontal motion by means of the rod 66 which is provided with a cam surface 67, which bears against the surface 68 to force the plate inwardly while the cam surface 69 gives the plate an outward movement near the end of the upward stroke of the press. 71 represents a sectional view of the board in place in the die. From this construction it will be seen that in the early part of the downward stroke of the press the cam 67 engages the surface 68 and pushes the plate 65 toward the left bringing it in close contact with the side of the board which is approximately the same width as the portion 63 of the upper die. As the downward stroke progresses the plate 65 is firmly held against the board by the flat surface 72 bearing against the straight side 73 of the opening through plate 65. While the plate 65 is thus held in close contact with the board the part 63 applies the necessary compression and when the upper die 62 returns to a point near the upper end of its stroke, the cam surface 69 pushes the plate 65 outwardly to the position indicated in the drawings. The arrangement of the plate 65, as described, not only tends to straighten lumber by forcing it into a perfectly straight

position during the application of pressure, but serves the further purpose of releasing the board to permit it to be fed forward freely during the upward stroke of the press.

Since the rod 66 which is fitted with the cam surfaces 67 and 69 travels up and down with the upper die 62, the plate 65 is free to move sideways in accordance with the pressure of the cam surface 67 which forces the plate inwardly during the down stroke of the die. Similarly the plate 65 is forced outwardly by the pressure of the cam surface 69 during the upward stroke of the die. Therefore the motion of the side plate 65 is automatically co-ordinated with the motion of the die 62 so that the inner surface of the plate always bears against the board while it is subjected to pressure by the projection 63, and is released to the position shown in Figure 2 during the upward stroke of the die. While the plate 65 is free to slide sideways, means (not shown) is provided to prevent it from being lifted out of position during the upward stroke of the press.

Referring to Figure 3, this diagrammatically represents a series of presses operating upon the same board 70 whereby each press further reduces the thickness and increases the hardness of the board, until it is finally discharged as a finished product. In this view the lower toggle of the press is represented by the numeral 43a; the upper die by 40a and the lower die by 33a. In this case both the upper and lower dies are sloped at the forward end to make the compression of the boards more gradual, the sloping surfaces being represented by the numerals 75 and 76.

Figure 4 diagrammatically represents a pair of boards being fed between the dies together whereby the thickness of the boards is reduced and at the same time the hard portions of one board are impressed into the softer portions of the opposite board to produce a smooth undulating surface upon the face of the boards which lends itself to artistic treatment as will hereafter be described. If desired the pattern of a fabric such as canvas or wire screen or like materials may be impressed in the board surfaces by placing such a fabric between the boards during compression.

In carrying out the objects of my invention the process is substantially the same whether dies as illustrated in Figure 1 are used or whether the type of dies illustrated in Figures 2 and 3 are used. In either event the press may be set to reduce the thickness of the boards by about 10% during the first one or two passes through the press. If extreme hardness is desired the amount of reduction may be reduced with each successive pass. A typical operation where pine or fir lumber having an original thickness of $\frac{1}{2}$ inch is used (the boards preferably having been previously planed) would be to reduce the thickness $\frac{1}{8}$ of an inch the first pass, $\frac{1}{8}$ of an inch the second pass and $\frac{1}{8}$ inch each for the third and fourth passes thus reducing the thickness of the board from $\frac{1}{2}$ to $\frac{1}{4}$ of an inch. I have found that for a short time after the compression there is a slight expansion of the wood, increasing the thickness to a small degree, but after the compressed lumber is seasoned for a few hours or at the most for a few days it holds its size without further change unless subjected to the action of dampness or liquids.

Ordinary commercial lumber either with or without kiln drying may be used in carrying out

the purposes of my invention. It is preferable to have the lumber planed on all four sides prior to compression but this may be dispensed with to obtain certain effects. The treatment is ordinarily carried on at normal room temperature with entirely satisfactory results although in certain cases I have found it advantageous to warm the boards prior to compression, whereby the resinous material within the board structure is softened with certain beneficial effects.

A typical method of operating the apparatus shown in Figure 1 would be as follows: The boards are fed on to the rollers 54 either manually or automatically, the machine being operated at a speed which may vary to suit the work in hand. A speed of about 40 strokes per minute gives satisfactory results although this may be greatly varied in either direction. The dies 33 and 35 in a typical instance may be 24 inches in length with the sloping portion extending over about 6 inches of the length of the die, leaving the parallel surfaces about 18 inches long. With this arrangement a forward feed of 12 to 15 inches may be used. In any event the feed forward should be somewhat less than the length of the parallel portion of the dies so that there is a certain amount of overlapping of compression at each stroke. It will be understood, however, that these figures are all subject to wide variation which depends more or less upon the hardness of the lumber and the power of the press. For instance, soft pine boards receiving $\frac{1}{8}$ or $\frac{1}{4}$ inch compression may readily be fed 15 or 16 inches at each stroke of the press without drawing excessively upon the power of the machine; but if oak planks are under treatment either the amount of compression or the amount of feed should be reduced as the power required to compress oak planks is obviously greater than that required for soft pine.

If it is desired to reduce the thickness of the board to a large extent in a single pass through the machine then the sloping portion 40 of the die 35 may extend almost the entire length of the die and the forward opening in the die may be half an inch or more wider than the parallel surfaces of the die. In this instance the feed of the board is reduced so that it is always somewhat less than the length of the parallel surfaces of the die. Therefore if the die is 24 inches long and the sloping portion extends for a distance of 18 inches, the feed should be reduced to 3 or 4 inches. In this case a board $\frac{3}{4}$ of an inch thick may readily be reduced to half of its original thickness at a single pass through the machine. The same principles apply when both the upper and lower dies have inclined surfaces at the forward end as illustrated in Figures 3 and 4. Thus it will be seen that the desired result may be obtained either by rapid feeding with a small amount of compression or by slow feeding with a large amount of compression at each stroke. It is of importance to note that in either event the compression from one stage to another is gradual so that the wood fibers are not ruptured or subjected to undue strain at any stage of the process. It is this gradual step by step process which makes it possible to treat boards of any desired length.

As soon as the boards are advanced upon the rollers 54 far enough to be engaged by the dogs 53 automatic feeding takes place. The flat portion of upper die 35 at all times maintains its parallel relation with the die 33 and in its down-

ward stroke compresses the board to the required extent, then as the die 35 recedes from the board the cam 45 forces the follower 46 and the feed rod 47 forward and the board is thus advanced by the dogs 53. It should be noted that the cam 45 is keyed to the shaft 50 to which the gear wheel 38 is also fixed. Thus the crank pin 39, which is carried by the gear wheel 38, and the cam 45 maintain a fixed relation to each other such that the cam 45 always acts upon the follower 46 and rod 47 to feed the lumber during the upward stroke of die 35. The board 52 in the drawings is represented as being in progress of advancing in preparation for the next stroke. The longitudinal lines on the side of the board represent the harder grain of the wood which, as will be noted at the point indicated by the numeral 81, are not disrupted by the gradual process of compression but are forced closer together as the softer portions of the wood yield to compression. When a considerable degree of compression is to be used on the lumber it is desirable to use the type of die illustrated in Figure 2 which, as previously explained, supports the sides of the board and prevents bulging or splitting.

The type of die illustrated in Figure 2 is particularly important when it is desirable to straighten the lumber simultaneously with the hardening. For instance, narrow boards that are warped in a sidewise direction may in some cases be straightened by compression in a die of this type. This straightening is accomplished by reason of the rearrangement of fibers within the board during heavy compression, while the board is forcibly held in a straight position by the side plates of the die.

The arrangement shown in Figure 3 represents a plurality of similar dies operating in series each pair being somewhat closer together than the preceding pair. The series of dies are assumed to be operated in timed relation with each other so that the board 52a is released by all of the dies of the series simultaneously and is fed forward with a single feed mechanism. In this figure the amount of compression of the board is somewhat exaggerated for purposes of illustration, and it will be noted that in this figure both the upper and lower dies have the sloping forward surface as shown at 75 and 76 which makes it possible to compress the boards with less disturbance to the fiber structure than when only the upper die is tapered as shown in Figure 1.

It should be noted that the results obtained with a single pair of dies as shown in Figure 1 is ultimately the same as the results produced with the series arrangement shown in Figure 3, but when a single press as shown in Figure 1 is used, a single batch of lumber is run through the same dies several times, the dies being adjusted closer together after each operation. This adjustment may be accomplished through the screw adjusting means customarily used in punch presses for regulating the distance between the dies, or one of the dies as 33 or 35 may be replaced by a thicker one after each reduction in thickness of the batch. In some cases I have found it convenient to reduce the space between the dies and thus increase compression by securing one or more flat spacing plates to the top of the lower die 33.

In the preceding description it was assumed that the boards were to come from the press 75 with a smooth, hardened surface as imparted

by the polished surfaces of the dies. But when it is desired to obtain an irregular surface on the face of the boards for antique or rustic effects the arrangement illustrated in Figure 4 is used. In this instance the upper die 40b and the lower die 33b are mounted in a press similar to that shown in Figure 1 and all of the operations are substantially the same except that two boards 82 and 83 are placed face to face and fed through the machine simultaneously. By this process the lumber is hardened as it is in the instances previously described, but the harder portions of one board tend to make depressions in the softer portions of the opposite board and vice versa, in a manner that gives each board a peculiar undulating surface which, when stained and otherwise decorated, produces pleasing and interesting effects with patterns that are peculiar to each individual board and which never repeat themselves. A knot in one board makes a depression in the opposite one, and the varying densities of the two boards, which are not obvious before compression is applied, causes the contours of the boards to vary and at the same time the surfaces are made extremely hard, thus reducing the absorptive qualities of the boards and thereby minimizing the quantity of materials required for staining, varnishing etc. Both boards are hardened and the tendency is for their hardness to be equalized.

As hardening of the boards tends to reduce the amount of stain which they will absorb, it is sometimes desirable, in order to give contrast in color, to apply stain and allow it to dry prior to compression. This applies to the treatment described with reference to Figures 1, 2, and 3, as well as to Figures 4 and 5.

In the modification shown in Figure 5 the dies 40c and 33c are used as previously described, but in this instance the face of the die 33c is covered with rubber, fabric, or any other resilient material as indicated by the numeral 84. In this modification the boards are fed through the press singly and the effect of the resilient surface on the die is to compress certain grains of the wood while others are brought out in relief. The same result may be produced by placing a loose sheet of rubber between the board and die.

If it is desired to harden boards with an irregular surface on both sides, then both the dies 40c and 33c may be covered with resilient material the hardness of which is varied to suit the type of lumber being treated and if desired certain patterns or undulating surfaces may be provided in any of the dies herein described to produce special effects on the surfaces of the lumber.

In Figure 6 the numeral 85 represents a section of an upper die corresponding to 63 in Figure 2, upon which the beads 86 are an example of one form of pattern or decoration that may be impressed upon the lumber during compression.

Obviously three or more boards may be passed through any of the dies at a time, in which instance all of the boards except the upper and lower ones will have both of their surfaces impressed with the irregular pattern produced by the adjacent board.

From the foregoing it will be understood that boards or timbers of any size and length may be hardened by the use of a simple machine which can readily be adjusted to suit any size material. Any chemical or other treatment applicable to

lumber in general may be applied to the lumber either before or after treatment by my process. For instance a quantity of lumber may be placed in a vacuum chamber to remove the air from the cells after which it may be submerged in a preservative such as creosote or a liquid such as linseed oil, varnish, sodium silicate or any other liquid which may be forced into the chamber under pressure to completely impregnate the pores of the wood, after which the boards are subjected to the compression herein described which will remove the surplus liquid and leave the boards in a hardened condition thoroughly impregnated for whatever purpose such special treatment may be desired.

The boards may be steamed or subjected to treatment in hot or cold water prior to treatment to obtain special effects.

Boards of veneer or plywood may be successfully compressed after such veneer or plywood is manufactured or the individual layers which make up the product may be compressed prior to being glued together. In either instance a veneer or plywood of superior hardness is obtained.

One of the advantages of my process for producing an irregular surface as described in connection with Figures 4 and 5 is that the surface produced, while irregular, is still smooth and pleasing to the touch. However, when it is desired to produce certain rustic effects, and particularly where it is desired to open the pores of the wood to make it more receptive to stain, the surface of the compressed board, whether it is compressed with a smooth finish or with an uneven surface, may be treated with water or with a water stain, or other liquid. This causes an opening of the pores at the surface and swelling of the grain which lends itself to a great variety of decorative effects well known in the arts. Ordinarily it is desirable to waterproof the lumber after compression as the surface of the lumber treated by my process is more susceptible to the action of water than ordinary lumber. This, however, is not essential so long as the compressed lumber is kept in a reasonably dry place.

From the foregoing it will be understood that soft wood in the form of commercial lumber may be hardened to any desired degree up to a point where it equals or exceeds the hardness of the so-called hard woods such as oak, maple, hickory, etc., and the natural hard woods when treated by my process are greatly increased in strength and wearing qualities and decorative effects are produced by the methods herein described that have heretofore been unattainable in commercial lumber.

I claim:

1. A method of simultaneously hardening and producing an irregular surface on boards having hard and relatively soft portions which comprises placing a plurality of boards together with their adjacent surfaces in contact, subjecting said boards to a compressive pressure sufficient to permanently reduce the thickness thereof, said thickness varying moderately in different portions of said boards in accordance with the compressibility of said hard and relatively soft portions and the extent to which the hard portions of one board have been impressed into the relatively soft portions of the adjacent board, and then separating said boards to expose said adjacent surfaces.

2. A method of hardening wooden boards and

the like by compression comprising, subjecting a section of a substantial area of a board to a substantially uniform compressive pressure sufficient to permanently reduce the thickness thereof and simultaneously subjecting a second section of a substantial area adjoining said first-mentioned section to compressive pressure such that the stress in said section gradually decreases in degree in a direction away from said first-mentioned section, releasing the pressure on said sections, and then subjecting said second-mentioned section to a substantially uniform compressive pressure equal to that previously applied to said first-mentioned section to permanently reduce its thickness to a substantially uniform thickness corresponding to that of said first-mentioned section.

3. A method of simultaneously compressing and producing an irregular surface on boards having alternate hard and relatively soft portions which comprises, compressing a board against a substantially flat resilient surface by applying compressive pressure thereto in excess of the elastic limit of said soft portions to thereby compress said portions to different degrees to form a board of varying thickness with certain parts of the hard portions standing out in relief relatively to the soft portions of said board.

4. A method of simultaneously hardening and ornamenting wooden boards having hard and relatively soft portions comprising, placing a plurality of boards in superposed relationship, subjecting a section of a substantial area of said superposed boards to a substantially uniform compressive pressure sufficient to permanently reduce the thickness of said section of said boards and simultaneously subjecting a second section of a substantial area of said boards adjoining said first-mentioned section to compressive pressure such that the stress in said second section of said boards gradually decreases in degree in a direction away from said first-mentioned section of said boards, whereby the soft portions of said boards are compacted and certain of the grains of said hard portions are forced against certain of said soft portions to form indentations therein, releasing the pressure on said boards, then subjecting said second-mentioned section of said boards to a substantially uniform compressive pressure equal to that previously applied to said first-mentioned section of said boards to permanently reduce the thickness thereof to a substantially uniform thickness corresponding to that of said first-mentioned section of said boards, and then separating said boards to expose said indentations to view.

5. The method of simultaneously hardening and producing an irregular surface on boards which comprises, placing a board upon a resilient surface, applying a compressive pressure to a section constituting a substantial area of said board, said compressive pressure being sufficient to permanently reduce said section to a substantially uniform thickness, simultaneously compressing a contiguous section of said board to different degrees of compression to produce a longitudinally varying thickness in said contiguous section, releasing said pressure, and then applying compressive pressure to said contiguous section to permanently reduce its thickness to a substantially uniform thickness corresponding to that of said first-mentioned section.

6. The method of hardening wooden boards by compression which comprises, supporting the opposite longitudinal edges of a board to prevent

transverse expansion of said board when compressed, applying a compressive pressure to a substantial portion of said board sufficient to permanently reduce said portion to a substantially uniform thickness and simultaneously compress a contiguous portion of said board to different degrees of compression to produce a longitudinally varying thickness in said contiguous portion, releasing said pressure, then applying compressive pressure to said contiguous portion to permanently reduce its thickness to a substantially uniform thickness corresponding to that of said first-mentioned portion.

7. A method of filling, hardening and producing an irregular surface on boards having hard and relatively soft portions which comprises, applying sealing material to at least one surface of a plurality of boards to fill the pores thereof, placing said boards together so that two filled surfaces are adjacent and in contact, subjecting said boards to a compressive pressure sufficient to enclose in the pores of said boards the sealing material which has penetrated below the surface of said boards and to permanently reduce the thickness of said boards, said thickness varying moderately in different portions of said boards in accordance with the compressibility of said hard and relatively soft portions and the extent to

which the hard portions of one board have been impressed into the relatively soft portions of the adjacent board, and then separating said boards to expose said adjacent surfaces.

8. A method of treating wooden boards and the like by compression, comprising, impregnating at least one face of a board with a sealing material, subjecting a section of a substantial area of said board to a substantially uniform compressive pressure sufficient to permanently reduce the thickness thereof and to enclose within the board structure the sealing agent which has penetrated beneath the surface of said board, and simultaneously subjecting a second section of a substantial area adjoining said first mentioned section to compressive pressure such that the stress in said section gradually decreases in degree in a direction away from said first mentioned section, releasing the pressure upon said sections, and then subjecting said second mentioned section to a substantially uniform compressive pressure equal to that previously applied to said first mentioned section to permanently reduce its thickness to a substantially uniform thickness corresponding to that of said first mentioned section.

ERNEST J. SWEETLAND.