Sept. 1, 1925 1,551,964

H. S. MITCHELL

METHOD OF MANUFACTURE OF LUMBER AND APPARATUS FOR EFFECTING THE SAME

Filed Dec. 12, 1922 4 Sheets-Sheet 1

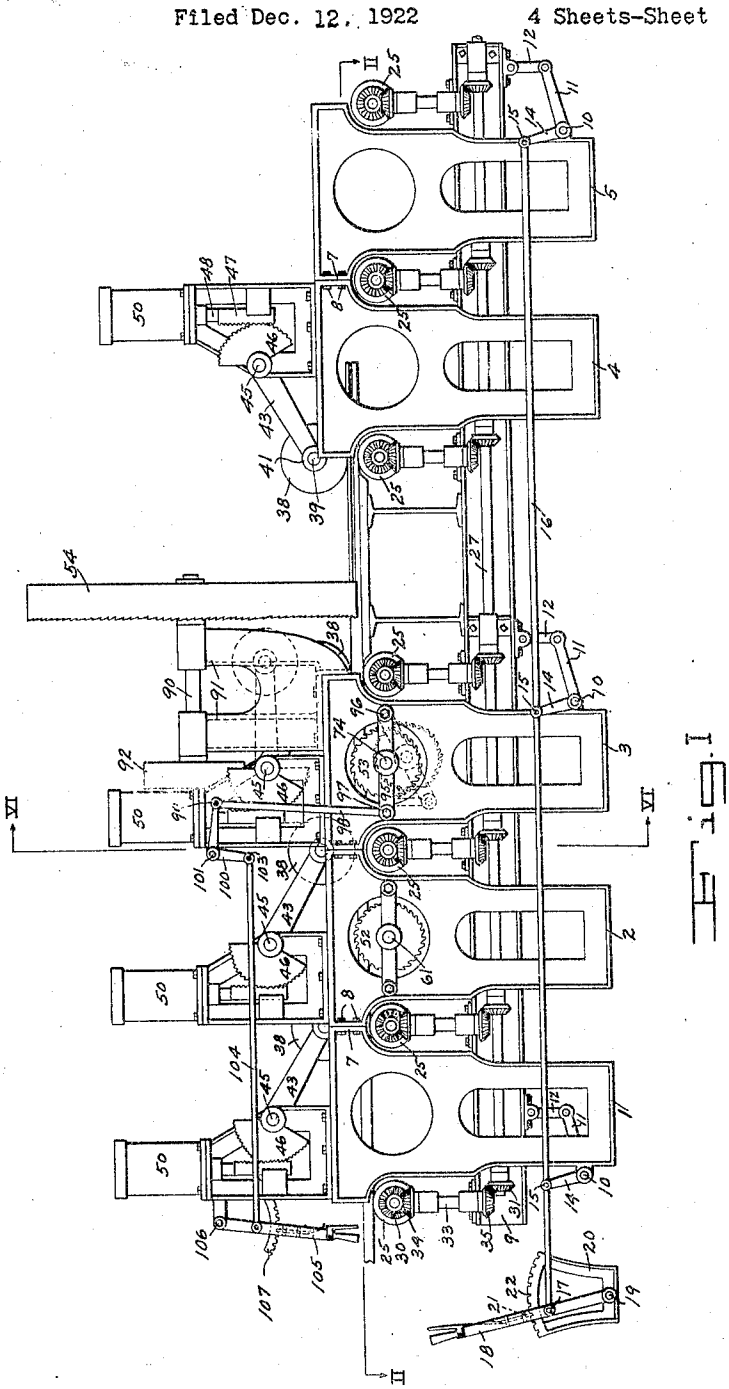


Fig. 1.

INVENTOR:
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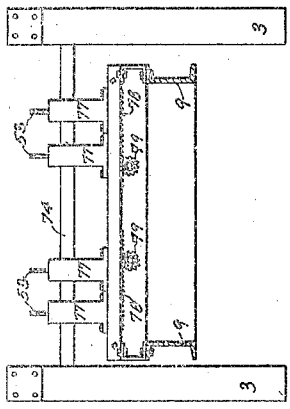


Fig. IV

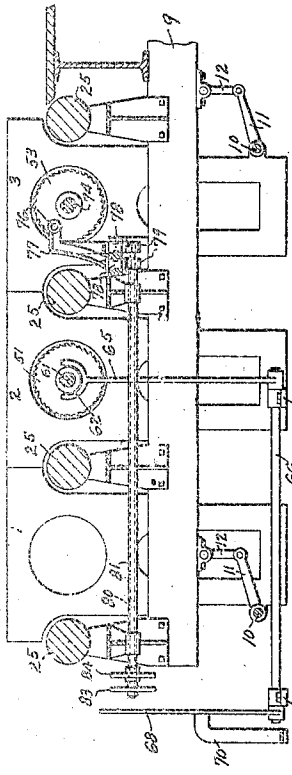


Fig. III

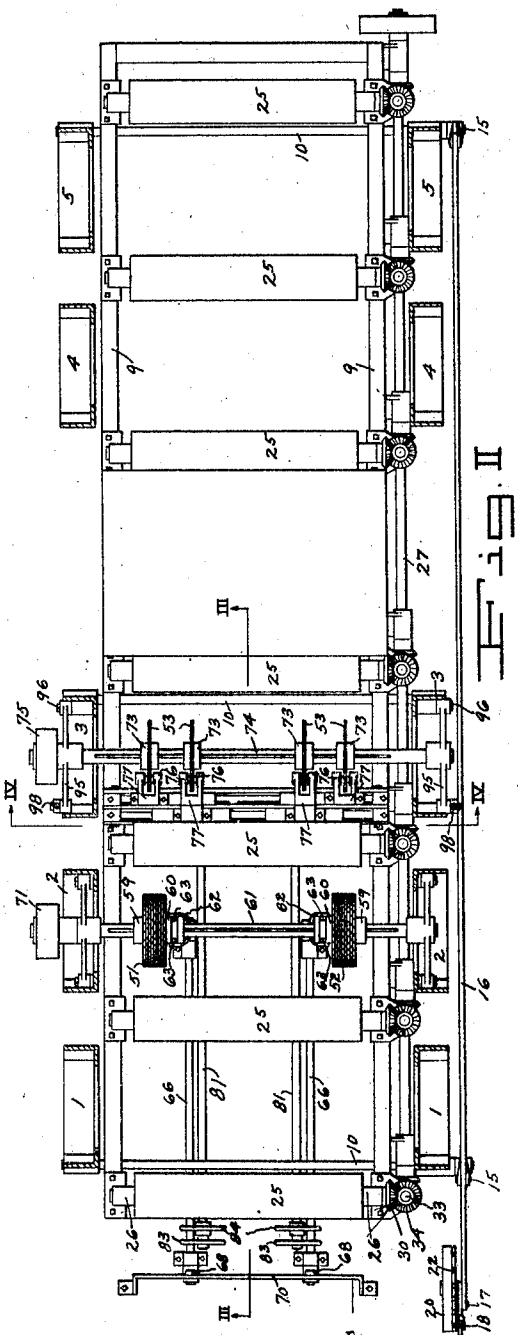


Fig. II

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4 Sheets-Sheet 3

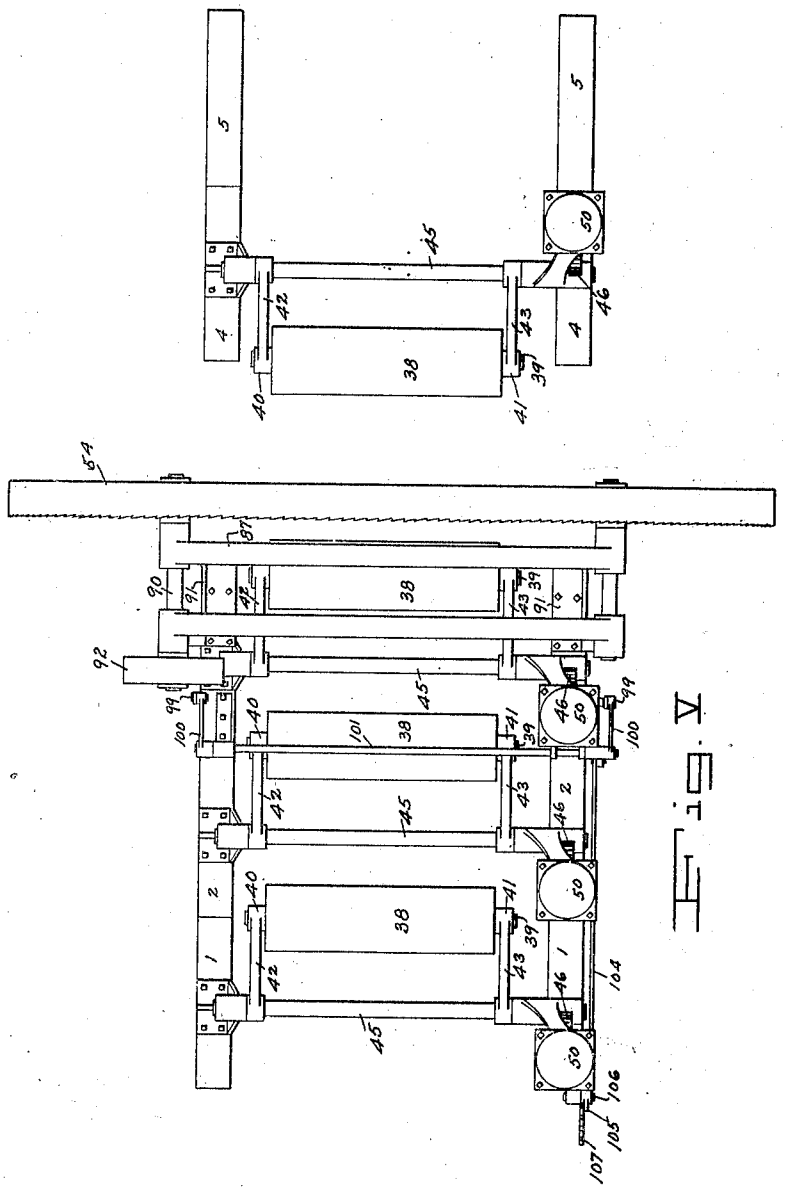


Fig. 4.

INVENTOR:
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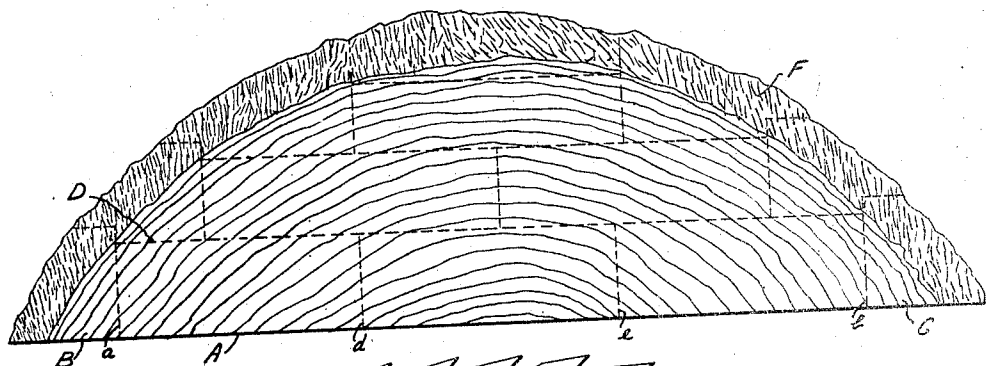
Sept. 1, 1925. 1,551,964

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Filed Dec. 12, 1922 4 Sheets-Sheet 4

Fig. VII



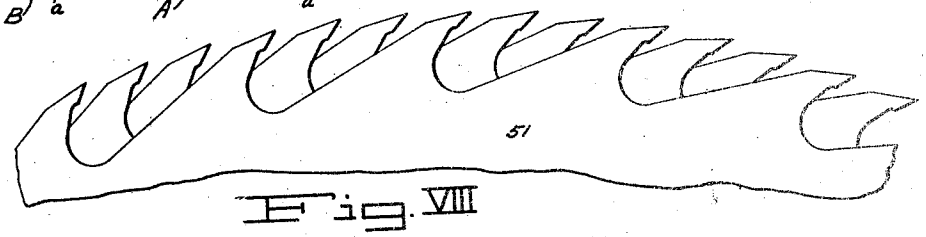


Fig. VIII

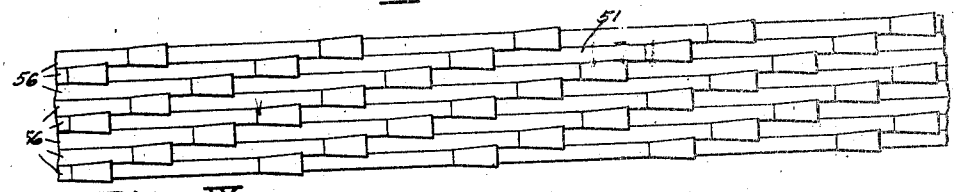


Fig. IX

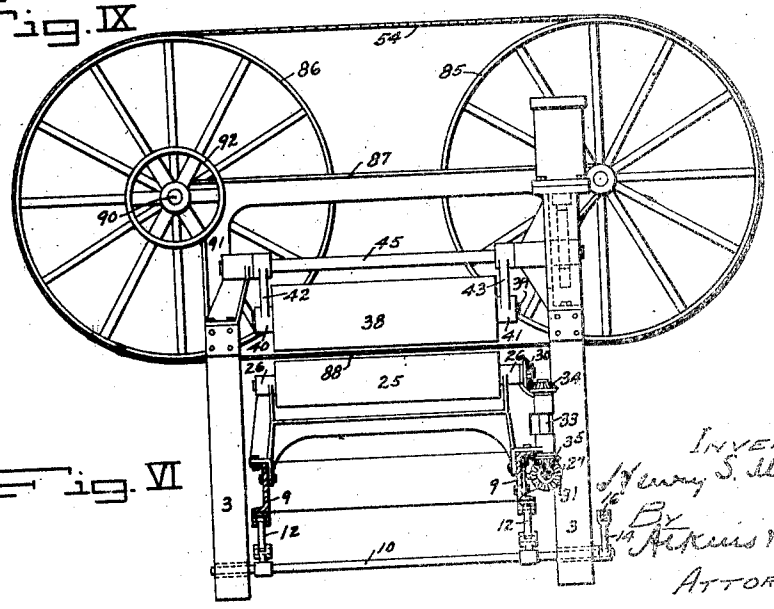


Fig. VI

INVENTOR:
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By Perkins & Perkins,
ATTORNEYS

Patented Sept. 1, 1925. 1,551,964

UNITED STATES PATENT OFFICE.

HENRY S. MITCHELL, OF PORTLAND, OREGON.

METHOD OF MANUFACTURE OF LUMBER AND APPARATUS FOR EFFECTING THE SAME.

Application filed December 12, 1922. Serial No. 606,429.

To all whom it may concern:

Be it known that I, HENRY S. MITCHELL, a citizen of the United States of America, and resident of Portland, in the county of Multnomah, in the State of Oregon, have invented certain new and useful Methods of Manufacture of Lumber and Apparatus for Effecting the Same, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to the manufacture of lumber from logs, and has for its chief object the promotion of economy therein, first, through the production of saving in the working up of the slab cuts of a log, and, second, in the elimination of injurious wear on saws which, in accordance with usual methods hitherto employed, occurs therein in consequence of the necessity of cutting through the outside of the bark of a log. It is recognized that the outside cuts of a log yield the best quality of lumber. Consequently, in cutting a log into lumber it is considered desirable to square it to the largest practicable transverse dimensions. In order to do so it is often necessary to saw through considerable stretches of bark, with the well known result of injury to the saw.

My invention consists, in part, in first separating a length of wood from a log, and then working it into lumber from the inside outwardly, and by a method which provides always clean wood in which the saws or cutters work. It would be practicable to work up an entire log into lumber according to my process, by first splitting a log longitudinally into halves and afterwards working up each half, separately.

In practice, however, I prefer to square a log by a head saw in the usual way, and afterwards to apply my invention to the working up of the slabs remaining from the operation of squaring the log. It should be observed that if the subsequent application of my invention to the working up of the slabwood be contemplated, it becomes wholly unnecessary to take into account in the direction of the head saw, anything except the available transverse dimensions of the small end of the log, and to cut the log, in the first instance, accordingly. The reason is that by the use of my invention there is substantially none of the lumber in the slab lost, and consequently an economical reason for minimizing the slabwood in operating the head saw is eliminated.

The result arrived at through the employment of my invention is again of an economy of time in the operation of the head saw, and an additional gain through saving of wear on the saws by reduction of the thickness of bar to be cut, together with a material saving of lumber and economy of production obtainable over other methods.

In the carrying of my process into effect, I prefer to employ the form of apparatus hereinafter illustrated and described, the same being a resawing and edging machine whose principle of operation is novel and which is devised to conform to the requirements of my process, as will be hereinafter fully and at large set forth.

What constitutes my invention will be hereinafter described in detail and succinctly set forth in the appended claims.

In the accompanying drawings wherein I illustrate apparatus comprehended by my invention in its present preferred form of embodiment,

Figure I is an elevation of one side of my machine.

Figure II is a longitudinal horizontal section of the subject matter of Figure I, taken as on the line II—II of Figure 1.

Figure III is a vertical section of the subject matter of Figure II taken as on the line III—III of Figure II.

Figure IV is a transverse vertical section of the subject matter of Figure II, taken on the line IV—IV of Figure II.

Figure V is a top plan view of the subject matter of Figure I, down to line II—II.

Figure VI is a transverse vertical section of the subject matter of Figure I, taken as on the line VI—VI thereof.

Figure VII is a diagrammatical figure illustrative of the method of manufacture comprehended by my invention, showing as in cross section a slab cut from a log, and showing my method of working, wholly from the inside of the slab, the wood thereof into merchantable lumber.

Figure VIII is a side elevation of a portion of a nest of saws detached.

Figure IX is a view taken at right angles to that of Figure VIII of a nest of saws detached.

Referring to the numerals on the drawings, 1, 2, 3, 4, and 5 indicate (see Figure I) a series of frame sections, of which each section is the counterpart of another, with the advantage secured thereby of being able indefinitely to extend the length of the entire composite frame simply by the addition of a single section or as many as may be required. Convenient means of assemblage of the frame sections may be provided in cheek flanges 7 upon abutting edges of the sections and in bolts or rivets 8 which serve to unite them together. The frame sections formed and united substantially as described, constitute the preferred form of embodiment of the main frame of my machine.

Longitudinally disposed to the frame and extending substantially throughout its entire length between the main sides of the sections which constitute it is a vertically adjustable frame 9 which is supported at intervals by bell-crank levers pivotally secured, respectively, at their elbows 10 to sections of the main frame, and each having one arm 11 operatively pivoted, as through an intermediate link 12, to the frame 9. Each remaining arm 14 of each of said bell-crank levers is pivoted, as indicated at 15, to a rod 16, extended longitudinally a little beyond the entire length of the main frame (compare Figures I and II).

At the in-feed end of the main frame, namely, the end to the left as shown in Figure I of the drawings, the rod 16 is pivotally joined as indicated at 17, to a hand lever 18, whose lower end is pivoted, as indicated at 19, to a frame 20 which is fixed to the floor upon which the main frame of the machine finds support. The lever 18 carries means for adjusting it in different positions, preferably, for example, a latch 21 whose latch member takes into the notches 22 of a notched quadrant on the frame 20. The lever 18, being preferably of the familiar type illustrated and just described in general terms, is adapted through its manipulation at the hand of an operative to impart longitudinal movement to the rod 16 which automatically, as through the means described, converts itself into corresponding vertical adjustment of the frame 9.

Said frame, being provided, as is well shown in Figure VI, for example, with transverse feed rolls 25 carried as in suitable pillow blocks 26 distributed in pairs at required intervals, affords support for the stock or material to be cut during its passage longitudinally through the machine; and its vertical adjustment named at the end of the last preceding paragraph affords to such stock a means of coarse adjustment or of presentation to the operation of the machine.

The vertical adjustment indicated may be imparted to the stock as a whole and in a single operation, upon each occasion, by manipulation of the lever 18. The adjective "coarse" is applied to it by way of distinction from other and finer adjustments relative to the work, although the latter are made through relative movements of individual operative elements as is hereinafter fully set forth, and not of the stock as a whole.

The several feed rolls 25 are, in effect, geared together through the mediation of a driven shaft 27 (see for example, Figure I), preferably extending a little beyond the opposite ends of the main frame and rotatable in suitable bearings provided for it thereon. To said shaft each roll 25 is operatively united as by a train of gears, represented by bevel gears 30 and 31 on the roll and shaft, respectively, and an intermediate shaft 33, said shaft being provided at its opposite ends, respectively, with bevel gears 34 and 35, which respectively intermesh with the gears 30 and 31 aforesaid.

Above each one of certain of the feed rolls 25, in accordance with usual machine shop practice which is so usual as to be unnecessary to specify in greater detail, I provide a compressor roll 38 whose weight may be sufficient to hold to its place upon the rolls 25 the stock to be cut during its passage through the machine, any suitable and usual means being provided for guiding the said stock through the machine in a true longitudinal course. Each roll 38 is preferably provided with a shaft 39 carried in journals 40 and 41, respectively, provided near the free ends of supporting arms 42 and 43 hinged, respectively, to a cross axle 45 on the main frame. The shaft 45 is provided with a toothed sector 46 united to it. The teeth of each sector 46 mesh with a rack 47 on a piston rod 48 whose piston is operatively encased and concealed by the walls of a steam or air cylinder 50.

The function of the several cylinders 50 is, by aid of their respective pistons, to lift in manner or order preferred the weight of the rolls 38 as often as occasion may require, and is one so well understood in the general art to which my invention belongs as to render further specification of it or of means for accomplishing it unnecessary.

What has already been specified is found, with exceptions of details specified in the prior art. What constitutes my contribution to that art consists in the main, in the provision, in such a machine, for example, as I have hitherto described, of a certain succession of cutting instrumentalities, and in the provision of means for effectively presenting the same to the stock to be cut in a definite order of succession and in such a predeterminate relationship thereto as will

effect the result desired. It is in respect to the mode and order of the subjection of the stock to be cut to different cutting operations, that my invention constitutes an improved method in the manufacture of lumber.

The instrumentalities contemplated in the last paragraph preferably include a plurality of transversely adjustable nests of cutters 51 and 52; a plurality of transversely and vertically adjustable blades 53 of which four are illustrated; and a saw 54, preferably a band saw, whose cutting portion is disposed in a definitely fixed plane with respect to which the vertical location of the cutters 51 and 52 and of the blades 53, respectively, is referred.

Each nest of cutters, indicated, respectively, by the numerals 51 and 52, consists, preferably, of a plurality of circular saw blades set side by side with a suitable spacing washer between, the whole number of each nest being assembled as a unit upon a sleeve, as by aid of collars 59 and 60 thereon. The sleeve carrying the circular saw blades is splined or in some like manner operatively attached to a preferably horizontal shaft 61, upon which it may be longitudinally shifted as by means of a bifurcated arm 62 which straddles and, as by means of diametrically opposite pins 63 carried by said arm, makes engagement with the collar 60 which is grooved for accommodation of the said pins. The arm 62 (see Figure III) is terminally disposed upon a lever 65 which is secured at its end opposite that which carries the arm 62 to a rock shaft 66 that is mounted in suitable bearings 67 fixed to the floor upon which the machine is installed. The shaft 66 is adapted to be oscillated in opposite directions as by a lever handle 68 fixed to it at one end and working with adjustable control in operative proximity to a frame 70 provided for the purpose.

When the nest of cutters is made, as preferably it is, of an assemblage of saw blades, each tooth of each blade is disaligned from the corresponding tooth in the next adjacent blade as shown in Figures VIII and IX of the drawing. By this arrangement the lateral spread of each tooth finds ample accommodation; the combined cutting edge of all the companion teeth is unified in effect; and the power necessary to drive each nest of cutters is reduced because the teeth of the nest attack the work presented to them one at a time in succession and not all together simultaneously. The result is a smooth even cut without any injurious shock or jar to the machine when the nest cutters 51 and 52 are put into action. The shaft 61 derives rotative motion as from a belt pulley 71 secured to one end of it, as shown, for example, in Figure II.

Each of the blades 53 is preferably a circular saw blade and is carried in a transversely split hub 73 which, when its parts are united, is, in effect, splined to a horizontal shaft or saw arbor 74, adapted to be driven as by a pulley 75 secured to one end of it (see Figure II).

Each of the blades 53 rotates between guide fingers 76 on a bracket-arm 77, that is fixed to a rack 78 which is in engagement with a pinion 79. Through rotation of a pinion 79 longitudinal motion is imparted to the rack 78 with which it engages, with the effect of shifting the position on the shaft 74 of that blade 53 with which the fingers of the bracket-arm 77 that is attached to the rack last indicated engage. (Compare Figures II, III, and IV.)

To accommodate the four blades 53 illustrated, four racks 78 and four pinions 79 are required, one rack for each blade and one pinion for each rack, but the number of racks and pinions may vary with the number of the blades 53. It is deemed to be unnecessary to designate the several pinions by separate reference numerals, but to be sufficient to specify that the pinions 79 are preferably disposed in pairs as shown, for example, in Figure III, and that one pinion of each pair is actuated preferably by a shaft 80 which is coaxial to a hollow shaft 81 which actuates the other one of the pair of pinions.

The shafts 80 and 81 are provided, respectively, at the in-feed end of the machine with hand wheels 83 and 84, by which the operator in control of the machine may, from a fixed station or point of control, set the blades 53 at any place of adjustment desired.

The saw 54, as has been specified is preferably a band saw but that form of saw is preferred only because that is at present deemed a most convenient form for the purpose in view. It is illustrated as carried upon pulleys 85 and 86 mounted at opposite ends of a cross piece 87 and has for its working stretch or cutting portion 88 the lowermost reach of it between the said pulleys. It may be observed in this connection that such an arrangement is wholly conventional, and that by merely lowering the disposition of the centers of the said pulleys and by looping the saw around a portion of the main frame, the upper reach of the band saw 54 may be substituted for the lower reach thereof as its working stretch. In Figure I, I illustrate a shaft 90 and its bearing support 91 for the driving pulley 85 of the band saw 54, the shaft 90 being provided with a belt pulley 92 for driving said shaft.

The horizontal shaft 74 which carries the blades 53 is made vertically adjustable. To that end, for example, its opposite ends are

mounted, respectively, in parallel side bars 95, each of which is pivoted at one end to the main frame of the machine as indicated by the numeral 96 (Fig. I). The free end of each of the side bars is operatively joined, in effect, as indicated at 97, to one end of a link 98, whose other end is joined, in like manner as indicated at 99, to one arm of a bell-crank lever 100, pivoted at its angle, as indicated at 101, to the main frame of the machine. The arm of the lever 100 other than that last described is operatively connected as indicated at 103 to a rod 104 which leads from the point 103 to the intake end of the machine where it makes operative connection with a latch-controlled lever 105, which preferably depends from a pivotal support 106 on the main frame of the machine, and whose latch, for purposes of adjustment, takes into the notches of a notched quadrant 107.

In this connection it may be observed that the manipulative control of all the operations of the machine is preferably placed within easy reach of an operator stationed adjacent to the lever 105, for instance.

The operation of my machine and the description of my invention, in so far as it constitutes an improvement in the art proper of manufacturing lumber, remain to be set forth.

Proceeding towards that end, let it be assumed that the sawyer in charge, after taking due account of the dimensions of a piece of stock to be cut, adjusts the frame 9 to the height desired, said stock, as shown for example in Figure VII, being laid upon the rolls 25 with its face A in a downwardly disposed horizontal position. It is afterwards firmly and securely held, as by action of the compression rolls, in the same position throughout its run through the machine, and all cutting operations upon it are made from below. This is an important feature and constitutes in itself a valuable contribution to the art, in that it promotes a distinct economy both in the saving of wear and tear on the machine, and in the saving of lumber in the cut.

Proceeding with the description of the process comprehended by my invention, after the stock is secured in proper position on the rolls 25 and is confined therein by cooperation with said rolls of the compression rolls 38 or preparatory to such confinement adjustment of the nests of cutters 51—52 is made to meet requirements, through manipulation of the lever 68. Said cutters being properly set with respect to the stock to be cut, their actuation results in an edging operation performed upon the slab illustrated in Figure VII. Said edging operation consists in cutting away bodily each lower corner B and C of the slab, to a predetermined extent indicated by the lines *a* and *b*, respectively. The length of the lines *a* and *b* must be sufficient to expose a transverse stretch of good wood along an imaginary line D which, by way of example, represents a severing cut parallel to the face A to be made subsequently to the cuts made along the lines *a* and *b* in the edging operation above referred to. Let it be noted that the said edging operation is performed by the cutters 51—52 working from within the bark outwardly through the bark of the log indicated by F. The result is that stones, grit, or other substance which are likely to be present in the bark and which ordinarily tend to break or injure the saws or cutters while at work in bark, oppose, by the method I employ only a negligible degree of resistance to the operation of the cutter, in that said operation tends to throw them off instead of to produce the result of catching and drawing them towards the cutter to its injury, which result the usual method of working through the bark inwardly produces.

Following upon the edging operation aforesaid, provision is next made by the sawyer in charge of the machine for ripping the merchantable material which extends longitudinally of the slab, as shown for example in Figure VII between lines *a* and *b*. To that end he sets the saws 53, or as many of them as he desires to bring into requisition, at the adjustments he desires upon the shaft 74. Having done so, say as by manipulation, primarily, of the band wheels 83—84, he accurately gauges the cut of the said saws 53 so that it will reach the lower side of the imaginary line D. It should be observed that the previous cutting operations are performed at right angles to the plane face A of the slab stock, and that at all times rigid walls of uncut solid wood continue to oppose resistance in opposite directions against the cooperating pressure developed between the rolls 25 and 38.

After performance upon it of the operations hitherto described, by which the lines *a* and *b* and the ripping cuts *d* and *e* are effected, the stock at length reaches the cutting stretch 88 of the band saw 54 or its equivalent, which cuts a kerf conformably to the line D. Said kerf obliterates the uppermost terminals of the kerfs cut by the saws 53, and defines in parallel juxtaposition to the line D a plane surface on the underside of the remaining uncut slab corresponding to the face A already described.

After the stock clears the band-saw 54, the parts severed from the original slab by the cut along the line D are taken in charge by an operative to be conveyed away; and the remnant of the slab, if any, is returned by any suitable conveyer not illustrated, to the intake end of the machine for repetition of the operation last above described. Said

operation is repeated as often as need be until the wood of the stock is all worked up, and naught substantially remains thereof but the bark.

In this connection it is proper to add that inasmuch as the vertical adjustment of the saws 53 is entirely within the control of the sawyer in charge of the machine, it is feasible for him, if he finds he may do so to advantage, to change, at any time, to the vertical adjustment of the frame 9 and in that way to vary, if he so desires, the cut of the saws 53 so as to produce a broadside cut and, thereby to make the band-saw 54, in effect, the edge cutter.

What I claim is:

1. That improvement in the art of manufacturing lumber which consists in first removing the opposite thin edges of a bark-covered length of slabwood by substantially parallel edge cuts formed so as to sever the bark progressively from the inside to the outer surface thereof, and afterwards severing a thickness of the clean wood exposed between said edge cuts by a transverse cut made through that portion of the wood that is exposed between said edges inside the bark.

2. That improvement in the art of manufacturing lumber which consists in successively reducing a length of slabwood by edge cuttings made so as to cut the bark progressively from the inner to the outer surface thereof and to expose with each edge cutting a thickness of clean wood with the bark removed, from both edges and after each edge cutting severing by a transverse cut made through the wood exposed as aforesaid.

3. The improvement in the art of manufacturing lumber from slabs, which consists in comminuting the edge portions of a slab, and then severing from the slab a section, the edges of which have been freed from bark by said comminuting operation.

4. In a machine for the manufacture of lumber, the combination with a main frame, a vertically adjustable stock-supporting frame therein, and means for feeding stock to be cut lengthwise thereof, of a driven shaft operatively mounted in the main frame independently of the stock-supporting frame, said shaft extending transversely of the stock-supporting frame between the ends of said frame, a plurality of rossing instrumentalities on said shaft and driven by it, and means for operably adjusting said instrumentalities lengthwise of said shaft to vary the distance separating them.

5. In a machine for removing the edges of slabs by comminuting them, the combination with a main frame, a vertically adjustable stock-supporting frame therein, and means for feeding stock to be cut lengthwise thereof, of a driven shaft operatively mounted in the main frame and extending across the stock-supporting frame between the ends thereof, a plurality of cutting instrumentalities on said shaft and driven by it, and means for operably adjusting said instrumentalities lengthwise of said shaft, said instrumentalities consisting each of a nest of saws whereof each is operative as a cutting unit.

6. In a machine for removing the edges of slabs by comminuting them, the combination with a main frame, a vertically adjustable stock-supporting frame therein, and means for feeding stock to be cut lengthwise thereof, of a driven shaft operatively mounted in the main frame and extending across the stock-supporting frame between the ends thereof, a plurality of cutting instrumentalities on said shaft and driven by it, and means for operably adjusting said instrumentalities lengthwise of said shaft, said instrumentalities consisting each of a nest of saws, each nest being operative as a cutting unit, and the teeth of each saw-blade of a nest being disaligned from that of its next neighbor.

7. In a machine for removing the edges of slabs by comminuting them, the combination with a main frame, a vertically adjustable stock-supporting frame therein, and means for feeding stock to be cut lengthwise thereof, of a driven shaft extending across the stock-supporting frame between the ends thereof, a plurality of cutting instrumentalities on said shaft and driven by it, and means for operably adjusting said instrumentalities lengthwise of said shaft, said instrumentalities consisting each of a nest of saws, each nest being operative as a cutting unit, and the teeth of each saw-blade of a nest being disaligned from that of its next neighbor in successive order of arrangement substantially as specified.

8. In a machine for the manufacture of lumber, the combination with means for supporting a slab and feeding the same longitudinally, of rossing means adapted to remove bark from opposite edges of the slab as it moves longitudinally, by cutting outward toward the bark, and a transverse cutter for severing from the slab a section the edges of which have been feed from bark by said rossing means.

9. In a machine for the manufacture of lumber, the combination with means for supporting a slab and feeding the same longitudinally, of two sets of rotary cutting means positioned to remove bark from the edges of the slab, by cuts extending outward through the bark, as the slab moves longitudinally, and means for severing from the slab a section from the edges of which the bark has been thus removed.

10. In a machine for the manufacture of lumber, the combination with means for

supporting a slab and feeding the same longitudinally, of rossing means adapted to remove bark from opposite edges of the slab as it moves longitudinally, by cutting outward toward the bark, and a transverse cutter for severing from the slab a section of less thickness than that which has been freed of bark by said rossing means.

11. In a machine for the manufacture of lumber, the combination with means for supporting a slab with its sawed face down and feeding the slab longitudinally, of rossing means adapted to remove bark from opposite edges of the slab, as it moves longitudinally, by cuts extending upward from the lower face of the slab toward the bark, and a transverse cutter for severing from the slab a portion which has been freed of bark by said rossing means.

12. In a machine for the manufacture of lumber, the combination with means for supporting a slab with its sawed face down and for moving the slab longitudinally, of means adapted to remove bark from both edges of the slab by cutting outward through the bark, cutters acting to form longitudinally extending kerfs in the lower face of the slab, and a transverse cutter adapted to sever from the slab the sections separated by the last said cutters.

13. In a machine for the manufacture of lumber, the combination with a main frame, a vertically adjustable stock-supporting frame therein, and means for feeding stock to be cut lengthwise thereof, of a driven shaft extending transversely of the stock-supporting frame, a plurality of rossing instrumentalities on said shaft and driven by it, means for operably adjusting said instrumentalities lengthwise of said shaft, and a driven saw blade operatively disposed so as to cut the stock longitudinally and at right angles to the cut of said cutting instrumentalities.

14. In a machine for the manufacture of lumber, the combination with a main frame, a vertically adjustable stock-supporting frame therein, and means for feeding stock to be cut lengthwise thereof, a driven shaft extending transversely of the stock-supporting frame, a plurality of rossing instrumentalities on said shaft and driven by it, and means for operably adjusting said instrumentalities lengthwise of said shaft, of another driven shaft also extending transversely of the stock-supporting frame, a plurality of blades on said last named shaft and driven by it, means for independently adjusting said blades longitudinally of the shaft which carries them, and a driven saw-blade operatively disposed so as to cut at right angles to said blades last named and in a plane parallel to and determinable by the vertical adjustment of the stock-supporting frame.

In testimony whereof, I have hereunto set my hand.

HENRY S. MITCHELL.