June 12, 1928. 1,673,265

R. H. PANGBORN

ART AND APPARATUS FOR DEBARKING PULP SLABS

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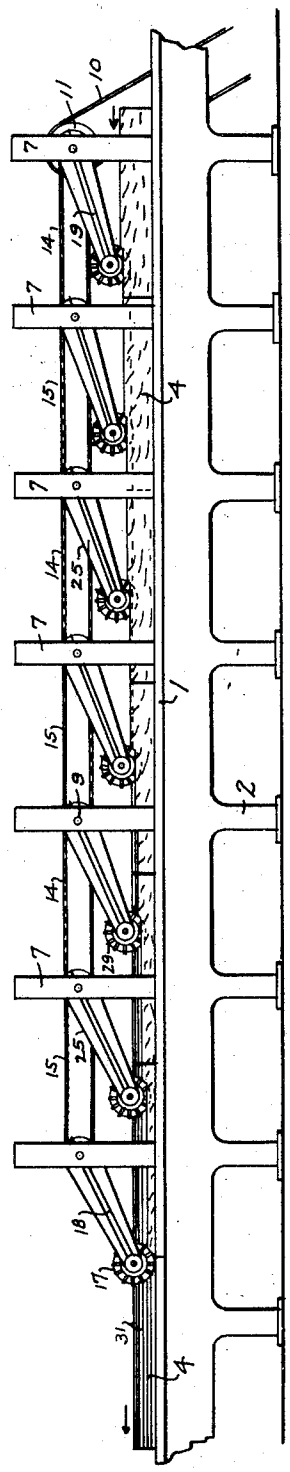


Fig. 1.

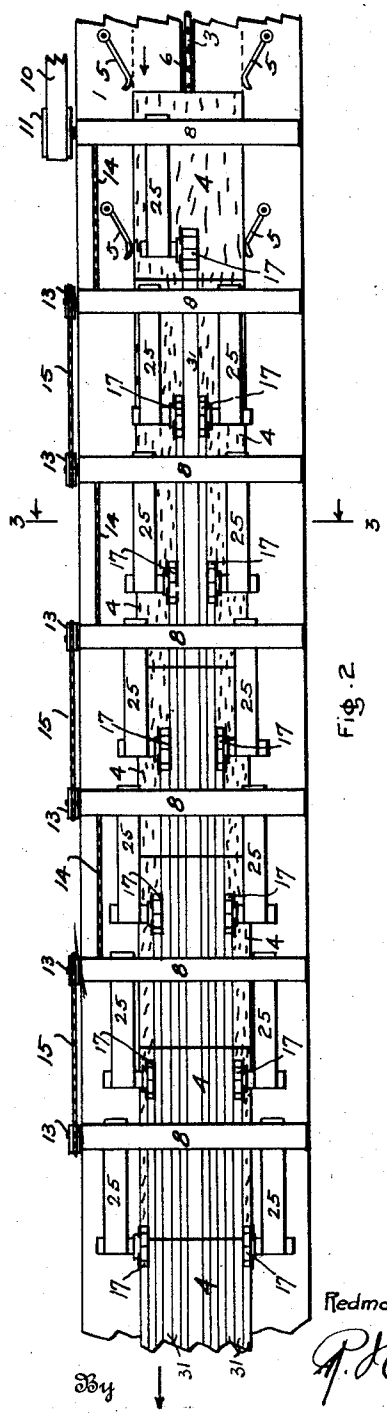


Fig. 2.

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Fig. 3.

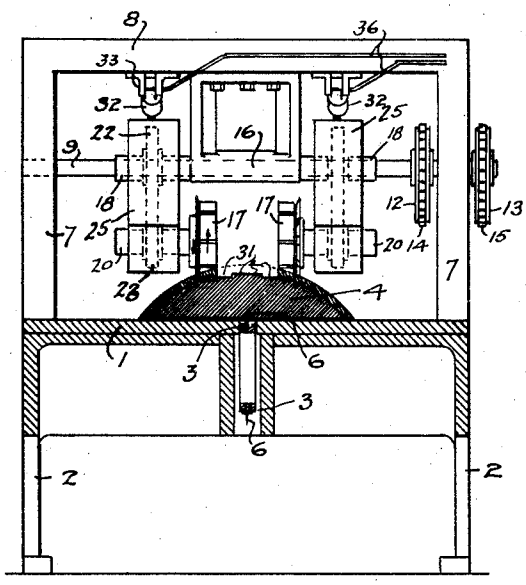
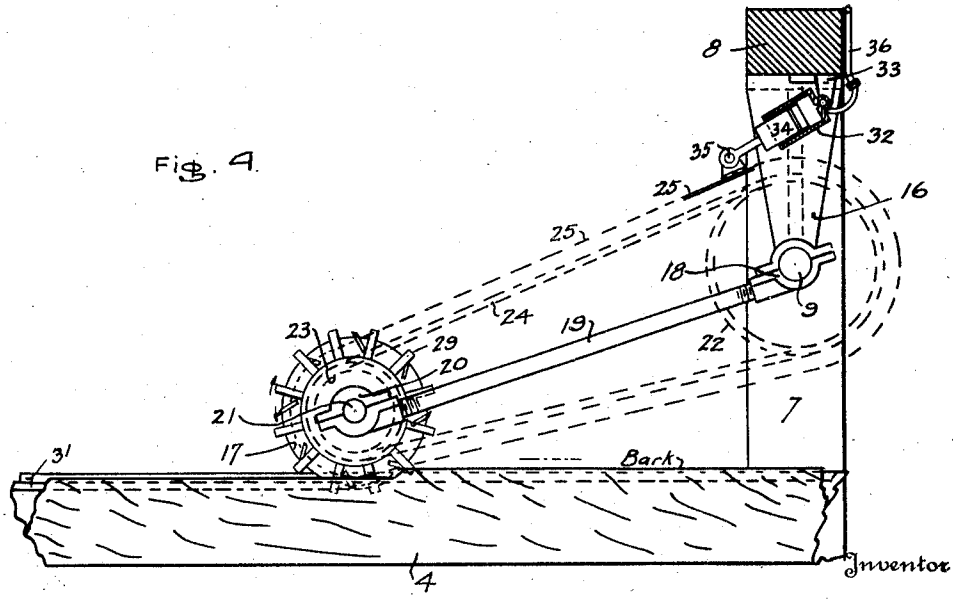


Fig. 4.



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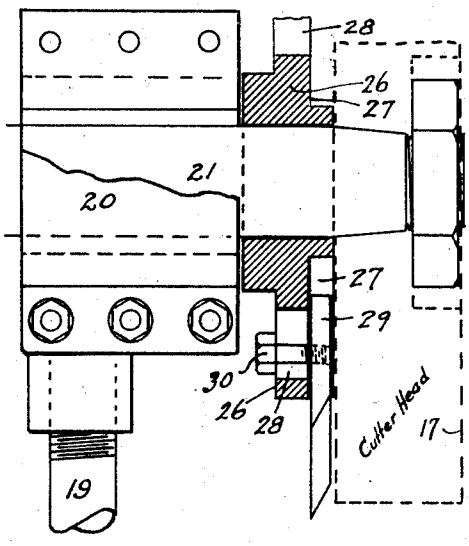


Fig. 5

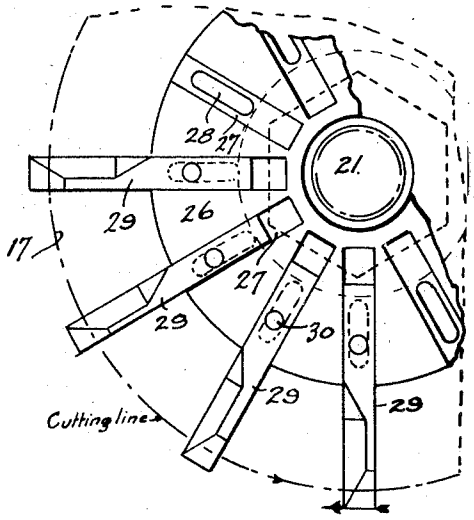


Fig. 6

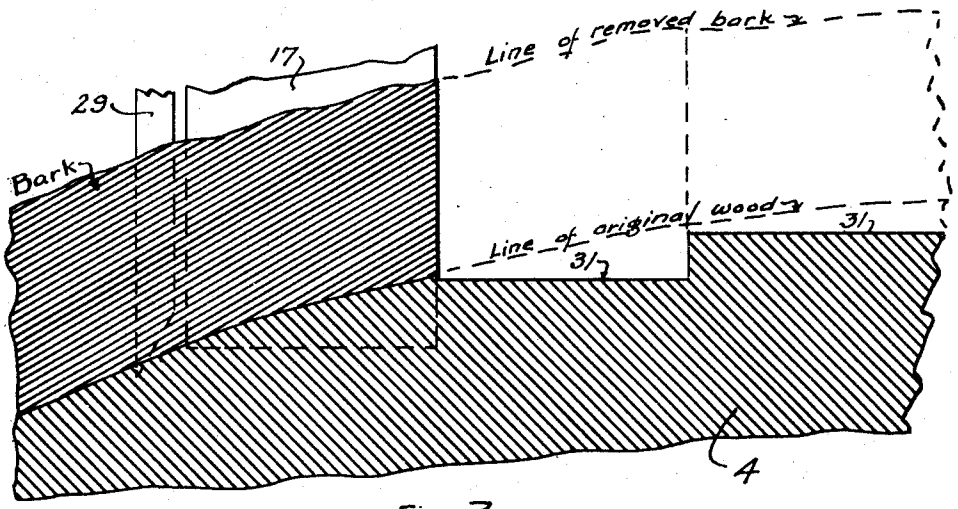


Fig. 7.

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UNITED STATES PATENT OFFICE.

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ART AND APPARATUS FOR DEBARKING PULP SLABS.

Application filed October 31, 1927. Serial No. 229,941.

My invention relates to the art of stripping the bark from sawmill slabs in order to render the wood thereof available for use in a pulp mill, and to the apparatus employed therein.

The objects of my invention are, first, to provide a means of utilizing the waste wood of sawmills, especially in such mills as handle logs of large diameter in which the bark is often several inches in thickness; second, to provide a machine adapted to be fed slabs of any length, width, or thickness, having bark of any thickness, in a continuous manner; third, which acts on the slabs in accordance with the particular characteristics of each slab, automatically gouging thereinto to depths sufficient to remove all the bark thereof in a series of relatively narrow strips or steps; fourth, which is successive in its action on any one slab, the central portion thereof being first cleared of bark, then the two next contiguous portions, then those further removed from the center, and so on until the entire bark surface has been removed from the slab.

A further object is to provide a means of automatically preventing the cutter from going too deeply into the wood of the slab and thereby preventing the undue wastage of wood. Another object is to provide a device which is sensitive to the position of the wood under the bark, rather than the surface of the bark. Another object is to provide for the adjustment of the mechanism, whereby the wear of the parts may be readily taken up. Another object is to provide a pneumatic means of controlling the pressure of the cutting mechanism on the slab. Another object is to provide adjustment of the bark gaging device, whereby similar tools may be used economically on different parts of the machine, the device being set further out from its center for those parts engaging near the edge of the slab than for those engaging the central portion thereof.

I attain these and other objects by the devices, mechanisms, and arrangements illustrated in the accompanying drawings, in which—

Figs. 1 and 2 are side elevation and plan, respectively, of my complete machine, showing it in use; Fig. 3 is a cross-section thereof on the line 3—3 in Fig. 2; Fig. 4 is an enlarged side elevation of one of the operating arms, showing its support and the pneumatic control in section; Fig. 5 is a plan view, on a larger scale, showing a portion of the operating end of the arm, and showing the cutter head removed; Fig. 6 is a side elevation of the parts shown in Fig. 5; and Fig. 7 is a cross-section, on a larger scale, of a portion of the slab being debarked, showing a part thereof already debarked and showing the position of the next cutter head and its gage spider.

Similar numerals of reference refer to similar parts throughout the several views.

It is well known that the bark of the tree which is to be used in making wood pulp for paper making, must first be removed therefrom. The problem of removing the bark from the western timber is entirely different from that arising from trees grown in the eastern and southern portion of the country and no machine has yet been developed which is able to economically operate with the western conditions.

My machine is primarily intended for use on western growth of timber and especially to the slabs of outer wood which are cut from the logs in western lumber mills. These slabs are cut lengthwise of the log and comprise a segment of the log having the bark on the curved side. Since the bark is of varying thickness, and is rough and often knotty, it is impossible to gage the distance that the wood surface is removed from the bark surface by merely following a certain depth below the surface of the bark.

I have solved this problem by guiding the cutter head by means of a spider having sharp rays which pierce the comparatively soft bark and which cease their downward movement when they reach the surface of the wood underlying the bark, the cutter head acting beside the spider on the side nearest the center of the slab, and, therefore, cutting all the bark and a shallow part of the slab.

Referring to the drawings, it will be seen that my machine comprises a long table 1, suitably supported on legs 2, and having a centrally disposed feed chain 3, or other suitable means for causing the slabs to travel along the table 1. Suitable guiding means, indicated at 5 (Fig. 2) may be provided on the table 1, adapted to engage the sides of the slabs 4 whereby each slab is directed to

bring its central axis substantially coincident with the center of the machine. The feed chain 3 may have sharp prongs 6 to hold the slabs 4 in such position as they pass through the machine. The slabs 4 may be of any length and thickness, and thin narrow slabs may be followed by thick broad ones, but I have shown them, in the drawings, as being of uniform size, in order to show the consecutive action of the parts of the machine on a single slab.

The table 1 is also provided with uprights 7 arranged periodically along both sides, and these are joined together, over the top of the table by means of horizontal bridge pieces 8. Horizontal transverse shafts 9 are mounted in the uprights 7 and extend across the machine below the said bridges 8. The shaft 9 of the first framing, formed by the parts 7 and 8, is driven by a belt 10 on a pulley 11, on the outer end of the shaft, or by any other suitable driving means. It has a sprocket wheel mounted on the inner side of the same upright 7. All the other shafts 9 each have two sprocket wheels 12 and 13 mounted thereon, the wheel 12 being on the inner side and the wheel 13 on the outer side of the upright 7. The wheels 12 are joined together in pairs by the sprocket chains 14 (Fig. 2) while the alternate pairs of wheels 13 are joined together by the outer sprocket chains 15. Thus the belt 10 drives all the shafts 9 at the same speed. The shafts 9 may also have intermediate hanger bearings 16 secured to the under side of the bridges 8 (Figs. 3 and 4).

The first shaft 9 is preferably provided with one only of the following described cutter arms, but the others are each provided with two. However, since they are similar, the description of one will apply to all, with the understanding that those acting on the right or left of the central axis are provided with right-hand or left-hand cutter heads.

As above stated, the slab 4 passes axially through the machine, therefore a cutter head 17, engaging and cutting into the slab and rotating on an axis at right-angles to the direction of motion of the slab, will cut a strip of the bark therefrom. The cutter heads 17 are therefore arranged in the machine in such position as to cut such strips in consecutive order, the arms supporting the cutter heads 17 from one shaft 9 being displaced laterally from those on the next shaft by a space equal to the width of the cutter head.

Referring particularly to Figs. 3 and 4 it will be seen that each cutter head 17 is supported on the outer free end of an arm, the upper end of which is supported on and pivoted about the shaft 9. Two bearings 18 are journaled on the shaft 9 and each is provided with a tubular arm 19 screwed thereinto. The two arms 19 are similar and are provided with right- and left-hand screw threads at the two ends. The outer ends of the arms 19 are screwed into the outer bearings 20. A shaft 21 is mounted in the two bearings 20. The alinement of the shaft 21 and its distance from the shaft 9 is controlled by turning one or the other of the arms 19 in the bearings 18 and 20. A sprocket wheel 22 is mounted on the shaft 9 between the two bearings 18. A smaller sprocket wheel 23 is mounted on the shaft 21 between the two bearings 20. The sprocket wheels 22 and 23 are of the same pitch and are connected together by a sprocket chain 24. Therefore the shaft 21 is rotated by the shaft 9. The sprocket wheels 22 and 23 and the chain 24 are enclosed by a suitable metal box 25. The end of the shaft 21 which lies nearest the central axis of the machine, extends beyond the bearing 20 and carries the spider disk 26, loosely mounted thereon, next to the said bearing, and the cutter head 17 is tightly mounted on the outer end.

Referring particularly to Figs. 5 and 6, the spider disk 26 rotates freely on the shaft 21 and is provided with a series of radial grooves 27 on the side next to the cutter head 17. Each groove 27 is also provided with a radial slot 28. The spider rays 29 lie in the grooves 27 and are secured therein, in adjusted position, by clamping screws 30 which pass through the slots 28. The rays 29 may be of any desired form and I have illustrated one such form in the drawings. In this form the ray 29 is chisel shaped, having its outer end and one side beveled and sharpened as shown.

The spider rotates entirely independent of the shaft 21, on which it is mounted, in fact it rotates in the opposite direction thereto. It is rotated entirely by contact with the moving slab 4, as it passes. Each ray 29 cuts into the bark of the advancing slab 4, the sharpened corner first entering the bark and then cutting down deep thereinto, as the spider rotates, until it engages the relatively hard wood below the bark. At this point it is directly under the shaft 21 and is supporting the said shaft. The weight of the free end of the arm, and all its parts, together with the reaction of the chain 24, presses the spider rays 29 into the bark so that its point or end passes completely through the bark and a short distance into the wood of the slab. If the bark is thinner in one place than another the spinder reaches down only to the wood and therefore allows the cutter head 17 to cut away only the same quantity of wood from the slab as it would if the bark were thicker. In each case the spider lowers the cutter head only so far as will insure its cutting all the bark away from the strip on which it is operating.

Referring now to Fig. 7, it will be seen that, since the spider rays 29 are on the side of the cutter head 17 further removed from the central axis of the machine and of the slab, the said spider gages the lowest part of the wood to be cut by the cutter head, which therefore cuts a notch or step 31 in the side of the slab 4 as it passes. In this view two such steps 31 have already been cut by the cutter heads of the machine which this particular part of the slab has passed before reaching the point at which the section is taken, and the next cutter head 17 is about to cut the third such step, as shown by the broken lines in said view. It will also be understood from this view, that the adjustment of the rays 29 for those arms which are further removed from the central axis of the machine must be such that the outer sharpened edge will extend slightly further from the center of the shaft 21, in relation to the cutting line of the cutter head 17, than those nearer to the center, because of the difference in the angle made by the bark-wood joint to the horizontal. Also it will be seen from this view that the chisel-like form of the rays 29 tend to push the soft bark towards the cutter head.

I have also provided a pneumatic means of increasing or decreasing the pressure of the free end of the arm on the slab, as illustrated in Figs. 3 and 4. This consists of a cylinder 32 mounted to oscillate on trunnions mounted in hangers 33 secured to the under side of the bridge frame 8. This cylinder 32 has a piston 34 which is connected to the top of the gear box 25, of the arm, by a pivot connection 35. A suitable air pipe 36 leads to the cylinder 32, through the trunnions or otherwise, and the air pressure applied therein is transferred through the piston 34 and the box 25 to the arm. Therefore an increase of air pressure in the cylinder 32 will mean an increase in downward pressure of the spider on the slab. Suitable means for controlling the air pressure may be provided but is not shown herein.

Thus it will be seen that I am able to remove all the bark from a slab by passing it successively past a series of cutter heads, each positioned in a definite relation to the others and to the central axis of the slab, whereby first the central portion of the bark of each slab is cut away and then the cut away part is widened on each side by each pair of cutter heads until the whole has been removed. Also, when the slabs are in short lengths, the machine may be acting on many slabs at the same time.

The above-described method of removing the bark from slabs seems to be the only practical solution of the problem presented in handling western timber.

Though the above-described machine might be said to be an assembly of independent machines, yet, as a matter of fact, they are all cooperating to produce a single result which none could accomplish alone, the tying-in feature being the feeding and guiding means whereby the slab is passed in the central position through the successive portions of the single machine.

The particular form of the various parts of the machine, as above described, can, of course, be varied; as, for instance, the drive of the several shafts may be changed; the construction of the arms may be altered; and the drive of the cutter heads may be different, without affecting, in any substantial way, the machine. So, too, the spider described may have its chisel-shaped rays changed to pointed rays, or it may comprise a saw-shaped disk, or even a thin circular disk, so long as it is able to penetrate through the soft bark and to reach the hard wood below it, without departing from the spirit of my invention.

Having, therefore, described my invention, what I claim is—

1. The art of debarking slabs, comprising moving a slab axially past a series of rotating cutter heads; each cutter head being offset from the position of the other cutter heads relatively to the slab; guiding the slab in its motion past the cutter heads; pressing the cutter heads into the slab; and limiting the downward motion of the cutter heads by the height of the wood of the slab under the bark being removed.

2. In a debarking machine, the combination of means for moving a slab axially therein; a rotating cutter head; means supporting the rotating cutter head and permitting free vertical movement thereof in the machine; and means, mounted on said supporting means, and adapted to pass through the bark of the slab to contact with the wood thereunder, whereby said cutter head is limited in its downward movement by the position of the surface of the wood under the bark.

3. In a debarking machine, the combination of means for moving a slab axially therein; a rotating cutter head; means supporting the rotating cutter head and permitting free vertical movement thereof in the machine; and means, mounted adjacent said cutter head and on said supporting means, and adapted to pass through the bark of the slab to contact with the wood thereunder at a point adjacent the lowest point of cutting of said cutter head, whereby said cutter head is limited in its downward movement by the position of the surface of the wood under the bark.

4. In a debarking machine, the combination of means for moving a slab axially therein; a pivoted arm mounted in the machine

and adapted to swing vertically therein; a rotating cutter head, mounted on the free end of said arm; and means mounted on said pivoted arm, adjacent to said cutter head, and adapted to pass through the bark of the slab to contact with the wood thereunder at a point adjacent the lowest point of cutting of said cutter head, whereby said arm and cutter head are limited in their downward movement by the position of the surface of the wood under the bark.

5. In a debarking machine, the combination of means for moving a slab axially therein; a driven shaft mounted in the machine; an arm, journaled upon said shaft and adapted to swing vertically in the machine; a rotary cutter head mounted on the free end of said arm; actuating means connecting said driven shaft with said cutter head, whereby the cutter head is rotated by the driven shaft independently of its vertical position in the machine; and means mounted on said arm, adjacent to said cutter head, and adapted to pass through the bark of the slab to contact with the wood thereunder at a point adjacent to the lowest point of cutting of said cutter head, whereby said arm and cutter head are limited in their downward movement by the position of the surface of the wood under the bark.

6. In a debarking machine, the combination of means for moving a slab axially therein; a rotating cutter head, adapted to cut the bark from said slab, and cutting with a motion opposed to the motion of the slab therepast; means supporting said rotating cutter head and permitting free vertical movement thereof in the machine; and means, mounted on said cutter-head-supporting means, and free to be rotated thereon in a direction opposite to that of the cutter head by the motion of the slab therepast, and adapted to pass through the bark of the slab to contact with the wood thereunder, whereby said cutter head is limited in its downward movement by the position of the surface of the wood under the bark.

7. In a debarking machine, the combination of means for moving a slab axially therein; a frame bridging across the machine, above the slab; an arm pivotally mounted in said bridging frame and adapted to swing vertically therein; a rotating cutter head, mounted on the free end of said arm; means mounted on said arm and adapted to pass through the bark of the slab to contact with the wood thereunder, whereby said arm and cutter head are limited in their downward movement by the position of the surface of the wood under the bark; and pneumatic means interposed between said bridging frame and said arm, whereby the downward pressure of said arm, with its cutter head and its limiting means, may be controlled.

8. In a debarking machine adapted to strip a longitudinal section of bark from the curved side of a slab, the combination with means for moving the slab axially therein, with its curved side exposed; a rotating cutter head; means supporting the rotating cutter head and permitting free vertical movement thereof in the machine, said cutter head being adapted to cut a longitudinal strip of bark from said slab as it is moved therepast; and limiting means, coaxial with and adjacent said cutter head, said limiting means being positioned on that side of the cutter head furthest removed from the central axis of the slab, and adapted to pass through the bark of the slab to contact with the wood thereunder, whereby said cutter head is limited in its downward movement, to cut completely through the bark and a limited distance into the wood, by the position of the surface of the wood under the bark and immediately adjacent the strip being cut.

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