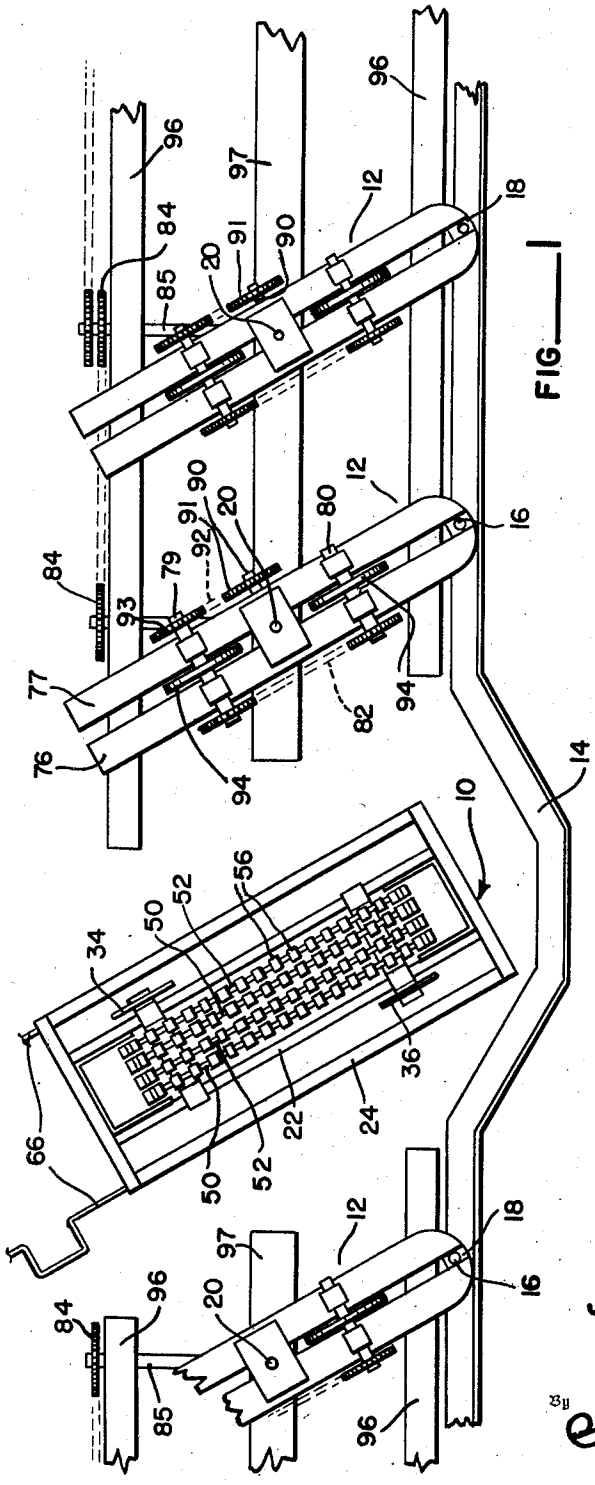
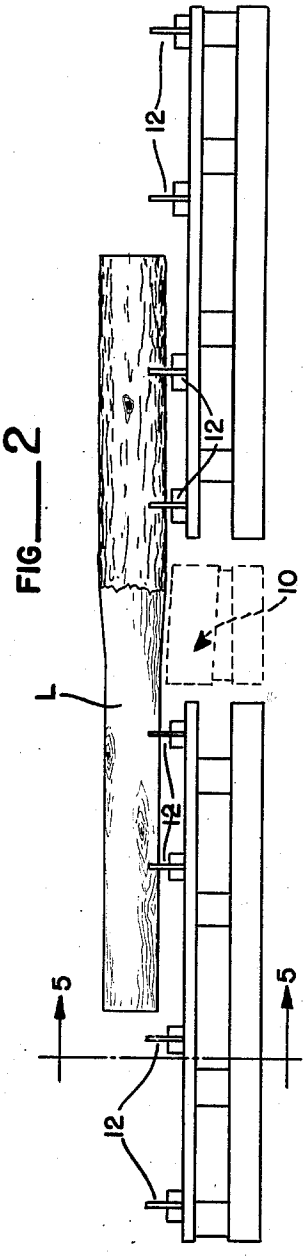
June 23, 1953 J. H. PEARCE 2,642,904

LOG DEBARKER AND CHIPPER

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LOG DEBARKER AND CHIPPER

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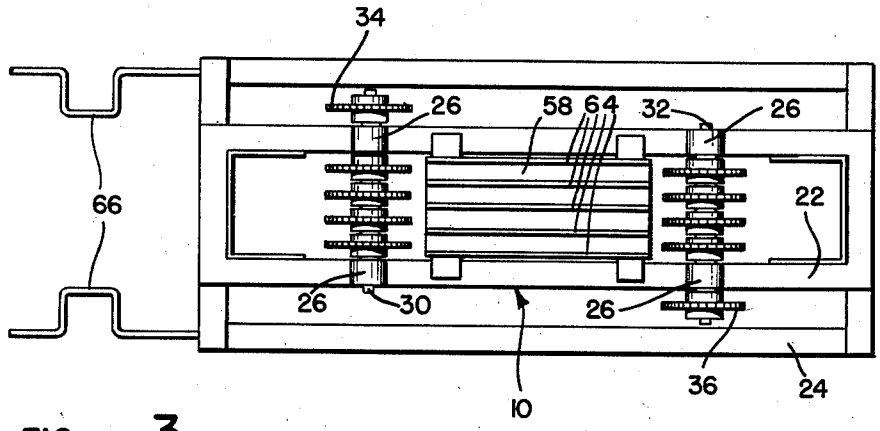


FIG. 3

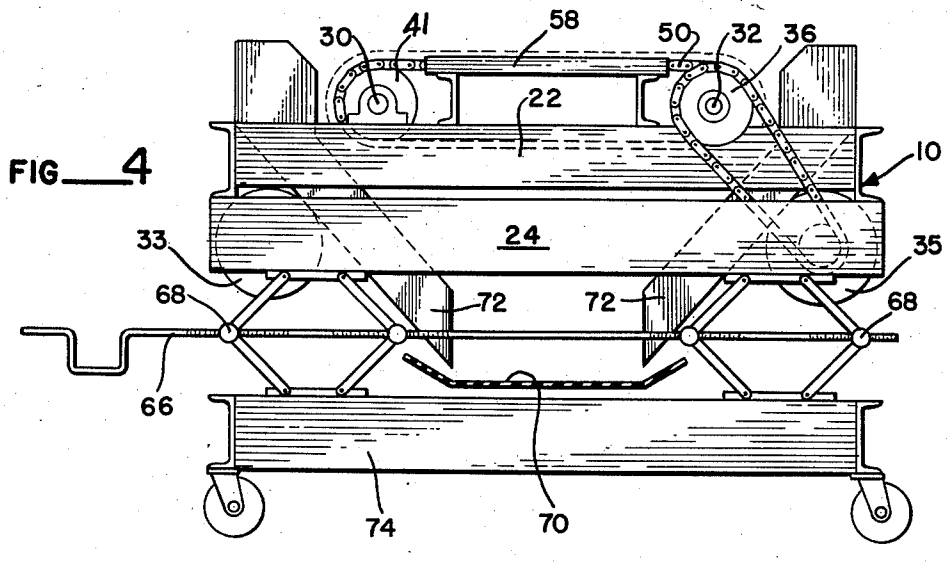


FIG. 4

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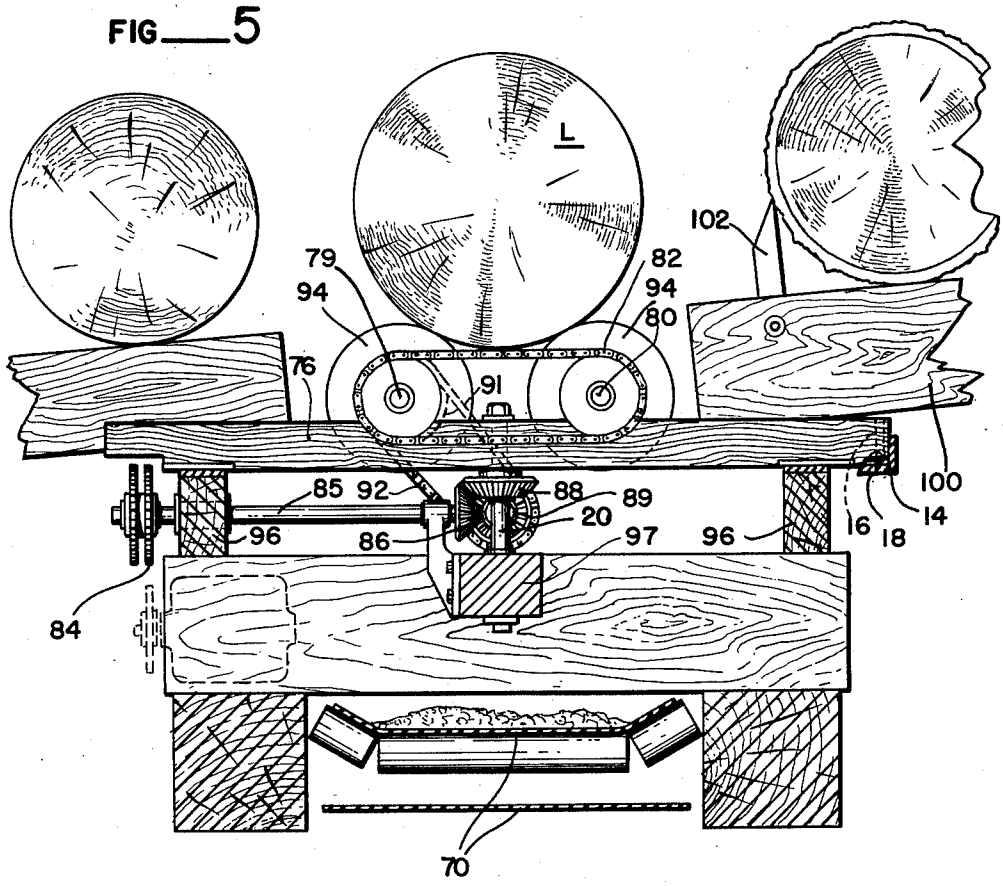
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LOG DEBARKER AND CHIPPER

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FIG. 5



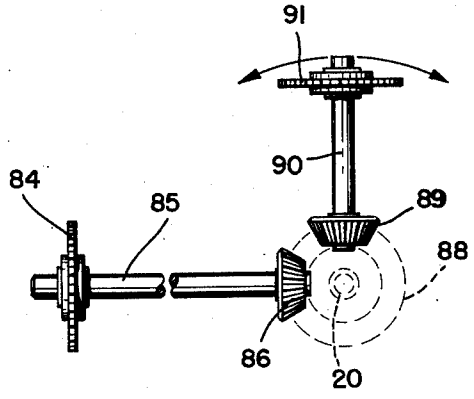


FIG. 6

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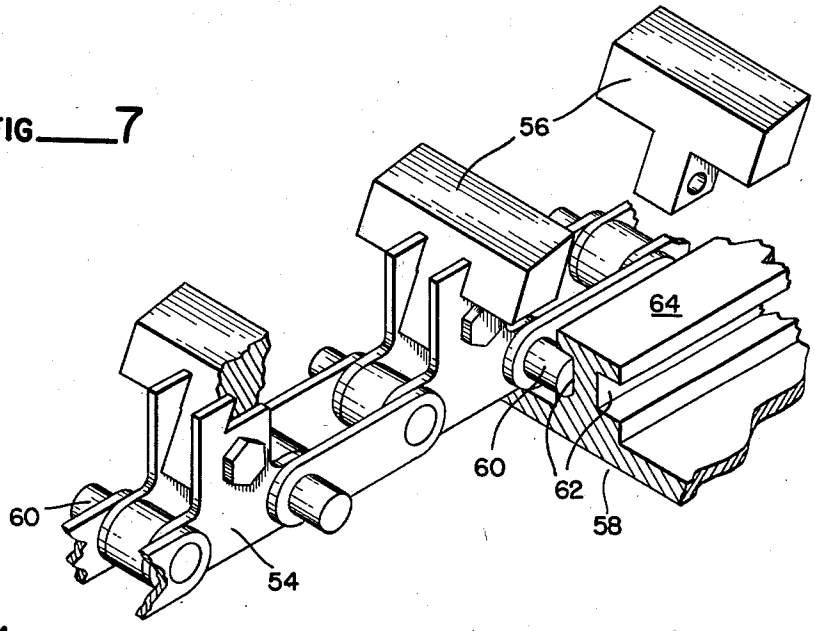
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LOG DEBARKER AND CHIPPER

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FIG. 7



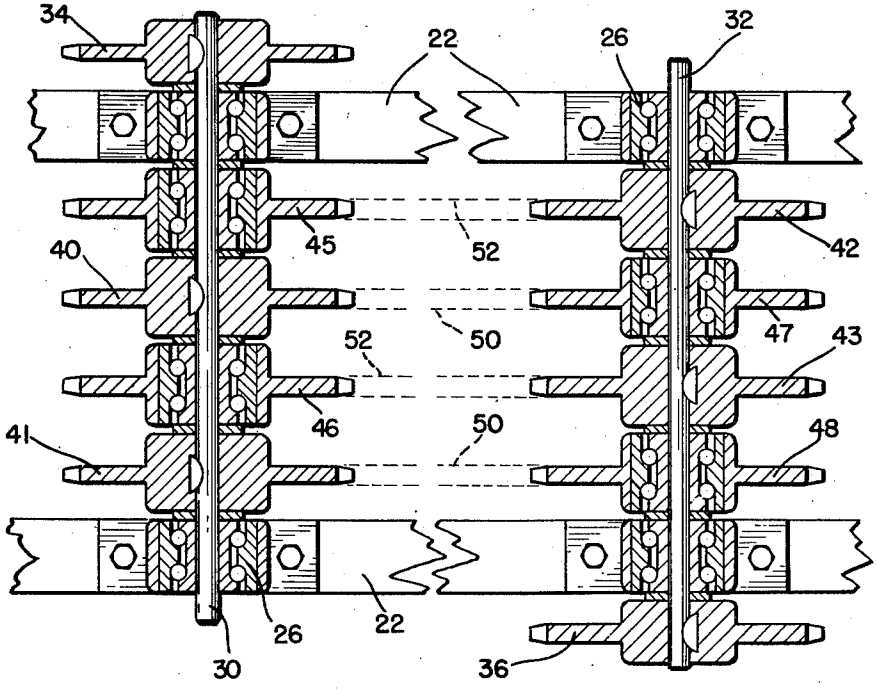


FIG. 8

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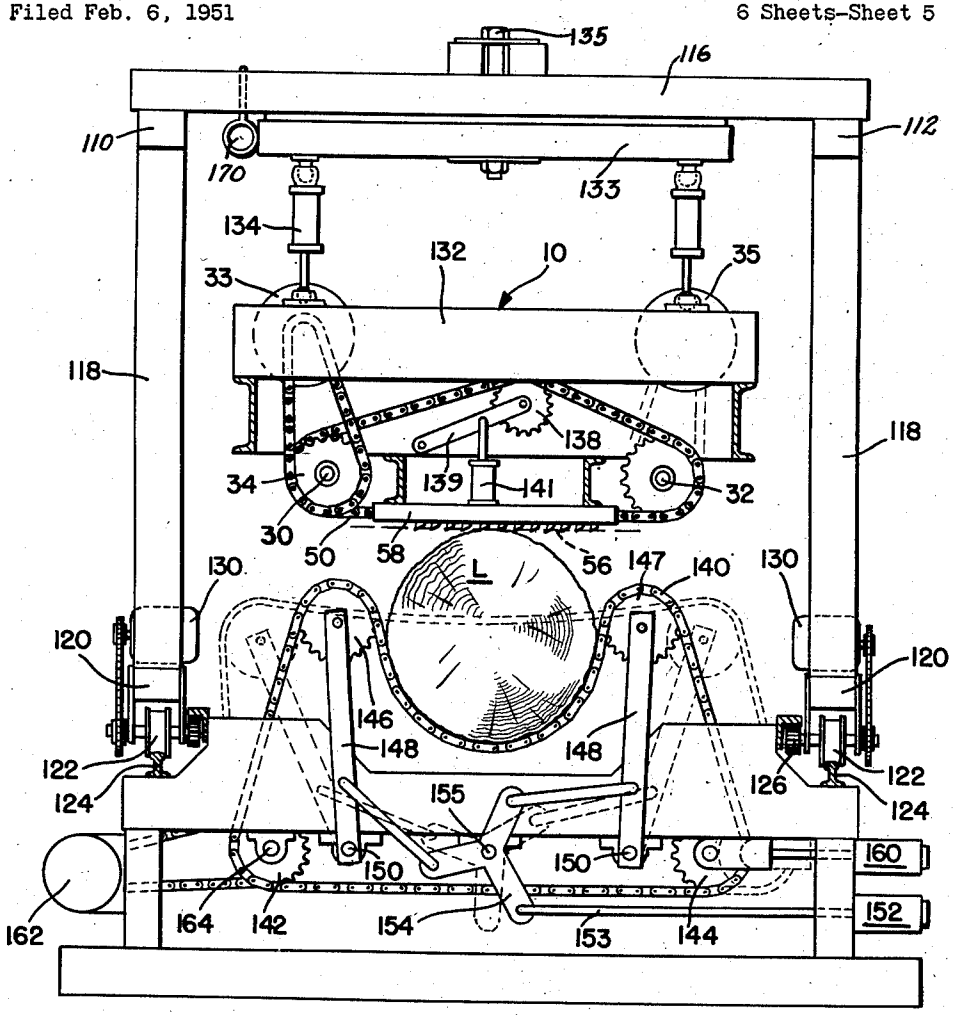


FIG. 9

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LOG DEBARKER AND CHIPPER

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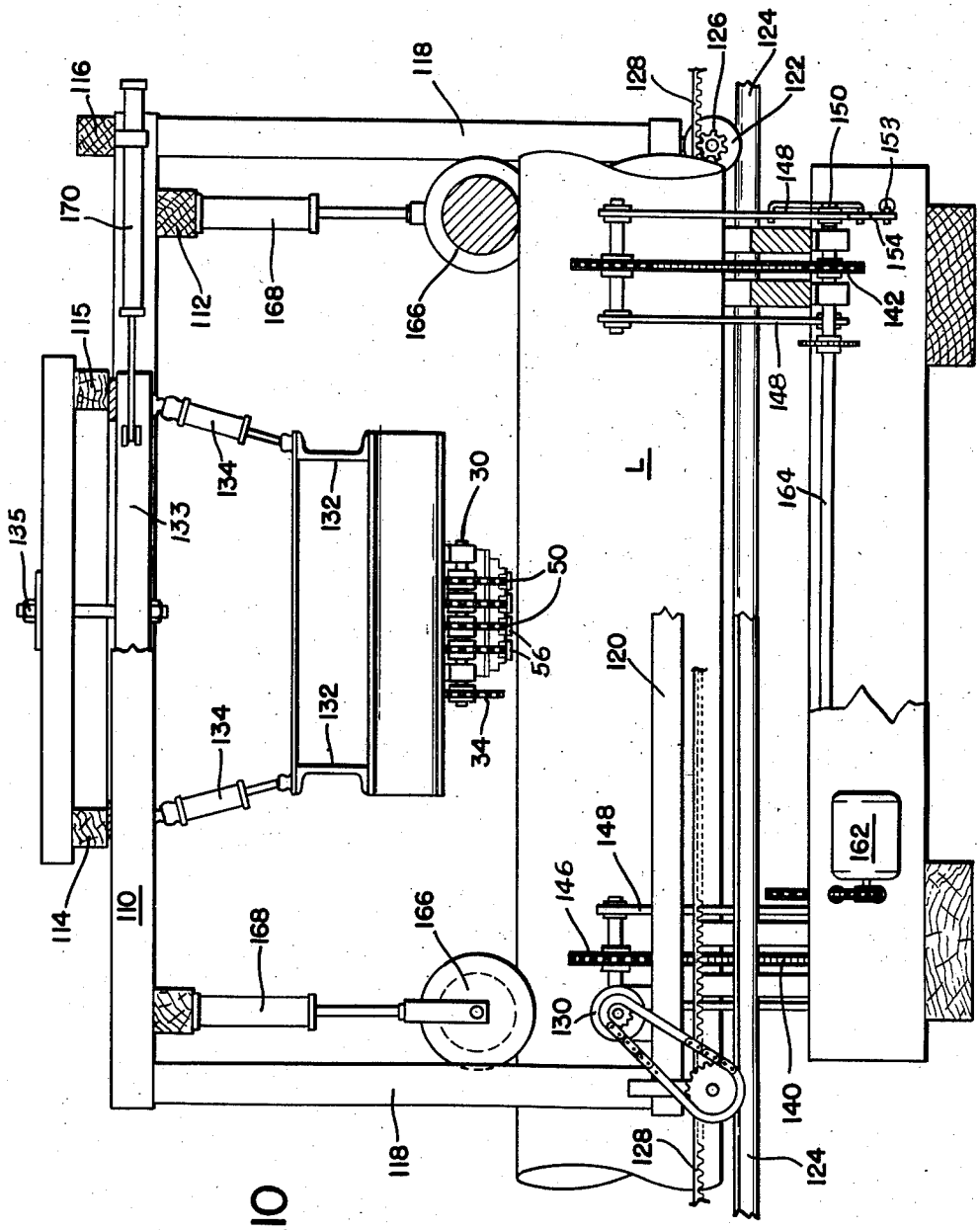


FIG. 10

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UNITED STATES PATENT OFFICE

2,642,904

LOG DEBARKER AND CHIPPER

John H. Pearce, Seattle, Wash.

Application February 6, 1951, Serial No. 209,595

6 Claims. (Cl. 144—208)

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This present invention consists of a unit having a log bed which is arranged with a plurality of power-driven units capable of turning a log around its longitudinal axis and moving it lengthwise at the same time, and a debarker or chipping device which may be employed to process the moving log and either remove the bark from the same as a preliminary to other processing of the log or it may remove the bark and convert a portion or the whole of the log into chips. The chips may be employed in the paper or pulp industry or they may be made into briquettes for use as fuel.

The present high cost of converting logs into usable forest products has made the cost of the various products such as lumber, fibres and dense board, plywood and pulp stock so high that substitute materials are making serious inroads in various fields that formerly were supplied entirely by forest products. In order to prevent the present economic conditions from pricing the forest products so high as to put them out of the competitive market, the industry is forced to seek out more economical means for handling these forest products and to prevent wastage in that handling and it is to fill this very pressing need that this present log debarker and chipper has been provided.

The principal object of this present invention therefore is to provide a piece of equipment that is light and readily portable, that can even be taken to log operations in a forest, and as the logs are brought to the loading deck they can there be debarked, loaded and brought to market ready to be cut up into lumber, turned into pulpwood or made available for other commercial uses.

A further object of this invention is to provide means whereby only the portion of the log that is wanted is brought to market and the waste portion is left out in the forest where by proper treatment it can act to fertilize the ground and thus make the area more productive for second growth trees.

A further object of this invention is to provide improved means for cleaning the log by removing the outer surface including the bark into which is usually embedded rock and other grit and dirt which has the usual effect of quickly dulling the cutting equipment of the mill and thus requires frequent expensive sharpening of such tools together with a very appreciable loss in time as the cutting tools are changed during the working day.

Another object of this invention is that it provides convenient means, after it has removed the bark, of forming the remaining log into whatever shape is desired. It is possible to convert the log easily into a true cylinder or a taper cylinder so that most careful study of the log may be made as it is brought into the mill and it can be presented to the cutting saws to best advantage. This is particularly true when the smaller logs are being cut today, so often by gang saw equipment, or wherein the exact positioning of the log due to its possible bends can greatly increase the effective amount of planks cut from a given log.

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A further object is to provide improved log debarking means whereby the debarked logs can be flattened on one or more sides for instance so that smaller timber can be made into railroad ties and other similar materials.

Further objects, advantages and capabilities will be apparent from the description and disclosure in the drawings, or may be comprehended or are inherent in the device.

In the drawings:

Figure 1 is a top plan view in somewhat fragmentary form and shows the arrangement of the various parts forming my log debarker and chipping device;

Figure 2 is a schematic side elevation showing the general positioning of the various parts forming my device and showing a log in position thereon;

Figure 3 is a top plan view of the drive means of the cutting system which does the actual work of removing the bark or producing chips from the log;

Figure 4 is a side elevation of the equipment of Figure 3 and shows some additional equipment in section associated therewith;

Figure 5 is a cross-sectional view, taken on line 5—5 of Figure 2, and shows the majority of the parts in end elevation with a log in place on the log bed and showing the manner in which the logs are fed to the same and supported while being processed;

Figure 6 is a fragmentary view of the drive mechanism of the log bed illustrating one arrangement of such a drive which permits swinging the plane of the log-supporting discs;

Figure 7 is a perspective view showing the actual form of chain attachment cutters used for debarking and chipping, together with the guide means employed therewith. Certain parts are shown in section;

Figure 8 is a sectional view in plan, partly broken away, and shows the alternate direction

drives employed on the chains carrying the cutters illustrated in Figure 7;

Figure 9 is an end elevation of a simplified form of my log barker and chipper, certain parts being shown in section, and some parts, such as a log hold down means, being omitted;

Figure 10 is a left side elevation of the modification shown in Figure 9, certain parts being broken away, and some parts being shown in section.

Referring more particularly to the disclosure in the drawings, the numeral 10 designates generally the cutting system or mechanism employed with my device. This unit may be considered the cutter bed of the debarker. While any number of these units might conceivably be employed, they are high power consuming units and normally one such unit appears to be the most practical arrangement and particularly for the portable or semi-portable units.

Associated with the cutter bed are a plurality of log beds 12. These units are employed to support the logs and employ power driven discs or chains which will revolve the log and by skewing the log bed units the log is caused to move lengthwise so that it will pass over the cutter bed 10. It has been found quite desirable to have the various log beds 12 operatively connected for simultaneous adjustment by a shiftable bar 14 which pivotably and slidably engages each of the members 12 by a pivot pin 16 and a slipper block 18, the units 12 being pivotably disposed for limited rotation about central pivot shafts 20.

Referring to the cutting system more particularly shown in Figures 3, 4, 7 and 8, a frame 22 rests upon a sub-frame 24. Journaled upon the frame 22 by bearings 26 are two parallel shafts 30 and 32. These shafts are each provided with their own driving sprockets 34 and 36. These are preferably driven by separate motors 33 and 35 and rotate in opposite directions, the separate motors being desirable in that under certain conditions it is desirable to drive one shaft at a different speed from the other.

Referring particularly to Figure 8, it is to be noted that each shaft 30 and 32 has keyed to it a pair of driving sprockets 40 and 41, and 42 and 43, respectively. Alternately spaced on the shafts 30 and 32 are pairs of idler sprockets 45 and 46, and 47 and 48, respectively. With this relationship established, the four driving sprockets and the four idler sprockets mount two chains 50 moving in one direction and two chains 52 moving in the opposite direction. The chains themselves are made to conform to the general showing of Figure 7 in which attachment links 54 are employed, each of which in turn supports a cutter 56. The cutters 56 should be formed of a steel that has high resistance to damage as they are required to cut through all the material that may be picked up by a log during the logging operations. This usually consists of dirt, grit and rocks which become embedded in the bark. There are numerous steels which will serve this purpose, the high manganese steels and especially certain varieties of the so-called high-speed steels. Adequate backing must be provided for the chains 50 and 52 so that the cutters can not be forced away from the log L. A satisfactory arrangement is to provide a backing member 58 which provides a firm support for the chains as the weight of the log is imposed upon them. It has further been found desirable to provide means to prevent the chains either jumping upwardly or chattering, when materials of varying hardness are encountered, or when the density of the log changes, as when a knot is struck during the chipping operation. Such means are illustrated in Figure 7, wherein pivot pins 60 for certain links of the chains are extended outwardly on each side and caused to ride in grooves 62 formed in a substantial central guide member 64. This guiding of the upper run of the chains is quite advantageous. The chains to be effective in performing the debarking and chipping operations, must run at high speed, and as they are always working under conditions of varying loads, severe chattering of the chains will occur unless they are adequately guided. The means shown properly safeguard this operation as will be observed in Figures 4 and 7. The guide members 64 are preferably formed as a part of the backing plate 58.

The cutter bed 10 must be vertically adjustable in order to control the depth of cut. This depth of cut should be varied in accordance with the density of the material being cut and also to provide a control in the hands of the operator so that chips of varying thickness can be produced. One satisfactory means of such adjustment is shown in Figure 4 in which a threaded crank 66 is provided which in turn controls a plurality of toggle units 68.

Means should be provided for conveying the chips, whether they are bark or wood, away from the equipment and this is preferably provided by a conveyor belt 70 which is supported in the conventional manner as is illustrated in Figure 5, and guide chutes 72 are further provided to insure the delivery of the chips to this belt. In order to be able to move the cutter bed 10 horizontally, a wheel supported car 74 is provided.

The cutter bed of the debarker also should be capable of a transverse tilting adjustment so that the side of the backing member 58 toward which the log L approaches, will have a lower elevation than its outfeed side, as indicated by broken lines in Figure 2. With this arrangement and with the cutter bed skewed, as illustrated in Figure 1, that portion of the log in contact with the cutters will appear tapered, as illustrated in Figure 2. In this manner the plurality of chains, which may be more than the four illustrated, can each be so presented to the wood that it will do its proportionate share and thus provide means for the sequential cutting that appears to be essential if the high speed processing of the logs is to be achieved. One effective means for providing this tilt to the cutter bed is to employ two cranks 66 disposed one under each side of the cutter bed and thus by adjusting one crank more than the other the entire bed may be tipped transversely of itself or in the direction of an oncoming log.

In order to feed the log lengthwise and cause it to pass over the cutter bed, and at the same time to revolve the log, it has been found best to provide a plurality of the log bed units 12. These units are mounted so as to pivot about the centrally disposed vertical shafts 20 which are in turn directly below the logs being processed. Each unit comprises two spaced beams 76 and 77 mounting two pairs of aligned bearings for transversely disposed parallel shafts 79 and 80. These two shafts are preferably driven from a common source of power and are operatively connected by means of a secondary drive belt 82. Power is supplied to this belt or chain by means of the gear arrangement illustrated in Figure 6 in which power from the prime source is transmitted to a

sprocket 84, then through a shaft 85 to a beveled pinion 86. This pinion meshes with a beveled gear 88 of larger diameter which is mounted on the pivot 20 and serves as an idler to drive a pinion 89, secured to a horizontal shaft 90 to which a sprocket 91 is secured and then by means of a chain 92 this rotation is transmitted to a sprocket 93 which may be positioned on either the shaft 79 or 80. This form of drive is not affected by the partial revolution of the member 12 as a whole about the pivot 20. Positioned between the supporting bearings of shafts 79 and 80 are log-supporting members 94, 94 both turning in the same direction. These log-supporting members may be sprockets carrying a suitable chain or they may be sprockets or discs which directly engage the log. An economical form of construction is to merely employ the steel discs 94 that are burned in circular form from steel plate of a thickness that will not be distorted by the weight of the log. Since these discs have a rather narrow face, they tend to bite into the log and thus give better longitudinal movement of the same when the beds 12 are skewed with respect to the log axis. The direction of skewing of the beds 12 with respect to the longitudinal axis of the whole assembly as shown in Figures 1 and 2 will determine the direction of movement of the logs. Thus, either a forward or a reverse feeding means is provided.

In debarking a log it is of course desirable to take off the minimum amount of wood, and sometimes the debarker may be so set up that it will not completely clean a log. Under such conditions it is very desirable to be able to back up the log and feed it through again. There are other conditions such as the type of log, the symmetry of it, or the thickness of the bark, or even the type or variety of wood which make it desirable to feed the log through at different speeds. Therefore it has been found most satisfactory to be able to control the rate at which the logs are fed through and to have complete control over them at all times. To this end the arrangement shown more or less diagrammatically in Figure 1 has proved very satisfactory. Each of the log bed members 12 is pivotably secured by pivot shaft 20 to fixed pivot beam 97 and rests principally on the longitudinal beams 96. As mentioned before, the slipper or crosshead member 18 is disposed between the beams 76 and 77 and is mounted on the pivot member 16 which is secured in turn to the longitudinally disposed actuating member or adjusting bar 14. Some suitable means is provided for conveniently moving the bar 14 longitudinally and as this is done, each of the members 12 is similarly adjusted angularly with respect to the axis of the log. The amount of angularity will determine the speed of movement of the log over the driven members 94 and a reversal of angularity will propel the log in the opposite direction, consequently a speed-controlling and reversing mechanism is thus provided for the handling of the log.

In operating this equipment the log L is first deposited on inclined ramps 100 (see Fig. 5) and arrested in a lowermost position by a plurality of mechanically operated dogs 102. By the lowering of these dogs the log can roll onto the log bed of the debarker and come to rest on a plurality of the log-handling members 94. This entire operation will take place with the leading end of log L to the right of the cutter bed 10 as viewed in Figure 2. The log is then fed to the left, as viewed in Figure 2, by the action of members 94, and the cutter bed 10 is adjusted upwardly so as to properly process the log, the log moving from right to left until it is entirely debarked. If it is then desired to follow up the debarking operation by chipping the log into pulp or fuel-sized chips, the log is merely passed repeatedly over the cutter bed. Each pass will result in reducing the log diameter appreciably and this can be continued until the log is so small in diameter as to be of no further commercial value. The equipment as generally illustrated employs a cutter 56 approximately two inches wide. The proper size, of course, depends mainly upon the power applied to the equipment, but with this form of equipment, the average chip taken off of the log after it has been debarked will be approximately two inches wide and one-sixteenth to one-eighth of an inch thick. Using the four chains, four times the thickness of the chip will be taken off the radius of the log for each passage through the cutter, and the log can be reduced to a minimum diameter very quickly. Since the weight of the log decreases as its diameter becomes smaller, it is important that the adjacent chains move in opposite directions, because the cutters will then hit the log from opposite sides, and thus tend to balance each other and not to interfere with the normal rotary drive of the log. However changing the speed of one set of chains with respect to the other can be used to assist or detract from the turning effort provided by members 94.

There are occasions when it is desirable to have a more simple form of my debarker and chipper, as when making mining timbers or railroad ties from small trees, that are removed during selective logging and the like, and when it becomes advantageous to be able to move the plant from one location to another after the trees in one area are cut and processed. Under such conditions the more preferred form of this invention, requiring considerable equipment, while portable in the sense that it is taken to the center of the woods and assembled, is not so small that it can be easily loaded aboard a truck and moved to a new location. In Figures 9 and 10 I have illustrated a simplified form of my device. The modified chipper mechanism 10 also has a dual motor drive and a plurality of alternately positioned chains bearing cutters, which as before are then capable of being driven in opposite directions, and wherein the speed of one set of chains can be varied with respect to the other. It has been found however that in simplifying the structure it is best to invert the debarker and chipper unit 10 and have it engage the top of the logs instead of the bottom. To this end an overhead framework having longitudinal frame members 110 and 112, and cross members 114, 115 and 116, is fixedly secured to vertical corner posts 118. These posts rest upon lower longitudinal members 120 which complete the framework and provide a movable carriage which supports the debarker and chipper unit.

Flanged wheels 122 are mounted below the longitudinal timbers 120 so as to engage parallel disposed rails 124. The rails are broken away in Figure 10 but should be of sufficient length so that the carriage can move the debarker and chipper mechanism 10 not only over the entire length of the log but also entirely beyond the log supporting mechanism so that logs can either be placed on the supporting means or removed therefrom when the processing has been completed. Means for moving the carriage longitudinally of the rails is shown in Figures 9 and 10, and comprises

rotatable axles to which the carriage wheels 122 are secured. On the inner end of each axle is fixed a gear pinion 126 adapted to operatively engage a gear rack 128 which parallels each rail 124. The opposite or outer end of the shaft is provided with a suitable sprocket so that the shaft and its gear pinion may be driven by an electric motor 130.

As brought out previously it is desirable that the cutter mechanism be made tiltable so that it can take a tapered cut and thereby make full use of the plurality of chains 50, and to this end the cutter mechanism is mounted on the underside of a frame 132 which is in turn suspended from an overhead frame 133 by preferably four hydraulic cylinders 134. With this arrangement the cutters can be presented to the log after the fashion of my former showing. It is desirable to have chain tighteners, one for each of the various chains, and these are illustrated in one exemplary form by a sprocket 138 mounted upon a pivoted arm 139 and actuated by a hydraulic cylinder 141. The overhead frame 133 is supported by a single large bolt 135, which makes it possible to swing the cutter assembly about a vertical axis so as to achieve the angular disposition, shown in plan view in Figure 1, of the other form of this device.

In order to again simplify the structure even though its built-in speed of operation may be considerably reduced, I have made provision for rotating and supporting the log as it is acted upon by the cutter 10, but as distinguished from the former plan, where the rotating log is moved axially past a relatively stationary cutter, the carriage supporting the cutter is moved along a non-traveling log, and thus the entirety of the log can be processed. Log L is normally deposited upon skids that are above the level of the chain 140 and the log through additional short skids is rolled onto the chain assembly which must consist of at least two complete units of the chain 140 and supporting elements, and, under certain conditions, where long logs are to be handled, additional chain mechanisms may be employed. The chain 140 passes over a fixed drive sprocket 142, a lower, horizontally adjustable sprocket 144, and two upper swinging sprockets 146 and 147. These swinging sprockets 146 and 147 are supported on arms 148 which are pivoted at 150 and their position is normally controlled by a hydraulic cylinder 152 operating through a rod 153 and a Y lever 154. The lever 154 is pivoted at 155 and is connected to the arms 148 by suitable links so that as the lever 154 is partially revolved by the cylinder 152, the sprocket can assume any position between the full line position indicated in Figure 9 and the dotted line position. The dotted line position is that assumed when the log is being loaded or unloaded from the device. It has been found that in order to properly turn log L, the chain supporting and driving it should wrap around it at least 180 degrees. The swinging sprocket arrangement illustrated appears to be a preferred solution of this problem. A hydraulic cylinder 160 which positions the sprocket 144 provides a yieldable element in the support means for the chain 140, and by having a plurality of the cylinders 160 connected together, each will give a proper degree of tension to the various chains 140 so that the log will be equally supported by the various chains 140 and thus the log will turn without bending, and a minimum of strain will be placed upon the mechanism. A preferred drive for the various chains 140 comprises a single motor 162 driving through a shaft 164 common to all of the sprockets 142. A plurality of hydraulically positioned presser rolls 166 controlled by hydraulic cylinders 168 is found to be desirable in order to hold the log securely while it is being acted upon by chipper 10. To afford complete control, the chipper 10, through its framework, is revolved by a hydraulic cylinder 170 or by suitable motor means.

It is believed that it will be clearly apparent from the above description and the disclosure in the drawings that the invention comprehends a novel construction of a log debarker and chipper.

Having thus disclosed the invention, I claim:

1. In a log debarker and chipper, a cutting mechanism frame relatively movable in substantially parallel relation with respect to a longitudinal axis of a rotating log; a bank of flexible endless conveyors positioned on said cutting mechanism frame; said conveyors being positioned side by side and each following a path lying in an upright plane and having one run located in spaced relation to said axis, and extending transversely of said axis; a multiplicity of cutters secured to each of said conveyors and having cutting edges that lead the cutters as they travel with said conveyors, said one run of each conveyor extending a substantial distance in a substantially horizontal direction, so that each cutter follows a similar cutting course; means to drive said conveyors; and a first group of said conveyors being connected to travel in one direction and a second group of said conveyors being connected to travel in an opposite direction, the conveyors in said first and second groups being alternately disposed.

2. The subject matter of claim 1, and supporting means for said cutting mechanism frame including means for independently lowering and raising opposite sides of said bank of conveyors for presenting said bank at various angles to said axis.

3. The subject matter of claim 1, and there being a backing member secured to said cutting mechanism frame and supporting said flexible endless conveyors in said one run against movement away from said log.

4. The subject matter of claim 3, and said flexible endless conveyors being chains having pivot pins extending outwardly of each side of each chain and said backing member having secured thereto a guide member disposed at each side of each chain, said guide members having grooves facing the adjacent chains in which the ends of said pivot pins in said one run ride to thereby prevent movement of the chains away from said backing member.

5. In a log debarker and chipper, a cutting mechanism comprising: a bank of flexible endless conveyors, said conveyors being positioned side by side and each following a path lying in an upright plane; a multiplicity of cutters secured to each of said conveyors and having cutting edges that lead the cutters as they travel with said conveyors; power means for driving said conveyors; and a first group of said conveyors being connected to said power means for travel in one direction and a second group of said conveyors being connected to said power means for travel in an opposite direction, said conveyors in said first and second groups being alternately disposed.

6. The subject matter of claim 5, and said power means being capable of furnishing differ-

ent and variable amounts of power to each group of conveyors.

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