April 4, 1950 F. H. SWIFT 2,502,763

HYDRAULIC-BARKER NOZZLE-ASSEMBLY PRODUCING COMPOSITE OSCILLATORY MOVEMENT OF DISCHARGING JET

Filed Oct. 3, 1946 4 Sheets-Sheet 1

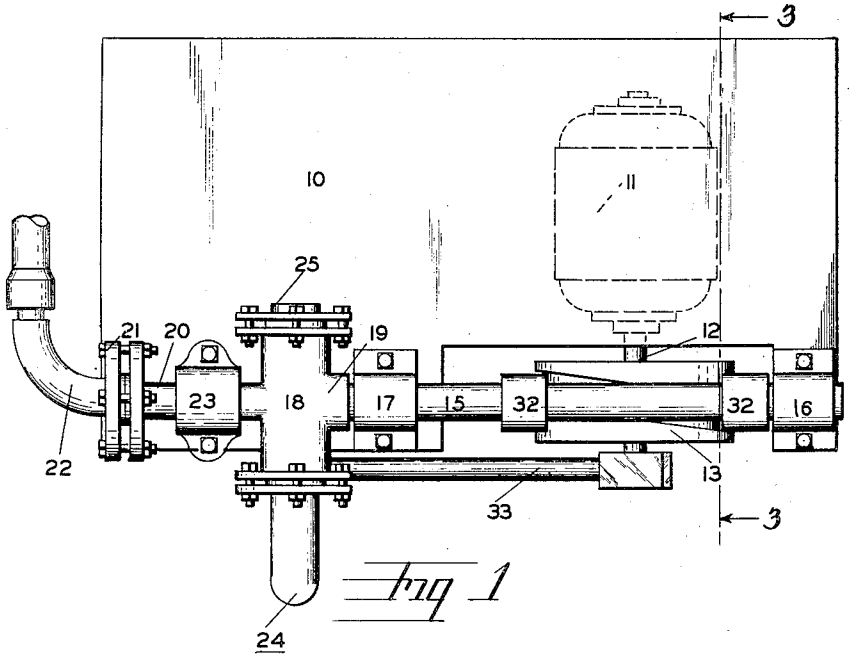


Fig 1

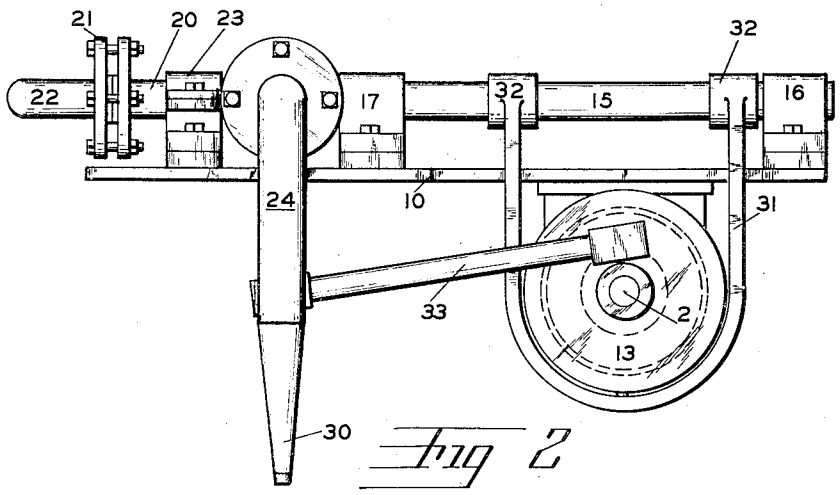


Fig 2

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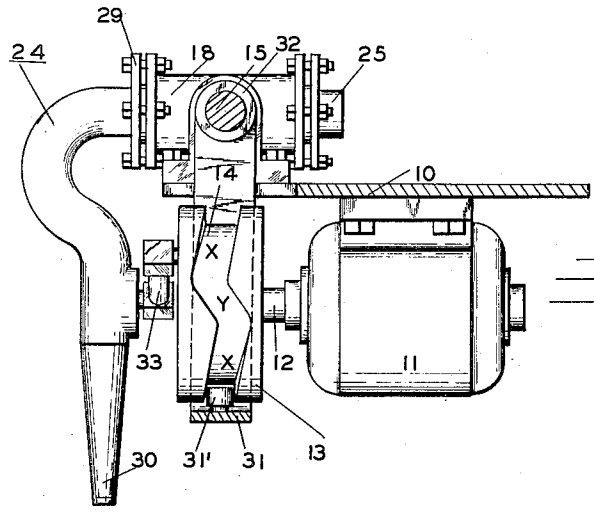


Fig 3

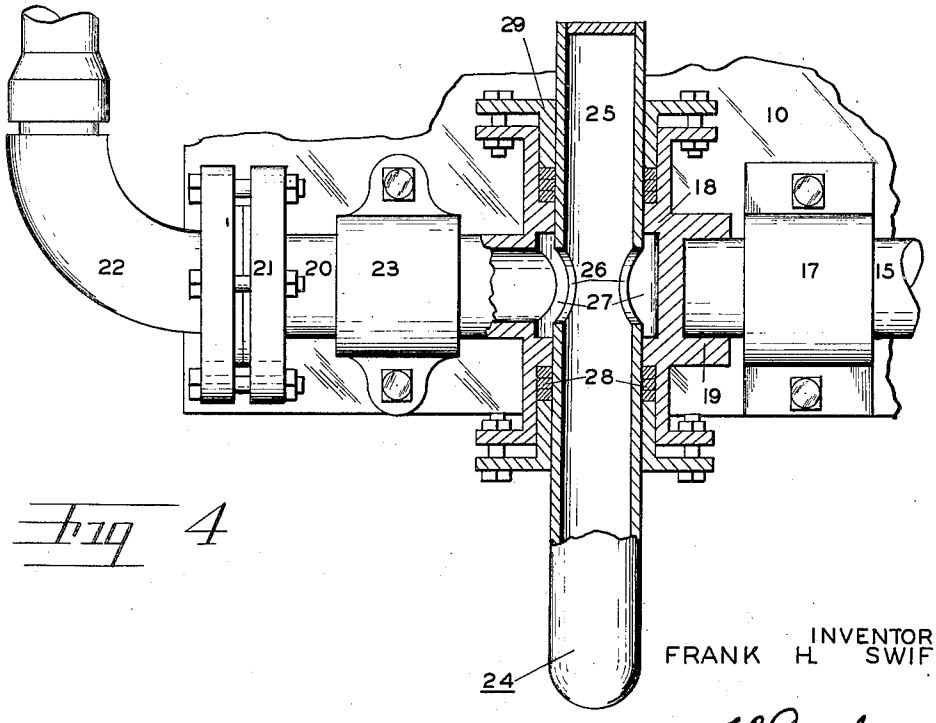


Fig 4

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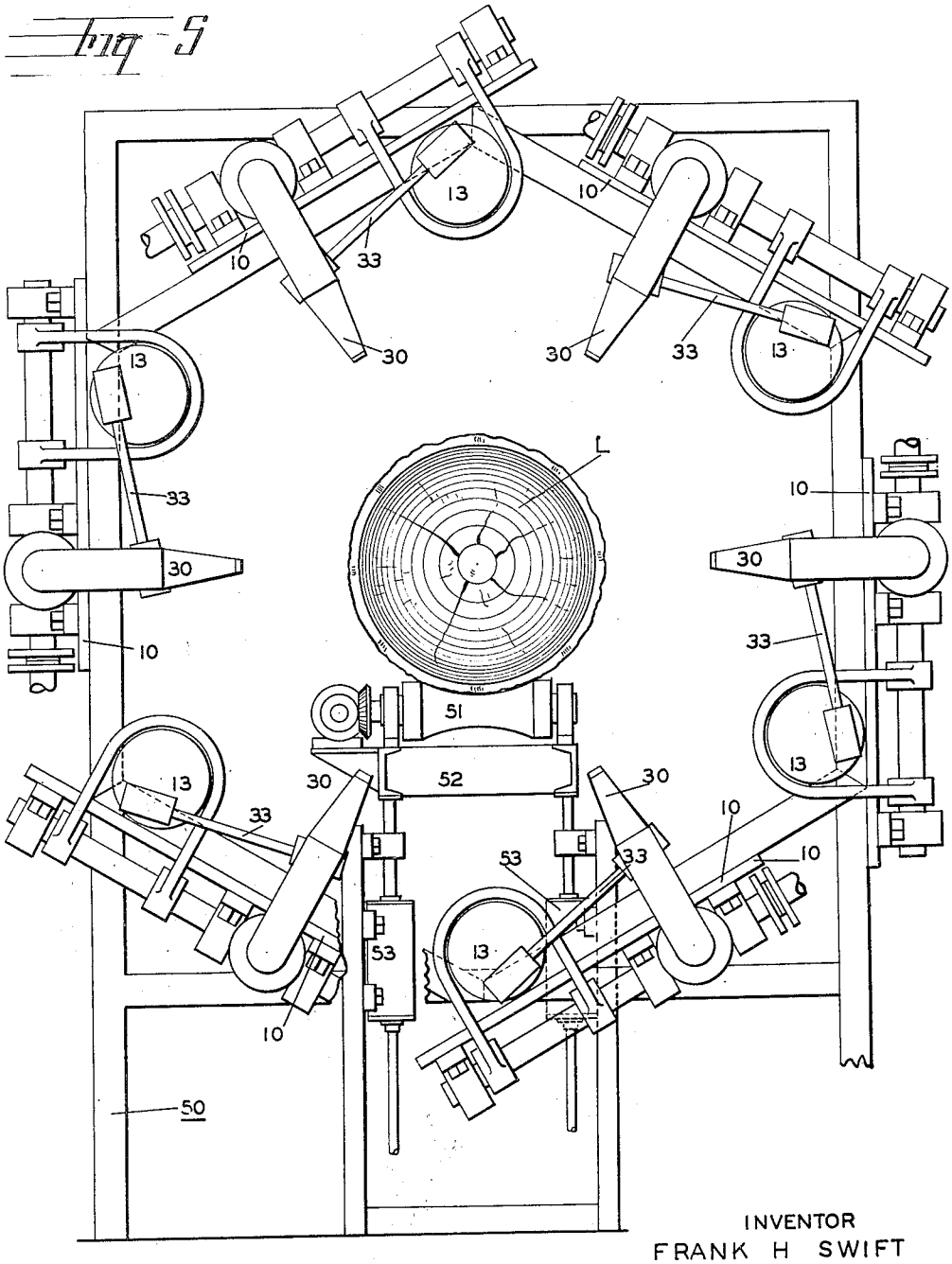
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HYDRAULIC-BARKER NOZZLE-ASSEMBLY PRODUCING COMPOSITE OSCILLATORY MOVEMENT OF DISCHARGING JET

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Fig 5



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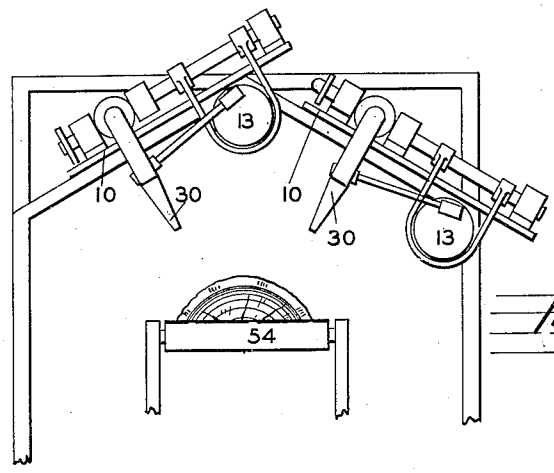


Fig. 6

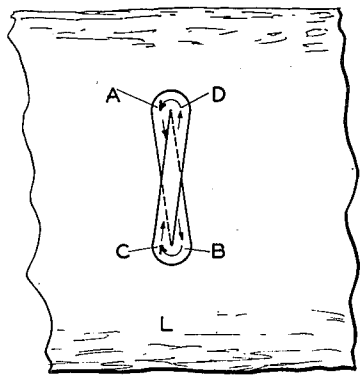


Fig. 7

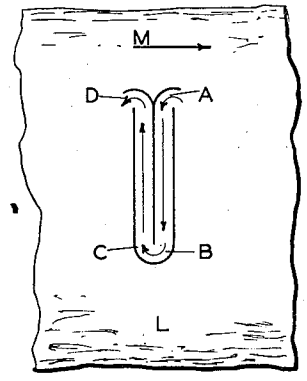


Fig. 8

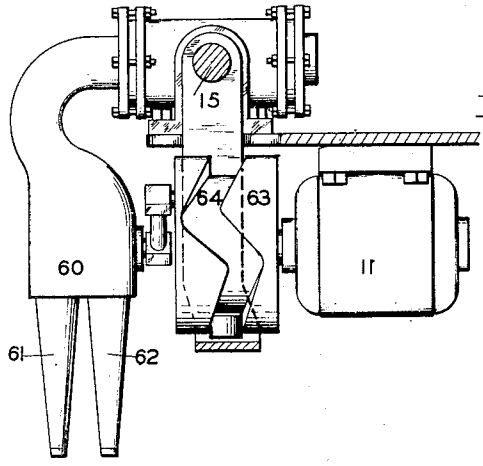


Fig. 9

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UNITED STATES PATENT OFFICE

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HYDRAULIC-BARKER NOZZLE ASSEMBLY PRODUCING COMPOSITE OSCILLATORY MOVEMENT OF DISCHARGING JET

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Application October 3, 1946, Serial No. 700,999

5 Claims. (Cl. 144—208)

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This invention relates to the removal of bark from logs, cants or slabs by high velocity jets of water, and relates to means which may be employed for carrying out the method described in my co-pending application of even date, Serial No. 700,998, now U. S. Patent No. 2,448,041, issued November 15, 1949.

Various devices which are at present being employed for the hydraulic debarking of logs have shown that a high velocity jet of water, if properly directed against the bark surface of a log, will remove the bark in its path satisfactorily without the aid of any mechanical debarking means. Some of these devices, however, require the logs to be rotated as well as moved longitudinally during the debarking and are less satisfactory on that account, since the necessity for mounting the logs for rotation and for rotating them at the proper rate under varying circumstances, present certain difficulties and problems; and furthermore, these devices cannot be used for cants or slabs. Other hydraulic debarking devices necessitate the simultaneous employment of a considerable number of debarking jets, and thus require the utilization of a large volume of water under high pressure in order to enable the debarking to proceed with sufficient speed to be practicable.

The object of the present invention is to provide simple and practical means for debarking a log with a minimum number of hydraulic debarking nozzles without rotation of the log.

Another object of this invention is to provide an improved hydraulic debarking means which can be utilized for cants and slabs as well as whole logs.

In the accompanying drawings:

Fig. 1 is a top plan view of one of the debarking nozzle assemblies employed in my improved barker, the same being shown removed from the supporting frame on which the entire assembly is mounted;

Fig. 2 is a front elevation of the same assembly;

Fig. 3 is a sectional side elevation of the same assembly taken on line 3—3 of Fig. 1;

Fig. 4 is a fragmentary top plan view and partial plan section of the assembly drawn to a larger scale;

Fig. 5 is a more or less diagrammatic front elevation of my entire barker showing how the barker is employed in the debarking of a log;

Fig. 6 is a fragmentary similar elevation of the upper portion of my barker indicating the employment of the same in the debarking of a slab;

Fig. 7 is a diagrammatic plan view of the path described on the surface of a log by the jet from

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one of the nozzle assemblies of my barker when the log is stationary;

Fig. 8 is a similar diagrammatic plan illustrating the resulting path of the same nozzle jet on the log surface when the log is moved longitudinally at a proper rate of speed; and

Fig. 9 is a fragmentary elevation corresponding in part to Fig. 3, showing a double nozzle in place of a single nozzle in the nozzle assembly.

Referring first to Fig. 5, a rigid frame structure indicated as a whole by the reference character 50, is arranged to support a plurality of debarking nozzle assemblies (for example, 6, as shown in the figure), in equal spaced relationship about a log L. The log L is supported on, and moved longitudinally by, a plurality of driven rollers 51, the rollers being mounted on a supporting track or framework 52. The supporting track 52 extends horizontally through the frame structure 50 except for a brief space where the nozzle jets strike the log, the track preferably being formed in two longitudinally-extending sections with their ends spaced a short distance apart where the nozzle jets operate so as not to intercept any portion of the jets from the lower nozzle assemblies. Suitable means (not shown) is provided for driving the rollers, and thereby moving the log L longitudinally at a predetermined rate of speed. In order to provide for different sizes of logs, both sections of the supporting track 52 are so mounted that they may be raised or lowered in order that the axis of the log being debarked will extend approximately through the center of the barker. Any suitable means for adjustably supporting the track sections may be employed, for example, a plurality of hydraulic cylinders and pistons, such as those indicated at 53 in Fig. 5, with suitable controls (not shown). The debarking nozzle assemblies are separate but similar, each being independently connected to a source of water under pressure. The construction and manner of operation of each nozzle assembly will be described with reference to Figs. 1 to 4.

Referring now to Figs. 1 to 4 inclusive, 10 indicates a platform or deck which is secured on the frame structure 50 of Fig. 5. An electric motor 11, supported by the platform 10 rotates a horizontal shaft 12 on the end of which a drive wheel 13 is secured. The perimeter of the wheel 13 is formed with a specially shaped cam groove 14 (Fig. 3), the nature and purpose of which will be subsequently explained.

A shaft 15 is rotatably supported in a pair of bearing blocks 16 and 17 mounted on the oppo-

site side of platform 10. A nozzle housing 18, the shape and construction of which are shown most clearly in Fig. 4, is secured to the end of the shaft 15. Preferably the housing 18 is formed with an external boss 19 into which the end of the shaft 15 is fitted and to which it is firmly secured in any suitable manner. The housing 18 has a lateral pipe branch or arm 20 extending in the opposite direction from the boss 19 and so arranged as to extend in axial alinement with the shaft 15. The pipe branch 20 terminates in a swing joint 21 through which the housing is connected to a supply pipeline 22. A bearing block 23, mounted on the platform 10, rotatably supports this pipe branch 20 of the housing 18.

The nozzle, designated in its entirety by the reference character 24, has a horizontal portion 25 which is rotatably mounted in the housing 18. A plurality of ports 26 (Fig. 4), in this portion of the nozzle, connect with an interior chamber 27 of the housing. Thus water from the supply pipeline 22 passes through the housing branch 20 into the housing chamber 27 and thence into the nozzle through the ports 26. Suitable packing glands are provided around the nozzle on the exterior of the housing 18 and are held in place in the usual manner by locking rings 29 provided with external flanges which are connected by bolts to adjacent flanges formed at corresponding ends of the housing.

From the description thus far it will be apparent that while the nozzle is mounted to rotate in the housing 18 on one axis, the entire housing, and with it the nozzle, is mounted to rotate on another axis, the two axes being normal to each other. The nozzle 24 terminates in a discharging tip 30 by means of which a debarking jet of predetermined shape and dimension is directed against the surface to be debarked.

A U-shaped metal strap member 31 has both ends formed with sleeves 32 which are keyed or otherwise rigidly secured on the shaft 15. At the center of member 31 is mounted a roller 31' (Fig. 3), which extends into the cam groove 14 on the perimeter of the drive wheel 13 and acts as a cam follower.

With the rotation of the wheel 13 the cam follower 31', and with it the bottom of member 31, will be moved towards and away from the motor 11, as apparent from Fig. 3. In other words, member 31 will be rocked back and forth as the wheel 13 rotates. The rocking of member 31 will cause a rocking of the shaft 15 to which it is rigidly secured and the rocking of shaft 15 in turn will cause the entire housing 18 and thus the entire nozzle assembly 24 to be rocked similarly.

The cam groove 14 has two identical main sloping sections, indicated by x in Fig. 3, and two short and more abruptly and oppositely curved sections y between the main sections x. Thus with each counterclockwise half rotation of the wheel 13 the nozzle tip 30, as viewed in Fig. 3, will be moved gradually to the right and then quickly moved back to the left to the original position.

The rotation of the wheel 13 also produces another movement of the nozzle through the intermediary of a connecting rod 33. This connecting rod is shown more clearly in Figs. 1 and 2. One end of the connecting rod 33 is connected to the drive wheel 13 preferably through the intermediary of a universal joint, and the other end is similarly connected to the nozzle 24. Thus with each rotation of the drive wheel 13 the nozzle 24 is swung back and forth in the nozzle housing 18, but at the same time the nozzle housing 18 is also rocked on its separate axis by the member 31 as previously described. The effects of these two component directions of reciprocating movement on the resultant path of the jet from the nozzle will be described with reference to Figs. 7 and 8.

In Fig. 7 it is assumed for the purpose of illustration that the log L, against the bark surface of which the jet from the nozzle tip is impinged, is temporarily stationary while the nozzle is being driven by the rotation of the wheel 13 in the manner previously described. The location of the connection between the drive wheel 13 and the connecting rod 33 is so arranged with respect to the sections x and y of the cam groove 14 on the wheel 13 that one of the sections y (Fig. 3) will engage the roller 31' of member 31 whenever the wheel and rod connection is at either end of the longitudinal diameter of its circular path. As the rotation of the wheel 13 and the operation of the connecting rod 33 cause the nozzle tip to swing transversely with respect to the log axis, the travel of the cam follower or roller 31' in one of the main sections x of the cam groove of wheel 13 will also cause the nozzle tip to move slightly longitudinally with respect to the log axis. Then, when the connecting rod 33 is about to reverse the direction of transverse swing of the nozzle tip, the travel of the cam follower on the next section y of the cam groove will cause the nozzle tip to move quickly back longitudinally with respect to the log axis. Thus, referring to Fig. 7, let it be assumed that the center of the jet from the nozzle strikes the log at some point A when the connecting rod has reached the limit of its travel in one direction. While the connecting rod causes the nozzle to swing transversely with respect to the log axis, one of the cam groove sections x causes the nozzle to move longitudinally with respect to the log axis. As a result of these two component forces acting on the nozzle the jet from the nozzle will travel in the oblique path A—B on the surface of the log. When the center of the jet reaches the point B, however, the engagement of the cam follower 31' with one of the sections y of the cam groove 14 results in movement of the jet quickly to the point C. Next, the moving of the nozzle by the connecting rod, and the engagement of the cam follower in another cam groove x will result in the jet traveling the transverse oblique path from C to D. Finally, when the center of the jet reaches the point D the engagement of the cam follower with another section y of the cam groove causes the center of the jet to move again to the point A, and the jet proceeds to repeat its same travel. The amount of slope of the sections x and y in the cam groove 14 is made such that the tilting of the nozzle jet longitudinally with respect to the log axis will in each instance be approximately equal to the width of the jet longitudinally as it strikes the log surface.

If, instead of remaining stationary during the movements of the nozzle jet as previously described, the log L is moved longitudinally in the direction of the arrow M in Fig. 8, and if the rate of longitudinal travel of the log is constant and corresponds to the width of the nozzle jet with each transverse swing of the nozzle produced by the crank arm 33, the jet paths A—B and C—D will be normal to the log axis and will adjoin each other, as illustrated in Fig. 8, and, with

the continued travel of the log and transverse swinging of the nozzle, the bark will be removed from the log surface in a broad, longitudinal strip equal in width approximately to the distance A—B.

Thus the hydraulic jet from each nozzle assembly operates to debark a relatively wide strip extending the length of the log. By arranging the several nozzle assemblies symmetrically about the log so that the broad strips debarked by the jets from the respective nozzles will be adjacent to one another and slightly overlap, the entire log surface will be debarked as the log moves longitudinally. Due to the width of the paths debarked by the nozzle jets only a minimum number of nozzles and nozzle assemblies are required. As a rule, a total of five or six nozzles are sufficient for debarking a complete log, the number of nozzles depending of course upon the size of the logs being debarked.

In Fig. 6 it is assumed that cants or slabs are to be debarked instead of whole logs. In order to support cants or slabs and move them longitudinally, it will generally be necessary to substitute other supporting and moving rollers and means in place of the rollers **51** of Fig. 5. Thus in Fig. 6 I show slab rollers **54** for the slab S. It is assumed that the slab rollers **54** likewise are rotated by suitable means (not shown), so as to cause the slab S to be moved longitudinally at the desired predetermined speed.

Inasmuch as the slab S of Fig. 6 presents less surface to be debarked, it is assumed, for purpose of illustration, that the jets from two of the nozzle assemblies, debarking broad, adjoining and slightly overlapping strips, will entirely cover the bark surface. Consequently, in all but two of the assemblies the water and motor power are turned off and the slab passes through the device with only the two upper nozzle assemblies in operation, as indicated in Fig. 6. Thus my barker can quickly and easily be adapted for use with either logs, cants or slabs, as the case may be.

Instead of having a single nozzle, or a nozzle producing a single jet, in each assembly as previously described, it would be possible to substitute a double nozzle or even a plurality of nozzles acting in unison in each assembly, so placed or arranged that their jets combine to form a single broader path on the surface to be debarked. Such a modification is shown in Fig. 9 in which a double nozzle **60** takes the place of the single nozzle tip **30** of Fig. 3. The jets from two tips **61** and **62** from the double nozzle **60** will combine on the bark surface to form a single path equal approximately to the combined widths of the two jets. The single broad path would then follow the forwardly oblique courses in the strip to be debarked, as previously described. With this modification a drive wheel **63**, having a wider perimeter than the drive wheel **13** of Fig. 3, would be used inasmuch as a cam groove **64** producing more movement of the shaft **15** is required. The cam groove **64** would be so arranged that the termination of each oblique course of the single broad path from the double nozzle would be approximately the width of such path in advance longitudinally of the beginning of that course, the same as previously described.

I claim:

1. In a hydraulic barker, a hydraulic nozzle assembly, means for producing relative travel of the surface to be debarked with respect to said assembly, a hydraulic nozzle in said assembly directed against said surface and connected to a source of water under pressure, a bearing support, said nozzle mounted in said bearing support for movement in a plane substantially normal to the direction of said relative travel, means in said assembly for imparting back and forth movement of said nozzle in said plane, a mounting in said assembly for said support, said support mounted in said mounting for rotation about an axis substantially normal to the direction of said relative travel, means in said assembly for imparting oscillatory rotative movement to said support to swing said nozzle in the direction of said relative travel during each back and forth movement of said nozzle in said support, and associated means for alternately imparting more rapid return swing of said support in a direction opposite to the direction of said relative travel during the termination of each of said back and forth movements of said nozzle, whereby the jet from said nozzle will follow resulting alternate oblique courses on the surface to be debarked with each of said oblique courses being in a forward direction with respect to the direction of said relative travel, for the purpose described.

2. In a hydraulic barker, means for producing relative longitudinal movement of a log or cant with respect to the barker, a nozzle assembly, said assembly including a debarking nozzle connected to a source of water under pressure and directed towards the bark surface of said log or cant, a bearing support for said nozzle in said assembly, the nozzle supported in said bearing for swinging movement in a plane normal to the longitudinal axis of said log or cant, a mounting in said assembly for said bearing support, said bearing support rotatably mounted in the mounting for swinging on an axis normal to the longitudinal axis of said log or cant, means in said assembly for swinging the nozzle back and forth in said bearing support, means in said assembly for tilting said bearing support, and therewith said nozzle, in a direction corresponding to the relative longitudinal movement of the log or cant during each swing of the nozzle, and associated means for tilting said bearing support rapidly back in reverse direction at the end of each swing of the nozzle in the bearing support, whereby the jet from said nozzle will travel in alternate, oblique, forward-extending strokes with respect to the direction of relative longitudinal movement of said log or cant.

3. A hydraulic barker of the character described including means for conveying a log or cant longitudinally at predetermined rate of speed through the barker, a plurality of nozzle assemblies, each assembly including a debarking nozzle connected to a source of water under pressure and directed towards the bark surface of said log or cant, a bearing support for each nozzle in its assembly, the nozzle supported in said bearing for swinging movement on an axis lying in a plane containing the longitudinal axis of said log or cant, a mounting in each assembly for the bearing support, said bearing support rotatably mounted in the mounting for swinging on an axis normal to the axis of swing of said nozzle, means in each assembly for swinging the nozzle back and forth in said bearing support, means in each assembly for tilting said bearing support, and therewith said nozzle, in a direction corresponding to the longitudinal movement of the log or cant during each swing of the nozzle, and associated means for tilting said bearing support rapidly back in reverse direction at the end of each swing of the nozzle

in the bearing support, whereby the jet from each nozzle will travel in alternate, oblique, forward-extending strokes with respect to the direction of longitudinal movement of said log or cant.

4. In a hydraulic barker, means for conveying a log or cant longitudinally through the barker, a nozzle assembly, said assembly including a debarking nozzle connected to a source of water under pressure and directed towards the bark surface of said log or cant, a bearing support for said nozzle in said assembly, the nozzle supported in said bearing for swinging movement on an axis lying in a plane containing the longitudinal axis of said log or cant, a mounting for the bearing support, said bearing support rotatably mounted in the mounting for swinging on an axis normal to the longitudinal axis of said log or cant, a drive wheel in said assembly, the axis of said drive wheel lying in another plane containing the longitudinal axis of said log or cant, a connecting rod connecting said wheel and said nozzle, whereby rotation of said wheel will cause the nozzle, and therewith the jet from said nozzle, to move back and forth transversely with respect to said log or cant, an element connected with said bearing support, cooperating cam means connecting said wheel and said element and causing the bearing support, and therewith the nozzle, to tilt in a direction corresponding to the longitudinal travel of said log or cant during each reciprocating stroke of said connecting rod, related cam means causing a rapid reverse swing of said bearing support during each reversal of direction of the reciprocating strokes of said connecting rod, and means for rotating said wheel, whereby the nozzle jet will be tilted forwardly while it is being moved transversely with respect to the longitudinal axis of said log or cant and will be tilted back at the termination of each transverse movement, whereby said nozzle jet will travel in alternate, oblique, forward-extending strokes with respect to the direction of travel of said log or cant.

5. A hydraulic barker of the character described including means for conveying a log or cant longitudinally at predetermined rate of speed through the barker, a plurality of nozzle assemblies, each assembly including a debarking nozzle connected to a source of water under pressure and directed towards the bark surface of said log or cant, a bearing support for each nozzle in its assembly, the nozzle supported in said bearing for swinging movement on an axis lying in a plane containing the longitudinal axis of said log or cant, a mounting in each assembly for the bearing support, said bearing support rotatably mounted in the mounting for swinging on an axis normal to the axis of swing of said nozzle, a drive wheel in each assembly, the axis of said drive wheel lying in another plane containing the longitudinal axis of said log or cant, a connecting rod connecting said wheel and said nozzle in each assembly, whereby rotation of said wheel will cause the nozzle, and therewith the jet from said nozzle, to swing back and forth transversely with respect to said log or cant, an element connected with the bearing support in each assembly, cooperating cam means connecting said wheel and said element in each assembly and causing the bearing support, and therewith the nozzle, to tilt in a direction corresponding to the longitudinal travel of said log or cant during each reciprocating stroke of said connecting rod, related cam means causing a rapid reverse swing of said bearing support during each reversal of direction of the reciprocating strokes of said connecting rod, and means in each assembly for rotating the wheel in that assembly, whereby the nozzle jet in each assembly will be tilted forwardly while it is being swung transversely with respect to the longitudinal axis of said log or cant and will be tilted back at the termination of each transverse swing, whereby each nozzle jet will travel in alternate, oblique, forward-extending strokes with respect to the direction of travel of said log or cant.

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