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HYDRAULIC LOG-BARKING MACHINE

Filed Feb. 24, 1941

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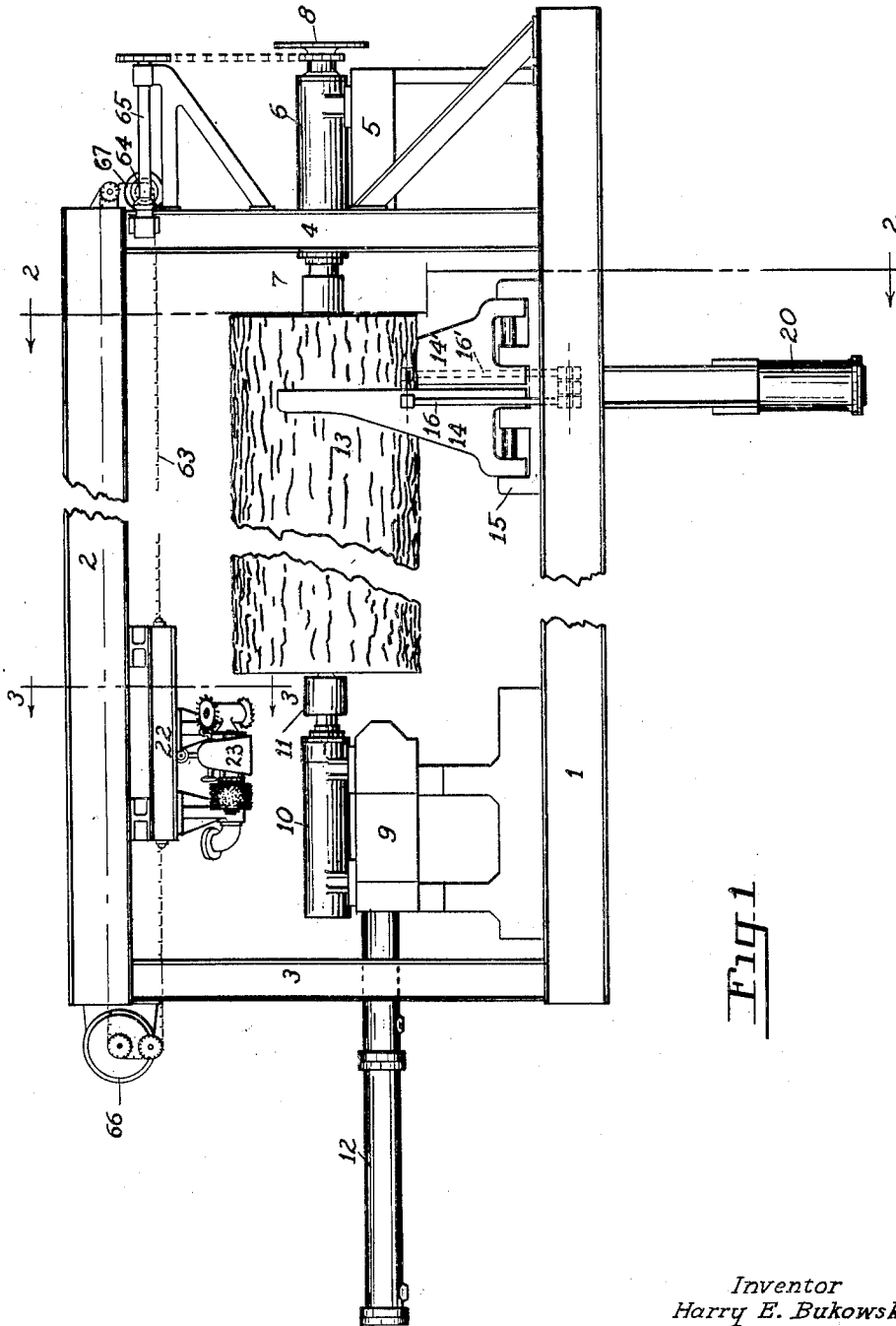


Fig 1

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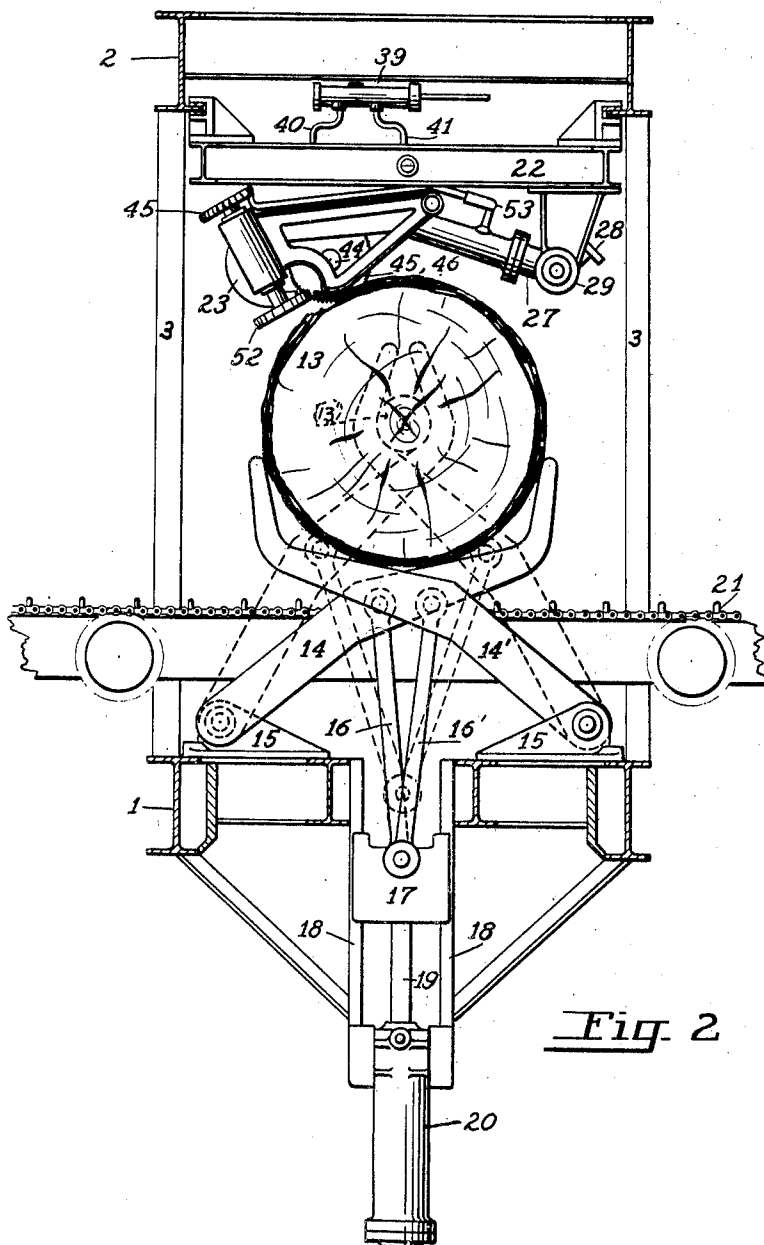


Fig. 2

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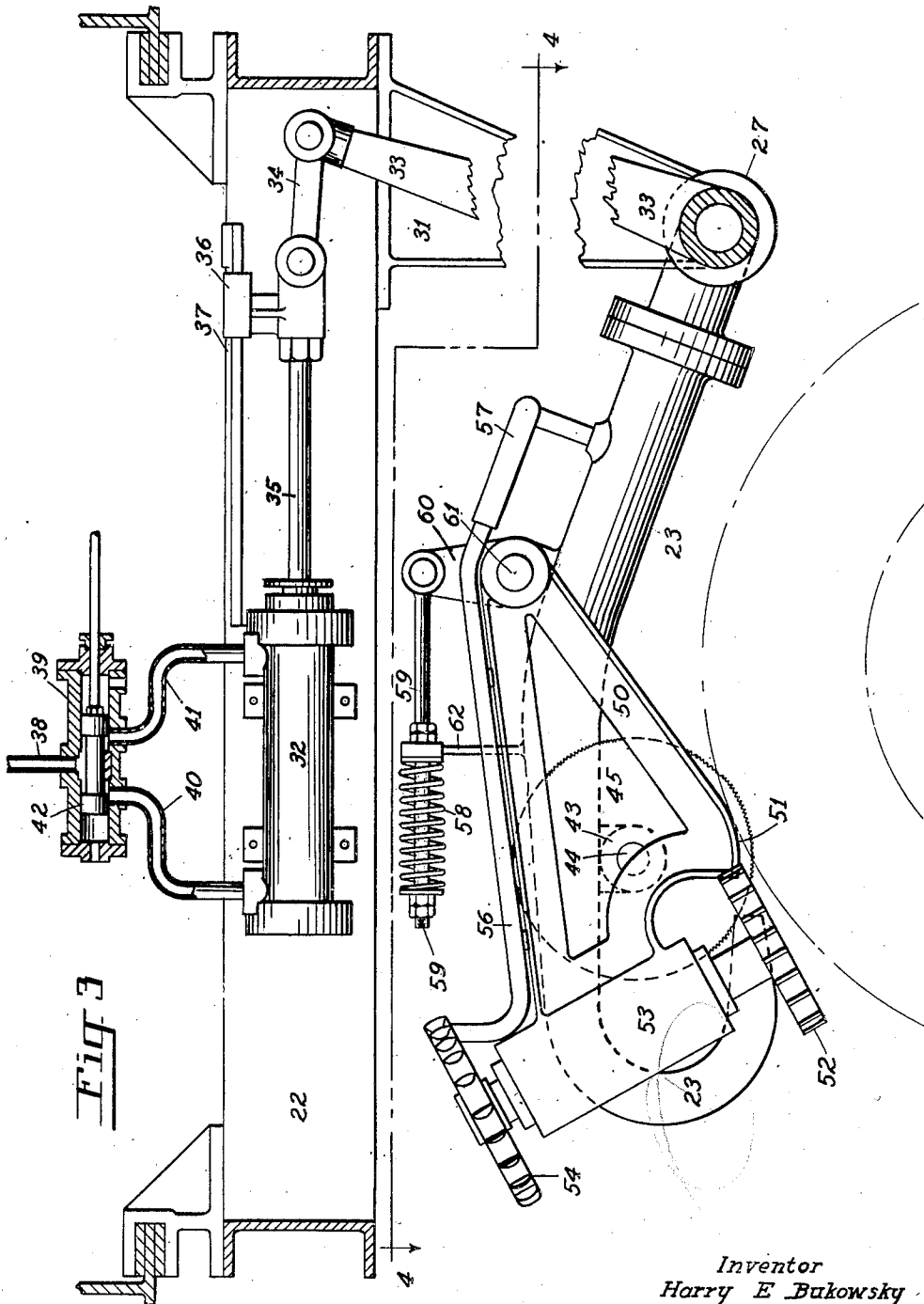
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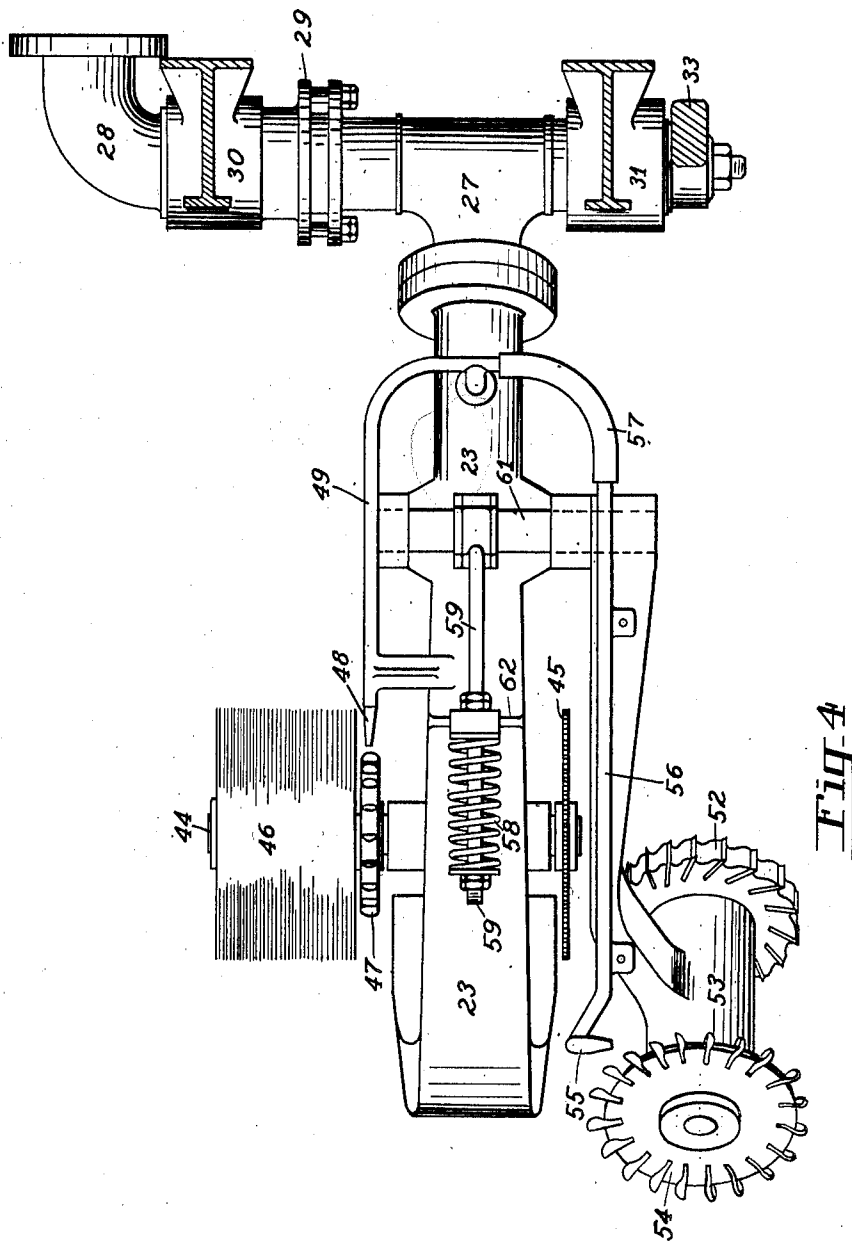
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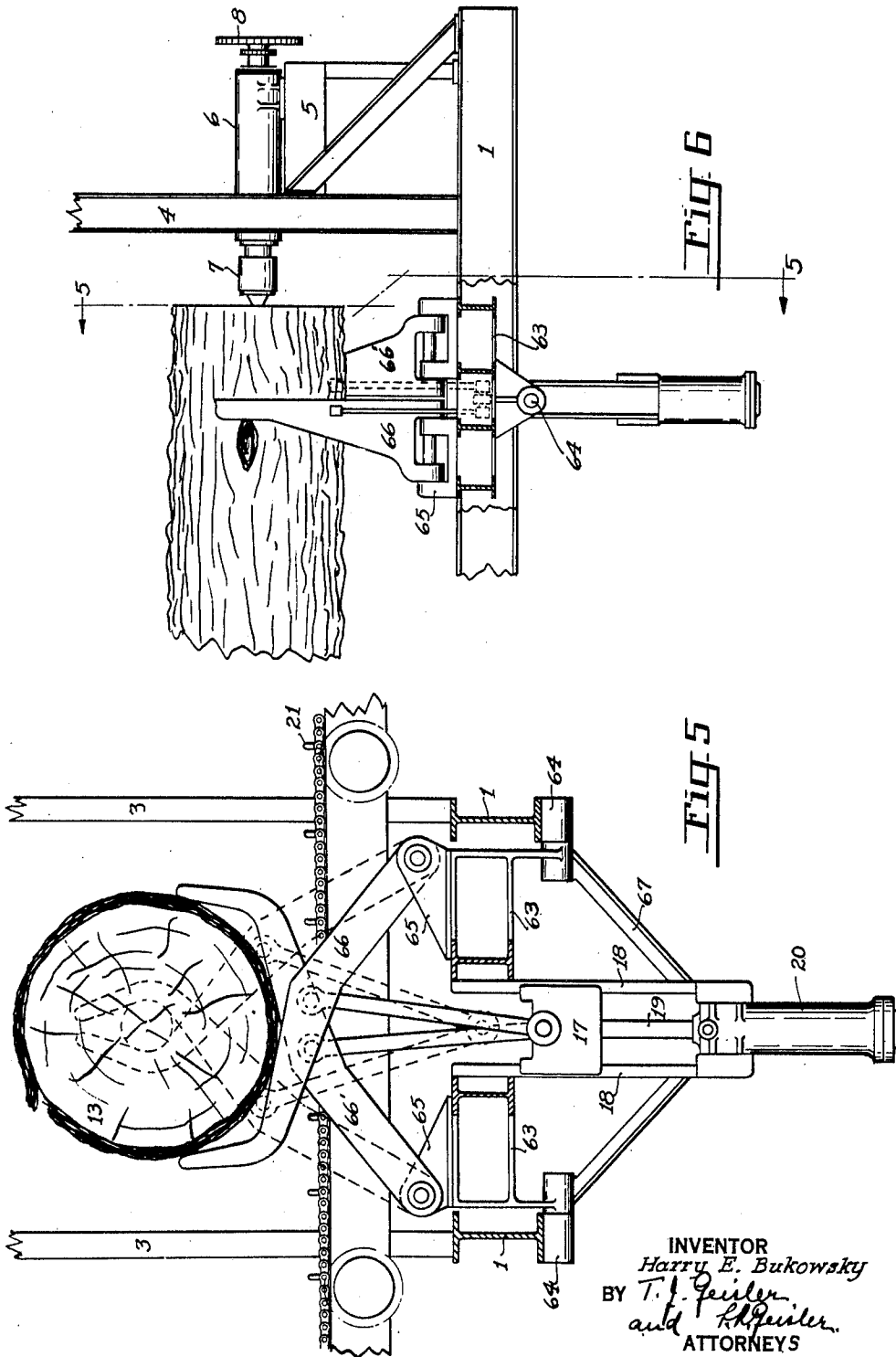
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HYDRAULIC LOG-BARKING MACHINE

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UNITED STATES PATENT OFFICE

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HYDRAULIC LOG-BARKING MACHINE

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8 Claims. (Cl. 144—208)

This invention relates to machines designed to remove the bark from logs to be used for the production of pulp in paper manufacture, or to be used for debarking logs in the manufacture of veneering or other products. More specifically, this invention relates to hydraulically-operated log debarking devices.

One object of this invention is to provide an improved hydraulic log barking machine suitable for logs of various diameters.

Another object of this invention is to provide hydraulically-operated means for removing knots and similar projecting portions, as well as bark, from the body portion of the log.

A further object of this invention is to provide improved loading means for supporting and centering the log in the machine preparatory to the debarking operation.

A still further object is to provide an improved movable and adjustable means for supporting the hydraulic debarking elements.

Other objects reside in the details of construction and arrangement of the various parts comprising my improved hydraulic log-barking means, as hereinafter described with reference to the accompanying drawings.

In the drawings:

Figure 1 is a foreshortened side elevation of my machine showing one of the pairs of log-raising arms and the log raised into position preparatory to the debarking operation;

Figure 2 is an end elevation of the log of Figure 1 and a transverse section of the machine taken on the line 2—2 of Figure 1, but illustrating the debarking means in actual contact with the log;

Figure 3 is a section through the nozzle carriages, taken on the line 3—3 of Figure 1, but drawn to a much larger scale, and showing the nozzle arm and associated debarking elements separated from the carriage and dropped slightly below the carriage for the sake of clarity;

Figure 4 is a sectional plan taken on the line 4—4 of Figure 3;

Figure 5 is an end elevation of the log, showing a slight modification in the mounting of the log-raising elements, corresponding to a fragmentary transverse section taken on line 5—5 of Figure 6; and

Figure 6 is a fragmentary side elevation, drawn on a slightly smaller scale, corresponding in part to Figure 1, but illustrating the modified mounting for the log-raising elements.

Referring first to Figures 1 and 2, my machine includes a rigid base frame 1 which is formed of

members, and a rigid top frame 2 supported at each end on a pair of columns 3 and 4 mounted on the base frame.

In the forward or right-hand end of the machine, as viewed in Figure 1, a shelf 5, supported on the base frame and also on the pair of columns 4, in turn supports a bearing housing 6 for a power-driven spindle 7, mounted on suitable thrust and radial load ball bearings. At one end of the spindle 7 is a sprocket wheel 8 by which the spindle is driven, rotation being imparted to the sprocket wheel 8 by any suitable means (not shown). At the other end of the spindle 7 is a spur center designed to penetrate a short distance into the end of the log and to support that end of the log and to cause the log to be rotated with the spindle 7.

At the other or left-hand end of the machine, (as viewed in Figure 1) a slidable support 9, slidably mounted on the base 1, carries a bearing housing 10 in which a spindle 11 is rotatably supported by thrust and radial load ball bearings. The spindle 11 carries a spur center at the inner or right-hand end, similar to that on the spindle 7, designed to support that end of the log, both spindles 7 and 11 being in axial alignment. The support 9 is moved longitudinally by means of a double-acting hydraulic cylinder 12.

The log is lifted into position between the spur centers of the spindles 7 and 11 by a plurality of pairs of lifting arms, one such pair 14, 14' being shown in Figures 1 and 2. Since the pairs of lifting arms are all similar, it will suffice to describe the pair 14, 14' shown. Each arm is pivoted to a suitable bracket 15, attached to the base, the arms being pivoted for up and down movement in vertical planes, and the arms of each pair being pivoted at opposite sides of the base frame 1. Rods 16 and 16' are pivotally connected at their tops to the arms 14 and 14' respectively, and these rods have their other ends pivotally connected to the crosshead 17 which is slidably mounted on the vertical guides 18. The crosshead 17 is carried on a piston rod 19, movement of which is produced by the hydraulic cylinder 20. Thus upward movement of the piston rod and crosshead 17 produces a scissors-like movement of the arms 14, 14'.

A novel and very important feature in my invention resides in the shape and manner of operation of these pairs of lifting arms 14, 14'. The arms are formed with identical bent-end portions and the shape of the arms is such that, regardless of the diameter of the log, the con-

tact of the bent-end portions with the opposite sides of the log will always occur when the longitudinal axis of the log coincides with the common axes of the spindles 7 and 11 at the ends of the log, and will not occur otherwise. The log is carried into the machine on suitable transfer chains, such as the transfer chain indicated at 21 in Figure 2. The pairs of lifting arms are then operated to raise the log from the transfer chains into central position and into axial alignment with the spindles 7 and 11. Due to the shape of the lifting arms 14, 14' the log will be properly centered regardless of its diameter, without any special skill on the part of the operator without any loss of time. In Figure 2 a log 13 of large diameter is shown raised into position by the arms 14, 14'. The broken lines in this figure also illustrate how a log 13' of greatly reduced diameter would similarly be centered in the same manner.

When the log is raised into the central, axially-aligned position, as previously described, the slidable support 9 (Figure 1) is moved towards the log by means of the hydraulic cylinder 12, forcing the spur end of the spindle 11 against the log and forcing the log end-wise into engagement with the spur end of the spindle 7. When the log is thus firmly engaged by the spindle spurs at each end, the pairs of arms 14, 14' are lowered, permitting the log to be rotated with the spindles.

In Figures 1 and 2 the log-lifting arms 14 and 14' are shown hinged to brackets 15 which are rigidly attached to the base frame 1. In Figures 5 and 6 I show an improved means for supporting the log-lifting arms and associated elements. In the modified construction illustrated in these figures the log-lifting arms 66 and 66' are similarly hinged to brackets 65 for up and down movement, but each pair of brackets 65 is mounted on a rigid inner frame 63 which is pivoted transversely to the base frame 1 of the machine by a hinge 64 at each side. In this construction the hydraulic cylinder 20, the vertical guides 18 for the crosshead 17, and side braces 67 are all rigidly connected to this inner, pivotally-mounted frame 63. Each pair of log-lifting arms, with the hydraulically-operable lifting means, constitutes a sort of pendulum log support, permitting axial or end-wise movement of the log between the spur centers at each end of the log. If the outer bark surface of the log is unusually rough, considerable resistance would be offered to any slight sliding of the log end-wise on the arms 14, 14' of Figures 1 and 2 when forcing the log into engagement with the spur end of the forward spindle 7. With the pendulum loading supports illustrated in Figures 5 and 6 it is not necessary to slide the log end-wise on the supporting arms, but the end-wise adjustment of the log into position can be brought about with a slight tilting of these supporters or loaders.

The actual debarking means is supported from a carriage 22, the carriage being slidably mounted on the top frame 2. The debarking means includes a debarking or bark-peeling water nozzle 23, a circular saw 45 (see Figures 3 and 4), a revolving wire brush 46, and a rotary knot-cutter 52. The nozzle 23 consists of a reversely-curved pipe so flattened at its outlet as to direct a flat jet of water at high velocity against the bark of the log in such manner as to produce a peeling action. The nozzle 23 is secured to a pipe section 27 which in turn is joined by a swivel connection

29 to a supply pipe 28. The supply pipe 28 is supported in a bracket 30 (Figure 4) depending from the carriage 22, and the end of the pivotal pipe connection 27 is rotatably supported in a similar bracket 31 depending from the carriage. The pivotal connection 29 makes possible the swinging of the nozzle in an arc about the supply pipe 28 in order to accommodate the nozzle to logs of various diameters, and the fact that the pivotal connection is located at the opposite side of the log from that at which the water jet is delivered enables a fairly constant distance to be maintained between the tip of the nozzle and the bark to be peeled, regardless of the size of the log.

The positioning of the nozzle 23 up or down with respect to the supporting carriage 22 (Figure 3) is controlled by means of a hydraulic cylinder 32 rigidly mounted on the carriage 22. A lever arm 33, firmly secured to the end of the swivel pipe section 27, is connected by means of a link 34 to the end of a piston rod 35 of the hydraulic cylinder 32. The piston rod 35 has a support 36 at its outer end which slides on a horizontal track 37 mounted on the carriage 22.

The operation of the hydraulic cylinder 32 is in turn controlled by any suitable valve element, such as that illustrated in Figure 3. A flexible hose 38 delivers water under pressure to the valve housing 39 and the water may be permitted to pass to the hydraulic cylinder 32 through pipe 40 or pipe 41 depending upon the position of the slide valve 42. The slide valve 42 is manually operated by any suitable means (not shown).

A bearing 43, mounted on the nozzle 23, supports a rotatably-mounted shaft 44. A circular saw 45 is secured to the forward end of this shaft, and a rotary wire brush 46 is secured to the other end. A water wheel 47, such as a Pelton water wheel, is also securely mounted on the shaft 44 and is driven by a jet of water delivered from a nozzle 48 at the end of a branch pipe 49 connected to the main nozzle 23.

A frame 50, supporting the knot-cutting means, is pivotally-mounted on the nozzle 23 as shown in Figure 3. The bottom of the frame 50 has a curved surface portion 51 which normally rides on the outer surface of the bark of the log. The knot-cutter 52 is carried at the bottom end of a shaft which is mounted in a bearing housing 53 constituting part of the frame 50. A Pelton water wheel 54 is secured at the top of this knot-cutter shaft. A jet of water is delivered from a suitable nozzle 55, (Figure 4) on the end of a branch pipe 56, and drives the water wheel 54 and therewith the knot-cutter 52. The pipe 56 is joined by a flexible hose 57 to a connection with the main nozzle 23. The flexible hose connection 57 permits a slight movement of the frame 50 with respect to the main nozzle 23.

From Figure 3 it will be noted that the knot cutter 52 is so placed with respect to the curved bottom surface or shoe 51 of the pivotally-mounted frame 50 that, as this portion of the frame rests on and rides over the outer bark surface of the log, the knot cutter will always be held at a desired position slightly spaced from the log so as to cut off knots without engaging any other portion of the log surface. The discharging end of the tip of the main nozzle 23 will also be kept spaced from the log by means of the spring 58 carried on the threaded rod 59, the rod 59 being connected to an arm 60 keyed to the pivoting shaft 61 of the knot cutter frame 50 and the rod 59 slidably extending through a

post 62 rigidly mounted on the main nozzle 23. The spring 58 also permits absorption of a considerable amount of the vibration which would otherwise be imposed upon the main nozzle 23 by the riding of the bottom surface or shoe 51 over the irregular outer surface of the log.

The carriage 22 (Figure 1) is connected to the ends of a sprocket chain 63 which passes over a sprocket wheel 64 which is connected by suitable gearing to a shaft 65, the shaft in turn being connected with and driven from the spindle 7 so that rotation of the spindle 7, and therewith rotation of the log, will cause the carriage to move towards the forward end of the machine or from left to right as viewed in Figure 1 at a predetermined ratio with respect to the rotation of the log. Thus the sprocket and gears of this connecting means are so arranged that with each rotation of the log the carriage 22 will be moved ahead a distance equal to the width of the jet or discharging end of the nozzle 23. A magnetic clutch, indicated at 67 in Figure 1, is preferably interposed in this carriage-moving mechanism so that the carriage 22 may be engaged or disengaged at will by the machine operator while the log is being rotated. An additional electric motor 66 is also preferably included in this carriage-moving means to be used for the purpose of retracting the carriage at high speed to its starting point or to any point desired by the operator. The mechanism for rotating the log should also preferably be one which permits variable speeds so that the operator may have the log rotated at relatively high speed when the bark is easy to remove and at lower speed when the bark is harder to remove.

The operation of my machine briefly is as follows:

The log is first brought into the machine by transfer chains, or other suitable means, and raised into position in alinement with the spindle spurs in the manner previously described. As the log is rotated the carriage, bearing the rotating knoter, rotating saw, peeling nozzle and rotating brush, is moved along longitudinally of the log, the nozzle first having been lowered or raised to the proper position depending upon the size of the log. The hydraulic means for raising or lowering the main nozzle serves not only to place the debarking means in proper position, depending upon the size of the log, but also serves as a buffer or stabilizer against too violent reactions of the spring means attached to the knoter frame, should the log be unusually rough on its outer surface. As the carriage moves along the rotating log, the knoter first removes protruding knot portions. Then the saw follows, making a helical kerf. This kerf reduces the bark to short longitudinal sections and destroys any stringiness it may at times possess to hinder the peeling operation of the jet from the main nozzle. The main nozzle jet lifts the bark and peels it from the body of the log. Finally the brush removes any films of inner bark which may remain on the log after the peeling.

It would of course be possible to make variations in the individual members of my machine without departing from the principle of my invention. It might be desirable under some circumstances to use more than one debarking nozzle, and, for instance, to have a second nozzle sending a jet against the surface over which the first nozzle has passed. It is not my intention to limit my invention otherwise than as set forth in the claims.

I claim:

1. In a log-barking machine of the character described, a debarking nozzle, means for positioning said nozzle, a circular bark-cutting saw mounted on said nozzle, hydraulic means for rotating said saw, a rotary knoter, hydraulic means associated with said nozzle for operating said knoter, a frame pivotally-mounted on said nozzle for supporting said knoter, said frame adapted to rest on the log and to keep said knoter from too close contact with the log, spring means connecting said frame and said nozzle, whereby said frame will also prevent inadvertent contact of said nozzle with the log.

2. In a log-barking machine, a carriage movable parallel to the log, means for rotating the log, a debarking nozzle supported from said carriage and adapted to have its discharging end directed against the log transversely, said nozzle connected to a supply of water under pressure, a circular saw supported from said carriage, said saw located slightly ahead of said nozzle in the direction of travel of said carriage, the axis of said saw being substantially parallel to the log axis, means for rotating said saw, said saw and nozzle so arranged that, as said carriage moves along the log while said log is rotated, said saw will cut a helical kerf through the bark on the log and enable the stream from said nozzle to lift the bark from the log in the form of a strip bordered by said kerf.

3. In a log-barking machine, a carriage movable parallel to the log, a debarking nozzle pivotally supported from said carriage, water under pressure supplied to said nozzle, a circular saw mounted for rotation on said nozzle, fluid pressure means for rotating said saw, fluid pressure means mounted on said carriage for positioning said nozzle and saw, said saw and nozzle and positioning means so arranged that, as said carriage moves along the log, said saw will cut a kerf through the bark on the log to enable the stream from said nozzle to lift the bark from the log in the form of a strip bordered by said kerf.

4. In a log-barking machine, a carriage movable parallel to the log, means for rotating the log, a debarking nozzle adjustably supported from said carriage and adapted to have its discharging end directed against the log transversely, said nozzle connected to a supply of water under pressure, a circular saw supported from said carriage, said saw located slightly ahead of said nozzle in the direction of travel of said carriage, the axis of said saw being substantially parallel to the log axis, means for rotating said saw, fluid pressure means mounted on said carriage for positioning said nozzle and saw, said saw and nozzle so arranged that, as said carriage moves along the log while said log is rotated, said saw will cut a kerf through the bark on the log transversely to enable the stream from said nozzle to lift the bark from the log in the form of a strip bordered by said kerf.

5. In a log-barking machine, a debarking nozzle, fluid pressure means for positioning said nozzle, said nozzle connected to a source of water under pressure, a circular saw mounted for rotation on said nozzle, a rotary knoter mounted on said nozzle and located ahead of said saw, means for rotating said saw and knoter, said knoter, saw and nozzle so arranged that said knoter will remove knots from the bark surface and said saw will follow said knoter to cut a kerf through the bark and said nozzle will follow said saw to en-

able the stream from said nozzle to lift the strip of bark severed by said kerf.

6. In a log-barking machine, a debarking nozzle discharging a stream of water under pressure, a circular saw mounted for rotation on said nozzle, a rotary knoter mounted on said nozzle and located ahead of said saw, a rotary brush mounted on said nozzle and located on the other side of said nozzle from said saw, fluid pressure means for rotating said saw and knoter and brush, said brush, knoter, saw and nozzle so arranged that said knoter will remove knots from the bark surface and said saw will follow said knoter to cut a kerf through the bark, said nozzle will follow said saw to enable the stream from said nozzle to lift the strip of bark severed by said kerf and said brush will follow said nozzle to remove any bark fragments remaining on the log after the lifting of the bark strip.

7. In a log-barking machine, a debarking nozzle,

means for positioning said nozzle, a circular bark-cutting saw mounted on said nozzle, a rotary knoter, a frame pivotally-mounted on said nozzle for supporting said knoter, said frame adapted to rest on the log and to keep said knoter from too close contact with the log, spring means connecting said frame and said nozzle, whereby said frame will also prevent inadvertent contact of said nozzle with the log, and means for rotating said saw and said knoter.

8. In a log-barking machine, a de-barking nozzle, hydraulic means for positioning said nozzle, a circular bark-cutting saw mounted on said nozzle, hydraulic means for rotating said saw, a rotary knoter, hydraulic means for operating said knoter, a frame supporting said knoter, said frame pivoted on said nozzle, said frame adapted to rest on the log and to keep said knoter from too close contact with the log.

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