Jan. 24, 1961 L. R. FOREMAN 2,969,190

DEBARKING NOZZLE

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Fig. 1.

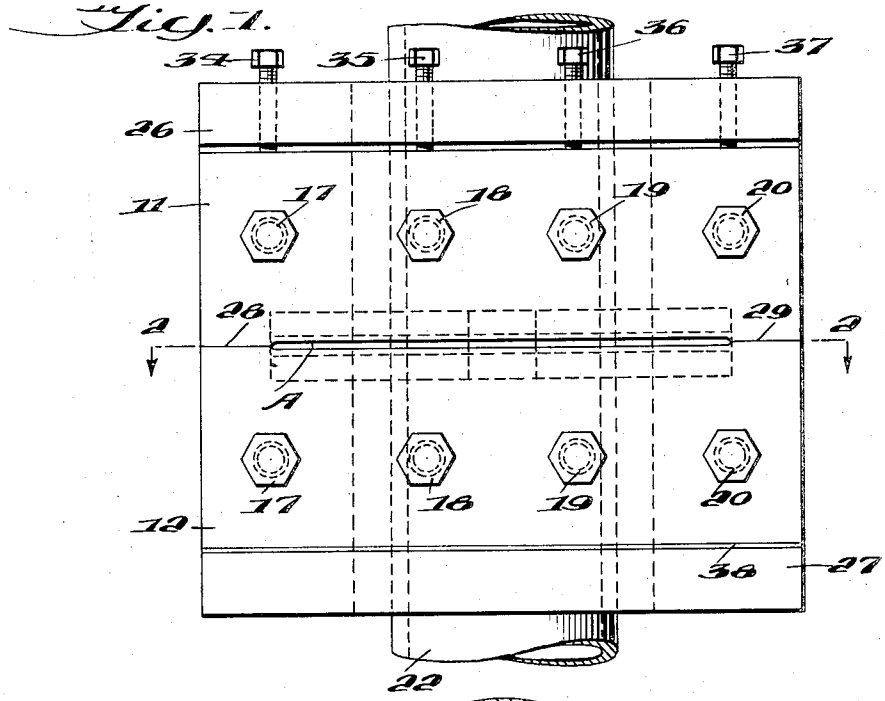


Fig. 2.

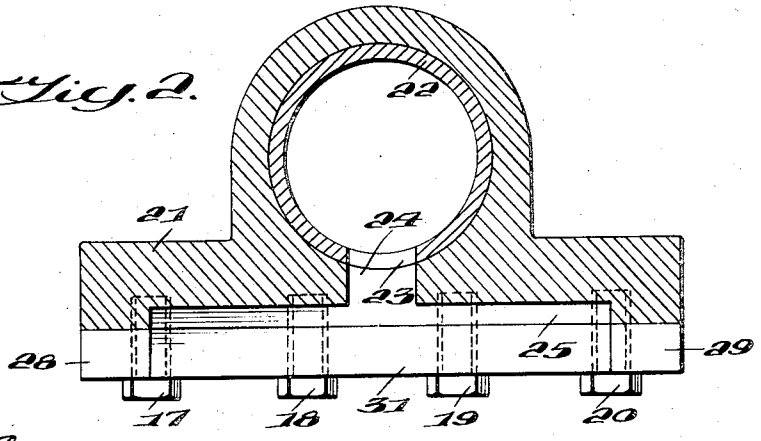
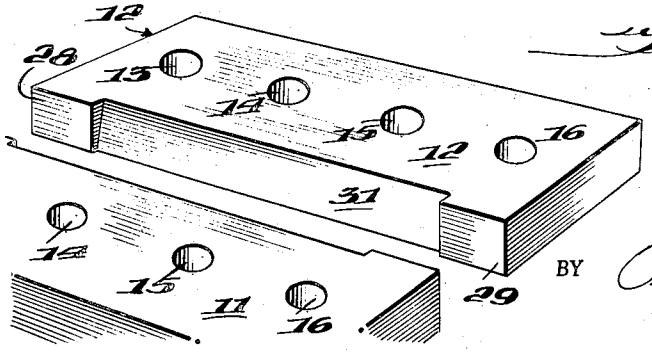


Fig. 3.



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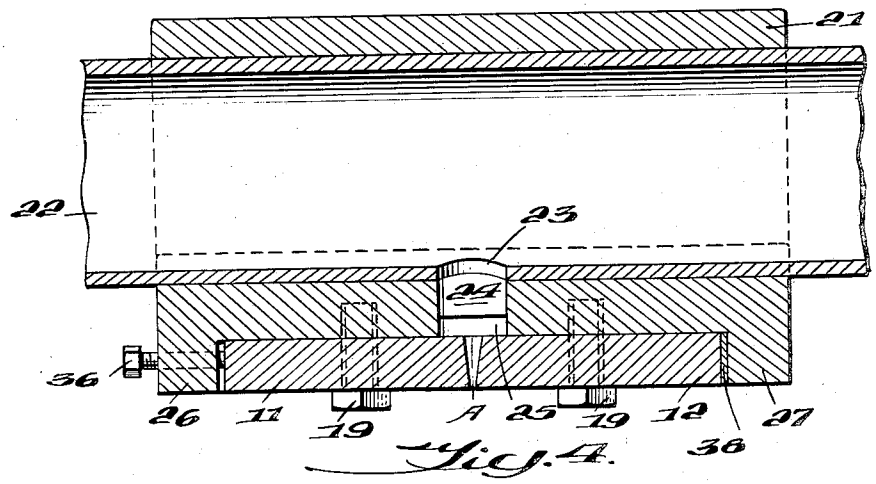

Fig. 4.

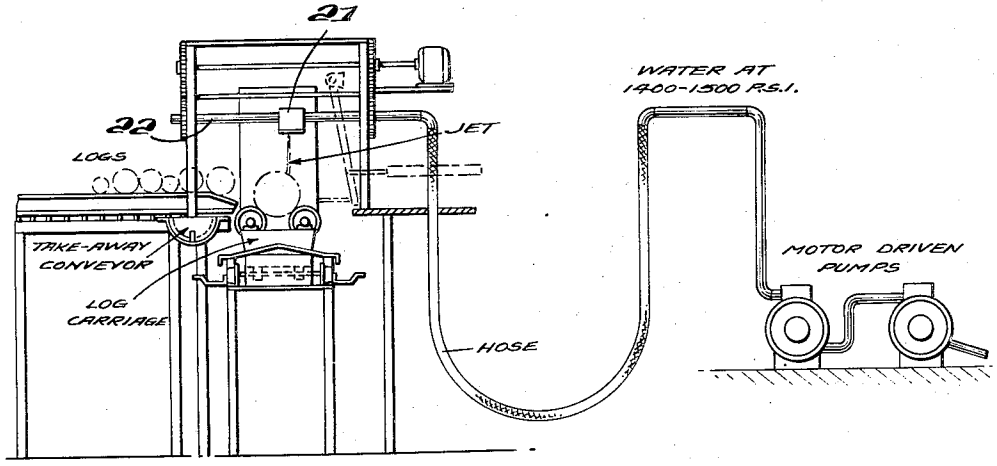

Fig. 6.

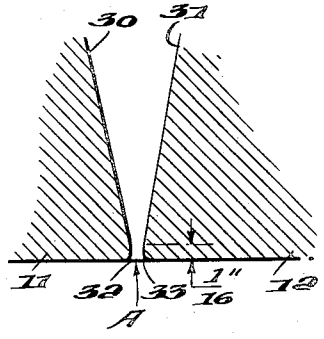

Fig. 5.

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2,969,190

DEBARKING NOZZLE

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3 Claims. (Cl. 239—597)

This invention relates to nozzles for projecting high pressure water jets of controlled form and dimensions against logs to remove and fragmentize the bark and phloem adhering thereto, so that the logs are stripped clean and are ready for immediate sawing into lumber without further processing.

This application is a continuation-in-part of my abandoned application Serial No. 644,128 filed March 5, 1957, which was a continuation-in-part of my application Serial No. 572,572 filed March 19, 1956, now patent No. 2,800,155 issued July 23, 1957.

In accordance with the disclosure of said patent, a stationary water jet under high pressure (1400 p.s.i.) is directed vertically downwardly against a log which is supported horizontally on a traveling carriage which reciprocates under the jet, the carriage having sets of corrugated wheels which are rotated to turn the log on its longitudinal axis as the carriage travels beneath the jet. The jet rips the bark off the log by a sort of spiral chiseling action, and disintegrates the bark. The debarked and cleaned log is thrown off the carriage and conveyed immediately to the sawing station. The jet of water must not only have the proper shape and necessary energy: it must strike the log at the right spot and at the correct angle to perform its work efficiently; hence to adjust its position to logs of various diameters, the operator, before debarking begins, moves the jet both verticaly and laterally, if necessary, relative to the log. This adjustment of the jet is claimed in the patent referred to.

Objects of my invention are to provide a nozzle of the character indicated which will project a flat fan-shaped jet of water under high pressure (1400–1500 p.s.i.) against the log to have the chiseling action referred to above; to provide a nozzle which will give long service when subjected to high pressure; to provide a nozzle whose water jet may have any desired length (the dimension lengthwise of the log), being limited only by the water pressure that is available; and to provide a nozzle which when worn by erosion to the extent that it is no longer efficient, may be readily serviced by a simple machining operation to restore its initial efficiency. Another object is to provide a nozzle which is inexpensive to manufacture and easy to assemble and disassemble. A further object is to provide a nozzle which will confine the high pressure water to the nozzle channel without packing yet with no leakage, hence no loss of power or water. Other objects will be understood from the following description of the preferred embodiment of the invention which has been in successful commercial operation.

In the accompanying drawings forming a part of this specification,

Fig. 1 is a bottom plan view of the nozzle, the jet aperture of which is shown exaggerated in width to make it visible on the scale of the drawing, showing also a portion of the header for supplying water under high pressure to the nozzle;

Fig. 2 is a vertical cross section on line 2—2 of Fig. 1;

Fig. 3 is a perspective view of one of the nozzle blocks shown separated from the complementary nozzle block, only part of which is illustrated;

Fig. 4 is a vertical section through the central zone of the nozzle shown in Figure 2;

Fig. 5 is a detail in vertical cross section, on an enlarged scale, showing the shape of the walls of the jet aperture, whose width is exaggerated for clearness; and

Fig. 6 is a diagrammatic elevation showing the debarking machine of my Patent No. 2,800,155 but showing the nozzle in approximately the correct position for debarking a log.

The nozzle of my invention employs two massive alloy steel blocks each preferably about 16 in. long, 4 in. wide and 2 in. thick, so shaped that when laid together their abutted edges provide a jet aperture $\frac{1}{25}$ in. wide and 11 in. long, or longer if desired. To provide the necessary volume of water at a pressure of 1400–1500 p.s.i., I use two motor-driven booster pumps in tandem, requiring 800 H.P., the general arrangement being shown in Fig. 6 and more fully in my patent referred to above. A jet of this shape and power will tear or split the logs if they are not properly moved during the debarking operation.

Referring to Figs. 1–4, two nozzle blocks **11** and **12** are shown, but as they are substantially identical, being mirror images of each other, a detailed description of one will suffice for both. Block **11** has four bolt holes **13, 14, 15** and **16** extending through it from top to bottom, each bolt hole being preferably $1\frac{3}{8}$ in. in diameter. Through these holes four $1\frac{1}{4}$ in. studs **17, 18, 19** and **20** respectively are passed to secure the heavy blocks rigidly but adjustably upon a massive nozzle body **21**, which is rigidly mounted as by welding upon a header **22** connected to the high pressure water supply mentioned above. Header **22** has a port **23** on its underside, and body **21** has an inlet port **24** registering with the header port **23**. A delivery chamber **25** is formed in body **21** and receives the discharge of port **24** and has the same length as the aperture A from which the jet issues. Body **21** further has a pair of integral downwardly extending flanges **26, 27** between which the nozzle blocks **11, 12** are positioned when bolted to the body **21**.

The nozzle blocks are in direct contact with each other only at their abutted surfaces **28, 29**, which are rectangular plane finished surfaces located at the opposite ends of each block, and extending vertically when the blocks are in place. As shown in Figs. 1 and 3, the aperture A extends between abutted surfaces **28, 29** and is straight throughout its length. Sloping or beveled surfaces **30, 31** are provided on the facing edges of blocks **11, 12** respectively, and the two opposed surfaces **30, 31** together provide a narrowing passageway for flow of water from the delivery chamber **25** to aperture A. The aperture is formed principally by two opposed vertically curvilinear surfaces **32, 33** on blocks **11, 12** respectively. The narrowest part of the aperture is spaced about $\frac{1}{16}$ in. in from the lower faces of the blocks, as Fig. 5 illustrates. This narrowest part is $\frac{1}{25}$ in. wide at the start of an operation.

When erosion from the high pressure water has worn away the walls **32, 33** to the extent that aperture A has a width of $\frac{1}{18}$ in., the efficiency of the jet is so diminished that usually the nozzle will be removed for reconditioning. According to my invention as claimed in divisional application Serial No. 834,869 filed August 19, 1959, reconditioning is accomplished in a unique manner by grinding the surfaces **29, 30** of both blocks and also the aperture walls **32, 33** sufficiently to restore the original $\frac{1}{25}$ in. width of the aperture at its narrowest point. A plurality of adjustment screws **34—37** are tapped through

flange 26 and bear at their inner ends against block 11, thrusting it against block 12 with sufficient force to substantially seal the contacting plane surfaces 28, 29, no packing being used. Even after many reconditioning operations, the adjustment screws 34—37 will hold the reground nozzle blocks together in sealed relation, without packing. Shims 38 (Fig. 4) may be used with screws 34—37 if desired, being inserted between flange 27 and block 12, to position the aperture centrally relative to the delivery chamber 25. The bolt holes 13—16, being larger than the studs 17—20, permit some relative movement of the blocks for adjustment of their positions; or the bolt holes may be elongated for a wider latitude of adjustment.

In a commercial installation, one of the described nozzles with an eleven inch jet at about 1400 p.s.i. (average) has debarked yellow pine logs, many of which were as small as 8 in. to 12 in. in diameter, to yield an average of 12,000 board feet of lumber per hour. The bark is not only cut off the log by the chiseling action of the flat jet: it is lifted and tossed many feet and fragmentized, so that it may be conveyed immediately to a furnace or boiler. Also the powerful jet cleans the bark and the log, flushing away all dirt, grit or stones embedded in the bark and yielding a clean log which is safely delivered to the saw. Other debarking jets sometimes drive the grit into the bark and surface of the log, and also excessively wet the bark, which my jet cannot do because of the very short period of time the water is in contact with the bark. The nozzle of my invention can be removed when worn by erosion and replaced by a new or serviced nozzle within 20 to 25 minutes, which is a great advantage for a busy mill. A further and most important advantage of my installation is that it delivers substantially full pump pressure at the point of discharge (the nozzle aperture). This is not true of other debarking installations known to me.

I am well aware of such patents as No. 532,085 to Murray and Welch, dated Jan. 8, 1895, on a Die or Mold for Making Clay Shingles; No. 2,019,119 to Crane and Fields, dated Oct. 29, 1935, on Extrusion Apparatus (for cellulose derivatives or similar plastics); and No. 2,061,042 to Parkhurst dated Nov. 17, 1936, on a Machine for Extruding Plastic Materials (such as cellulose esters). Not one of these patented machines could possibly be used as a nozzle for debarking logs, nor could the hereindescribed nozzle be used for making the clay and plastics extrusions mentioned in the patent specifications. I therefore believe I am fairly entitled to the subjoined claims and solicit a patent containing the same on the basis of the foregoing specification; it being understood that the specification discloses merely one of a number of constructions which may be comprehended within the scope of said claims.

What I claim is:

1. A hydraulic nozzle for debarking logs adapted to be used with water supplied under pressures of 1400–1500 pounds per square inch comprising a massive body having an inlet port adapted to be coupled to the water supply and a delivery chamber formed therein to receive all the water from the inlet port; a pair of heavy metal nozzle blocks abutted against each other and sealed at their abutted surfaces; means rigidly fixing said nozzle blocks upon said body; said nozzle blocks having opposed elongated surfaces together providing the principal walls of a water-discharging aperture which receives the high pressure water directly from said delivery chamber; said aperture having a width at its narrowest point of between about $\frac{1}{25}$ in. and about $\frac{1}{18}$ in. and said narrowest part of the aperture being spaced about $\frac{1}{16}$ in. in from the lower faces of the blocks, the aperture below said narrowest part being bounded by curvilinear and separating surfaces on the two blocks, said aperture being straight throughout its length and forming a flat fan-shaped jet of water capable of acting as a chisel to remove the bark and phloem and disintegrate the same.

2. The invention defined in claim 1, wherein the nozzle blocks are each further provided with a sloping surface extending from the inner surface of the block to the aperture surface formed thereon, the two sloping surfaces together providing two opposed walls of a constantly narrowing passageway leading from said delivery chamber to said aperture.

3. The invention defined in claim 1 wherein the nozzle body has two integral parallel depending flanges between which the nozzle blocks lie when secured to the nozzle body; adjustment screws being tapped through one of said flanges and bearing at their inner ends against the adjacent nozzle block and thrusting it against the other nozzle block, the other nozzle block transmitting said thrust to the other flange; the bolt holes being sufficiently large to permit a lateral positioning of the nozzle blocks between the two flanges.

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