

Dec. 4, 1923.

1,476,032

G. AICHER ET AL

APPARATUS FOR DEFIBERIZING WOOD

Filed May 7, 1923

3 Sheets-Sheet 1

Fig. 1.

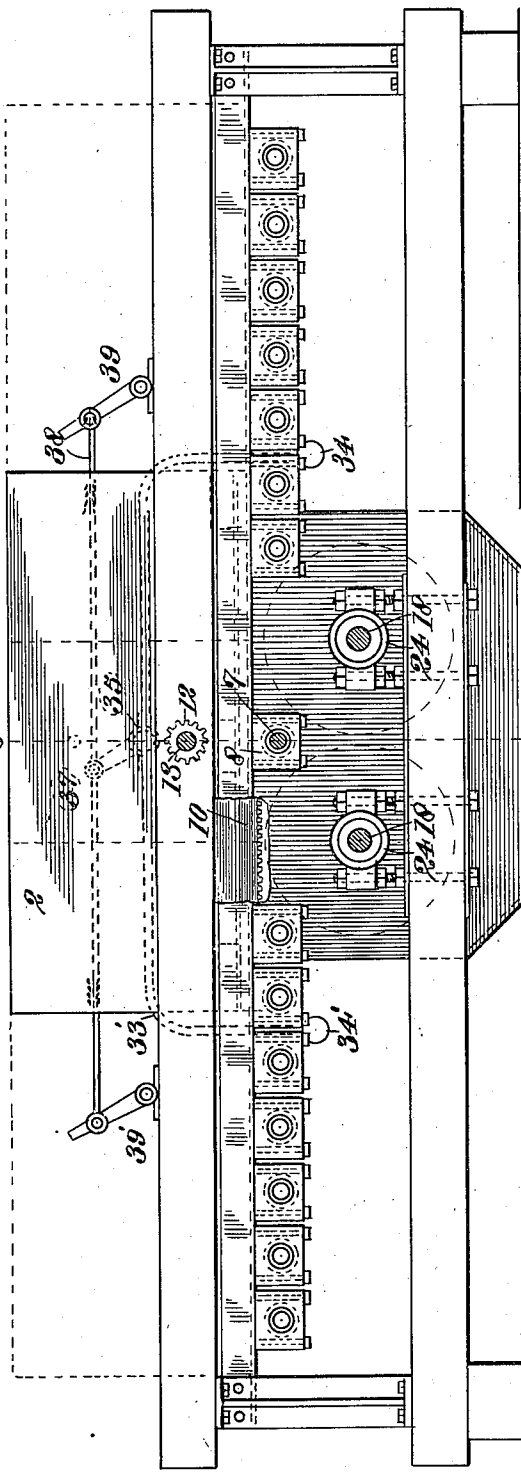
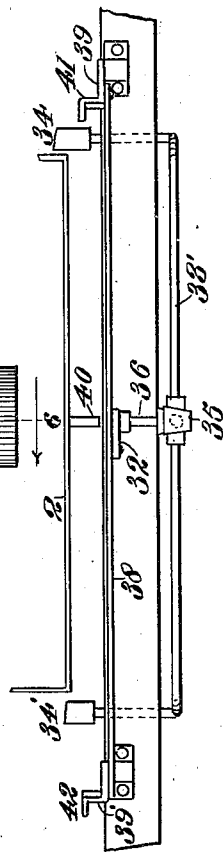


Fig. 2.



Inventors.
Gustav Aicher
U.S.McMillan
By Aicher & McMillan
Thurs Attorneys.

Dec. 4, 1923.

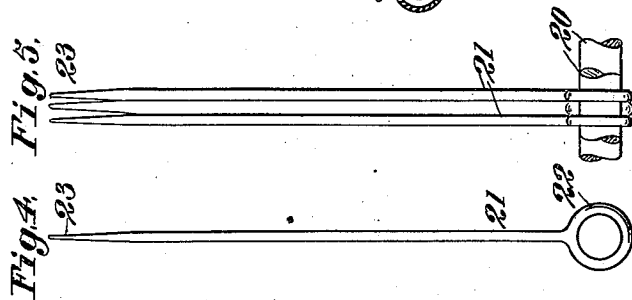
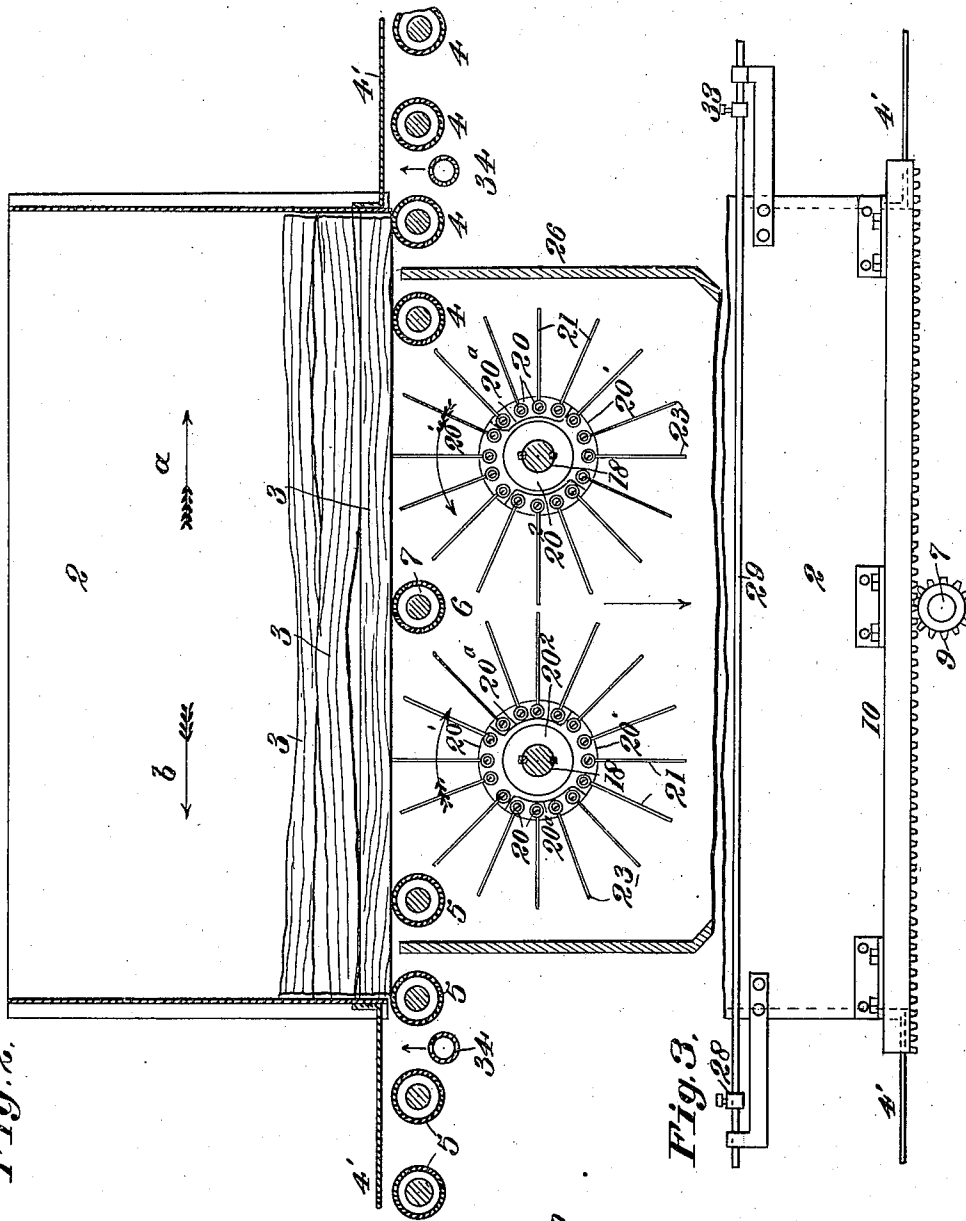
1,476,032

G. AICHER ET AL

APPARATUS FOR DEFIBERIZING WOOD

Filed May 7, 1923

3 Sheets-Sheet 2,



Inventors.
Gustav Dicker
U.S.M^c Millan

By Arker & Jester
their attorneys.

Dec. 4, 1923.

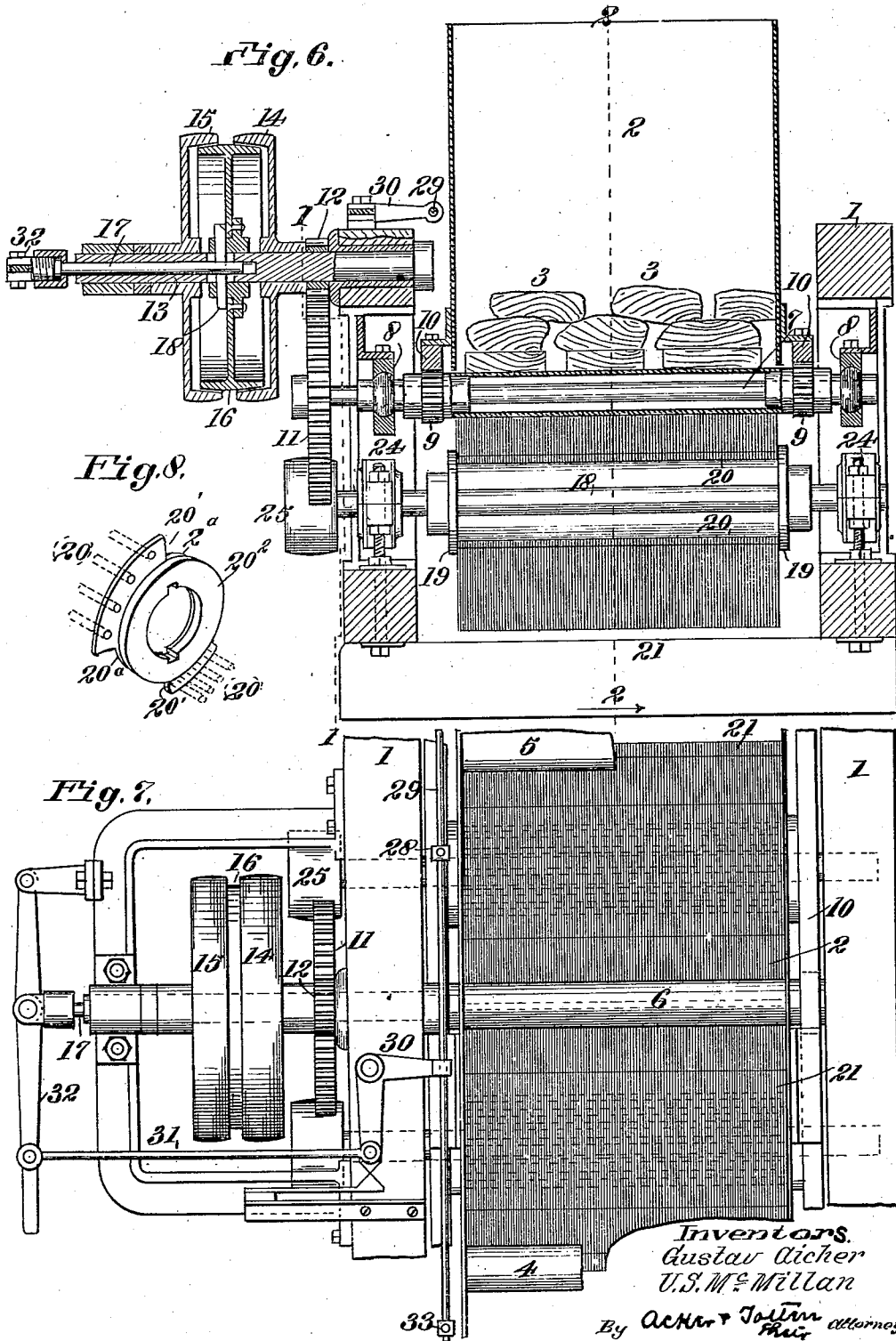
1,476,032

G. AICHER ET AL

APPARATUS FOR DEFIBERIZING WOOD

Filed May 7, 1923

3 Sheets-Sheet 3



UNITED STATES PATENT OFFICE.

GUSTAV AICHER AND UEL S. McMILLAN, OF SAN FRANCISCO, CALIFORNIA, ASSIGNORS
TO McMILLAN PROCESS COMPANY, OF SAN FRANCISCO, CALIFORNIA, A CORPORATION OF NEVADA.

APPARATUS FOR DEFIBERIZING WOOD.

Application filed May 7, 1923. Serial No. 637,589.

To all whom it may concern:

Be it known that we, GUSTAV AICHER and UEL S. McMILLAN, citizens of the United States, residing at city and county of San Francisco and State of California, have invented certain new and useful Improvements in Apparatus for Defiberizing Wood, of which the following is a specification.

The hereinafter described invention comprises an apparatus for the defiberization of wood in such a manner that the fiber is removed from the solid wood in line with the length of the same, the fibers recovered from the defiberization of the solid wood being for use in connection with the industrial arts generally, and the invention relates more particularly to an improvement in the apparatus set forth and described in United States Letters Patent #1,344,180 granted Uel S. McMillan under date of June 22, 1920; the objects of the invention being the production of an apparatus capable of defiberizing solid wood in large tonnage quantity per day, to provide an efficient, economical and practical apparatus for the carrying out of the work of defiberizing solid wood and to produce an apparatus capable of successfully defiberizing solid wood of any character and in line with the length of the fiber thereof.

To comprehend the invention, reference should be had to the accompanying sheets of drawings, wherein—

Figure 1 is a side view in elevation of the apparatus with certain parts thereof removed.

Fig. 2 is a longitudinal sectional view taken on the line 2—2, Fig. 6 of the drawings.

Fig. 3 is a broken detailed side elevation of the hopper for the wood to be defiberized, illustrating the means for imparting longitudinal reciprocating motion thereto.

Fig. 4 is a detailed view of one of the combing teeth of one of the defiberizing elements of the apparatus.

Fig. 5 is a similar view illustrating the relative arrangement of a plurality of the combing teeth of the defiberizing elements.

Fig. 6 is a cross sectional elevation taken on the line 6—6, Fig. 1 of the drawings, illustrating the drive mechanism for imparting reciprocating motion to the hopper for the wood to be defiberized, and the arrange-

ment of the defiberizing elements relative to said hopper.

Fig. 7 is a broken plan view of the apparatus.

Fig. 8 is an end view of one of the spools of the defiberizing elements with the combing teeth applied thereto and illustrating the radial disposition which they assume when the spool is in rotation.

Fig. 9 is a broken plan view disclosing the hopper for the wood to be defiberized, the trip means for controlling the spray of water or steam onto the under surface of the wood during the longitudinal reciprocating movement of the hopper.

In the drawings, the numeral 1 is used to designate a suitably constructed frame structure above which is mounted for longitudinal reciprocating movement an open-bottomed hopper 2, preferably composed of metal and adapted to receive slabs or layers 3 of wood to be defiberized, which slabs are arranged within the hopper length-wise thereof and delivered thereto in any suitable manner. Within the frame structure 1 is arranged a plurality of separated series of transversely disposed idler rollers 4 and 5, which are adapted to support or uphold the hopper 2 and the arrangement of the foremost roller of each of the series 4 and 5 is so disposed as to support in conjunction with an intermediate idler roller 6 the slabs 3 of wood contained within the hopper 2, the arrangement of the said supporting rollers being clearly shown by Fig. 2 of the drawings. The idler roller 6 is mounted upon a transversely disposed driven shaft 7, which works in bearing boxes 8 secured to the frame structure 1 and has mounted thereon the rack pinions 9 which mesh with the rack plates 10 secured to and carried at each side of the hopper 2, Fig. 6 of the drawings, and it is these rack pinions 9 which impart longitudinal reciprocating movement to the said hopper 10 depending upon the direction of rotation imparted to the driven shaft 7. To one end of the said shaft 7 is secured a master gear 11, which meshes with a pinion 12 secured to a driven shaft 13 and upon the shaft 13 is mounted the pulley drums 14 and 15 within which works the friction clutch pulley 16 feathered to the shaft 13. Through the shaft 13 is extended a shift rod 17 to which the clutch pulley 16 is united by a

key 18. It will be understood that the pulley drums 14 and 15 are independently driven by drive belts not shown, which are adapted to impart reverse rotation to the respective pulley drums. It is through the medium of the clutch pulley 16 that the rotation of the drums 14 and 15 respectively is transmitted to the master gear 11 through the medium of the gear 12 for imparting reverse rotation to the shaft 7 for alternately varying the longitudinal reciprocating motion of the hopper 2, the reverse rotation of the shaft 12 being controlled by means hereinafter set forth.

Below the hopper 2 and mounted within the frame structure 1 is arranged a plurality of rotary means for the defiberization of the wood contained within the hopper 2, which means have opposite rotary motion imparted thereto. Each defiberizing means comprises a spool formed of a transversely disposed shaft 18 having secured thereto the spaced collars 19, united one to the other by a series of circumferentially disposed tie rods 20. On each tie rod is mounted in longitudinal alignment for free swinging movement a series of radially disposed combing teeth 21, the arrangement of the combing teeth on the respective tie rods 20 being such that one row of combing teeth stand in staggered relation relative to an adjacent row of teeth, each tooth 21 being formed with an eye 22 through which is adapted to be passed the tie rods 20 in the assembling of the spool structure for the defiberizing means and each tooth terminates in a pointed end 23 and it is these pointed or sharpened ends of the combing teeth 21 which during the rotary movement of the defiberizing element is brought into physical contact with the under surface to be defiberized of the wood contained within the hopper 2. The shaft 18 of each defiberizing element works within bearing boxes 24 secured to the frame structure 1 and to one end of each shaft is secured a belt pulley 25, over which pulleys work drive belts not shown for imparting opposite rotation to the respective defiberizing elements and the drive mechanism for the said belts which preferably is in the form of an electric motor is of such a character as to impart high rotative speed to said defiberizing elements and which preferably are driven at the rate of 2500 revolutions per minute.

The defiberizing elements rotate intermediate the idler roller 6 and the innermost rollers 4 and 5 of the respective series of idler supporting rollers and the said defiberizing elements work within an enclosing housing 26, which is provided with a discharge outlet 27. It is into this housing 26 that the fibers of the wood, as the slabs 3 contained within the hopper 2 are defiberized, fall and are discharged from within the

hopper 26 through the outlet 27 and are carried therefrom to a suitable place of deposit in any desired manner.

Assuming the hopper 2 to be supplied with slabs 3 to be defiberized and arranged therein lengthwise of the said hopper 2 and power applied to the pulley drum 14 and the clutch drum 16 in frictional engagement therewith, then the movement of the hopper 2 will be in the direction of the arrow *a*, Fig. 2 of the drawings and will continue in this line of travel until the tappet 28 secured to a longitudinally disposed rod 29 carried by the hopper 2 engages with the bell crank lever 30, Fig. 7 of the drawings, which engagement of the tappet cam 28 therewith throws the bell crank lever to actuate the connecting rod or link 31 to throw the fulcrum lever 32 outwardly, which carries therewith the shift rod 17 and throws the clutch pulley 16 out of frictional engagement with the pulley drum 14 and places the same into frictional engagement with the pulley drum 15, so that the rotation of the said pulley drum 15 is transmitted to the shaft 7 and reverse rotation imparted thereto, which movement through the action of the rack pinions 9 causes a reverse movement to be given to the hopper 2, causing the same to move in the direction of the arrow *b*, Fig. 2 of the drawings, which line of travel of the said hopper is continued until the tappet 33 secured to the rod 29, in spaced relation relative to the tappet 28, is brought into contact with the bell crank lever 30 and actuates the same to draw inwardly the rod 31 and throw the fulcrum lever 32 to actuate the shift rod 17 to throw the clutch drum 16 out of frictional engagement with the belt pulley 15 and into frictional engagement with the belt pulley 14, for imparting through the described mechanism a reverse line of movement or travel to the hopper 2.

It will thus be seen that at predetermined moments the direction of the longitudinal movement of the hopper 2 is varied, so that reciprocating longitudinal movement is imparted to the said hopper throughout the working moments of the apparatus.

Inasmuch as the hopper 2 is an open-bottomed one, it is apparent that the slabs of wood 3 contained therein have the under surface thereof exposed to the action of the combing teeth of the defiberizing elements and during the reciprocating movement of the said hopper the said defiberizing elements driven at a high rate of speed engage with the under surface of the wood and defiberize the same through the medium of the pointed ends of the combing teeth 21 in line with the length of the fibers of the wood and the fibers are removed in line with the length thereof owing to the yielding combing action which takes place through the medium of the defiberizing elements and

the further yielding action which takes place by reason of the fact that the slabs 3 of wood to be defiberized are loosely arranged lengthwise within the hopper 2, the wood being held in proper position by the weight thereof.

Preference is given to the use of green timber for the production of the desired fiber by a defiberization of the wood and the slabs of wood to be defiberized and arranged lengthwise within the hopper 2 may be delivered directly into the hopper as removed from within a steaming chamber for placing the wood in a proper moist condition. However, to insure the surface of the wood being acted upon by the defiberizing elements being maintained in a moist condition we have provided a steam pipe 33' which is arranged at one side of the frame structure, perforated transversely projected nozzle extensions 34 thereof being disposed to run beneath the line of travel of the hopper 2, and which extensions are disclosed by Fig. 2 of the drawings as being interposed between two of the idler rollers 5 and two of the idler rollers 4, the perforations being in the upper surface of the nozzle extensions 34 and 34' so that steam ejected therefrom in jets is projected upwardly onto the under surface of the exposed slabs of wood contained within the hopper 2. During the reciprocating movements of the said hopper, jets of steam are alternately ejected from the nozzle extensions 34 and 34'. Steam is admitted into the distributing pipe 33 under pressure and the flow of the steam through the said pipe toward the perforated branch nozzle extensions 34 and 34' respectively, is controlled by the action of a 3-way valve 35, the stem 36 of which is connected to a crank arm 37 united to a longitudinally disposed rod 38 and centrally thereof, Figs. 1 and 9 of the drawings, which rod 38 is pivotally connected at its ends to the upwardly extended arms 39 and 39', pivotally mounted relative to the frame structure of the apparatus in spaced relation. From the hopper 2 and centrally thereof is projected a stud 40, which on the hopper approaching the end of one of its strokes engages with a flanged extension 41 of the pivotally mounted arm 39 and moves the rod 38 to throw the 3-way valve through its described connection with the rod 38 to cut off the flow of steam toward the perforated nozzle extension 34 and admit steam to flow toward the perforated nozzle extension 34' of the pipe 33 and to discharge therefrom through its perforations as jet streams onto the under surface of the slabs of wood within the hopper 2 as the hopper moves in the direction of the arrow b, Fig. 2 of the drawings, until the projecting stud 40 of the hopper 2 is brought into engagement with the angular extension 42 of the rod 38 for causing a shifting of the said rod

38 to throw the 3-way valve 35 to divert the flow of steam through the pipe 33 toward and into the perforated branch nozzle extension 34 thereof. It will thus be seen that the trip or shift rod 38 controls the action of the 3-way valve 35 to alternately open and cut off the flow of steam to the perforated nozzle extensions 34 and 34', respectively, in accordance with the longitudinal reciprocating movement of the hopper 2, so that at all times during the working movement of the apparatus steam under pressure is ejected against the exposed surface of the wood within the hopper 2 to be defiberized.

While preference is given to the employment of a plurality of defiberizing means for the defiberization of the slabs of wood contained within the hopper 2 and in line with the length of the fiber thereof, it is apparent that only one of such defiberizing means need be employed, but in such case the positioning of the defiberizing elements should be such as to cause the same to underlie the hopper 2 centrally thereof.

To provide against the fiber of the wood as defiberized escaping upwardly from within the housing 26 during the reciprocating movements of the hopper 2, there is provided for the said hopper at each end thereof a covering plate 4', which overhangs or projects from the ends of the hopper to such an extent as to cover the housing 26 on the hopper being carried inwardly during its reciprocating movements beyond the end walls of the said housing 26 and which portion of the housing would be unprotected were it not for the covering plates 4'.

The construction of the defiberizing elements will be understood by reference more particularly to Figs. 2 and 8 of the drawings, it being understood that on the shaft 18 is keyed or feathered a series of collars 20', the collars being separated or held a slight distance apart by a washer 20² and the tie rods 20 pass through perforations formed in the collars 20', each collar being formed with cutout portions 20², the tie rods 20 passing through the perforations in the outstanding portions or surfaces of the collars 20', and the said collars 20' are arranged in staggered relation relative to each other, Fig. 2 of the drawings, so that the comb teeth 23 loosely mounted upon the rods 20 of the respective tie rods of the staggered arranged collars 20' stand in staggered relation.

While we have described the preferred embodiment of an apparatus for the carrying out of our invention, we do not wish to be understood as restricting ourselves to the details of construction illustrated and described, but we wish to be understood as claiming the invention as broadly as the state of the art will warrant.

Having thus described our invention,

what we claim as new and desire to secure by Letters Patent, is:

1. An apparatus for the defiberization of wood in line with the length of the fiber thereof, the same comprising a frame structure, an open-bottomed hopper mounted thereon for longitudinal reciprocating movement and adapted to contain slabs of wood lengthwise, means for imparting longitudinal reciprocating movement to the said hopper, and a pair of oppositely rotating defiberizing means mounted within the frame structure below the hopper and adapted to operate upon the under exposed surface of the wood held therein to be defiberized.

2. An apparatus for the defiberization of wood in line with the length of the fiber thereof, the same comprising an open-bottomed hopper adapted to contain lengthwise thereof wood to be defiberized mounted upon said frame for longitudinal reciprocating movement, oppositely rotating defiberizing means mounted within the frame structure below the hopper and adapted to operate upon the under exposed surface of the wood held therein to be defiberized, and means for imparting longitudinal reciprocating movement to the said hopper.

3. In an apparatus for the described purpose, the combination with a longitudinally reciprocating open-bottomed hopper adapted to contain lengthwise thereof wood to be defiberized, of rotary defiberizing means located beneath the said hopper and comprising a spool provided with a series of longitudinally aligned circumferentially disposed radially projected combing teeth mounted relative to the said spool for free swinging movement, said combs adapted successively to engage with the under exposed surface of wood held within the hopper for the defiberizing thereof in line with the length of the fiber, and means for imparting longitudinal reciprocating movement to the said hopper.

4. In an apparatus for the described purpose, the combination with a longitudinally reciprocating open-bottomed hopper adapted to contain lengthwise thereof wood to be defiberized, of rotary defiberizing means located below said hopper and comprising a spool composed of a transverse shaft provided with spaced collars united one to the other by a plurality of circumferentially disposed tie rods, a series of looped end combing teeth loosely mounted upon each of the rods in longitudinal alignment and projected radially therefrom, each tooth terminating in a pointed end extremity and the teeth of one line of teeth positioned in staggered relation with the teeth of an adjacent line, said teeth adapted to engage the under exposed surface of the wood held within the hopper for the defiberization

thereof in line with the length of the fiber thereof, and means for imparting longitudinal reciprocating movement to the hopper.

5. In an apparatus for the described purpose, the combination with an open-bottomed hopper mounted for longitudinal reciprocating movement and adapted to contain lengthwise thereof wood to be defiberized, of a plurality of spaced series of idler rollers adapted to support the wood contained within the hopper during the reciprocating movement thereof, an idler roller situated beneath the hopper and intermediate of the series of mentioned idler rollers and loosely mounted on a driven shaft, rotary defiberizing means mounted within the frame structure below the hopper and situated intermediate the centrally disposed idler roller and the spaced series of idler rollers and adapted to engage with the under exposed surface of wood within the hopper for defiberization thereof in line with the length of the fibers thereof, means automatically thrown into action during the reciprocating movement of the hopper for varying the direction of rotation of the mentioned driven shaft of the centrally disposed idler roller, and means carried by said driven shaft for coaction with means carried by the hopper for varying its longitudinal line of travel in accordance with the direction of rotation imparted to said driven shaft.

6. An apparatus for the described purpose, the combination with a frame structure, of an open-bottomed hopper mounted thereon for reciprocating movement and adapted to contain lengthwise thereof wood to be defiberized, longitudinally disposed racks carried by said hopper, a driven shaft mounted transversely of the hopper carrying rack pinions for engagement with the racks of the hopper for imparting longitudinal reciprocating motion thereto in accordance with the direction of rotation imparted to the said driven shaft, means thrown into action by the movement of the hopper for automatically varying the direction of rotation imparted to the said driven shaft, and rotary means mounted within the frame structure and below the hopper for engaging with the under exposed surface of the wood held therein for the defiberization thereof in line with the length of the fiber thereof.

7. A rotary defiberizing element for use in an apparatus for the defiberization of wood in line with the length of the fibers thereof, the same comprising a built-up spool having rows of aligned combing teeth loosely mounted circumferentially thereof and radially disposed therefrom, said aligned rows of loosely mounted combing teeth adapted to successively engage with the exposed surface of wood for the defiberization thereof in line with the length of its fibers.

8. An apparatus for the described purpose, the same comprising a frame structure, an open-bottomed hopper mounted thereon for reciprocating movement and adapted to contain lengthwise thereof wood to be defiberized, oppositely rotating flexible means located below the said hopper and adapted to engage with the under exposed surface of wood held therein for the defiberization thereof in line with the length of its fiber, and means thrown into action by the longitudinal movement of the hopper for automatically varying its direction of travel.

9. In combination, an open-bottomed hopper mounted for reciprocating movement and adapted to contain wood to be defiberized, a plurality of roller sets arranged in spaced relation to receive the hopper and wood, rotary defiberizing means mounted for operation on the wood between the roller sets, and means for reciprocating the hopper.

10. In combination, an open-bottomed hopper mounted for reciprocating movement and adapted to contain wood to be defiberized, means for reciprocating the hopper, and independent oppositely rotating means mounted below the hopper adapted for

simultaneous operation to defiberize the wood in said hopper.

11. In combination, an open-bottomed hopper adapted to contain wood to be defiberized mounted for reciprocating movement, means for reciprocating the hopper, rotary defiberizing means mounted below the hopper for operation on the wood therein, and moistening means operated periodically in conjunction with the movement of the hopper for moistening the wood therein.

12. In combination, an open-bottomed hopper adapted to contain wood to be defiberized mounted for reciprocating movement, means for reciprocating the hopper, rotary defiberizing means mounted below the hopper for operation on the wood therein, spray pipes mounted at opposite sides of the defiberizing means in line with the movement of the hopper, and means for admitting fluid to be sprayed from said pipes governed by the movement of the hopper.

In testimony whereof we have signed our names to this specification.

GUSTAV AICHER.
UEL S. McMILLAN.