(Specimens.)

# W. LATIMER.

## PROCESS OF MAKING FIBER FROM PINE NEEDLES.

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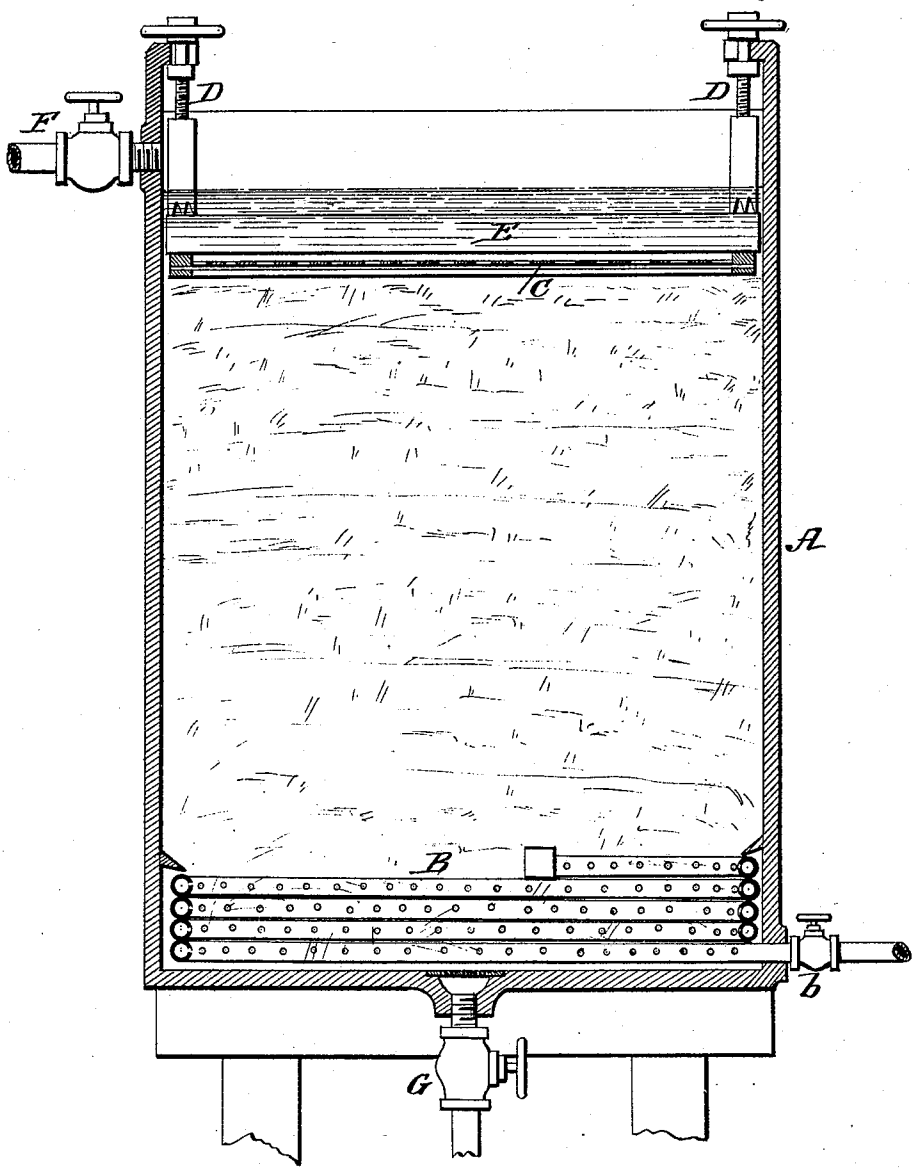


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WILLIAM LATIMER, OF WILMINGTON, NORTH CAROLINA.

## PROCESS OF MAKING FIBER FROM PINE-NEEDLES.

SPECIFICATION forming part of Letters Patent No. 397,240, dated February 5, 1889.

Application filed December 10, 1888. Serial No. 293,066. (Specimens.)

*To all whom it may concern:*

Be it known that I, WILLIAM LATIMER, of Wilmington, in the county of New Hanover and State of North Carolina, have invented a new and useful Improvement in Processes of Making Fiber from Pine-Needles, of which the following is a full, clear, and exact description.

My invention is in the nature of a new and improved process of treating the leaves of pine and other coniferous trees, commonly known as "pine-needles," for the purpose of producing a fiber for various uses in the arts, but more especially a fiber adapted for weaving a textile fabric for making bags for inclosing cotton-bales and other articles.

Heretofore attempts have been made, extending through a series of years, to produce a useful fiber from pine-needles, the method usually employed being to boil the leaves in an alkaline bath, and then to wash out the solution and disintegrate the fiber mechanically; but a long strong fiber has not been produced and substantial fabrics could not be woven from the same.

My process consists in the peculiar method hereinafter claimed of treating the stock prior to the mechanical rubbing and breaking up of the same into finer filaments, whereby the fiber is preserved long and tough, as it lies in the needles, and is not broken up and shortened in staple by this mechanical action.

My process is founded upon the discovery that the organic growth of the pine-needles occurs in layers of an entirely different material that requires different treatment. Thus the outer coating is of a hard silicious nature, somewhat similar to the surface of palm-leaf, while the inner portions are of a resinous, gummy, and pulpy nature, in which are embedded the fibers. This outer coating requires a very active treatment to remove it, and yet if this active treatment be continued through the inner layers it eats away and destroys the strength of the fiber, so that it does not possess sufficient strength to stand the subsequent mechanical separation, and is so weakened and broken in staple that the fibers are too short to be successfully woven. On the other hand, if a less active treatment be employed from the beginning of the process the silicious coating is not attacked, and the heat of the boiling process solidifies and carbonizes the gums and makes the stock hard and brittle without separating the fiber.

My process is designed to overcome these difficulties; and to that end it consists in the method of treatment hereinafter claimed, which I will now proceed to describe with reference to the drawing which forms part of this specification, and which represents a vertical section of an apparatus applicable to my improved process.

I first place the pine-needles in a suitable vat or tank, A, which may be made of cast-iron or other suitable material and of any desired size and shape. These tanks are each provided with a coil of perforated steam-pipe, B, in the bottom, around the sides of the tank, and extending out through the tank, where it may be fitted with a valve, *b*, for controlling the admission of steam to and shutting it off from the coil. After the needles are placed in the tank a grating or other cover, C, is made to bear down upon them by means of screws D D, applied to the ends of any number of binder-bars, E, so as to tightly compress the needles in the vat or tank. A water-inlet-valve connection, F, is furnished near the top of the tank and a suitable water or solution outlet-valve connection, G, at its bottom.

My process is as follows: The tank is first provided with a charge of the needles, which are preferably in a green state. The grating C is then forced down by the screws until the needles are tightly compacted into a small compass. The object of this is to get them in such small bulk as to allow a minimum amount of the alkaline solution to be used, thus economizing this reagent. A solution of caustic soda in water is then allowed to flow into the tank through valve F until its level rises to nearly the grating C. The strength of the solution is preferably about three to four per cent. of soda to the weight of the charge of the needles; but a slight variation of the quantity either way may be permitted. Steam is now turned on through coil B, and the contents of the vat are boiled hard at 212° Fahrenheit for ten or fifteen minutes, or until the ebullition of the water causes a head of foam to rise up above the level of the grating, where

it remains. This step constitutes the active treatment necessary to remove the outer silicious coating of the needles, and the foam is the result of the glutinous mass of soluble glass formed by the union of the soda with the silica forming silicate of soda. After the few minutes of active boiling the screws are released, and the grating C is raised and the mass allowed to expand and the liquor allowed to homogeneously soak through the entire mass. The steam is now partially cut off, so that boiling entirely ceases, and only enough steam is left to maintain the whole mass at a slow digestion for about ten hours at a reduced temperature, which may vary from 70° to 208° Fahrenheit. This reduced temperature effects the gentle saponification and solution of the gummy and pulpy matters, and while converting and dissolving them sufficiently to permit their removal does not attack the cellulose or woody fiber, and does not weaken its tensile strength, but leaves the fiber the full length of the needles, strong and tough, and able to resist the subsequent rubbing and mechanical subdivision without shortening its staple. After the needles have been thus cooked the solution is drawn off from the tank through valve G. I then subject the product or cooked needles to any number of successive washing and steeping operations in clean water, subject to the action of heat. Thus, for instance, I next fill the drained tank with clean water and again turn on the steam and gradually increase the heat of said water, which floods the cooked needles, to from 180° to 200° Fahrenheit. I then shut off the steam and allow the water to remain in the tank and cool gradually for about twelve hours, more or less, as desired, and after the water has cooled sufficiently it is drawn out of the tank. The vat or tank is then filled a second time with clean water, and the steam turned on to gradually heat it to a temperature of from or between 150° to 180° Fahrenheit, more or less, and afterward the steam is shut off and the water allowed to remain in the tank and cool, as before, and when sufficiently cool is run off from the tank. This second washing and steeping of the product will be at a lower temperature than the preceding one. After this I usually fill the tank a third time with clean water, turn on steam, and heat the water to a still lower temperature than the preceding soaking—say to about or between 100° to 150° Fahrenheit—and then shut off the steam and allow the water to cool gradually. This completes the soaking process, and the last or third water may either be run off in a few hours or be allowed to remain on the needles for several days without injury to the same, which latter may then be removed from the tank. The needles now present a transparent amber-colored appearance, and contain only the cellulose or fiber, and then are ready to be subdivided into filaments by mechanical action on a rubbing or decorticating machine. One or more of these soakings might be dispensed with, and the needles or product be removed for working after the second soaking operation; but the fiber will not be as clean or bright, and the longer the needles soak the better and cleaner will be the product or fiber. They furthermore might be soaked as many times as desired, and each time the needles are soaked they would become more transparent and the fiber cleaner. The temperature of the water in all of these washings must not be allowed to fall below 70° Fahrenheit.

The object of the repeated washings at successively lower temperatures is to secure the gradual shrinkage of the fibers, and the gradual closing of the cells and pores and the squeezing out, by contraction, of the gumming-matters from said cells into the surrounding warm solution, so that it may be drawn away and the fiber left perfectly clean.

The great merit of my process, it will be seen, lies in the fact that the process of eliminating the fibers does not shorten its staple and weaken it, and its great length and toughness permits it to be spun and woven into fabrics upon the ordinary jute machinery, which permits of the economical production of the fiber and its successful use for cotton-bagging and analogous uses.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The process herein described for treating pine-needles for making fiber for spinning and weaving into textile fabrics for bagging and for other purposes, which consists in first actively boiling the needles for a few minutes in an alkaline solution until a head of foam is raised, then lowering the temperature to below the boiling-point and slowly digesting the mass for a period of ten hours, more or less, and then drawing off the solution, and washing the mass with pure water, substantially as shown and described.

2. The process herein described of treating pine needles for making fiber for spinning and weaving into textile fabrics for bagging and other purposes, which consists in first actively boiling the needles for a few minutes in an alkaline solution until a head of foam is raised, then lowering the temperature below the boiling-point and slowly digesting the mass for ten hours, more or less, and then draining off the solution and subjecting the cooked needles to a series of successive washing and steeping or soaking operations in clean water, each of said washing and soaking operations being at a lower temperature than the preceding one, substantially as specified.

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