

UNITED STATES PATENT OFFICE.

JAMES E. LAPPEN, OF DECORAH, IOWA, ASSIGNOR TO LORENZO L. C. BROOKS AND FREDERICK M. CATLIN, OF ST. PAUL, MINNESOTA.

PROCESS OF RETTING FIBROUS STOCK.

SPECIFICATION forming part of Letters Patent No. 785,618, dated March 21, 1905.

Application filed July 16, 1901. Serial No. 68,501.

To all whom it may concern:

Be it known that I, JAMES E. LAPPEN, a citizen of the United States, residing at Decorah, in the county of Winneshiek and State of Iowa, have invented certain new and useful Improvements in Processes of Retting Fibrous Stock and the Novel Product Secured Thereby; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention has for its object to provide an efficient process for the quick retting of fibrous stock, such as flax and other fibrous plants, and to provide the new product resulting from the use of said process.

To this end my invention consists of the novel process and novel product hereinafter described, and defined in the claims.

The process was especially designed for use in the treatment of flax and will be described as applied to that use. It may be applied to the flax-straw directly, or the flax-straw may first be reduced to the form of tow. It is preferable to have the flax in the form of tow.

The process consists in first cooking the stock in a solution of lime under steam-pressure and then subsequently cooking the same stock in a solution of caustic soda under steam-pressure. By actual experience I have found that the proportions of the ingredients and the times of the cookings may advantageously be as follows: Commingle six hundred pounds of good quality fresh unslacked lime in fifteen hundred gallons of water and heat the same to boiling-point within a suitable tank. This will give the lime solution or what I call the "milk of lime." Into a suitable digester adapted to cook the stock under a steam-pressure of fifty pounds put a charge of eight thousand five hundred pounds of flax-tow and onto the same draw the lime solution above noted and then cook the said stock in said lime solution within said digester under fifty pounds direct steam-pressure for one hour at about 297° temperature. Then blow off the liquor from the stock and out of the digester. Commingle three hundred and sixty-five pounds

of caustic soda within fifteen hundred gallons of water in a suitable tank and boil the same, thereby forming the solution of caustic soda. Draw this caustic solution onto the stock within the digester, which had been previously treated with the lime solution, as above described, and cook the same under a steam-pressure of fifty pounds for three and one-half hours at about 280° temperature. Then blow off the liquor from the stock. Then remove the stock from the digester and wash the same in clean water. This is the retted stock and is ready to run through suitable cleaning-machines for the removal of the shive from the fiber. The fiber may then be put up like cotton-batting or in any other desired form, according to the use for which it may be intended.

Assuming the original charge to have been eight thousand five hundred pounds of tow of medium grade, as stated, the product in fiber under the treatment above described would be about five thousand five hundred pounds. If the stock had been in the form of flax-straw, the product in fiber would have been about one-fourth the weight of the straw.

The product or fiber secured by the process above described, with the cookings timed, as above stated, is of a grade or quality especially well adapted for use as a heat and cold insulator. Otherwise stated, said product or fiber is well adapted for use as linings for refrigerators and cold-storage houses. Said fiber or product can be handled much like mineral wool with the exception, of course, that it does not have the fireproof qualities of mineral wool. For example, said product or fiber may be stacked in the open air and be permitted to get wet; but it will not heat or rot like air-retted stock.

If the cookings be varied in length of time, products can be obtained which will differ in quality from the product above considered. For example, if the cookings be longer than those named, so as to be of proper duration, a product can be secured which is well adapted for use in the manufacture of all kinds of paper. On the other hand, if the times of

the cookings be shortened up to the proper duration a product or fiber can be secured which is well adapted for use in spinning.

If a fiber or product suitable for paper be desired, the cooking in the lime solution should be for about three hours, and in the solution of caustic soda the cooking should be for about seven hours. If a fiber or product suitable for spinning is desired, the cooking in the lime solution should be for about one hour, and the cooking in the solution of caustic soda should be for about two hours.

I am not able to state the exact chemical reactions which take place under the process hereinbefore described. Having regard to the results on the stock, however, I have found that by the cooking thereof in the lime solution the gummy matter is loosened up and removed from the stock and that the woody matter and fiber are softened to some extent; but said woody matter is not in any wise dissolved. I find, further, that by the subsequent cooking of the same stock in the solution of caustic soda that the shive or woody matter will become dissolved and incorporated with the liquid, leaving the fiber entirely free from the shive with the exception of such portions as are held in solution by the liquid absorbed in the fiber when removed from the retort. This statement is absolutely true when the boilings have been made under a pressure of one hundred pounds. If the boilings have been made under a pressure of fifty pounds, some small fractions of the shive may remain undissolved, but can be readily shaken off from the fiber after the same has been washed and dried. The boiling at fifty-pounds pressure is preferable for some purposes, for the reason that the fiber will be left in a somewhat tougher condition. For some purposes it is desirable to boil under the higher and for others under the lower pressure.

It should be especially noted that carbonate of soda cannot be employed at either step of the process. The chemical formula of carbonate of soda is Na_2CO_3 , and the chemical formula of caustic soda is NaHO . The carbonate is a salt, and the caustic soda is an alkali, and the two are radically different from each other. By actual tests made by high-class experienced chemists it has been demonstrated that the carbonate of soda cannot be substituted for caustic soda in the treat-

ment of flax-straw to produce fiber. Under these tests it has been shown that the carbonate of soda will not dissolve the woody matter of the stock, but that the caustic soda when applied as above described at the second stage of the process after the stock has been boiled in the lime solution will dissolve and remove the woody matter. It then only remains to rinse the fiber in water and then shake out and dry the same to get the desired product, which is herein claimed.

From the foregoing statements it must be obvious that the process above described is one capable of being carried out at comparatively small cost and that the results are quickly secured. Flax-straw is available in great abundance, and the demand for the fiber or product produced by said process is large. Hence the process is important in value.

So far as I know the product or fiber secured by the above-described process is also in itself new as an article of manufacture. At this time, however, I am unable to define the said novel product otherwise than by the process of producing the same. So far as I know the said product cannot be secured or produced by any other process. Hence I believe this form of definition to be sufficient.

What I claim, and desire to secure by Letters Patent of the United States, is as follows:

1. The process of retting fibrous stock, such as flax, whether in the form of straw or tow, which process consists in first cooking the stock in a solution of lime, under direct steam-pressure, and then, subsequently, cooking the same stock in a solution of caustic soda, under direct steam-pressure, substantially as described.

2. As a new article of manufacture, a fibrous product resulting from the treatment of a fibrous stock, such as flax straw or tow, by cooking the same first in a solution of lime, under direct steam-pressure, and then subsequently in a solution of caustic soda, under direct steam-pressure, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES E. LAPPEN.

Witnesses:

E. R. ACRES,
A. W. LEWIS.