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METHOD AND APPARATUS FOR TREATING FLAX

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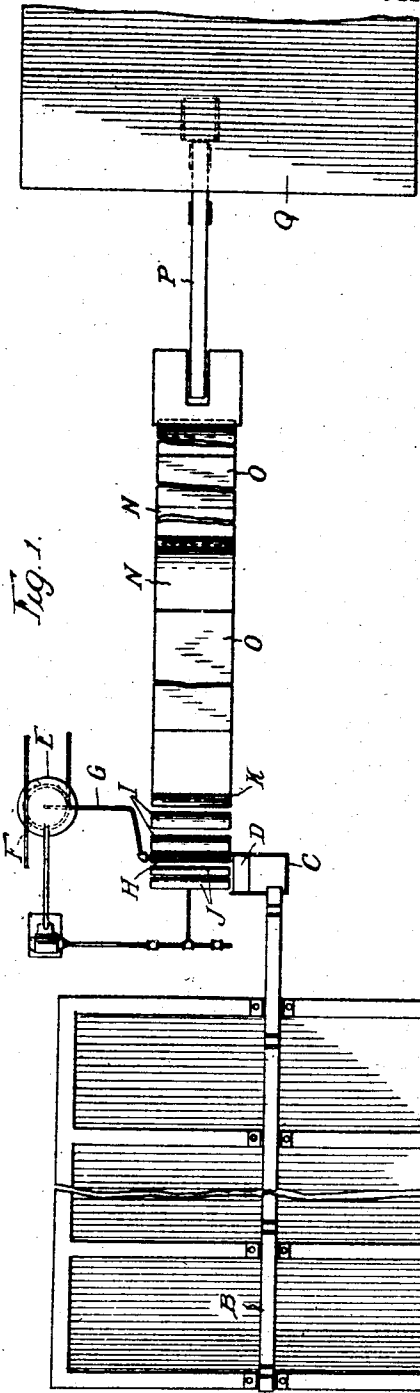


Fig. 1.

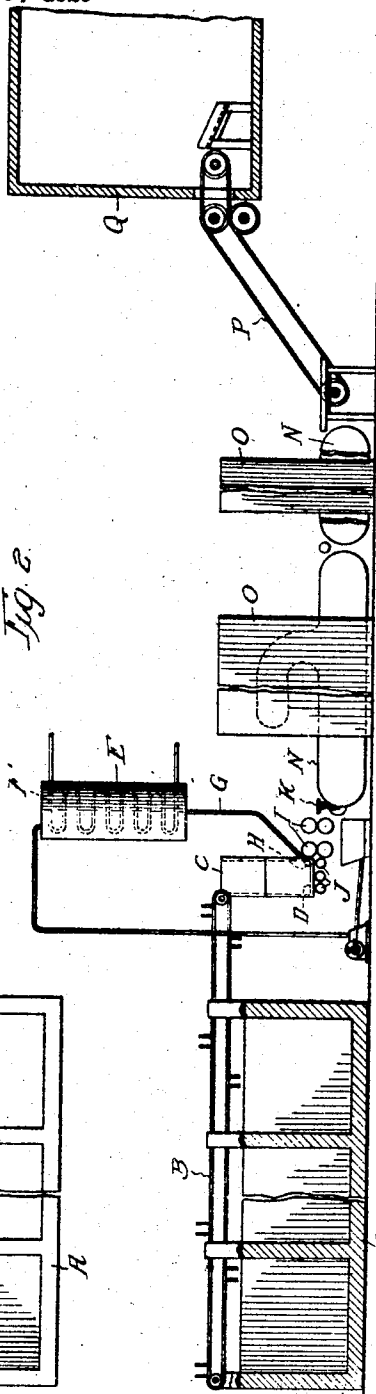


Fig. 2.

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METHOD AND APPARATUS FOR TREATING FLAX.

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To all whom it may concern:

Be it known that I, BERTRAND S. SUMMERS, a citizen of the United States, residing at 2557 Military Street, Port Huron, county of St. Clair, and State of Michigan, have invented certain new and useful Improvements in Methods and Apparatus for Treating Flax, of which the following is a specification.

My invention relates to an improved method and apparatus for the treatment of flax straw to produce therefrom fiber suitable for commercial use in the manufacture of yarns and linens, and has for its object to provide a method and apparatus for carrying out the method by means of which such treatment may be conducted continuously and expeditiously and resulting in the production of a fiber having high spinning quality and superior strength. With this object in view, my invention is fully described in the accompanying specification and more particularly pointed out in the claims.

In the drawings, Figure 1 is a plan view of the apparatus, Figure 2 is an elevation.

In the treatment of the flax straw as commonly carried out, it is retted after being cured in the field, or immediately after it is gathered while in the green state. The retting process, generally speaking, softens the straw and renders the fiber more easily separable from the woody tissue and at the same time gives the required spinning qualities to the fiber. After retting, the retted straw is spread out in the field for drying and to complete the process. The straw as thus treated in the field is dried only to a partial extent, and is left in, what I term, a natured state, that is to say, the valuable fiber together with the woody matter of the straw are both in a tough, pliable condition. This condition of the fiber is essential for successful scutching and for the subsequent spinning operation. The woody matter is, however, difficult to separate from the fiber by the scutching, so that the proper separation of the fiber from the wood material of the straw has always been a problem of some difficulty. This is illustrated in scutching mills working with naturally retted straw natured as above described. In these mills it is necessary to stop the operation when the atmosphere is surcharged with moisture owing to the increased toughness of the woody matters in

the straw due to the presence of such moisture. This is because the straw natured as above described is so moist that the addition of a small amount of moisture is sufficient to render the material incapable of commercial operation. Field drying is, of course, subject to interruption by rain, dews, or other local disturbances, and can only be practiced at certain favorable seasons of the year in flax producing countries. After being thus prepared, the flax straw is bundled and shipped to the scutching mills, where it is subjected to the scutching operation to separate the fiber from the straw. The fiber so separated by the scutching operation is then ready for spinning. In the treatment of flax straw so carried out the favorable outcome is dependent to a large extent upon weather conditions, and is subject to interruption thereby and to a non-uniformity of product, resulting in considerable hazard to the product. It is also necessary that a sufficient supply of flax straw be treated during the favorable season to care for the demand until the next retting season occurs. The losses due to this method of treating flax straw amount to very large sums of money.

I have discovered that it is possible to so treat flax straw as to make the production of fiber independent of weather conditions so that flax may be retted and treated continuously throughout the year as the demand therefor requires and to produce in this way a more uniform quality of fiber having superior spinning qualities and of a high strength.

In carrying out my invention, I use field cured straw, which, of course, has not been retted or natured, and I provide a retting vat, or vats, adapted for the continuous retting of flax straw. For present purposes, these vats may generally be described as containing retting liquor, which is continuously withdrawn therefrom and subjected to treatment to increase the beneficial bacteria, which cause the retting operation, the treated liquor being returned to the vats. The retting vats are provided with a conveyor adapted to withdraw therefrom, at the proper time, the straw contained therein. On the conveyor the retted straw is carried to a system of squeeze rolls through which it is passed. When the fiber reaches the squeeze rolls, it is in soft plastic condition and impregnated with a gummy, sticky substance

deleterious to spinning qualities. It is necessary that this substance be removed, and, as the fiber at this point is in a delicate condition, it must be removed gently so as not to
 5 tear and disintegrate the ribbon of fiber. For this purpose I bring a stream of warm water to the feed roll, which flows upon the surface of the feed rolls, and is, in turn, conveyed by the feed rolls in such a manner that
 10 it flows gently upon the fiber just in advance of the entry of the fiber between the squeeze rolls. This water thus applied to the fiber softens and dissolves the gummy matter so that it is readily squeezed out from the
 15 fiber by the squeeze rolls. In commercial operation large quantities of flax fiber are thus conveyed from the retting vat to the squeeze rolls. The proportion of fiber to the gummy matter and woody matter is about
 20 one to five, so that a very large proportion of these waste matters must be removed, amounting I should say to approximately five to ten per cent of the total weight of the straw. By my method of washing as above
 25 described, I am able to remove these deleterious matters with the least expenditure of time and labor, at the same time doing this without disturbing the ribbons of fiber and yet
 30 more thoroughly cleansing them than is otherwise possible, and without interruption to the continuity of the process. The gummy and sticky matters are present in the straw retted in vats to a greater degree than
 35 when the straw is subjected to the natural retting and subsequent field drying, as above described, so that the washing out of these matters is an important step. From the squeeze rolls the cleaned straw is deposited
 40 upon conveyors which carry it to a dryer in which the straw is completely dried. After drying, the straw is carried by suitable conveyors to a naturing room where it is allowed to remain under proper conditions of tem-
 45 perature and moisture to effectuate the naturing of the straw.

It will be here noted that in carrying out my present process, I first completely dry the straw before subjecting it to this naturing,
 50 whereas in all the prior processes with which I am acquainted the straw is in an incomplete state of dryness when taken from the field and is, therefore, naturied, whereas in my process the flax straw is practically
 55 completely dried and is subsequently naturied. In the straw retted by the natural process, containing as it does considerable amounts of moisture, while the fiber is tough and strong the wood is also more or less
 60 affected by the moisture contained, which makes it more or less pliable and, therefore, difficult to remove from the fiber with which it is associated, in the scutching operation, while by my process both the wood and the
 65 fiber are first practically completely dried

so that the straw is brittle. By the subsequent naturing the fiber becomes soft and pliable before the woody matters assume such a condition, so that the straw treated by my process is carried to the scutching
 70 machines with the fiber in the soft and pliable condition and the wood in a brittle state so that the former is more easily separated from the wood and in better condition than is possible in any other way known
 75 to me.

Having thus generally described my process, I have shown in the drawings an apparatus suitable for carrying out this process, although it will be understood that
 80 my process is not dependent upon the particular apparatus shown. The apparatus shown comprises the retting vats "A" provided with a suitable conveyor "B" which carries the retted straw to a chute "C"
 85 whence it falls upon a platform "D", from which platform it passes to the feed rolls "J", which carry it to the squeeze rolls "I". "G" is a pipe conducting warm water from a suitable source of supply "E" shown in
 90 the present instance as a reservoir heated by coil "F". The pipe "G" is provided, at a point adjacent the squeeze rolls, with a spray nozzle "H", which sprays the warm water against the surface of one of the
 95 squeeze rolls "I", from which the water flows gently upon the retted flax just in advance of the entry of the flax between the squeeze rolls. These squeeze rolls remove from the flax the gummy, sticky matters as well as the excess of water. From the squeeze rolls the straw passes to oscillating
 100 apron "K" upon which the straw is agitated and spread out while passing therefrom to the dryer conveyor "N". The dryer
 105 apron carries the straw through a suitable dryer or dryers, O, in which the moisture is substantially completely removed from the straw at a temperature preferably of from 160 degrees to 190 degrees F. I have
 110 shown in the drawing two dryers by means of which the drying temperatures may be varied in order to dry first with a higher temperature and later with a lower temperature, or vice versa, if desired. In some instances, however, a single dryer may be
 115 sufficient. From the dryers the straw is conveyed by a suitable conveyor "P" to the naturing room "Q". In this room the straw is allowed to remain under suitable conditions of temperature and moisture to bring the straw into suitable condition for the scutching operation. This condition, as
 120 above described, is that the fiber portion of the straw should be in a soft and pliable condition while the wood is yet brittle. These temperature and humidity conditions have a somewhat wide variation. Preferably, the temperature should be above 40
 125 degrees and the humidity above 50% satu- 130

ration. It will, of course, be understood that the naturing takes place more rapidly with a sufficient amount of moisture in the air than in a dry atmosphere. The ideal conditions are 70 degrees temperature and 60% to 65% saturation. It will be understood, of course, that the apparatus for carrying out my process is arranged in a suitable building. By treating flax straw in the manner described in this specification I am able to work upon field cured straw throughout the entire year, the various operations being conducted continuously and without interruption. By my method of vat retting, I secure a uniform product, and by my method of washing I remove the gummy and sticky matters from the retted straw without injury to the fiber and by the step of completely drying the retted and cleaned straw and subsequently naturing it under uniform conditions, I am able to separate the fiber from the woody matters more efficiently than has hitherto been possible in this art. While vat retting, washing and drying have been hitherto suggested, I believe that I am the first to discover that completely dry retted straw can be subsequently natured as herein described to render the straw suitable for further treatment, and I believe that I am the first to suggest an arrangement of apparatus whereby the straw can be treated continuously and without interruption throughout the year.

Having now described my invention, what I claim and desire to secure by Letters Patent, is:

1. The process of treating flax straw which comprises the steps of retting straw, substantially completely drying the retted straw, and then subjecting the dried straw to a naturing process.

2. The process of treating flax straw which comprises the steps of retting the straw, washing out the gummy matter therefrom, substantially completely drying the washed straw, and then subjecting the dried straw to a naturing process.

3. The process of treating flax straw

which comprises the steps of retting the straw, removing the gummy matters therefrom, and substantially completely drying the straw, and then subjecting the dried straw to a naturing process.

4. The process of treating flax straw which comprises the steps of substantially completely drying the straw, and then subjecting the dried straw to a naturing process.

5. The process of treating flax straw which comprises the steps of retting the straw, eliminating substantially all the moisture therefrom, and then gradually re-introducing moisture to a degree sufficient to render the fiber portion of the straw pliable, while leaving the woody portion brittle.

6. The process of treating flax straw which comprises the steps of vat retting the straw, artificially drying the retted straw, and then artificially naturing the dried straw.

7. The process of treating flax straw which comprises the steps of subjecting the retted dried straw to the naturing action of an atmosphere carrying sufficient moisture whereby the fiber of the straw is softened without softening the woody content of the straw.

8. Apparatus for treating flax straw comprising a retting vat, squeeze rolls, a dryer, means for conveying the straw from the retting vat to the squeeze rolls, and further means for conveying the straw from the squeeze rolls through the dryer.

9. Apparatus for treating flax straw comprising a retting vat, a dryer, a naturing room, means for conveying the straw from the retting vat through the dryer, and means for conveying the straw from the dryer to the naturing room.

10. Apparatus for treating flax straw comprising a dryer and a naturing room, means for conveying the straw through the dryer, and further means for conveying the straw from the dryer to the naturing room.

April 13th, 1920.

BERTRAND S. SUMMERS.