

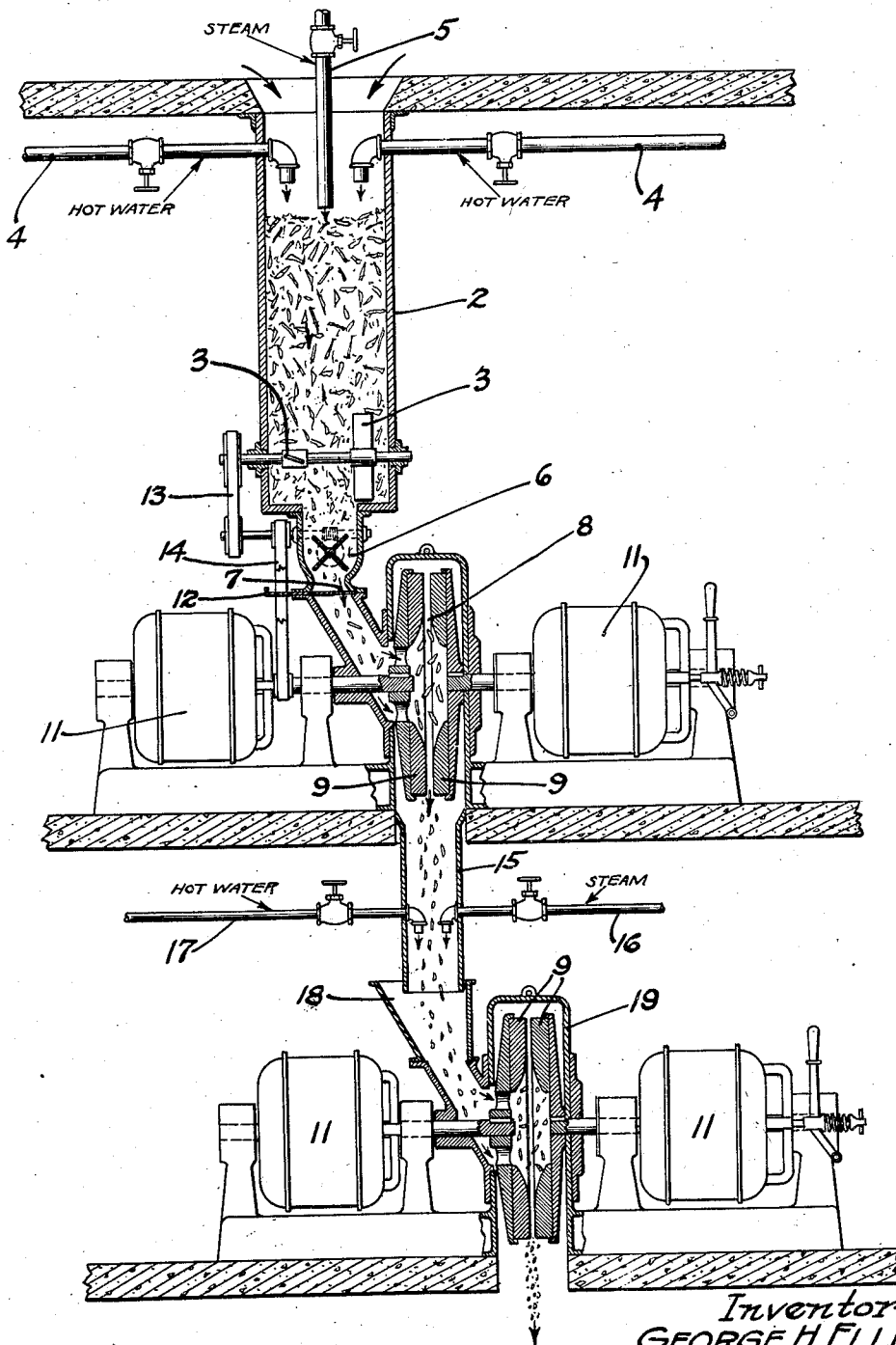
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PROCESS OF SEPARATING WOOD FIBERS

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PROCESS OF SEPARATING WOOD FIBERS

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This invention relates to improvements in processes of separating wood fibers whereby small pieces of waste wood may be utilized and reduced to a pulpy mass suitable for the manufacture of insulating boards or slabs, and various other articles, used in the building trade.

Heretofore it has been customary to cook the wood chips in the presence of chemicals under steam pressure to remove the lignin, a substance, or mixture of substances which, with cellulose, constitutes the essential part of wood tissue, and forms a binder for the wood fibers.

The above process of separating wood fibers has been found objectionable for various reasons, principally because of using chemicals to dissolve the lignin, and also because of the expensive equipment required to treat the wood chips under steam pressure.

The improved process featured in this invention does not employ the use of chemicals to dissolve the lignin, nor are the wood chips treated under steam pressure in the process of separating the fibers. The wood is first reduced to a substantially uniform size by the use of a suitable machine, such as that commonly known as a "chipper", ordinarily used in chipping wood for the production of wood pulp. The small wood chips are then discharged into a hopper and subjected to the heating action of hot water or steam, or both at the time of introduction, which functions to soften the lignin to the extent that the fine fibers of the wood may readily be separated from one another. The steam laden wood chips are softened as they pass downwardly and are then passed through one or more abrading devices wherein the wood fibers are reduced to the desired degree of fineness to produce a fine pulpy mass.

By introducing the steam at the same time with the chips, the softening or digesting process progresses while the stock is moving toward the abrading device, and thus time is saved. Moreover, the stock is much softer because of the greater length of time that is left in the digester. I have discovered that the chips do not soften so quickly when the steam is introduced at some point within

the mass or at some point immediately adjacent the abrader. Likewise, more abrading operations are necessary because the softening process has not advanced sufficiently before reaching the abrader.

The particular object of this invention, therefore, is to provide an improved and speed up the process of separating wood fibers.

Other objects of the invention will appear from the following description and the accompanying drawing and will be pointed out in the annexed claims.

In the accompanying drawing there has been disclosed a structure designed to carry out the various objects of the invention, but it is to be understood that the invention is not confined to the exact features shown, as various changes may be made within the scope of the claims which follow.

The accompanying drawing illustrates, in a general way, the various steps employed in this novel process of separating the wood fibers.

My improved process of separating wood fibers preferably provides a hopper 2 having its upper end open, as shown, to receive the small wood chips which may be delivered thereto from a conveyer or other suitable means, not shown.

Agitators or paddles 3 are mounted in the lower portion of the hopper 2 to constantly agitate and stir the wood chips so that they will become thoroughly saturated with steam and hot water, introduced into the hopper without pressure through the hot water pipes 4 and the steam pipe 5. These steam and hot water pipes are arranged as shown in the drawing in the upper portion of the hopper so that the entire mass of wood chips in the hopper will be subjected to the steam and hot water discharged therefrom. By thus heating the wood chips, and retaining them at substantially a constant temperature equal to that of the steam and hot water, the lignin will become sufficiently softened so that the small wood fibers may readily be separated from one another.

From the hopper 2 the heated chips are fed through a feeding device 6 and through

a restricted passage 7 into a suitable grinder or abrading device 8, comprising rotary members 9 which are adapted to be operated by suitable motors 11 as shown. The size of the restricted passage 7 may be varied by means of a slide 12 so that the feeding of the material from the hopper 2 to the grinder 8 may be controlled. The paddles 3 and feeding device 6 may be driven by means of suitable belt drives 13 and 14, the latter being connected to a pulley mounted upon one of the shafts of the motors.

From the grinder 8 the material is discharged into a depending spout 15, which has mounted therein, a steam pipe 16 and a hot water pipe 17 for the introduction of steam and hot water thereinto. From this spout the steam-heated, partially separated wood fibers are discharged into a hopper 18, and thence into a second grinder 19 wherein the long sliver-like fibers, mixed with water in the form of a fine pulp, are completely separated from one another and dropped by gravity into a suitable receiving means, not shown.

An important feature of the improved process above described, resides in maintaining the wood chips and fibers at a constant temperature while passing through the various steps of the process, such temperature being substantially equal to that of the steam and hot water which is continuously introduced into the hopper 2. In practical operation it may not be necessary to further subject the partially separated fibers to the action of steam and hot water after passing through the first grinder 8, but if the partially separated fibers, being discharged from the grinder 8, have a tendency to cool, additional hot water and steam may be introduced into the spout 15, thereby again heating them to the proper temperature before being discharged into the hopper 18 and thence into the grinder 19.

The improved process consists first in discharging the wood chips, which may be small pieces of waste wood, into the hopper 2 and subjecting them to the heating and softening action of steam and hot water, thereby causing the lignin to become softened to a degree which will permit the wood fibers to readily become separated from one another. From the hopper 2 the wood chips, together with steam and water, are delivered to the grinder 8 which reduces the size of the chips in the presence of hot water and steam, thereby producing a coarse pulp having very long sliver-like fibers which drop by gravity into the spout 15 and thence into the second grinder 19, where it is reduced to any desired degree of fineness required to produce a fine pulpy mass of the proper consistency required for the work intended.

In the drawing and in the above description I have referred to the process as com-

prising two grinders, but it is to be understood that one or more of such grinders may be employed depending upon the degree of fineness to which the wood chips are to be reduced. In some cases one grinder may be all that is needed. I have also shown means for introducing steam and hot water into the material at a point ahead of each grinder, but I wish it to be understood that various changes and modifications may be made in the apparatus shown without departing from the invention.

The time element is important, and for this reason the steam is introduced at the top against the incoming chips. By so introducing the steam the same is drawn downwardly through the chips by the sucking action of the pulper with the result that there is a much more efficient softening action. Moreover, applicant has discovered that the chips will not soften sufficiently, when they are first soaked only in hot water and then fed, or when the steam is introduced just before the chips reach the pulper.

Steam and hot water are introduced above the pulper. Rapid rotation of pulper disks 8 creates suction below the feeder, draws the steam into the pulper. The effect of steam is to soften the outer surfaces of the chips as the fiber is being removed (at the pulper). If steam and cold water is used it seems that there is no softening of the lignin, or that if there is some softening by the steam, the lignin is re-set by the cold water. In other words, the heat must be retained, to maintain a softened condition of the lignin. If the lignin is sufficiently softened the fibers can be separated without shortening them. It seems that steam and cold water tend to break or shorten fibers. This is not so with steam and hot water and where the temperature is maintained.

With the present process, satisfactory fiber is produced from mixtures of various kinds of wood, for example spruce, balsam, jack pine, white pine, poplar, hemlock, cedar, birch, tamarack and ash in the form of waste slab wood known as "wood hog."

The chips are fed by gravity and are agitated while the moist heat such as hot water and steam is admitted and is drawn or sucked into the pulper along with wood chips as the result of rapid rotation of the pulper disk in opposite directions.

Note that the introduction of the solvent is made so that it will be in contact with the wood substantially during the entire travel of the wood towards the grinder or pulper. It is to be further noted that the maximum of heat is retained to maintain the lignin in softened condition.

I claim as my invention:

1. A method for separating the fiber of wood chips only by moistening and grinding which consists in introducing steam with the

chips and slowly feeding the mass to the grinder and agitating the mass at a point adjacent the grinder.

2. A method for softening the cementing material and separating the fibers of chipped wood which consists in slowly feeding the chips by gravity, applying moist heat, agitating, grinding, then applying additional moist heat and regrinding.

3. A method for softening the cementing material and separating the fibers of chipped wood which consists in slowly feeding the chips by gravity through an open top receptacle, applying moist heat, agitating the moistened and heated mass, and then suction grinding.

4. A method for softening the cementing material and separating the fiber of chipped woody material which consists in repeatedly treating the mass with moist heat and grinding, slowly feeding, and agitating and without substantial heat loss, and in a manner to retain all of the woody substance as well as the moist heat.

5. A method for softening the cementing material and separating the fiber of chipped woody material which consists in repeatedly treating the mass with moist heat and grinding, and slowly feeding the mass by gravity, and agitating and without substantial heat loss, and in a manner to retain all of the woody substance as well as the moistening agent.

6. A method for softening the cementing material and separating the fibers of comminuted wood which consists in slowly feeding the comminuted wood by gravity, applying moist heat, agitating, and then suction grinding.

In witness whereof, I have hereunto set my hand this 11th day of June, 1925.

GEORGE H. ELLIS.