

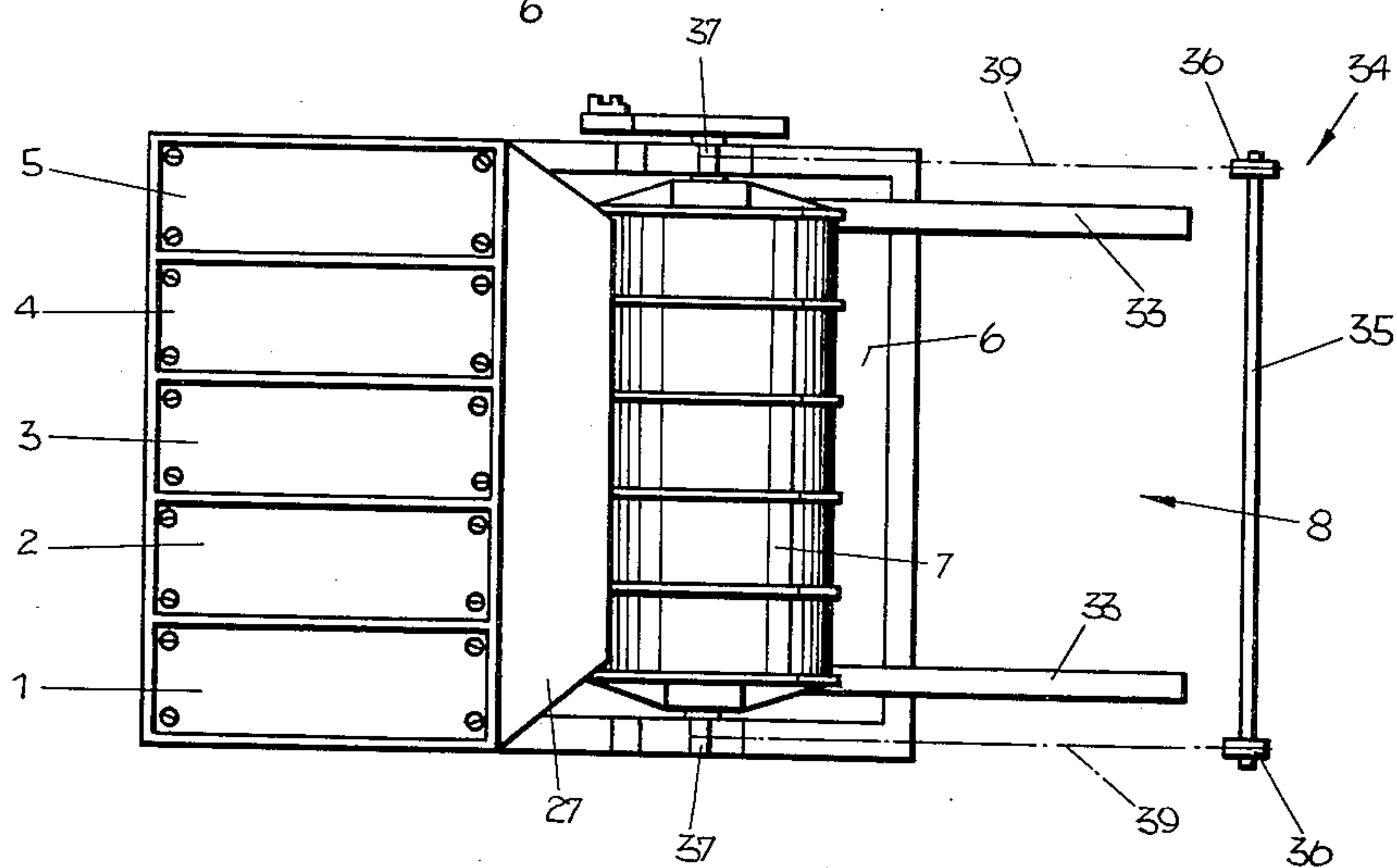
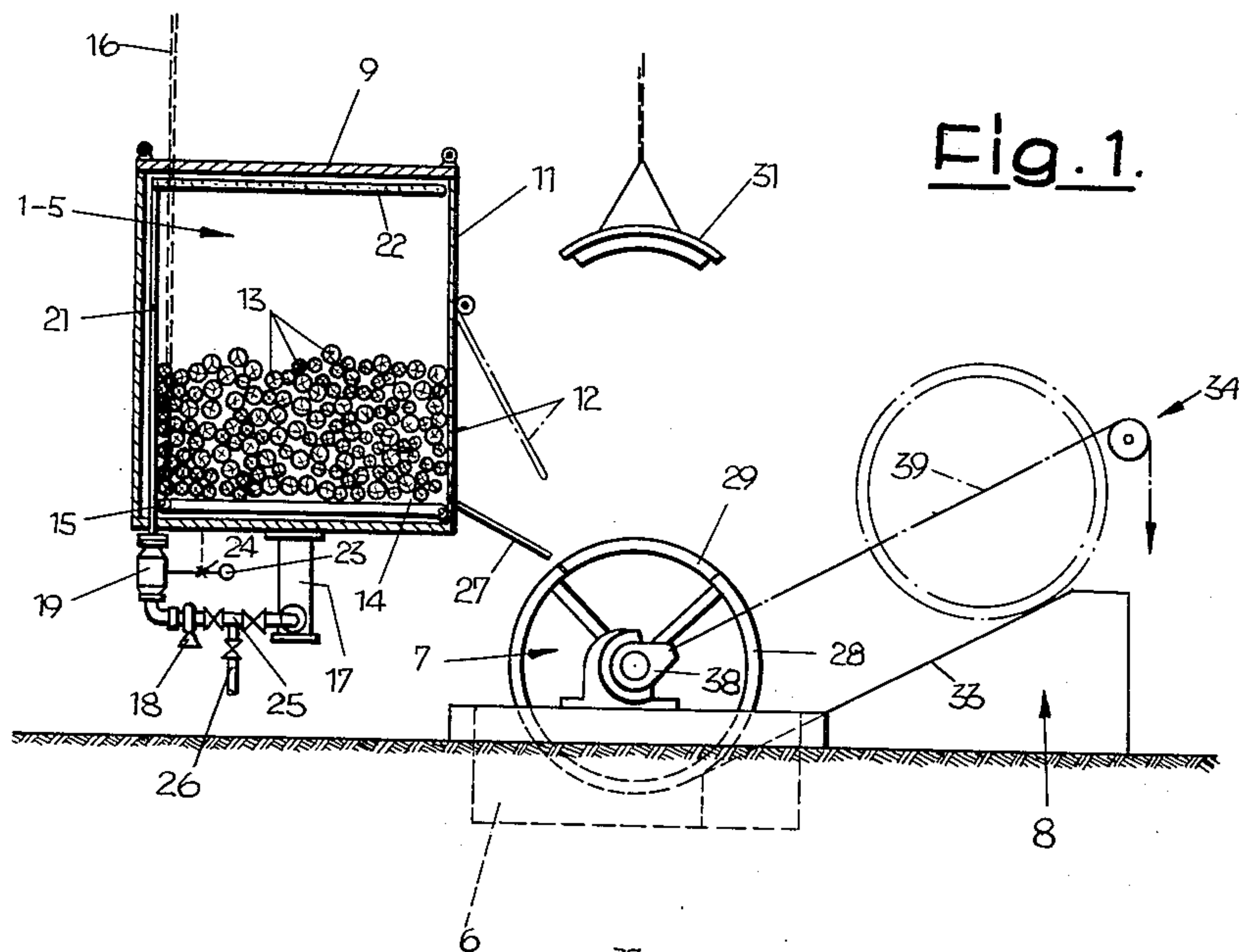
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METHOD FOR DECORTICATING LOGS

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METHOD FOR DECORTICATING LOGS

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The present invention relates to a new method and apparatus for decorticating logs, particularly when the lumber is to be used for producing fibrous materials.

Although the customary method of softening the cambium zone of the logs by floating the logs for a long time in water may be adequate for some types of lumber and may sometimes permit a relatively easy removal of the bark without any great loss in wood, many other types of lumber will resist such simple treatment. In all such cases it is necessary to subject the lumber to a special preliminary treatment to soak and soften the cambium zone of the logs sufficiently so that it will no longer retain the bark as tenaciously on the wood and permit the bark to be easily stripped off the logs in the subsequent mechanical process. When the bark is to be completely stripped from the logs without first subjecting them to such preliminary treatment, the loss of a considerable amount of valuable wood is unavoidable.

Such special soaking treatment to soften the cambium zone of the lumber must, however, comply with certain conditions. Primarily it is necessary to make the soaking period as short as possible as otherwise the whole decorticating process will be uneconomical. Furthermore, especially on logs which are to be used for producing fibrous materials, the soaking operation must be carried out to such an extent that the bark may be removed from the logs completely and economically, and without leaving thereon any residue worth mentioning. Last but not least, it must be carefully observed that during the soaking process the logs themselves will absorb as little as possible of the turbid or coloring substances dissolved from the bark by the liquids or the steam condensate used in the process since this would affect the degree of whiteness of the fibrous materials to be made of the logs.

Although prior to this invention there have been various methods of decorticating lumber, none of these methods has been able to comply sufficiently with the above-mentioned requirements. Thus, for example, in one prior method the logs were treated for a long time, for example, for 5 to 13 hours, with steam and were subsequently "quenched" for a long time in cold water. However, the steam condensed on the unsoaked dry lumber into small drops which then absorbed the coloring matter from the bark. These drops mixed with the coloring substances were then gradually absorbed by the logs themselves resulting in a poor degree of whiteness of the decorticated logs and of the fibrous materials subsequently produced therefrom.

If according to the prior methods the hot-soaking treatment was omitted, it was necessary to provide very large containers since the lumber often had to be in the cold water for several weeks until it had been soaked sufficiently. The production and maintenance of such large containers was, however, very expensive. Furthermore, all of the known methods required very large quantities of water or heat which often rendered the entire decorticating process uneconomical. Finally, some of these prior methods required logs to be quite straight and uniform. Obviously, such special selection of only the most valuable lumber also rendered these prior methods rather uneconomical.

It is the principal object of the present invention to provide a new method of decorticating logs of any shape

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or form, whether straight, curved or knotty, in a manner so as to avoid and overcome all of the mentioned disadvantages of the prior methods, insuring a more economical operation than previously possible and permitting the logs to be used just as they are felled in the forest and without being especially assorted.

Although the present invention also relies upon the basic method of inserting pre-cut log sections into closed containers and soaking and softening the cambium zone of the logs by means of moist heat, and of thereafter stripping the bark from the logs, it is distinguished from the known methods by subjecting the log sections in the different containers for a considerable length of time, for example, for 3 to 8 hours, depending upon the type of wood, to the influence of water to which in certain cases chemical neutralizing agents may be added, and which in the course of the treatment is heated to a temperature of 80° to 105° C., and preferably to 90° to 100° C., and by thereafter removing the bark from the logs while in a hot and moist condition in a decorticating drum of a type known as such.

An important feature of the invention is also the fact that only a relatively small quantity of water, preferably about 0.1 cubic meter per each cubic meter of stacked timber, has to be circulated through each container.

The operation of the method according to the invention may be carried out at a maximum of economy if the apparatus is provided with a plurality of pretreatment containers, the number of which corresponds to the quotient of the time required for soaking the cambium zone of the lumber and the time required for decorticating one charge of lumber in the decorticating drum. The containers are thus filled one after the other with a charge of timber, and the time required for each filling operation and the interval between successive filling operations is gauged as to correspond to the length of time required for one complete operation of the decorticating drum on one such charge of logs. The drum used according to the invention may be of a type known as such. However, its operation is continuous, consisting of the successive steps of filling it with the pretreated charge of lumber of one container, decorticating such charge, rolling the drum from its treatment bath upwardly about its own axis along an inclined runway, and then emptying it of its fully treated charge and returning it for the next filling operation from another container. Consequently, the decorticating drum never stands idle, and the entire method according to the invention is carried out continuously, resulting in a much higher output of fully decorticated logs than was attainable by previous methods.

According to one of these prior methods, the logs before being decorticated were heated by means of hot water or steam. The hot water then leached out the bark and took up the coloring substances therefrom. This colored water was then absorbed by the wood of the logs, thereby discoloring or darkening the wood so that its value for a subsequent production of fibrous material was considerably reduced. According to the present invention, this disadvantage may be overcome by first treating each charge of logs in a separate container by means of water of a relatively low temperature so that the outer portions of the logs will be saturated with clear water, the coloring substances will not be leached out of the bark, and the fibers of the wood will not become discolored.

It has further been found that by such treatment of the logs and by then gradually increasing the temperature of the water, and decorticating the logs immediately while still in a hot and moist condition, the bark may be more easily and completely removed than if the logs are

"quenched" in cold water before being decorticated. Thus, for example, it was found in a comparative test in which the bark was removed by a jet of water that, if the logs were treated according to the invention for only one-half the length of time required when treated with steam and thereafter with cold water, they only retained one-half of the residue of bark as the other logs. Furthermore, the logs as treated according to the invention showed a degree of whiteness which could be attained on the logs which were treated according to the known methods only after they were subjected to a special bleaching process.

As already indicated, another important feature of the new method is its low consumption of water, which, for example, amounts to no more than $\frac{1}{5}$ to $\frac{1}{10}$ of the quantity required by previous methods. Furthermore, the final production output of an apparatus according to the invention is much higher than that of one of the known apparatus of similar size. The superiority of the new method both insofar as its rate of output, the quality of the decorticated lumber and the degree of decortication are concerned will be particularly apparent if the pretreatment of the logs is carried out in a plurality of containers, each of which is filled with a separate charge of logs within the period required for one complete decortivating operation.

Further objects, features, and advantages of the present invention will be apparent from the following detailed description thereof, particularly when read with reference to the accompanying drawings, in which—

FIG. 1 shows a side view, partly in cross section, of an apparatus adapted for carrying out the method according to the invention; while

FIG. 2 shows a plan view thereof.

Referring to the drawings, the apparatus according to the invention consists primarily of a plurality of pretreatment containers 1 to 5 arranged adjacent to each other, a decortivating drum 7 which is rotatably mounted so as to be partly immersed in a container 6, and an inclined runway 8 which permits the decortivating drum to be quickly emptied.

Each of the pretreatment containers 1 to 5 has a substantially rectangular shape and has at its upper side a cover 9 which is adapted either to be pivoted upwardly or lifted up entirely to permit such chamber to be filled with logs 13. At the side facing toward the decortivating drum 7, each container 1 to 5 also has a discharge gate 12 which is pivotable toward the outside.

For easily removing the logs 13 from each container, the bottom of each container 1 to 5 supports a false bottom plate 14 which is pivotable upwardly toward the discharge gate 12 by means of a rope, chain or the like 16 connected to its free end 15 and adapted to be drawn upwardly by a suitable draw gear, crane or the like, not shown.

For spraying the logs 13 in the pretreatment containers 1 to 5, a separate vessel 17 is provided underneath the bottom of each container and connected thereto so as to communicate with the inside thereof. This vessel is adapted to receive the circulating liquid on its return from the respective container. The liquid is then passed by a pump 18 from vessel 17 to a heater 19 and then through a conduit 21 to a sprinkling system 22 mounted in the upper part of containers 1 to 5.

Heater 19 is preferably heated by means of exhaust steam supplied under a pressure of up to 8 atmospheres from a steam pipe 23 through a temperature control valve 24.

For filling the circulating system with the required quantity of liquid, a valve system 25 is provided between container 17 and pump 18 and connected to a feed line 26.

Underneath and at one side of decortivating containers 1 to 5 facing toward discharge gates 12, a decortivating drum 7 is mounted, operating in the usual manner known

in the art. A chute 27 is mounted underneath gates 12 on the frame supporting the containers 1 to 5 and extends entirely across these containers and at a downwardly inclined angle toward drum 7. When one of gates 12 is opened, chute 27 guides the material 13 from the respective container 1 to 5 toward and into an opening 29 in the outer wall 28 of drum 7. This opening 29 may be closed by means of a cover 31 which may be lifted and lowered, for example, by a suitable hoist or the like, and should be firmly secured to drum 7 before its operation is started.

In order to attain an economic operation of the entire apparatus, it is necessary according to the invention to provide suitable means for emptying drum 7 as quickly as possible. For this purpose, an inclined runway 8 is provided at one side of drum 7 consisting of two or more parallel rails 33 which extend from a point within container 6, on which drum 7 is mounted so as to dip deeply into the same, to a level above the ground from which drum 7 can be conveniently emptied through opening 29 after cover 31 has been removed. For drawing drum 7 upwardly along rails 33, suitable means may be provided, as indicated diagrammatically at 34, which may, for example, consist of a winch or the like, not shown, a pair of pulleys 36 on a common shaft 35, a pair of draw sleeves 38 over the ends of shafts 37 of drum 7, and a pair of ropes or cables connected to draw sleeves 38 and extending over pulleys 36 to the winch.

The operation of the apparatus is as follows:

The individual pretreatment containers 1 to 5 are filled alternately and at certain periodic time intervals relative to each other with the material to be treated. These time intervals are gauged so that each interval corresponds to the period of revolution of drum 7 as required for decortivating one charge of one of containers 1 to 5 plus the time required for filling and emptying the drum. Due to such order of succession of filling the individual containers and pretreating their charges of logs there will always be one pretreated charge ready and available in one container to be further treated in the decortivating drum 7.

If, for example, the charge of container 2 has been fully decorticated in drum 7, the charge of container 3 will be ready for further treatment. After the charge of the last container 5 has been treated in drum 7 a new charge in container 1 which has in the meantime been sufficiently pretreated therein will be ready to be inserted into drum 7.

The operation of the apparatus may now be further illustrated by an actual example which was carried out to test its advantages.

A charge consisting of 16 cubic meters of stacked logs of medium thickness was filled into one of the containers 1 to 5 which was then closed. This required approximately 30 minutes. Approximately 1.5 cubic meters of water of a temperature of about 45° C. was then filled into the container and circulated therethrough. Within 45 minutes of such circulation the water was heated to a temperature at the discharge point of 90° C. and maintained at such temperature for 4 hours. The logs were then removed from the container and dumped into the decortivating drum 7. This operation required approximately 3 minutes. The logs were removed from drum 7 substantially clean of any residue of bark and then either subjected to further treatment or stacked.

Since the apparatus had five containers 1 to 5 which were filled and emptied one after the other at every 80 minutes, the decortivating drum 7 could always be refilled with a new charge of soaked logs immediately after it was emptied of the previous charge. Accordingly, a charge of soaked logs is introduced into the decortivating drum every 80 minutes. The total output of the five containers of the decortivating apparatus within a period of 24 hours amounted to 280 to 300 cubic meters of stacked logs at a total water consumption of about

0.08 cubic meter of water per each cubic meter of stacked lumber. The degree of whiteness of the unbleached wood fibers of the logs as measured by a photoelectric meter, a so-called photo volt meter, was about 3.5% higher than the degree attainable with the conventional processes in which the logs were treated with steam and cold water.

Although my invention has been illustrated and described with reference to the preferred embodiments thereof, I wish to have it understood that it is in no way limited to the details of such embodiments, but is capable of numerous modifications within the scope of the appended claims.

Having thus fully disclosed my invention, what I claim is:

1. A method of decorticating logs of any shape, comprising the steps of first saturating the outer layers of the logs in a watery liquid of relatively low temperature substantially without bleaching out any coloring substances of the bark so that said liquid will remain substantially clear and will not discolor the wood of said logs, then gradually heating said watery liquid to a temperature near the boiling point and maintaining such temperature for a period of approximately four to ten hours, and immediately thereafter removing the bark from said logs by the action of frictional forces while the logs are still in a hot and moist condition.

2. A method as defined in claim 1, wherein the watery liquid used in the saturating and heating the logs is circulated through the charge of logs during the soaking and heating of the logs, and wherein the amount of said watery liquid is approximately 0.1 m.³ of water per each cubic meter of logs.

3. A method of decorticating logs of any shape comprising the steps of first saturating the outer layers of the logs in a watery liquid, then gradually heating said liquid to a temperature near the boiling point and maintaining such temperature for a period of 4 to 10 hours, depending upon the particular type of wood, and immediately thereafter inserting the logs into a decorticating drum and removing the bark from the logs in said drum while said logs are still in a hot and moist condition.

4. A method of decorticating logs of any shape in a continuous operation comprising the steps of periodically inserting separate charges of logs into a plurality of containers at spaced time intervals, saturating the outer layers of the logs in each container in a watery liquid of a relatively low temperature, then gradually heating said watery liquid to a temperature near the boiling point and maintaining such temperature in each container for a period

of approximately four to ten hours depending upon the particular type of wood, then subjecting the charge of logs of the first container to a decorticating process immediately after being removed from said container and while still in a hot and moist condition, immediately thereafter subjecting the charge of logs of the second container to said decorticating process, continuing such operation with the charges of the remaining containers, and successively refilling the emptied containers and pretreating the logs therein while the charges of the other containers are being decorticated.

5. A method of decorticating logs of any shape in a continuous operation comprising the steps of periodically inserting separate charges of logs into a plurality of containers at spaced time intervals, saturating at least the outer layers of the logs in each container in a watery liquid at a temperature of approximately 45° C., then gradually heating said watery liquid to a temperature near the boiling point thereof and maintaining such temperature in each container for a period of 4 to 10 hours, depending upon the particular type of wood, then subjecting the charge of logs of the first container to a decorticating process by first removing the pretreated logs from said first container, inserting said charge directly into a decorticating drum, and immediately thereafter removing the bark from the logs in said drum while still in a hot and moist condition, and then emptying said logs from said drum, immediately thereafter filling said drum with a second charge of logs from the second container and decorticating said logs, then while continuing such operation with the charges of the remaining containers periodically refilling the containers from which the logs have been removed and pretreating the new logs therein, so that said drum will remain in continuous operation of being filled, of decorticating the successive charges of logs and of having them removed from said drum.

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