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K. MIEDLER

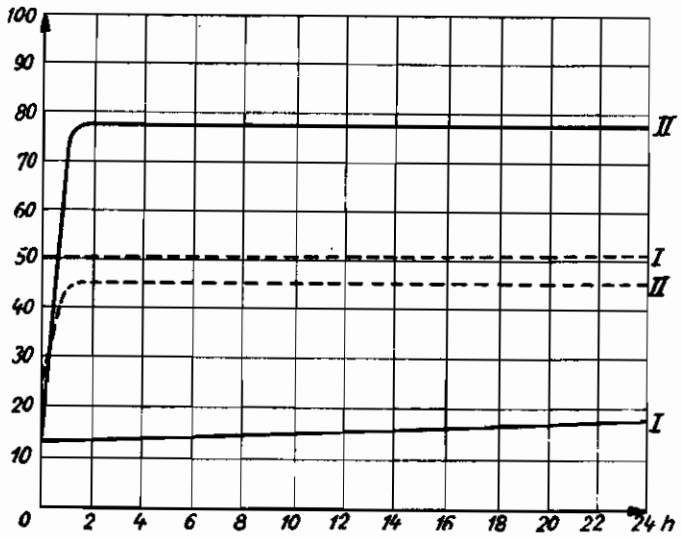
PROCESS FOR THE PRELIMINARY TREATMENT OF WOOD

Filed June 27, 1939

Serial No. 281,416

2 Sheets-Sheet 1

Fig. 1



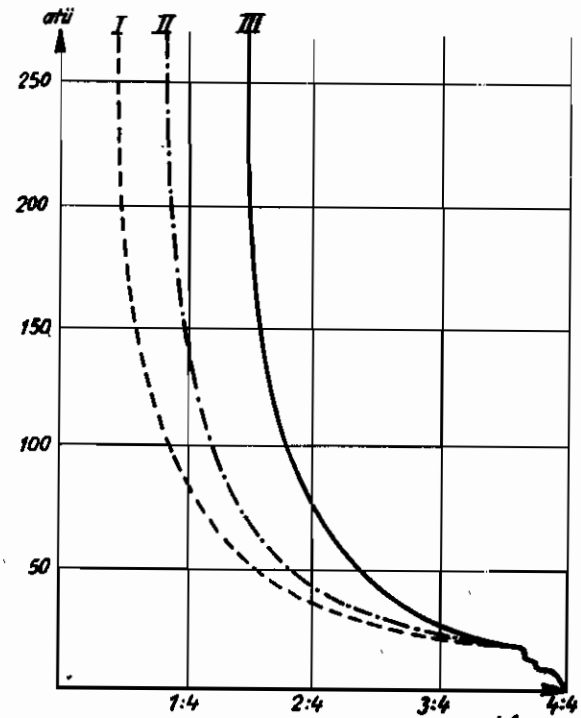


Fig. 2

Inventor

KARL MIEDLER

By Beau, Brooks, Buckley & Beau.

Attorneys

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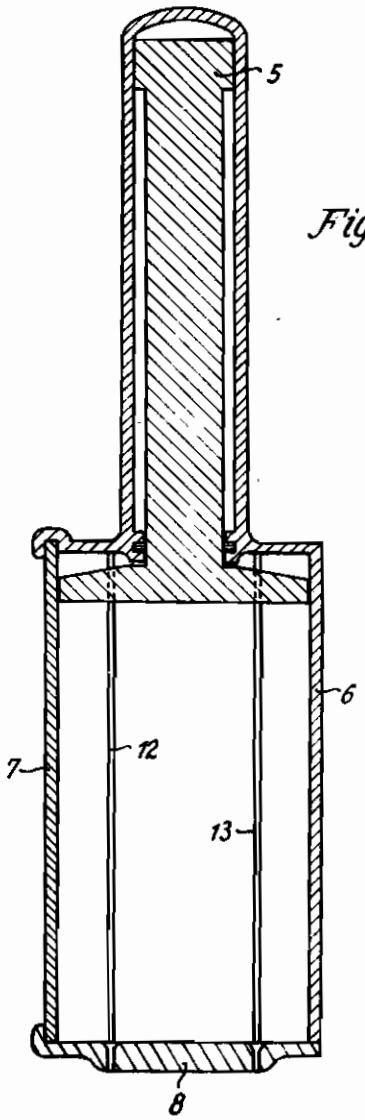
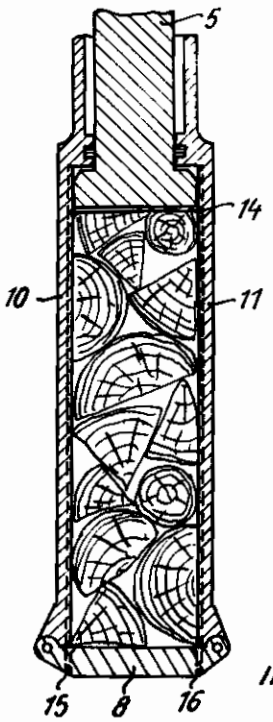


Fig.3

Fig.4



Inventor

KARL MIEDLER

By

Beau, Brooks, Buckley & Beau.

Attorneys

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ALIEN PROPERTY CUSTODIAN

PROCESS FOR THE PRELIMINARY TREATMENT OF WOOD

Karl Miedler, Tharandt, Germany; vested in the Alien Property Custodian

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It is known to compress wood, particularly wooden veneers, in order to vary its mechanical properties, such for example as its power of resistance to fracture, its superficial hardness or the like so as to improve these properties. This compression is frequently carried out at a high temperature, after previously steaming the wood or with the help of other measures such as the use of binding agents for example.

The present invention relates to a preliminary treatment of wood, which likewise makes use of compression, but does not aim at any consolidation of the wood, on the contrary its aim is to act upon its cellular structure only transitorily. The treatment of wood according to the present invention consists in compressing the wood in large pieces of rough form such as cuttings from tree trunks, logs or billets, sticks, rolls, etc., the wood being compressed transversely to the direction of the fibres to a fractional part of its volume. This process is intended to be used in particular for wood the cellular structure of which is to be subsequently opened up for the purpose of manufacturing paper, cellulose and the like therefrom, and can therefore serve as a preliminary stage in the usual process of opening it up, e. g., the boiling process.

The result of the application of the process according to the present invention is a double one. By the compression of the cut up wood without any additional treatment, a considerable saving is obtained in space required for transport particularly in the case of woods of light weight in proportion to their volume. The invention therefore provides a decisive means of importing overseas woods, such as elk tree wood or the like, the cost of freight for which is otherwise intolerable.

The charging of the boilers in which the wood is boiled for the manufacture of paper and other disintegrating operations carried out can be considerably increased by the use of the present invention, so that the expenditure of liquor or lye and the cost of heating, etc., is rendered particularly economical.

The invention is however as experiments have shown of special advantage in that the compressed wood possesses an astounding power of rapidly absorbing into itself a considerable amount of liquid and swelling up in doing so very nearly to its original volume, the liquid moreover not only penetrating into the marginal zones of the wood but saturating it completely.

In this way the process according to the present invention is of extraordinary importance as a preliminary treatment of woods previous to a disintegrating process, as it renders possible a hitherto unknown intensive and rapid penetration of the liquor or lye into the wood, thereby shortening the time required for boiling and also ensuring a uniform opening up of the fibrous structure of the wood whilst being boiled, without the undesirable formation of zones which, in the known processes frequently leads to the destruction of the outer layers of the fibres, before the inner parts of the wood have been properly opened up. By means of the present invention therefore the total yield of cellulose, in proportion to the dry substance of the boiler wood, can be considerably increased, as there are no parts which have been opened up too much and which otherwise yield fibrous materials which are quite unusable or are of inferior quality.

The surprising degree in which the process according to the present invention increases the power of wood to absorb liquids is shown in the accompany Fig. 1 by a diagram which reproduces the results of comparative tests.

Of two equal squared pieces of elk tree wood (Musanga Smithii) of the same natural weight in proportion to their volume one was laid in water untreated and the other after having been compressed to one fourth of its volume. The abscissae of the diagram give the time of immersion in hours while the ordinates show on the one hand the increase in weight (absorption of water) in grams and on the other hand the increase in volume in millimetres. The curves drawn in solid lines relate to the absorption of water, those drawn in dotted lines to the increase in volume.

The untreated sample of wood I had accordingly absorbed only 50% of its weight of water in 24 hours, while its volume had risen by about 2%. The pressed sample II had absorbed even after 1½ hours 500% of its weight in water, its original volume having almost been restored, notwithstanding the great pressure to which it had been subjected.

Fig. 1 shows the special importance of the idea on which this invention is based, at once. The pressing of the wood not only effects the above mentioned economical and decisive cheapening of the transport thereof, but also makes it possible, in a manner which has been hitherto entirely unknown, for the wood to absorb the liquor or lye in a surprisingly rapid and complete manner into its innermost zones whilst being opened up.

Fig. 1 also shows that according to the subsequent use to which the wood was to be put, that

it would also be imaginable to press light wood at the place where it was felled and cut up and then to convey it to some place oversea where it could be treated and finally bring it to substantially its original volume again by absorption of water, after which it could be dried by one of the usual processes, e. g., heating, vacuum or the like and mechanically worked up in the form of pieces.

The pressure under which the process according to the present invention is to be carried out, may vary according to the kind of wood treated, the degree of compression necessary and the behaviour of the wood desired after pressing.

Specific pressures of about 100 to 150 atmospheres above atmospheric pressure under which the wood is compressed to about one fourth of its original volume may however be used with particular advantage. The accompanying Fig. 2 shows this by means of curves the abscissae of which indicate the reduction in volume and the ordinates the specific pressure. Curve I shows the maximum compression of regular experimental bodies of elk tree woods, curve II shows the re-expansion which takes place after the pressure has been taken off and curve III the permanent reduction in the volume of the wood.

From Fig. 2 it can be seen that above 150 atmospheres above atmospheric pressure only a compression which takes place substantially asymptotically ensues, whereas below about 100 atmospheres above atmospheric pressure the permanent elastic part is too great for the normal case.

In all cases it is advisable, in view of the possible premature reexpansion of the pressed wood, particularly when it is intended for prolonged transport, to provide the bundles of pressed wood with a binding material which does not expand, e. g., iron bands.

To carry out the process according to the present invention any desired kind of press, such as a hydraulic press for example, may be used, which may be stationary or capable of being moved about from place to place. The latter type of press, which may be driven by the engine of a tractor for example, has the advantage that it can be erected at the place where the wood is cut.

Investigation of the pressing operation shows that in the first part of it, which extends to about two-thirds of the stroke of the ram, really only a closer piling up and initial consolidation of the separate pieces of wood takes place, and that accordingly the ram of the press can be moved comparatively rapidly and with but a slight expenditure of force during this part of the operation. In the second part of the pressing operation however it is necessary to allow the ram to act more slowly and to work the press at a higher pressure. For this reason it is preferable to use a press which works in two or more stages, and the stages can be arranged to come into action automatically.

In view of the fact that the logs of wood or the like must all be arranged in layers in a definite direction when being pressed, it is preferably to use a horizontal press with a horizontally working ram. In Fig. 3 is shown a vertical section and in Fig. 4 a horizontal section through a diagrammatic construction of a press such as should be used for carrying out the process according to the present invention. 5 denotes here for example a hydraulically controlled press ram, which is moved horizontally in a press cylinder 6. The press cylinder 6 is preferably so constructed that both the upper wall 7 and also the back wall 8 can be removed, i. e., swung aside or lifted off. After removing the top cover the wood can then be placed in the cylinder of the press from above as shown in Fig. 4, while after the conclusion of the pressing operation and after the removal of the back cover 8 the compressed bundle of wood can be expelled by the ram.

Instead of the top cover of the press being made removable one side wall thereof may naturally be made capable of removal, so that the wood can be packed in layers into the cylinder from the side thereof.

The principal reason why the wood is used in the form of rough pieces in this operation is that its fibres can be easily arranged transversely to the direction in which the ram of the press moves. Experiments have shown that when wood is pressed in the direction in which the fibres run the object aimed at by the present invention cannot be attained, particularly for the reason that the fibres of the wood are crumpled up and burst. If therefore the wood were to be pressed in a finely subdivided form, say in the form of chips for example, uniform alignment of the fibres transversely to the direction in which the ram of the press moves would be impossible or at least uneconomical.

Figs. 3 and 4 show simultaneously an arrangement which makes it possible to bundle the pressed wood in a convenient and reliable manner. For this purpose there are provided in opposite walls 10 and 11 of the press cylinder one or more parallel grooves 12, 13 which run parallel with the direction of the pressure and in which before the cylinder of the press is filled, strips of iron band or the like can be laid in the form of U-shaped stirrups or yokes which are open towards the removable back cover 8 of the press and are of a suitable length of limb. The free ends of these stirrups or yokes 14 are forced as the ram of the press moves forwards through guides 15, 16 in the bottom cover 8 in an outward direction and after the bottom cover of the press has been removed previous to the expulsion of the pressed bundle of wood are connected to each other in any suitable manner.

It is of course possible to bundle the wood in other ways as for example by adding to the press cylinder instead of the bottom cover 8 an apparatus by which the pressed wood is pushed against a band which can be unwound from a stock roll and which after the wood has been completely expelled from the cylinder of the press can be closed on the side of the wood next to the ram.

KARL MIEDLER.