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APPARATUS FOR DIGESTING CELLULOSE MATERIAL

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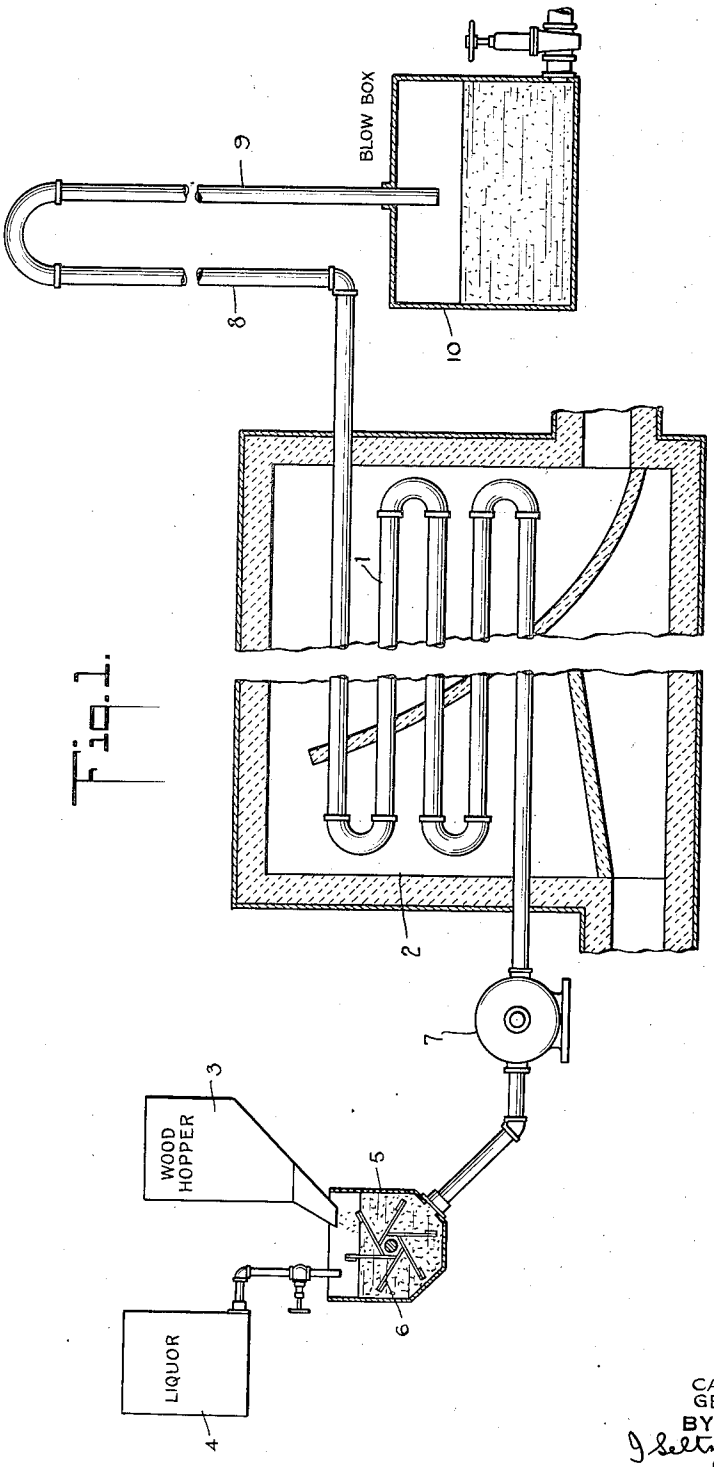


Fig. 1.

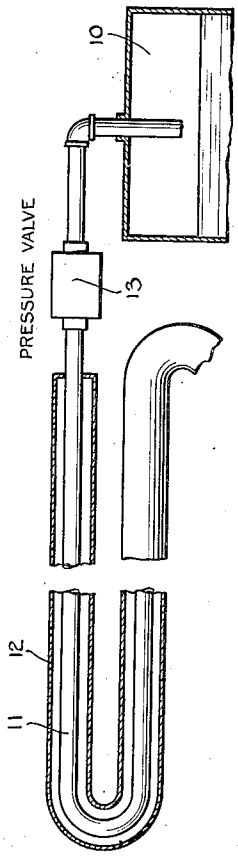


Fig. 2.

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APPARATUS FOR DIGESTING CELLULOSE MATERIAL

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1 Claim. (Cl. 92—7)

This invention relates to the digestion of cellulosic material to liberate the cellulose fibres, and relates more particularly to the digestion of wood to form wood pulp in an economical and safe manner.

An object of our invention is to provide means for digesting cellulosic material in a continuous manner, whereby the process may be carried out more economically and safely than by prior methods. Other objects of our invention will appear from the following detailed description.

In the preparation of chemical wood pulp in accordance with prior practice, chips of wood are treated with suitable chemical solutions in very large digesters at very high temperatures and at pressures of several atmospheres. This method is open to many serious objections. The large digesters are quite expensive since they must be built to withstand high temperatures and pressures. Moreover such digesters often are corroded by the chemicals used in the digestion and develop hidden defects which sometimes cause disastrous accidents due to the digester giving way with explosive violence.

We have found that cellulose-bearing material may be purified in a continuous manner in relatively inexpensive apparatus by causing the same to pass together with the purifying chemicals continuously through a passageway while at the required high temperatures and under the high pressures necessary to effect the desired degree of purification of the cellulosic material.

In accordance with our invention we digest cellulose-bearing material in a continuous manner by causing the same to pass continuously together with a chemical liquor adapted to liberate the cellulose through a passageway where it is subjected to the required temperatures and pressures and then continuously discharging the material.

Any suitable cellulose-bearing material may be treated by this invention such as soft wood or hard wood, straws, grasses, stalks etc. The wood may be in the form of chips, sawdust, ground pulp or in any other suitable form.

Any chemical liquor may be employed for purifying the cellulose-bearing material. If the sulfite process is employed the liquor may be a solution of the bisulfite of calcium or magnesium, or of sodium sulfite. A solution of caustic soda may be employed for the soda process, or a solution containing caustic soda and sodium sulfide may be employed for the sulfate process.

Any suitable form of apparatus may be employed for carrying out this invention. The mixture of the chemical liquor and wood in suitable form may be passed through heated passages, such as pipes, coils and the like that are maintained at the required pressure and until the required temperature is attained. The pipes or coils may be heated by means of combustion gases in a furnace, by means of steam or hot liquids in a jacket surrounding the same, or by the injection of steam under pressure, or in any other manner. The required pressure may be maintained by a pressure release valve at the exit of the passageway, or the pipes or coils may be connected with stand pipes of sufficient height so as to develop a hydrostatic pressure corresponding to that required. The length of the passage and the rate of flow is regulated so that the wood or like material is subjected to the treatment for the required period of time.

As to the concentration of the chemical liquors, temperature, pressure and time of treatment, these will vary with the nature of the purifying chemical employed, and the degree of purity of the cellulose desired. Thus if calcium bisulfite is employed, the pressure may be 70 to 90 lbs. per square inch, the final temperatures 140 to 160° C., and the total time of treatment 2 to 12 hours. If a solution of caustic soda of 21 to 25% concentration is employed as the purifying agent, the pressure may be 75 to 140 lbs. per square inch, the final temperatures 160 to 190° C., and the total time of treatment 4 to 8 hours, the proportion of liquor being of the order of 1600 gallons per ton of pulp.

After the mixture is passed from the treating device, the waste liquor is separated from the pulp, and the pulp is washed in beaters, and may be bleached and given any other desired treatment in any known or suitable manner.

The cellulose material prepared in this manner may be employed for chemical transformation, such as making cellulose acetate, cellulose nitrate, viscose, etc., or it may be employed for the making of paper.

For further illustration of this invention, reference is had to the accompanying drawing, which shows diagrammatically two of the many modes of carrying out this invention.

Fig. 1 is a vertical cross-section of a diagrammatic showing of one mode of carrying out this invention, and

Fig. 2 is a fragmentary cross-section of a diagrammatic showing of another mode of carrying out this invention.

Referring to Fig. 1, a pipe or coil 1 is provided in the furnace 2. The pipe or coil 1 is of sufficient

length so that the time required for the material to pass therethrough is sufficient to cause the required purification of or chemical action on the wood or other cellulose-bearing material.

Wood or other cellulose-bearing material, in the form of chips, sawdust or ground pulp, is supplied from the hopper 3, and sulfite, soda or other liquor is fed from the supply tank 4, to the mixing vessel 5, where the rotating paddle 6 causes the wood material to be submerged under the liquor. The mixture of liquor and wood material is drawn from the vessel 5 by the pump 7 and forced into the heating coil 1, which is under pressure imposed by the hydrostatic pressure of the liquor in the tall stand pipe 8, the height of this pipe 8 being approximately 2' for each pound per square inch pressure that is to prevail in the coil 1. The mixture of digested wood and spent liquor is then conveyed by pipe 9 to the blow box 10, from which is drawn to the washers, beaters, bleachers, etc.

In Fig. 2, a modification of means for heating the digestion coils and for imposing pressure is shown. In this modification, the coil 11 is surrounded by the pipe 12 to provide a jacket through which steam under pressure, and heated gases, or hot liquids of high boiling point are circulated to heat the contents of the coil 11. At the exit of the coil 11, a pressure release valve 13, which is set at the desired pressure, is provided. After passing the pressure valve 13, the digested wood and spent liquor is led to the blow box 10.

It is to be understood that the foregoing description is given merely by way of illustration and that many variations may be made therein without departing from the spirit of our invention.

Having described our invention, what we desire to secure by Letters Patent is:

In apparatus for digesting wood, the combination of a furnace, an elongated pipe or coil in said furnace, means for feeding wood and a chemical liquor to said pipe or coil, means for imparting super-atmospheric pressure on the contents thereof, and means permitting the discharge of the contents from the pipe or coil.

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