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liquor is drawn out and stored in air tight lined tanks, until it is required for use.

The real process of pulp making begins when the chips and liquor are brought together in the digesters, which vary in size, and may be either upright or rotary. But the great difficulty in making digesters for this process, is to obtain a suitable lining which will protect the iron plate from the corrosive action of the sulphurous acid. The lining in the past has been generally in the form of lead linings, as they are but slightly acted upon by the acid, and are further protected by the coating of lead sulphate which forms. The objection to the use of lead, to overcome which many devices have been tried is the fact that it has about the co-efficient of expansion of iron, so that in alternate heating and cooling, it buckles and draws to such an extent as to soon necessitate repairs.

Bronze linings have been used with some success, and boiler scales in the form of sulphite of lime or silicates of iron and calcium have worked very well.

But the digester lining that takes the precedence and which is now being rapidly introduced is merely a layer of Portland cement about one inch in thickness, and this may be applied to the boiler directly or first made into slabs and then fitted in. At first it is more or less porous, but the interstices are soon filled by a deposit of sulphate and sulphite of lime which render it quite impervious. The cheapness of the application and repair of this lining will recommend its general adoption.

In a digester containing two cords of chips, about twenty-five hundred gallons of a three and one-half per cent. liquor is used. The temperature is raised slowly until after the wood has become saturated with the liquor, and then a steam pressure of sixty-five to eighty-five pounds is turned on, which is equivalent to a temperature of one hundred and fifty-five to one hundred and sixty-five degrees centigrade. At these high temperatures the bi-sulphite is decomposed into sulphurous acid, and the normal sulphite, which being insoluble, is deposited in the pipes or pulp. The sulphurous acid gas forms a hydrostatic pressure, which, added to that of the steam for the given temperature, gives the total pressure in the boiler.

Thus the pressure may be considerably increased by the formation of this gas, without an equivalent rise in temperature. On account of the greater convenience the digesters are heated by means of live steam, which, by condensing in the pipes, is continually diluting the solution, but by employing a non-conducting jacket very little difficulty is experienced in practice, especially when cement linings are used.

At the end of the cook the gas is nearly all blown off and then the pulp is blown out under a pressure of about thirty pounds. This saves time in handling and the trouble of heating. It must now be thoroughly washed to remove any the precipitated sulphite, especially when leaching is to follow, for the sulphite is a strong color itself, as it takes up the free oxygen

formed by the action of the chlorine

The pulp is never a pure, permanent white until after the ligneous and coloring matters remaining, have been broken up and removed by the action of a bleaching agent. The true bleaching action is purely an oxidization, which breaks up the coloring matters into simple colorless oxidized derivatives. With bleaching powder (Ca O Cl_2) the chlorine unites with the hydrogen of the water and this action liberates the oxygen which does the work. Pure oxygen, ozone or hydrogen peroxide, may also be used with equal effect. On the other hand the bleaching action of sulphurous acid is of a quite different character, for it combines with the coloring matters to form colorless compounds, which are easily reduced with a return of the color when the acid is neutralized.

You will naturally wonder what becomes of the waste liquor in this process, and this is one of the problems that has been left for this country to decide. In some places the gas is recovered but the general practice is to dump the liquors into the nearest pond or stream to get rid of them. This not only means a loss of half the woody structure and the gas in solution, but the effect of these liquors in fishing streams is remarkable. The sulphurous acid being a reducing agent, combines with the free oxygen in the water, and the organic paste in the solution forms a coating over the gills of the fish, therefore the fish have left no atmosphere and could not breathe if they had. If the waste liquor is evaporated, the residue has no fuel value, therefore we must look in other directions for methods of conversion into valuable by-products. All that is known concerning the chemical composition of these liquors, is that they are sulphates containing the OCH_3 group. Future research may result in the manufacture of either glucose, alcohol, oxalic or acetic acid, from this organic residue.

Resinous woods are not very suitable for pulp making, as the resins are insoluble in hot bi-sulphite solutions, and although they are dissolved by the alkaline solvents, every hundred parts of resin will neutralize eighteen parts of the alkali.

Woods such as chestnut, which contain tannin, should not be treated by the sulphite process, as the tannic acid would act as an oxidizing agent, converting the sulphurous into sulphuric acid. Spruce and poplar are used almost exclusively in the sulphite process.

TO ASSIST PULP MAKING.

An act was passed by the British Columbia Legislature, at its recent session, to assist the development of the pulp industry in that province. The bill reads as follows:

Whereas it is expedient to encourage the manufacture of wood pulp and paper; therefore, His Majesty, by and with the advice and consent of the Legislative Assembly of the Province of British Columbia, enacts as follows:

This act may be cited as the "Wood Pulp Act, 1901." It shall be lawful for the Chief Commis-

sioner of Lands and Works to enter into an agreement or agreements with any company holding any water records or water privileges under the "Water Clauses Consolidation Act, 1857," and amending acts, by which on the erection and completion by the company of a pulp or paper mill of such capacity as shall be provided for in such agreement, all said water records or water privileges held by the company shall be reserved to the company without liability to forfeiture, except for non-payment of fees, for a period not exceeding twenty-one years from the date of such agreement, and providing for the payment of fees to the government of British Columbia for the said period of twenty-one years in accordance with the schedule of fees which shall be in force at the date of the said agreement. After the said period of twenty-one years, the scale of fees shall be fixed under such conditions and regulations as may be deemed advisable and determined by the Lieutenant-Governor-in-Council. The said agreement may contain such terms and conditions as the Lieutenant-Governor-in-Council may deem advisable.

PULP NOTES.

—It is said that J. B. Klock of Klock's Mills, Ont., is talking of erecting large pulp and saw mills at Les Erables, near Mattawa, Ont.

—The dispute over the location of the pulp mill of the Blanche River Pulp & Paper Company has been settled, and it is expected that the mill will be built at Mattawa, where there is reported to be ample water power.

—A meeting of the creditors of the Consolidated Pulp & Paper Company, of Toronto, has been called. The company was organized last year, with a capital of \$500,000, and recently took over the paper mills of Thompson Bros. at Newburg, Ont.

—William Kennedy, jr., of Montreal, consulting engineer for the Hull & Ottawa Power, Pulp & Paper Company, is preparing plans for the improvement of the water power and for the power house and pulp and paper mills. The company have recently acquired the rights of the portion of the Table Rock water power formerly owned by Alex. Fraser.

—The Inglewood Pulp & Paper Company held a meeting in St. John, N.B., recently at which it was decided that the saw mill at Musquash should be continued to be operated this season, and that in the fall steps would be taken to erect pulp and paper mills. The directors elected include Duncan Stetson, George McAvity and G. Mullins, of Bangor, Me., B. F. Pearson, of Halifax, and Chas. Burill, of Weymouth, N.S.

—A syndicate has been formed to build a pulp mill at Petawawa, on the Ottawa river, ten miles above Pembroke, Ont. Messrs. J. W. Munro, M. P.P., of Pembroke, and A. T. Mohr and J. C. Scovel, of Buffalo are the promoters. The extent of pulp limits to be set apart has not been decided by the Government, but the syndicate has been granted the necessary water power. The agreement calls for the erection of a mill of a daily capacity of 50 tons.

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