

I. KITSEE.

PROCESS OF TREATING THE SPENT LIQUOR OF PAPER MILLS.

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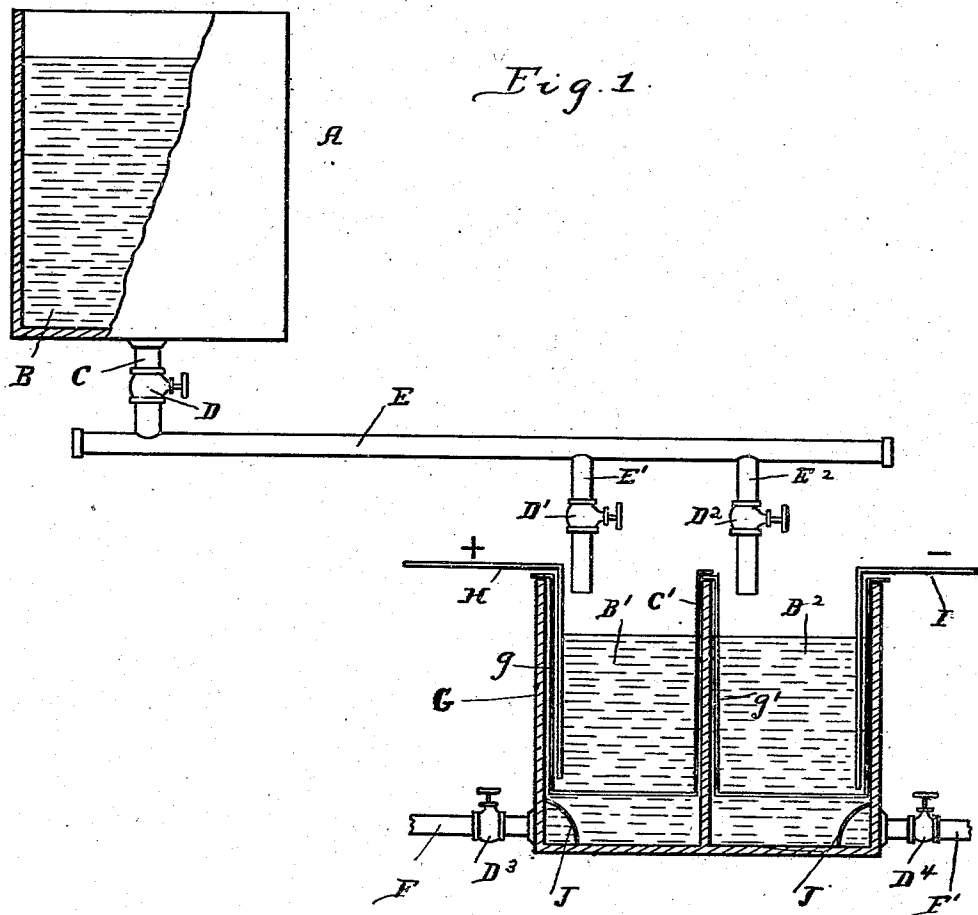
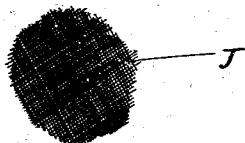


Fig. 2.



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PROCESS OF TREATING THE SPENT LIQUOR OF PAPER-MILLS.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, ISIDOR KITSEE, of the city and county of Philadelphia, State of Pennsylvania, have invented a certain new and useful Improvement in the Process of Treating the Spent Liquor of Paper or Pulp Mills, of which the following is a specification.

My invention relates to an improvement in the process of treating the spent liquor of paper or pulp mills, so as to be enabled to extract from said spent liquor the caustic or alkali, and also to extract from said liquor the resinous and allied substances, and it is the further aim of my invention, to prepare the reclaimed caustic or alkali in a manner so as to impart to the same the causticity necessary for its reemployment.

In the process of producing paper from wooden fiber, the wood is either cut or ground into pieces of convenient size and then boiled in a caustic or alkaline solution. Through this process, all the intercellulose substance, such as resinous material, etc., is extracted from the wood and dissolved in the caustic or alkaline solution. To reclaim the caustic or alkali, the solution is boiled down to a syrupy consistency and then fired, whereby the resinous matter becomes entirely carbonized. The residue is again dissolved in water, and then filtered. In this process, the resinous material is not only lost, but it requires a great amount of fuel to carbonize or burn up the same, so as to be enabled to reclaim the alkaline or caustic matter. In this process, a great amount of hydrated alkali has always to be added to keep up the causticity, as it is technically called.

It is one of the aims of my invention, to dispense with this cumbersome process and to reclaim the caustic, and also the resinous material, and to bring the caustic to the required degree in a simple and efficient manner.

One of the methods of practicing this my invention is as follows:—The spent liquor is made the electrolyte in an electrolytic apparatus consisting of two compartments, a positive compartment and a negative compartment, preferably separated from each

other by a porous septum. Each of these compartments is provided with an electrode, the electrode of the negative compartment may consist of copper, iron or lead or other suitable conductor, but the electrode of the positive compartment should consist if possible of a material not injuriously affected by the electrolyzing action of the current, such for instance as platinum, but as the price of this metal may be a bar to employing the same, lead, graphite, or carbon may be used instead. I am well aware that the lead will slowly oxidize and may even impart to the liquid in the positive compartment a reddish tint, but as the liquid contents of this compartment will not be used for any other purpose than for separating the resinous material, this action of the current will not be detrimental enough to prevent its use. The connection of the two electrodes as to the charging current is as usual. The negative electrode or the electrode contained in the negative compartment is connected to the negative pole of the charging circuit, and the electrode contained in the positive compartment is connected to the positive pole of the charging circuit. In a short time, the test will show that the contents of the negative compartment has acquired a stronger alkaline re-action than the contents of the positive compartment. In my experiments, I have generally added a slight amount of sulfuric acid in the positive compartment, so as to hasten the separation of the resinous matter from its liquid contents. After the current has passed through the electrolytic apparatus for a sufficient length of time, it was found that all the alkali had accumulated in the negative compartment and all the acid in the positive compartment, but the liquid in the negative compartment remained surcharged with various matters and it needed a second process to clarify this liquid. In my later experiments, I therefore used the following arrangement:—I placed the spent liquor only in the positive compartment of the electrolytic apparatus containing two compartments, using in the second or negative compartment plain water, and as this water has to be made more conducting and

as it was necessary to add to the resulting caustic liquid of the former experiments more caustic, I added to the plain water a chlorid of sodium, known in commerce, as common table salt. Through this arrangement, I gained the following points:—First, through the electrolyzing action of the current, the chlorid of sodium separates in its two elements,—chlorin, which goes to the positive compartment, and sodium, which remaining in the negative compartment, becomes a hydrated caustic. Second,—through the presence of chlorin, the contents of the positive compartment becomes aciduous and the resinous material thereby coagulates and separates out of the liquid. Third,—the liquor in the negative compartment remains clear and unadulterated. Fourth,—the necessary degree of causticity is imparted to the liquid. But, it is obvious, that to regain for the negative compartment the degree of causticity required will take a greater length of time than if part of the spent liquor would have been therein. And it is a matter to be decided by the person in charge of the plant, if the first method should be employed or if the second method is preferred in his particular case. In both cases, if the negative compartment consists at the beginning of pure water with an addition of salt, or consists in the beginning of spent liquor with an addition of salt, the resultant product is: in the negative compartment, an alkali, and in the positive compartment, the resinous material mostly floating on top, because of its fine subdivision, and the chlorin or chlorinated liquid. In such cases, where the spent liquor has only traces of resinous material, and where the causticity should be of a greater degree, the chlorin generated in the positive compartment will be in such superabundance that it will, in its gaseous state, leave the compartment and it is therefore advisable, for the purpose of protecting the atmosphere, as well as for the purpose of saving the chlorin gas, to close the positive compartment and to provide the same with an outlet pipe, preferably passing into a tank of water. This water, as well as the contents of the positive compartment, after being cleared from the resinous and allied matter, may then be used for the purpose of bleaching as is well known by persons versed in the art.

For such mills where my process is adapted, I would suggest that the usual high temperature should not be employed in the treatment of the wood fiber with the caustic liquor, as the lower the temperature adopted, the more perfect will be the state of the reclaimed resinous and other matter, and the better quality of the product more than repays for the greater length of time required.

In the accompanying drawing, in which Figure 1 illustrates in a partial section and partial diagram one arrangement in which an electrolytic apparatus is used to recover simultaneously the caustic and resinous substances, and in which Fig. 2 is a plan view of the material designed to strain the liquid,—A is the tank containing the spent liquor B, this tank is provided with the pipe C connected with the interposition of the valve D to the pipe E, having the branch-pipes E¹ and E², provided with the valves D¹ and D² respectively.

The electrolytic apparatus consists of the containing vessel G, here divided into two compartments B¹ and B², each filled with the necessary liquid. These compartments are divided by the porous partition C¹; the compartment B¹ is provided with the + electrode H, and the compartment B² is provided with the — electrode I. These two compartments are also provided with the removable receptacles *g* and *g*¹ respectively. These removable receptacles preferably consist of a material, such as a very closely woven wire gauze or textile, so as to be able to collect the mechanical impurities contained in the liquid to be electrolyzed, and also so as to be able to collect the resinous material and to have the drained-out liquids as pure and clarified as possible; for this reason I have also provided the guards J, J, which guards may consist of very closely woven wire gauze or textile. The compartment B¹ is provided with the outlet pipe F containing the valve D³, and the compartment B² is provided with the outlet pipe F¹ containing the valve D⁴. It is obvious that the arrangement of this electrolytic apparatus may differ and I have illustrated a form which I have found well adapted for the purpose.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. The process of treating spent liquor from paper or pulp mills which comprises placing the spent liquor in the positive compartment of an electrolytic apparatus, in placing a solution of salt in the negative compartment of said apparatus, in sending currents of electricity through said compartments whereby the solution in the negative compartment becomes alkaline and the intercellulose and resinous material is retained in the positive compartment.

2. The process of treating spent liquor from paper or pulp mills which comprises subjecting said spent liquor to the action of an electric current in the positive compartment of an electrolytic apparatus, the negative compartment of said apparatus containing a second conducting fluid.

3. The process of recovering the caustic

and resinous matter of the spent liquor from
paper or pulp mills, which comprises mak-
ing said spent liquor the anolyte in an elec-
tric apparatus and sending currents of elec-
5 tricity through said apparatus.

In testimony whereof, I hereby sign my
name in the presence of two subscribing wit-

nesses, this seventeenth day of February,
A. D. 1903.

ISIDOR KITSEE.

Witnesses:

EDITH R. STILLEY,
CHAS. KRESSENBUCH.