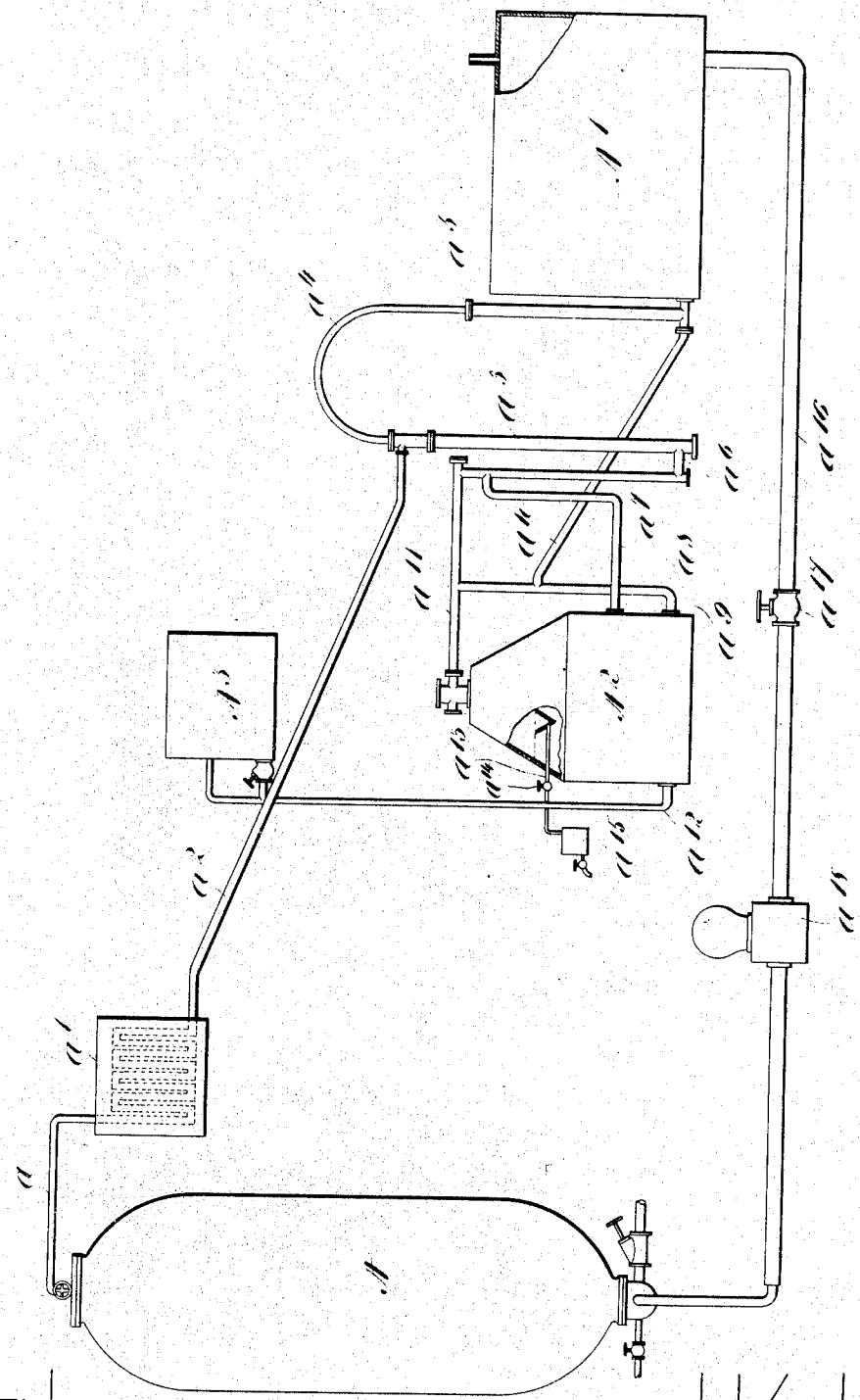
C. B. CLARK.

RECLAIMING APPARATUS FOR PULP MILLS.

APPLICATION FILED JUNE 6, 1908.

927,951. Patented July 13, 1909.



WITNESSES

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CHARLES B. CLARK, OF BANGOR, MAINE.

RECLAIMING APPARATUS FOR PULP-MILLS.

No. 927,951. Specification of Letters Patent. Patented July 13, 1909.

Application filed June 6, 1908. Serial No. 437,069.

To all whom it may concern:

Be it known that I, CHARLES B. CLARK, of Bangor, in the county of Penobscot and State of Maine, a citizen of the United States, have invented a new and useful Improvement in Reclaiming Apparatus for Pulp-Mills, of which the following is a full, clear, and exact description, reference being had to the accompanying drawing, forming a part of this specification, in explaining its nature.

My invention relates to an apparatus for reclaiming bisulfite liquor (and incidentally gas) discharged from the digesters during the digestive treatment of wood by the sulfite process to form wood pulp. The apparatus is especially adapted for carrying out the process of reclaiming the bisulfite liquor according to the process described in my pending application for Letters Patent of the United States filed June 12, 1907, Serial No. 378,507, in which liquor containing the constituents and extractives of the wood (which for the purposes of this application may be described as woody matter), are reclaimed by diluting the discharged liquor with fresh bisulfite liquor, which facilitates the separation of the woody matter contained in the discharged or combined liquors and after which separation the woody matter may be removed when the discharged liquor thus clarified and regenerated by the fresh bisulfate liquor may be used for further digestive purposes.

In the present apparatus my essential object is to provide for the clarification of the discharged liquor containing the woody matter by directing it to a tank separate from the so-called "reclaiming tank" in which the used liquors are ultimately stored for re-use, the discharged liquor being introduced into this auxiliary tank, maintained therein and diluted prior to its entry into the reclaiming tank. The particular manner in which this is done and the essential advantages accruing therefrom can better be understood and appreciated by describing the apparatus.

In the drawing the improved apparatus is shown diagrammatically in plan.

Referring to the drawing:—A represents a digester. Extending from the top of the digester is an outlet pipe a through which the gas and liquor discharged from the digester are adapted to pass. This pipe connects with a cooler a^1. From the cooler the outlet pipe is continued by a pipe a^2 connecting with a standpipe a^3. From the standpipe a^3 there extends upwardly a pipe a^4 which connects with a standpipe a^5 that communicates with a reclaiming and storage tank A^1 at a point preferably at or near its base. From the standpipe a^3 preferably at or near the bottom thereof there extends a pipe connection a^6 which connects with an upright pipe a^7. From the pipe a^7 there extends a pipe a^8 that connects with what may be termed a clarifying tank A^2, the pipe a^8 connecting with the body of this tank preferably at a point some little distance removed from the bottom thereof. From the tank A^2 there extends an outlet pipe a^9 extending from the tank preferably at or near the bottom thereof and extending upwardly alongside the same. Branching from this pipe a^9 is a pipe a^{10} which runs down to connect with the bottom of the standpipe a^5 and empties into the storage or reclaiming tank A^1. From the top of the clarifying tank A^2 there extends a pipe a^{11} with which pipe the upright pipes a^7, a^9 are preferably extended to connect. Connecting with the clarifying tank A^2 preferably at a point at or near the bottom thereof is a pipe a^{12}. This pipe a^{12} connects with a tank A^3 containing fresh bisulfite liquor and the pipe provides means by which liquor is led out of the tank A^3 into the clarifying tank A^2. The clarifying tank A^2 it will be observed is preferably made with a contracting top or head. Proceeding from this portion of the tank is an outlet pipe a^{13} controlled by a valve a^{14}. The pipe a^{13} empties into any suitable retort or receptacle a^{15}.

The aforesaid description is merely for the purpose of identifying the parts of the apparatus. Reference will now be made more particularly to the specific arrangement of them and their operation tending to the reclamation of the sulfite liquor discharged from the digester. In the first instance the liquor and gas discharged from the digester will pass out of the digester by the way of the outlet pipe a to pass through the cooler a^1. From the cooler the discharged liquor and gas will pass downwardly through the pipe a^2 to enter the standpipe a^3. At this point any free gas that may be in the liquor will rise and pass over, by the way of the pipe a^4, into the standpipe a^5, thence down through this pipe into the reclaiming and storage tank A^1. The discharged liquor,

however, will pass downwardly through the pipe a^3 and thence out of this pipe by the way of the connecting pipe a^6 to enter the upright pipe a^7 and rise therein. This upright pipe a^7 it will be noted extends upwardly so high with respect to the clarifying tank A^2 that the liquor rising in the pipe a^7 will flow out of it through the pipe a^8 and enter the body of the clarifying tank A^2 preferably at a point some little distance removed from the bottom of the tank. In order that the liquor may freely run into the clarifying tank irrespective of the amount of liquor therein, I prefer that the pipe a^8 shall branch from the upright pipe a^7 at a point relatively high with respect to the clarifying tank. In the apparatus shown the pipe a^8 branches from the pipe a^7 at a relative point just a little lower than the top of the clarifying tank. I prefer, also, that the pipe a^8 shall extend downward and enter the clarifying tank in a substantially horizontal position so that the liquor discharged through the pipe a^8 into the clarifying tank may be disseminated throughout the body of the tank.

With respect to the outlet pipe a^9 and pipe a^{10} branching therefrom to connect with the reclaiming and storage tank A^1, it will be observed that the pipe a^{10} branches from the pipe a^9 at a point relatively high with respect to the clarifying tank, or in other words, at a point relatively commensurate with some point in the contracted portion or head of the clarifying tank. The reason for this is that as the discharged liquor flows into the clarifying tank to rise therein the liquor will also rise to a commensurate extent in the pipe a^9. Accordingly no liquor can flow out of the clarifying tank until the liquor has risen so high in the pipe a^9 as to reach the point where the pipe a^{10} branches therefrom when the liquor will flow out through this pipe. The effect of this arrangement is that the clarifying tank will always be kept filled with liquor and preferably so filled that the top surface of the liquor in the tank will lie in the contracted top or head thereof.

The advantage of the afore-described arrangement in the first place is that by permitting the gas discharged from the digester to pass directly over into the storage tank and not into the clarifying tank, an excessive agitation of the liquor in the clarifying tank, which might prevent a rapid separation of the woody matter contained in the liquor, is prevented. It is desirable, however, that the liquor in the clarifying tank be subjected to some agitation to insure a rapid separation of the woody matter and I find that just the proper amount of agitation may be produced therein by the inflow of fresh liquor into the tank, this being preferably directed to flow into the tank in such manner as to cause the liquor therein to swirl around within the tank. Another advantage resides in the fact that the clarifying tank is continuously kept filled with a large body of liquor. When the fresh bisulfite liquor is introduced the tendency is for the liquor in the clarifying tank to clear from the bottom of the tank so that only clarified liquor will escape from the tank by the way of the outlet pipe and flow into the storage tank. By continuously maintaining a large quantity of liquor in the clarifying tank the woody matter will be continuously separating therein as discharged liquor from the digester is flowing into the tank and as this discharged liquor flows into the tank the liquor therein which has already become cleared at the bottom of the tank will flow out of it into the storage tank, producing the effect in other words of a continuous operation. Moreover as the storage tank contains only clarified liquor this liquor can be drawn from the storage tank regardless of the amount of liquor in the tank.

The advantage of maintaining such an amount of liquor in the clarifying tank that the top surface of the liquor therein will come or lie in the contracted top or head of the tank resides in the fact that the surface area of the liquor in the contracted portion of the tank will be relatively less than it would be if the tank were not so contracted. On this account the woody matter separated from the main body of liquor in the tank and lying in the upper contracted portion of the tank will be made to occupy a position presenting less area in extent of surface but of greater depth than if the woody matter occupied a position presenting a larger surface area. Accordingly not only can the woody matter be more conveniently drawn off by the way of the pipe a^{13}, but it is also unnecessary to wait until a large amount of the woody matter has accumulated before it can be drawn off without the withdrawal also of the sulfite liquor.

It will be understood that the woody matter is drawn off intermittently from the clarifying tank as it accumulates therein after its separation, by opening the valve a^{14} controlling the pipe a^{13} when the woody matter may pass out of or be withdrawn from the tank. To prevent the contents of the clarifying tank from accidentally siphoning out of it into the storage tank, which effect might be obtained unless some provision were made to prevent it, the pipe a^{11} is extended from the top of the clarifying tank to connect with the pipes a^7, a^9, thereby overcoming any tendency to siphoning. It will be understood also that the liquor in the storage tank may be withdrawn therefrom and discharged into the digester, as occasion may require, through the pipe a^{16} after the valve a^{17} controlling this pipe has first been opened, the liquor being discharged into the digester by means of a pump a^{18}.

Having thus fully described my invention,

I claim and desire to secure by Letters Patent of the United States:—

1. In an apparatus of the character specified, the combination with a digester, of a clarifying tank, a storage tank, means connecting said digester with said clarifying tank whereby liquor discharged from the digester may pass into said clarifying tank to be clarified of the woody matter contained therein by the separation of the woody matter from a body of said discharged liquor maintained in said clarifying tank, means whereby the woody matter separated from the liquor in said clarifying tank may be removed therefrom without disturbing the main body of liquor therein, and means connecting said clarifying tank with said storage tank whereby clarified liquor therein may pass over and be discharged into said storage tank.

2. In an apparatus of the character specified, the combination with a digester, of a tank, means connecting the digester with said tank whereby liquor discharged from the digester may be directed to pass into said tank and become clarified of the woody matter contained therein by the separation of the woody matter from a body of said discharged liquor maintained in said tank, means whereby other liquor may be directed into said tank for facilitating such separation, means whereby the woody matter may be removed from the tank after such separation without disturbing the main body of liquor therein, and means providing an outlet from said tank for directing clarified liquor out of the same.

3. In an apparatus of the character specified, the combination with a digester, of a clarifying tank, a storage tank, means connecting said digester with said tanks arranged whereby gas discharged from the digester may pass into said storage tank and liquor discharged therefrom may pass into said clarifying tank to be clarified of the woody matter contained therein by the separation of said woody matter from a body of said discharged liquor, maintained in said clarifying tank, means whereby the woody matter may be removed from the clarifying tank after such separation without disturbing the main body of liquor therein, and means connecting said clarifying tank with said storage tank whereby clarified liquor therein may be discharged into said storage tank.

4. In an apparatus of the character specified, the combination with a digester of a clarifying tank, means connecting said digester with said clarifying tank whereby liquor discharged from the digester may pass into said clarifying tank to be clarified of the woody matter contained therein, and means providing an outlet from said clarifying tank whereby liquor clarified therein may freely pass out of said tank and which means is arranged whereby a body of liquor may be continuously maintained in said tank.

5. In an apparatus of the character specified, the combination with a digester of a clarifying tank, a storage tank, means connecting said digester with said clarifying tank whereby liquor discharged from the digester may pass into the clarifying tank to be clarified of the woody matter contained therein, and means providing an outlet from said clarifying tank and connecting with said storage tank, which means is arranged whereby clarified liquor in the clarifying tank may freely pass out of said tank into said storage tank and which means is arranged also whereby a body of liquor may continuously be maintained in said clarifying tank.

6. In an apparatus of the character specified, the combination with a digester of a clarifying tank, means connecting said digester with said clarifying tank whereby liquor discharged from the digester may pass into said clarifying tank to be clarified of the woody matter contained therein, means for introducing a fresh liquor into said clarifying tank, and means providing an outlet from said tank through which the clarified liquor therein may be discharged, said means being arranged whereby a body of liquor may continuously be maintained in said tank and clarified liquor therein may pass out of said tank as liquor is discharged into the same.

7. In an apparatus of the character specified, the combination with a digester of a clarifying tank, means connecting said digester with said clarifying tank whereby liquor discharged from the digester may pass into said clarifying tank to be clarified of the woody matter contained therein, an outlet pipe from said clarifying tank adapted and arranged whereby a body of liquor may continuously be maintained in said tank, and means for preventing the liquor in said tank from siphoning outwardly through said outlet pipe.

8. In an apparatus of the character specified, the combination with a digester of a clarifying tank having a contracted top or head, means connecting said digester with said clarifying tank whereby liquor discharged from the digester may pass into said clarifying tank to be clarified of the woody matter contained therein, means for introducing a fresh liquor into said tank, means providing an outlet from said tank adapted and arranged whereby a body of liquor may continuously be maintained in said tank to fill said tank up into the contracted top or head thereof, and means providing an outlet through said contracted top or head of the tank from the top surface of the liquor contained therein.

9. In an apparatus of the character specified, the combination with a digester of a clarifying tank and a storage tank, means connecting said digester with said storage tank and said clarifying tank whereby gas discharged from the digester may enter directly into the storage tank and liquor discharged from said digester may pass into said clarifying tank to be clarified of the woody matter contained therein by the separation of the woody matter from a body of the discharged liquor maintained in said clarifying tank, means whereby fresh liquor may be admitted into said clarifying tank, means whereby the woody matter after its separation may be removed from the clarifying tank and means providing an outlet from said clarifying tank at or near the bottom thereof and connecting with said storage tank, said means being adapted and arranged whereby a body of liquor may continuously be maintained in said clarifying tank.

CHARLES B. CLARK.

In the presence of—
CHARLES C. HOYT,
FRED C. DOLLIVER.