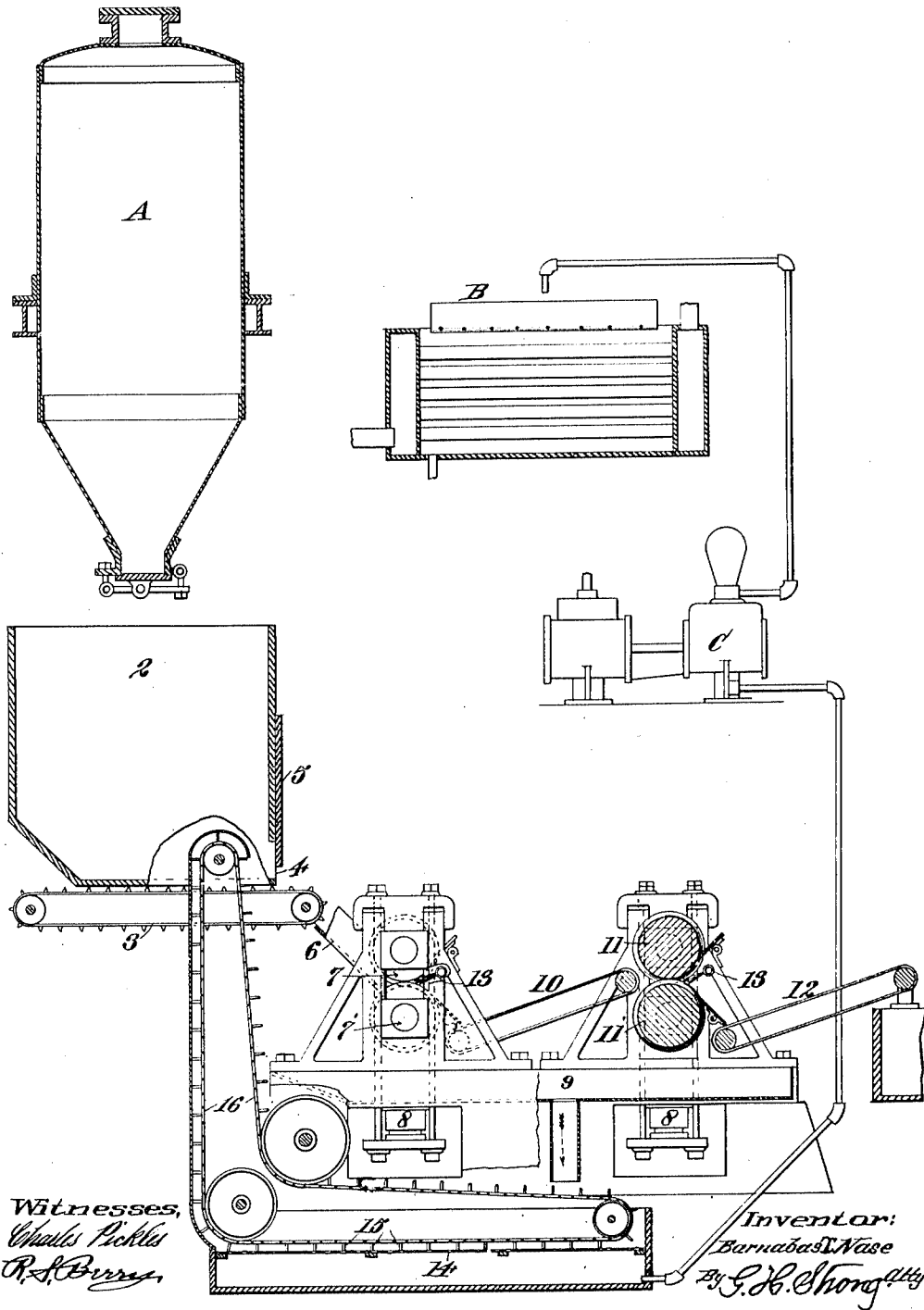


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TREATMENT OF WOOD PULP.
APPLICATION FILED DEC. 2, 1911.

1,061,316.

Patented May 13, 1913.



UNITED STATES PATENT OFFICE.

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TREATMENT OF WOOD-PULP.

1,061,316.

Specification of Letters Patent.

Patented May 13, 1913.

Application filed December 2, 1911. Serial No. 663,488.

To all whom it may concern:

Be it known that I, BARNABAS T. NASE, a subject of the King of Great Britain, residing in the city and county of San Francisco and State of California, have invented new and useful Improvements in Treatment of Wood-Pulp, of which the following is a specification.

This invention relates to the treatment of wood pulp for use in paper manufacture, and pertains particularly to a method of, and means for, the removing and recovering of soda values of the caustic soda used in digesting the pulp.

It is the object of this invention to provide a simple and effective process for treating digested fibrous materials to remove chemical-containing liquors therefrom so that the digested fibrous material or pulp will be practically freed from the chemicals employed or liberated in the digesting process, and the digesting chemicals restored for reuse.

Another object is to provide a process of the above character which is highly effective, and by the employment of which, the desired results may be obtained with greater rapidity and effectiveness than is possible in the processes now generally used.

In the manufacture of wood pulp, in which the process constituting my present invention is employed, the wood or other fibrous material to be converted into pulp is cut into short lengths and "hogged" to separate the fibers, so that they will be thoroughly acted on in the cooking process. The fibrous material is then subjected to the cooking operation, which, in brief, consists of subjecting it in a closed cooking tank or digester to a solution of caustic soda, and then cooking it for a period of approximately ten hours, by means of steam, under a pressure ranging up to 120 pounds to the square inch and at a temperature of approximately 320° F.

When the cooking of the fibers in the soda solution has been accomplished, the cooked fibers and the liquors in the digester are discharged therefrom, and are then so treated as to remove the liquor, comprising the caustic soda solution and such chemicals as may become incorporated therewith in the cooking operation, from the fibrous mass. This is done with the object of freeing the fibrous mass or pulp from the caustic soda

solution, or digesting liquor, preparatory to using the pulp in the manufacture of paper or other articles.

The purpose of the present invention, as before mentioned, is to thoroughly remove the chemical-containing, digesting-liquor from the fibrous pulp after the cooking process just described. Heretofore this has usually been accomplished by discharging the cooked mixture from the digester, under 120 pounds pressure per square inch, into a receiving tank having a series of baffle plates for breaking up the cells and disintegrating the fibrous mass. The chemical-containing liquors are then drained from the tank and delivered to an evaporating plant. The drained pulp is put into washing tanks, where it is agitated in wash water, which is drawn off and delivered to the evaporating plant, where it is mixed with the chemical-containing liquors previously separated from the pulp. The liquor being concentrated in the evaporator is then delivered to an open incinerating plant, which acts to convert solid residue into ash, from which the soda is leached with water. The carbonate of soda thus obtained is then treated with lime to convert it into caustic soda, the recovery of which is about 80% of the caustic soda employed in the original soda solution used in the digester.

In the old process just described a large quantity of water is used in the washing operation, which is objectionable, inasmuch as considerable time and fuel is required in evaporation and condensing it in the evaporating plant. In this old process, the pulp, after being washed, is put through a series of screens to separate the non-digested or coarse portions of the fiber, which are dried and burned in a furnace, thus entailing an objectionable waste which my present process eliminates.

The apparatus employed in carrying out my invention is shown in the accompanying drawing, in which the figure is a diagrammatic view showing the apparatus partly in elevation and partly in section.

In the drawing, A indicates a digester of any suitable description, having a gated discharge opening at its lower end, through which the contents of the digester, consisting of the cooked fibers and the digesting liquor, may be discharged into a receiving hopper 2.

An endless conveyer belt 3 leads beneath the discharge opening 4 of the hopper 2, onto which the digested mixture is fed; a gate 5 over the opening 4 being employed for regulating the flow of the mixture onto the belt 3. From the belt 3 the mass is delivered to a chute 6 and is discharged between a pair of horizontally extending superposed rollers 7—7', which are corrugated circumferentially, the corrugations on one roller intermeshing with those on the other roller.

The uppermost roller 7 is weighted in any suitable manner, a hydraulic press 8 being here shown for that purpose, so that the fibers on passing between the rollers 7—7' will be subjected to a combined compressing and disintegrating action, which serves to break up and separate the fibers and at the same time squeeze the chemical-containing liquor therefrom.

The liquor removed from the fibers by the rollers 7—7' flows into a tank 9, while the compressed and disintegrated fibrous mass is discharged onto a conveyer belt 10, after leaving the rollers 7—7', and after being subjected to a washing spray 13, from whence it is fed between a second pair of rollers 11—11', corresponding to the rollers 7—7', where it is subjected to a second compressing action, then to a second washing by spray 13' and delivered to a conveyer belt 12, from whence it is discharged to any desired mechanism.

The fibrous mass, on leaving the rollers 7—7', is largely free from the digesting liquor and is in a high state of compression. A stream of clear, preferably warm, water in fine jets is discharged from the pipe 13 upon the fibers the moment they pass through the rollers 7—7' and begin to expand; the water discharged upon the fibrous mass being of such quantity only as the fibers are capable of absorbing and holding, so that practically no water will flow into the pan 9 at this point.

The washing of the pulp goods by the spray 13 on leaving rollers 11—11' is of the same character; care in each case being taken to spray the fibers to a point only short of saturation, so that by the first spraying the chemical solution collected in tank 9 and the ultimate fiber product which is delivered by the conveyer 12 to any suitable point ready for the beating machines, will contain a minimum amount of water. Preferably the water is warmed to a temperature of 100 to 110° F., so as to keep the pulp soft and pliant, and assist the solubility of the soda.

If desired, the degree of compression to which the pulp is subjected by the rollers 11—11' may exceed the pressure exerted by the first set of rollers 7—7'. As a matter of practice, the pulp will usually leave the

rollers 7—7' carrying only about 45% by weight of moisture, and when it leaves the second set of rollers, it usually carries only about 40% or less of moisture.

The saturation of the fibers is facilitated by reason of the water being delivered thereon while the fibers are in a state of compression; the natural expansion of the fibers drawing the water into the cells so that the water will permeate the fibers throughout. From this it will be seen that the fibers will be saturated when delivered between the rolls 11—11'; the fresh water absorbed by the fibers in turn absorbing and mixing with such chemicals and liquor as was not removed from the fibers by the rollers 7—7', during the time in which the fibers are carried forward on the belt 10, so that when the fibers are acted on by the rollers 11—11' practically all of the chemical-containing liquors will be removed therefrom. The liquors removed from the fibers by the rollers 11—11' pass to the tank 9 and mingle with the liquor delivered from the rollers 7—7'. By thus feeding the water on the fiber in an amount corresponding to the absorptive power of the fiber, a minimum of wash water will be used, thereby insuring no excessive liquor being delivered to the evaporator. If the fibrous mass is not sufficiently cleansed on leaving the rollers 11—11', it may be delivered to a third set of rollers (not shown) and more water added thereto, which operation may be repeated to any desired extent.

The chemical-containing liquor in the tank 9 is discharged onto a screen 14, which acts to separate such fine particles of the fibers as may be held in the liquor therefrom; the strained liquor being then delivered to an evaporator B of any suitable description, by means of a pump C, or other arrangement.

The fine particles of fiber collected on the screen 14 are removed therefrom by means of a series of wipers 15 mounted on an endless belt 16, which wipers are carried across the screen 14 continuously by the operation of the belt 16, in such manner as to pick up the fibers and deposit them on the belt 3, so that they will be again delivered to the pressing rollers 7—7'; the wipers 15 also acting to keep the screen 14 clean. In this manner, practically all the fiber is saved, which, in conjunction with the disintegrating action of the corrugated rolls 7—7' and 11—11' on the coarser fibers, obviates waste.

From the foregoing it will be seen that I have produced a process for extracting the chemical-containing liquor from digested fibers, which is rapid and thorough, in which there is no waste of fiber or unnecessary liquor to evaporate in the evaporator, and in which practically all of the chemicals can be restored; practice showing that

98° of the caustic soda is recovered by the use of my process. By this arrangement all the digested pulp, thoroughly cleaned and disintegrated, is delivered to the beating machines with a minimum amount of water; and the chemicals are capable of treatment for reuse with a minimum amount of dilution.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

1. The process for treating digested fibrous materials to remove chemical containing liquors therefrom, consisting of subjecting the fibers to a combined compressing and disintegrating action, spraying water on the compressed fibers at the moment they start to expand after their release from pressure, and then recompressing them to remove the water.

2. The process for treating digested fibrous materials to remove chemical containing liquors therefrom, consisting of subjecting the fibers to a combined compressing and disintegrating action, spraying water on the compressed fibers at the moment they start to expand after their release from pressure, in a quantity corresponding to the absorptive power of the fibers, and then recompressing them to remove the water.

3. The method of treating wood pulp, which consists in subjecting it to a digesting process in the presence of the soda solution, then passing it through disintegrating rollers to disintegrate the pulp and remove

a part of the soda solution, then spraying the pulp with water, passing this sprayed pulp through other rolls under pressure, and then treating the liquids thus extracted successively in an evaporator and incinerator to recover the soda values.

4. In an apparatus for treating pulp, the combination with a digester, of successively arranged pulp disintegrators, each disintegrator comprising coacting, corrugated pressure rolls, means by which the digested pulp is fed successively to the rolls, and means by which the pulp is subjected to a cleansing spray after leaving each set of rolls.

5. In an apparatus for treating pulp, the combination with a digester, of successively arranged pulp disintegrators, each disintegrator comprising coacting, corrugated pressure rolls, means by which the digested pulp is fed successively to the rolls, means by which the pulp is subjected to a cleansing spray after leaving each set of rolls, a tank for collecting the liquid extracted by the rolls, and means by which the pulp fibers carried into the tank are collected and re-delivered to the pressure rolls.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

BARNABAS T. NASE.

Witnesses:

CHARLES EDELMAN,
W. COOK.