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PROCESS FOR MAKING PAPER PULP.

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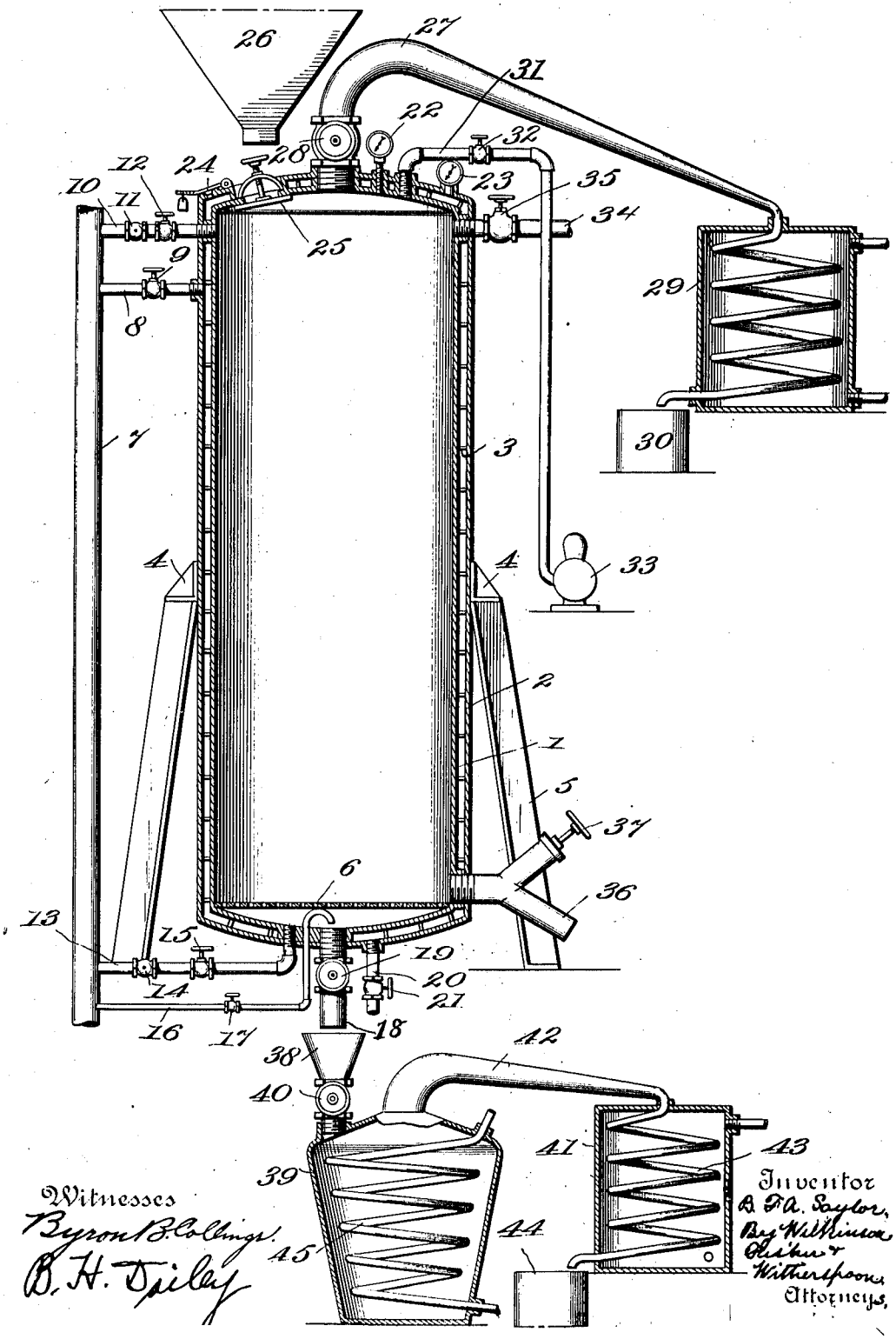
1,004,473. Patented Sept. 26, 1911



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PROCESS FOR MAKING PAPER-PULP.

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To all whom it may concern:

Be it known that I, BENJAMIN F. A. SAYLOR, a citizen of the United States, residing at Rome, in the county of Floyd and State of Georgia, have invented certain new and useful Improvements in Processes for Making Paper-Pulp; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in processes for making paper pulp, and is especially designed for making pulp from the resinous woods abundant in the Southern States, turpentine and rosin being obtained as by-products.

The object of my invention is to make paper pulp from stumps, roots, chips, and the refuse of pine woods generally, for example, the refuse of saw mills, and at the same time to save the rosin and turpentine in said wood as by-products. By my method, an excellent article of paper pulp is made from what has hitherto been considered as worthless material and in fact a source of expense in clearing land. Hitherto such wood has been very worthless for pulp making purposes, because the rosin, turpentine, and similar resinous materials therein prevent the sulphite or soda liquor from suitably attacking the wood fiber so as to produce a good article of wood pulp, but by my invention all these materials are thoroughly removed from the wood and I am enabled to produce an excellent pulp, admirably suited for paper making, the whole expense of the process being more than compensated for by the value of the by-products.

The accompanying drawing shows, in vertical section, partly in elevation, an apparatus used in carrying out my process.

1 is a steel cylinder, provided with a jacket 2. The cylinder and jacket are fastened together by the spacing bolts 3 in the usual manner. On the outside, the jacket is provided with metal brackets 4, bolted thereto, and inclined angle bars 5 are bolted to said brackets, thus supporting the cylinder. These angle bars may be united so as to form a frame, if desired, but any suitable means for supporting the cylinder may be used. The bottom of the cylinder is rounded, as shown in the figure, and is provided with a false bottom 6, made of perforated metal or of heavy wire.

7 represents a pipe for supplying steam to the apparatus, and a branch pipe 8, provided with a valve 9, connects this cylinder with the jacket. A similar branch pipe 10, provided with a check valve 11 and hand valve 12, connects the supply pipe with the top of the cylinder. Similarly, the branch pipe 13, provided with a check valve 14 and a hand valve 15, connects the steam supply pipe with the bottom of the cylinder, entering said cylinder beneath the false bottom.

16 represents a small steam pipe, provided with a valve 17, which enters the bottom of the cylinder and is then bent over and downward, with its end just above the rosin discharge pipe 18, which is provided with a valve 19. The steam pipe 16 is for the purpose of clearing out the pipe 18 if the rosin should happen to clog up said pipe.

20 represents a discharge pipe for the water of condensation, and is provided with a valve 21 and enters the jacket 2 near its lowest point. Steam gages 22 and 23 are provided, which are connected, respectively, with the jacket and with the interior of the cylinder, so that the pressure therein may at all times be clearly shown. I have also shown a safety valve 24, connected with the jacket, but this is not really necessary.

In the top of the cylinder, which is curved, an opening is made about fourteen inches in diameter, ordinarily closed by the manhole cover 25, this opening being provided for the purpose of charging the cylinder with the material to be treated.

26 represents a hopper, with its discharge end located above the manhole, so that the charging of the cylinder may be readily effected.

Connected to the center of the top of the cylinder is a discharge pipe 27, for the turpentine vapors, which may be closed when desired by the valve 28. The pipe 27 terminates in a worm located in an ordinary condenser 29, and the turpentine is delivered into a suitable receptacle 30.

Connected to the top of the cylinder and running through the jacket, is a pipe 31, provided with a valve 32, which pipe leads to a vacuum pump 33, of ordinary construction.

34 is a pipe for conducting the soda solution into the top of the tank, and is pro-

vided with a valve 35. 36 represents the discharge pipe for the material after it has being treated, a Y valve, provided with a hand wheel 37, being provided.

Below the pipe 18, is located a small hopper-shaped receptacle 38, which leads into the top of the rosin still 39, being provided with a valve 40. This rosin still is connected to a condenser 41, of the ordinary type, by a pipe 42, terminating in a worm 43, which delivers into a receptacle 44. 45 represents a steam pipe, passing through said still, through which steam may be passed to heat the same, when desired.

In carrying out my invention, I take pine wood and reduce it to small chips approximately a half an inch long and from an eighth to a quarter of an inch in thickness and fill the cylinder 1 therewith nearly to the top, putting in, at the same time, about 10 pounds per cord of dry caustic soda. The cylinder 1 is about 30 feet high and 10 feet in diameter, and will hold 5 or more cords of chips. The manhole cover 25 is then closed, the valves 12, 28, 19, 35, 17, and 37 being closed, and the valve 32 in the pipe leading to the air pump opened, and the valves 9 and 15, leading into the jacket and lower part of the cylinder, respectively, being slightly opened. Steam is allowed to flow in in small quantities and under a low pressure, which warms up the cylinder and the contents thereof and rarefies the air, the vacuum pump 33 being at the same time kept in operation. After this preliminary heating has continued for a short time, all the air has been drawn out of the cylinder 1, being replaced by steam, the valves 9 and 15 are then closed, and the vacuum pump is put in operation until practically a perfect vacuum has been obtained within the cylinder 1. This preliminary operation takes about twenty minutes. This removal of the air from the interior of the cylinder, before the latter becomes heated up to any great degree, is of great importance. It prevents the charring of the chips and the discoloring of the turpentine and rosin, defects that are incident to all the processes known to me. After practically a perfect vacuum has been obtained within the cylinder 1, I close the valve 32 and, all the outlets from the digester or cylinder 1 being closed, the valves 9, 12 and 15 are opened wide and the steam is rushed into the jacket and digester or cylinder 1 as fast as possible, until a pressure of from 80 to 100 pounds to the square inch has been obtained within the cylinder and within the jacket. This heating operation is continued for about an hour, during which time the turpentine has been separated from the wood and the melted rosin goes to the bottom of the still. The valve 28 is then opened and the heating is continued for about two hours longer. During these two hours, the turpentine and steam escape together through the pipe 27 and are delivered into the receptacle 30 after being condensed in the condenser 29. They are then separated in the usual manner. After about three hours of this treatment, the valves 28 and 15 are closed, leaving the valve 12 still open, and the valve 19 in the pipe 18 is opened, whereupon the steam pressure presses the rosin which has collected below the false bottom 6 through the pipe 18 into the hopper 38, from which it is conducted to the turpentine still 39. The valve 12 is then closed. At the end of this treatment there still remains considerable rosin in the wood, about two-thirds of the original quantity.

Up to the present time, it had been supposed that by three hours of heating all the turpentine would have been recovered that can be recovered, and in this three hours treatment only about one-third of the rosin had been removed from the wood, but I have discovered that about 8 gallons more of turpentine per cord of wood can be recovered, and that practically all of the remaining rosin can be recovered.

The wood is reduced to a pulp in the digester or cylinder 1 without removal therefrom in the following manner:—After the rosin first accumulated has been discharged through the pipe 18, the valve 19 is closed and a solution of caustic soda, at a strength of 15° Baumé, is forced in through the pipe 34 under a pressure greater than the pressure still existing in the cylinder 1, the valve 35 being opened. Enough of this solution of caustic soda is introduced to completely cover the chips. The valve 35 is then closed, the valves 12 and 15 are opened and steam is introduced into the digester or cylinder 1 and the jacket, until the pressure has been brought up to about 120 pounds in the cylinder and jacket, and this condition is maintained for about five hours, all the valves to the cylinder being closed except the steam inlet valve 12.

Soon after the increased pressure is put into the digester, the valve 28 is opened for a short time and the remaining turpentine is allowed to escape. This amounts to about eight gallons per cord and is a clear gain on any of the previous processes. The pressure of 120 pounds, however, is still kept up in the cylinder until the wood is reduced to a pulpy mass. The chips are treated with this soda solution for about five hours, the rosin meanwhile collecting and settling below the false bottom 6. At the end of an hour and a half, however, I open the valve 19 and allow the rosin which has collected to escape through the pipe 18. The valve 19 is then closed. At the end of this treatment of five or six hours, the wood has been completely changed into a first class article for making paper pulp. The valve 15 is

then closed and the valve 19 opened for a short time. The pressure in the digester or cylinder forces out the solution of caustic soda, this solution being delivered by the pipe 18 into a suitable receptacle (not shown), from whence it is led away to an evaporator (not shown) and treated in the usual manner. The valve 19 is then closed and the valve 37 opened, whereupon the pulpy material is discharged with considerable force through the pipe 36 and is conducted to the washer, the subsequent operations of washing and beating being of the well known type. As it leaves the cylinder or digester 1, however, it is completely reduced to a fibrous cellulose, which, after being washed, is admirably adapted for making paper.

The whole treatment can be completed in ten hours, after which the cellulose is washed and beaten in the usual manner.

Having thus described my invention, I claim:—

1. The process of making paper pulp from resinous wood which consists in treating the wood with steam under pressure, and caustic soda in a closed vessel and extracting the rosin and turpentine therefrom; then raising the pressure of the steam and adding to the wood 15° Baumé caustic alkali solution sufficient to disintegrate the wood and recovering the rosin remaining in the wood; and finally withdrawing the pulpy mass from the vessel, substantially as described.

2. The process of making paper pulp from resinous wood, which consists in extracting the turpentine and rosin therefrom by charging the wood, mixed with a small percentage of caustic soda, into a closed vessel, creating a vacuum in said vessel, at the same time admitting a small quantity of steam thereinto, then heating said vessel on the inside and outside by steam, under a pressure of between 80 to 100 pounds, continuing this heating for some time, then allowing the turpentine and other vapors to escape from the top of the vessel and the rosin to escape from the bottom of the vessel, then closing said vessel and submerging the wood therein in a solution of caustic soda, and then subjecting said vessel on the inside and outside to the action of steam at about 120° pressure, and recovering the rosin remaining in the wood substantially as described.

3. The process of making paper pulp from resinous woods, which consists in extracting the turpentine and rosin therefrom by subjecting the wood, mixed with a small percentage of dry caustic soda, in a closed vessel, to the action of steam under a low pressure, and creating a vacuum in said vessel, whereby the air is entirely removed from the interior of said vessel, then subjecting said vessel, both on the inside and outside, to a steam pressure of from 80 to 100 pounds, this action being continued for about an hour, then allowing the turpentine to escape from the top of said vessel and the rosin from the bottom of said vessel, the steam pressure being still kept up, then closing the outlets from said vessel and submerging the wood in a solution of caustic soda of a strength of about 15° Baumé, raising the steam pressure, both inside and outside of said vessel, to about 120 pounds, again allowing the turpentine and rosin to escape, this action being continued for five or six hours, and finally withdrawing the pulpy mass from the vessel, substantially as described.

In testimony whereof, I affix my signature, in presence of two witnesses.

BENJAMIN F. A. SAYLOR.

Witnesses:

R. M. PARKER,

B. A. DAILEY.