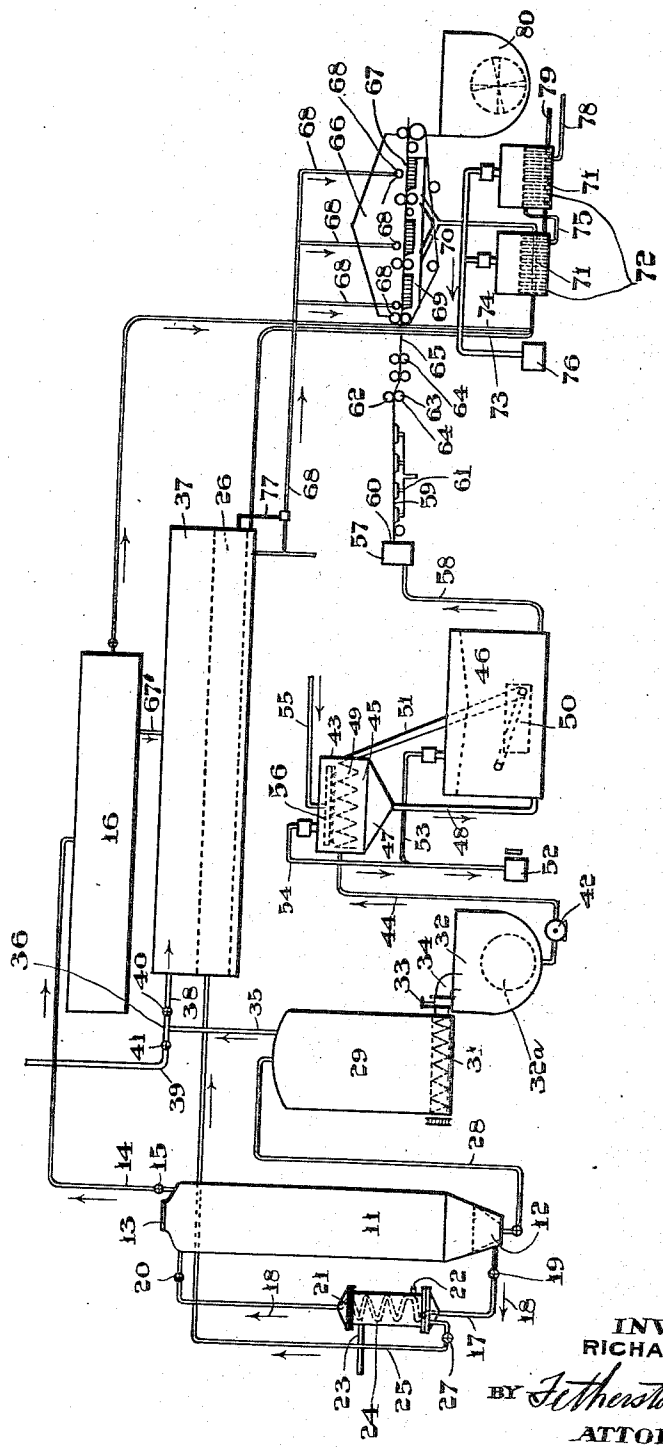
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METHOD OF TREATING SULPHATE AND SODA PULP

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METHOD OF TREATING SULPHATE AND SODA PULP.

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This invention relates to new and useful improvements in the method of and apparatus for treating sulphate pulp, soda pulp, and the like, and particularly to the method employed in the recovery of the liquor and chemicals contained in the pulp digester.

In the manufacture of sulphate or soda pulp, the usual method employed is as follows: A quantity of wood chips and a certain volume of soda liquor are fed into a digester which is then sealed up and heated under steam pressure. After a certain time the wood chips are reduced or "cooked" to a pulp and this pulp, together with the liquid, is blown into diffusers or wash tanks. These tanks are arranged so that the pulp is washed by means of large quantities of water. The steam given off during the blowing and exhausting operation is usually separated and may be condensed to produce warm water to assist in the washing process, but in most cases it is allowed to exhaust itself into the atmosphere. The washing operation is performed by forcing warm water on top of the pulp and the liquor in the wash tank. This added weight of water washes the liquor out of the pulp and through an outlet at the bottom of the tank. The great amount of water usually employed in this process for the satisfactory washing of the pulp considerably reduces the strength of the liquor, and in the latter part of the washing operation, the liquor is so weakened or diluted that it does not pay to attempt to evaporate the liquid, with the result that there is a large quantity of liquor running to waste. The soda from the recovered liquor is used over again, but to obtain the soda it is necessary to evaporate the water out of the liquor so as to return it to the recovery plant at the greatest possible density. This high density is only obtained by more or less excessive cost of live steam necessary to accomplish the evaporation of the water from the liquor.

In sulphate mills, if the washing of the pulp has been accomplished satisfactorily, the liquor fed to the evaporating plant is very weak, which fact necessitates the use of increased quantities of steam for evaporating purposes. There comes a point where the cost of steam to evaporate the liquor more than balances the value of the soda recovered. At this point, the very weak liquor is considered a useless quantity and is allowed to go to waste. It is obvious that a washing process which will produce a liquor of a high density will result in a very considerable saving in steam.

According to my invention the pulp and liquor blown from the digester is so treated that about 85% of undiluted liquor is extracted or recovered from the mixture before being submitted to a water or steam washing treatment. Some of the recovered liquor is returned to the digester to assist the circulation of the charge of strong active white liquor for a second batch of chips, and the remainder is returned to the recovery room where it is treated to an evaporating process to recover the soda. The pulp with the remaining 15% of liquor is then submitted to a water and steam treatment to recover the liquor and before this is returned to the recovery plant, it is treated to an evaporating process. The steam and water of condensate discharged from the digester and from the digester heating apparatus is used in the evaporating process. The evaporating process recovers the liquor at practically the same density as the liquor already extracted from the pulp in the first operation, so that all liquor returned to the recovery room is of practically the same comparatively high density, so that considerably less steam is used to recover the soda in the recovery room than when the usual treatment aforementioned is employed.

In my invention I provide means for thoroughly washing the pulp and at the same time recovering the liquor at as high density as possible, and this is accomplished in a simple and economical manner by utilizing the steam from the digester, and also using the condensate from the heaters which are used in the cooking operation to the best advantage. The steam released from the digester exhaust operation, is collected in one vessel, and the steam from the "blow-off" and condensate from the heaters, is collected in another vessel which is kept under a slight pressure. All of the steam and water required for washing the pulp in my method, is obtained from the said vessels. To obtain a uniform washing, the uncooked knots are removed from the wood pulp and may be returned to the digester. The knots are removed in a screen which is worked under a slight vacuum to prevent the liquor foaming. The pulp and liquor, freed from knots, is fed to a traveling wire or to presses which

squeeze out a very large quantity of undiluted liquor free from any contact with water or steam. The layer of pulp containing the liquor still to be removed is fed into a machine, the upper part of which consists of a low pressure steam chamber and the lower part of a travelling wire and a series of vacuum boxes enclosed in a pan, which is under vacuum. A small amount of steam from the steam vessel and the condensate from the heaters is used from the chamber on top of the machine, and is forced through the layer of pulp under a slight pressure into the pan. The liquor from this pan is fed into evaporators working under vacuum. The efficiency of the evaporators is greatly increased by using all of the waste steam collected in the aforementioned vessels.

In the diagrammatic assembly drawing, an apparatus is shown which is capable of being used in the method of recovering liquor according to my invention.

Referring more particularly to the drawing, 11 designates a digester which is preferably of cylindrical form provided with a conical bottom 12, and a cover 13 at the top. Projecting upwardly from the top is the relief pipe 14 which may be provided with a relief valve 15. The relief pipe communicates with a chamber or storage tank 16. The digester is filled with a predetermined quantity of wood chips and a quantity of cooking liquor and sealed. The liquor in the digester circulates through the pipe 17 in the manner indicated by the arrow 18 and valves 19 and 20 may be placed in the pipe line to regulate the flow of liquor through the heater 21, which may be of the tank type having an inlet pipe 23 and an outlet pipe 25, connected to a source of steam supply. The heater surrounds a coil 24 formed in circulating pipe 17. The condensate from the heater is drawn off through the pipe 25 which leads from the heater into a water storage tank 26. A wash-out or cleaning hole 22 may be provided in the bottom of the tank and this hole may be provided with a removable plug. A valve 27 is placed in the pipe line 17. The cooked chips and liquor in the form of pulp, are blown from the digester through the pipe 28 into the wash tank 29, which is provided with a worm screw 31. Liquor is added to the pulp in the wash tank to dilute the mass and to enable the tank to be emptied by means of the worm screw conveyor 31, which draws the pulp into the storage tank 32. A valve 33 may be provided in the connecting pipe 34 between the wash tank and the storage tank 32. The steam released from the digester into the wash tank is drawn therefrom by means of the relief pipe 35, the other end of which is connected to a branch pipe connection or T 36, one side 38 of which may be connected to a steam storage tank 37, surrounding the hot water storage tank 26. The other side 39 of the T may form a connecting means to a condenser (not shown). Suitable valves 40 and 41 may be placed in the pipe line 38 and 39 to regulate the flow of steam therethrough. Connected to the storage tank 32 is the pump 42, which pumps the pulp and liquor contained therein towards the knot screening device 43, through the pipe line 44. Any type of agitating means may be mounted in the tank 32, as shown in dotted line 32^a. Mounted within the knot screen device is the screen 45 through which the suitable particles of pulp, or pulp free from knots, flows into a prepared pulp tank 46. The lower end 47 of the knot screen device is conically shaped and connecting said end with the tank 46, is the pipe line 48. The knots collected in the knot screen are driven therefrom by means of the worm conveyor 49, and are led into the knot storage tank 50 through the pipe 51. The knot screener and the prepared pulp storage tank are kept under a slight vacuum by means of the vacuum pump 52 connected to said tank by means of the pipe lines 53 and 54. Liquor may be fed into the knot screener through the pipe 55 and spraying nozzles 56, so that the pulp will be properly washed and released from the knots during this operation. The pulp free from knots is fed from the tank 46 into the flow box 57, through the pipe 58, and from said flow box the pulp flows on to a travelling wire or screen 59 through the orifice 60 over which an apron may be fitted. Vacuum boxes 61 may be placed below the wire to draw liquor from the pulp from whence it may be returned to the digester for a further charge, or to the recovery room for treatment. It will be noted that the liquor has not been brought into contact with fresh supplies of steam, water, or such like fluids, which would dilute the liquor so that said liquor would have to be returned to the recovery room before it could be used again. The liquor is in a concentrated state at this point in the operation of the apparatus. The pulp is in the form of a mat after it has passed from the wire and may then be taken through press or squeeze rolls 62 and 63, some of which may be fitted with suction boxes 64 to draw out part of the liquor remaining in the sheet. The liquor thus drawn out may be returned to the digester as it is still in its undiluted or concentrated form or it may be returned to the recovery room, not shown. The pulp sheet 65 is now in the form of a semi-dry mat, from which it would be difficult to draw any further liquor without damaging it, so it is led into a steam tight chamber 66 within which is mounted a travelling wire 67. The chamber may be sealed in any suitable manner well known in this art. A small quan-

tity of the steam in the tanks 16 and 37, which are connected by means of pipe 67', may be fed into the chamber 66 through the medium of the pipe 68, so that the liquor in the mat of pulp passing through the chamber may be driven through the screen or drawn by means of the vacuum pans 69 positioned below the screen, into the pipes 70 connected to the evaporators 71. The remainder of the steam in the tanks 37 and 16 is fed into the heater coils 72 through the pipes 73 and 74. The evaporators are connected by any suitable means to the vacuum pump 76. Hot water may be fed from the tank 26 into the pipe lines 68 through the pipe 77, to assist in releasing the liquor from the pulp passing through the chamber 66. The concentrated liquor from the evaporators may be returned to the recovery plant, not shown, through the pipe 78. The steam from the coils in the evaporators may be discharged through the drain pipe 79. The pulp after it has passed through the chamber 66 is fed into a receptacle 80. The evaporators work in a vacuum so that their efficiency is increased and the recovery of the liquor in its undiluted form is greatly facilitated. When the liquor is discharged from the said evaporators, it is led to the recovery plant and the amount of steam required in said plant for the recovery of the soda or chemicals in the liquor is greatly reduced, when compared with the plants at present in use. The saving of fuel in the evaporating plant when using my method of pulp treatment when compared with methods at present in use, is as high as 60%, as practically every heat unit expended in the cooking of the charge in the digester is recovered and used to assist in the recovery of the liquor in its most valuable form, that is, practically free from water or such diluting liquids.

By my process or method, all the liquor used in the cooking is recovered, whereas in the methods at present in use for washing the pulp, a great amount of the liquor is in such a diluted state that it is lost entirely as it is unprofitable to try to recover same. This lost liquor has to be made up again by the addition of chemicals in the recovery plant. These chemicals are mixed in smelters and owing to the draught, a certain percentage of the chemicals is drawn through the system and lost up the chimneys of the smelters. My process reduces this loss, as less chemicals have to be added to the liquor returned by my process to the smelters.

Having thus described my invention, what I claim is:—

1. A method of treating pulp and the like, which consists in blowing the charge of pulp and cooking liquor from a digester, extracting the major portion of the cooking liquor from the pulp by drainage without dilution, separating the undiluted portion of the cooking liquor for subsequent recovery, washing out the remaining portion of the liquor from the pulp and evaporating the diluted liquor.

2. A method of treating pulp and the like, which consists in blowing the pulp and cooking liquor from a digester, draining the major portion of the cooking liquor from the pulp, without dilution, separating the undiluted portion of the cooking liquor for subsequent recovery, washing out the minor portion of the liquor from the pulp, and then concentrating the diluted liquor by evaporation separately from the undiluted liquor.

3. A method of extracting cooking liquor from pulp, which consists in draining off the major portion of the cooking liquor from the pulp, without dilution, then washing out the remaining minor portion of the liquor from the pulp, segregating the diluted liquor from the undiluted liquor, concentrating the diluted liquor by evaporation to approximately the same density as the undiluted liquor, and then combining the concentrated liquor with the undiluted liquor for subsequent recovery.

4. A method of separating cooking liquor from sulphate and soda pulp, which consists in separating the major portion of the cooking liquor from the pulp, without dilution, washing out the remaining minor portion of the cooking liquor from the pulp, separating the diluted liquor from the undiluted liquor, concentrating the minor quantity of diluted liquor by evaporation, under vacuum, to approximately the same density as the undiluted liquor, and then combining the concentrated liquor with the undiluted liquor for recovery of the chemicals.

5. A method of treating sulphate and soda pulp, which consists in blowing the charge of pulp and liquor from a digester, passing the pulp and liquor over a screening device to drain off the major portion of the liquor without dilution, segregating this major portion of the liquor for subsequent recovery, passing the pulp containing the remaining minor portion of the liquor over a further screening device, and washing the remainder of the liquor from the pulp, and then concentrating the diluted liquor by evaporation, independently of the undiluted liquor.

6. A method of treating sulphate and soda pulp, which consists in blowing the cooked charge of pulp and liquor from a digester, extracting the major portion of the liquor from the pulp by drainage, without dilution, segregating the undiluted liquor, passing the partially drained pulp over a screening device and washing the remaining liquor from the pulp, and then treating the diluted liquor independently of the undiluted liquor,

by evaporating the water under vacuum, by means of heat recovery from the cooking process.

7. A process of treating sulphate and soda pulp, which consists in discharging the pulp and hot liquor from a digester, collecting the steam from the cook into a tank, extracting the major portion of the liquor from the pulp by drainage, without dilution, then passing the pulp to another drainage device, and washing it with condensate and steam, at low pressure, obtained from the cooking apparatus, collecting the diluted liquor in a tank, and evaporating the diluted liquor under vacuum, by means of steam obtained from the cooking apparatus.

In witness whereof, I have hereunto set my hand.

RICHARD COLLINS.