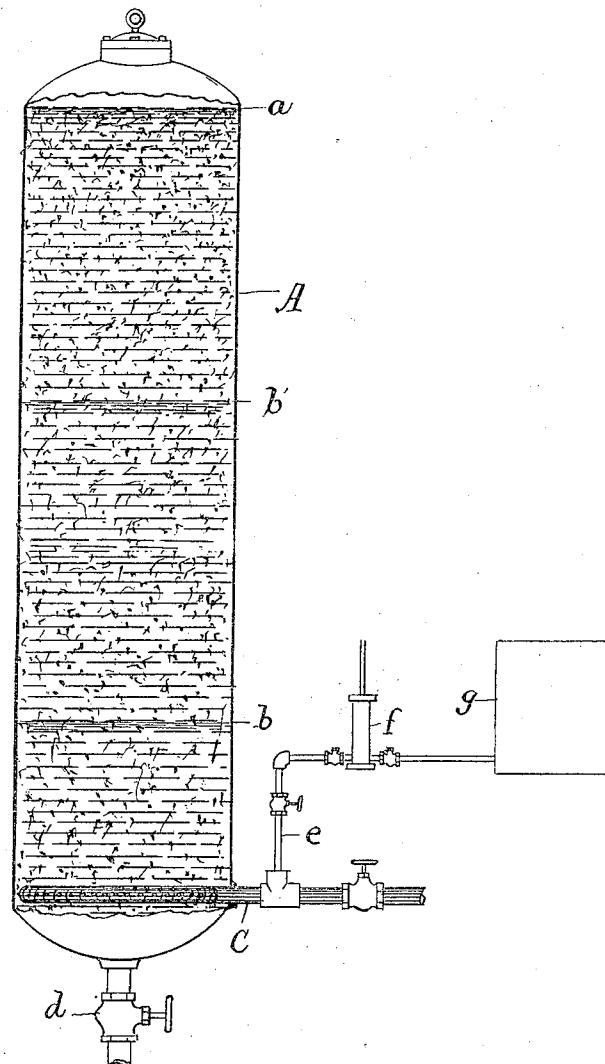


E. F. PARKER.
METHOD OF CHARGING PULP DIGESTERS.
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Witnesses:
E. M. Hunkley
C. W. Dennis.

Inventor:
Edward F. Parker
by S. W. Bates
Att'y.

UNITED STATES PATENT OFFICE.

EDWARD F. PARKER, OF FAIRFIELD, MAINE.

METHOD OF CHARGING PULP-DIGESTERS.

942,924.

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To all whom it may concern:

Be it known that I, EDWARD F. PARKER, of Fairfield, in the county of Somerset, State of Maine, have invented certain new and useful Improvements in Methods of Charging Pulp-Digesters, of which the following is a specification.

My invention relates to the manufacture of paper pulp from wood and it relates particularly to the method of cooking the wood in vertical digesters.

The vertical digesters in which the cooking operation takes place are usually made of steel capable of resisting a high pressure and are frequently as large as nine feet in diameter and about forty feet in height.

The process of treating wood in the manufacture of soda pulp as heretofore practiced was as follows: About twelve cords of wood cut into small chips by the use of suitable machinery was charged into the digester through the charge opening at the upper end and about 73,500 gals. of caustic soda liquor of a strength of 15° Baumé was pumped in at the top and the cover was then put on. Steam at a hundred pounds pressure was introduced through perforated pipes at the bottom of the digester and the cooking process was continued for about twelve hours after which time the contents of the digester was blown off through the discharge outlet at the bottom.

In the practical operation of this process it is found that the steam when it first enters the cold liquor and to a certain extent all through the process, condenses in the lower portion of the mass at or near the bottom of the digester and the condensed water acts to dilute the strength of the soda solution particularly at that point. At the same time the hot steam rises to the top of the digester forming a hot zone at that point and producing a counter current of partially cooled liquor down the side walls of the digester which passing down to the bottom, lowers the temperature at that point. Thus the contents of the digester are hotter at the upper end than at the lower end and the liquor at the upper end tends to become slightly stronger than that at the lower end on account of the diluting action of the condensed steam at the latter point. The result is that in treating pulp according to the old process I find that when the upper portion is thoroughly cooked and the wood converted into fiber the lower portion will be

somewhat undercooked with a portion of the chips not thoroughly pulped so that when the contents of the digester are blown off the uncooked chips will frequently remain behind. On the other hand if the process is continued long enough so that the bottom portion is thoroughly digested the upper portion is found to be overdone or cooked too much, weakening and partially destroying the fiber. For this reason it was necessary in charging the digester when using the old process to use liquor of sufficient strength so that it would cook the charge at the bottom where the lower temperature prevailed notwithstanding the fact that a less strength at the top where the temperature was higher would have been sufficient. Thus there was a considerable waste of liquor caused by the use of liquor of excessive strength.

Under the old process it was also customary to charge the digester with a considerably greater quantity of liquor more than was theoretically required for the work because there was a considerable difference in the amounts required for different kinds or grades of wood which varied as to the quantity of water, pitch, etc., contained therein. Thus there was generally used for this reason an excess in quantity of liquor more than was absolutely necessary, to avoid any possible danger of having a deficiency which might spoil the entire charge.

The object of my invention is to charge the digester in such a way that the entire mass will be evenly cooked and the pulp produced will be of a uniform character and waste of liquor eliminated.

My invention is founded on the fact that wood cooked in a weak liquor at a relatively high temperature may be digested when the heat and strength are properly proportioned in the same length of time as if it were cooked at a lower temperature with a relatively strong liquor.

In carrying out my process I divide my liquor into several grades as to strength and charge the digester with the different grades in layers or one grade on top of another.

The lower portion of the digester is charged with a solution somewhat stronger than the solution introduced at the middle and top, the strong solution being introduced first and the weaker solution last so that the stronger solution at the bottom by its more intense action on the wood will off-

set the effect of the greater heat at the top of the digester. This result is further effected and the full strength of the liquor at the lower portion is kept up by injecting at the lower portion of the digester a quantity of the stronger liquor after the steam has raised the contents of the digester to its highest temperature. We thus have throughout the cooking operation a relatively strong solution at the bottom where the temperature is relatively low and a weaker solution at the top where the temperature is relatively high, the variation in strength of the two kinds of liquor being such as to offset the variation in temperature between the upper and lower portions of the digester.

In carrying out my invention I have found that the following method produces satisfactory results;—I first introduce the chips, filling the digester from one quarter to one half full with about 1312 gallons of 14° caustic liquor. I then finish filling the digester with chips adding about 2937 gals. of 12° and 2937 gals. 10° caustic liquor also spent liquor to cover chips. The cover is then closed and the steam turned on. After the steam has been on long enough to bring the temperature up to its maximum point so that the condensation has practically ceased, I inject into the lower portion of the digester about 300 gals. of 14° liquor. The process is then continued for about 12 hours in all and the contents of the digester blown off in the usual way. If it is found at the end of about one hour that the liquor is not sufficiently strong to digest the wood an additional quantity is injected since on account of the difference in the quality of the wood it is not always possible to tell in advance just how much liquor is necessary to properly cook the wood. It is found that when manipulated in this way all the pulp is thoroughly converted into fiber, the digester is blown off clean leaving no residue of chips, more pulp is produced per ton of wood and the whole mass is of a uniform quality with little or no variation. There is also a considerable saving in the chemicals for when used in this way weaker solutions may be employed with a better effect than when the strong solutions were used in the old process for where in the old method the strength was fifteen degrees, under my present method I do the same work with an average of a twelve degree solution.

In the accompanying drawing I have illustrated an apparatus for carrying out my process, the drawing showing a vertical section through the digester which is provided with means for injecting the solution.

In the drawing A represents the digester, *b* the upper limits of the stronger solution, *b'* the upper limits of the intermediate solution and *a* the top of the charge. The steam

is introduced through a perforated steam pipe C at the bottom and the charge is drawn off through the valve *d*. I have here shown means for introducing the auxiliary supply of liquor through the steam pipe by means of a pipe *e* connected with the steam pipe with a tank *g* for holding the auxiliary liquor and a pump *f* for pumping it into the steam inlet pipe.

While I have shown means for forcing in the auxiliary supply of liquor it is evident that it may be introduced against the internal pressure of the digester in other ways.

While I have described the application of my process to the manufacture of soda pulp it is evident that it may be equally well applied to other processes as the sulfite process or the sulfite of soda process there being always a tendency in digesters of great height and relatively small diameter to get an unequal amount of heat at the top and bottom and consequently an unequal effect in the cooking of the pulp.

It is evident that instead of using three grades of the liquors as above set forth, I may use two or any desired number of grades and the more grades used the more uniform the result will be.

Instead of charging the digester in grades it may be charged in the old way with one grade and additional liquor injected during the operation either to keep up the necessary strength at the bottom or to keep the necessary quantity in the digester should it be found that there is a deficiency at the start.

By being able to add liquor in the process of cooking I am enabled to approximate more closely to the correct amount required in charging when under the old system a considerable excess was always used to avoid any possible danger of having a deficiency and a failure of the process.

I claim:—

1. The herein described method of cooking wood in the manufacture of wood pulp which consists of charging the digester with wood and caustic soda or other like liquor with a relatively strong solution at the bottom and a relatively weak solution at the top of the digester and finally injecting steam under pressure.

2. The herein described method of cooking wood in the manufacture of wood pulp which consists of charging the digester with wood and caustic soda or other like liquor with a relatively strong solution at the bottom and a relatively weak solution at the top of the digester, injecting steam under pressure and while the mass is cooking injecting an additional quantity of liquor at the bottom of the mass.

3. The herein described process of cooking successive quantities of wood in the manufacture of wood pulp which consists of charging the entire quantity to be treated into

the digester with caustic soda or other like liquor, subjecting it to the action of steam under pressure and when the mass has reached substantially its normal cooking temperature injecting an additional quantity of liquor at the bottom of the mass.

4. The herein described process of cooking successive quantities of wood in the manufacture of wood pulp which consists of charging the entire quantity to be treated into the digester with caustic soda or other like liquor of normal strength, subjecting it

to the action of steam under pressure and when the mass has reached substantially its normal cooking temperature injecting an additional quantity of liquor at the bottom of the mass.

In witness whereof I have affixed my hand this 30th day of March 1909.

EDWARD F. PARKER.

Witnesses:

B. H. LAWRENCE,
A. A. MERRILL.