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METHOD OF MAKING STRAW PULP FOR STRAW BOARD

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This invention relates, generally, to pulp and paper board making and the invention has reference, more particularly, to a novel method of preparing straw pulp for the manufacture of straw board, such as used for corrugated paper board and other uses.

Heretofore, it has been the common practice to employ the lime process in cooking straw to be used in producing straw board. The straw board produced by the lime process is not entirely satisfactory for many uses owing to the relative softness of the fibers composing the same, and the consequent tendency of such board to disrupt or tear, when subjected to forming operations, for example, when using straw board to form corrugated sheets or boards. Soft fiber board while passing through present day high speed corrugating machines is frequently disrupted or injured resulting in an inferior and oftimes useless product.

The principal object of the present invention is to provide a method of making straw pulp suitable for the manufacture of straw board, which method will cause the resulting board product to be composed of hardened, tough and strong fibers, so that a straw board made by the method possesses ample strength, elasticity and tenacity to enable the same to be subject to forming operations such as its passage through high speed corrugating operations without disruption or other injury.

Another object of the present invention lies in the provision of a method for making straw pulp for the manufacture of straw board which method will increase the pulp yield over that of the lime process.

Still another object of the present invention is to provide a method for making straw pulp suitable for the manufacture of straw board, which method consists in treating straw with chemicals in a rotary or other digester or container to produce straw pulp which may be manufactured into straw board with relatively little washing, thereby reducing the loss of chemicals, and reducing the amount of slime, whereby a reduction in the depreciation of cylinders and felts is obtained, resulting in a corresponding saving.

The present invention contemplates a method by means of which straw may be so treated with lime, soda ash and sulphur in a rotary or other digester in the presence of water and steam, whereby a pulp is produced having strong, tough fibers, rendering the same suitable for use wherever strength is required and which is especially adapted for manufacturing board to be used for corrugating purposes.

Other objects of this invention, not at this time more particularly enumerated, will be clearly understood from the following detailed description of the same.

In carrying out the method of the present invention, straw is fed into a rotary or other suitable container and water is added along with the straw. Slacked lime is also added, whereupon the head of the rotary is closed and the rotary is then revolved for about a half hour with the admission of steam which "wilts" or breaks down the straw somewhat and renders the same more compact. The head of the rotary is then opened and more straw added, whereupon the head is again closed and the charge again steamed or "wilted" as before. This operation is repeated a number of times until the full amount of straw which the rotary is capable of taking has been added. When the rotary has been filled with its entire quota of straw, soda ash and sulphur are introduced thereinto, whereupon the rotary head is closed and the rotary revolved while the steam pressure therein is increased for the cooking operation. The full batch is cooked for about eight hours, whereupon the liquor is drained off, the charge is cooled, the head removed and the charge dumped. The charge is then washed and proceeded with in the usual way to produce pulp suitable for making paper board.

Without restricting the invention to details, the following is given as an example of the method of the present invention. The rotary, digester or other suitable container is charged with 4000 pounds of dry straw, such as wheat, rye or oat straw. Water is then added to the extent of 2000 gallons, whereupon 575 pounds of slacked lime is added.

The rotary head is now closed and steam is admitted thereto and the rotary revolved for about thirty minutes. The head of the rotary is then opened and about 2000 additional pounds of straw are added, whereupon the rotary is again closed and the charge steamed down or "wilted" for another thirty minutes while revolving the rotary. The rotary is then opened and more straw added whereupon the charge is again steamed down while rotating the rotary. This cycle of operations is continued until the rotary has received its full quota or batch of straw which in the present instance is approximately 15000 pounds. Dry soda ash to the approximate amount of 500 pounds is then introduced into the rotary, together with 50 to 75 pounds of lump sulphur. The exact amount of sulphur to be used depends upon the initial softness of the straw, i. e. the softer the straw the more sulphur necessary as the sulphur functions to strengthen and harden the straw fibers. When a fairly firm straw is employed only 50 pounds of sulphur need be used, but with soft straws the amount of sulphur is increased nearer the 75 pound figure.

The rotary is now closed and the batch is cooked for eight hours under a steam pressure of from 30 to 50 pounds per square inch, depending upon the softness of the straw, the rotary being rotated all the while. During the cooking process the lime functions to loosen and separate the incrusting matters, such as starches, gums and silicates from the cellulose of the straw, while the soda ash acts as a digesting agent to aid in loosening and separating the straw fibers. The sulphur acts as an agent for toughening and hardening the straw fibers and is an important ingredient used in the present process since through its use the straw fibers are rendered hard and strong so as to enable the paper or board produced from them to withstand desired forming operations, such e. g. as corrugating operations. The lime, soda ash and sulphur combine with the lignin and foreign matter of the straw to form various soluble or semi-soluble compounds, while gases such as carbon dioxide, sulphur dioxide, oxygen and hydrogen are produced. After cooking the batch, the liquid and steam are blown off, the rotary is opened and the stock dumped, to be thereupon washed, beaten and proceeded with in the usual way to produce straw board. No foul odors are present when the rotary is blown off.

Owing to the use of soda ash and sulphur in combination with the lime during the cooking process, the cellulose straw fibers are rendered more pure, are better separated and are stronger and tougher than the fibers produced by the old lime process. Also, the soluble compounds formed during the cooking are readily dislodged from the fibers leaving them clean and workable with much less washing than is necessary when using the lime process.

It is not intended to limit the invention to the relative proportions of straw, soda ash, lime and sulphur mentioned, inasmuch as variations from these proportions may be made depending upon the physical characteristics of the straw used. Also, additional quantities of lime, soda ash and sulphur may be added during the cooking process in some instances.

The straw fibers produced by the present method are strong and tough and possess the desired elasticity, flexibility and tenacity which, when pulped and matted to form paper sheets, enables the paper or board produced to be run through corrugating machines at high speed with little or no risk of disrupting or breaking up the paper or board body. Furthermore, the produced paper or board possesses uniform strength and texture.

It is to be understood that the steps above recited are given merely for the purpose of illustrating the invention and are not to be considered in a limiting sense. Modifications will occur to those skilled in the art. It is intended to cover all such modifications that fall within the scope of the appended claims.

What is claimed is:—

1. A cooking process for disintegrating straw, consisting in first partially disintegrating an initial quantity of straw by the application of lime and steam, adding additional quantities of straw and similarly disintegrating the same until a total batch of straw is obtained, adding to this batch of straw, soda ash and sulphur, and then finally cooking the batch by the use of steam under pressure and while agitating the batch.

2. A process of disintegrating straw which consists in first treating a minor quantity of straw with lime and steam while agitating in a rotary, adding additional quantities of straw at intervals until a full batch is loaded into the rotary, and then adding soda ash and sulphur to the batch and then cooking the batch.

3. A process of disintegrating straw which consists in first treating a minor quantity of straw with lime and steam while agitating in a rotary, adding additional quantities of straw at intervals until a full batch is loaded into the rotary, and then adding soda ash and sulphur to the batch and then cooking the batch under steam pressure for about eight hours.

In testimony, that I claim the invention set forth above I have hereunto set my hand this 27 day of March, 1930.

MAX ZIMMERMAN.