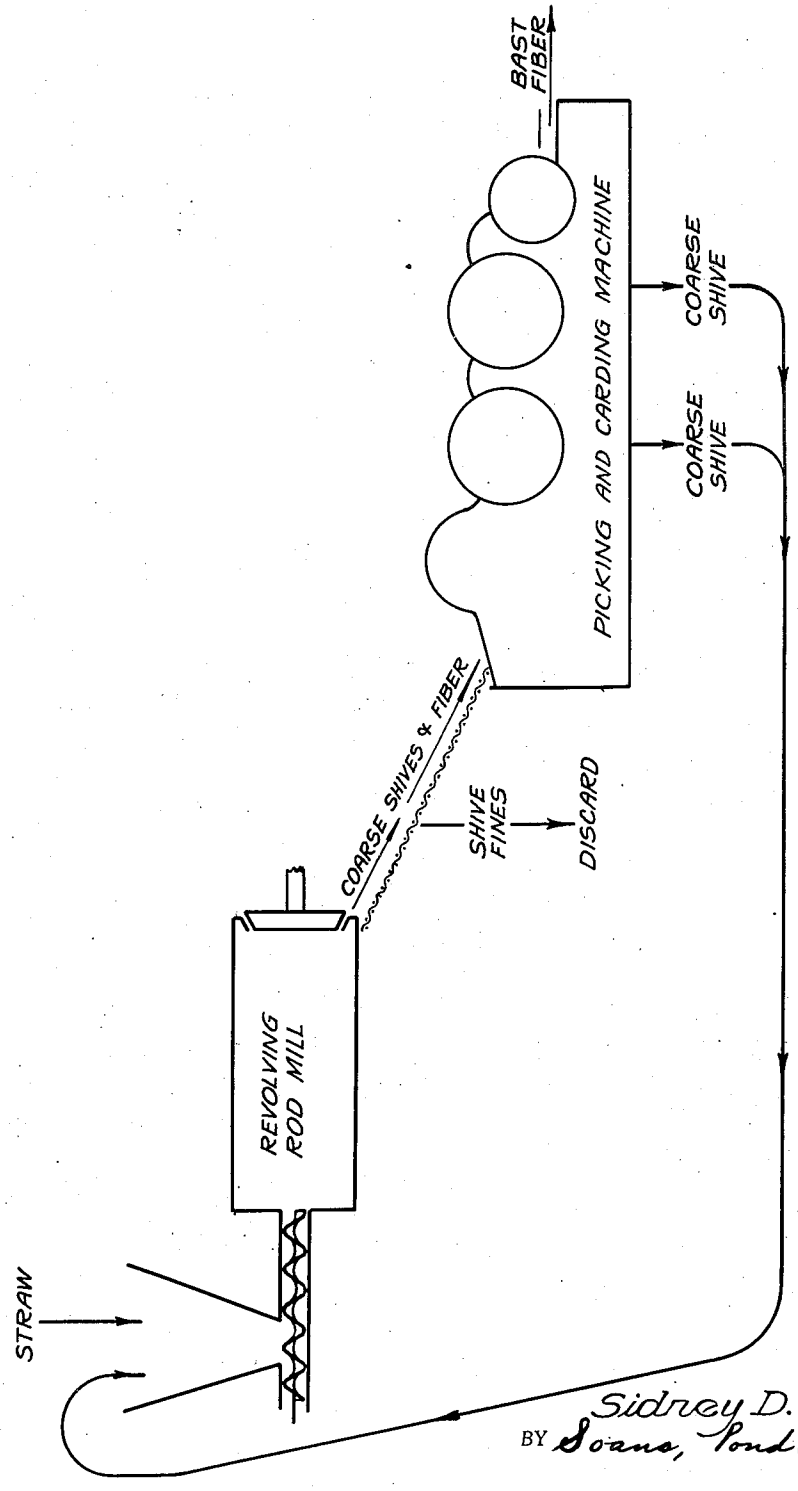
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MANUFACTURE OF PAPER-MAKING FIBER

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MANUFACTURE OF PAPERMAKING FIBER

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2 Claims. (Cl. 19—5)

My invention relates to improvements in the manufacture of an improved paper-making fiber from bast fiber which is a constituent of various plants, for example flax, hemp, ramie, and nettle, which plants may be included under the general designation of bast fiber straw.

In the manufacture of cigarette paper, bank-note, currency and similar papers, it is recognized that fiber such as linen, hemp, ramie etc., consisting of bast fibers, impart essential properties which cannot be obtained from fiber derived from seed such as cotton or fiber derived from lignocellulose such as the various types of wood pulp. The supply of rags made from purified bast fibers is decidedly limited and it is usually necessary to use certain proportions of fibers, not of bast origin, in order to supply the demand for paper of the type mentioned with the amounts of linen, hemp and other rags that are available.

In time of war, when communication with countries that produce and use linen is cut off, the situation is acute. At the same time that this condition occurs quantities of flax straw, more than sufficient to supply all of the requirements of bast fiber in paper manufacture, are destroyed annually in Minnesota and North Dakota as a waste product from the production of flax seed. Efforts to mechanically separate the bast fibers from the remainder of the stem so as to produce a fiber free from shive have not been successful, although countless thousands of dollars have been devoted to the problem during the past fifty years.

According to prior practice in the manufacture of paper-making materials, it was supposed that any pulverizing treatment of a raw material would so shorten the fiber that it would be unsuitable for the manufacture of fine papers. On the contrary, I have discovered that the most economical and most effective way of detaching bast fiber from the shive of the straw is by subjecting the material to a percussive treatment which almost approaches a pulverizing operation. I find that such treatment, it is true, does shorten the fiber, but the length of the fiber is found to be quite sufficient for paper-making purposes, contrary to popular belief. As a matter of fact, the percussive treatment, when properly carried out and in the properly selected equipment, does not effect any important reduction in the length of the fibers, in view of the fact that the fibers, being relatively elastic, can be subjected to considerable pressure or percussion before they are severed, while at the same time the shive, which comprises about seven-eighths of the straw, is shattered into small pieces which can be readily separated from the fiber by proper treatment and equipment.

After the bast fiber has been separated from the shive part of the straw, it is preferably subjected to a cooking operation of the usual character, for example a conventional lime boil, and the usual washing and bleaching steps characteristic of the paper-making procedure in the manufacture of bank-note, currency and cigarette papers.

Example

In the drawing, the figure represents in diagrammatic form an apparatus which I have successfully used in producing bast fiber by my improved process.

In extracting bast fiber from flax straw, the straw, if desired, may be cut to convenient lengths by means of a rag cutter or other suitable device. Although this, in certain instances, may not be necessary with certain types of straw, I have found it of some advantage in preparing the raw material for subsequent steps in the process.

The percussive treatment to which the straw is then subjected is effected preferably in a rod mill such as is used for pulverizing ores. A rod mill sixteen feet in length, seven feet in diameter and filled about half full with rods averaging two inches in diameter, is effective for the purpose, when operated at a speed of about twelve and one-half revolutions per minute.

Such rod mills as I have seen employed have all been designed for operating upon wet material. Of course, it is understood that, in practicing my process, it is advantageous to have the straw as dry as possible so that it will be quite brittle and shatter freely into small particles when subjected to the percussive treatment.

The raw straw is fed into one end of the rod mill, preferably by means of some force feeding arrangement such as a cylinder and piston or a screw feed of conventional type such as is used for feeding coal to a stoker or chaff in a threshing machine. The delivery end or discharge end of the rod mill is formed by allowing an open space of about three-fourths of an inch in width between the outer revolving shell of the rod mill and the inner cone or center portion of the same.

The shattered or comminuted material discharged from the delivery end of the rod mill is conducted to a gravity type shaker screen of about 40 mesh which removes the smaller particles of broken up shive, these smaller particles

usually representing more than one-half of the total shive. This is discarded. The remainder of material consisting of virtually all of the fiber and approximately an equal weight of shive is then conducted into a garnetting equipment such as is employed in the manufacture of upholstery felt from cotton linters. The picking and garnetting or carding operation to which the material is subjected in this machine serves to card out the fiber from the woody shive parts. These shive parts which are rejected by the garnetting machine are returned to the inlet end of the rod mill for further treatment. In this way, practically all of the bast fiber is recovered.

The bast fiber which results from the final carding operation contains an insignificant percentage of shive. This is shown by the fact that the waste shive separated in this way contains about 25.6% of pentosan; whereas, the bast fiber which is the final product from the carding operation contains only approximately 2.8% of pentosan.

I claim:

1. The method of making an improved papermaking fiber which consists in subjecting dry flax straw to a percussive treatment so as to shatter the woody parts and thereby detach most of the bast fibers from the shive parts, and subsequently subjecting the material to a carding operation so as to separate the bast fiber from the shive parts, and mechanically separating the larger particles of the shive from the smaller particles of the shive, and then repeating the percussive and carding treatments in the case of the larger particles of shive so as to salvage the bast fibers not effectively detached from the shive parts during the first percussive treatment.

2. The method of making an improved papermaking fiber which consists in subjecting dry flax straw to a percussive treatment so as to shatter the woody parts and thereby detach most of the bast fibers from the shive parts, then mechanically separating the smaller particles of the shive from the fiber and the larger particles of the shive, then subjecting the material to a carding operation so as to separate the bast fiber from the larger particles of the shive, and then repeating the percussive and carding treatments in the case of the said larger particles of shive so as to salvage the bast fibers not effectively detached from the shive parts during the first percussive treatment.

SIDNEY D. WELLS.