J. L. JARDINE.

APPARATUS FOR PREPARING BAMBOO AND KINDRED MATERIAL FOR PULP EXTRACTION.

APPLICATION FILED MAR. 4, 1919.

1,329,973. Patented Feb. 3, 1920.

2 SHEETS—SHEET 1.

FIG. 1.

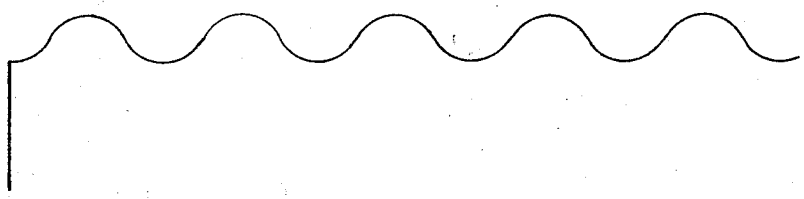


FIG. 2.

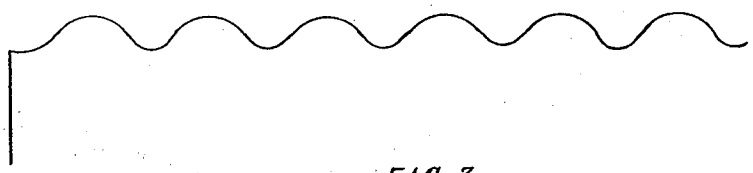


FIG. 3.

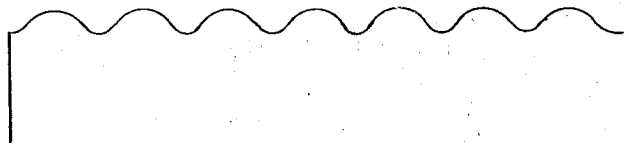


FIG. 4.

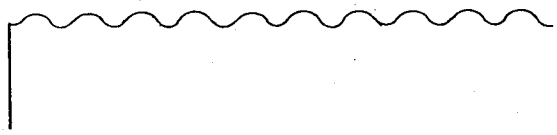
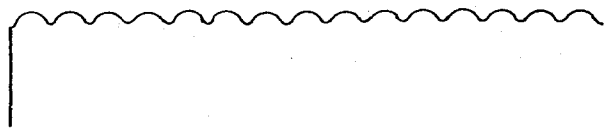


FIG. 5.



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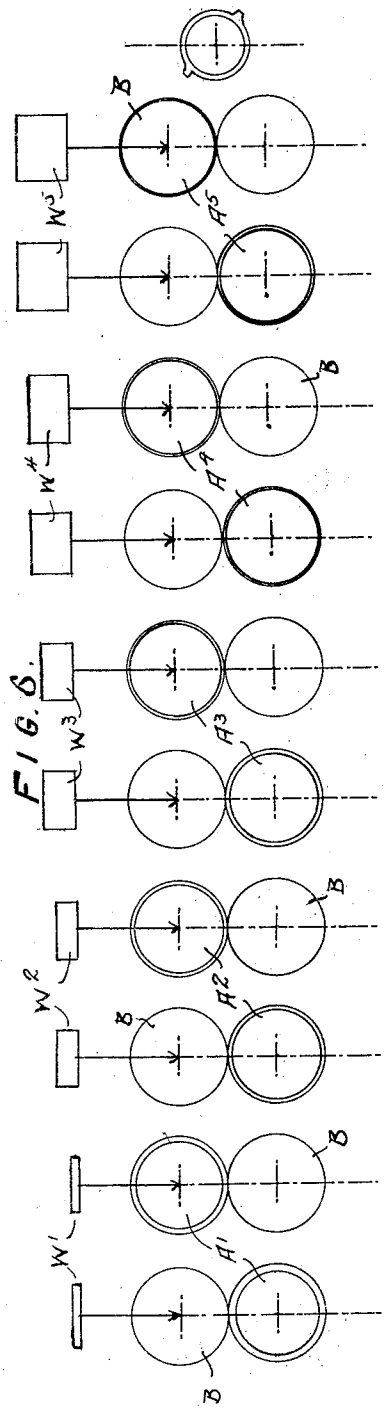


FIG. 6.

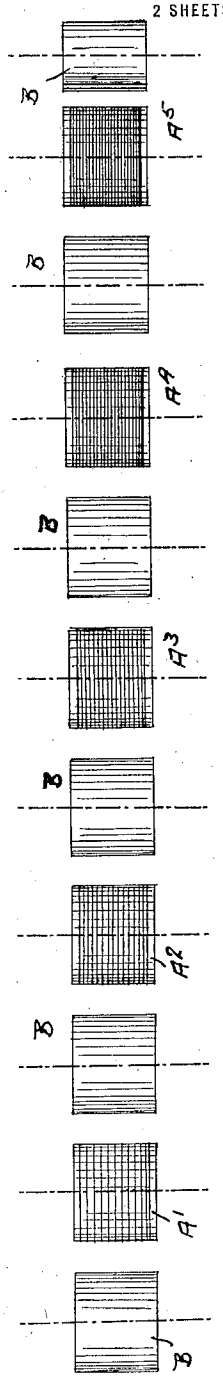


FIG. 7.

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UNITED STATES PATENT OFFICE.

JAMES LOCKHART JARDINE, OF PENICUIK, SCOTLAND, ASSIGNOR TO BAMBOO PAPER COMPANY, LIMITED, OF LONDON, ENGLAND, A CORPORATION OF GREAT BRITAIN.

APPARATUS FOR PREPARING BAMBOO AND KINDRED MATERIAL FOR PULP EXTRACTION.

1,329,973. Specification of Letters Patent. Patented Feb. 3, 1920.

Application filed March 4, 1919. Serial No. 280,571.

To all whom it may concern:

Be it known that I, JAMES LOCKHART JARDINE, a subject of the King of Great Britain and Ireland, and a resident of Penicuik, Scotland, have invented certain new and useful Improvements in Apparatus for Preparing Bamboo and Kindred Material for Pulp Extraction, and of which the following is the specification.

The invention relates to apparatus for crushing split bamboo or kindred material preparatory for its conversion into pulp and of the type in which the split bamboo is passed endwise between pairs of rolls, one roll of each pair being grooved or corrugated circumferentially and the other smooth surfaced, the position of the rolls being reversed in each succeeding pair, all as described in the specification of the earlier British Patent, No. 14,421 of 1914.

The invention has for its object to so form and proportion the grooves or corrugations of successive rolls, that the breaking down and crushing of the cane structure is accomplished in a highly effective manner.

According to the invention there is provided a considerable number of pairs of rolls—there may for example be as many as ten. Each pair consists of one grooved, or corrugated roll, and one smooth surfaced roll. The pitch and depth of the grooves, or corrugations vary progressively from a maximum at entering end of the range to a minimum at the leaving end. The variation between the greatest and the least is preferably considerable—for example, the pitch and depth of the greatest may be three times that of the least.

The corrugations are of such form as to stretch the split cane the maximum amount laterally without penetration or subdivision of the mass. For this purpose the first roll is, as already set forth, the most deeply corrugated, and there is applied to its journals the least pressure. As, however, the cane becomes softened and widened into a tissue-like structure by the successive squeezings and crushings, the finer and more shallowly corrugated rolls having a heavier pressure applied to their journals become necessary to insure the maximum separating and softening effect without destroying the lateral continuity of the web, so that it is finally discharged from the rolls as a mat-like hand of tissue.

Therefore preferably the form of grooving is that of circumferential corrugations—that is to say, a series of arcs of circles having their ends joined by reversed reëntrant arcs. Preferably the grooves are relatively shallow in depth—their depth may for example be one quarter of their pitch. By way of example and as defining but not limitatively the size of the corrugations, the pitch of the greatest may be 1.25 inches and of the least of a series of ten may be 0.375. Corrugations of these proportions are suitable for dealing with bamboo stems with walls from 0.5 to 0.625 of an inch thick. If the walls be thinner the corrugations of the first roll may be lesser, but those of the last should not be decreased.

The positions of the rolls in successive pairs are reversed, that is to say, in one pair the plain roll is above, in the next pair it is below or in like relationship when the rolls are not horizontal.

In the accompanying drawings Figures 1 to 5 are diagrammatic partial side elevations of a roll group in which the rolls are circumferentially grooved or corrugated in accordance with my invention.

Figs. 6 and 7 are, respectively, more or less diagrammatic side elevations and plan, (drawn to a smaller scale) of the arrangement of the rolls in which my invention is illustratively embodied.

Referring to the drawings, it will be noted that each grooved roll A', A^2, A^3, A^4, A^5 coöperates with a plain roll B, and that there are five roll groups each comprising two pairs of rolls in which the roll grooves are of the same size, but arranged in reverse position with relation to the plain roll, so that the split cane is subjected on opposite sides to the pressure of a roll in which the circumferential grooves are of the same size. Thus, while there are grooved rolls of five different sizes, there are ten pairs of rolls. Furthermore, as above explained, the pressure on the journals of each succeeding group of roll pairs increases as the size of the grooves diminishes. This I have indicated diagramatically in Fig. 6 by the weights W', W^2, W^3, W^4, W^5, which successively increase in size from the feed end to the dis-

charge end of the range. Of course this pressure on the bearings may be exerted in any desired manner, so long as it is least at the feed end of the range, where the rolls of largest grooves are situated, and greatest at the discharge end of the range, where the rolls with grooves of least size are arranged. By this construction and arrangement of the rolls the split cane is stretched laterally the maximum amount without penetration or subdivision of the mass, the cane becoming gradually softer, and its fibers separating and widening into a tissue-like structure or web without destroying the lateral continuity thereof, and is finally discharged from the range as a mat-like hand of cane tissue.

What I claim is:—

1. In a machine of the type described, a range of roll pairs of like type adapted to crush a material such as split bamboo, each roll pair comprising a smooth roll and a cooperating circumferentially grooved roll, the grooves in the rolls at the feed end of the range being greater in pitch and depth than those of the rolls at the discharge end of the range, and the range serving to stretch the split cane into a mat-like hand of tissue without destroying the lateral continuity of the web, substantially as described.

2. In a machine of the type described, a range comprising a series of groups of roll pairs of like type adapted to crush a material such as split bamboo, each group having two pairs of rolls, the rolls of one pair being reversed with relation to the rolls of the other pair, and each roll pair throughout the series of groups comprising a smooth roll and a coöperating circumferentially grooved roll, the grooves in the rolls of successive groups varying in pitch and depth, and those of the group at the feed end of the range being greater in pitch and depth than those of the rolls of the group at the discharge end, and the range serving to stretch the split cane into a mat-like hand of tissue without destroying the lateral continuity of the web, substantially as described.

3. In a machine of the type described, a range of crushing roll pairs arranged in sequence and comprising pairs having a plain roll and a coöperating circumferentially grooved roll, the grooves of the rolls at the feed end of the range being of greater pitch and depth than those of the rolls in the discharge end of the range, and the range serving to stretch the split cane into a mat-like hand of tissue without destroying the lateral continuity of the web, substantially as described.

4. In a machine of the type described, a range of crushing roll pairs arranged in sequence and comprising pairs having a plain roll and a coöperating circumferentially grooved roll, the grooves of the rolls at the feed end of the range being substantially three times the pitch and depth of those of the rolls at the discharge end of the range, and the range serving to crush the material into a mat-like hand of tissue without destroying the lateral continuity of the web, substantially as described.

5. In a construction such as specified in claim 3, grooved rolls throughout the range in which the grooves are of a depth substantially one quarter of their width.

6. In a construction such as specified in claim 3, grooved rolls at the feed end of the range having grooves with a pitch of $1\frac{1}{4}''$ and grooved rolls at the discharge end of the range having grooves of a pitch of 0.375, and intermediate grooved rolls with grooves gradually diminishing in pitch from the feed to the discharge end of the range.

7. In a machine of the construction specified in claim 3, grooved rolls in which the grooves are formed by arcs of circles joined by reverse reëntrant arcs, substantially as described.

8. In a machine such as specified in claim 3, pressure means for the coöperating rolls of the range, the pressure upon the rolls at the feed end of the range being less than that upon the rolls at the discharge end of the range.

In testimony whereof I have signed my name to this specification.

JAMES LOCKHART JARDINE.