UNITED STATES PATENT OFFICE.

WILLIAM N. CORNELL, OF BROWNVILLE, NEW YORK.

PROCESS OF MAKING PAPER-PULP BOARDS IN IMITATION OF NATURAL WOOD.

SPECIFICATION forming part of Letters Patent No. 522,513, dated July 3, 1894.

Application filed August 31, 1893. Serial No. 484,498. (Specimens.)

To all whom it may concern:

Be it known that I, WILLIAM N. CORNELL, a citizen of the United States, residing at Brownville, in the county of Jefferson and State of New York, have invented certain new and useful Improvements in Processes of Making Paper-Pulp Boards in Imitation of Natural Wood; and I do hereby declare the following to be a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

In Letters Patent of the United States No. 433,326, dated July 29, 1890, I described and claimed an improved process for making boards of wood pulp in imitation of natural woods. In this process the configuration or the grain of the wood was obtained by making the upper press roll of a cylinder pulp machine of the wood which was to be imitated, or in imitation thereof, so that when the pulp was wound on said press roll, each layer thereof would receive the impression from said press roll. The results obtained by this process were perfect imitations of natural woods but in order to carry the process into effect it was necessary to remodel the machine to a certain extent, and when the machine was thus remodeled it could be used only for this particular purpose. In addition to this, a press roll made of wood is not altogether satisfactory, especially when it is made of soft wood, and if the upper press roll was made in imitation of wood by etching or engraving the graining thereof on a metal cylinder, the cost of constructing such press roll would be very considerable.

In Letters Patent of the United States No. 435,684, dated September 2, 1890, I described and claimed an improved machine for making imitation burls and knots in wood pulp or paper pulp boards. Said machine consists in the addition to an ordinary cylinder wood pulp machine, of an extra roll placed above the upper press roll, said extra roll being composed of spongy rubber or similar material having a reciprocating motion above the upper press roll and also a rotary motion above the same. In said machine I also make use of suitable coloring devices for imitating the dark color of burls and knots. The results obtained by this machine were perfect imitations of burls and knots but the addition of the extra roll and coloring appliances not only were expensive but made the machine cumbersome and said extra appliances had to be removed from the machine when ordinary work was to be done thereon.

I have now invented an improved process, which I shall presently describe, of making paper pulp boards or paper in imitation of natural woods.

By the use of my improved process I can also imitate in a perfect manner burls and knots in natural woods.

In carrying out my improved process I can make use of any well known paper or wood pulp machine without making any changes or additions thereto whatsoever.

My improved process can be carried out economically and requires no special skill or knowledge on the part of the operator.

In describing my improved process I propose to first refer to the machine with which I am most familiar and which is referred to in my said patents above mentioned, *i. e.* a cylinder wood pulp machine. Such a machine consists of a vat in which the pulp is placed. In said vat is mounted a making cylinder and above said making cylinder passes the web or felt of the machine, said web or felt extending over rollers in the usual way and having suitable mechanism for applying the necessary tension thereto. The said web or felt passes between the two press rolls of the machine, which are pressed together by means of weights or other mechanism. The making of wood pulp boards on such a machine is well understood by all familiar with the art, and is substantially as follows: The making cylinder takes up out of the vat a thin film or layer of the pulp, which is passed on to the web or felt of the machine. By the web or felt this film or layer of pulp is carried down between the two press rolls, by means of which, or by means of the ordinary couch roll or vacuum box, or all of these three elements, it is relieved of its water. This thin film or layer of pulp is then taken up by the upper press roll and is allowed to wind convolutionally thereon, until a board of the requisite thickness is obtained. The pulp on the upper press roll is then cut straight across from one side to another by means of a sharp

knife and is removed from the upper press roll. A wood pulp, or paper pulp board is thus obtained of the requisite thickness and having a length equal to the circumference of the upper press roll, as will be understood. The board is then flattened out, dried, calendered, sand papered, and, in some instances, varnished and otherwise finished and is then ready for the market. In carrying out my present process with such a machine when it is desired to imitate the grain of wood, I proceed substantially as follows:

Let it be supposed that a wood pulp board is to be obtained thirty inches wide, that being the width of the making cylinder, and having a thickness of forty laps or layers of the pulp on the upper press roll, said board being of a length equal to the circumference of the upper press roll, as in all such machines. I first dye the pulp in the vat by any suitable animal or mineral dyes or pigments of the color of the wood which is to be imitated. I then start the machine and allow, for instance, ten laps or layers of the pulp to be taken up by the upper press roll. I then take a separate sheet of pulp and tear it in an irregular form, which is, let it be supposed, not more than fifteen inches wide at its widest portion and not being longer than the circumference of the upper press roller. I will suppose this separate piece of pulp has a thickness equal to fifteen laps or layers of the pulp on the upper press roll. This separate piece of pulp, which should be either drier than the pulp on the upper press roll, or which should have a greater density than the same, but should not be absolutely dry and hard like a finished board or sheet, is placed on the center or about on the center of the pulp which has been wound on the upper press roll and is taken up thereby and wound on the roll with the pulp from the vat, so that the separate piece at its widest portion will be seven and one-half inches from each side of the pulp on the upper press roll. It will now be seen that that portion of the pulp on the upper press roll coincident with the separate piece which was introduced thereon is equal to twenty-five laps or layers thereon, whereas, at each side of said separate piece, the pulp on the upper press roll is equal to only ten laps or layers thereon. The greatest pressure is therefore brought to bear on the thickest portion of said piece of pulp and the tendency of the press rolls is to crush said thick portion down so as to make the pulp on the upper press roll of even thickness throughout. This uneven pressure causes the pulp on the upper press roll, and particularly the thick portion of the pulp thereon to separate and slip, so as to form wrinkles and ridges therein, which wrinkles and ridges extend through the board. The machine is allowed to operate until the desired thickness of the pulp on the upper press roll is obtained and by such time the effect of the press rolls has been to bring the pulp down to an even thickness throughout. The pulp is then removed from the upper press roll in the usual way. The board is then dried and may be calendered or not. After the calendering of the board, or after the drying, if the board is not calendered, one or both sides thereof is suitably sand-papered so as to efface the wrinkles and ridges which are formed therein, and make the board perfectly smooth. When this is done it will be found that there is left on the board a perfect representation of the grain of wood, as I have found by experiment. After the sand-papering of the board, the smooth surface is finished in any suitable way, such as by varnishing and polishing.

The adaptability of this new and improved process to paper machines of the Fourdrinier type will be obvious. Ordinarily such machines are used for the manufacture of a continuous strip of paper, but it is a fact well known to paper makers, that Fourdrinier machines can be used in substantially the same way as cylinder machines by allowing the pulp to wind convolutionally on one of the press rolls thereof, preferably the first press roll. When this is done my improved process is carried out on a Fourdrinier machine in precisely the same way as on a cylinder machine.

In carrying out my improved process with a cylinder machine, for the imitation of burls and knots, I proceed substantially as follows: The pulp is colored and is allowed to wind on the upper press roll as before explained, until the desired number of laps has been formed thereon. I then take small separate pieces of pulp having a greater density or being drier than the pulp on the press roll and being of a darker color than the pulp on the press roll, and allow such small pieces, at proper distances apart, to be wound up on the upper press roll with the pulp thereon. These small pieces are of irregular shape, and may be, for example, from one to three inches across the widest portion. These small pieces of pulp act in precisely the same way as before explained and in flattening out cause the pulp on the press roller to become wrinkled or ridged directly adjacent to said small pieces. The pulp board is then removed from the upper press roll and is dried or calendered as before and the side closest to the said pieces is sand-papered as before. This sand-papering process is carried on until the small separate pieces of pulp show on the outside, and these, being of a darker color than the base of the sheet, will show up in irregular lines in close imitation of burls or knots. The board is then finished by varnishing or polishing in the usual way. The introduction of these small separate pieces to the pulp on the cylinder machine may be carried on with or without the separate piece before explained for the imitation of the grain of wood, and it will also be understood that when only the grain of wood is to be imitated, that the single irregular piece which is allowed to wind up

on the press roll may be colored to a darker color than the wood, similar to the small separate pieces which are wound thereon when burls and knots are to be imitated.

Having now described my improved process, what I claim as new therein, and desire to secure by Letters Patent, is as follows:

1. An improved process of making paper pulp boards in imitation of natural wood, which consists in winding convolutionally on a paper machine a pulp board of less than the desired thickness; then in adding a separate piece or pieces of pulp to the partially finished pulp board and finally in finishing the winding of the pulp board to the desired thickness whereby said separate piece or pieces of pulp cause the pulp board to slip and wrinkle on the forming roll, substantially as set forth.

2. An improved process of making pulp boards in imitation of natural wood, which consists in winding convolutionally on a paper machine, a pulp board of less than the desired thickness; then in adding to the partially finished pulp board a separate piece or pieces of pulp of greater density or drier than the pulp board; and finally in finishing the winding of the pulp board to the desired thickness, whereby said separate piece or pieces of pulp cause the pulp board to slip and wrinkle on the forming roll, substantially as set forth.

3. An improved process of making pulp boards in imitation of natural wood, which consists in winding convolutionally on a paper machine, a pulp board of less than the desired thickness; then in adding to the partially finished pulp board, a separate piece or pieces of pulp of greater density or drier and of another color than the pulp board, and finally in finishing the winding of the pulp board to the desired thickness, whereby said separate piece or pieces of pulp cause the pulp board to slip and wrinkle on the forming roll, substantially as set forth.

4. An improved process of making pulp boards in imitation of natural wood, which consists in winding convolutionally on a paper machine, a pulp board of less than the desired thickness; then in adding to the partially finished pulp board, a separate piece or pieces of pulp of greater density or drier and of a darker color than the pulp board; then in finishing the winding of the pulp board to the desired thickness, whereby said separate piece or pieces of pulp cause the pulp board to slip and wrinkle on the forming roll; then in removing the pulp board from the machine, and finally in drying, sand-papering, and finishing said pulp board, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM N. CORNELL.

Witnesses:
C. W. ROBERTS,
H. I. HARRIS.