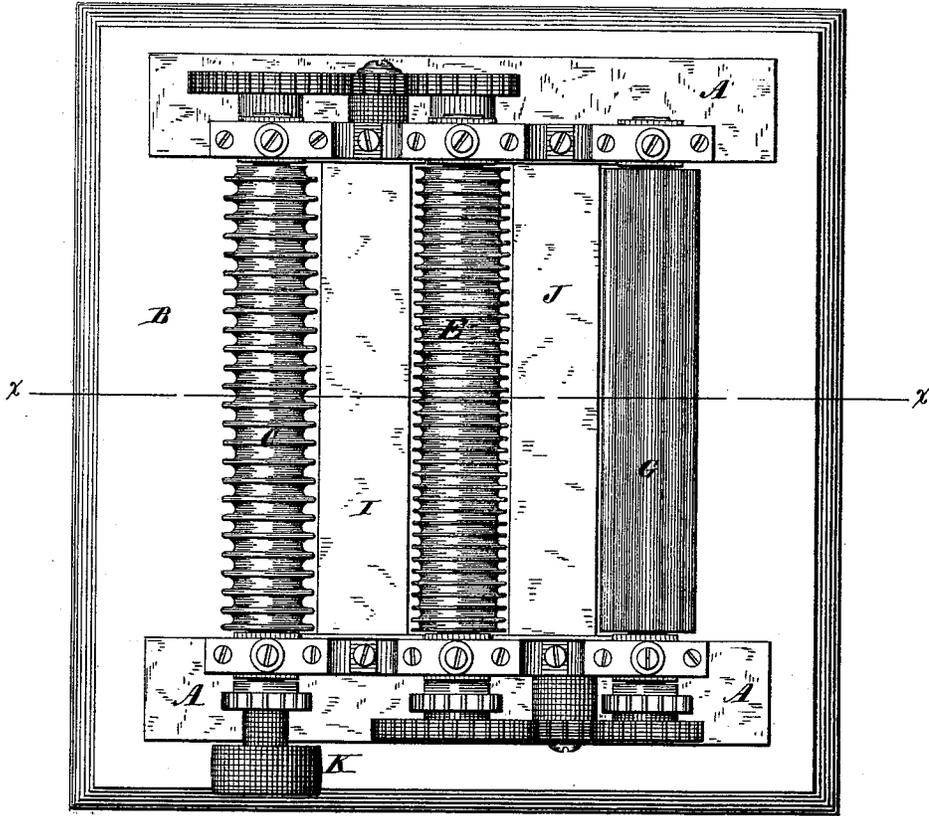


H. A. FRAMBACH.  
 Process and Machinery for Making Paper-Pulp  
 from Wood.

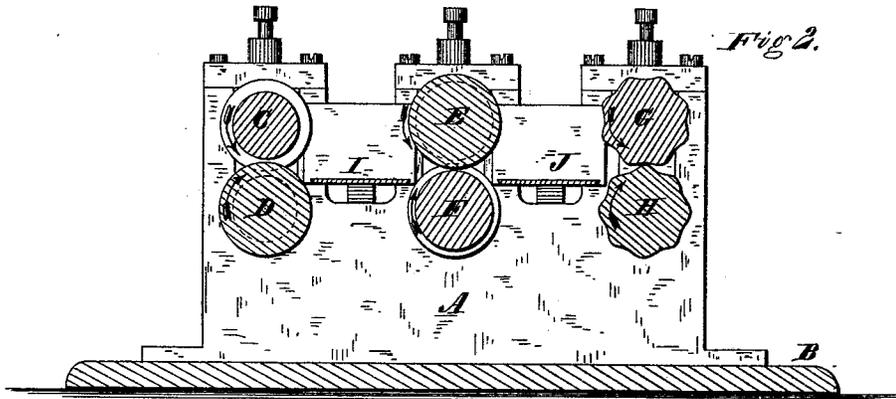
No. 221,404.

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*Fig 1.*



*Fig 2.*



*Fig 3.*



Witnesses

*Harry King*  
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Inventor.

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# UNITED STATES PATENT OFFICE.

HENRY A. FRAMBACH, OF MENASHA, WISCONSIN.

## IMPROVEMENT IN PROCESSES AND MACHINERY FOR MAKING PAPER-PULP FROM WOOD.

Specification forming part of Letters Patent No. **221,404**, dated November 11, 1879; application filed October 7, 1879.

*To all whom it may concern:*

Be it known that I, HENRY A. FRAMBACH, of Menasha, and State of Wisconsin, have invented certain new and useful Improvements in Processes and Machinery for Making Paper-Pulp from Wood; and I do hereby declare that the following is 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, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

Figure 1 is a plan or top view of the disintegrating-rollers employed in my process. Fig. 2 is a transverse vertical section of the same on line *xx* of Fig. 1. Fig. 3 is a face view of a part of the first pair of rollers, showing how their corrugated surfaces mutually engage or interlock with each other:

The same letter indicates the same part wherever it occurs in the drawings.

My invention relates to a process for reducing wood to paper-pulp; and it consists in subjecting the wood, previously divided into pieces of proper size, to the action, first, of a series of crushing-rollers of peculiar and various configuration; then, to the action of chemical agents, to remove the gluten and resin which it contains, and to bleach it if desired, and, finally, to the action of a grindstone or rasping-cylinders, or to a second passage through the series of rollers, from which it comes in a proper condition to be transferred to the pulping-engine, to be treated in the same manner as other pulps for the manufacture into paper, all as hereinafter more particularly described.

The first practical problem presented in the reduction of wood to pulp is the breaking down with the least expenditure of power of that portion of the material (parenchyma) which holds and supports the fibers and filaments without destroying the tenacity of the fibrous and filamentous portions themselves, whose condition determines the strength and quality of the paper formed from them; and the second problem is to present the prepared wood to the action of the bleaching and cleansing chemical solutions in such a state of aggrega-

tion as will invite the ready penetration of those solutions and their immediate contact with and prompt action upon the particles of wood which they are to purify and whiten.

The ultimate object is to bring the woody fiber into pulp in proper size and length and color to make paper of the required degree of fineness and purity of tint, while it retains its tensile strength unimpaired by the operation of the mechanical processes to which it has been subjected. It is obvious that sawing, abrading, rasping, grinding, tearing, stamping, and some forms of crushing, do not fully answer the conditions of these problems.

The process which I have devised has, I believe, met them better than any of the combined mechanical and chemical processes and devices with which I am acquainted.

The wood to be treated I saw into lengths of about one foot, and divide, also by sawing, into planks about one inch thick, a thickness equal to the distance between the corrugations of the first pair of rollers. Thus prepared the wood is ready for subjection to longitudinal and transverse pressure in a series of corrugated and fluted rollers of peculiar construction and arrangement. The drawings represent three pairs of such rollers, and illustrate the character of the forces to which I subject the wood prior to its immersion in the chemical liquors.

In the drawings, A marks a strong frame, supported upon a suitable bed-plate, B. On journals resting on suitable plummer-blocks in this frame turn three pairs of heavy iron rollers, C D, E F, and G H. These rollers are geared together, so that the speed of each pair shall be greater than that of its predecessor.

The pulley K, on the end of the shaft of the upper roller, C, of the first pair indicates the point of application of the driving power. The rollers are geared to turn in the direction indicated by the arrows in Fig. 2. A feed-table (not shown) is placed in front of the first pair of rollers, and the plates I J, interposed between the rollers, support the wood while passing from one pair of rollers to another.

Fig. 3 shows the form of the corrugations of the first pair, and how they interpenetrate. The corrugations of the second pair are

narrower, but similar in form and arrangement to those of the first pair. The third pair are fluted longitudinally, as shown. Any number of pairs may be used, which the peculiar character of the material to be operated upon may be found to require, and the operation may be arrested at any point, or prolonged, according to the character of the material and of the paper it is desired to produce from it.

The wood is fed to the rollers in the line of direction of the length of the fibers. The rollers act by a wedge-like movement to press the fibers apart laterally, and by pressure to break down the parenchyma of the wood and release the fibers and filaments from the bond which has held them together.

The second pair of rollers, E F, follow up the action of the first pair by a still more minute longitudinal subdivision of the fibers and filaments of the wood, which comes from them in the shape of a congeries of long parallel loosely-adherent fibers which have not been transversely broken by the forces to which they have been subjected.

In this state they pass between the fluted rollers G H, which, running at a high rate of speed, bend the fibers at regular intervals in a direction at right angles to their length, and prepare them to be broken on lines indicated by the summits and bottoms of the flutes of the roller. Between those lines the fibers will be unbroken and unweakened by the operations they have undergone.

When the wood leaves the rollers it has become a light, open, spongy mass of fibrous material, which, when immersed in the alkaline or bleaching solutions, readily and immediately absorbs them.

In consequence of this fine state of subdivision, and the facility which it affords for the rapid application of the chemicals, I am enabled to employ milder solutions, and avoid the weakening effect upon the fiber of the strong caustic alkalies or acids which are required in processes in which the mechanical action has been less thorough.

In the application of the chemical part of the treatment I prefer to use a rotating "bleach," and to employ a weak solution of lime and soda-ash under a steam-pressure of about three atmospheres.

An open tub, however, will answer the same purpose, though at a much greater expendi-

ture of time in the cooking operation. In either case the strength of the chemicals and the length of the operation would be affected by the character of the wood under treatment.

From the tubs or bleach the wood is transferred to a reducing-mill or pulping-machine of any preferred description, or may be subjected a second time to the action of the rollers before described, when it is ready for the ordinary paper-engine, is washed, and "beat off" as paper stock by the ordinary methods and appliances.

Having thus described my wood-pulping process, what I claim, and desire to secure by Letters Patent, is—

1. The method of preparing the fiber of wood for the action of the chemicals, the same consisting in separating the fibers by subjecting them to the lateral action of corrugated rollers arranged in a series of pairs of constantly increasing fineness and speed, followed by one or more pairs of longitudinally-fluted rollers which compress and bend the fibers transversely, all in the manner and for the purposes described.

2. The method of preparing and treating wood fibers for making paper-stock, the same consisting in subjecting them to the opening and bending operation of the series of corrugated and fluted rollers hereinbefore described, and afterward to the action of mild alkaline and bleaching solutions for the removal of the gluten, resin, and coloring matters, and to the usual subsequent operations of paper-making, all as set forth.

3. The mechanism, substantially as described, for dividing woody fibers longitudinally and bending and compressing them transversely in a continuous operation, as stated, the same consisting of the series of pairs of corrugated rollers having the configuration and arrangement shown, and increasing in fineness and speed as they follow one another, in combination with one or more pairs of longitudinally-fluted rollers similarly geared, all constructed and operating substantially in the manner specified.

In testimony that I claim the foregoing as my own invention I affix my signature in presence of two witnesses.

H. A. FRAMBACH.

Witnesses:

I. H. STANSBURY,  
CHAS. F. STANSBURY.