UNITED STATES PATENT OFFICE.

STEPHEN M. ALLEN, OF DUXBURY, MASSACHUSETTS.

IMPROVEMENT IN THE MANUFACTURE OF PAPER-PULP FROM WOOD.

Specification forming part of Letters Patent No. **212,782**, dated March 4, 1879; application filed May 1, 1878.

To all whom it may concern:

Be it known that I, STEPHEN M. ALLEN, of Duxbury, in the county of Plymouth and State of Massachusetts, have invented a new and useful Improvement in the Manufacture of Paper-Pulp from Wood, which improvement is fully set forth in the following specification.

This invention has for its object certain improvements which I have made upon my original wood-pulping process and pulp for paper and other purposes, as described in my patent of March 21, 1863, No. 38,620.

The filaments of wood are so tenaciously intwined and set together that I have found in fibrilizing the same for fine papers, where it is indispensable to preserve a good length as well as to produce fineness in the fibril, that a stripping and crushing process could be used with advantage in preparing the wood for ultimate crushing and grinding. A steeping in acid or alkaline solutions is also employed when deemed desirable.

I secure a good length to the fiber, which is well maintained by stripping the same longitudinally, and by the crushing downward process which upsets the fiber, so to speak, or sets it down against itself, thereby making it more porous or spongy without breaking or severing the thread of the same.

The effect of this mechanical treatment or longitudinal stripping and crushing of the fiber from the wood is, that it materially aids any subsequent chemical treatment, enabling the latter to be accomplished with less strength of solution, while the subsequent crushing and grinding to complete the pulping process is thereby rendered much easier, from the fact that the filaments are softer, and consequently they come out of the machine larger and finer than they could otherwise be manufactured.

The following description will enable those skilled in the art to which it appertains to make and use my invention.

I take nearly all the varieties of wood, such as cotton-wood, bass-wood, poplar, pine, spruce, maple, birch, beech, hemlock, and cedar, and cut or saw the logs into suitable size for the machine used in reducing the same ready for crushing, and strip or fibrilize the same by means of machinery so arranged as to tear the fiber in its longitudinal direction in small filaments.

The teeth or spurs of the crushing or stripping machine are usually of about one-eighth of an inch in diameter, moving by feed-rollers against the sides or face of the stick of wood, and tearing and crushing it downward along lines of the annual deposits or growth of the fiber, upsetting though not cutting the same across their axes, and making the filaments more spongy.

This stripping and crushing process may be done in various ways. An endless belt armed with spurs or teeth and sustained in contact with the wood by rollers behind might be used, suitable mechanism for feeding the wood to the belt being employed. Instead of a belt, plates moving in right lines in contact with the wood, or even cylinders of proper diameter, might be used. Other means might also be employed. The effect is not only to preserve the fiber in good length for paper-pulp, but to open the filaments or separate the small fibrils one from the other, so that future grinding or treatment by alkaline solutions will leave them much finer as well as longer than when torn by transversely-crushing rollers from the solid stick or bolt of wood.

The alkaline or acid solutions permeating more thoroughly and dissolving the albuminous or starchy matter therein more easily than before, the fiber is more readily crushed and pulped. After thus stripping the fiber from the stock, I usually treat the same with warm water, or acid or alkaline solutions, and sometimes with bleaching liquors.

The composition of such solutions and the mode of application of them need not be here more fully set forth, as such treatment of fiber is well known in the art, and does not by itself, but only in connection with other steps in the treatment, form a part of this invention.

After this chemical treatment I compress the fibers in bundles, and crush or grind the same by friction against revolving metal, stone, or composition rollers, properly dressed on their surface, preferably as shown in my patent of March 12, 1878, and thus reducing the same to a fine pulp, to be used pure or mixed with other pulped fibers. I sometimes

crush or grind the stripped filaments without the steeping process, according to the quality of pulp desired.

The action and result of the process of longitudinally crushing down and stripping off the fiber as above explained is essentially different from grinding off the fiber by forcing the stick of wood endwise between stones rotating in the same or opposite directions toward or away from the wood, or from any known process of separating the fibers from wood. The fiber and the pulp and paper prepared therefrom are superior to pulp and paper of wood fiber heretofore made in the softness, fineness, and good length of the filaments.

Having thus described my wood-pulping process, which is an improvement upon my original pulping process as described in my patent before named, what I now claim, and desire to secure by Letters Patent, is—

1. The method of preparing fiber, the same consisting in separating the fibers or filaments from a block or stick of wood by crushing down or upsetting them, and stripping or tearing them off in a direction lengthwise of the stick of wood, substantially as described.

2. The method of preparing and treating fiber, the same consisting in crushing down and stripping the filaments longitudinally from a block or stick of wood, and in crushing and grinding said longitudinally-stripped filaments, substantially as set forth.

3. The process of preparing wood fiber for pulp, the same consisting in successive operations of longitudinally stripping or crushing the filaments off the blocks or sticks of wood, crushing or grinding the same by means of rollers, and the treatment of the same in acid or alkaline solutions, in combination, substantially as and for the purposes before named.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

STEPHEN M. ALLEN.

Witnesses:
WALTER JONES,
GEO. A. SAVAGE.