

UNITED STATES PATENT OFFICE.

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IMPROVEMENT IN REDUCING WOOD TO PULP FOR PAPER.

Specification forming part of Letters Patent No. **203,437**, dated May 7, 1878; application filed February 21, 1878.

To all whom it may concern:

Be it known that I, A. H. FISHER, of Bel-
lows Falls, in the town of Rockingham, county
of Windham, and State of Vermont, have in-
vented a new and useful improvement in the
art of reducing wood to fiber or pulp from
which paper may be made; and that the fol-
lowing is a full, true, and exact description
thereof.

Prior to the date of my invention, wood has
been reduced to pulp by subjecting the wood
to the action of grinding-surfaces of various
forms and of various kinds, the fiber of the
wood being acted upon in various directions
and manners by the grinding-surface. For in-
stance, wood has been ground upon the pe-
riphery of cylindrical and conical grindstones,
upon the interior surface of cylindrical or con-
ical grinding-surfaces, and upon flat surfaces
like that of a millstone; and it has been sub-
mitted to the action of these grinding-surfaces
in the manner of the two Voelters, in the way
patented by Brooman, and in other ways.
Also, prior to the date of my invention, wood
had been subjected to the action of steam in
closed vessels, to the action of water at a
higher temperature than that of boiling, to
the action of steam at atmospheric pressure,
and to the action of water boiling in open ves-
sels; but the wood was always so treated be-
fore it was subjected to the action of the grind-
ing-surfaces. The object of such preparatory
treatment of the wood was to save power in
grinding, and in some cases either to make a
better pulp or a better-colored pulp.

Now, I have discovered a new process, which
consists in heating the wood in presence of
water by the act and during the process of
grinding, by which I produce, as I think, bet-
ter pulp—pulp finer or more attenuated in di-
ameter, more regular in both length and thick-
ness, a little whiter, and of superior felting
quality. At any rate, I am able to use, in
making paper from this pulp, a larger percent-
age of it, in proportion to rag pulp, than has
heretofore been possible, and at the same time
produce equally good paper.

In the ordinary operation of reducing wood
to pulp by grinding, in the several modes and
by the various forms and kinds of grinding-

surfaces heretofore alluded to, it has been cus-
tomary to furnish an ample supply of water to
the grinding-surfaces, of whatever character
they might be, so as to substantially cool down
the grinding-surface and the wood to the tem-
perature of the water, or, in other words, to
furnish such an ample supply of water as
would practically prevent either the wood be-
ing ground or the grinding-surface from at-
taining a temperature substantially higher
than the water supplied to the wood and to
the grinding-surface.

The friction between the wood and the stone
of course develops heat, and there is a tend-
ency to heat up both the grinding-surface and
the wood; but this heat was always, so far as
I know, prevented from increasing, to any con-
siderable extent, by the presence of an ample
supply of running water. Now, I have dis-
covered that this old practice did not produce
the best results, and that the true plan is to
diminish the usual supply of water and suffer
the wood to heat up, in the same way that a
piece of steel or iron heats up when ground
upon a grindstone insufficiently supplied with
water; but care must be taken that the sup-
ply of water is so regulated that the wood will
not char or discolor. This is the upward limit
of the heat, and I find that wood thus heated
during the operation and by the action of
grinding furnishes, as before stated, a supe-
rior pulp.

In the ordinary operation of reducing wood
to pulp upon a grindstone, the practice has
been to run the stones about as fast as they
can be run without danger of bursting. I find
it necessary to run them no faster, and can
even run them slower, provided the supply of
water to the stone be reduced and the wood
be fed to the stone so fast that the attrition
of the stone and the wood will generate a
heat which will heat up the wood and stone
above the heat of the water supplied thereto,
whether that water be hot, warm, or cold.

In practice, I prefer to use an ordinary grind-
stone, and to apply the wood thereto Henry
Voelter fashion, or in some modification there-
of; and as for the rule or standard of supply
of the water, I get the best results when the
supply is such that steam rises from the wa-

ter at the points where grinding is going on, and the water in the trough below the stone (which has been, of course, cooled in falling) is not below milk-warmth in temperature. This is the apparatus and temperature I prefer; but I do not limit myself to the precise apparatus, nor to the precise mode of submitting the wood thereto, nor to the precise temperature to which the water or wood is raised; but the supply of water must be so short or scanty that it is heated materially by the heat derived from the wood and stone, and not so scanty that the wood chars or dissolves. As far as I can ascertain, the best results are produced when that part of the wood in contact with the grinding-surface is of a temperature about that of or above the boiling-heat of water. I cannot measure the temperature at this point by a thermometer; but I judge by the steam or vapor rising from the stone and wood that the heat is, at the place of contact of the two, about the same or a little above that of the boiling-point of water.

I am not able to give the exact, or any exact, reason why my process is so successful as practice proves it to be. I suppose that the heat existing in the wood at the moment of grinding melts the starchy, resinous, or glutinous matter which cements the fibers together, and permits the stone to drag out fibers nearly approximating to ultimate fibers, instead of dragging out small bundles composed of attached ultimate fibers, as happens when the wood is not subjected to a moist heat during the process and by the operation of grinding. This may or may not be the ra-

tionale of my process; but I do know that it produces a more regularly fine pulp, a pulp more homogeneous in the size of its fibers, a good—in fact a superior—felting-pulp, and a pulp a little whiter than is produced when the wood is not permitted to heat up during the operation of grinding by the heat developed during the process of grinding.

Any operator skilled in the usual practice of reducing wood to pulp can work out my process by watching the wood being ground and the supply of water, and reducing this supply until steam or clouds of vapor rise into the air from the surfaces of contact of the wood and the grinding-stone, the operator at the same time being careful not to lessen the supply of water to so great an extent that the wood will char or torrefy or become discolored.

My process does not depend upon the use of any special kind or form of grinding-surface, or upon any special way or manner of applying the grain of the wood to such surfaces, or upon any particular method of feeding the wood so that it may be ground by the stone or other grinding-surface; and

I claim and desire to secure by Letters Patent—

As an improvement in the art of reducing wood to pulp, heating the wood in the presence of water during the process and by the act of grinding, substantially as described.

A. H. FISHER.

Witnesses:

WHITFIELD TERRIBERRY,
THOS. W. HYATT.