

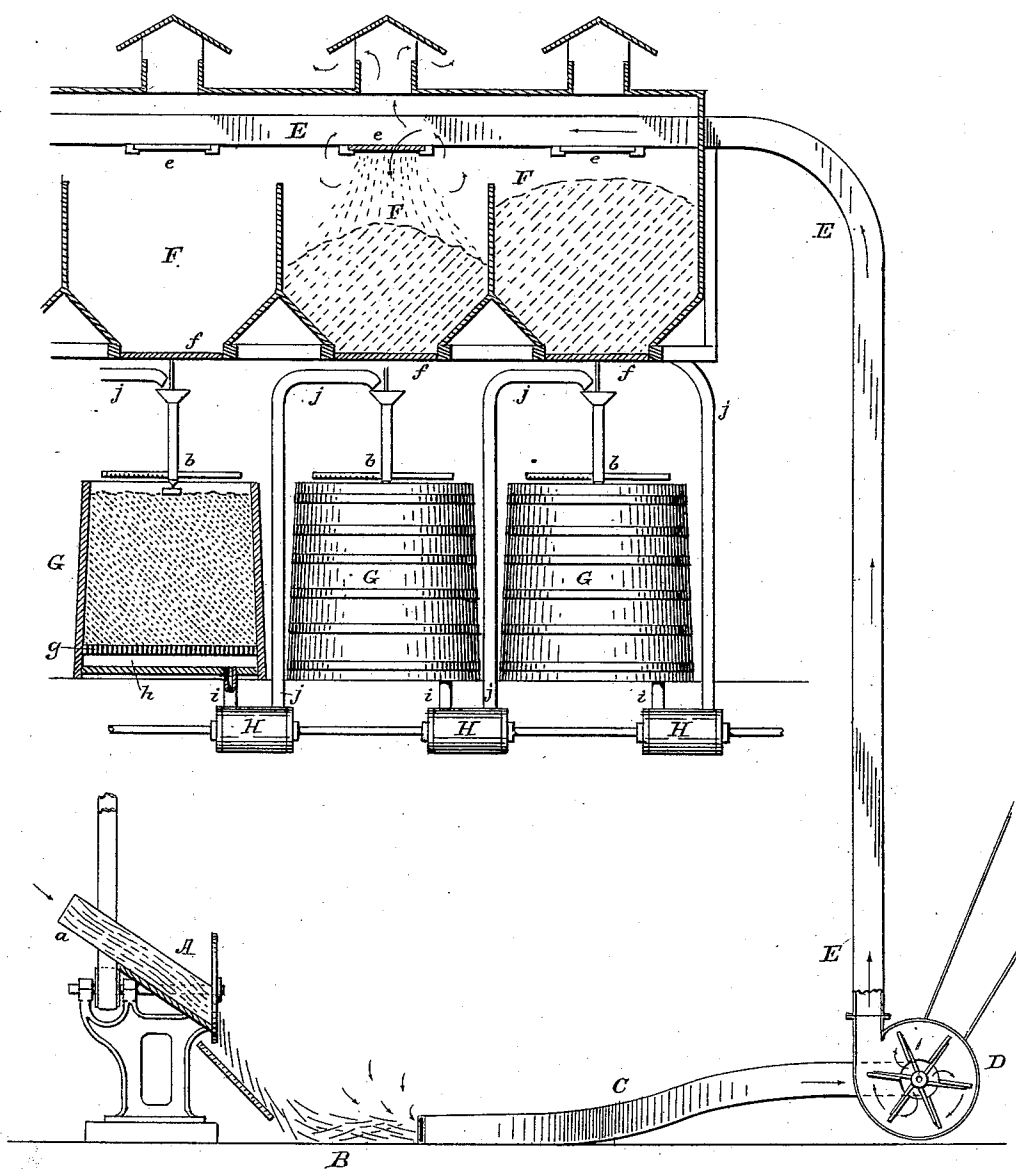
A. MORAND.

MANUFACTURE OF TANNIN EXTRACT FROM WOOD.

No. 357,129.

Patented Feb. 1, 1887.

Fig. 1.



WITNESSES:

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Fig. 2.

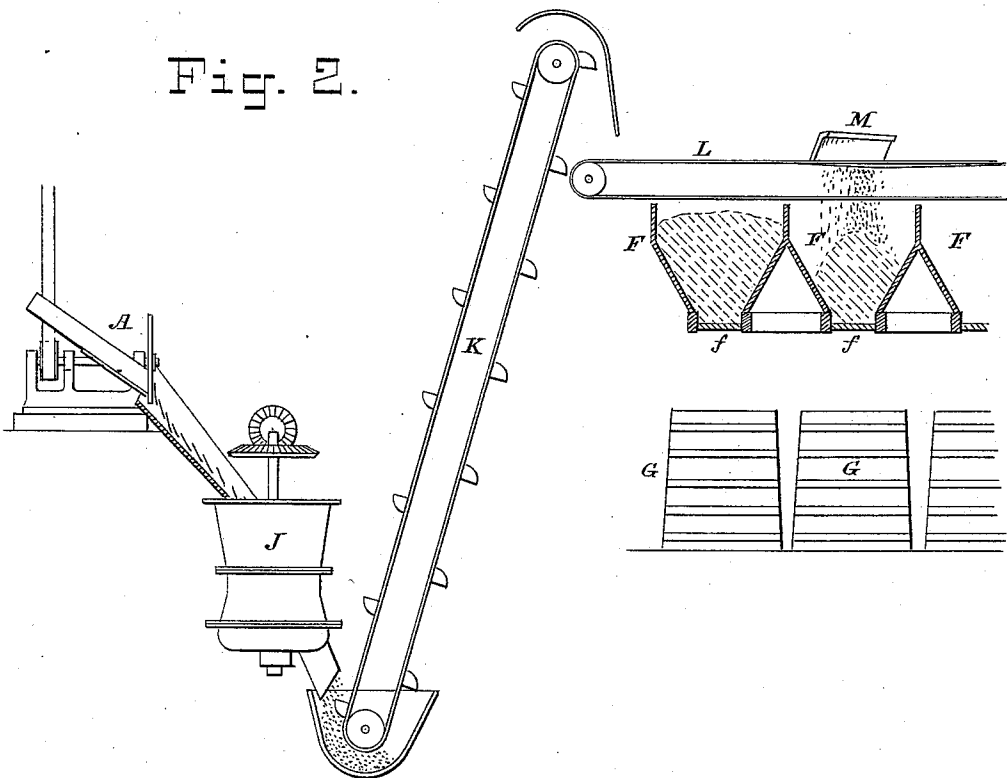
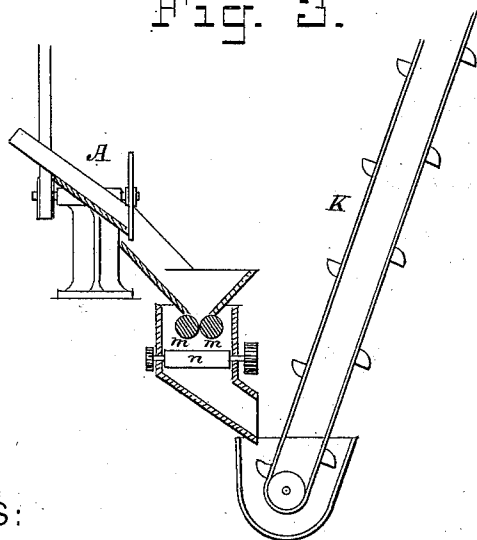


Fig. 3.



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UNITED STATES PATENT OFFICE.

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MANUFACTURE OF TANNIN EXTRACT FROM WOOD.

SPECIFICATION forming part of Letters Patent No. 357,129, dated February 1, 1887.

Application filed August 17, 1885. Serial No. 174,557. (No model.) Patented in France March 23, 1886, No. 162,288; in Belgium March 31, 1886, No. 23,550, and in Italy June 30, 1886, XX, 20,016, XXXIX, 390.

To all whom it may concern:

Be it known that I, AUGUSTUS MORAND, a citizen of the United States, residing at Germantown, in the city of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in the Manufacture of Tannin Extract from Wood, of which the following is a specification.

I have received Letters Patent for this invention in the following foreign countries: France, No. 162,288, March 23, 1886; Belgium, No. 23,550, March 31, 1886, and Italy, June 30, 1886, Registro Generale, Vol. XX, No. 20,016, and Registro Attestati, Vol. XXXIX, No. 390.

Prior to this invention tannin has been extracted from various vegetable matters, chiefly bark and wood, principally by two methods—by percolation and by maceration.

The percolating process has been used chiefly with bark—never, so far as I am aware, with wood. The bark is ground in a mill, placed in a tank having a perforated false bottom, and water is sprinkled or poured over it and allowed to percolate or leach down through it, draining into the space beneath the false bottom, and being thence drawn off. The percolation is repeated through a series of tanks until the liquor acquires the maximum richness and until the greater portion of the tannin has been dissolved from the bark.

The maceration process has been used chiefly in extracting from wood, and is, so far as I am aware, the only method heretofore used with wood. The wood, usually chestnut or oak, is sliced transversely of the grain, and the slices are placed in a tank, hot water is poured in, and steam is turned on, the mass being boiled or macerated for an hour or so. The liquid is then drawn off, fresh water is added, and the mass is again boiled, this operation being repeated usually about twelve times, or until the wood is spent, the weaker liquors passing from one tank to another until they acquire the requisite strength.

My present invention aims to improve upon this maceration process for extracting the tannin from wood, and to enable the percolation process to be substituted therefor. The percolation process has the marked advantages over maceration that the extraction may be ac-

complished without the agency of heat, a uniform and thorough circulation of the liquid through the vegetable matter is effected by gravitation alone, the manipulations and the skill required therefor are greatly decreased, the apparatus is simplified, and the cost reduced. The avoidance of the heat necessary in maceration results in an improved product, it being well known that tannin is impaired by an excess of heat.

I will now proceed to describe my improved method with reference to the accompanying drawings.

Figure 1 is a general view of the preferred apparatus for carrying out my invention, the several devices being shown in elevation and partly in vertical section. Figs. 2 and 3 illustrate modifications, both views being elevations partly in vertical section.

Referring to Fig. 1, let A designate a wood-slicing machine, driven by power at suitable speed and cutting diagonally transverse slices from a log, *a*, which is fed to it by an attendant, the slices falling upon the floor B, or, if preferred, into a pit. C is a large tube or conduit opening above this floor near the slicing-machine, and leading thence to a centrifugal blower, D. E is a similar tube or conduit extending from the blower to a series of receiving bins or compartments, F F F. Directly under the respective bins are a series of percolating-tanks, G G G, one of which is shown in section. The conduit E has dampers *e e e*, each opening into one of the bins F, and each bin F has a trap-door, *f*, in its bottom, opening over the corresponding one of the tanks G. Each tank is constructed with a perforated false bottom, *g*, and by preference has a revolving sprinkler, *b*, arranged centrally over it. From the space *h* beneath the false bottom a pipe, *i*, leads to a force-pump, H, and from this pump a pipe, *j*, leads to the sprinkler *b* for the next tank G.

The operation of this apparatus in practicing my improved method is as follows: As the slices fall from the slicing-machine A upon the floor, they are raked by an attendant toward the mouth of the conduit C. The blower D being driven at high speed by suitable power, a strong blast of air is drawn in through the conduit C and forced out through the con-

duit E. This blast draws with it into the conduit C the slices of wood as fast as they are brought near its open mouth, and carries them at great speed through this conduit to the blower. As the slices are cut substantially transversely to the grain and are quite thin, they are very brittle, and in passing into and through the conduit C they are broken by the blast into small pieces, which on being drawn into the blower are further reduced by its rapid centrifugal action into still smaller particles, by which means the slices are eventually reduced to the form of small angular granules, of about the size of buckwheat, and in this condition they are delivered from the conduit E through one of the dampered openings *ee* into one of the compartments F, the granulated wood falling to the bottom of the compartment or bin and the air escaping at the top through suitable ventilating-openings. The blast is directed into one after another of the compartments F, as each is filled, and whenever it is desired to fill a tank, G, with the granulated wood the full compartment F above it is emptied into the tank by opening the trap-door *f* thereof, care being first taken that the slide *e* of this tank is closed. When the tank G is filled, the door *f* is again closed, the pump H is started, and the sprinkler *b*, which it supplies, is thereby caused to revolve. A stream of water, either pure or containing more or less tannin in solution, is thus slowly sprinkled over the top of the mass of granulated wood. The liquid first saturates the upper part of the mass, soaking into every particle of the woody fiber, and as the accumulating liquid causes a supersaturation, the liquid is forced downward through the mass, saturating successively lower strata until it emerges from the bottom and drips through the false bottom *g* into the chamber *h*. The operation then becomes continuous, the mass holding a great weight of liquid in suspension, and this liquid slowly leaching down through the compacted particles of wood, being thus held in contact with the wood for a sufficient time to enable it to thoroughly penetrate the vegetable cells and dissolve all the soluble matter. The sprinkling and leaching proceeds until the wood is so far spent that the liquor coming from it is unprofitably weak, when the sprinkling is suspended, and the soaked woody matter, after being left to drain, is emptied out of the tank and the latter is again filled with fresh comminuted wood. The liquor which flows into the chamber *h* is drawn by the pipe *i* into the pump H, and thereby forced up the pipe *j* to the sprinkler *b* of the next succeeding tank in the series. If the next tank is being filled at the time the liquor is pumped to the one beyond it, or to any other convenient tank, or if it is already sufficiently rich, it is carried to a storage-tank, there to await the subsequent steps of the manufacture—namely, the purification of the crude extract and its concentration for market. The

same liquor is passed several times through the wood, the best practice being to run the fresh water into the nearly-spent wood, and then through tanks containing successively richer charges of wood, until the requisite density is attained. Thus the fresh wood receives first a sprinkling of comparatively rich liquor, and as it is gradually depleted it is leached with liquors successively less rich, until finally fresh water is passed through it to carry off any remaining traces of tannin, and it is then emptied out.

One specific feature of my invention, by means of which the best and most economical results are secured, consists in treating the fresh rich charge of wood with cold liquor, or liquor at the ordinary temperature, and as the wood becomes depleted and weaker liquors are passed through it using liquors of gradually higher temperature, until for the final leaching with pure water the water is used quite hot—say at a temperature of about 150° Fahrenheit. This I accomplish by heating the water and passing it first through the spent charge of wood, then in succession through successively richer charges, the water continually giving up its heat to the wood and becoming cooler as it reaches the richer charges until, when it encounters the fresh wood, it is quite cool or of the normal temperature. By this means I avail myself of the greater solvent powers of hot water in dissolving the final portion of tannin from the wood, which is the least soluble, and at the same time I avoid heating the richer portions of the tannin, which are readily soluble in cold water.

My improved process of extracting tannin from wood is much more economical than the maceration process heretofore practiced, in that with fewer manipulations and with less labor and cheaper labor the extraction is effected in shorter time, and the crude extract thus obtained is purer, contains a less proportion of gallic acid, and is less liable to ferment. This result is due, chiefly, to the utilization of the percolation system of extraction, which prior to my invention has been impracticable with wood. With granulated wood prepared and leached according to my invention the percolation process is even more successful than with bark, since the latter contains more impeding foreign matters and must be reduced by grinding, which produces a large proportion of dust, that chokes the percolation and forms a sediment in the extract.

Prior to my invention the slices of wood falling from the slicing-machine have been shoveled into baskets and carried to and dumped into the tanks G G whenever it was desired to fill one of the latter with new chips. In so handling them the chips were somewhat broken up, but were not granulated. If the slices were treated in the same manner and placed in the tanks in the same condition for the percolation process, the latter would be found to be impracticable, since the mass of

wood in the tank is ramified by numerous free passages formed by the slices falling together in such way as to form spaces between and beneath them, and the water poured upon the top of the mass would flow down through these passages so freely and quickly that it would fail to come into contact with the greater portion of the woody matter and would pass out, carrying so slight a percentage of tannin in solution that the process, however often repeated, would be extremely wasteful and unprofitable. No practicable amount of stamping down or compacting of the slices in the tank will suffice to overcome these free openings or passages and make the water hang in the mass and leach slowly down through the particles of wood, giving it time to enter every cell and dissolve all soluble matters, as is essential to a successful percolating operation.

The granulation of the sliced wood may be effected by other means than the pneumatic blast which I have described; but I prefer the latter, because of its cheapness and effectiveness, and because at one operation it both granulates the wood and carries it into the supplying bins or compartments. The slices may be fed into a bark-mill adjusted for coarse grinding, or they may be passed between corrugated rollers, or they may in any other known way be broken up into granules.

Fig. 2 shows a modified apparatus. The slicing-machine delivers the slices into the hopper of an ordinary bark-mill, J, which granulates the slices and delivers the granulated wood to a conveyer, K, which elevates the same and deposits it upon an endless traveling apron, L, which passes over the series of bins or compartments F F F, and from which the material is removed by a scraper, M, and caused to fall into one or another of the bins.

Fig. 3 shows a further modification. From the slicing-machine A the slices fall into a hopper, which conveys them between two rollers, *m m*, which are geared together, driven by power, and pressed forcibly toward each other by springs. They may be corrugated. Beneath these rollers are two others, *n n*, of similar construction, and preferably arranged at

right angles to the rollers *m m*. The chips in passing between these two pairs of rollers are broken up into granules, and fall thence to the conveyer K, by which they are carried to the bins F F, as in Fig. 2.

These modified forms of apparatus are illustrated only to show that my improved method, in its generic feature, is not limited in its application to the one particular apparatus illustrated in Fig. 1.

I claim as my invention—

1. The improvement in the art of manufacturing tannin extract from wood, which consists in cutting the wood into thin slices across the grain, breaking these slices into granules, placing the granulated wood in a leaching-vessel, and percolating water through the mass, substantially as set forth.

2. The improvement in the art of manufacturing tannin extract from wood, which consists in cutting the wood into thin slices across the grain, carrying the slices through a conduit by means of pneumatic blast, whereby they are broken into granules, placing the granulated wood in a leaching-vessel, and percolating water through the mass, substantially as set forth.

3. The improvement in the art of manufacturing tannin extract from wood, which consists in cutting the wood into granules of the character described, placing the granulated wood in a leaching-vessel, and percolating water through the mass, commencing with cool or cold water containing already a considerable proportion of tannin in solution, and gradually as the wood becomes depleted of tannin supplying weaker solutions at successively higher temperatures, until finally when the wood is nearly spent the percolation is effected with pure water heated to the highest temperature, substantially as and to the effect set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

AUGS. MORAND.

Witnesses:

ARTHUR C. FRASER,
GEO. BAINTON.