(No Model.)

J. E. McCARTY, Dec'd.

E. M. McCARTY, Administratrix.

PROCESS OF AND APPARATUS FOR MAKING EXTRACTS.

No. 491,370. Patented Feb. 7, 1893.

Fig. 1.

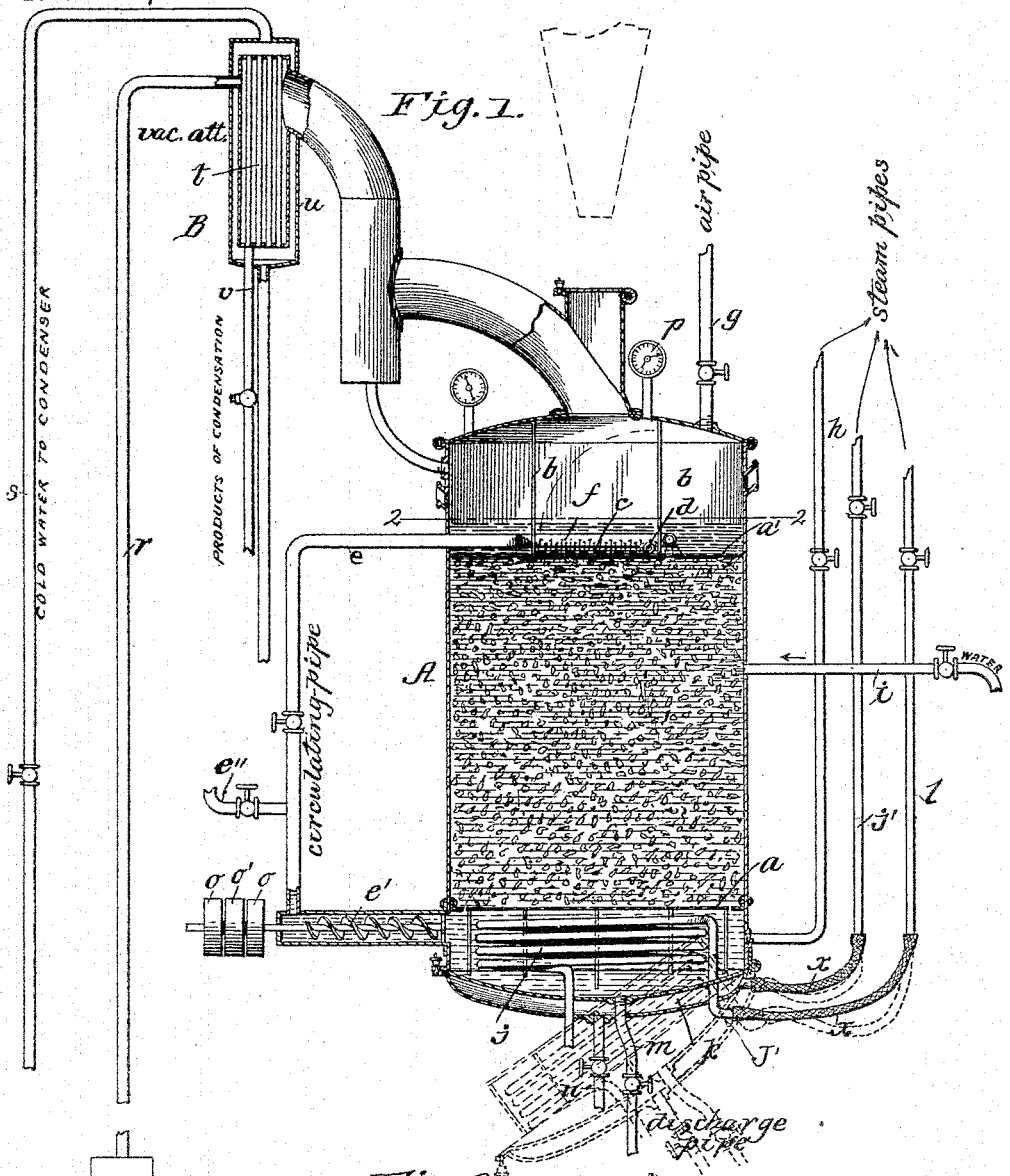
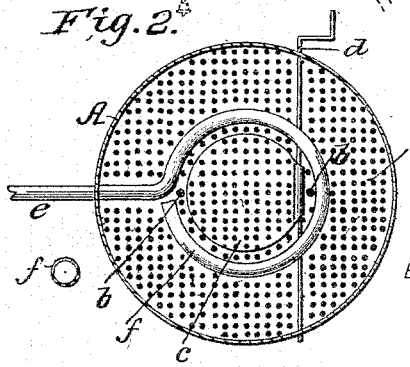


Fig. 2.



WITNESSES:

Fred J. Dieterich

W. D. Blondel

INVENTOR:

J. E. McCarty.

BY Munn & Co

ATTORNEYS

UNITED STATES PATENT OFFICE.

JOHN E. McCARTY, OF ELKINS, WEST VIRGINIA; ELLA M. McCARTY ADMINISTRATRIX OF SAID JOHN E. McCARTY, DECEASED.

PROCESS OF AND APPARATUS FOR MAKING EXTRACTS.

SPECIFICATION forming part of Letters Patent No. 491,370, dated February 7, 1893.

Application filed July 3, 1891. Serial No. 398,431. (No model.)

To all whom it may concern:

Be it known that I, JOHN EDWARD McCARTY, of Elkins, in the county of Randolph and State of West Virginia, have invented a certain new and useful Improvement in Processes of and Apparatus for Treating Vegetable Matters for Making Extracts, &c., of which the following is a specification.

The object of my invention is to effect a great economy in the extraction of tannin or tannic acid from barks and woods, or other vegetable products containing it in considerable quantity. I have conceived and experimentally developed a process of and an apparatus for carrying out the same, by which this object is most successfully attained. The economy results from reduction of the length of time required for extraction, and the much greater amount of tannin obtained from a given quantity of material, also from conversion of the refuse material into a dry, combustible product.

The apparatus is compact and portable, notwithstanding its construction adapts it for various operations necessary or incidental to the ultimate result.

In the accompanying drawings, Figure 1 is a vertical section of my entire apparatus; and Fig. 2 is a section on line 2—2 of Fig. 1.

I will first describe the construction and operation of the apparatus, and then specifically indicate the steps constituting my main and subsidiary processes.

The vessel or extractor proper, A, is preferably constructed of sheet copper, or of iron lined with copper, and cylindrical in form. It is provided, interiorly, with two perforated diaphragms *a*, *a'*, arranged horizontally. The lower one, *a*, supports the wood shavings or other product to be treated, and is located a short distance above the bottom of the vessel, wherein it is in turn supported by means of small rods or posts. The upper diaphragm, *a'*, is similarly located relative to the upper end of the vessel A, and suspended rigidly by pendent rods *b*. It has a central opening for admission of material to be treated, and the same is provided with a cover or door *c*, which is hinged at one side and thus adapted to be opened or closed by any suitable means. I preferably employ for this purpose a crank-rod *d*, (Fig. 2,) which extends through the side of vessel A, and forms the pintle of the hinge of the cover *c*. The main function of the upper diaphragm *a'* is to prevent the comminuted material under treatment from rising in the water which usually submerges it, and thus clogging the circulating pipe *e*, whose annular or coiled terminal, or nozzle, *f*, is arranged just above the said diaphragm, as shown. The material is, in practice, delivered from a suitable hopper, (see dotted lines) through a man-hole at the top of the vessel A, and enters the chamber in the latter through the opening in diaphragm *a'*. An air conducting pipe *g* connects with the top of vessel A, and a steam pipe, *h*, connects with the same below the lower diaphragm *a*. A water pipe *i* connects with the middle portion of the vessel, that is to say, at a point intermediate of the two diaphragms. Beneath the lower diaphragm is arranged a steam coil *j* with which a pipe *l* is suitably coupled. The lower end or head *k* of vessel A is double-walled and hollow, and steam may be let into the chamber of the same through a pipe *j'*. The said head is hinged at one side, to adapt it to open downward for discharging the spent material when treatment has been completed. In this case, the lower diaphragm *a* and subjacent steam coil *j*, being rigid attachments of the head *k*, necessarily move with it, when the latter is opened or closed; and the steam pipes *j'* and *l* are also necessarily provided with flexible couplings, as shown at *x*, Fig. 1, to accommodate such movement of the head. The latter is provided with a pipe *m* for discharge of extract from the vessel A. All the aforementioned pipes *e*, *g*, *h*, *j'*, *l* and *m* are provided with stop-cocks, as shown. A pipe *n* for outlet for water of condensation is attached to the hinged head *k*.

On one side of the vessel A are arranged the pipe *e* and pump *e'* for circulating the extracting liquor through the material in the former. The upper end of said pipe passes through the side of the vessel A, and terminates in the coil *f* before-mentioned, which is perforated on the under side, so that liquid discharges from it in a shower, and at various angles, over the whole surface of the diaphragm *a'*. The pump *e'* is arranged in the

lower limb of the pipe *e*—which is coupled to the vessel A below the lower diaphragm. The said pump is preferably of the rotary type, it being in the form of a screw on whose projecting shaft are mounted two loose belt pulleys *o*, and an intermediate and fast, driving-pulley *o'*. It will be seen that by rotating the screw *e'* in one direction, the liquid in vessel A will be circulated, that is to say, it will be taken from beneath diaphragm *a*, carried up through the pipe *e* and discharged from nozzle *f* in a shower, over the whole surface of the upper diaphragm *a'*, so that it percolates through the whole body of the material uniformly. A pipe *e''* connects with the circulating pipe *e*, and both are provided with stop-cocks as shown, to enable the extractive liquor to be drawn off through *e''*, if desired.

The material to be treated having been introduced into the vessel A, and the latter tightly reclosed, steam is first admitted through pipe *h* to warm and soften the material, if required, and thus prepare it for the subsequent stages of the extractive process. The next step is the admission of water through pipe *i*, in sufficient quantity to fill the vessel A to a point above the upper diaphragm *a'*. If the water is already hot, it may not be necessary to apply a further degree of heat by means of steam; that is to say, if the material being treated is very rich in tannin, the degree of heat should be lower, and it may be injurious to apply steam heat directly (as by the pipe *h*) which would be otherwise practicable. The indirect application of steam heat is then made by means of the coil *j*, or the jacketed head *k*, or by both, if required, and the heat maintained for any length of time desired.

The step in the treatment succeeding the above described preparatory stage consists in the application of pressure to the liquid in the vessel. To effect this, air is admitted through the pipe *g*, under pressure of several atmospheres. The pressure is maintained at the required degree—as indicated on a gage—and for the length of time required to enable the water to permeate the individual particles of the material—which is essential to thorough extraction—of the tannin therefrom. When the hydrostatic pressure has been continued a sufficient time, the circulating pump is put in operation and the extractive liquor drawn off from the space below the lower diaphragm, and delivers it in a shower from the nozzle *f*, whence it percolates through the whole mass of material. This operation is very effective in result and is continued till inspection of the color and strength of the liquor indicates that the acid has been thoroughly extracted. If the material is densely packed, the action of the pump *e'* may be reversed, for the purpose of reversing the direction of the circulating current which, flowing upward through the mass, tends to lift and separate the particles from each other, thereby facilitating the access of the liquor to them, and consequently promoting the extraction. The cock of discharge pipe *m* is now opened, and the liquor forced out by the air pressure.

For the highest economy, the material subjected to the extractive process must be converted into fuel fit for immediate combustion, so that it may be at once utilized in the furnace. To this end, the saturating liquid must be removed, and for this purpose the material is subjected to the action of a blast of air,—preferably hot,—which quickly dries the material, thus converting it into a readily combustible product. The head *k* is then unlocked and allowed to drop into a vertical position, which permits the simultaneous discharge of the dried material from the vessel A. It may be at once delivered into the firebox, thus enabling the required heat to be obtained at minimum cost of fuel and labor in handling the same.

The continuance of the process involves the use of the vacuum attachment B, as hereinafter described.

The discharged liquor in which the extracted tannin is contained is quite thin and weak and requires to be evaporated to form the ultimate product, or thick extract. It is usual to effect this evaporation by means of separate apparatus, which involves time and expense that I greatly economize by using the apparatus already described, with the said vacuum attachment B. The weak liquor is reconducted into the vessel A and the cocks of the air pipe *g* and steam pipe *h* are closed. Steam is then admitted into the coil *j* or hollow head *k*, or both, and a vacuum pump *q*, attached to the pipe *r*, is put in operation. The liquor is thus heated to the required degree and simultaneously circulated, the hottest portion being removed by the pump, and forced up through pipe *e* and delivered from the coil *f*, in a shower, directly beneath the vapor exit pipe, which latter draws off the vapor into the condensing attachment, B. The liquor is thus reduced to the desired consistency in a short time. In the said condenser, B, the vapor is not allowed to come into direct contact with water and thereby weakened, but kept separate and the product of condensation saved for the purpose of subsequent treatment in order to extract whatever valuable by-products it may contain. To this end the cold water delivered from the pipe, *s*, is allowed to pass through and around the multitubular vapor receiver *t*, located in the enlarged portion, *u*, of the vacuum attachment, B, while the liquid into which the vapor is condensed in such receiver, *u*, escapes by a pipe, *v*, attached to the bottom of the latter.

My apparatus is adapted for various other uses than those hereinbefore indicated, such for instance, as the evaporation of maple sap for making maple sugar, and of milk for the production of "condensed milk."

Having thus described my invention, what I claim is—

1. The process of making extracts, which consists in holding the material to be acted on submerged in hot water in a closed vessel for a suitable length of time, maintaining a regulated degree of pressure and temperature, and simultaneously and mechanically producing a vertical circulation of the hot liquid through the mass, substantially as specified.

2. In an apparatus for making extracts, the combination of the vessel or boiler A, having perforated horizontal diaphragms, between which the material is confined, and a hinged bottom or head adapted to open as specified, an air-conducting pipe water pipe, and steam pipe connected respectively with the top, middle and bottom portions of said vessel, a circulating pipe and pump and vacuum attachment connected and arranged as specified.

3. In an apparatus for making extracts, the boiler or vessel A having its bottom or lower head hinged and adapted to open as specified, the perforated diaphragm supported upon and rigidly attached to said head, a steam coil arranged in the space between the head and diaphragm, and a flexible pipe connection for said coil, all combined as shown and described.

4. In an apparatus for making extracts, the combination with the vessel A having the two horizontal perforated diaphragms as specified, of the circulating pipe connected with the upper and lower portions of the vessel, a pump arranged in such pipe, and a steam pipe coil connected with the portion of the vessel below the lower diaphragm, as shown and described.

5. In an apparatus for making extracts, the combination, with the vessel A, adapted to be tightly closed and having a perforated diaphragm for supporting the material to be acted upon, and means for applying steam heat to the vessel, of a pipe connected with the upper and lower portions of said vessel, and a mechanical circulating pump connected with such pipe whereby the liquid may be circulated vertically through the material without increasing the quantity of the liquid and diluting the extract, substantially as shown and described.

J. E. McCARTY.

Witnesses:
SOLON C. KEMON,
AMOS W. HART.