

(No Model.)

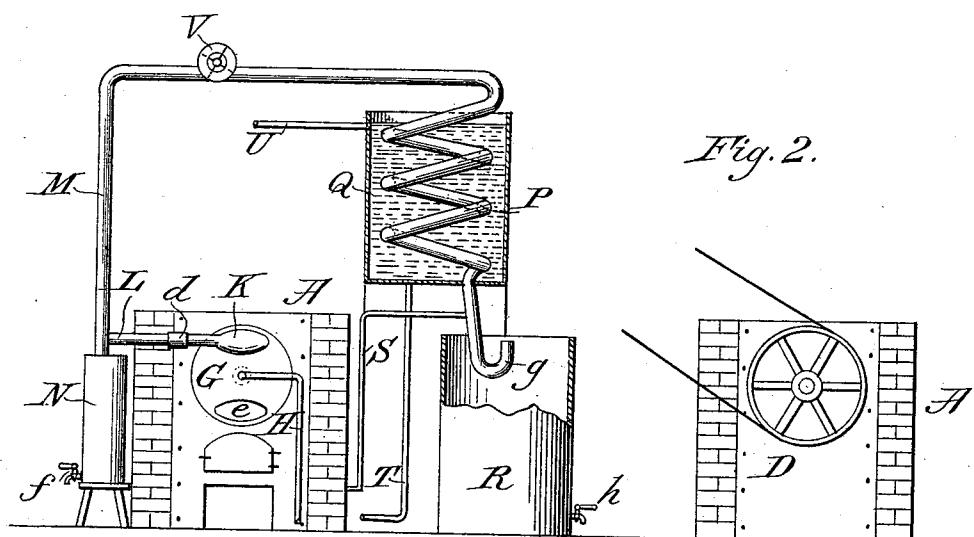
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APPARATUS FOR DISTILLING WOOD.

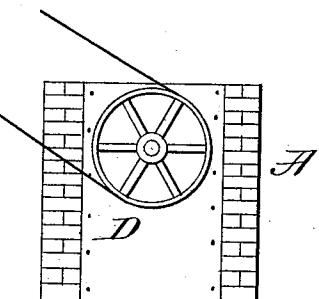
No. 332,320.

Patented Dec. 15, 1885.

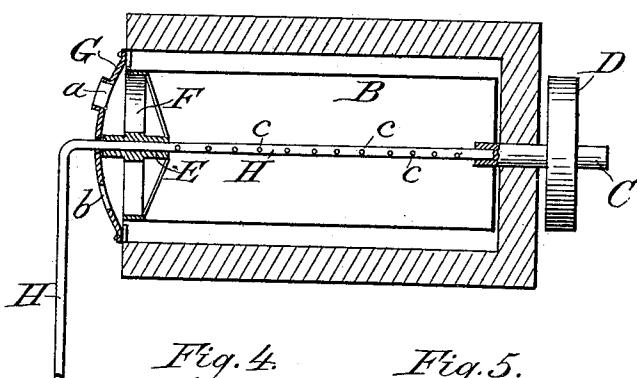
*Fig. 1.*



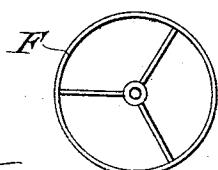
*Fig. 2.*



*Fig. 3.*



*Fig. 4.*



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# UNITED STATES PATENT OFFICE.

THOMAS HUN BERRY, OF PHILADELPHIA, PENNSYLVANIA.

## APPARATUS FOR DISTILLING WOOD.

SPECIFICATION forming part of Letters Patent No. 332,320, dated December 15, 1885.

Application filed May 1, 1885. Serial No. 164,126. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS H. BERRY, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful improvements in apparatus for treating cocoanut-shells, fruit-stones, and refuse vegetable substances for extracting oil, pyroligneous acid, and other products; and I do declare the following to be a full, clear, and exact description of the invention, such as 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 the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to an apparatus for extracting oils, acids, and other products from vegetable shells, seeds, stones, and nuts by destructive distillation; and it consists in the combination of a furnace, a rotary retort, a condenser, and receiving-tanks with suitable connections, and also in certain details of construction, as hereinafter more fully set forth.

In the annexed drawings, illustrating the invention, Figure 1 is a sectional elevation of my machine or apparatus for treating vegetable shells, seeds, stones, and nuts to obtain oil, tar, acids, and other products. Fig. 2 is a view of one end of the furnace with pulley for rotating the retort. Fig. 3 is a longitudinal section of the rotary retort and a transverse section of a portion of the furnace-walls. Fig. 4 is a plan view of a spider-frame at one end of the rotary retort. Fig. 5 is a plan view of a stationary cover with ports for closing one end of the rotary retort.

Like letters refer to like parts throughout the several views.

A designates a furnace having a grate, fire-box, and ash-pit of ordinary construction. In the upper part of this furnace is journaled a rotary retort, B, preferably cylindrical in form, and arranged horizontally, as shown. One end of the retort B is permanently closed and fixed to a shaft or journal, C, that carries at the outer side of the furnace a pulley, D, for belting by which the retort is rotated. The opposite open end of the retort is sup-

ported upon a tubular shaft or journal, E, by means of a spider-frame, F, as shown in Fig. 3. A stationary head or cover, G, is secured to the furnace at the open end of the retort, which is thereby inclosed. This stationary head or cover is formed of metal, preferably concavo-convex in form, though it may be made flat, if desired, and is provided with an upper port, a, and a lower port, b, as shown in Fig. 5. Through the center of the stationary head G, and also through the tubular shaft E, is passed a stationary injector-pipe, H, that extends the entire length of the retort, and is provided with perforations c c, through which water or steam is admitted to spray the contents of the retort when required. The upper port, a, of the stationary head G is closed by a removable hood, K, that communicates by means of a pipe-coupling, d, Fig. 1, with a pipe or conductor, L, for conveying away the products of distillation. The lower port, b, is closed by a removable cover, e, having a suitable fastening. The pipe L empties into a main conduit, M, that communicates at one end, near the furnace, with an oil or tar receiver, N, having a discharge-cock, f, while at its opposite end the conduit M communicates with the worm P of a condenser, Q. The lower end of the condensing-worm P, after passing through the condensing-tank Q, enters an acid-receiving tank, R, and terminates in a siphon-bend, g, that forms a trap to prevent the passage of incondensable gases. These incondensable gases are permitted to escape from the worm P through a gas-pipe, S, that may be arranged to convey the gas into the furnace A or to any other desired point for waste or for utilization, as may be found convenient or desirable. The tank R has a discharge-faucet, h, for withdrawing the collected acid.

The condenser Q is provided with a water-supply pipe, T, and an overflow-pipe, U, as shown in Fig. 1, which also shows the conduit M, provided with a fan, V, for facilitating the passage to the condenser of the lighter products of distillation, as hereinafter explained. This fan may be driven by the same power that actuates the rotary retort.

In employing this apparatus for obtaining tar, oils, acids, gases, and charcoal from the

shells of nuts, fruit-stones, and similar vegetable substances the material to be subjected to destructive distillation is placed in the retort B in a comminuted condition and exposed 5 to the heat of the furnace, the retort being meanwhile rotated by means of its pulley and power connections, so as to distribute the heat uniformly throughout the mass. The broken nut-shells, fruit-stones, and like substances are 10 fed into the retort while stationary through the upper port, *a*, of the head G, the hood K having been previously detached by disconnecting the coupling *d*, while the lower port, *b*, remains closed. After the retort has been 15 charged the hood K is replaced in position, as shown in Fig. 1. Under the rotary action of the retort B and the exhaust induced by the fan V the oils, tar, and vapors disengaged by the furnace-heat are drawn through the upper 20 port, *a*, hood K, and pipe L into the conduit M, whence the heavier matters—such as tar and oil—descend by gravity into the receiver N, while the vapors and lighter matters ascend, assisted by the fan, and pass through the conduit to the condenser. In passing through 25 the worm P the vapors are condensed, and the resulting acids collected in the tank or receiver R. The incondensable gases may be conducted through the pipe S into the furnace to assist in 30 combustion; or they may be allowed to escape as waste or be collected at any suitable point for use, as required.

This apparatus is especially adapted for utilizing the large quantities of cocoanut-shells and fruit-stones that accumulate at fruit canning and packing establishments, and which have heretofore been a source of considerable trouble and expense, on account of the difficulty of disposing of them in a satisfactory 35 manner without violating sanitary requirements. It is well known that the fermentation and gradual decomposition of refuse vegetable substances—such as cocoanut-shells and fruit-stones—when exposed to decay in large masses 40 under the action of sunlight, air, and moisture, is offensive and injurious to health. It is therefore objectionable, and in many places prohibited, to cast away or dump such material in vacant places near cities or towns, and it is expensive to dispose of it otherwise, either by carting 45 to greater distances or by burning in refuse-furnaces, the latter being, besides, inexpedient on account of the offensive odors generated by combustion where no provision is made for 50 consuming the resulting gas. These difficulties are obviated by utilizing the refuse cocoanut-shells, fruit-stones, and the husks and seeds of vegetable substances from canning and packing establishments in such a way as 55 to obtain the tar, oil, acids, and carbon or charcoal resulting from the destructive distillation of such material, while, by conveying the incondensable gases into the furnace of an apparatus arranged as above described, whereby 60 said gases are consumed, all unpleasant odors are prevented or greatly diminished.

The products resulting from the destructive distillation of cocoanut-shells, fruit-stones, nuts, and various vegetable husks and seeds are pyroligneous acid, charcoal, tar, and incondensable gases in different proportions, the products and quantities of each varying somewhat with the condition of the various materials employed and the extent to which combustion is carried. The tar, pyroligneous acid, 70 and charcoal are useful for all the purposes to which such materials are ordinarily adapted, and their value considerably exceeds the expense of destroying the refuse material from which they are produced. The incondensable 75 gases are preferably consumed in the furnace that forms a part of the apparatus, thereby economizing fuel and avoiding offensive odors. The charcoal or unconsumed residue of the retort contents is discharged or withdrawn 80 through the lower port, *b*, after the operation of distillation has been completed. By spraying the contents of the retort with steam or water introduced through the injector H after 85 distillation or destruction of the material has partly proceeded the further combustion of the charcoal can be arrested at any desired point, according to the qualities or grades required for various uses in the arts.

The apparatus is simple and effective in 95 operation, and possesses the advantage of providing an economical means for disposing of an obnoxious refuse material, while obtaining therefrom several valuable products.

It may be remarked that the process of 100 treating cocoanut-shells, fruit-stones, and other refuse vegetable substances for obtaining pyroligneous acid, charcoal, and other products by means of destructive distillation is the subject of a separate application for 105 patent filed herewith.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination of the furnace A, the 110 rotary retort B, journaled in said frame, a stationary head, G, having ports communicating with said retort, a detachable hood, K, for one of said ports, the hood being removably connected to a stationary pipe, L, the 115 conduit M, communicating with the pipe L, the receivers N R, condenser Q, and a fan, V, located in the conduit, substantially as described.

2. The rotary cylindrical retort B, open at 120 one end and provided with spider-frame F, in combination with the stationary head G, having ports *a b*, and the hood K and connections for conveying the products of distillation, substantially as described.

3. The combination of the rotary cylindrical retort B, open at one end and provided with spider-frame F and tubular shaft E, the stationary head G, having ports *a b*, the perforated injector-pipe H, and the hood K, substantially as described.

4. The combination, with a furnace, a ro-

tary cylindrical retort, B, open at one end and provided with a spider-frame, F, the condenser Q, receiving-tanks N and R, conduit M, and pipe L, of the stationary head or cover G, having ports a b, and the detachable hood K, for connecting the pipe L and port a, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

THOS. HUN BERRY.

Witnesses:

GEORGE HALL,  
D. B. TAYLOR.