No. 773,139. PATENTED OCT. 25, 1904.

W. H. GESNER.

DISTILLING AND EVAPORATING APPARATUS.

APPLICATION FILED OCT. 21, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

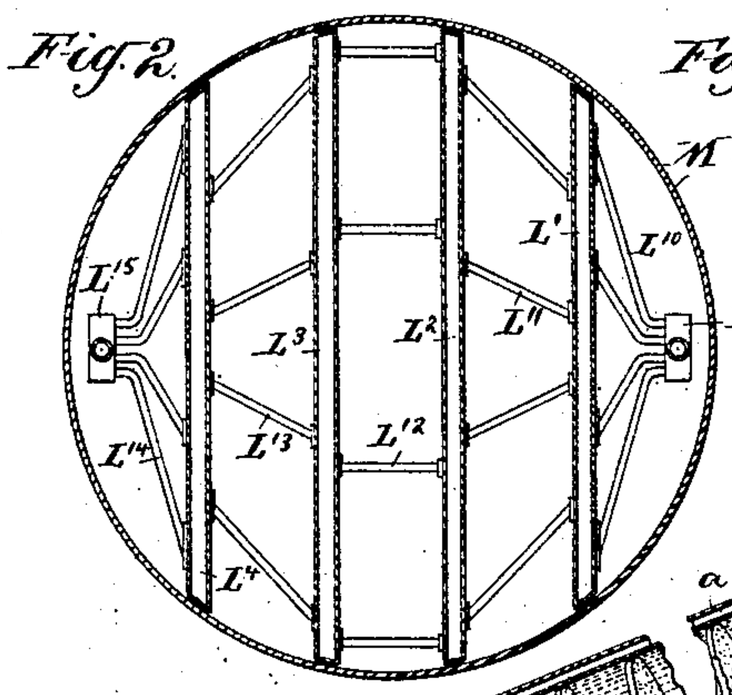


Fig. 2.

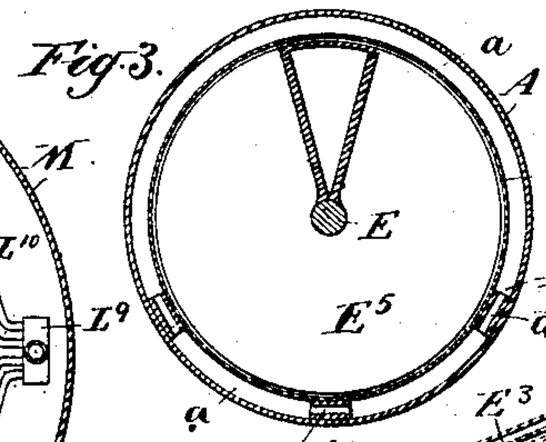


Fig. 3.

Fig. 1.

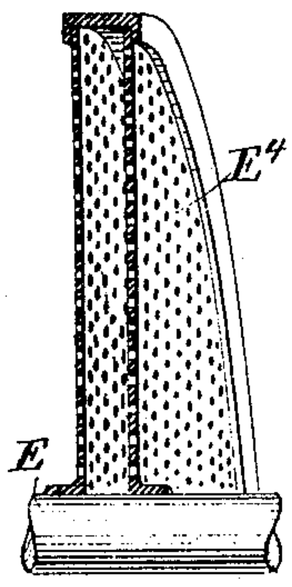


Fig. 4.

Witnesses:

Pierre Joseph Kamperdyk

Henry Wagner

Inventor:

William H. Gesner,

by his attorney

Charles R. Searle.

No. 773,139. PATENTED OCT. 25, 1904.

W. H. GESNER.

DISTILLING AND EVAPORATING APPARATUS.

APPLICATION FILED OCT. 21, 1903.

NO MODEL. 2 SHEETS—SHEET 2.

Fig. 6.

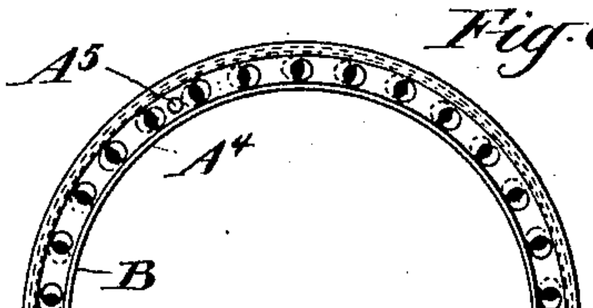
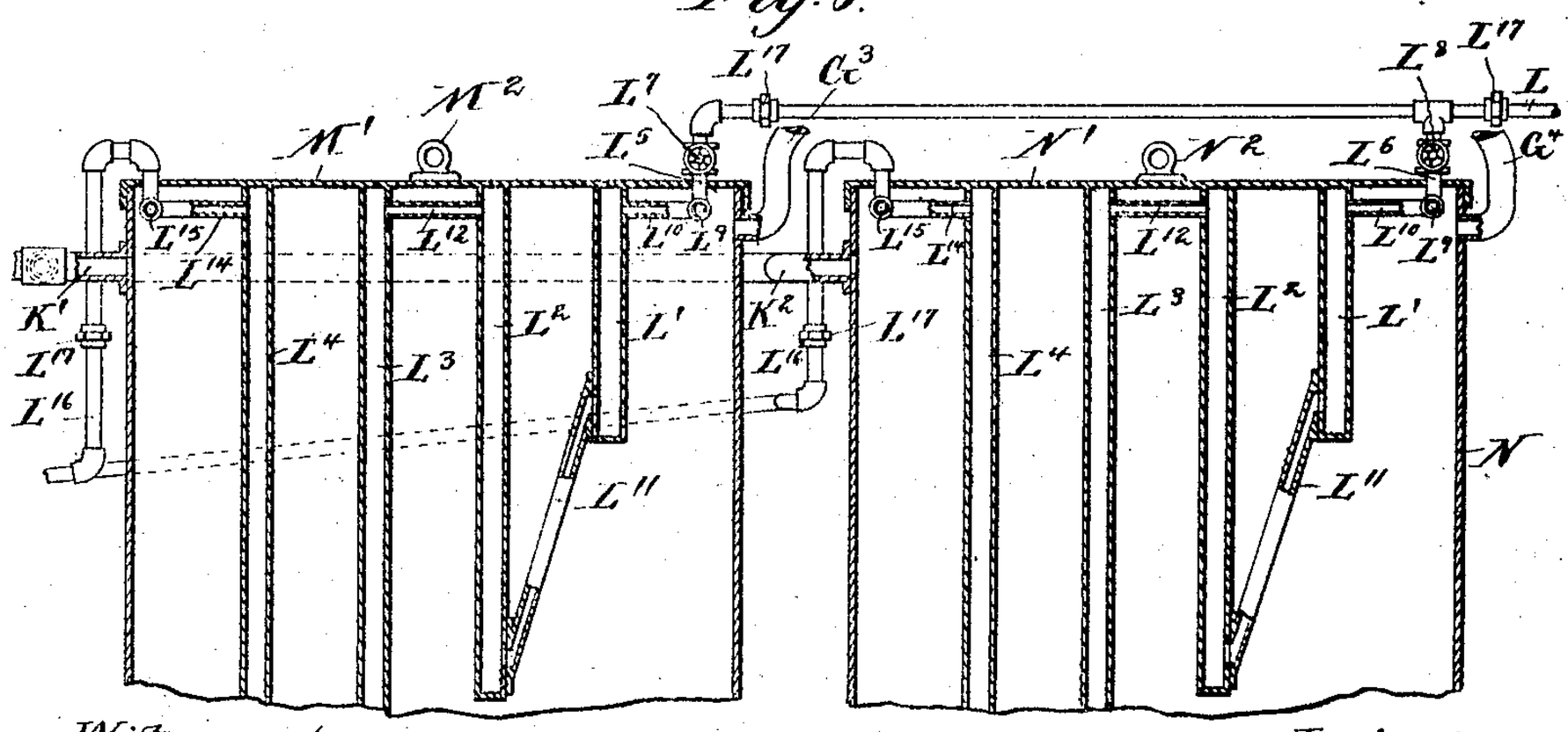


Fig. 5.

Fig. 7.

Fig. 8.



Witnesses:
F. E. Eccart.
B. T. Kapp.

Inventor:
William H. Gesner,
by his attorney,
Charles R. Searle.

No. 773,139. Patented October 25, 1904.

UNITED STATES PATENT OFFICE.

WILLIAM H. GESNER, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO CARIBBEAN MANUFACTURING COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

DISTILLING AND EVAPORATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 773,139, dated October 25, 1904.

Application filed October 21, 1903. Serial No. 177,867. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. GESNER, a citizen of the United States, residing in the city of New York, borough of Manhattan, in the county and State of New York, have invented a certain new and useful Improvement in Distilling and Evaporating Apparatus, of which the following is a specification.

The invention relates to continuous-treatment apparatus; and the object of the invention is to provide an apparatus of simple construction which shall be economical in operation and efficient in service.

The invention consists in certain novel features and arrangements of parts and details of construction, by which the above objects are attained, to be hereinafter described.

The accompanying drawings form a part of this specification and show a preferred form of the invention.

Figure 1 is a vertical section, partly in elevation, showing the entire working parts of the apparatus. Fig. 2 is a horizontal section, partly in plan view, showing one of the subsidiary condensers and receivers. Fig. 3 is a transverse section, on a larger scale, of the conveyer and its casing in which the material to be treated is subjected to heat taken near the discharge end; and Fig. 4 is a section showing a detail of the conveyer construction on a still larger scale. Fig. 5 is a longitudinal section through certain portions of the casing and conveyer corresponding to Fig. 1, but on a larger scale. Fig. 6 is an end elevation of a portion of the casing. Fig. 7 is a corresponding transverse section taken on the line 7 7 in Fig. 5. Fig. 8 is a vertical section through the upper portions of the receivers or subsidiary condensers and certain connected parts, partly in elevation.

Similar letters of reference indicate the same parts in all the figures.

The apparatus comprises a continuously-running screw conveyer in which the material to be treated is subjected to the action of steam or other heating agent, a condenser in which the volatile elements driven off by the heat may be liquefied, subsidiary condensers arranged to be used alternately in receiving the resultant liquids and provided with favorably-presented cold surfaces on which any uncondensed vapors may liquefy, and means for mechanically inducing a flow of the vapors from the conveyer to the subsidiary condensers.

A is a cylindrical casing set preferably at an inclination to facilitate the downward travel of the material, and B is an inclosed fixed foraminous shell of smaller diameter, supported concentrically therein on longitudinally-extending strips A′ between its under surface and the interior of the casing, maintaining the shell axially with an annular space *a* between it and the casing, free circulation being permitted through holes *a*′, produced in the strips A′. At the upper part of the casing and extending through to the interior of the shell is a hopper C, to which the material to be treated is supplied continuously either by hand or machinery. The upper ends of the casing and shell are closed by a cap or circular plug D, secured therein and also closing the annular space *a*. The cap has a central opening provided with a bushing D′, forming a bearing for a shaft E, extending axially of the shell and having a beveled gear-wheel E′ at its upper end in mesh with a corresponding pinion F′ on a shaft F, through which the power to slowly revolve the shaft E is received. On the shaft E is a continuous spiral flange or screw, matching the interior of the shell. A portion E^2 at the upper end beneath the hopper C is of quick pitch, adapted to engage and rapidly compress the material into the interval between the succeeding threads E^3 of slower pitch for the purpose of sealing the screw and casing to prevent the escape of vapors through the hopper C. This portion of the screw and a number of the slower convolutions are solid and smoothly join the hollow and perforated convolutions E^4, forming the main mid-length portion of the screw. This portion receives steam under pressure from a boiler (not represented) through a pipe H, arranged axially of the shaft E, controlled by a valve H′, and

entering the axial passage *e* in the shaft through a stuffing-box H^2. The passage *e* communicates, through a radial branch e^2, with the interior of the first of the perforated convolutions E^4 and circulates through the latter and through the hollow but unperforated convolutions E^5, forming the lower end of the screw. The lower ends of the shell and casing are open, the former to permit the exhausted material to escape freely and continuously and the latter to allow free entrance of external air to the annular space *a*. The supply of air to the space *a* may be controlled by an annular damper A^4, operated by a handle A^5 on the lower end of the casing.

E^6 is a cock set in the projecting end of the shaft, communicating through the axial passage e' and a radial branch e^3 with the last of the hollow unperforated convolutions E^5, serving to drain therefrom any water of condensation or other liquid collected in the screw.

A^2 is a chamber placed at the lowest portion of the casing to receive any liquid escaping from the space *a* and lead it through a pipe A^3 to any suitable receptacle.

G is a condensing-worm in communication with the upper portion of the space *a* and bathed, as usual, in water at a low temperature in a tank G'. Its outlet G^2, at the lower end, branches, as indicated at G^3 G^4, the several passages being controlled by the three-way cock G^5, by which the flow may be directed through either branch to either of two subsidiary condensers and collecting-tanks M and N, preferably in the form of tall cylindrical casings having removable covers M' N'. The branch G^3 leads to the upper portion of the receiver M, and the branch G^4 is similarly connected to the receiver N.

Each subsidiary condenser or receiver is equipped with a series of depending hollow partial partitions or diaphragms arranged with their planes parallel with each other and supported from the under face of the cover. The partitions are of different lengths, the shortest, L', being adjacent to the branch inlet, and the others, L^2, L^3, and L^4, of successively-increased length. Water at low temperature is supplied to the interiors of the two series of partitions through a pipe L, having branches L^5 L^6, Fig. 6, controlled by valves L^7 L^8, leading to headers L^9, from which distributing-pipes L^{10} convey the water to the upper portions of the first partitions, L'. These are connected at their lower portions through obliquely-arranged pipes L^{11} to the lower portions of the partitions L^2, which connect to the next partitions, L^3, through pipes L^{12} at the top. The partitions L^3 deliver their water through a second set of inclined pipes, L^{13}, Fig. 1, to the bottoms of the longest partitions, L^4, from which the water escapes through pipes L^{14} at the top to headers L^{15} and thence through discharge-pipes L^{16} to any convenient drain or receptacles. By this construction the water circulates through the partitions and cools their plane surfaces, which thus serve as auxiliary condensers for any vapor in the receivers M and N.

The water supply and discharge is through the covers M' N', and the pipes are provided with ordinary unions L^{17}, Fig. 8, to allow the covers, with their attached partitions, to be easily removed and replaced by any suitable lifting device connected to the eyes M^2 N^2.

K is an exhaust-fan or other device serving to induce a partial vacuum in the receivers or subsidiary condensers through pipes K' K^2, connected to the upper portions below the covers.

Material to be treated, which for the purposes of this description may be understood to be those portions of the tea-berry or winter-green plant containing volatile oils, is supplied to the hopper in sufficiently finely divided condition, either moist or dry, in quantities sufficient to fill or nearly fill it, and thus serve to close its discharge-opening. The material passing through the latter is caught by the screw, compressed, and forced downward along the shell. As soon as it reaches the perforated convolutions E^4 it is subjected to heat and the penetrating and opening action of the steam, which escapes through the perforations into both sides of the thin spiral mass. The temperature is rapidly raised and the volatile elements driven off in the form of vapor mixed with steam. This action is continued until the material reaches the hollow but unperforated portions E^5 of the screw and should be of sufficient duration, governed by the length of the screw and its rate of revolution and the temperature of the steam, to drive off all the desired volatile matter in the material. When the unperforated hollow convolutions are reached, the supply of steam directly into the mass ceases, and the latter is then gradually dried by the contact with the hot surfaces, and the material falls from the open end of the shell in a dry condition, exhausted of all the elements volatilizable at the temperature to which it has been subjected. The vapors mingled with steam escape through the perforations in the shell into the annular space *a*, from which they are drawn to the worm G by the partial vacuum therein and are condensed and delivered to one or the other of the two receivers where any liquid immediately falls. Any uncondensed vapor coming in contact with the cold surfaces of the partitions are condensed thereon, and the resulting drops trickle down and join the liquid in the bottom of the tank. The vapor tends by its levity to rise in the space *a*, and its travel through the worm to the tanks M and N and its circulation therein are aided by the exhaust-fan K, tending to maintain a partial vacuum

in the tank in service and to induce a current toward the latter throughout the whole system. The liquid, consisting of condensed vapors of water and volatile matter, accumulates in the tank until its level reaches nearly to the lower edge of the partition L^4, as indicated by a series of water-gages. (Not shown.) Then the water-supply to the partial partitions of that tank and the suction-pipe from the fan K is shut off, and the other tank is connected, the flow from the worm being correspondingly diverted by the three-way cock G^5. The tanks are thus used alternately. The liquid is allowed to stand until separated into layers by gravity, and the portions are drawn off through cocks J, entering the tanks M and N at different levels.

Modifications may be made in the forms and proportions, and parts of the invention may be used without the whole.

The perforations in the screw may be omitted, depending on the transmission of heat from the surfaces alone in treating materials on which it is undesirable to allow steam to act directly, as in evaporating operations the vapor driven off, if valuable, may be condensed, as before, or may be allowed to escape before entering the worm. In this arrangement the hollow imperforated convolutions E^5, forming the lower end of the screw, as shown in Figs. 1, 3, and 5, are continued to the solid convolutions E^3 at the upper end, taking the place of the perforated convolutions E^4, as will be readily understood.

Instead of steam hot air under pressure may be employed under some conditions, or other gases or vapors may be used for which certain volatile elements have an affinity, thus serving as vehicles therefor to be afterward separated therefrom.

The inclination of the casing should be varied to conform to the conditions obtaining in the treatment of various materials. It is important that the material shall practically close the hopper and also the spaces between the convolutions of the screw, so that the steam shall act against the mass before its pressure becomes too low for effective service.

I claim—

1. In an apparatus of the character set forth, a screw conveyer having a portion of its convolutions solid and a portion hollow, a perforated shell receiving said screw conveyer, means for supplying heat to said hollow convolutions, and a casing of larger diameter than said shell and inclosing the latter.

2. In an apparatus of the character set forth, a screw conveyer having a portion of its convolutions solid and a portion hollow, part of said solid portion being of quicker pitch than the remainder, means for supplying heat to said hollow portion, a perforated shell receiving said screw, and a casing of larger diameter than said shell and inclosing the latter.

3. In an apparatus of the character set forth, a screw conveyer having a portion of its convolutions solid and a portion hollow, part of said hollow portion being perforated, means for supplying heat to said hollow portion, a perforated shell receiving said conveyer, and a casing of larger diameter than said shell and inclosing the latter.

4. In an apparatus of the character set forth, a screw conveyer having the convolutions at one end solid and at the other hollow and unperforated, and the intermediate portion hollow and perforated, means for supplying heat to said hollow portions, a perforated shell receiving said conveyer, and a casing of larger diameter than said shell inclosing the latter.

5. In an apparatus of the character set forth, a screw conveyer having a portion of its convolutions hollow and means for supplying heat thereto, a perforated shell receiving said conveyer, a casing of larger diameter than said shell and inclosing the latter with an annular space between them, and a condenser connected to said space.

6. In an apparatus of the character set forth, a screw conveyer having a portion of its convolutions hollow and means for supplying heat thereto, a perforated shell receiving said conveyer, a casing of larger diameter than said shell and inclosing the latter with an annular space between them, a condenser connected to said space, and means as an exhaust-fan for inducing a current from said space through said condenser.

In testimony that I claim the invention above set forth I affix my signature in presence of two witnesses.

WILLIAM H. GESNER.

Witnesses:
ROBT. CONNOR,
CHARLES R. SEARLE.