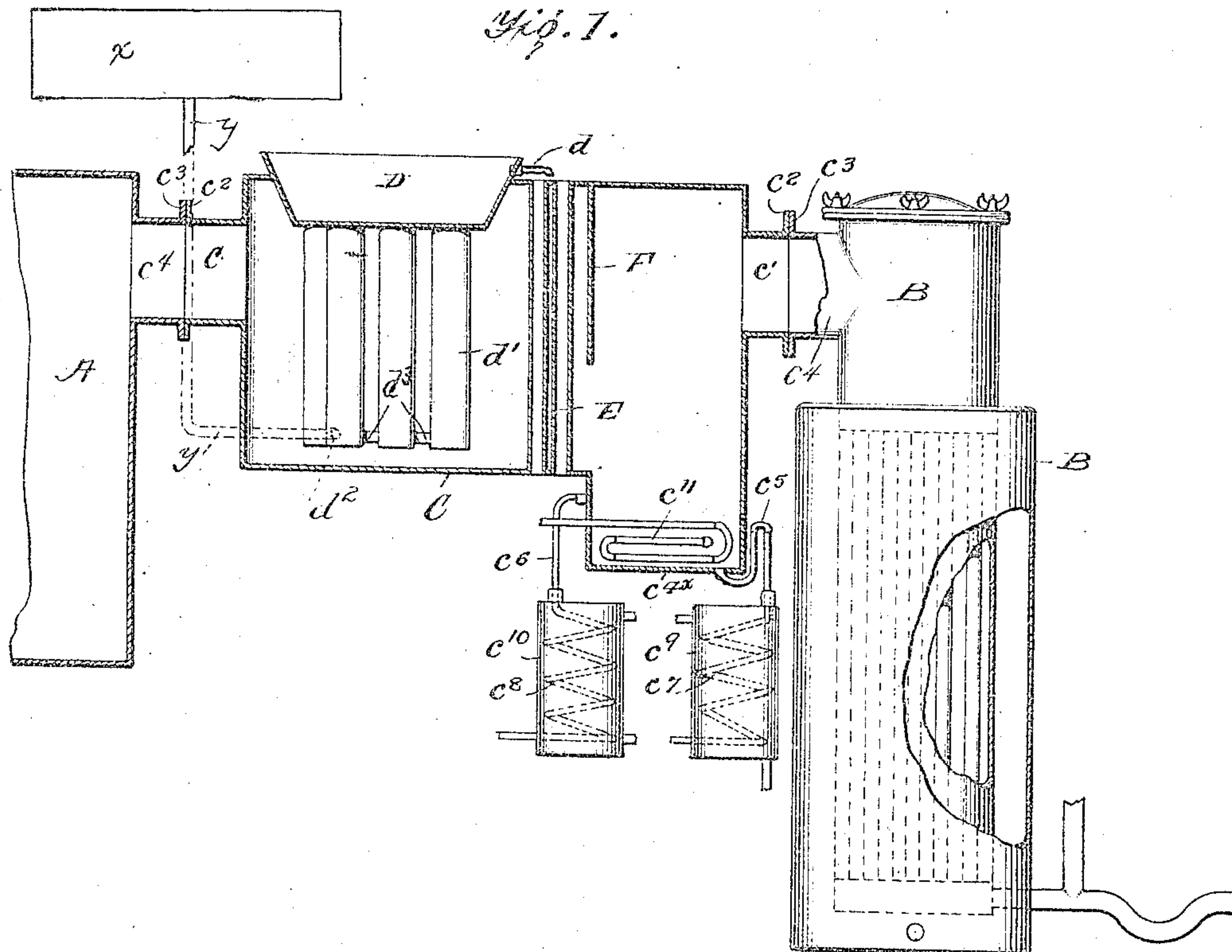
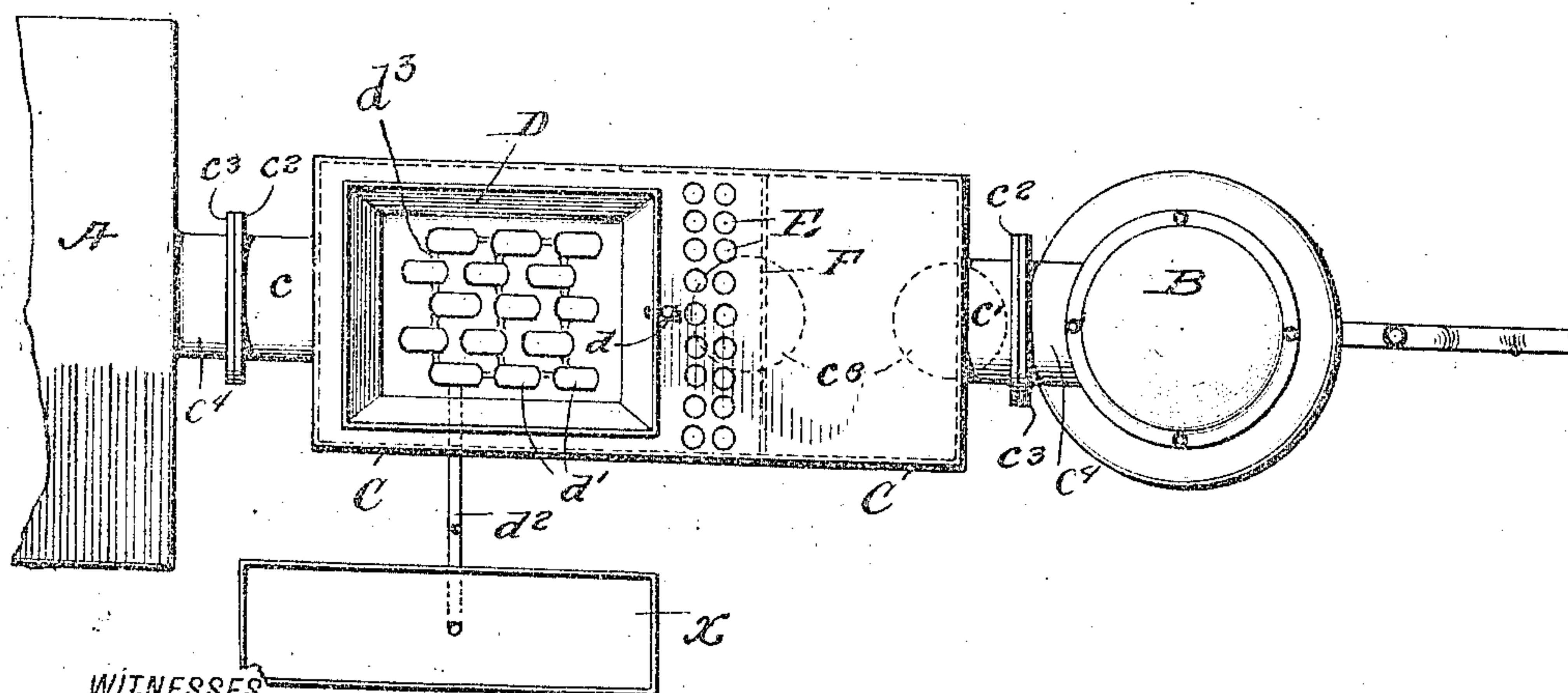


952,540.

Укр. 7.



340.2.



WITNESSES

L. H. Schmidt  
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**INVENTORS:**

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# UNITED STATES PATENT OFFICE.

MORTON J. LYSTER AND BENTON R. LYSTER, OF WHITEFIELD, NEW HAMPSHIRE.

APPARATUS FOR THE PRODUCTION OF ACETIC ACID.

952,540.

Specification of Letters Patent.

Patented Mar. 22, 1910.

Application filed January 16, 1909. Serial No. 472,675.

To all whom it may concern:

Be it known that we, MORTON J. LYSTER and BENTON R. LYSTER, citizens of the United States, residing at Whitefield, in the county of Coos and State of New Hampshire, have invented certain new and useful Improvements in Apparatus for the Production of Acetic Acid, of which the following is a specification.

Our invention pertains to apparatus for the production of acetic acid in large quantities by "destructive" distillation of wood. By destructive distillation of wood is meant, of course, the decomposition of wood by subjecting it to heat in a closed retort or oven, etc. Free access of atmospheric oxygen being denied, the wood, instead of charring or catching fire, is actually decomposed. If the destructive distillation is properly conducted, the product issuing from the retort is mainly pyroligneous acid (impure acetic acid). Among the impurities in pyroligneous acid are various heavy or tarry bodies, and it is desirable, as is well understood, that they be separated from the pyroligneous acid before it is condensed.

The object of our invention is to provide apparatus to be disposed intermediate of and in communication with a retort and a condenser, which will subserve the dual function of effecting separation of the tarry bodies from the pyroligneous or crude acetic acid, before the pyroligneous acid vapors pass to the condenser, and of utilizing the heat coming from the retort, in a novel and useful manner, to evaporate part of the water out of liquor charged or neutralized with lime, which is run through our novel evaporator.

With the above objects in view, and other objects appearing as the specification proceeds, the invention resides in the novel construction, combination, and arrangement of parts of a device characterized by our invention, as will be fully hereinafter set forth in the specification, summed up in the claims, and illustrated in the accompanying drawing.

In the drawing, which is illustrative of the underlying principles of our invention, and shows one form of embodiment thereof: Figure 1 is a central, vertical, longitudinal section through our apparatus, and Fig. 2 is a top plan view thereof.

Referring now in detail to the drawing: A represents an oven or retort for the destructive distillation of wood, and B a con-

denser. As these parts form no portion of our invention, and as they may be of the usual and well known, or of any preferred, construction, detailed description and illustration thereof are deemed superfluous.

Intermediate the retort and the condenser is the evaporating and separating apparatus constituting the subject-matter of our invention, and which may be described in the following manner: A passageway, or chamber or vessel C, of any appropriate or desired configuration and preferably constructed of copper, is disposed between the retort A and the condenser B (advantageously near to or at the top thereof, as shown in the drawing), and is in communication therewith in any suitable manner, in this instance, as shown, by tubular sections  $c$ ,  $c'$ , terminating in annular flanges  $c^2$  bolted to corresponding flanges  $c^3$  on similar sections  $c^4$ ,  $c^4$ , carried by the retort A and the condenser B, respectively. A portion  $c^{4x}$  of the bottom of the chamber C may be and preferably is disposed beneath the remainder of the bottom, and may be advantageously furnished with outlet-pipes  $c^5$ ,  $c^6$  communicating at their lower extremities with condensing-worms  $c^7$ ,  $c^8$  disposed in water-receptacles  $c^9$ ,  $c^{10}$ . A steam-coil  $c^{11}$  disposed in said portion  $c^{4x}$  may be provided for the purpose of vaporizing any low-boiling liquids that may be condensed by contact with our evaporator (hereinafter described). Let into the top of the vessel C and supported thereby is an evaporating-receptacle, of any suitable contour, in this instance shown as a pan D. (open-topped or closed, as desired), provided with an outlet  $d$ , serving as an overflow to pass the acetate to the final evaporator or drier (not shown). Within the chamber C and depending from the pan D and in communication therewith are water-legs or tubes  $d'$ , with which communicates an inlet-pipe  $d^2$ , and which communicate with each other by means of short sections of pipe  $d^3$ . The pan D and the legs  $d'$  constitute our evaporator, and the latter term is used hereinafter to designate these parts of our invention. Above the apparatus is a tank  $x$  for holding liquid, and depending therefrom is a pipe  $y$  in communication with the pipe  $d^2$ . Under some conditions of use, the fall of the temperature caused by the legs  $d'$  and the pan D is not sufficient to cause the tarry heavy bodies to condense and separate out in the chamber C, and,



therefore, we have devised the idea of providing spaced, open-ended, vertical flues E, which may extend, in the rear of the legs  $d'$ , transversely of the interior of the chamber C and communicate, at both ends, with the atmosphere exterior of said chamber. It will be seen that air may circulate through these flues, still further to condense the products coming from the retort A. To the rear of the flues E, we desirably provide one or more baffles or deflectors F (one thereof shown in the drawing), depending from the top and extending transversely of the chamber C and terminating short of the bottom thereof, which serve to direct the products downward before entering the condenser B, so that the tarry bodies are thrown into the portion  $c^{4x}$ , whence they pass off through the pipes  $c^5$ ,  $c^6$ , into the worms  $c^7$ ,  $c^8$ . The particular function of the pipe  $c^5$  is to receive the tar that condenses from the vapors and conduct it through the worm  $c^7$  to cool it before it is placed in barrels. The especial and distinguishing function of the pipe  $c^6$  is to receive the watery liquors that, being lighter, float above the tar, and pass them through the worm  $c^8$  for cooling.

The operation of our device may be briefly described as follows: The vapors and gases issuing from the retort A pass into the chamber C, where they pass around the water legs  $d'$ , which latter cool the vapors and gases sufficiently to allow the tar oils to separate out therefrom; but the vapors or gases are not cooled to a point where the water, acid and alcohol will condense out of the vapor in any considerable quantity. The flues E (if used) operate to still further cool and condense the gaseous products issuing from the retort, and assist in separating out the tar oils. After passing between the spaced flues E, the products strike the baffle F, and are deflected downward thereby, so that the tarry products are thrown into the portion  $c^{4x}$  (constituting a trap for said tarry products), and will not pass into the condenser B; the vapor and gases continuing their travel onward into the condenser B. It will be understood that the tarry products condense very much easier than the other fractions of the vapor, and require less than one-third of the cooling necessary to condense them into liquid that is required by the other portions. While the vapor and gases are passing through the vessel C, liquor—pyroligneous acid which has been neutralized by lime—which is held in the supply-tank  $x$ , is fed down in a small stream through the pipe  $y$  and communicating pipe  $d^2$ , whence it circulates up through the legs  $d'$  into the pan D, and passes out through the exit-pipe  $d$  to another evaporator or drier (not shown). It will be recognized that the said charged liquor is run through an evaporator for two

important purposes, namely: First: that part of the water may be evaporated out of the said liquor, or the heated liquor passed to an ordinary steam-jacketed evaporating-pan; second: that the vapors and gases from the retort A passing around the coils of the evaporator shall be cooled sufficiently to allow the tar-oils to separate out from the vapor.

The steam-coil  $c^{11}$  vaporizes any low-boiling liquids that may be condensed by sudden cooling of the evaporator; and this vapor, so produced, will pass into the condenser B with the other vapors and gases. It will be understood, of course, that the action of the steam-coil  $c^{11}$  is not such as to vaporize the tar, which is trapped in the portion  $c^{4x}$ .

Many changes and modifications in detail will suggest themselves, especially to those skilled in the art to which this invention appertains; but all such modifications and changes, within the scope of the appended claims, constitute no departure from the spirit of the invention and come within the scope and purview thereof.

Having thus fully described our invention, what we claim as new and desire to secure by Letters-Patent is:

1. In apparatus for the production of pyroligneous acid, the combination with a retort and a condenser, of a chamber disposed therebetween and communicating therewith, liquid-heating and vapor-condensing means projecting into said chamber in the path of the gases passing therethrough, and comprising a receptacle let into the top of said chamber, water legs depending therefrom and communicating therewith, branch-pipes disposed between the legs and communicating therewith, whereby all the legs communicate one with the other, an outlet-pipe communicating with said receptacle, and an inlet-pipe communicating with said legs.

2. In apparatus for the production of pyroligneous acid, the combination with a retort and a condenser, of a chamber disposed therebetween and communicating therewith, liquid-heating and vapor-condensing means projecting into said chamber in the path of the gases passing therethrough, and comprising a receptacle let into the top of said chamber, water-legs depending therefrom and communicating therewith, branch-pipes disposed between the legs and communicating therewith, whereby all the legs communicate one with the other, an outlet-pipe communicating with said receptacle, an inlet-pipe communicating with said legs; and spaced, open-ended flues disposed in said chamber to the rear of said legs and communicating at both ends with the exterior atmosphere.

3. In apparatus for the production of pyroligneous acid, the combination with a re-



tort and a condenser, of a chamber disposed therebetween and communicating therewith, liquid-heating and vapor-condensing means projecting into said chamber in the path of the gases passing therethrough, and comprising a receptacle let into the top of said chamber, water-legs depending therefrom and communicating therewith, branch-pipes disposed between the legs and communicating therewith, whereby all the legs communicate one with the other, an outlet-pipe communicating with said receptacle, an inlet-pipe communicating with said legs; spaced, open-ended flues disposed in said chamber to the rear of said legs and com-

municating at both ends with the exterior atmosphere, a portion of the bottom of said chamber, to the rear of said flues, being depressed; an outlet-pipe leading from said depressed portion; a worm carried by the lower extremity of said pipe; and a receptacle surrounding said worm.

In testimony whereof we affix our signatures in presence of two witnesses.

MORTON J. LYSTER.  
BENTON R. LYSTER.

Witnesses:

WELLS G. HADLEY,  
WILLIAM H. COLBATH.