

(No Model.)

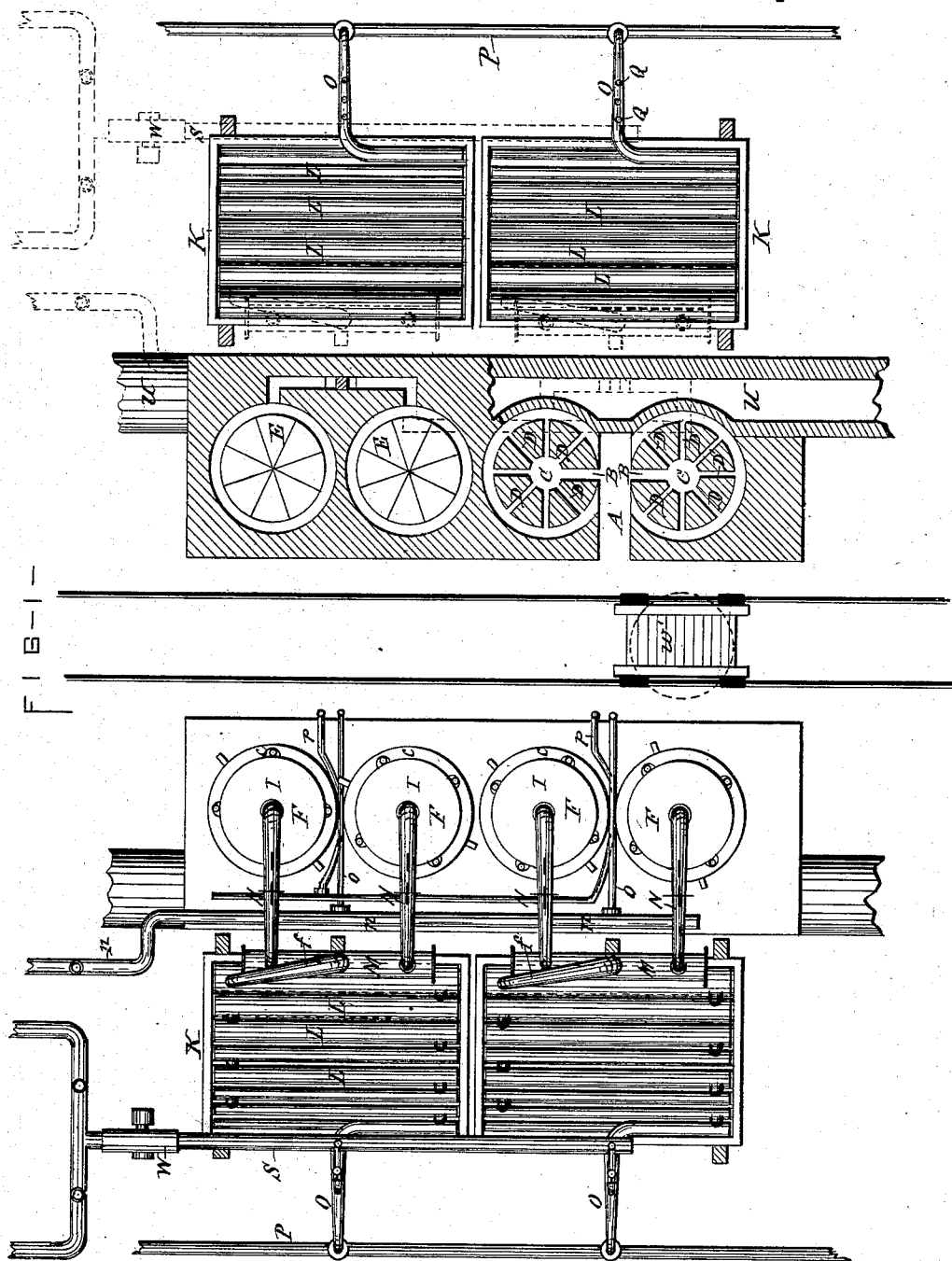
3 Sheets—Sheet 1.

C. J. T. BURCEY.

## WOOD DISTILLING APPARATUS.

No. 263,851.

Patented Sept. 5, 1882.



WITNESSES -  
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Ch. Benson

INVENTOR—  
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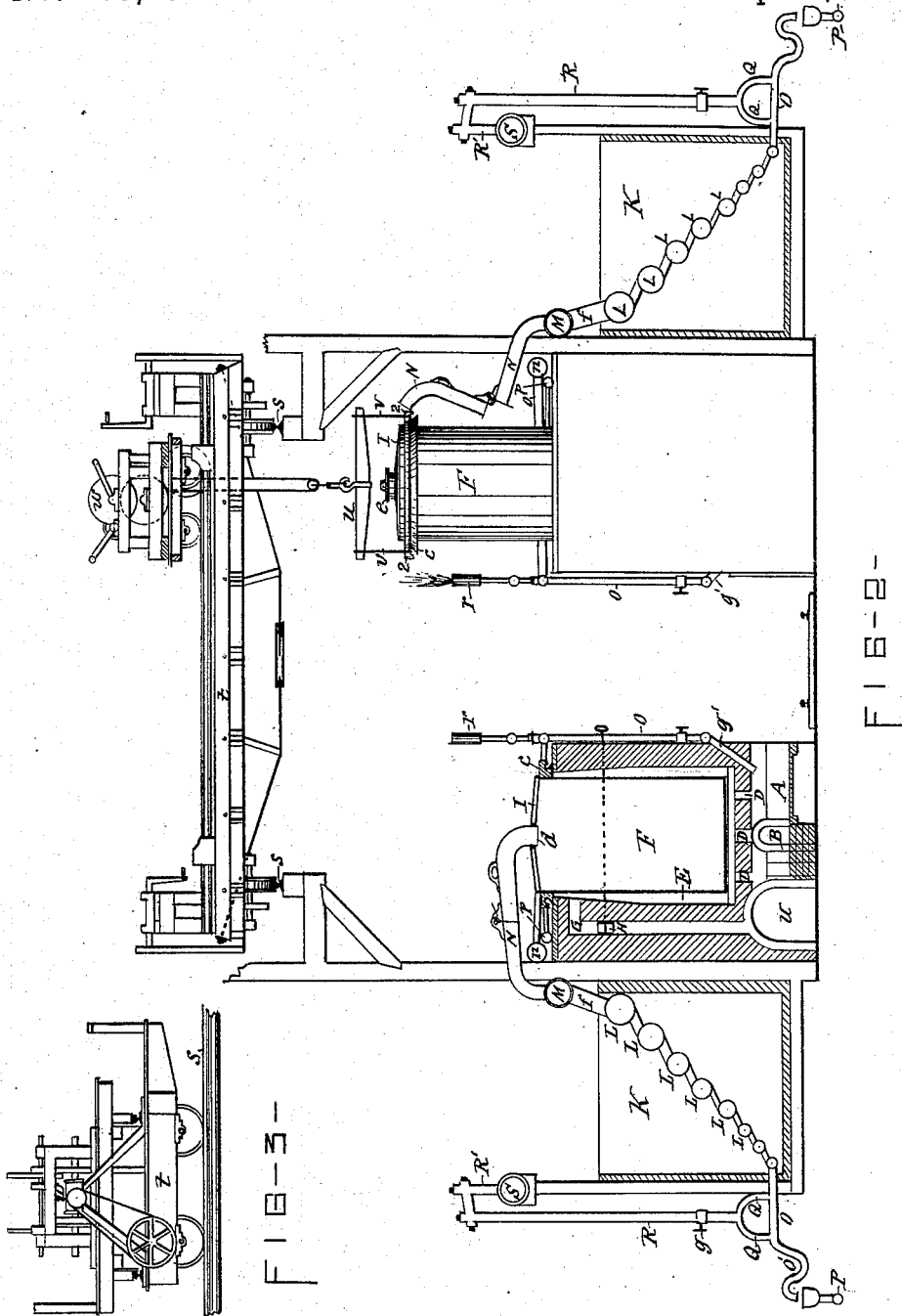
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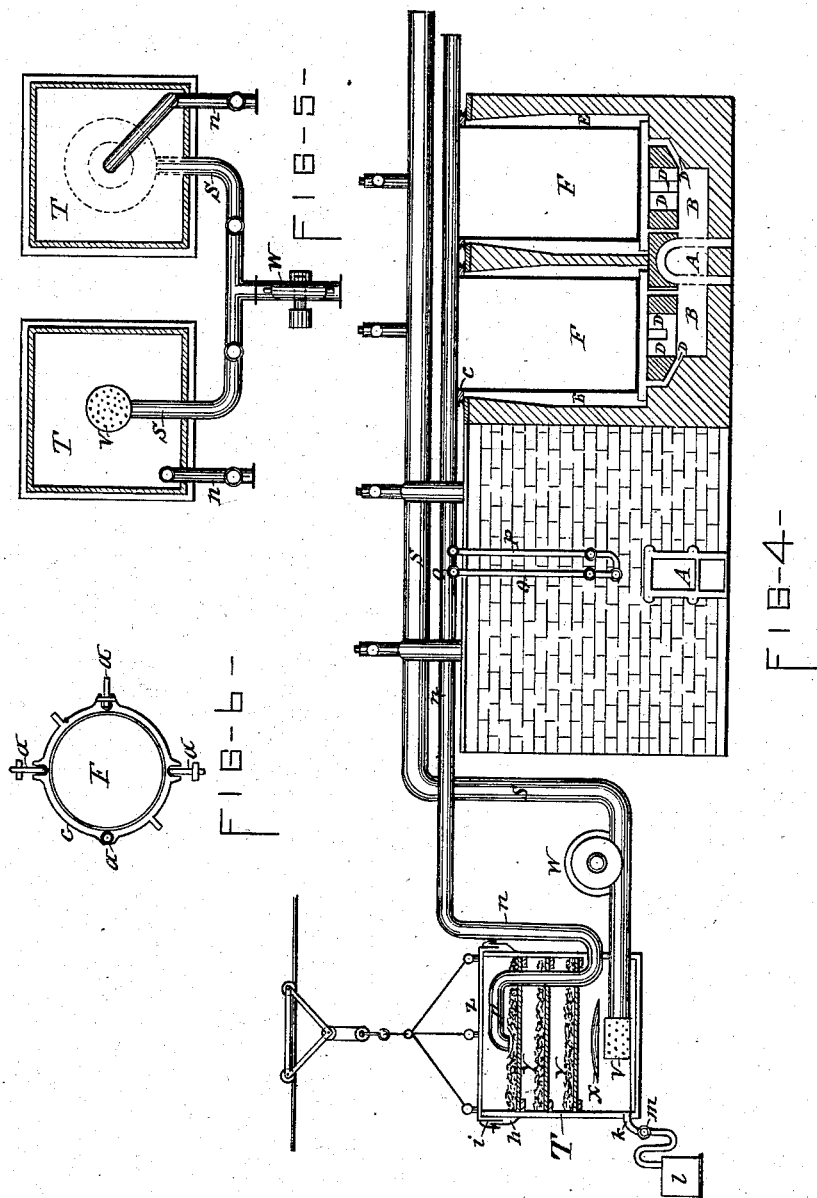
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3 Sheets—Sheet 3.

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# UNITED STATES PATENT OFFICE.

CHARLES J. T. BURCEY, OF BINGHAMTON, NEW YORK.

## WOOD-DISTILLING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 263,851, dated September 5, 1882.

Application filed June 2, 1882. (No model.)

### *To all whom it may concern:*

Be it known that I, CHARLES J. T. BURCEY, of Binghamton, in the county of Broome, in the State of New York, have invented new and useful Improvements in Wood-Distilling Apparatus, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention consists in an improved method and means for charring wood and obtaining therefrom pyroligneous acid, preparing said acid for distillation, and at the same time extracting therefrom and separating and utilizing the gases and accompanying acetic acid, all as hereinafter more fully described, and specifically set forth in the claims.

In the annexed drawings, Figure 1 is a plan view of two sets of distilling apparatus facing each other, between which is a railway or supply track adapted to operate for the supply of either set, portions of said apparatus being shown in section to better illustrate the detail construction of same. Fig. 2 is partly an end view and partly a vertical transverse section of the aforesaid apparatus. Fig. 3 is an end view of the movable platform mounted on the elevated railway and the hoisting apparatus on said platform. Fig. 4 is a side elevation of the wood-distilling apparatus, partly shown in section; Fig. 5, a plan view of the gas-chamber, and Fig. 6 is a top view of the retort detached.

Similar letters of reference indicate corresponding parts.

A represents a fire-arch or furnace, from which extend in opposite directions horizontal flues B B, which terminate in two annular combustion-chambers, C C. From each of these combustion-chambers radiate a series of flues, D, which communicate with two super-constructed cylindrical chambers or ovens, E E. In each of said ovens is arranged a removable retort, F, in the form of a cylindrical tank, built of boiler-iron or stout sheet-iron, and about eight feet four inches high by about five feet four inches in diameter. It is provided around the exterior of its upper portion with a rigid collar, c, of proper width to engage the top edge of the oven E and support the retort in a suspended position in said oven. The top of the retort F is provided with a removable

cover, I, formed of two sheets of sheet-iron with a dead-air space between them to prevent radiation of heat from the retort, said cover being secured to the tank by bolts a a. Tiles b are interposed between the bottom of the retort and the flues D to protect the former against excessive heat. The retort is somewhat smaller in diameter than the oven E, so as to form around the retort a passage for the products of combustion which enter said passage from the extremities of the flues D D. An exit-flue, G, is extended from the upper portion of the oven E to another flue, U, which communicates with and supplies either partly or wholly the heat to the furnace of the steam-boiler employed for furnishing the power and steam heat required in the operation of the apparatus, and in evaporating and distilling the pyroligneous acid. By means of a damper, H, arranged in the exit-flue G the egress of the products of combustion from the oven E can be regulated or completely cut off when desired. The cover I of the retort F is provided at its center with an opening, d, to which is applied a removable air-tight cap, e.

K represents a water-tank longitudinally, in which are arranged a series of horizontal pipes, L L, placed successively in lower planes and connecting with one another consecutively at alternate ends. The uppermost pipe L communicates with a drum, M, by a pipe, f, and from said drum are extended two pipes, N N, which reach to and are adapted to enter the opening d of the covers of the two retorts F F, said pipes being hinged or provided with a suitable joint, so as to allow them to be either inserted in the aforesaid hole d of the retort-cover or swing out of the way, for the purpose hereinafter explained.

To the lowermost pipe L in the water-tank K is connected an outlet-pipe, O, which passes through the side of the tank K, and at some distance from the exterior thereof it has a vertical deflection, O', forming a trap to prevent the ingress of air through said pipe. The extremity or discharge end of the pipe O communicates with a pipe, P, which is extended to a suitable apparatus for distilling the pyroligneous acid obtained from the retort F, as hereinafter more fully described, and con-

ducted through the pipes N, M, *f*, L, and O, to the pipe P.

From the top of the pipe O, between the trap O' thereof and the tank K, rise two pipes, 5 Q Q, which meet in a pipe, R, extended vertically therefrom. To the upper end of the latter is connected a lateral branch pipe, and from the end of this depends a short pipe, R', which communicates with a larger pipe, S. A 10 valve, *g*, connected to the pipe R, serves to control the communication between the pipes Q and S. The extremity of the pipe S enters the base of a chamber, T, termed "gas-chamber," for the reason hereinafter explained, and 15 to the mouth of the said pipe is connected a finely-perforated case or strainer, V.

W denotes a fan-blower, arranged to draw the gas through the pipe S from the point where it communicates with the pipes R R', 20 and blow said gas through the strainer V into the gas-chamber T. Over the strainer V in the gas-chamber is arranged a concavo convex shield or deflecting-plate, X, with its concavity on the under side, and above said deflector are 25 a series of wooden racks placed one above the other. These racks are covered with quicklime.

To the top of the gas-chamber is applied a removable cover, Z, rendered perfectly air- 30 tight by a water-joint formed of an annular sheet-metal band, *h*, of greater circumference than the exterior of the gas-chamber, and surrounding the upper portion thereof, the bottom edge of the band *h* being joined water- 35 tight to the gas-chamber, so as to form a water-trough around the same. The cover Z projects over the top of the gas-chamber, and has around its edge a downward-projecting flange, *i*, which enters the water-trough *h*, and is immersed in 40 the water thereof, thus effectually excluding the air from underneath the cover. The bottom of the gas-chamber is inclined to one side, and at the lowest point thereof a pipe, *k*, taps the gas-chamber, and is extended therefrom to 45 a vat or suitable receptacle, *l*. A usual downward deflection of the intermediate portion of the pipe K forms a trap to prevent ingress of air, and a stop-cock, *m*, controls the egress of 50 fluid.

From the upper portion of the interior of the gas-chamber T is extended a pipe, *n*, out 55 through the side of said chamber and along the side of the top of the ovens E E, where it is tapped by branch pipes *o*, which are extended to and communicate with the furnaces underneath said ovens, said pipes *n* and *o* 60 conveying pure gas from the gas-chamber T to the aforesaid ovens, as hereinafter more fully explained, and being joined by air-ducts *p*, which serve to commingle air with the gas at its entrance into the furnaces of the ovens E E, and thus promote combustion of said gas, suitable valves or cocks being applied to the gas- 65 pipes and air-pipes to control the flow of gas and air.

*g'* is a pipe, connected to the gas-pipe *o*, and

provided with a stop-cock and a suitable burner, *r*. By opening said stop-cock and lighting the burner the factory can be supplied 70 with light when required.

*s* represents an elevated railway, arranged 75 over the ovens E E at a sufficient height to allow the retorts F to be lifted out of said ovens and carried along underneath said railway. This I accomplish by the following in- 80 strumentalities: Two series of ovens E E, with their hereinbefore-described appliances, being arranged in two parallel rows or ranges, with the front of the furnaces facing each other, the two track-rails of the aforesaid railway are ex- 85 tended lengthwise the rows of ovens and respectively along the rear portion thereof. A platform, *t*, reaching across the two rows of ovens, is mounted on suitable wheels, by which it rides on the aforesaid elevated railway. The 85 top of the platform *t* is provided with a track reaching from end to end thereof, and upon this track is mounted a windlass, *w*, or suitable hoisting apparatus, from which depends a tackle-block, provided with suitable means for 90 hitching onto a bar, *u*, which is provided on its extremities with chains *v*, which can be connected with ears 2 on the collar *c* of the retort. By means of the described hoisting 95 mechanism and railway-tracks the retorts F can be raised out of the oven E and carried away from the same and lowered onto a suitable track, *w'*, mounted on a railway extended along the bottom of the space between the two 100 rows of ovens.

The operation of the described apparatus is as follows: The retorts F are lifted out of their respective ovens, their covers I removed, and the retorts filled with wood cut into blocks of about one foot in length. Then the cover I is 105 replaced and bolted down onto the retort which is then carried in front of the oven, to which it pertains, by means of the track *w'* on the lower railway. The hoisting apparatus *w* on the elevated movable platform *t* being placed directly 110 over the retort on the track *w'*, the pendent tackle-block of the hoisting apparatus, together with the cross-bar *u* and its chains *v*, is lowered, the chains *v* hitched onto the ears of the collar *c* of the retort, and then the hoist- 115 ing apparatus is set in motion to draw up the retort F. When it has reached a proper height the hoisting apparatus is locked to retain the retort in its elevated position. Then the hoisting apparatus is moved along the track of the 120 platform *t* until the retort is brought directly over the oven E, when said retort is lowered into the oven. The chains *v* of the cross-bar *u* are then detached from the retort and the said cross-bar moved out of the way to give 125 access to the cap *e* of the retort, which cap is to be removed and the mouth of the pipe N to be inserted in the hole *d* in the cover of the retort and fitted air-tight therein. Two retorts are to be thus prepared and placed in 130 two ovens E E, having in common one furnace A. Fire is then to be applied to said furnace

and the ovens to be heated sufficiently to char the wood in the retorts F F, the products of combustion from the furnace passing through the flues C D and around the retorts in the  
 5 ovens and thence through the exit-flue G to flue U, which conveys said products of combustion to the fire-box of the boiler, (not shown in the drawings,) which furnishes the requisite power for the operation of the fan W and  
 10 such other parts of the apparatus as may be deemed expedient, and also furnishes the steam heat required for the subsequent treatment of the pyroligneous acid to obtain therefrom wood-alcohol and acetates, the apparatus for which is also omitted in the drawings,  
 15 it being the subject-matter of another invention, for which I am about to apply for Letters Patent.

During the process of charring the wood in the retorts F a vapor composed of pyroligneous acid and gas is generated in said retorts, from which it escapes through the pipes N to the drum M, and thence through the pipe f and series of pipes, L L. The latter, being surrounded  
 25 by cold water in the tank K, causes the pyroligneous acid to become condensed. The condensed substance passes out through the pipes O and into the pipe P, which conducts said substance to suitable tanks or receptacles, in  
 30 which to allow it to settle preparatory for subsequent distillation. The gas which becomes separated from the liquid spirit by the aforesaid condensation rises in the pipes Q Q and R, and thence passes through the pipe R' into  
 35 the pipe S. This latter pipe conveys said gas to the gas-chamber T, the fan W connected with said pipe drawing the gas from its described source and blowing it into the gas-chamber aforesaid, and at the same time producing a vacuum in the retorts, and thereby  
 40 relieving the same of the gases which tend to cool it, and thus facilitating the evaporation of the liquid contents of the wood in process of charring. The gas, as it enters the chamber T, becomes disseminated by its passage  
 45 through the perforated case V and diffused by the deflector X. In its ascent in the gas-chamber T it encounters the beds of quicklime laid on the crates or racks Y. This lime serves to  
 50 eliminate from the gas the alcohol and acetic acid with which it is saturated, the alcohol being condensed and precipitated to the bottom of the gas-chamber T, from whence it is drawn off by the pipe k, and collected in the receptacle l. The acetic acid is absorbed by the  
 55 lime, and when said lime is completely saturated with said acid, the influx of gas to the chamber is stopped, the cover Z removed, and the trays y y emptied and recharged with fresh lime, when the cover can be replaced, and the  
 60 operation of purifying the gas renewed.

In order to avoid interruption of the operation of the apparatus I employ two gas-chambers, T T, so that the flow of the gas from the  
 65 pipe S may be diverted from one chamber T to the other chamber while the former is be-

ing emptied and refitted for use. The purified gas passes out through the pipe n, from which it is distributed, by the branch pipes o, to the  
 70 furnaces A of the ovens E to take the place of the fuel by which the initial heat was obtained. The air-pipes p, intersecting the gas-pipe or entering the furnace in proximity with said pipes, commingle sufficient air with the gas to  
 75 produce perfect combustion.

So soon as the wood in one of the retorts is completely charred and all the vapor extracted therefrom the valve g of the pipe R is closed. The pipe N is then removed from the opening  
 80 d in the top of the retort, and the cap e immediately applied to said opening, so as to exclude the air until the charcoal is cooled. The valve or damper H in the exit-flue G is then closed, and the influx of gas from the pipe o  
 85 stopped to prevent as much as possible further circulation of heat. The retort is then raised out of the oven E, carried to one side, and lowered onto the truck, which stands on the  
 90 railway in front of the furnace A. By means of said truck the retort is carried away to be emptied and refilled. In the meantime another already filled and prepared retort is brought to the empty oven and introduced therein and set in operation. It is on this account I prefer to employ two ovens side by side, and a  
 95 sufficient number of retorts to admit of taking them out and replacing them alternately in the two ovens, and thus maintain the apparatus in constant operation.

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

1. A wood charring and distilling apparatus consisting of an oven or chamber communicating with a furnace or heat-generator, a  
 105 metal tank arranged in said oven and provided with a removable air-tight cover, an orifice in said cover, and a ventiduct or vapor-pipe, and a cap adapted to be interchangeably applied to the said orifice, substantially as and for the  
 110 purpose set forth.

2. A wood-distilling apparatus consisting of a furnace or heat-generator, an oven or chamber communicating therewith, an air-tight  
 115 tank arranged in said oven and provided with an outlet for the vapor, a ventiduct, and a cap adapted to be interchangeably applied to said outlet, and a condenser connected with the ventiduct, substantially as and for the purpose  
 120 set forth.

3. A wood-distilling apparatus consisting of an oven provided with a suitable heating apparatus, an air-tight tank situated in said  
 125 oven, a vapor-duct communicating with the tank, a condenser connected with the ventiduct or its extensions, a pipe tapping the vapor-duct at or near its exit from the condenser, a fan-blower arranged to exhaust the aforesaid pipe, and having its discharge communicating  
 130 with a condensing and purifying chamber, substantially as described and shown.

4. The combination, with the ovens E E and

retorts F F, of the furnace A, branch flues B B, combustion-chambers C C, and radial flues D D, substantially in the manner described and shown.

5 5. The combination, with the oven E, of the retorts F, provided with the supporting-collar c, and the cover I, provided with the orifice d, the removable cap e, and the vapor-duct N, provided with a hinge, substantially as and  
10 for the purpose set forth and shown.

6. The combination, with the retorts F F, of the vapor-ducts N N, drum M, pipe f, pipes L L L, arranged in different planes and communicating with each other successively at alternate  
15 ends, the water-tank K, and the discharge-pipe O, provided with the trap O', as shown and set forth.

7. In combination with the retort F, vapor-duct N, drum M, pipes f L O, and condenser  
20 K, the pipes Q, Q, R, R', and S, blower W, and the chamber T, having racks y for the reception of quicklime, substantially as shown and described.

8. In combination with the gas and vapor pipe

S, the chamber T, provided with an inclined 25 bottom, the strainer V, lime-racks y y, outlet-pipe k, and receptacle l, substantially in the manner and for the purpose set forth.

9. In combination with the ovens E, retorts F, and gas and vapor pipe S, the chamber T, pro- 30 vided with an inclined bottom, the strainer V, deflector X, lime-racks y, pipe k, tapping the base of the chamber and communicating with the receptacle l, the pipe n, extended from the upper portion of the chamber and having 35 branch pipes o communicating with the furnace of the ovens E, substantially as and for the purpose specified.

In testimony whereof I have hereunto signed my name and affixed my seal, in the presence 40 of two attesting witnesses, at Syracuse, in the county of Onondago, in the State of New York, this 31st day of May, 1882.

CHARLES J. T. BURCEY. [L. s.]

Witnesses:

C. H. DUELL,

WM. C. RAYMOND.