No. 799,426. PATENTED SEPT. 12, 1905.

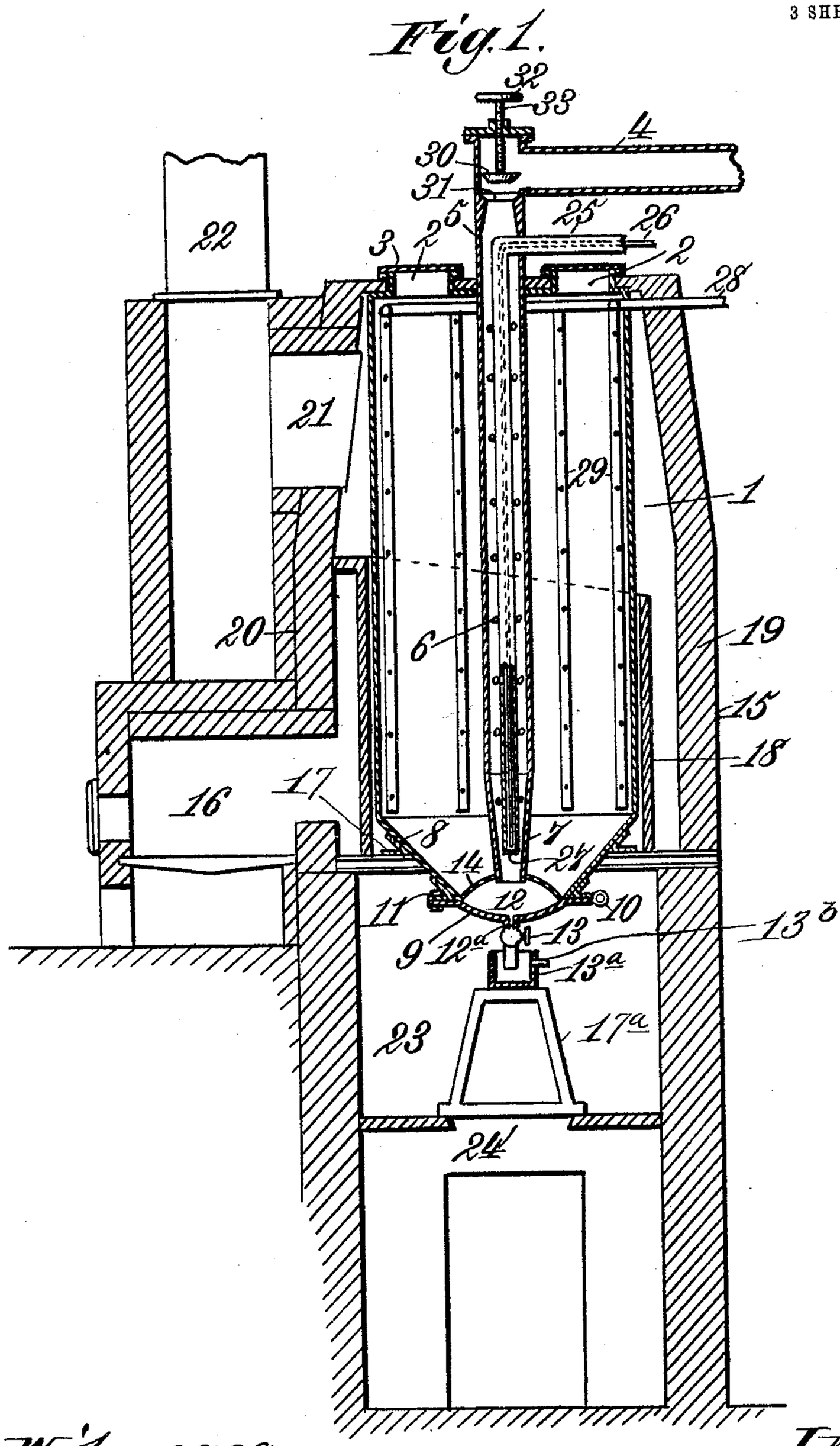
H. B. WILLIAMS.

APPARATUS FOR DISTILLING WOOD.

APPLICATION FILED JAN. 16, 1905.

3 SHEETS—SHEET 1.

Fig. 1.



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3 SHEETS—SHEET 2.

Fig. 2.

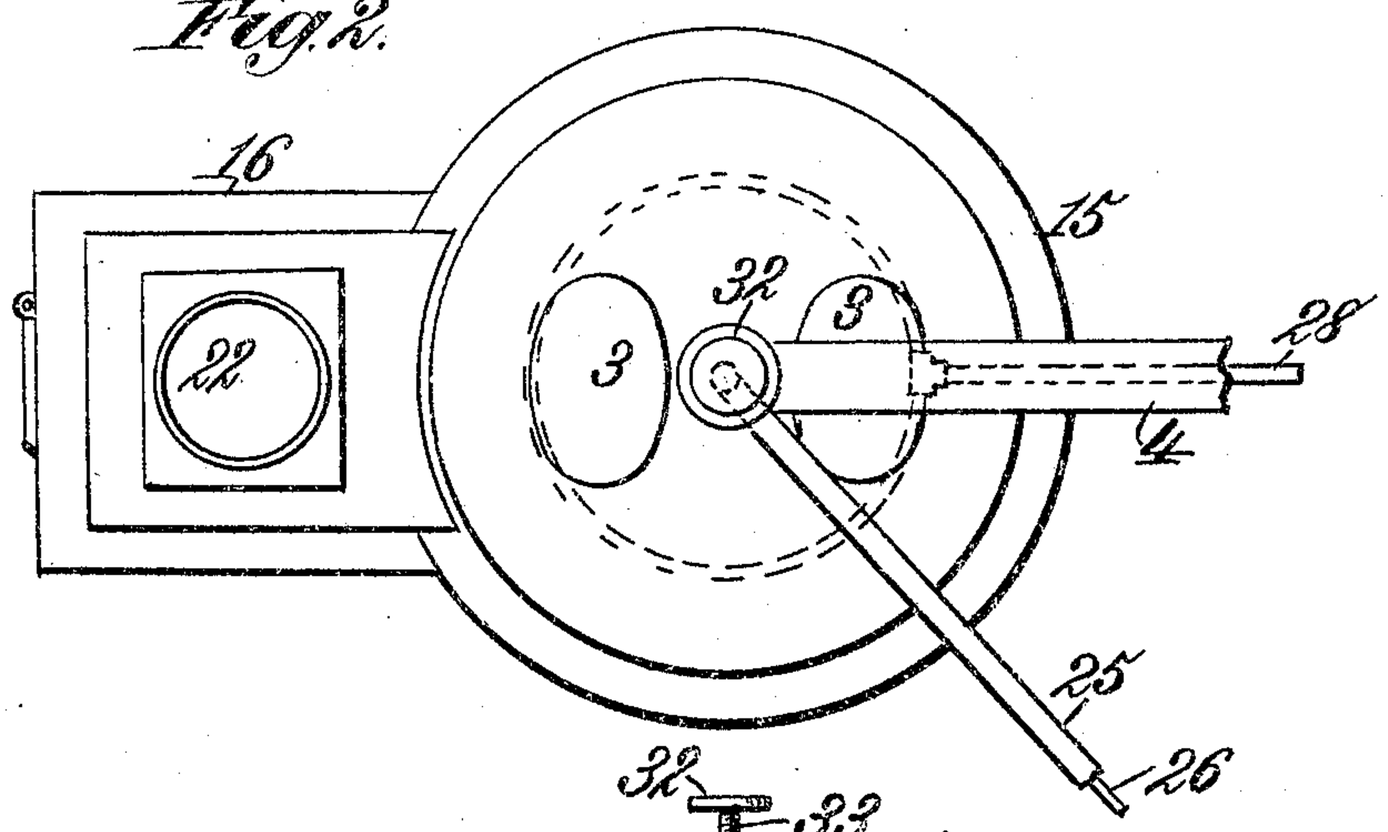
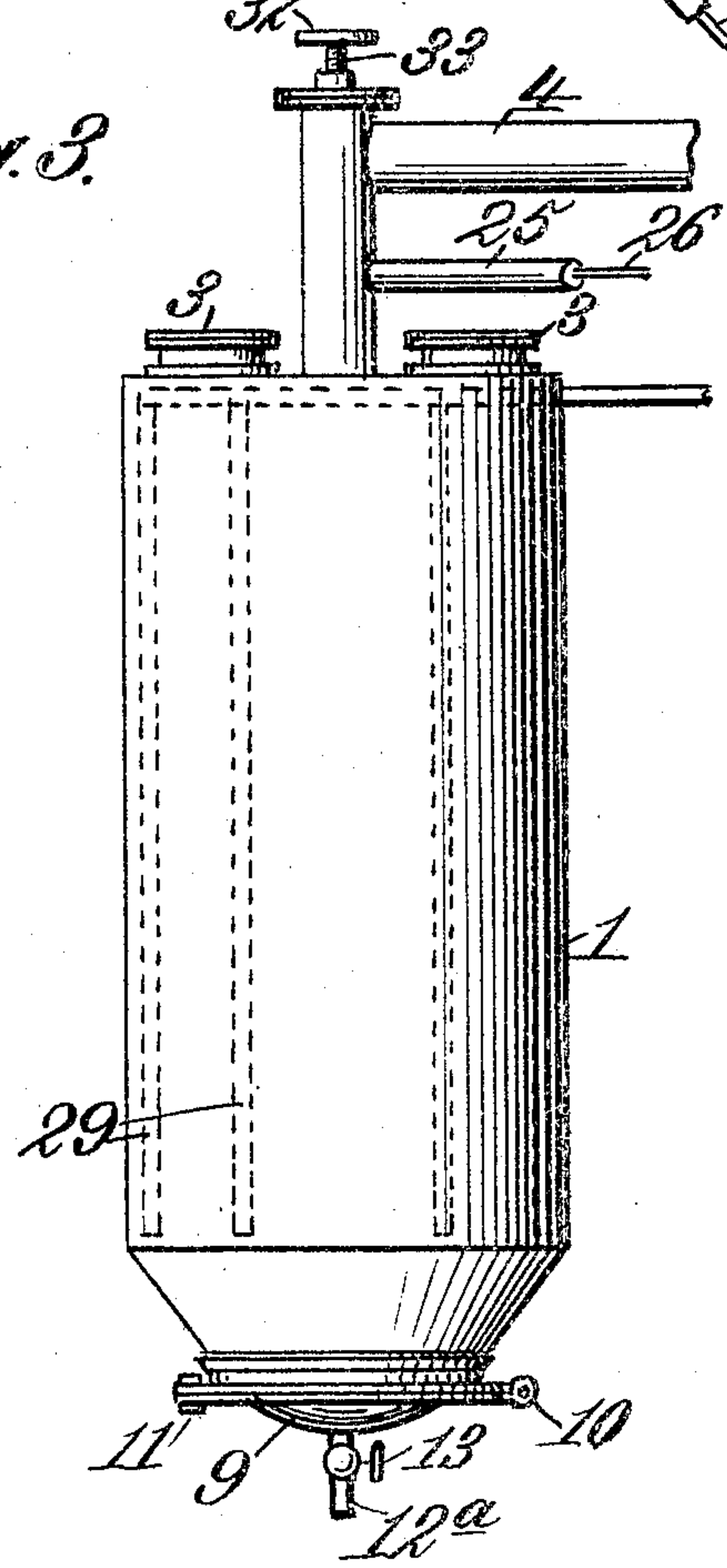


Fig. 3.



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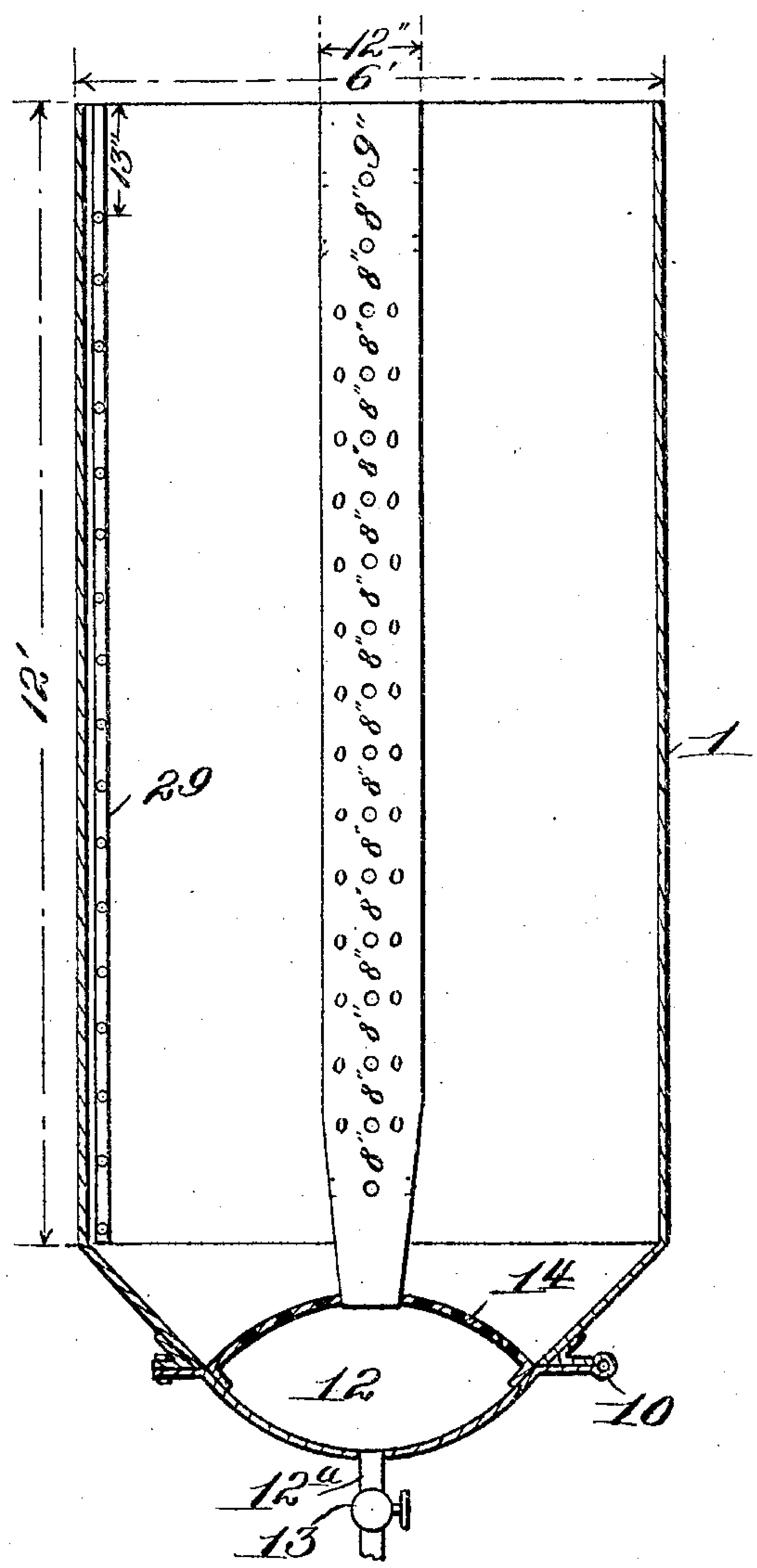
3 SHEETS—SHEET 3.

Fig. 4



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UNITED STATES PATENT OFFICE.

HERBERT B. WILLIAMS, OF McMURRAY, WASHINGTON.

APPARATUS FOR DISTILLING WOOD.

No. 799,426. Specification of Letters Patent. Patented Sept. 12, 1905.

Application filed January 16, 1905. Serial No. 241,269.

To all whom it may concern:

Be it known that I, HERBERT B. WILLIAMS, a citizen of the United States, residing at McMurray, in the county of Skagit and State of Washington, have invented new and useful Improvements in Apparatus for Distilling Wood, of which the following is a specification.

This invention relates to an apparatus adapted for the destructive distillation of coniferous woods, more especially designed for distilling pine and other resinous wood and substances to obtain the essential oils and other useful products therefrom—such as turpentine, light and heavy creosote-oil, tar, charcoal, &c.—by one continuous distilling operation on a single charge of the wood.

The invention further aims to construct an apparatus for distilling wood which shall be simple in its construction and arrangement, strong, durable, and efficient in its operation, and comparatively inexpensive to set up.

With the foregoing and other objects in view the invention consists of the novel construction, combination, and arrangement of parts hereinafter more specifically described, and illustrated in the accompanying drawings, which form a part of this specification and wherein is shown the preferred embodiment of the invention; but it is to be understood that changes, variations, and modifications can be resorted to without departing from the spirit of the invention or sacrificing any of its advantages, said changes, variations, and modifications coming within the scope of the claims hereunto appended.

In the drawings, wherein like reference characters denote corresponding parts throughout the several views, Figure 1 is a vertical sectional view of an apparatus for distilling wood constructed in accordance with this invention. Fig. 2 is a top plan. Fig. 3 is a side elevation of the retort removed from the furnace; and Fig. 4 is a sectional elevation of the retort, showing the arrangement of the perforations in the draw-off pipe and one of the steam-spray pipes, certain of the parts being omitted.

Referring to the drawings by reference characters, 1 denotes a retort or receptacle adapted to receive the material which is to be distilled, and said retort 1 is provided with charging-openings at the top thereof, preferably two in number, as indicated by the reference character 2, although the number of charging-openings can be increased or diminished, as desired, and each of said openings is provided with a closure 3.

The reference character 4 denotes a vapor-conducting pipe which communicates with a perforated vapor-draw-off pipe 5, which depends into the retort 1 to near the bottom thereof and is perforated throughout, as at 6, and has its lower end contracted, as at 7. The perforations 6 are so arranged as to effect as nearly as possible the equal drawing off of the vapors from all parts of the wood charge and also effect an equal distribution of heat through the charge. The perforations of the pipe 5 are so arranged that the combined area of the perforations about equals the sectional area of the pipe 5, and the perforations are so distributed as to insure a uniform circulation of the vapors generated in the retort. By way of example, the arrangement of the perforations in the pipe 5 to obtain the results just referred to are illustrated. The arrangement of the openings in the pipe 5 and pipe 29 in Fig. 4 is in connection with a retort six feet in diameter and twelve feet high. The first row of openings in the pipe 5 is nine inches from the top of the retort and from there on are in rows eight inches apart. The first and second rows consist of four openings and all the other rows eight openings, with the exception of the last row, which consists of four openings. These openings are slightly over one inch in diameter, and the total number is one hundred and twenty-four, so that their combined area about equals the sectional area of the pipe 5. In regard to the pipe 29, the first opening is arranged thirteen inches from the top of the retort, and from there on are eight inches apart throughout the entire length of the pipe. In retorts of different sizes the number and diameter of the openings will vary somewhat from the arrangement as given; but in all cases the combined area of the openings would about equal the sectional area of the pipe 5 and the openings would be spaced equally apart, with this exception that there would be fewer openings in the first top and bottom rows than in the remaining rows of openings.

The lower portion of the retort 1 is coned, as at 8, so as to form a contracted discharge-opening closed by a door 9, which is hinged, as at 10, and secured in closure position by the fastening means 11. The door 9 is concavo-convex in cross-section, so as to also form a collecting-chamber 12, having an outlet-pipe 12^a, provided with a cock 13. The pipe 12^a

extends and opens into a receptacle 13ª, which is provided with an outlet 13ᵇ, said outlet 13ᵇ being arranged above the end of the pipe 12ª. The receptacle 13ª is mounted upon a support 17ª, said support, as shown, being substantially trapezoidal in contour, yet any other suitable form of support can be employed. The door 9 has secured to its inner face a perforated shield 14, substantially convex in cross-section and provided with a centrally-arranged opening, which receives the lower end of the perforated draw-off pipe 5 when the door 9 is closed. Said shield retains the wood charge at the proper level, prevents the wood from entering the chamber 12, and also acts as a screen to keep excessive heat from said chamber 12, formed by the door 9. The door 9 when closed is made air-tight by use of a gasket, and the fastening means 11 consists of bolts, which are adapted to be connected to a flange carried on the bottom of the retort. By constructing the door 9 in the manner heretofore referred to the chamber 12, as before stated, is formed, and said chamber 12 is adapted to collect the liquid products below the heating zone of the retort. These products are drawn off through the medium of the cock 13.

The retort 1 is mounted within the furnace 15 and at the rear of the fire-box 16, and said retort is supported upon the rings 17, which are held in position by I-beams having their ends supported by the walls of the furnace. The furnace has arranged therein a shield 18, constructed of any suitable material, which surrounds the retort a portion of its length, and the said shield is interposed between the walls 19 20 and the retort. The furnace is provided with a flue 21, which communicates with a stack 22. Arranged below the door 9 is a chamber 23, having an entrance-opening 24, so that after a distilling operation has been had the door 9 can be opened and the charcoal dropped down through the opening 24 into the chamber 23, where the charcoal can be cooled out of contact with the air.

Arranged within the pipe 5 is a water-circulating means, so arranged that water can be made to circulate so that the temperature of the vapors in the pipe 6 can be regulated, if desired. The means to secure the circulation of the water consists of a pair of pipes 25 26, the pipe 26 being arranged in the pipe 25, and said pipe 25 is closed at its lower end, as at 27. The pipe 25 extends to near the lower end of the pipe 5. The pipe 26 is termed a "water-supply" pipe and the pipe 25 the "water-discharge" pipe, or, if desired, the pipe 25 may be used as the water-supply pipe and the pipe 26 as the water-discharge pipe. The pipe 25 or the pipe 26 communicates with a suitable water or steam supply, as the case may be.

Extending within the retort, near the top thereof, is a steam-supply pipe 28, from which depend a plurality of perforated steam-spray pipes 29. These pipes 29 extend to near the bottom of the retort and are arranged around the vertical sides of the retort, and the perforations thereof enable the forcing of the steam through the wood charge.

The conducting-pipe 4 is provided with a valve 30, adapted to find a seat at 31 at the upper end of the pipe 5, and said valve is adjusted through the medium of a hand-wheel 32 engaging the stem 33 of the valve. By such an arrangement the pipe 5 can be opened and closed at the top thereof when occasion requires.

The operation of the apparatus is as follows: The wood to be distilled is cut in about lengths of two feet, the best size being that of ordinary stove-wood. The wood after being cut is charged into the retort 1 through the openings 2 until the retort is full. The valve 30 is then nearly closed, and steam at a high temperature is supplied to the interior of the retort through the pipes 28 and 29 and allowed to escape gradually past the valve 30. The pressure of the steam is controlled by said valve 30. The steaming of the wood is continued as long as desired or until the more volatile oils are driven off and a large percentage of the pitch or resin melted out and collected in the chamber 12, whence it is drawn off from time to time through the draw-off cock 13. When this operation is completed, which takes place in from two to six hours, according to the size of the retort and temperature of the steam, the steam is shut off. The valve 30 is then fully opened, the draw-off cock 13 opened, and the receptacle 13ª filled with tar or other suitable material, so as to close the end of the outlet-pipe 12ª, to which is connected the cock 13, which forms a trap owing to the fact that the outlet 13ᵇ is arranged above the free end of the pipe 12ª, so that when the valve or cock 13 is open air cannot enter the retort. The fire is then started in the furnace and the heat is gradually raised until destructive distillation of the wood is obtained, the vapors passing into the pipe 5 and out through the pipe 4 and discharged into a condenser. (Not shown.) During this operation if the temperature rises too high in the pipe 5 water or steam, as desired, is run into the pipe 26 and out through the pipe 25, so as to hold the temperature to the proper point and prevent the breaking up of the turpentine and tar compounds due to overheating and also to prevent the pitch being carried out with the vapors, which would occur to a certain extent if the temperature is too high. The pitch and liquid products collecting in the chamber 12 are drawn off continuously or intermittently through the pipe 12ª and cock 13. When this operation is finished and the wood completely charred, the temperature is lowered somewhat, the door 9 opened, and the charcoal dropped into the chamber 23 to cool.

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

1. In an apparatus for distilling wood, the combination with a retort provided with a centrally-arranged perforated draw-off pipe and a discharge-opening, of means for closing said opening, said means adapted to receive the lower end of said pipe and forming a receptacle for the liquid products dripping from said pipe, and means for drawing off said products through the said closure means.

2. In an apparatus for distilling wood, the combination of an exteriorly-heated retort provided with a discharge-opening, of a closure means for said opening, said means forming a collecting-chamber for certain products of distillation and provided with a perforated shield adapted to retain the wood charge at the proper level, to prevent the wood from entering the collecting-chamber and to screen said chamber from excessive heat.

3. In an apparatus for distilling wood, the combination with a retort having a centrally-arranged perforated draw-off pipe, of a series of perforated steam-pipes arranged in close proximity to the inner face of said retort and outside of the wood charge so that the steam can be forced through the wood charge and drawn off through the draw-off pipe.

4. In an apparatus for distilling wood, the combination with a retort having a centrally-arranged perforated draw-off pipe, of means for circulating water arranged within said draw-off pipe and adapted to regulate the temperature within said pipe.

5. An apparatus for distilling wood comprising an externally-heated vertically-arranged retort provided with charging-openings and a discharge-opening, a door for closing said discharge-opening, said door concaved in cross-section and provided with a perforated shield convexed in cross-section, said door forming a collecting-chamber for the liquid products of distillation, a vertically-extending perforated draw-off pipe arranged within said retort and having its lower end extending through said shield into said collecting-chamber, a conducting-pipe communicating with said draw-off pipe, a valve for closing communication between the said two pipes, and means for controlling the temperature within said draw-off pipe.

6. In an apparatus for distilling wood, the combination of a vertical retort heated externally on the sides and provided with charging-openings at the top and a draw-off door at the bottom, and a valved conducting-pipe, of a perforated draw-off pipe arranged centrally within said retort and adapted to communicate with said conducting-pipe, the perforations of said draw-off pipe so arranged that the combined area of the perforations about equals the sectional area thereof, said perforations so distributed as to insure a uniform circulation of the vapors generated in the retort.

7. An apparatus for distilling wood, comprising an externally-heated retort provided with an entrance means for the material to be treated and with means to permit of the discharging of the treated material, a perforated draw-off pipe arranged within said retort, and a plurality of perforated steam-supply pipes arranged within said retort in close proximity to the wall thereof.

8. An apparatus for distilling wood, comprising an externally-heated retort provided with an entrance means for the material to be treated and with means to permit of the discharging of the treated material, a perforated draw-off pipe arranged within said retort, a plurality of perforated steam-supply pipes arranged within said retort in close proximity to the walls thereof, and means arranged within said draw-off pipes for circulating a cooling medium therein.

9. An apparatus for distilling wood, comprising an externally-heated retort provided with an entrance means for the material to be treated and with means to permit of the discharging of the treated material, a perforated draw-off pipe arranged within said retort, a plurality of perforated steam-supply pipes arranged within said retort in close proximity to the walls thereof, means arranged within said draw-off pipe for circulating a cooling medium therein, and a valved conducting-pipe adapted to communicate with said draw-off pipe.

10. An apparatus for distilling wood, comprising a retort having an entrance-opening for the material to be treated and a discharge-opening for the treated material, a closure for said discharge-opening, said closure forming a collecting-chamber for the liquid products of distillation, and means for drawing off the said products.

11. An apparatus for distilling wood comprising a retort having an entrance-opening for the material to be treated and a discharge-opening for the treated material, a closure for said discharge-opening, said closure forming a collecting-chamber, a fire-shield surrounding a portion of said retort, means for exteriorly heating said retort, means for supplying steam into said retort, and means for conducting off the vapors generated in said retort.

12. An apparatus for distilling wood comprising a retort having an entrance-opening for the material to be treated and a discharge-opening for the treated material, a closure for said discharge-opening, said closure forming a collecting-chamber, means for exteriorly heating said retort, means for supplying steam into said retort, and means for conducting off the vapors generated in said retort.

13. An apparatus for distilling wood com-

prising a retort having an entrance-opening for the material to be treated and a discharge-opening for the treated material, a closure for said discharge-opening, said closure forming a collecting-chamber, means for exteriorly heating said retort, means for supplying steam into said retort, means for conducting off the vapors generated in said retort, and means for circulating a cooling medium through said means for drawing off the vapors generated within the retort.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

HERBERT B. WILLIAMS.

Witnesses:

A. M. HADLEY,

W. E. YOUNG.