A. DE FOCATIIS.

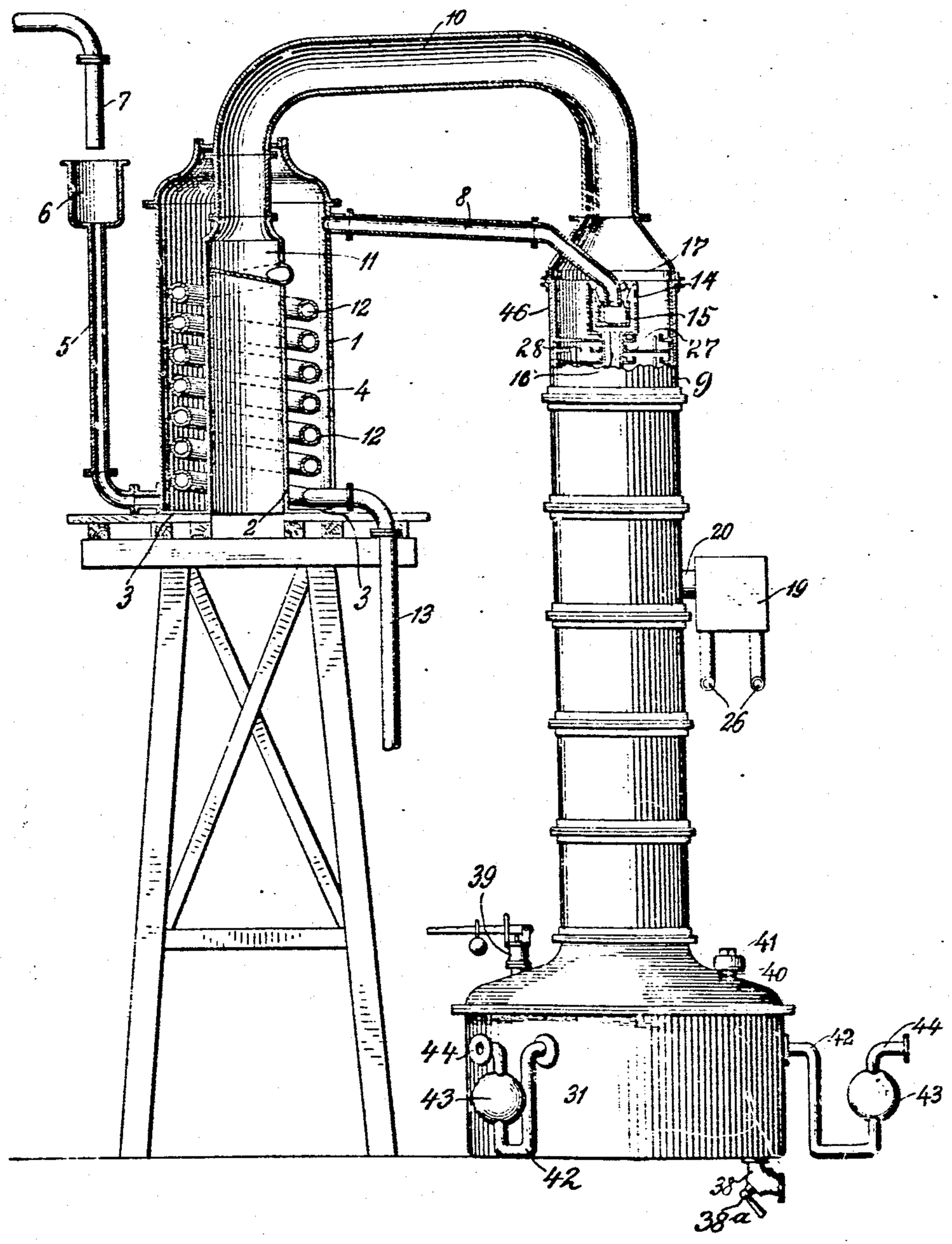
DISTILLING APPARATUS AND METHOD OF DISTILLATION.

APPLICATION FILED MAR. 8, 1904.

898,861. Patented Sept. 15, 1908.

3 SHEETS—SHEET 1.

Fig. 1.



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3 SHEETS—SHEET 3.

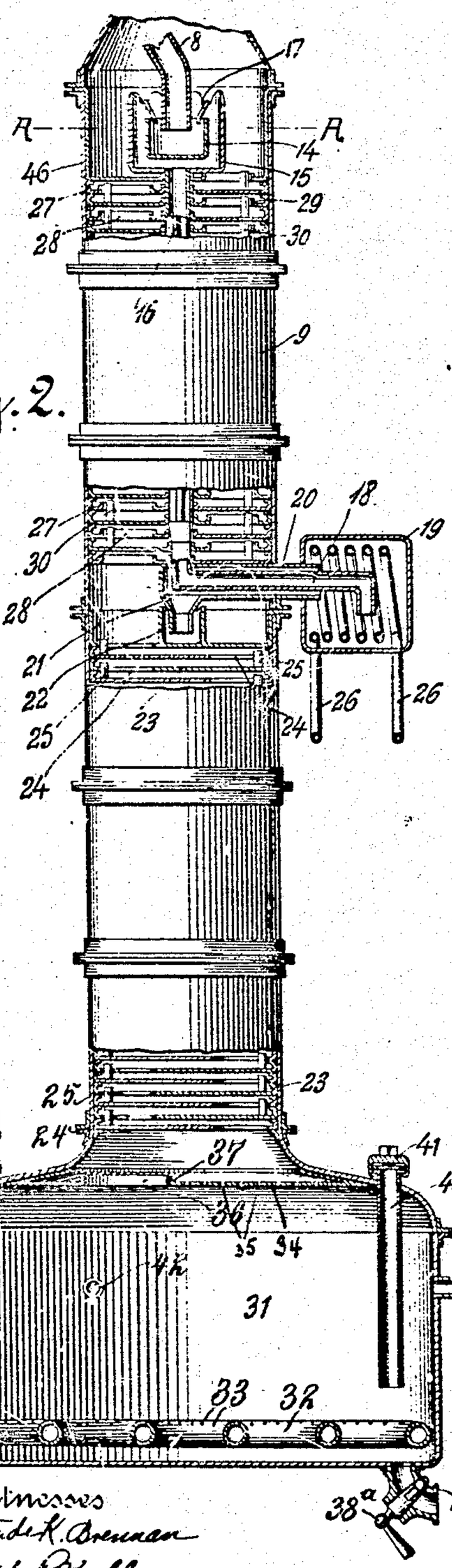

Fig. 2.

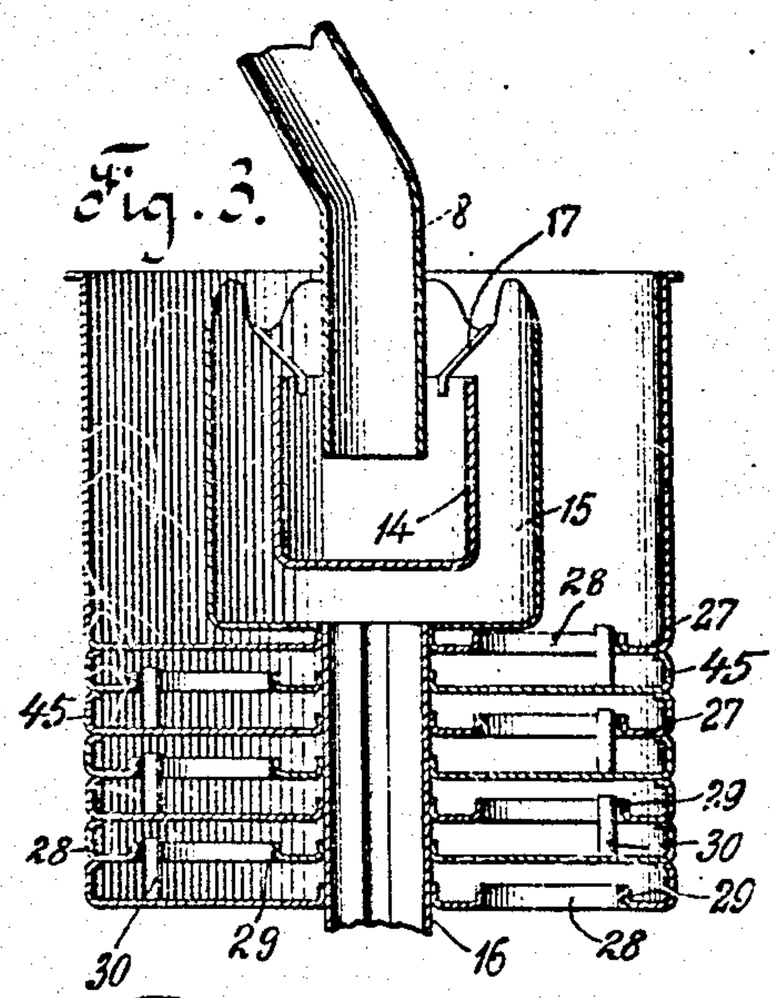

Fig. 4.

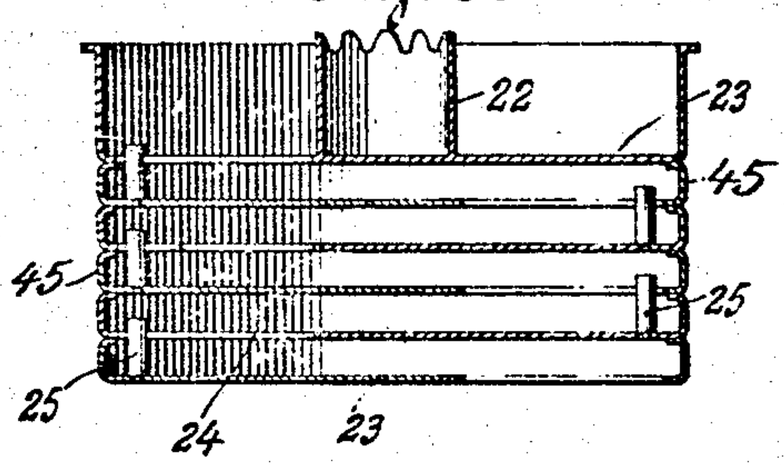

Fig. 3.

Fig. 5.

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Fig. 9.

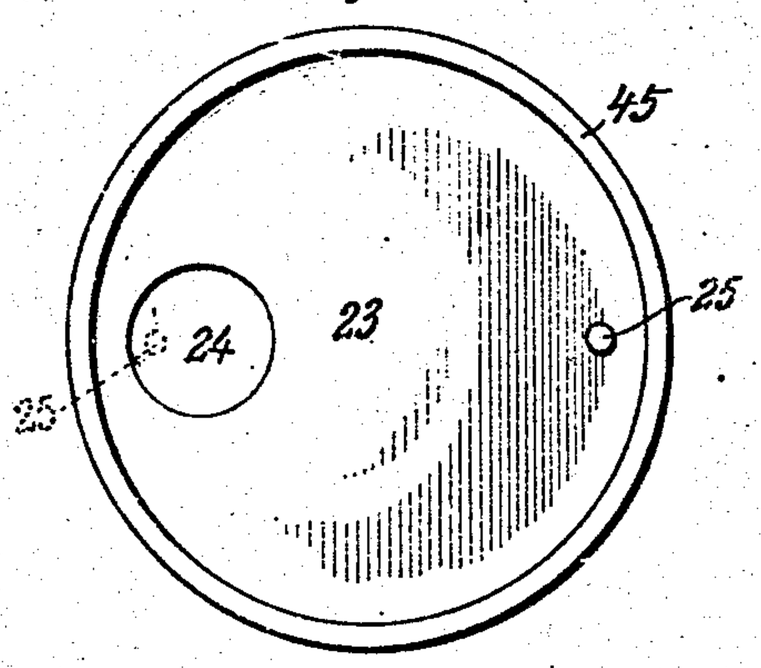


Fig. 6.

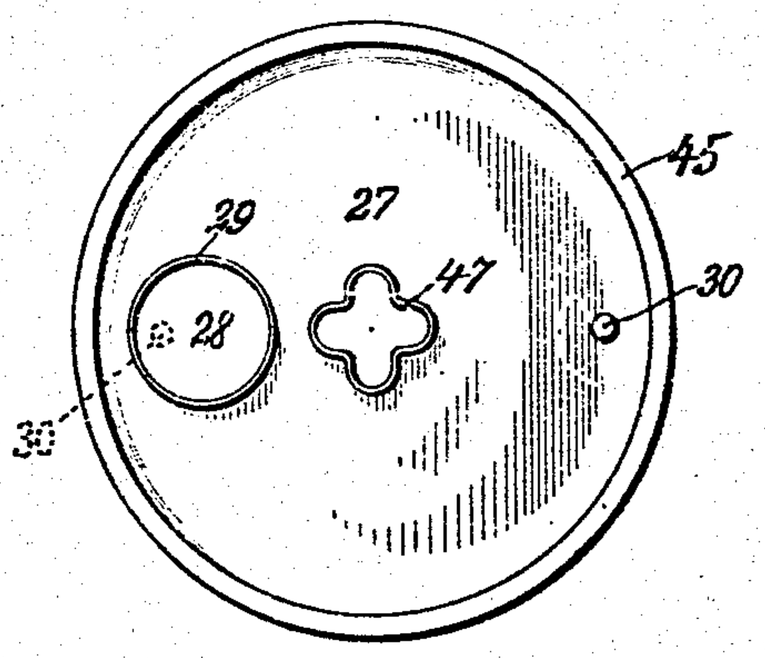


Fig. 10.

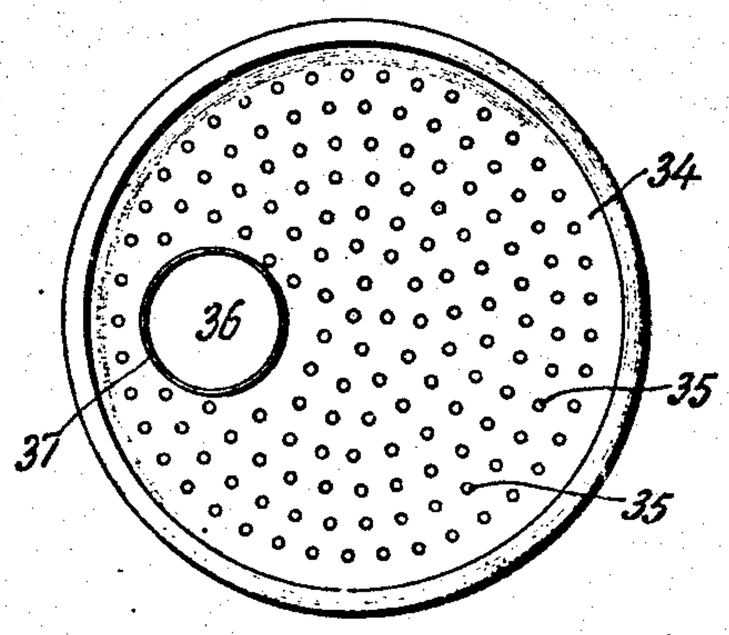


Fig. 7.

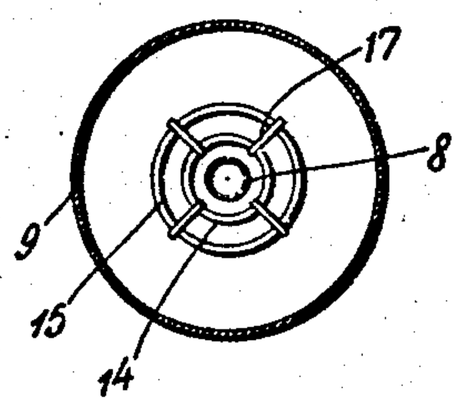


Fig. 11.

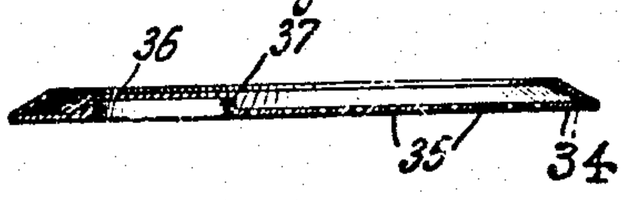
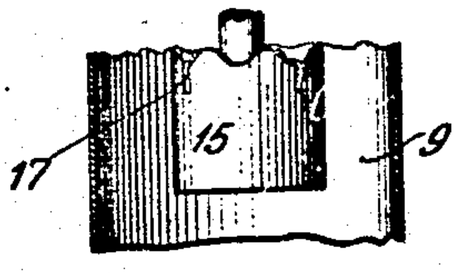


Fig. 8.



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UNITED STATES PATENT OFFICE.

ALFONSO DE FOCATIIS, OF NEW ORLEANS, LOUISIANA.

DISTILLING APPARATUS AND METHOD OF DISTILLATION.

No. 898,861. Specification of Letters Patent. Patented Sept. 15, 1908.

Application filed March 8, 1904. Serial No. 197,131.

To all whom it may concern:

Be it known that I, ALFONSO DE FOCATIIS, a citizen of the United States, and a resident of New Orleans, parish of Orleans, and State of Louisiana, have invented a new and useful Distilling Apparatus and Method of Distillation, of which the following is a specification.

My invention relates to distilling apparatus.

The principal objects of my invention are to provide an apparatus for causing continuous distillation; one by which high grade alcohol or other distilled liquid can be produced, and one that can utilize the fermented must, mash, wort or similar liquid for the purpose of condensing the vapors caused by ebullition.

By the use of my invention no additional source of heat is required to heat the fermented liquid on its passage to the boiler beyond that of the vapor arising therefrom, and no additional cooling means is needed for condensing the vapor beyond unheated fermented liquid to be distilled.

My invention consists of the apparatus herein shown and described, and Figure 1 illustrates a distilling apparatus shown partly in elevation and partly in section, the condensing or refrigerating portion of the same being in vertical section, and with the upper part of the still column in vertical section. Fig. 2 is a side view on an enlarged scale of the boiler and still-column shown in Fig. 1, with the boiler and parts of the still-column shown in vertical section. Fig. 3 is a vertical section enlarged of the upper part of the still-column as shown in Figs. 1 and 2. Fig. 4 is a transverse section of the pipe for the downwardly flowing liquid to be distilled. Fig. 5 is a vertical section enlarged of the lower portion of the still-column. Fig. 6 is a plan view of one of the plates or sections of the upper part of the still-column. Fig. 7 is a transverse section of the upper part of the still-column in the line A—A of Fig. 2. Fig. 8 is a part vertical section part side elevation of the features shown in Fig. 7. Fig. 9 is a plan of one of the plates or sections of the lower part of the still-column. Fig. 10 is a plan view of the atomizer plate at the bottom of the boiler or heater of the apparatus. Fig. 11 is a vertical section of said atomizer plate.

Similar numbers represent like parts in all the figures.

1 is a casing or receptacle, preferably cylindrical, and 2 is another casing of lesser circumference or perimeter than casing 1 and inclosed within the same. The casing 2 is open at its bottom, but the bottom of the casing 1 is closed at 3 from its walls to the walls of casing 2, and an annular chamber 4 with a closed bottom is thereby formed between the walls of the casings 1 and 2.

5 is a tube opening into the chamber 4 near the bottom of the same, and extending upward, where it terminates near its top in a bowl or hopper 6.

7 is a tube situated above the hopper 6 and having its lower end over said hopper.

Opening into the chamber 4 on a plane below the top of the hopper 6 is a tube 8. This tube extends laterally and opens into the top of a cylinder 9, and said tube preferably slopes in a direction downward from the casing 1 to said cylinder. The cylinder 9 is the casing of the still-column, which rises over the boiler or heater of a distilling apparatus, and from which the vapor from the heater passes.

10 is a tube leading to the top of the cylinder 9 to and through the top of the casing 2, where said tube terminates in a receptacle or chamber 11. This receptacle has preferably a slanting bottom and connected to the receptacle at its bottom is the upper end of the coil of pipe 12, which extends from the receptacle 11 in the annular chamber 4, down to the bottom of said chamber, and is provided with an extension 13, which passes out through the wall of the casing 1 near its bottom. The casing 1 is closed at its top, and through it the tube 10 passes.

The outlet of the pipe 8 for the liquid to be distilled opens into a cup 14 at the top of the cylinder 9, which cup is inclosed in a larger cup or chamber 15, which forms the upper terminal of a vertical pipe 16 in the cylinder 9. The cup 15 is closed at its bottom except where the upper end of the pipe 16 passes through it, and the cup 14 is supported by the cup 15 by braces or ties 17. The pipe 16 is preferably indented in some such form as is shown in Fig. 4, in order to give as much heat absorbing surface to its walls as possible. The lower part of the pipe 16 terminates at a point about midway of the height

of the cylinder 9 in a horizontal extension 18, which opens into a reservoir 19 outside of the cylinder 9. A horizontal pipe 20 is of greater diameter than the pipe 18, and surrounds said pipe so as to leave an annular space between the two pipes, and said pipe 20 is provided with a funnel shaped outlet 21 inside the cylinder 9, and which opens into a cup 22. Under the cup 22 are a plurality of horizontal plates or diaphragms 23, extending across the cylinder 9 and each of said plates is provided with a hole or opening 24, said plates being arranged so that the openings 24 of the adjacent plates will be staggered, and preferably on opposite sides of the cylinder, as shown in Figs. 2 and 5. 25 are pins on the plates 23 extending up from said plates in a position to pass through the opening of the next adjacent plate. These pins are longer than the space between the two adjoining plates, and are for the purpose of preventing the openings 24 of the adjoining plates from registering when the plates are being assembled, and also to assist in properly assembling the plates and keeping them in their proper positions. The reservoir 19 is provided with a steam coil 26, which surrounds the pipe 18. A plurality of plates 27 are arranged horizontally, one over the other, across the cylinder 9 between the cup 15 and the horizontal pipe 20, and each of these plates 27 is provided with a hole or opening 28 surrounded by an upwardly extending flange 29. The holes of the different plates are staggered and those in the adjacent plates are preferably on opposite sides of the cylinder 9. A pin 30 similar to pins 25, extends upward from each plate into the opening 28 of the next plate above for the purpose of properly assembling the different plates and assisting in keeping them in their proper positions, and from preventing the holes in the adjacent plates from registering.

31 is the boiler or heater of the apparatus, in the bottom of which are steam pipes 32 provided with perforated outlets 33. In the upper portion of the boiler 31, and below the still-column and cylinder 9, is a plate or diaphragm 34 provided with perforations 35, and a large hole or opening 36 surrounded by a vertical flange 37. The boiler is provided with a drawing off outlet 38 at its bottom, to be kept closed by a cock 38ª or other means during the process of distillation or while the apparatus is in use.

39 is a safety valve at the top of the boiler, and 40 represents one or more openings shown in Fig. 2 in the form of a tube through which the boiler may be cleaned, said opening being provided with a removable vapor tight stopper 41, which should close said opening except when the boiler and apparatus is being used.

42 is a U-shaped overflow pipe the outlet of which passes through the wall of the boiler 31, and is provided with a trap 43 on the leg farthest from the boiler. The boiling liquid from the boiler 31 will pass out through the overflow pipe 42 when it reaches the level of the inlet to said pipe, and will also flow through said pipe and trap 43 through the outlet end 44 of the pipe. As it is desired that the vapors from the boiler should not escape through the pipe 42, they are prevented from escaping by reason of the overflowing liquid from the trap 43 filling up the pipe 42 below said trap and thus preventing the escape of the vapor through said pipe. I prefer to have a plurality of said pipes 42 and traps 43 connected with the boiler 31 at regular distances apart, preferably three, and in Figs. 1 and 2 I have shown two of such pipes and traps, and the inlet to the third pipe.

The operation of my entire apparatus, including that of the condenser and heater, is as follows: The liquid to be distilled, such as cold or unheated must, mash, wort or similar liquid is dropped continuously through the pipe 7 into the hopper 6, and thence passes through the tube 5, into the lower portion of the annular chamber 4, and rises up in said chamber and passes out through the tube 8 into the cylinder 9. The liquid will then pass from the pipe 8 into the cup 14, until said cup is filled; then it will run over the top of said cup into the larger cup 15, and thence down the pipe 16 and through the pipe 18 into the reservoir 19. When the liquid has risen in said reservoir to the level of the pipe 20, a continuous flow of liquid in the reservoir, will cause the liquid to flow through said pipe 20 down through the funnel 21 into the cup 22, and then overflowing said cup will fall successively upon the plates 23, taking a zig-zag or irregular course from plate to plate as it passes over the upper surface of said plates and through the openings 24 in the same, until all of said plates have been passed by the liquid; then it will fall upon the diaphragm 34 and pass through the perforations 35 in a shower or spray into the boiler 31. The steam in the pipe or pipes 32 will pass through the perforations 33 in said pipes and boil the liquid that is in the boiler. When the liquid gets to a state of ebullition, the hot vapor from the boiler will rise through the opening 36 in the diapuragm 34, the flow of the liquid continuing as above stated, and the vapor will pass up through the openings 24 in the plates 23 and between said plates taking a zig-zag or irregular course through and between all of said plates 23, and then the vapor will continue to pass through the openings 28 of the plates 27 and between said plates in a zig-zag and irregular course, and thence out at the top of the cylinder 9 through the pipe 10 into the receptacle 11, where the heat arising from said vapor will radiate from the recept cle

11 into the chamber 4 around said receptacle, and the vapor will pass from the receptacle through the coil 12.

From the above it will be seen, that the first portion of the liquid that has been admitted to the heater 31 will be boiled and vaporized, and the liquid which is passing through and between the plates 23 down through the lower part of the cylinder 9 to the diaphragm 34 will be in contact with the vapor arising from the heater as it passes up through and between the plates 23, and the liquid will, therefore, by such contact get hotter and hotter as it approaches said diaphragm and the boiler 31, by reason of progressively coming in contact with hotter vapor, as the vapor is hottest nearest the boiler. The hot rising vapor also that passes through and between the plates 27 will, in its zig-zag or back and forth course, come in contact with the irregular walls of the liquid pipe 16, said walls absorbing the heat from said hot vapor and continuing to heat the liquid in said pipe. As the vapor is hottest near the boiler the liquid will be hottest at the bottom of the pipe 16, becoming gradually hotter from its top to its bottom. The hot vapor will pass out through the opening 28 in the uppermost plate 27 into the upper portion of the cylinder 9 that surrounds the cup 15, heating the liquid also in said cup. The hot vapor will then pass out through the top of the cylinder 9 through the pipe 10 into the receptacle 11 and proceed as above stated through the coil 12 toward its bottom, the hottest vapor after it has passed through the pipe 10 into the upper part of the cylinder 1 being within said cylinder, and being quite hot in the receptacle 11, and growing gradually cooler as it passes downward in the coil 12, and the coil is consequently hotter from its bottom to its top, and the receptacle 11 is still hotter. The liquid to be distilled passes from the pipe 5 to the boiler 31 in a reverse direction to that of the vapor arising from said boiler. The vapor being hottest at the beginning of its course in the boiler 31 and coldest at the end of its course, which is at a point between the upper and lower ends of the coil 12, and the condensed vapor being progressively colder from said point to the lowest end of the coil 12, and said coil being consequently progressively colder from its top to its bottom, the liquid which enters the annular chamber 4 cold through the pipe 5 near the lowest end of the coil 12, will surround said coil and be gradually and progressively heated during its course, and as it rises in the chamber 4 in contact with the coil 12, as each upper portion of the coil is hotter than the one below it. The liquid having been made hotter and hotter in its course upward in the chamber 4, when it arrives at a point where it surrounds the receptacle 11, it will become much hotter from the heat radiated from said receptacle, (the walls of said receptacle presenting a much larger radiating surface than the coil 12) and will then as soon as it gets to the outlet from the chamber 4 into the pipe 8, fall through said pipe into the cup 14 very hot. The liquid will then take the same course as above described from said cup to the boiler or heater 31, and by the time the liquid has reached the cup 22, it will take very little more to turn it into a state of evaporation. At this point some of the liquid will be turned into vapor and by the time the non-vaporized liquid reaches the boiler it will be small in quantity. The flange 36 on the diaphragm 34 prevents the liquid upon the latter from passing down through the large opening even should it accumulate to unusual depth, and thus all the liquid is compelled to pass through the small apertures 35. which it closes against the vapor below.

The reservoir 19 with the steam coil 26 is a temperature regulator, for the purpose of further heating the liquid and getting it near a state of evaporation before it passes through and between the plates 23 in contact with the rising vapor. It is not always necessary to use this regulator, as the liquid, after the rest of the apparatus is in full operation, may be sufficiently hot at the point opposite the reservoir 19. It will be very useful, however, to heat the inflowing liquid during the beginning of the operation of the apparatus, and before any vapor has been generated from the liquid in the boiler, so that the liquid will enter the boiler nearly in a state of evaporation. The temperature regulator may also be very useful to heat the liquid when the temperature surrounding the cylinder 9 is too low.

The casing 2 being open at its bottom provides means for the admission of air to the same and against its walls, which will aid the liquid in the annular chamber 4 to gradually cool the vapor in the coil 12.

As long as the flow from the pipe 7 to the hopper 6 of the liquid is constant, and as long as the boiling and ebullition in the liquid in the boiler is continuous, the distillation of the vapor is neither interrupted nor diminished, the temperature both of the liquid and the vapor in the different portions of the apparatus, and for the purposes stated, will be constant. No water or other additional cooling agent is needed as a refrigerator or condenser of the vapor, as the same material from which the high grade liquid is extracted, before ebullition, accomplishes the object of refrigeration and condensing the vapor. As there is no outlet for the vapor between the boiler and the tube 13 at the lower end of the coil 12, there will be a continual condensation in the coil of high grade liquid, and it will continually pass out cold from the tube 13, and by reason of the chamber 4 being

constantly supplied with fresh liquid through the tube 5, the cold and high grade liquid condensed and flowing out of the tube 13, will be of uniform quality. No pump or other forcing means is necessary to supply the cooling agent properly to the apparatus, as gravity and the seeking of its level by the liquid is all that is necessary.

A very important advantage of my invention is the uniformity of the liquid that is distilled, which is especially caused by the replenishing of the liquid which has been weakened by the abstraction of the alcohol or high grade liquid, as the boiling liquid is constantly giving off the vapor, which action weakens the liquid from which the vapor rises, and this liquid is constantly renewed, so that it remains at the same high grade. This uniformity of the product obtained by my invention is a most valuable one, as the quality of said product can always be relied upon, and this quality is of the best. By the use of my invention it is not necessary to separate alcohol of lower grades containing amylic alcohol or fusel oil, which is so injurious to the health, as there is only one grade of liquid distilled, and this is a high one. In processes and in apparatus in which it is necessary to separate the impure or attenuated alcohol, a more complicated method and apparatus is required, and also a much greater time is required by such method and apparatus for producing pure and rectified alcohol and of a high grade.

In order that the different parts of the still-column may be readily assembled, removed or replaced, I prefer to make the plates 23 and 27 independently of the rest of the apparatus, and with flanges 45 at their perimeters, and turned slightly inward, so that each plate will rest on the flange of the next adjacent one, all of said plates being then inclosed in the outer casing or cylinder 46 of the still-column. I prefer also to provide flanges 47 for the central portions of the plates 27, where they surround the pipe 16, to prevent any liquid which might be condensed from vapor on these plates, flowing down from the same.

My invention in its broader aspects, is not limited to the precise apparatus herein shown and described, as many changes in the same other than those suggested may be made without departing from the main principles of my invention, or sacrificing its chief advantages.

No claim is made in this specification to the specific form of the distilling apparatus shown and described, apart from the means for withdrawing the liquid from the column, heating such withdrawn liquid and returning the same to the column, for the reason that the specific construction of the distilling apparatus is covered by the claims in the specification forming part of a divisional application for Letters Patent of the United States and filed by me June 19, 1908, Serial Number 439,402.

What I claim as new and desire to secure by Letters Patent is:—

1. A distilling apparatus including a column, a boiling chamber, a liquid feeding means, and means arranged intermediate the height thereof and adapted to withdraw the liquid from the column, heated and returned thereto.

2. A still including a column, a boiling chamber, a liquid feeding means, a chamber arranged externally of the column intermediate the height thereof and communicating with the same and with the liquid feeding means, and a steam coil arranged within the chamber.

3. The combination with a still column having at its lower end devices for vaporizing the liquid to be distilled, of means for introducing such liquid into the upper part of the column, means for withdrawing such liquid from the column and returning it thereto at a point between its point of entrance and said vaporizing devices and means without the column for at will imparting heat to the liquid as withdrawn.

4. A still having a boiling chamber at its base, a liquid feeding means at the top of the column, and means for withdrawing the liquid as it passes through the column, heating it and returning it thereto.

5. A still having a boiling chamber at its base, a liquid feeding means at the top of the column and means for withdrawing the liquid as it passes through the column, heating it and returning it thereto at substantially the point from which it was withdrawn.

6. The herein described method of distillation, consisting in feeding the liquid to be distilled to a still column, withdrawing the liquid from the column at a point between its point of entrance and the vaporizing device, heating and returning the liquid to the column, boiling the liquid at the base of the column and conveying the vapor rising in the column to a condenser.

7. The herein described method of distillation, consisting in feeding the liquid to be distilled to a still column, initially heating the liquid in its passage down the column, withdrawing the liquid from the column at a point between its point of entrance and the vaporizing device, reheating and returning the liquid to the column, boiling the liquid at the base of the column and conveying the vapors rising in the column to a condenser.

8. The herein described method of distillation, consisting in passing the liquid to be distilled through a vessel lowering the temperature of the vapor, downwardly from such vessel through a still column, heating the

liquid in its passage down the column, withdrawing the liquid from the column at a point between its point of entrance and the vaporizing device, reheating and returning the liquid to the column, boiling the liquid at the base of the column and conveying the vapors rising in the column to a condenser.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

ALFONSO DE FOCATIIS.

Witnesses:

ALFRED L. M. BULLOWA,

PENNINGTON HALSTED.