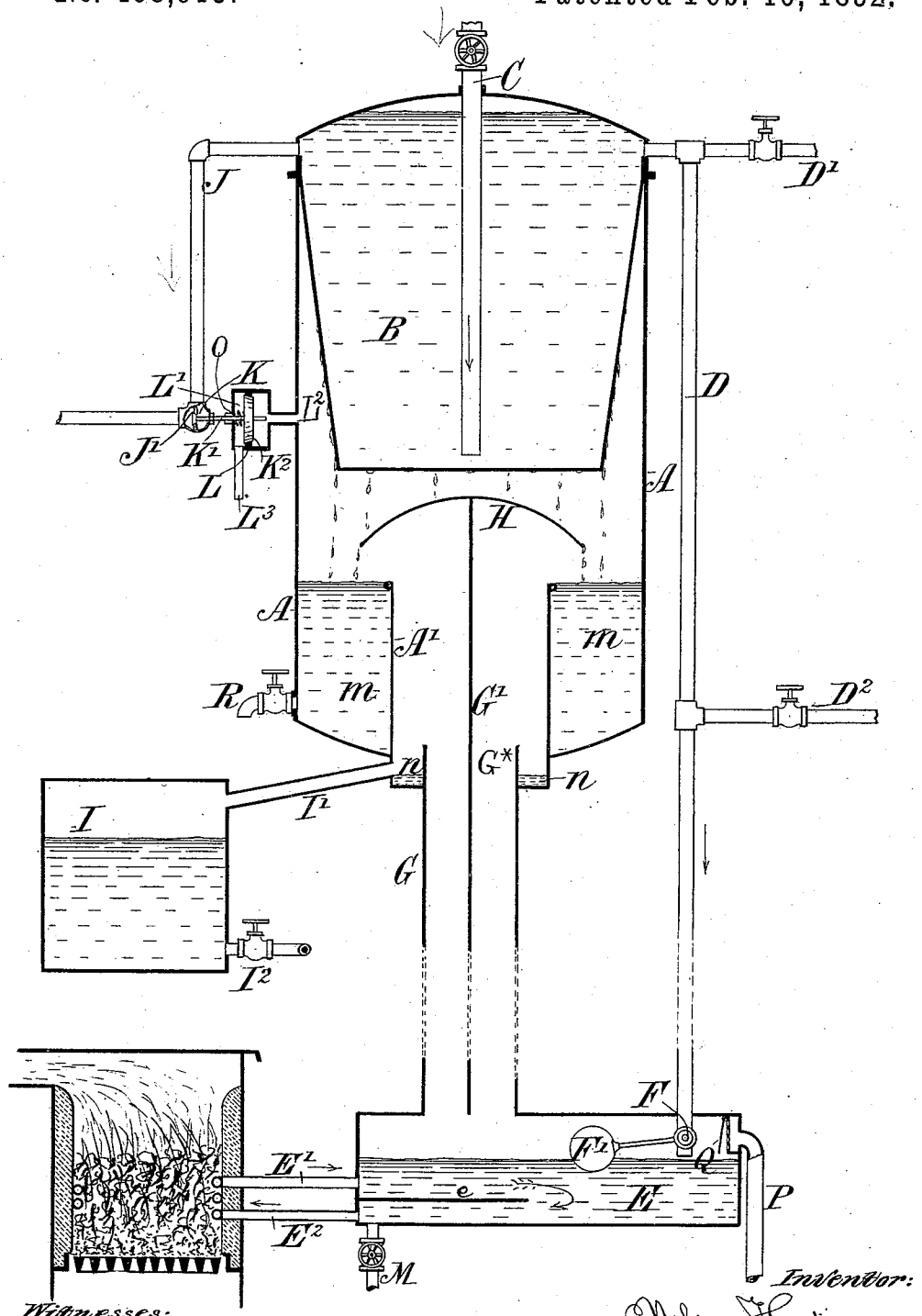
(No Model.)

N. HUNTING.

DISTILLING APPARATUS.

No. 468,913. Patented Feb. 16, 1892.



Witnesses:
Charles R. Searle.
Chas. S. Barbour.

Inventor:
Nelson Hunting
by his attorneys
Thurston Sykes Stetson

UNITED STATES PATENT OFFICE.

NELSON HUNTING, OF ALBANY, NEW YORK.

DISTILLING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 468,913, dated February 16, 1892.

Application filed November 26, 1890. Serial No. 372,662. (No model.)

To all whom it may concern:

Be it known that I, NELSON HUNTING, a citizen of the United States, residing in the city of Albany, in the county of Albany and State of New York, have invented a certain new and useful Improvement in Distilling Apparatus, of which the following is a specification.

My improved apparatus is intended for the distillation of water for domestic and other purposes. It is adapted to be operated by the heat from an ordinary domestic apparatus as a heating-stove or a cooking-stove. In houses which have ranges or analogous apparatus with water-backs and a circulation of hot water therefrom the apparatus may be set at any convenient distance from the range and the communication maintained by pipes. In houses of several stories it will be convenient to set my apparatus, with its heating portion, in the lower part and its cooling portion in the upper part of the building.

Air will absorb moisture from a water-surface up to a certain condition, which may be called the "saturated" condition. This condition varies with the temperature, the hot air holding the most moisture. I cause a limited quantity of air to circulate up and down in the interior between the hot and the cold portions of the apparatus. In the hot portion it it absorbs vapor. In the cold portion this vapor is condensed and forms water which is collected for use. The water produced has the purity of distilled water and also a properly-aerated condition, adapting it completely for drinking and other uses. The principle of action is the same on which nature works in raising the water of the ocean into the air and partially or completely saturating it in a warm condition and afterward precipitating the moisture from the air by lowering its temperature. Many efforts have been made to utilize this principle in distillation. I have in a previous application for patent, filed October 23, 1888, Serial No. 288,901, described apparatus which is fairly successful. The present invention is an improvement based thereon.

I have improved the means for regulating the flow of cold water into and through the upper portion or condenser of the apparatus. The distillation proceeds most rapidly with a tolerably-high temperature in the air circulated up and down in the apparatus. To maintain this the cooling-surfaces, which serve to condense the surplus moisture, must not be too cold, as otherwise the air will be too much lowered in temperature. It is difficult to adjust the flow of water by hand, so as to maintain the correct temperature. I effect it automatically. The moisture, on being first condensed into pure water on the cooling-surfaces, has the moderately-high temperature due to such surface. Instead of conducting this water away at once to a cool tank, as in my former apparatus, I provide an intermediate tank kept warm by presenting a large surface to the hot air within the apparatus, into which the freshly-condensed water is received and its temperature maintained. When the intermediate tank is full, it overflows and the overflow runs away into a tank so conditioned that it may cool. The present apparatus gives a liberal supply of distilled water, either in the hot or cold condition, according as it is taken from the one tank or the other when required. I use a large tank or reservoir for the cooling water, which, though heated to, say, 150° Fahrenheit or higher, being mainly inclosed within the other portions of the apparatus, radiates heat but slowly, and is capable of maintaining an approximately uniform temperature during a night or any considerable period while no additional heat is received. During the whole period while the apparatus is in active work this tank is maintained by the automatic provisions at a uniform temperature nearly up to that of the air inclosed in the apparatus—a temperature sufficiently high for all ordinary household purposes. I provide for conducting this water to any portion of the house, so that my cooling-tank serves the double functions of a condenser for my distilling apparatus and a hot-water supply for the general purposes of the house. I provide a valve for inducting air to supply the place of the air which is absorbed and carried away by my distilled water without allowing the air to be driven back when a pressure shall be raised by the accumulation of too much heat and the generation of steam.

The following is a description of what I con-

sider the best means of carrying out the invention.

The accompanying drawing forms a part of this specification, and is a central vertical section through the apparatus.

Referring to the drawing and the letters of reference marked thereon, A is the main casing, made of sufficiently strong sheet-copper or other material to support the other portions of the apparatus and to endure a moderate pressure of steam when such shall under certain conditions be generated in the interior.

B is a capacious condenser-tank set into the casing A, with liberty for the moisture-laden air to come in contact with an extended surface.

C is a pipe bringing cold water under pressure from a street-main, elevated tank, or other source, (not shown,) and opening into the tank B near the bottom.

D is a pipe leading from the tank B down into a heater E, the delivery of water into the latter being controlled by a stop-cock F, operated by a float F′. The heater E is connected with the casing A by a pipe G, provided with a dividing-plate G′. The contained air in the apparatus may descend freely through one side side of the pipe G, circulate over the water-surface in the heater E, and rise increased in temperature and laden with more moisture on the other side of the central partition G′. The air thus rising comes in contact with the cooler surface of the condenser B, and is lowered in temperature and returns. It being lowered in temperature its capacity for holding water is reduced, and the surplus water is deposited in the form of dew upon the exterior of the vessel B. This water gathers into drops and trickles down and falls from various parts of the bottom of the vessel or condenser B.

An internal shell A′ extends upward a considerable height from the bottom of the casing A. The annular space between the exterior of A′ and the interior of A forms a tank which I will designate *m*.

H is a shed or deflector, represented as dome-formed; but it may be conical or various other forms, extending over the whole central space and presenting its edges extending out beyond the annular shell A′. The presence of the shed H insures that all the water dropped from the condenser is delivered first into the annular tank *m*, from which its overflows when full and runs down on the inside of the shell A′ and is received in an annular gutter *n*, surrounding the extended top G* of the pipe G. From this gutter *n* it is led by a pipe I′ to a tank I, in which it is allowed to cool and from which it can be drawn as required through a valve or cock I^2. The upper end of pipe G, which extends up into the casing A to form the annular gutter *n*, is marked G*.

The heat to maintain a high temperature of the water in the heater E may be received from any convenient source. I have shown it as coming from what is intended to represent a water-back in an ordinary range, the water circulating between the heater E and the water-back through pipes E′ E^2, moving from the water-back through the upper pipe E′, and being by the partial partition *e* compelled to traverse a large part of the heater E and present itself to the air and give vapor thereto before returning through the lower pipe E^2 to the water-back to be again heated.

J is a pipe leading from the upper portion of the tank B. It is provided with a controlling-valve J′, which may be a small puppet-valve of any ordinary or suitable style which will work with little resistance. It is operated by a stem K′, carrying a light disk K^2, which fits into a seat L′ in the casing L, which is connected to the interior of the casing A by a sufficient passage and is provided with a suitable escape-pipe L^3. A gentle helical spring O, surrounding the stem K′ within the casing L, urges the stem K′ and its attached valve and disk into their tightly-closed positions, but is ready to yield and allow both to open with a slight force.

When for any reason the temperature of the water in the condenser B rises until it can no longer absorb heat from the air in the casing A, the water in the heater E being no longer cooled by the air, its temperature rises and steam is generated. This raises the pressure in the apparatus and the increased pressure, being felt by the disk K^2, moves the latter to the left and opens a liberal passage previously stopped by the disk K^2 in the seat L′, and also by means of the rigidly-connected stem K′ opens the valve J′. Now a quantity of the air and steam will flow past the disk K^2 and away through the pipe L^3, and the warmest water will flow out from the top of the tank B through the pipe J, past the now-opened valve J′, and cold water will be inducted through the pipe C and spread in a stratum in the bottom of the condenser B. The cooling thus introduced condenses the steam and lowers the temperature of the remaining air, the stem K′ being moved again to the right by the spring O, the apparatus again resumes its proper action; but there will be a demand for more air in the apparatus. This is supplied through a pipe P and valve Q. The latter I have represented as a light flap of thin rubber or other suitable material, hanging vertically against a grated surface; but this may be varied. It is important that the valve open inward with tolerable facility, in order that air may be inducted not only when there has been a portion driven out past the valve through overheating of the apparatus, but also under more ordinary conditions when required by the absorption of the air by the condensed water. It is important that this valve shall close with tolerable tightness when steam is generated in the apparatus, so that the pressure thus induced may have sufficient pressure to work the disk J′ and valve K.

D′ and D² are branches from the pipe D, adapted to lead water to any desired portion of the house. They may be controlled by apparatus either adjacent to the pipe D, as shown, or at any distance, as at a sink or bath-tub. The water drawn through these pipes comes from the upper and hottest portion of the condenser, and as the cold water to supply its place is inducted through the pipe C and spreads in the bottom of the condenser it follows that the considerable contents of the condenser B may be made available as hot water for any purposes about the house. The tank B is thus made to serve the double functions of a hot-water tank and a condenser, the water therefrom being at a conveniently high temperature, but in the crude or undistilled condition. The tank *m* in the lower portion of the casing A serves as a reliable supply of hot water in a distilled condition. It can be drawn through the stop-cock R or led to any place desired, while the tank I furnishes distilled water in a cold or relatively cold condition through the valve I² and led to any point.

M is a cock, which serves to clean the entire apparatus.

There may be a separate filter containing any suitable purifying material, as fresh burned charcoal; but I propose for all ordinary purposes to introduce the charcoal or other purifying agent directly in the tank I, which contains the cold distilled water. This tank may have a cover easily removed to allow the filtering materials to be changed at intervals.

A low degree of heat, considerably below the boiling-point in the generator, will suffice to produce a rapid absorption of vapor by the warm air. The heat for this purpose may be obtained from various sources. I have shown circulating-pipes leading thereto from a coil of pipe in a cooking-range. Instead of such coil, there may be the ordinary water-back. It will be understood that the water heated in the coil or water-back flows to my heater through one pipe E′ and returns through the other E². This maintains a heat in my generator approximating that in the coil or water-back.

Modifications may be made without departing from the principle or sacrificing the advantages of the invention. I can use a flexible diaphragm or analogous device in place of the disk K² to receive the gentle pressure of the steam and open the discharge-valve J′. I prefer the disk K², for the reason, among others, that it serves as a safety-valve and relieves the pressure from the interior of the apparatus. It may serve that function if there shall for any reason be an insufficient supply of cold water, or there shall be no cold water supplied for a time. In such case the opening of the valve K will be of little effect. It certainly will not perform its intended function of allowing the hottest water to be discharged by the pressure of cold water accumulating in the bottom of the condenser; but however much the apparatus may be overheated, no mischief will result, because the steam generated will all be discharged past the disk K² and out through the pipe L³.

Parts of the invention can be used without the whole. I can dispense with the connections D′ D² and use the apparatus for distilling alone.

I claim as my invention—

1. In a distilling apparatus operating with the presence of air to absorb and yield up the vapor, the main casing A, heater E at a lower level, and two separate passages connecting the heater with said casing for promoting the circulation of air upward and downward between the same, in combination with each other and with the condenser B at a high point in the casing-shed H below such condenser, adapted to deflect the drops of water and prevent them returning to the heater, and provisions for admitting water to the condenser and heater and for storing and delivering the distilled water, all substantially as herein specified.

2. In a distilling apparatus operating with the presence of air to absorb and yield up the vapor, the combination, with the casing A and connection G to a heater E, of the elevated condenser B, hot tank *m*, with its cock R at a lower level, the pipe I′, leading the overflow therefrom, the cold tank I, still lower, with its cock I² arranged as shown, so that the hot tank first receives the condensed water and holds it for a time within the influence of the warmest air, and the said cold tank receives the same water at a later period and holds it apart, so that it may become colder, all arranged for joint operation, as herein specified.

3. In a distilling apparatus operating with the presence of air to absorb and yield up the vapor, the provisions for automatic regulation, consisting in the casing A, condenser B at a high point therein, cold-water supply C, introducing the water into the base of the condenser, discharge-pipe J, delivering the water from the top of the condenser, valve J′, controlling such discharge-pipe, and disk K², mounted in the casing L, whereby the pressure received through the pipe L² is allowed to act on the valve for operating the valve automatically by such pressure when the condenser becomes too hot and steam is generated, all combined and arranged substantially as herein specified.

4. In a distilling apparatus operating with the presence of air to absorb and yield up the vapor, the air-induction passage P in the upper part of the heater E, and the valve Q, controlling such passage and opening inward, in combination with said heater E, the casing A, the large pipe G, leading from said heater to said casing, the condenser B, mounted at a high point, with pipe C for supplying cold water, the discharge-pipe J, connected to a high point in the condenser, and the casing

L, pipe L^2, disk K^2, and stem K', whereby the pressure is allowed to act on the valve J' in the pipe J to induce a flow of water through the condenser on the generation of steam-pressure, as herein specified.

5. In a distilling apparatus operating with the presence of air, alternately absorbing and yielding up the moisture, the combination, with the heater E, connecting-pipe G, main casing A, and cold-water tank or condenser B, of the discharge-pipe J and controlling-valve J' therein, casing L, having seat L', connecting-pipe L^2, discharge-pipe L^3, valve-stem K', fixed to disk K^2, inclosed in casing L, and spring O, acting on said disk to close it, all arranged to perform the double function, first, of a medium for receiving the pressure of the steam and thereby operating the water-discharge valve J', and, second, of a safety-valve to allow the steam to escape from the casing A, all substantially as herein set forth.

6. In a distilling apparatus operating with the presence of air to absorb and yield up the vapor, the vessel B, performing the double functions of a condenser and of a hot-water supply, in combination with the casing A, inclosing and supporting the same, heater E at a lower level, connection G, keeping the heater and casing A in free communication and allowing the air to circulate up and down as its temperature impels it, pipe D, leading from a high point in the condenser, valve F in such pipe, controlling means F', actuated by the height of the water in the heater, so as to deliver water from the condenser into the heater when needed in the latter, and one or more pipes D' D^3, leading the hot water from the condenser to be used for other purposes, all substantially as herein specified.

7. In a distilling apparatus, the combination of the vessel E, presenting a surface of hot water, liberal connections therefrom to the higher vessel A, having in its upper portion a condenser B, with a pipe C arranged for supplying cold water in the base of the latter, a discharge-pipe J, leading from the condenser, having a controlling-valve J', with connections thereto operated by the changes of temperature, all arranged substantially as specified, so that when the condenser becomes hot a pressure will be generated and the valve will be opened and warm water discharged, its place being supplied by cold water, and so soon as the condenser is sufficiently cooled the change in temperature will allow the closing of the valve and prevent any waste of water, all substantially as herein specified.

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

NELSON HUNTING.

Witnesses:
ROBT. A. KELLAND,
CHAS. S. BARBER.