No. 669,966. Patented Mar. 12, 1901.

D. L. ROSE.

WATER DISTILLING APPARATUS.

(Application filed June 27, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

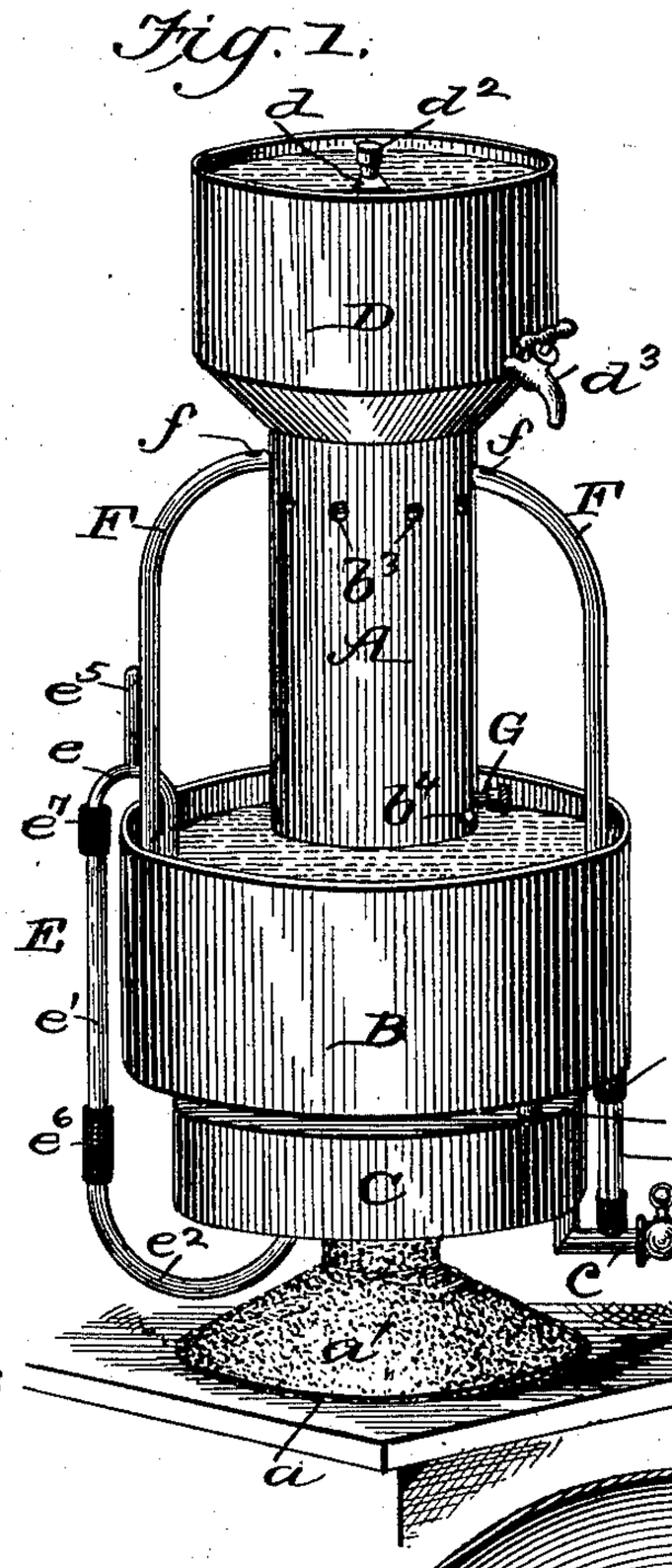


Fig. 4.

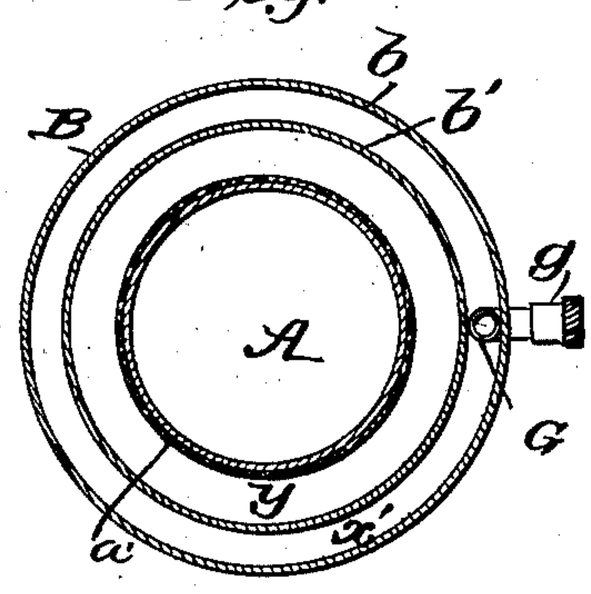


Fig. 2.

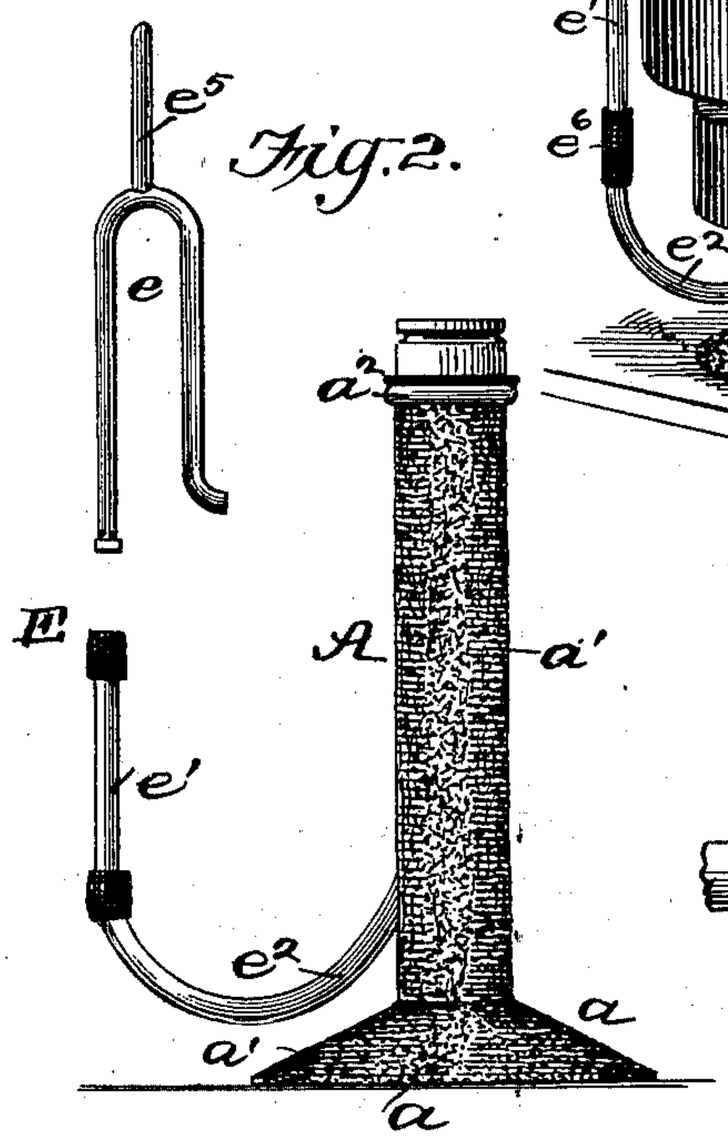
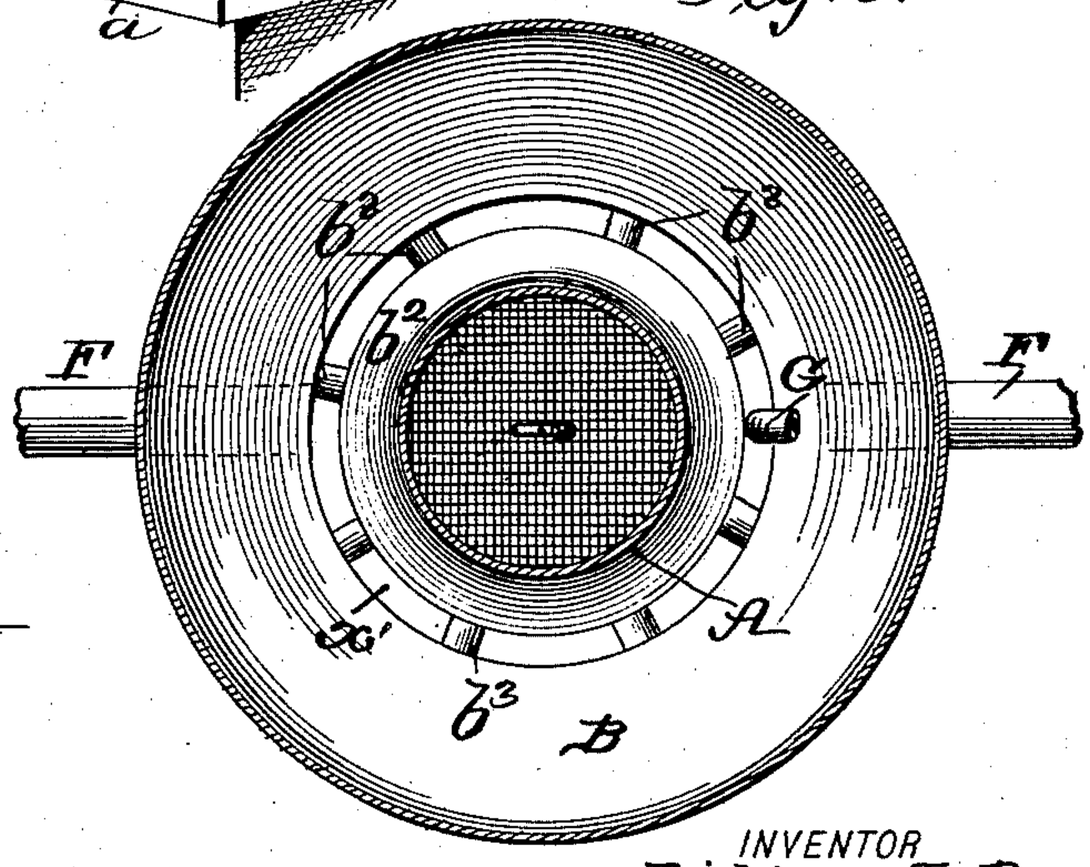


Fig. 3.



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WATER DISTILLING APPARATUS.

(Application filed June 27, 1900.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 6.

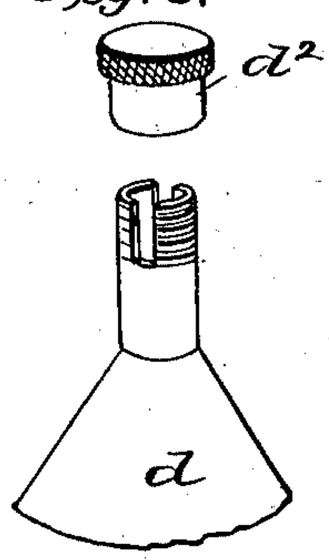


Fig. 5.

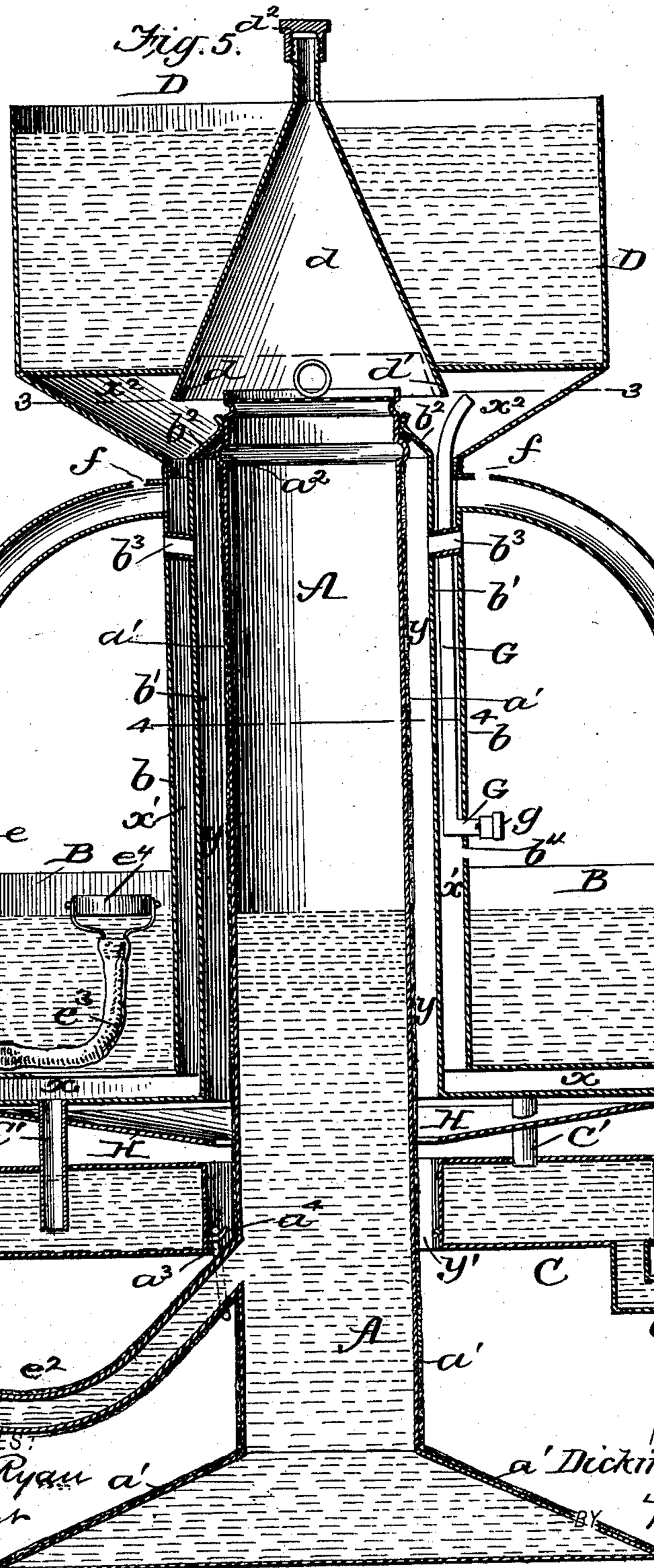
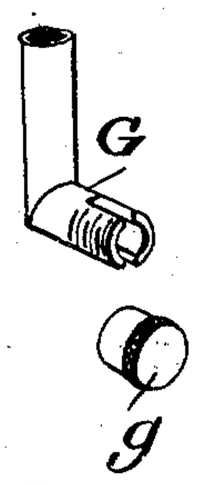


Fig. 7.



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UNITED STATES PATENT OFFICE.

DICKINSON L. ROSE, OF MANKATO, MINNESOTA.

WATER-DISTILLING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 669,966, dated March 12, 1901.

Application filed June 27, 1900. Serial No. 21,767. (No model.)

To all whom it may concern:

Be it known that I, DICKINSON L. ROSE, residing at Mankato, in the county of Blue Earth and State of Minnesota, have made certain new and useful Improvements in Water-Distilling Apparatus, of which the following is a specification.

My invention is an improved water-purifying and aerating apparatus especially adapted for domestic use. It is distinguished by a combination and arrangement of parts attaining economy of material, compactness, and convenient portability. It is adapted to eliminate volatile and mineral matter and effect rapid condensation and aeration by purified air.

The apparatus is constructed and operates as hereinafter described, reference being had to the accompanying drawings, in which—

Figure 1 is a perspective view of the apparatus completely assembled. Fig. 2 is a side view of the boiler and siphon attachment. Fig. 3 is a horizontal section on line 3 3 of Fig. 5. Fig. 4 is a cross-section on line 4 4 of Fig. 5. Fig. 5 is an enlarged vertical section of the apparatus. Figs. 6 and 7 are perspective views showing certain details hereinafter described.

The chief parts of the apparatus are the following: a vertical cylindrical boiler A, (shown detached in Fig. 2,) having a flared or conical base *a;* an annular water reservoir or holder B, surrounding the middle portion of said boiler; a closed annular chamber or reservoir C for the distillate or water of condensation, the same being arranged beneath the water-holder B; an enlarged condensing-chamber D, constituting the top of the apparatus and supported detachably upon a tubular extension of the reservoir B, and a siphon attachment E, connected with both boiler and reservoir. It will be noted that the latter and the distillate-chamber C surround and are concentric with the boiler A, with which they are detachably connected.

The details of construction, arrangement, and operation are as follows:

The boiler A is practically a hollow cylindrical column provided with a flared base. It constitutes the sole support of all the other parts of the apparatus, which may be readily detached when required. For heating the contents of the boiler the base *a* may be set upon a cooking or lamp stove or supported over a gas-flame. The boiler and its base may be covered with asbestos, felt, or other non-conductor of heat, as indicated at *a'*. The upper end of the boiler A is open and a removable wire screen is applied thereto and supported upon an internal rib for the purpose of preventing water splashing out when the ebullition is violent.

The reservoir B has a double bottom, Fig. 5, the two parts being separated by a narrow space *x*. The reservoir has also two inner upwardly-extended concentric walls *b* and *b'*, which are similarly separated by the space *x'*, that communicates with the aforementioned bottom space *x*. These spaces form the primary receptacle for the water of condensation, whence it passes into the holder or chamber C through pipes C', that project into said chamber, as shown in Fig. 5. It will be noted that the innermost wall *b'* of reservoir B and that of distillate-chamber C are separated from the boiler A by air-spaces *y* and *y'*, respectively, and that the space *y* is closed at the top by an inwardly-projecting collar b^2, forming the top of such reservoir-wall *b'*. The said collar b^2 rests upon a head a^2, formed exteriorly on the boiler A a short distance below its top. This head a^2 thus constitutes the point from which all the other parts of the apparatus are supported upon the boiler. An elastic gasket may be interposed, as shown, to form a tight joint. The air-space *y* between the boiler A and innermost wall *b'* of reservoir B is vented at the top by small pipes b^3, which pass through both walls *b* and *b'* and rigidly connect them, as shown.

Downwardly-curved tubes F connect the upper end of the outer reservoir-wall *b* with the space *x* in the double bottom of reservoir B and are provided with small vent-holes *f* at their upper ends. These pipes F are heated by conduction at their junction with the wall *b*, and thus the upward flow and escape of air is promoted, which tends to create a partial vacuum in the condensing-spaces *x* and *x'* and a consequent downward draft of steam into the latter. The essential point is that the upper ends of the pipes shall be heated and open or vented. An air-tube G extends upward in the space *x'* between the inner

walls *b b'* of reservoir B, and its lower end projects from the side of the wall, as shown in Fig. 5. Such end of the tube G is slotted and provided with an adjustable screw-cap *g*, as shown in Fig. 7, for regulating admission of air. Just below the mouth of said tube G one or more small openings b^4 are provided for escape of steam, which rising and mingling with the surrounding air purifies the same prior to its entrance into the tube. The proximity of the mouth of the latter to the water-reservoir B also promotes purification of the air, since vapor is constantly rising from the water. This result is effected upon the same principle that the purification of the atmosphere results by clouds or fogs passing through it. The upper end of tube G opens in the space x^2, directly beneath the condenser D. The central portion of the latter is a hollow cone *d*, which is arranged vertically directly over the top of the boiler A and into which the steam from the latter enters. The lower edge *d'* of this cone *d* is extended downward and forms an inner wall for the air-space x^2. The top of the cone *d* is open and slotted, as shown in Fig. 6, and provided with a screw-cap d^2. This cap may be closed down if the water to be distilled contains only a slight amount of organic matter; but otherwise it is set open to allow escape of gases, its adjustment being regulated by the amount of such matter in the water. When the cap d^2 is closed, approximately the whole amount of vaporized water may be retained and condensed.

The condenser proper, D, is an open-top water-receptacle. This, taken in conjunction with the annular space *x'* between the extended inner walls of reservoir B and the connected space *x*, forms a very important feature of my invention. In other apparatus of this class it is common to conduct off into a side receptacle the water of condensation in order to preserve it at low temperature, so that it will retain air, and it is necessary to fill the condenser with ice or snow or to keep it supplied with cool water to effect continued condensation. I have found by experiment that I can effect rapid and continuous condensation if the vessel D be full of warm or even hot water and at the same time arrange condensing-spaces below it for reception of the distillate. In other words, the steam is deprived of a considerable portion of its latent heat by contact with the bottom and cone of the vessel D regardless of the degree to which the water therein may have been raised (it is apparent it cannot rise above 212° Fahrenheit) and that further condensation takes place in space *x'* and complete condensation in the bottom space *x* of reservoir B.

It will be seen that the vented space *y* between the boiler and reservoir-wall *b'*, which permits a constant upward circulation of air, is a prominent factor in producing this result and that the condenser D coacts most efficiently to the same end. In brief, the relation of said condenser to the boiler and supplementary concentric conducting-surfaces is vital to the end of producing an apparatus combining maximum efficiency, compactness, and economy of construction and material.

As shown in Fig. 1, the condenser or vessel D is provided with a cock d^3 for drawing off water for domestic uses. The said cock is so arranged that it may discharge into the reservoir B when being used for preliminary purification of the water.

As previously noted, the purified air supplied by tube G enters the space x^2 beneath the condenser B, and as the steam and water of condensation are turned downward from the boiler and cone *d* such air mingles with them, and thus the distillate becomes aerated without impairing its purity. In this operation the pendent edge *d'* of the cone *d* performs an important function, since it directs the water and steam downward in a thin annular sheet, so that thorough intermixture of the air therewith is promoted. The current of cool air passing up around and through the central space *y'* of chamber C aids in cooling the distillate, and to the same end I may employ a concave shield H, the same being interposed between the said chamber C and reservoir B.

The siphon attachment E comprises a siphon-tube proper, *e*; a vertical glass tube *e*, in which its longer leg enters; a curved metal tube e^2, with which said glass tube is connected, and a flexible tube e^3, attached to the shorter leg of the siphon *e* within the reservoir B and extending upward to a float e^4. The inlet end of the siphon attachment is beneath the float, whereby water is drawn off at the surface, where it is hottest and also freest from sediment. The glass tube *e'* permits easy inspection for ascertaining the height of water in reservoir B and boiler A. The curve in metal tube e^2 being filled with water which is cooler, and therefore heavier, than that in the boiler prevents a free circulation of boiler-water therein.

The siphon-tube *e* may be provided with a vertical extension e^5 from its bend, (see Fig. 2,) which serves to collect and hold air that may escape and pass up into the siphon, so that the latter does not require removal to free it of accumulated air as often as would otherwise be necessary.

The lower end of the longer leg of the siphon proper is closed and provided adjacently with one or more lateral openings, which permit due circulation of water without allowing free entrance of air.

The glass tube *e'* is flexibly coupled with the metal tube e^2 by a rubber sleeve e^6 and has a protecting-sleeve c^7 at its upper end, which is open to the atmosphere.

One of the pipes C' is shorter than the others to serve as an air-vent for chamber C. The purified and aerated water is drawn off from chamber C by means of a pipe *c*, having a cock *c'*. A glass tube connects such pipe *c*

with the bottom space x in reservoir B by means of the rubber sleeves c^3. By means of this tube c^2 the height of the water in the chamber C may be readily ascertained.

To use the apparatus, proceed as follows: Fill reservoir B with water. To start the siphon E, remove and immerse the tube e in water, so that all air passes out. When full of water, place finger over end of shorter leg to prevent its flowing out. Then invert and insert the longer leg in tube e', being careful not to remove the finger until it is below the surface of the water in reservoir B. The boiler will then fill to the same level, as can be seen by watching the water in tube e'. Then place apparatus on stove or other heating-surface and fill water-chamber C. By not permitting water in reservoir B to be entirely drained through evaporation from boiler the siphon will require no further attention. If the water falls below the siphon end in reservoir B, the connection is broken by siphon becoming filled with air, and it will have to be removed and started as before.

The action of the apparatus is as follows: Steam is generated in boiler A and rises into cone d and communicates much of its latent heat to the water in D. The tubes F become heated, causing the air in them to rise, producing a partial vacuum in spaces x and x', which is supplied by steam descending from cone d. Air passes up through heated tube G into the space x^2. By the projection of the cone below the inner bottom of D this air is made to circulate and then thoroughly mingles with the descending steam. Together they now pass under the water in reservoir B through spaces x and x', and complete precipitation takes place at so low a temperature that the air will remain in the water. In other words, the temperature of the water does not reach 180° Fahrenheit, as is commonly the case in other apparatus of this class, and hence the contained air is not driven off, but remains to render the water agreeable and potable.

By closing the aerating-tube G and vents when the apparatus is not in use no outside odors or vapors can have access to the distillate, and thus contamination of the latter is avoided, since the chamber C is practically sealed. In view of the great absorbent power of distilled water this provision is very important.

As before intimated, the condenser D is detachable from the reservoir extension b, and the reservoir B, chamber C, and the siphon (save tube e^2, which forms a rigid attachment of the boiler) are all removable from the boiler. To connect the latter with ports B C, so that the apparatus may be lifted by the side tubes F as handles, a ring a^3, Fig. 5, is passed over the metal tube e^2 and engaged with a hook a^4 within the central opening of chamber C.

It is apparent that the condenser D is very useful as a water-heater for general purposes and that it may be readily detached for cleaning its interior.

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

1. In a water-distilling apparatus, the combination, with a vertical boiler which is open at the top, and a condenser located over said boiler, of a water-reservoir located exterior to the boiler and having an upward extension composed of double walls, separated by a space for receiving the water of condensation, both said walls surrounding the boiler, and the outer one being attached to the condenser and forming the outer side of the condensing space, or chamber, above the boiler, substantially as shown and described.

2. In a water-distilling apparatus, the combination with a boiler, of a condensing chamber or space communicating with the boiler, means for closing such space above, an air-inlet and a steam-exit located adjacent to such inlet, substantially as shown and described, for the purpose of purifying air admitted to the condensing-chamber, as specified.

3. In a water-distilling apparatus, the combination, with a vertical boiler, of an adjacent water-reservoir arranged below its top, a condenser arranged on such boiler, and a chamber or space below the same and extending down alongside the reservoir, substantially as shown and described.

4. In a water-distilling apparatus, the combination with a vertical open-top boiler, a closed condensing space or chamber above the same, a condensing-space below which communicates with such closed chamber, an air-inlet for such condensing-space, and means for regulating admission of air thereto, and an orifice adjacent to the air-inlet for exit of steam, substantially as shown and described.

5. In a water-distilling apparatus, the combination with a vertical boiler, of a condensing chamber or space surrounding the latter but separated from it by an air-space, a closed air space or chamber above the boiler, an air-inlet pipe, arranged in the condensing-space surrounding the boiler, and leading up into the chamber above the latter, substantially as shown and described.

6. In a water-distilling apparatus, the combination with a vertical open-top boiler an open-top water-reservoir surrounding the same, a closed condensing chamber or space above the boiler and a continuation of said chamber extending below, an air-inlet for the condensing-space, which inlet is a short distance above the water-reservoir, as shown and described.

7. In a water-distilling apparatus, the combination with a vertical open-top boiler, a water-reservoir below the top of said boiler, and an inclosed condensing-space in contiguity thereto, of pipes leading up from such space and connecting at the upper end with the wall of the condensing-space and having openings

for escape of air, substantially as shown and described.

8. In a water-distilling apparatus, the combination with a vertical open-top boiler, a water-reservoir below the top of the boiler, and an inclosed condensing-space as specified, of one or more pipes leading upward from such space, and connected with the heating-space and having openings for emission of air, substantially as specified.

9. In a water-distilling apparatus, the combination with the boiler, and a water-reservoir, of a siphon attachment comprising an outer tube attached to the body of the boiler, and the siphon proper, one leg of which is in the reservoir and the other in such tube, the said siphon being detachably connected with such outer tube, substantially as shown and described.

10. In a water-distilling apparatus, the combination with the boiler and a water-reservoir of a siphon attachment comprising an outer tube attached to the body of the boiler, the detachable siphon proper, the elastic sleeves or connections between such fixed tube and the siphon proper, a float in the reservoir, and flexible tube connecting the said float and siphon proper substantially as shown and described.

11. In a water-distilling apparatus, the combination with a vertical boiler of an annular concentric water-reservoir and distilled-water chamber tubes rigidly connecting them substantially as shown, and supported detachably upon the boiler, substantially as specified.

12. In a water-distilling apparatus, the combination with the vertical boiler of a water-reservoir having its inner wall extended upward and surrounding the body of the boiler and provided at its upper end with a ring or collar adapted to fit upon the boiler and thereby furnish a support, substantially as shown and described.

13. In a water-distilling apparatus, the combination with a vertical boiler of a water-reservoir having a double wall and suspended around the boiler, a space being formed between the walls to serve as a receptacle for steam and water of condensation, such space communicating with the boiler at the top, substantially as shown and described.

14. In a water-distilling apparatus, the combination with a boiler of a water-reservoir surrounding the same and having a space for receiving steam and water of condensation, a distillate-chamber arranged below said reservoir, and pipes connecting the two and serving to conduct water of condensation into the lower chamber, substantially as shown and described.

15. In a water-distilling apparatus, the combination with a distillate-chamber and a receiver for water of condensation, of one or more pipes leading from such receiver into the distillate-chamber, and all save one which opens at top of said chamber, extending nearly to the bottom of the latter, whereby a water seal is practically provided under working conditions, as shown and described.

16. In a water-distilling apparatus, the combination, with the vertical boiler, of a water-reservoir surrounding it, and a condensing-chamber arranged between the boiler and reservoir, and an air-chamber arranged between the boiler and said condensing-chamber, said air-chamber being open at the bottom and having vent-holes at the top, substantially as shown and described.

17. In a water-distilling apparatus, the combination with a boiler of a water-reservoir having a condensing space or chamber contiguous to its wall, a distillate-chamber arranged below and connected with the said condensing-space, a draw-off pipe communicating with the lower portion of said distillate-chamber, and an inspection or gage tube extending upward from said pipe and communicating with the condensing-space beneath the reservoir, substantially as shown and described.

18. In a water-distilling apparatus, the combination with the boiler of a water-reservoir and distillate-chamber, the latter being arranged below the reservoir and separated from it by an air-space, and a shield or fender arranged in said space and extended horizontally to protect the distillate-chamber from radiated heat, substantially as shown and described.

19. In a water-distilling apparatus, the combination with the boiler, a distillate-chamber and a water-reservoir both arranged adjacent to the boiler, and the reservoir being uppermost, of a shield interposed between said chamber and reservoir, as shown and described.

20. In a water-distilling apparatus, the combination with a boiler and receptacle for water of condensation, of a condensing vessel placed above the boiler, and having an internal chamber open at the bottom, and a rim pendent therefrom, and an air-inlet communicating with the space surrounding said rim as shown and described.

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

DICKINSON L. ROSE.

Witnesses:
SOLON C. KEMON,
AMOS W. HART.