No. 814,405. PATENTED MAR. 6, 1906.

J. H. SMITH.

STILL.

APPLICATION FILED JULY 20, 1904.

2 SHEETS—SHEET 1.

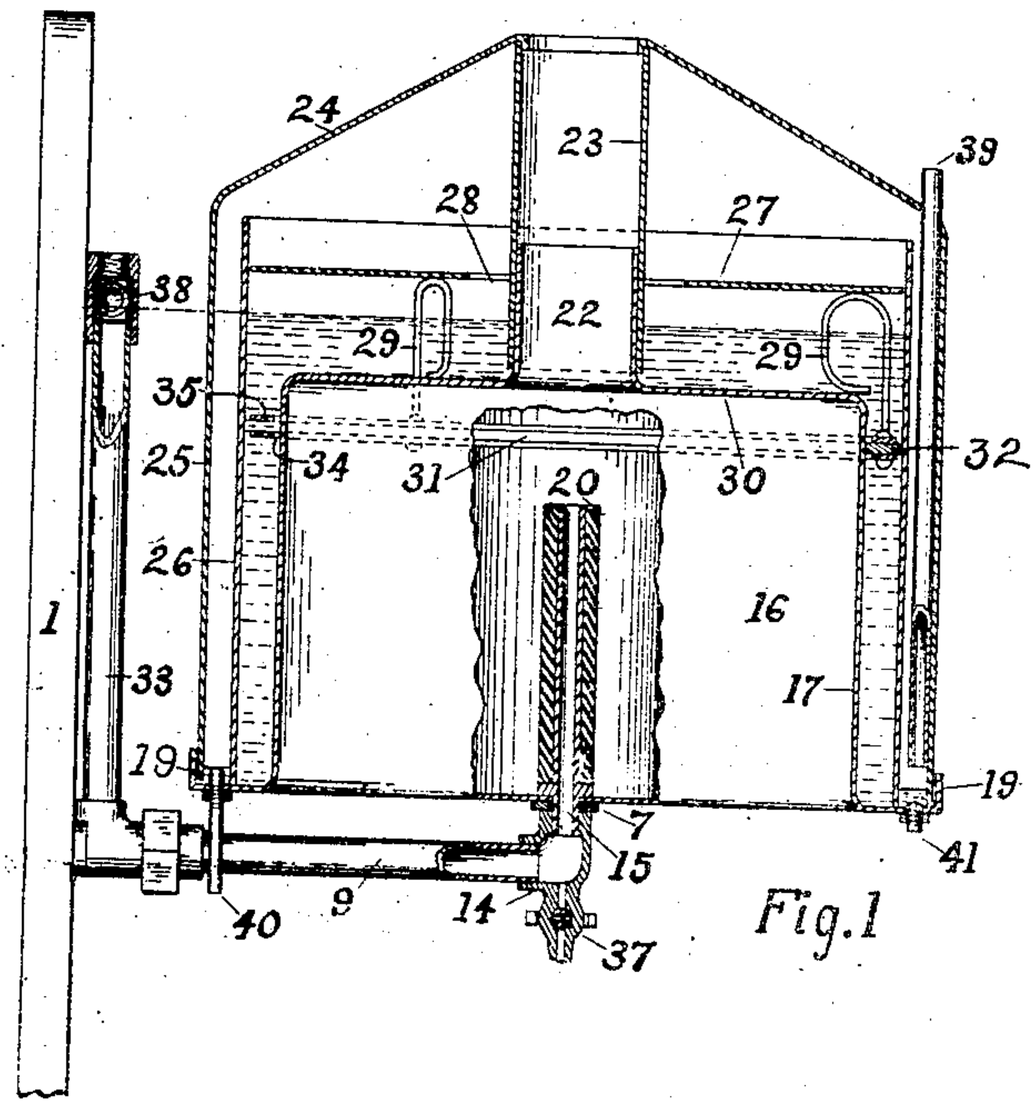


Fig.1

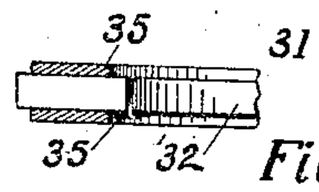


Fig.2

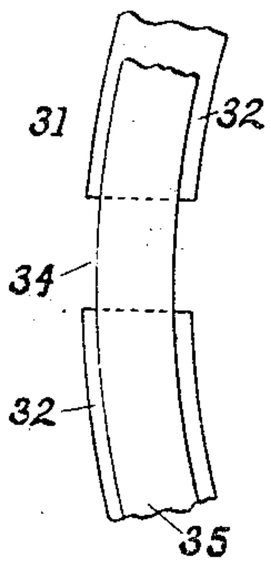


Fig.3

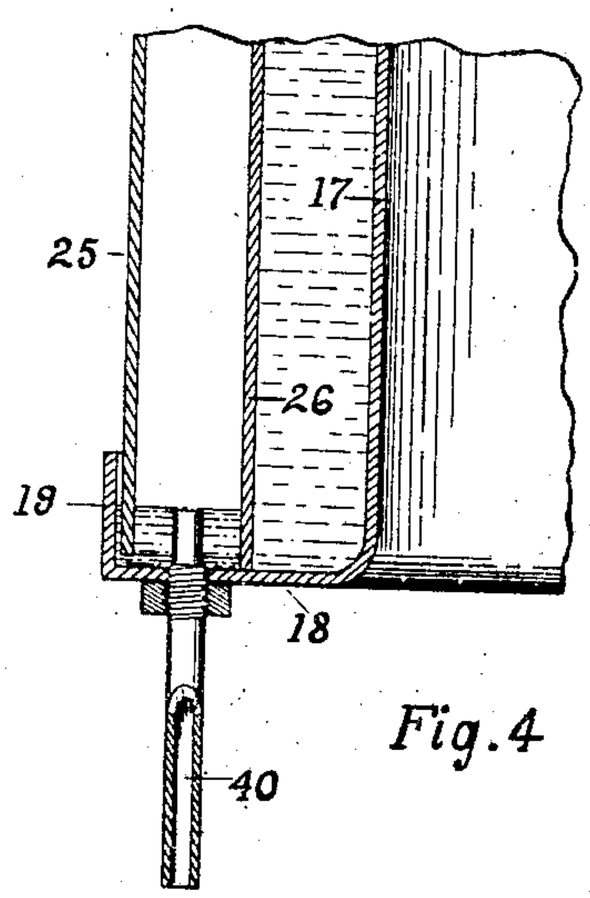


Fig.4

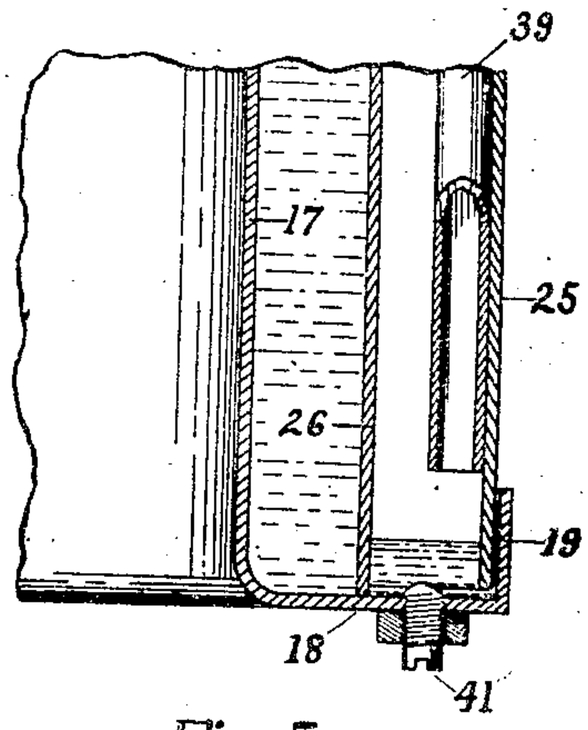


Fig.5

WITNESSES.

T. H. Fowler

H. E. Pritchett.

INVENTOR.

J. Hammond Smith.

BY H. C. Evert Hb

ATTORNEY

No. 814,405. PATENTED MAR. 6, 1906.

J. H. SMITH.

STILL.

APPLICATION FILED JULY 20, 1904.

2 SHEETS—SHEET 2.

Fig. 6

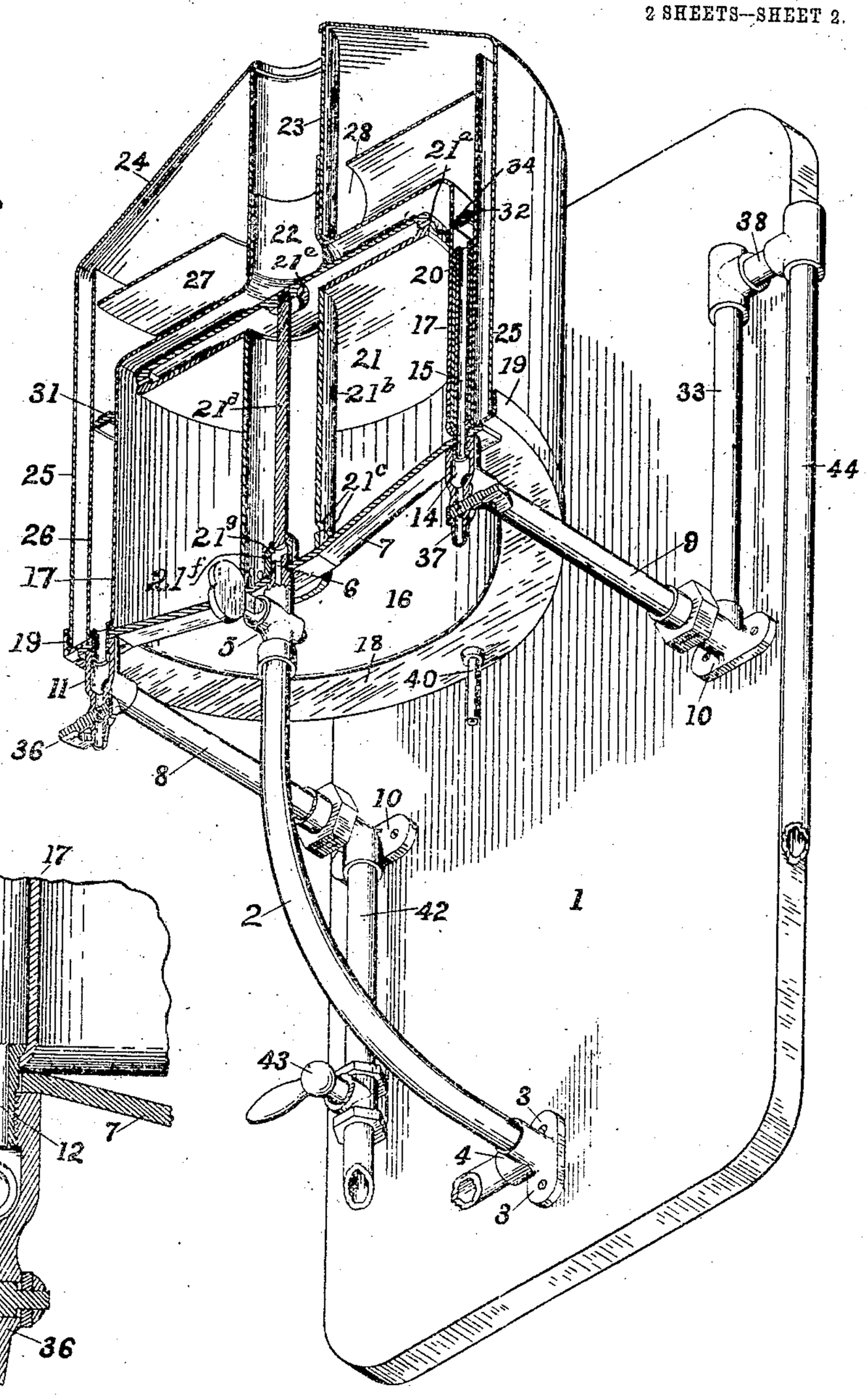
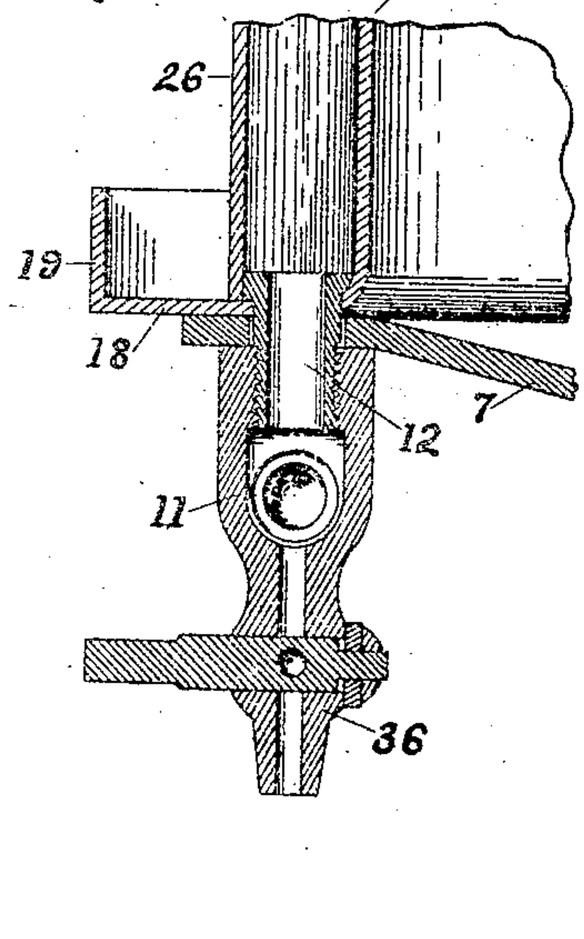


Fig. 7



WITNESSES:
F. D. V. Fowler
K. E. Critchett

INVENTOR.
BY J. Hammond Smith.
H. C. Evert & Co.
ATTORNEYS.

UNITED STATES PATENT OFFICE.

JOHN HAMMOND SMITH, OF ALLEGHENY, PENNSYLVANIA.

STILL.

No. 814,405. Specification of Letters Patent. Patented March 6, 1906.

Application filed July 20, 1904. Serial No. 217,353.

To all whom it may concern:

Be it known that I, JOHN HAMMOND SMITH, a citizen of the United States of America, residing at Allegheny, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Stills, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention has relation to stills, and has for its object to provide a still which may be used as a household-still, the same being constructed in such a way that it may be mounted in a convenient place for use within a house.

Another object of this invention is to provide a novel form of still which, with the aid of water-supply pipes and a suitable gas burner, will produce distilled water with suitable rapidity.

Briefly described, the fundamental feature of my invention resides in constructing a still in a compact manner, whereby the same will occupy comparatively small space and may be readily attached to a wall or suitable bracket which is convenient to water and gas supply pipes.

The still proper consists of a combustion-chamber, which is surrounded by a cold and a hot water receptacle, novel means being employed to partially separate the cold water from the hot water. Surrounding the cold and hot water receptacle is a condensing-chamber, which is adapted to receive the distilled water and convey the same therefrom by a suitable pipe. I employ safety means, such as overflow-pipes and drain-cocks, the drain-cock being employed to drain all sediment or ingredients foreign to the general operation of the still when it is desired.

In constructing the still I have embodied as simple a construction as possible to accomplish the desired results, at the same time maintaining a durable and strong construction, which will reduce the expense of manufacture to a minimum.

The construction employed to accomplish the results enumerated will be hereinafter described, and specifically pointed out in the claims.

Referring to the drawings accompanying this application, Figure 1 is a sectional side elevation of the still constructed in accordance with my invention, the said view being taken at right angles to Fig. 6 with the burner removed, a part of the combustion-chamber wall and the bracket-board broken away, and also showing a part of the floor of the combustion-chamber and a burner-pipe and its insulated covering in section. Fig. 2 is a sectional view of a portion of the diaphragm employed in my improved still. Fig. 3 is a top plan view of the same. Fig. 4 is an enlarged sectional view of a part of the still. Fig. 5 is a like view of another portion thereof. Fig. 6 is an enlarged perspective view with the still in vertical section, also showing the support upon which the still is mounted. Fig. 7 is an enlarged detail sectional view of a part of the still.

In the several views of the drawings accompanying this application like numerals of reference indicate like parts, the reference-numeral 1 designating a bracket-board upon which my improved still is adapted to be supported. This bracket-board may be dispensed with and the still supported from a wall or the like, as may be convenient to the user.

2 indicates a gas-supply pipe, which, as illustrated in Fig. 6 of the drawings, is supported from the bracket-board by lugs 3 3, formed integral with the elbow 4 of the pipe 2, the lugs 3 3 and the elbow 4 substantially constituting a bracket. The pipe 2 extends outwardly and upwardly and has a suitable shut-off cock 5 at its upper end, the casing of this shut-off cock having a screw-threaded nipple, (designated by the reference-numeral 6.) Upon this nipple is mounted a brace 7, the ends of which are bent upwardly slightly and are adapted to support the still.

8 and 9 indicate, respectively, two pipes that extend outwardly from the bracket board or wall 1, these pipes being supported by lugs 10 10, similar to the lugs 3 3 of the pipe 2, the said lugs 10 10 being carried by brackets having elbows to receive the respective pipes 8 9. The pipe 8 is a water-supply pipe and carries upon its outer end an elbow 11, and in the vertical portion of this elbow is mounted a screw-threaded sleeve 12, which passes through the brace 7 and through the annular flange 18 of the combustion-chamber wall, as clearly seen in Figs. 6 and 7 of the drawings. The pipe 9 (see Fig. 6) is an overflow-pipe, and on the outer end of this pipe is an elbow 14, which carries a sleeve 15. This sleeve 15 passes through one end of the brace 7 in the same manner as the sleeve 12, the still proper being supported by the outer ends

of the brace 7 and held thereon by said sleeves.

The combustion-chamber 16 of the still is preferably cylindrical in form, the shell 17 which forms the same being bent outwardly at its lower edge to form an annular flange 18, which in turn has its rim or outer edge bent upwardly to form an annular vertical flange 19. The annular flange 18, which is at right angles to the flange 19, is provided with apertures to receive the sleeves 12 and 15, heretofore described. The sleeve 15 extends upwardly and serves as an overflow-pipe. This sleeve 15, which, as stated, serves as the overflow-pipe, is preferably covered or surrounded with a sleeve 20 of some suitable insulating material, whereby any water that may pass through said overflow-pipe 15 will not affect the water surrounding the exterior of said overflow-pipe.

In the combustion-chamber 16 is mounted a circular hydrocarbon-burner 21, the burner being of any construction that is advantageous to the general results of the still, and this burner is secured upon the screw-threaded nipple 6 of the shut-off cock 5. This hydrocarbon-burner may be of any construction that may be found desirable; but for the purpose of illustration I have shown that type in which two circular plates are spaced apart and are connected at their periphery by a flange which is provided with outlet-ports 21^a to permit the escape of the gas to the point of ignition. The lower plate of the burner rests on a sleeve 21^b, which serves as a mixer for the air and gas. The chamber within the sleeve is in communication with the space between the two plates forming the burner proper. The sleeve 21^b rests at its lower end on the brace 7 and on said lower end is provided with apertures 21^c to admit air to the gas. The burner is further supported by a rod 21^d, extending centrally of the sleeve 21^b, and is received at its upper end in a bushing 21^e, provided on the underneath face of the top plate of the burner. At its lower end this rod 21^d is received in a socket 21^f, threaded onto the nipple 6 and provided with apertures 21^g to permit the gas to escape into the mixing-chamber and pass to the burner. The rod 21^d and socket 21^f while assisting in supporting the burner also act as means to secure the burner in position.

To carry off the fumes and gases from the interior of the combustion-chamber, I provide a flue 22 in the top of said chamber, and fitting down over this flue is a vertical pipe 23, which at its upper end supports a conical shell 24, the depending sides 25 of which extend into the space surrounded by the annular flange 19, a water seal being formed between the said flange 19 and the depending sides 25, as will be clearly seen by reference to Figs. 1, 4, and 5 of the drawings.

26 indicates an annular casing that is mounted on the horizontal flange 18 between the annular shell 25 and the wall 17 of the combustion-chamber, and this chamber extends some distance above the shell which forms the combustion-chamber to a point near the conical-shaped top 24 of the shell 25, heretofore described. Arranged within said annular casing 26, adjacent the upper end thereof, is an annular deflector-plate 27, having a central aperture 28 of considerably greater diameter than the pipe 23, so as to allow of a space between the wall of said opening 28 and said pipe 23. This deflector-plate is supported by substantially ℙ-shaped hangers 29, (see Fig. 1,) the loop portion of said hanger resting upon the top 30 of the combustion-chamber wall and supporting the deflector-plate within a short distance of the top of casing 26. The vertical portions or stems of the ℙ-shaped hangers extend downwardly between the sides of the combustion-chamber and the casing 26 (see Fig. 1) and support upon their lower ends an annular diaphragm 31, this diaphragm being supported above the overflow-pipe 15 and within a short distance of the top of the combustion-chamber; but, as illustrated in Figs. 2 and 3 of the drawings, the said diaphragm consists of a packing-ring 32, which is supported between two metallic rings 35, these rings being secured together at intervals. The packing-ring 32 is adapted to engage the side walls of the combustion-chamber 17 and the sides of the casing 26, thereby forming a partition in the annular space which exists between the combustion-chamber wall and the casing 26, communication being established between the space above and the space below the diaphragm or partition by means of opening 34, formed by cutting away the packing-ring 32. (See Fig. 3.)

A drain-cock 36 (see Figs. 6 and 7) is connected to the elbow 11, whereby the space between the combustion-chamber wall and the casing 26 may be drained and cleansed of all sediment foreign to the general operation of the still.

37 designates a cock similar to the cock 36 and which is connected to the elbow 14, the said cock 37 being employed to drain the overflow-pipe 15 and the pipe 9 should the same in any manner become clogged and is especially used to withdraw water from the overflow-pipe 15 and from the drain-pipe during winter, when the water would have a tendency to freeze and burst the pipes. Any excess amount of water which may accumulate in the annular space between the combustion-chamber wall and the casing 26 is removed through the overflow-pipe 15 and is then carried through the pipe 9 to the pipe 33, (see Fig. 6,) which pipe 33 extends upwardly from the elbow carried by the lugs 10 10 and communicates with a pipe 38, (see Figs. 1

and 6,) and this pipe 38 communicates with a pipe 44, (see Fig. 6,) which may lead to any suitable drain through which the overflow may pass.

The reference-numeral 39 (see Fig. 1) designates a stand-pipe, and this pipe is adapted to supply sterilized air to the still. The said pipe is mounted in the space between the outer shell 25 and the casing 26, the upper end projecting through the conical-shaped top 24 and the lower end extending to a point close to the base of the still.

The reference-numeral 40 (see Fig. 1) designates the pipe which is connected to the base of the still and projects into the space existing between the casing 26 and the outer shell 25, this pipe being adapted to remove the distilled water that accumulates at the bottom of said space, the pipe being made of a proper size to permit the water and air to pass readily therethrough. Should it be desired to place the pipe 40 on the opposite side of the still from that in which it is shown in Fig. 1, the plug 41 (see Fig. 1) is removed, the pipe 40 placed in the aperture vacated by the plug, and the plug placed in the aperture vacated by the pipe 40.

The operation of the still and the function of the above parts just described is as follows: Water is admitted to the still through the pipe 8 after having passed through pipe 42, which latter pipe carries a suitable valve 43. (Clearly shown in Fig. 6 of the drawings.) When the water passes through pipe 8, it passes through sleeve 12 into the annular space between the combustion-chamber and the casing 26, and this space may be termed a "hot and cold water receptacle or chamber." As the water enters this receptacle or chamber it rises until it reaches the diaphragm and passes above said diaphragm through the openings 34, heretofore described, the water rising to a level determined by the height of the pipe 33. (See Fig. 1.) In the meantime water is passing through the pipe 15 and is rising in the pipe 33, and when the water reaches a certain level it will overflow in the pipe 38 and pass through the drain-pipe 44. (Shown in Fig. 6 of the drawings.) When the water issues from this drain-pipe 44, the valve 43 is turned until just a sufficient quantity of water is passing into the water-receptacle and out through the drain or overflow to condense the steam being generated the water in the receptacle being kept at a constant level about midway between the crown-sheet or top 30 of the combustion-chamber and the deflector-plate 27. (See Fig. 1.) The burner 21 is placed in operation by admitting gas through the shut-off cock 5, and upon the gas being ignited the crown-sheet or top 30 of the combustion-chamber and the annular shell 17 forming said chamber become heated and the water that lies above the diaphragm will become rapidly heated, soon reaching the boiling-point, and the steam rising from the boiling water passes through the annular opening 28 (see Figs. 1 and 6) of the deflector-plate and passes into the space beneath the conical-shaped top 24 of the shell 25 and is deflected by said top 24 downwardly into the space which exists between the casing 26 and the shell 25. This space is preferably termed the "condensing-chamber." Since the cold water is admitted at the bottom of the cold and hot water receptacle or chamber, the sides of the casing 26 below the diaphragm 31 will be in a cooler state than the sides of the same casing that are above the diaphragm, this diaphragm being employed to prevent the free circulation of the water above the diaphragm and the water beneath the same, but at the same time permit a limited quantity of water to pass above the diaphragm, where it is boiled and passes off as steam into the condensing-chamber.

The opening 34, formed in the packing-ring 32 of the diaphragm 31, will permit water to pass above the said diaphragm, as above stated, and will to a certain extent divide the hot and cold water receptacle or chamber whereby the hot water will be always retained above the diaphragm.

The pipe 15 has been arranged in the manner shown in Figs. 1 and 6 of the drawings, whereby when an overflow occurs the water below the diaphragm will be removed before the hot water which is above the diaphragm; but after the still has been placed in operation the valve 43, as heretofore stated, is regulated to govern the supply-water being admitted to the hot and cold water receptacle or chamber, a sufficient quantity only being admitted to pass into the receptacle and out of the overflow to condense all steam generated.

The fit of pipe 23 over flue 22 is not snug, but fits loosely over said flue, so that the water as it rises above the lower end of pipe 23 may enter between said pipe 23 and flue 22 and form a water seal between the said pipe and said flue, and as the boiling water evaporates the steam will pass into the condensing-chamber which surrounds the hot and cold water receptacle or chamber. As the steam is carried downwardly it contacts with the sides of the casing 26, and as this casing below the diaphragm 31 is in contact with cold water the casing below said diaphragm will be cool, and the steam will be condensed and the distilled water will accumulate in the bottom of the space between the shell 25 and the casing 26. As the distilled water accumulates in said space it rises to such height until it will overflow into the pipe 40, which pipe, as heretofore stated, is made of a proper size to carry off the water with sterilized air as it accumulates.

Air is supplied to the still through pipe 39,

which pipe acts as a sterilizer, as it extends through the steam-space at the top of the still, and thus the sterilized air and the distilled water pass off through pipe 40 together. The heating of the water has a tendency to drive the air out of it. Therefore in distilled water the air is nearly all driven out when the water reaches the vaporized state, and no air can be incorporated into the water until it returns to the liquid form. I permit the air to pass down through the pipe 39, whereby the air will aerate the water as they pass out of the still through pipe 40.

By this construction of the still it will be seen that the same may be readily cleansed when it is not in operation by removing shell 25, the deflector-plate 27, and the diaphragm 31, and that the still may be readily further disassembled by removing the different casings and the gas-burner from their supports.

The drain-cocks 36 and 37, as heretofore stated, are used to cleanse the still when the same has become in any manner clogged. The sediment as accumulated in the same and all ingredients foreign to the operation of the still can be removed through these drain-cocks by flushing the same from the supply-pipe 8.

A particular feature of my still to which it is desired to call attention is that by the employment of the brackets which carry the lugs 10 10 a greater convenience in connecting the gas and water service pipes is facilitated. These brackets can be turned to any angle in a plane parallel to the bracket-board, thus permitting the adjustment of the gas and water service pipes. By experience I have found that the capacity of a still with an eight-inch (diameter) combustion-chamber is about two quarts of distilled water per hour. I preferably construct the still of a heavy sheet copper, which may be coated with tin where it contacts with the distilled water.

While I have herein shown a particular form of diaphragm embodying a packing-ring, it is obvious that I may vary the construction in any manner that will permit a limited quantity of water to pass into the boiling-compartment of the still, and other means than the hanger shown may be employed to support this diaphragm. I do not desire to limit myself to the especial shape and construction shown in the accompanying drawings, but may change the general arrangement of the supply-pipes of the still without departing from the spirit and scope of the invention.

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

1. In a water-still, a shell having a flanged lower end and provided with a flue in its top, a casing surrounding said shell and resting on the flanged lower end of the shell with a space between the casing and the shell, an exterior shell having a pipe receiving the flue of the first-mentioned shell, and having its sides projecting down to lie within the flanged lower end of said interior shell, a diaphragm within the space between the interior shell and the surrounding casing, and having an opening establishing communication between the space above and the space below said diaphragm, a burner arranged within the interior shell, a fuel-supply pipe communicating with said burner, a water-supply pipe communicating with the space between the interior shell and the casing, substantially as described.

2. In a water-still, an interior casing having a flanged lower end and provided with a flue in its top, a casing surrounding said shell, and received at its lower end within the flanged lower end of the shell, a diaphragm supported from the interior shell and dividing the space between said shell and casing into upper and lower compartments which are in communication one with the other, an exterior shell supported on the inner shell, a hydrocarbon-burner arranged within the interior shell, a fuel-supply pipe communicating with said burner, a water-supply pipe communicating with the space between the interior shell and the casing, and a discharge-pipe communicating with the space between the casing and exterior shell.

3. In a water-still, an interior shell having a flanged lower end and provided with a flue in its top, a casing surrounding said shell, and received at its lower end within the flanged lower end of the shell, a diaphragm supported from the interior shell and separating the space between said shell and casing into upper and lower compartments which are in communication one with the other, an exterior shell supported on the inner shell, a hydrocarbon-burner arranged within the interior shell, a fuel-supply pipe communicating with said burner, a water-supply pipe communicating with the space between the interior shell and the casing, a discharge-pipe communicating with the space between the casing and interior shell, and a water-inlet pipe also communicating with said space, substantially as described.

4. In a water-still, an interior annular casing having an outwardly and upwardly flanged lower end, and provided in its upper end with a flue, a casing surrounding said shell with its lower end resting on the outwardly-flanged portion of the shell, a diaphragm dividing the space between said shell and casing into upper and lower compartments which are in communication with each other, an exterior shell supported from the interior shell with its lower end inclosed by the upwardly-flanged portion of the interior shell whereby a water seal is formed around the lower end of said exterior casing, a burner, a fuel-supply pipe leading to said burner, a wa-

ter-supply pipe leading to the space between the inner shell and casing, and a distillate-discharge pipe communicating with the space between the casing and the exterior shell, substantially as described.

5. In a water-still, an inner shell having a flue in its top, a surrounding casing spaced from said shell, a diaphragm separating the space between the shell and the casing into an upper and lower compartment in communication one with the other, a water-supply pipe communicating with said space, a burner arranged within the inner shell, a fuel-supply pipe leading to said burner, an insulated pipe communicating with the space between the inner shell and the casing, an overflow-pipe communicating with said insulated pipe, an exterior shell surrounding the casing and the inner shell and spaced away from the casing, and an outlet-pipe for the distilled water communicating with the space between the outer shell and the casing, substantially as described.

In testimony whereof I affix my signature in the presence of two witnesses.

JOHN HAMMOND SMITH.

Witnesses:
H. C. EVERT,
E. E. POTTER.