

B. THOENS & S. S. SHEARS.
MULTIPLE STILL.

APPLICATION FILED JULY 8, 1910.

1,069,829.

Patented Aug. 12, 1913.

2 SHEETS—SHEET 1.

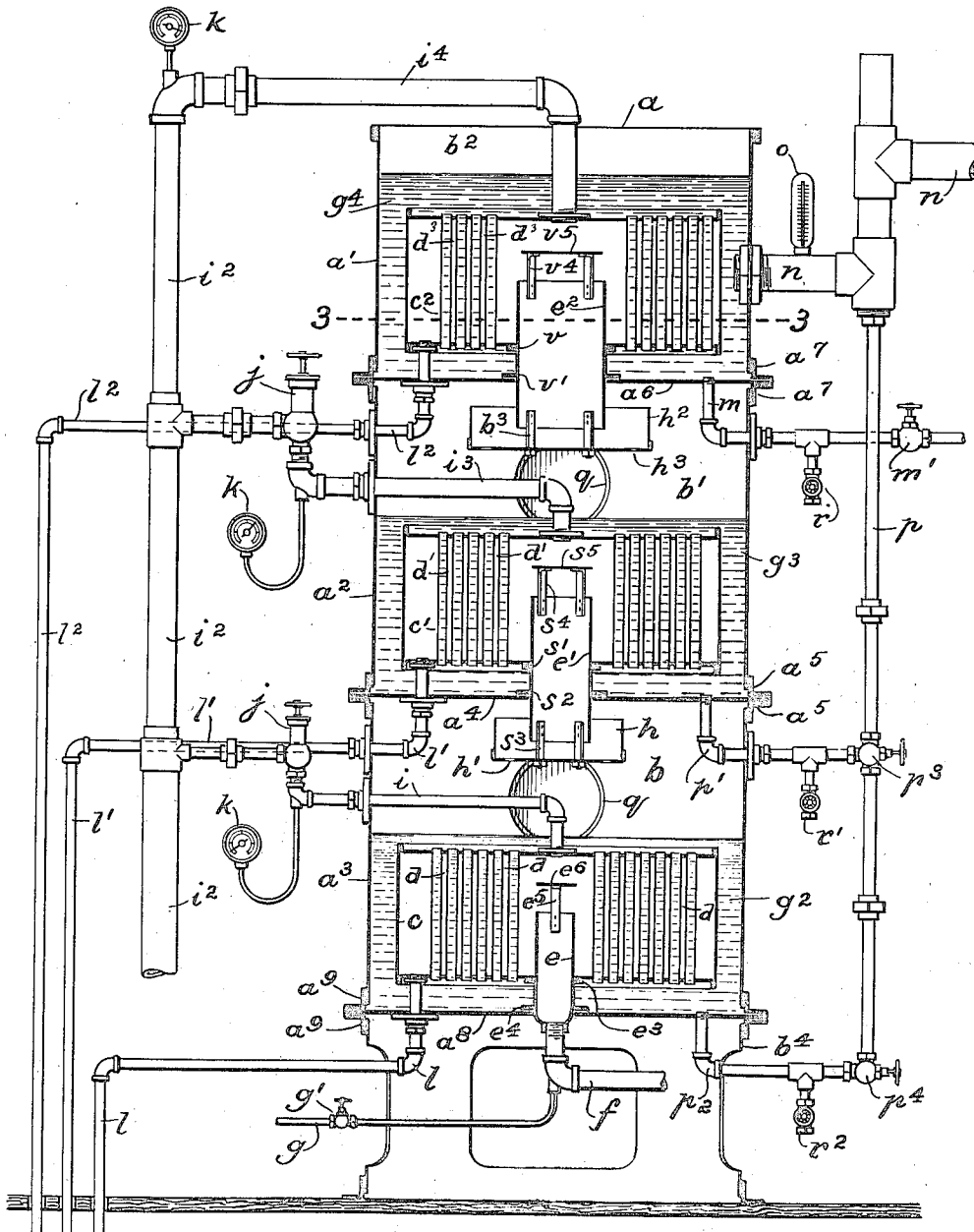


Fig. 1.

WITNESSES:

Edward M. Greenbaum
Charles V. Sawyer

INVENTORS

Burchard Thoens
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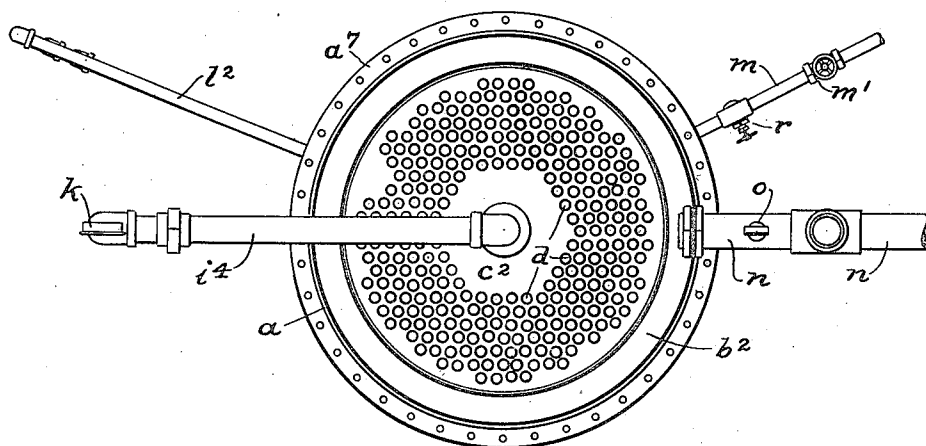


Fig. 2.

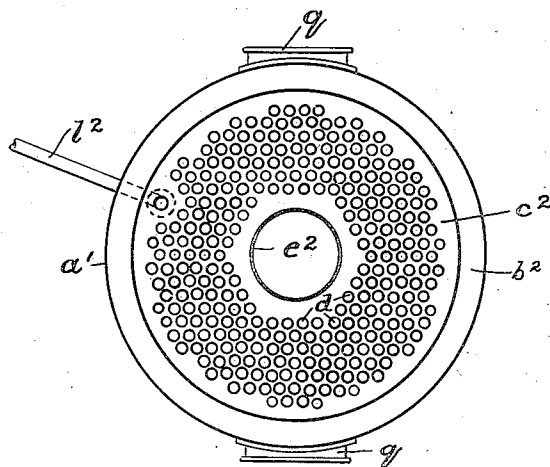


Fig. 3.

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UNITED STATES PATENT OFFICE.

BURCHARD THOENS AND SUMNER S. SHEARS, OF NEW YORK, N. Y.

MULTIPLE STILL.

1,069,829.

Specification of Letters Patent.

Patented Aug. 12, 1913.

Application filed July 8, 1910. Serial No. 570,927.

To all whom it may concern:

Be it known that we, BURCHARD THOENS, a subject of the Emperor of Germany, resident of the city, county, and State of New York, and SUMNER S. SHEARS, a citizen of the United States, and resident of the city, county, and State of New York, have invented certain new and useful Improvements in Multiple Stills, of which the following is a specification.

This invention relates to multiple water stills and has for its object to provide a still of such class in a manner as hereinafter set forth whereby the rapid and economical production of distilled water will be obtained.

A further object of the invention is to provide a multiple water still in a manner as hereinafter set forth in which the water is boiled and evaporated in several compartments or receptacles, which are kept at different degrees of vacuum thereby maintaining the water in the compartments at different boiling points, the compartments being so set up with respect to each other that the vapor from each preceding compartment is utilized for boiling or vaporizing the liquid of each succeeding compartment.

A further object of the invention is to provide a water still of the class referred to in a manner as hereinafter set forth and including a plurality of compartments fed from a common source and with the product discharged from each compartment.

Further objects of the invention are to provide a multiple water still which is comparatively simple in its construction and arrangement, strong, durable, efficient in its use, economical in its work, readily set up and comparatively inexpensive to manufacture.

With the foregoing and other objects in view, the invention consists of the novel construction, combination and arrangement of parts as hereinafter more specifically described and illustrated in the accompanying drawings, wherein is shown the preferred embodiment of the invention but it is to be understood that changes, variations and modifications can be resorted to which come within the scope of the claim hereunto appended.

In the drawings wherein like reference characters denote corresponding parts throughout the several views: Figure 1 is a vertical sectional view through the center

of the still partly in elevation. Fig. 2 is a plan, and, Fig. 3 is a section on line 3—3, Fig. 1.

Referring to the drawings in detail, —*a*— denotes a vertically-disposed shell constituting a casing formed of a plurality of sections, as shown three in number and indicated by the reference characters *a'*, *a*², *a*³. The number of sections of the casing can be increased if desired, depending upon the number of heating drums employed; said drums will be hereinafter referred to. Interposed between the sections *a*³, *a*² is a plate *a*⁴, which in connection with the section *a*³ forms a compartment —*b*— and in this instance constitutes the top of the compartment —*b*—. The plate *a*⁴ is secured in position by the angle irons *a*⁵ which are connected to the periphery of the sections *a*², *a*³. Interposed between the sections *a*², *a'* is a plate *a*⁶ which in connection with the section *a*² and plate *a*⁴ forms a compartment —*b'*—, the plate *a*⁴ forming the bottom of said compartment *b'* and the plate *a*⁶ the top of the compartment. The plate *a*⁶ is secured in position by the angle irons *a*⁷ which are secured to the sections *a'*, *a*². The plate *a*⁶ in connection with the section *a'* forms a compartment *b*² which is opened at its top. The compartment —*b*— is closed by a plate *a*⁸ which is secured in position by the angle irons *a*⁹ fixed to the section *a*³ and to a support *b*⁴ for the casing.

Arranged within the compartments *b*, *b'*, *b*² are the heating drums *c*, *c'*, *c*² respectively, to the heads of each of which are secured the pipes —*d*—. The drum —*c*— is supported within the compartment —*b*— by a vertically-disposed pipe —*e*— which extends through the lower head of the drum —*c*— and opens into the interior of the drum —*c*—. The pipe —*e*— is provided with a flange *e*³ upon which is supported the drum —*c*— and said pipe —*e*— is furthermore provided with a flange *e*⁴ which is seated upon the upper face of the plate *a*⁸. The pipe —*e*— projects through the plate *a*⁸ and has its lower end contracted with which engages a steam supply pipe —*f*— for connecting therewith an air supply pipe —*g*— provided with a valve —*g'*—. The compartment —*b*— is adapted to contain a body of water as indicated at *g*² and the heating drum —*c*— is submerged in the liquid. Supported from the inner end of the pipe —*e*— within the drum —*c*— by the supports *c*⁵

is a deflector e^6 for the incoming steam. Connected to the upper head of the drum — c — and communicating with the interior of said drum and projecting through the section a^3 is a pipe — i — which is connected to a head pipe i^2 communicating with a vacuum pump (not shown) for creating a vacuum in the drum — c —. Extending through the plate a^3 and opening into the drum — c — through the lower head of the latter is a drain pipe — l — for the eduction of condensation from the drum — c —, the said pipe — l — opening into a storage tank (not shown). The heating drum — c — is utilized to boil or vaporize the body of liquid — g^2 — within the compartment — b —.

Arranged within the compartment — b' — is the heating drum — c' — having secured to the heads thereof the vertically-disposed pipes — d' —. Extending through the lower head of the drum — c' — and opening into the interior of the drum — c' — is a vertically-disposed pipe — e' — which is of greater diameter than the pipe — e — and which is provided with a flange — s' — for supporting the drum — c' —. The pipe — e' — is furthermore provided with a flange — s^2 — mounted upon the upper face of the plate — a^4 —. The pipe — e' — extends through the plate — a^4 — and is open at each end and has the lower portion thereof arranged within the upper part of the compartment — b —. The lower end of the pipe — e' — has suspended therefrom through the medium of the hangers — s^3 — a collecting tray — h — which is of such diameter as to surround the lower end of the pipe — e' — and has its bottom formed with a plurality of openings — h' —. Supported upon the inner end of the pipe — e' — through the medium of the arms — s^4 — is a deflector — s^5 —. Within the compartment — b' — is arranged a body of liquid — g^3 — in which is submerged the heating drum — c' —. Connected to the upper head of the drum — c' — and opening into said drum and furthermore extending through the compartment — b' — and through the section — a^2 — is a pipe — i^3 — which connects with the pipe — i^2 — whereby a vacuum can be created in the drum c' . Extending through the plate a^4 and through the lower end of the drum c' and opening into said drum is a drain pipe — l' — which extends through the section a^3 and opens into the storage tank in which the pipe — l — opens. The pipe — l' — is utilized for draining off the products of condensation from the drum c' .

Arranged within the compartment — b^2 — is the heating drum — c^2 — provided with vertically-disposed pipes d^3 secured to the heads of the drum. Extending through the lower head of the drum c^2 is a pipe e^2 which is open at its upper and lower ends and is provided with a flange — v — for sup-

porting the drum c^2 within the compartment b^2 . The pipe e^2 is also provided with a flange v' which engages the upper face of the plate a^6 . The pipe e^2 is of greater diameter than the pipe e' and projects through the plate a^6 and into the upper portion of the compartment b' . The lower end of the pipe e^2 has suspended therefrom through the medium of the hangers b^3 a tray h^2 which is of greater diameter than the pipe e^2 and surrounds the lower end thereof and is provided with a series of openings h^3 . Supported upon the upper end of the pipe e^2 within the drum c^2 through the medium of the arms v^4 is a deflector v^5 . Communicating with the drum c^2 through the upper head thereof is a pipe i^4 which opens into the pipe i^2 whereby a vacuum can be created in the drum c^2 . Extending through the plate a^6 and through the lower head of the drum c^2 and opening into said drum is a drain pipe — l^2 — for the products of condensation and which opens into the storage tank with which communicate the pipes — l — and l' . Within the compartment b^2 is a body of water g^4 in which is submerged the drum c^2 .

The drum c' is utilized for boiling or evaporating the water g^3 and the drum c^2 is utilized for boiling or evaporating the water g^4 . The pipe e' establishes communication between the upper portion of the compartment — b — and the heating drum c' whereby the vapor will be conducted from the compartment — b — into the drum c' and utilized for heating the water within the compartment — b' — and the pipe e^2 establishes communication between the upper portion of the compartment b' and the heating drum c^2 whereby the vapors in the compartment b' are conducted to the drum c^2 for heating the water g^4 . The trays h' and h^2 allow for any liquid carried along with the vapors to drain back into the compartments b , b' .

The pipes — i —, — i^3 —, — i^4 — and — i^2 — in connection with the vacuum pump (not shown) are as before stated employed to create a vacuum inside of the heating drums; the different degrees of vacua are pre-determined and controlled by means of regulating valves — j — and gages — k —. As before stated, the pipes — l —, — l' — and — l^2 — are employed for draining the products of condensation from the drums, — c —, c' , c^2 into a storage tank (not shown) and the lower ends of the pipes are adapted to be submerged or water-sealed. The length of the pipes — l —, l' , l^2 must be somewhat greater than the barometric column of water which is 34 ft.

Water is supplied to the compartment b^2 through the medium of a supply pipe — m — provided with a cut-off valve m' and overflows from the compartment b^2 through the

pipe —*n*—, the latter opening into the compartment *b*², the amount of water supplied being regulated by the temperature thereof, which is indicated by the thermometer —*o*— mounted upon the pipe —*n*—. The overflow pipe —*n*— has communicating therewith a down-flow pipe —*p*— provided with branch pipes *p*¹, *p*² which are controlled by the valves *p*³ and *p*⁴ and which open into the compartments *b*¹, *b* respectively. The water within the compartment *b*, *b*¹ is maintained at a certain height, which can be observed by the glasses —*q*—, or can be regulated automatically by a float valve if desired. For cleaning or washing out the several compartments the pipe —*m*— is provided with a valved draw-off pipe connection —*r*—, the pipe *p*¹ with the draw-off valve pipe connection *r*¹ and the pipe *p*² with the draw-off valve pipe connection *r*².

The operation of the still is as follows: The valve connections *r*, *r*¹, *r*² being closed, water is supplied to the pipe —*m*— into the open compartment *b*² and overflows through the pipe —*n*— and pipe connections —*p*—, *p*¹, *p*² into the compartments *b*¹, *b*, these latter being filled to the required height, the height of the water being in said compartment controlled by the valves *p*³, *p*⁴. Steam is then introduced through the pipe —*f*— into the pipe —*e*— and passes into the interior of the drum —*c*—; this heats and vaporizes the body of water *g*² in which the drum —*c*— is submerged. The steam within the drum —*c*— is condensed and flows out as water through the pipe —*l*— into the storage tank. Should the steam be of high temperature and smelling somewhat badly, air is introduced through the pipe —*g*— to overcome such objection. The vacuum pump is now started withdrawing any air or noncondensable vapors from the heating drums. Preferably there is maintained in the drum *c*² a 26 inches vacuum with a boiling point of water at 126° F.; in drum —*c*— 17.5" vacuum with a boiling point of water at 169° F. and atmospheric pressure in the drum —*c*— with a boiling point at 212° F. The vapor rising from the water evaporated in the compartment —*b*— enters drum *c*¹ by passing over the edge of the tray *h* and into the pipe *r*¹, where it heats and evaporates the water in compartment *b*¹ and the vapor rising from the water evapo-

rated in the compartment *b*¹ passes over the edge of the tray *h*², into the pipe *e*² whence it is discharged into the drum *c*². The vapor entering from one compartment into the drum thereabove is compelled to change its direction twice owing to the arrangement of the trays and the deflectors and therefore will drop any water carried along therewith, the water falling in the trays and draining back into the compartments through the perforated bottoms of the trays. Should it be desired to admit air into the compartments *b*¹ and *b*², air supply pipes may be employed or a supply of air can be obtained by slightly opening the valves *r*¹, *r*² and allowing some air to leak into the compartments up through the water whereby it is aerated.

What we claim is:

A multiple water still comprising a plurality of closed compartments surmounted by an open compartment and each adapted to contain a body of water with the level of the water below the top of the compartment, a closed heating drum suspended in each of the compartments and submerged in the water within the compartment, pipes extending upwardly and opening into the drums and projecting through the bottoms of the compartments, said pipes having the lower end open and increasing in diameter from the lower to the upper compartment, a collecting tray arranged above the water level in each lower compartment for the pipe of the compartment next above, certain of said pipes depending in the upper portions of the lower compartments and connected to and suspending said trays, the lowermost of said pipes communicating with a steam supply, independent drain pipes for withdrawing the products of condensation from each of said drums, an air exhaust pipe common to all of said drums and adapted to communicate with a vacuum pump, and a pipe connection between said exhaust pipe and each of said drums.

Signed at New York city in the county and State of New York this 18th day of June A. D. 1910.

BURCHARD THOENS.
SUMNER S. SHEARS.

Witnesses:

EDGAR M. GREENBAUM,
CHARLES V. DWYER.