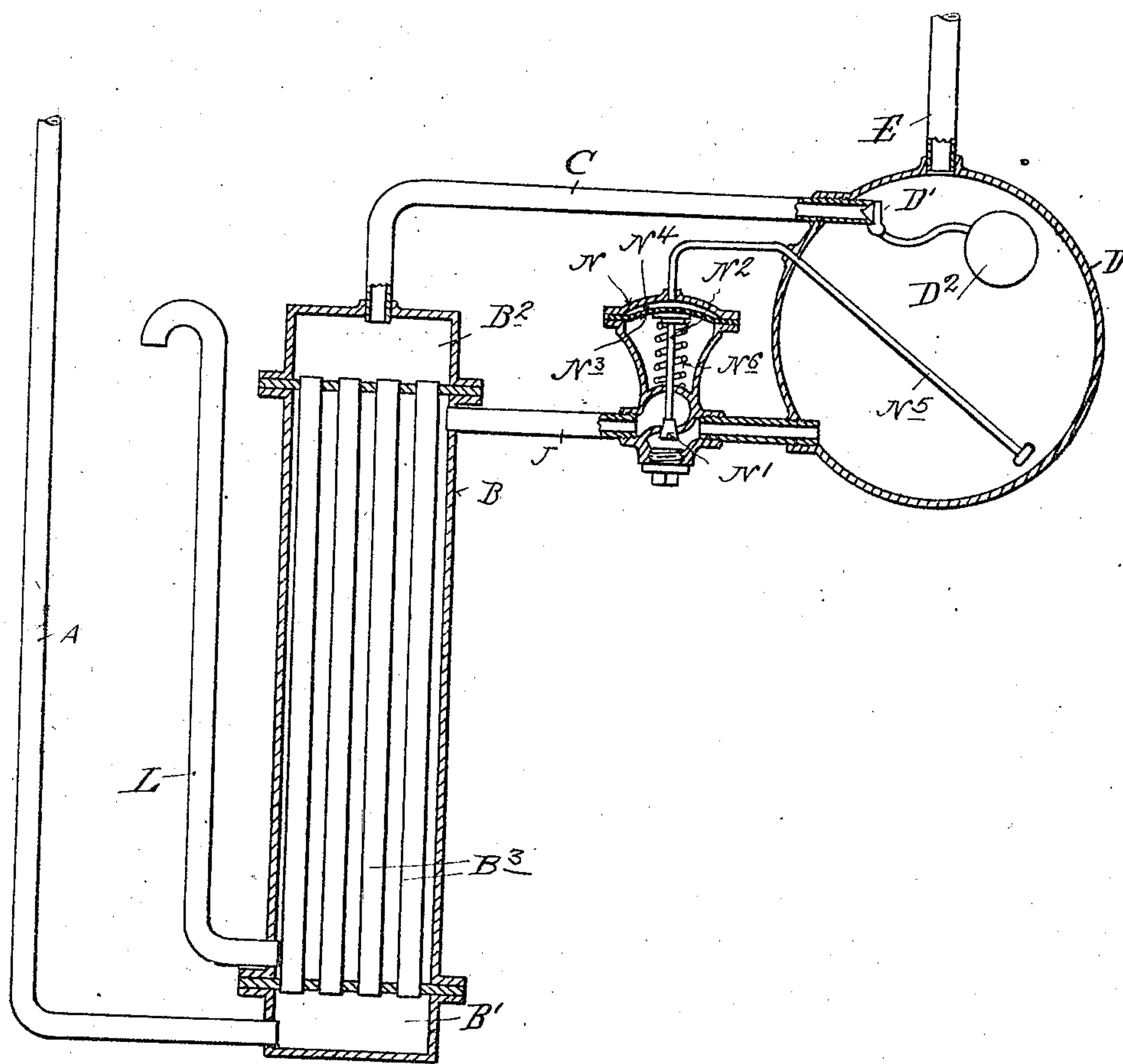


A. G. WATERHOUSE.
DISTILLING APPARATUS.
APPLICATION FILED NOV. 8, 1909.

989,672.

Patented Apr. 18, 1911.



Witnesses:
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UNITED STATES PATENT OFFICE.

ADDISON G. WATERHOUSE, OF NEW YORK, N. Y., ASSIGNOR TO THEODORE F. BOURNE,
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DISTILLING APPARATUS.

989,672.

Specification of Letters Patent.

Patented Apr. 18, 1911.

Original application filed August 24, 1908, Serial No. 449,995. Divided and this application filed
November 8, 1909. Serial No. 526,713.

To all whom it may concern:

Be it known that I, ADDISON G. WATERHOUSE, a citizen of the United States, and resident of New York city, borough of the Bronx, in the county of New York and State of New York, have invented certain new and useful Improvements in Distilling Apparatus, of which the following is a specification.

This application is a division of my application for patent for improvements in art of distilling alcohols and other volatile liquids, filed August 24, 1908, Serial No. 449,995, now Patent 939,361, granted Nov. 9, 1909.

The object of this invention is to control the flow of liquid to be distilled or evaporated by the temperature of the liquid being treated, and to conserve the heat required for distillation, whereby large volumes of liquid containing a small percentage of alcohol or other volatile fluid to be distilled can be economically employed, my invention being equally applicable to liquids more rich in alcohol or volatile properties.

In carrying out my invention I provide a boiler having supply and discharge passages and thermally-operated means actuated by the temperature of the liquid in the boiler to control the flow of liquid to and from the boiler, whereby the liquid may be caused to flow to and from the boiler by a substantially predetermined temperature of such liquid while in the boiler. I also employ in connection with said parts a heat exchange having supply and discharge passages communicating with the boiler, whereby the outflowing discharge liquid as permitted to flow from the boiler by said thermally-controlled means governed by the temperature of the liquid in the boiler will impart heat to the fresh liquid flowing through the heat exchange to the boiler, whereby the heat used in distillation is conserved.

My invention also comprises novel details of improvement and combinations of parts that will be more fully hereinafter set forth and then pointed out in the claims.

Reference is to be had to the accompanying drawing forming part hereof, which is a partly sectional diagrammatic view illustrating means for carrying out my invention.

The boiler D is a closed vessel, under which fire can be applied and into which boiler liquid can be automatically admitted so that its surface can be maintained at some fixed level, whereby a space will be left in the boiler for the accumulation and escape of vapor and steam. As shown such liquid level is maintained by means of the float D² which controls the inlet valve D'.

While the temperature of the liquid is raised and remains at a substantially predetermined degree, said liquid is automatically allowed to flow from the boiler causing fresh liquid to flow in; but such flow is regulated to accord with the effect of the heat applied to the liquid in the boiler, and such flow is made dependent upon such heat being maintained at substantially a fixed or predetermined temperature. This is effected by the thermal valve N, comprising a valve N' having a stem N², connected with a flexible diaphragm N³ above which is a closed space N⁴, from which extends a tube or feeler N⁵ into boiler D. Valve N' is kept normally closed, as by the spring N⁶, and is piped to the boiler D. Said tube or feeler N⁵ is charged with alcohol or other volatile fluid from which vapor will be generated, as the heat, when up to a predetermined temperature, is transmitted to it from the liquid in the boiler D, and the vapor in the feeler will then exert a pressure upon the diaphragm N³ in a way adapted for actuating valve N', only so long as the required temperature in the boiler is maintained, and during which time the liquid can flow in and out of the boiler at a rate corresponding to the opening of the valve by the heat of such liquid while in the boiler, and whereby as the temperature of the liquid in the boiler is reduced by reason of the inflowing supply liquid the temperature of the tube or feeler will be correspondingly reduced causing the closing of valve N', checking the flow through the boiler until the heat of the liquid in the boiler again rises to a substantially predetermined degree to cause the thermal valve to again operate to permit the flow of liquid through the boiler, and so on, whereby the temperature of the liquid in the boiler is maintained substantially at a predetermined degree.

To conserve the heat applied to the liquid in the boiler I provide a suitable heat ex-

change through which the inflowing fresh liquid and the outflowing discharge liquid pass in thermal relation. The heat exchange shown comprises a vessel consisting of an
 5 outer shell B having separate chambers B', B², connected by tubes B³ through which the supply liquid enters from pipe A and passes upwardly through tubes B³ on the way to
 10 boiler D through pipe C and valve D', while the liquid which flows from boiler D enters shell B through pipe J from valve N and then flows within shell B outside of tubes B³, thereby bringing the cold inflowing
 15 liquid in thermal contact with the hot exhaust liquid, so that the same heat is returned and used over and over again, or so that the cold liquid enters the boiler hot and the hot liquid from the boiler leaves the heat ex-
 20 change through discharge pipe L in a relatively cold state. Vapors from the boiler may be carried away through pipe E and condensed in any well known or desired manner.

It will be understood that full advantage
 25 can be taken of the state of the art in determining the practical forms which may be adopted in the construction of the apparatus utilized for carrying out my invention.

Having now described my invention what
 30 I claim is:—

1. The combination of a boiler having supply and discharge passages for the flow to and from the boiler of the liquid to be treated, a valve to control one of said pas-
 35 sages, a movable member coacting with said valve, and a pressure feeler containing fluid communicating with a chamber adjacent said member, said feeler being connected with the boiler to have the fluid in the feeler in ther-
 40 mal relation to the liquid in the boiler.

2. The combination of a boiler having supply and discharge passages for the flow to and from the boiler of the liquid to be treated, a valve to control one of said pas-
 45 sages, a movable member coacting with said valve, and a pressure feeler communicating with a chamber adjacent said member and projecting into the boiler in contact with the liquid heated therein.

3. The combination of a boiler having supply and discharge passages for the flow to and from the boiler of the liquid to be treated, a valve to control one of said pas-
 50 sages, means to normally maintain the valve

upon its seat, a movable member to coact 55 with the valve provided with a closed chamber opposed to the valve seating means, and a pressure feeler containing fluid extending into the boiler below the liquid level therein in thermal relation to the liquid in the 60 boiler.

4. The combination of a heat exchange having supply and discharge passages, a boiler connected with said passages to re-
 65 ceive and discharge liquid therethrough, a valve to control one of said passages, and a pressure feeler containing fluid in thermal relation to the liquid heated in the boiler for controlling the flow of said liquid through the heat exchange and the boiler by 70 the temperature of the liquid heated in the boiler.

5. The combination of a heat exchange having supply and discharge passages, a boiler connected with said passages to re-
 75 ceive liquid from and discharge it through said heat exchange, a valve to control the flow of said liquid to and from said boiler through said heat exchange, and pressure producing means for controlling said valve 80 by the temperature of the liquid heated in the boiler.

6. The combination of a heat exchange having supply and discharge passages, a boiler connected with said passages to re-
 85 ceive liquid from and discharge it through said heat exchange, a valve to control the flow of said liquid through one of said passages, and thermally governed pressure producing means associated with the boiler for 90 controlling said valve.

7. The combination of a heat exchange having supply and discharge passages, a boiler connected with said passages, a valve to control the flow through one of said pas-
 95 sages, a movable member associated with said valve and having a chamber opposed to the valve, and a pressure feeler communicating with said chamber and containing fluid, said feeler extending into the boiler 100 below the liquid level therein.

Signed at New York city, in the county of New York and State of New York this 6th day of November, A. D. 1909.

ADDISON G. WATERHOUSE.

Witnesses:

T. F. BOURNE,

MARIE F. WAINRIGHT.