

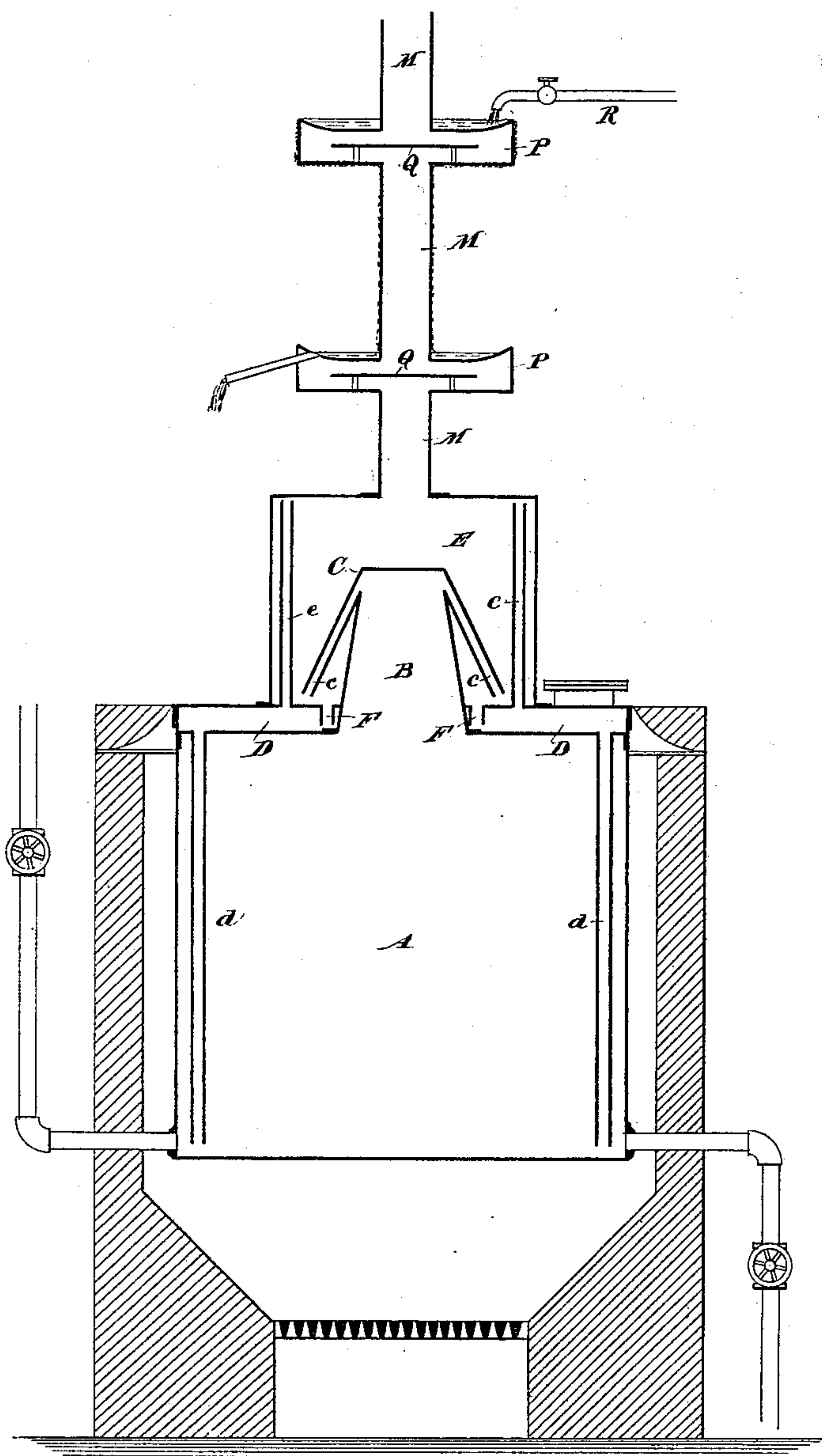
(No Model.)

H. GOLDWATER.

APPARATUS FOR VAPORIZING LIQUIDS.

No. 335,281.

Patented Feb. 2, 1886.



Witnesses:

Charles R. Searle,
Maniere Ellison

Inventor:

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by his attorney
Thimex Sres Selson

UNITED STATES PATENT OFFICE.

HENRY GOLDWATER, OF NEW YORK, N. Y.

APPARATUS FOR VAPORIZING LIQUIDS.

SPECIFICATION forming part of Letters Patent No. 335,281, dated February 2, 1886.

Application filed July 6, 1885. Serial No. 170,719. (No model.)

To all whom it may concern:

Be it known that I, HENRY GOLDWATER, of the city and county of New York, in the State of New York, have invented a certain new and useful Improvement in Apparatus for Vaporizing Liquids, of which the following is a specification.

The object of the invention is to aid in avoiding the carrying along of the particles of denser vapors with the vapor properly delivered at the various stages of the distillation.

When a still is driven so as to give off vapor rapidly, the vapor is liable to carry up some, and in many cases considerable, quantities of the heavier vapors, and finally the dense oil, paraffine, and tar, and in general it may be said the liquid from which the vapor is being disengaged. I provide means for arresting such heavier vapors and unevaporated liquid, retaining the vapors until a later stage, or conducting them and the particles of liquid back to mingle with the liquid remaining in the still. In some or all cases the vapors and liquid thus arrested are composed in part of material so volatile as to give off light vapors during the period while it is arrested and retained or being conveyed back. I provide for properly conducting away the vapor which may be given off by such arrested vapors and liquid, and mingling them with the other portions of the vapor given off by the still.

The accompanying drawing forms a part of this specification. It is a vertical section showing what I consider the best means of carrying out the invention in a very simple form of apparatus.

Referring to the drawing, and to the letters of reference marked thereon, A is a retort of rectangular section, B a capacious pipe through which the vapor is allowed to freely rise. These parts, as also the surrounding brick-work, the provisions for heating the still, also the pipe and controlling means for supplying the liquid, and a pipe and controlling means for drawing off the unevaporated portion from time to time may be of any ordinary or suitable construction, and need not be specifically described.

D is a casing inclosing a shallow chamber extending over the whole top of the still. From it descend two tubes, *d*, leading to points below the surface of the liquid in the still.

E is a smaller casing, mounted above D, and having considerable height. The tube B is led up to the middle or upper portion of E, and is there surmounted by a cap, C, which prevents the further direct rise of the vapors and of any unevaporated liquid which may be carried with them. From the cap C two conical casings, *c c*, extend down and open into the chamber E near its base. The direction of discharge of the vapors from the space between these casings is obliquely downward.

F are short tubes extending downward from the base of the chamber E nearly to the top of the still.

Tubes *e* extend upward from the casing D, and open into the upper part of the chamber E. From the top of the chamber E a pipe, M, conducts the proper vapor upward.

As the vapor delivered upward through M may under some circumstances still contain particles of liquid, I provide still further means for arresting and detaining or returning them. These are the extended vessels P, arranged to receive the vapor centrally from below and discharge it centrally above; but in the interim to conduct it around a flat plate, Q, which I term the "arresting-plate," interposed. The outer edges of the upper portion of each of these vessels, which I will term "traps," are raised a little above the main body, as shown. It has been common in other branches of the distilling art to employ one or more such traps, each receiving a stream of cold water on one side, and allowing the water to flow away more or less warmed from the other side; but as heretofore used all the traps received equally cold water.

I have devised and reduced to a practical form an improvement in which the water is received cold in the upper trap alone, and flows downward into the other traps with its temperature successively raised in each.

R is a pipe bringing cold water from an elevated reservoir or other suitable source. (Not represented).

Care should be taken to set all the traps P Q with their upper rims as nearly level as possible. This allows the water to flow over the edge in a tolerably uniform layer. It wets not only the entire periphery but also the entire bottom of each trap. I regulate the supply of water so that it shall rarely if ever

flow so fast as to induce the water to fall in drops or streams from the periphery of the bottom. It adheres to the bottom, following the laws by which water adheres to wetted surfaces, and, coming inward from the periphery, trickles down and wets the pipe and flows into the next trap below with its temperature raised. This operation is repeated for each trap.

10 Operation: The still A, being about two-thirds filled with petroleum or other liquid to be distilled, and properly heated, first gives off the lightest vapor; but certain portions of the heavier vapors and of the unevaporated liquid are carried up with it. The mixed vapor, containing also a small quantity of unevaporated liquid, rises through the pipe B, is arrested by the cap C, and caused to descend through the conical space *c*. The mingled vapor and liquid being projected obliquely downward, the particles of liquid, being denser than the vapor, are carried downward by momentum and collect on the bottom of the chamber, and the heavy vapors, on a nearly similar principle, separate from the light vapor and remain, while the light vapor is disengaged and rises in a dry condition. The heavy vapors and liquid, accumulating in the bottom of the chamber E, descend through the short tubes F into the casing D, where, receiving some heat from the top of the retort, the distillation continues, but more gently than in the body of the retort. The lightest vapor rises through the tubes *e*, and, being discharged into the upper portion of the chamber E, mingles with the other vapor and is conveyed away. The liquid which remains unevaporated descends through the pipes *d* and mingles with the liquid remaining in the still. The heaviest vapors may in some cases condense and descend also through *d*. Vapors of intermediate grade, by remaining a little time, find the conditions so changed that the retort is commencing to give off vapors about as heavy as themselves. When such period arrives, they are ready to rise through *e* and be carried away. Under all conditions the traps P contribute to the dryness of the escaping vapor and to the uniformity of the grade delivered at any one period by arresting the unevaporated particles. The particles thus arrested become slowly redistilled as they trickle back, the heavier particles consequently finding their way back into the vessel E, and from that into the chamber D, and down through that into the dense oil or tar remaining in the retort; but the greater proportion of the particles thus arrested will, like the corresponding particles of liquid and the greater quantity of denser vapor, be arrested in the portion of the apparatus first described, and be passed away as a vapor at a later stage of distillation. The result is that the petroleum-vapor rising from the apparatus below has a successively lowered temperature in each trap. The effect of the traps P with their successive differences of

temperature is slight, but sufficient to add materially to the arresting of the unevaporated liquid and to the retardation of the denser vapors.

The extension of the pipes *d* downward nearly to the bottom of the still insures that in any ordinary condition of the still no vapor shall ever rise through these pipes. The short pipes F, extending downward nearly to the top of the retort, attain the same end—that is, they insure that no considerable current of vapor shall rise through these tubes to obstruct the descent of the liquid.

The extension of the pipes *e* insures that the vapor generated in the casing D shall have a free discharge unobstructed by any liquid accumulated in the chamber E.

Modifications may be made in the forms and proportions within wide limits. One pipe, *d*, may suffice, or three or a larger number may be used. Instead of a continuous conical space, *c*, a series of pipes similarly arranged may serve. The passage or the pipes may be inclined to a greater or less extent than here shown, or they may be variously contorted, the essential feature being that the proper vapor, with any heavier vapor or vapors and all particles of unevaporated liquid carried therein, shall be projected downward, so that the momentum of the denser portions shall insure their descent and their retention in the bottom of the chamber E, while the proper vapor has liberty for free escape.

Parts of the invention may be used without the whole. I can dispense with the short pipes *f* and provide other means for conducting the liquid downward. The surfaces may be inclined, domed, coned, or otherwise varied instead of being horizontal.

I claim as my invention—

1. In combination with a still, A, casings D and E, and means, as B C *c*, for arresting the current of vapor and projecting it with its contents downward, the pipes *e*, leading from the casing D above the retort, and communicating with the upper portion of the chamber E, as herein specified.

2. In a petroleum-distilling apparatus, in combination with the retort A, and means, as C *c* D *d* E *e*, for arresting the principal portion of the heavy vapors and unevaporated liquid, the trap or traps P Q, having each a concave top and a level rim arranged in a series in the ascending portion of the delivery-pipe, and with provisions for flowing cold water on the upper trap and taking away the same from the lower trap, substantially as herein specified.

In testimony whereof I have hereunto set my hand, at New York city, N. Y., this 2d day of July, 1885, in the presence of two subscribing witnesses.

HENRY GOLDWATER.

Witnesses:

E. BROOKES,
M. F. BOYLE.