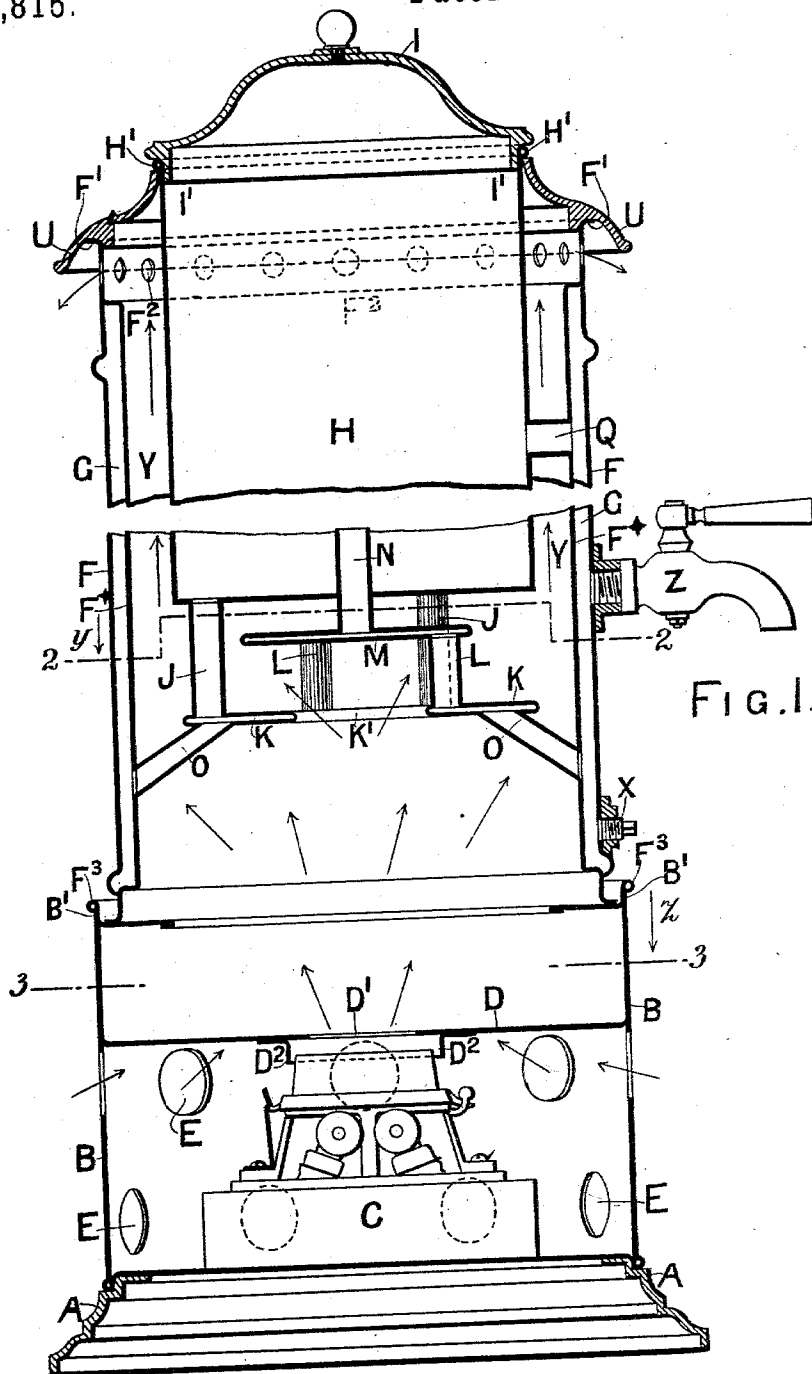


(No Model.)

W. & I. DARBY & J. H. PUNCHARD.
WATER HEATING APPARATUS.

No. 569,815.

Patented Oct. 20, 1896.



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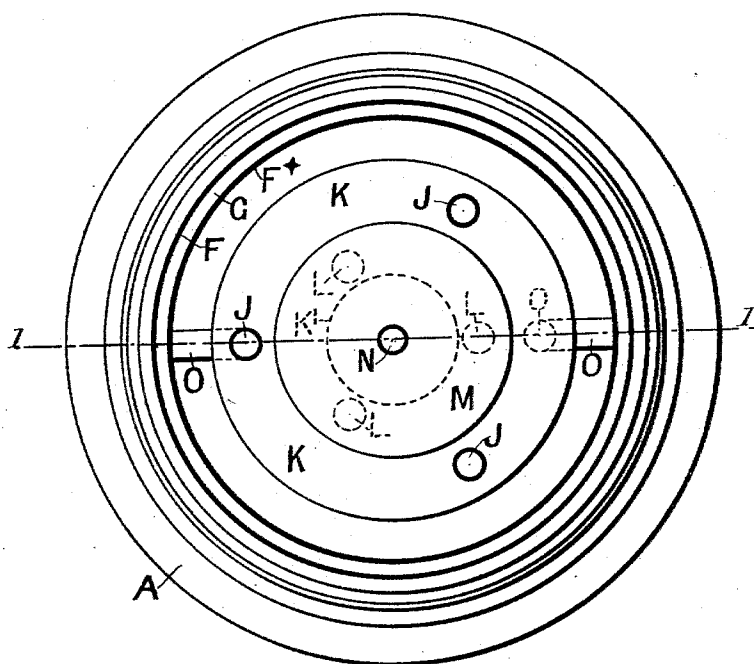
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FIG. 2.



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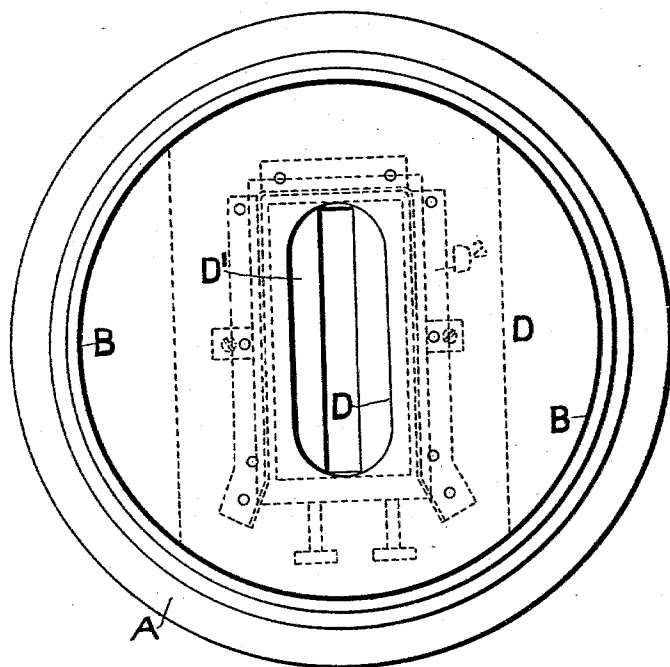
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FIG. 3.



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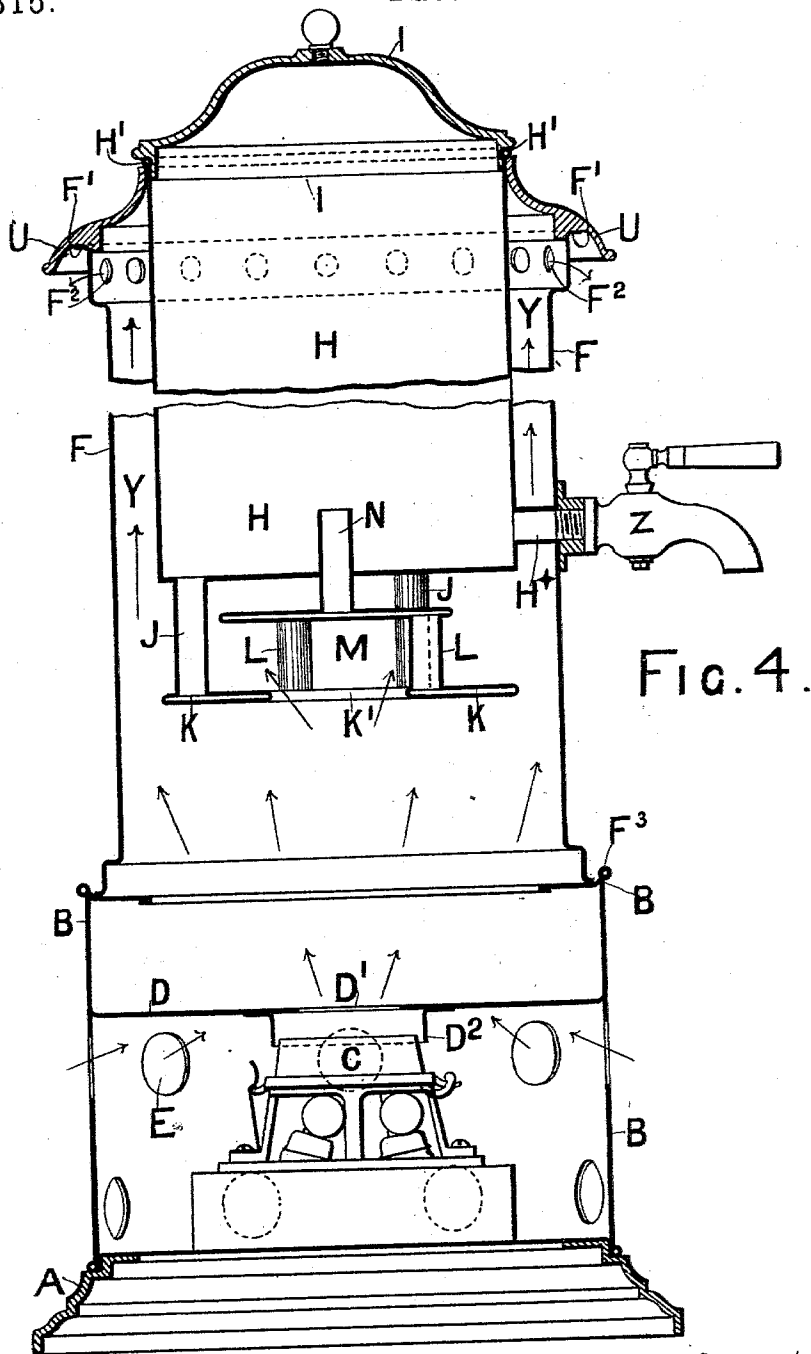


FIG. 4.

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UNITED STATES PATENT OFFICE.

WALTER DARBY, ION DARBY, AND JOHN HENRY PUNCHARD, OF LONDON,
ENGLAND.

WATER-HEATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 569,815, dated October 20, 1896.

Application filed February 12, 1896. Serial No. 579,099. (No model.)

To all whom it may concern:

Be it known that we, WALTER DARBY, ION DARBY, and JOHN HENRY PUNCHARD, subjects of the Queen of Great Britain, residing at London, England, have invented Improvements in Water-Heating Apparatus, of which the following is a specification.

This invention relates to improvements in apparatus for heating water for baths or other purposes, warming greenhouses or other places, generating steam for condensing or other purposes or uses to which same may be applicable.

In order that our present invention may be easily understood and readily carried into practice, we will proceed to fully describe same with reference to the drawings hereunto annexed; but we wish to here first remark that, although we may use any suitable burner or burners, (for instance, a gas or oil burner,) yet our said invention will be found specially advantageous when used with hydrocarbon-burners, (for burning heavy mineral oils, if desired,) in which two parallel long flat wicks are used with a large central air supply between the two wicks and the hood over same with a single slit or opening therein for the said central air supply, (or three parallel long flat wicks may be used with separate large air-supply passages between each of the wicks and a hood with a single slot or aperture therein over said central air-supply openings,) the lower part of the wick-tubes being set wide apart, and then these wick-tubes incline toward one another—but not so as to meet—at the top thereof.

Figure 1 is a central vertical section on the line 1 1, Fig. 2, of the complete apparatus for heating water according to our present invention. Fig. 2 is a plan on line 2 2, Fig. 1, looking in the direction of the arrow *y*. Fig. 3 is a plan on line 3 3, Fig. 1, looking in the direction of the arrow *z*. Fig. 4 is a central vertical section of an alternative arrangement of the casing.

Similar letters of reference indicate corresponding parts throughout.

A is the stand upon which the apparatus rests.

B is the burner-base or chamber, which rests on the stand A and contains the burner C.

D is a division-plate or partition formed or mounted in any suitable manner in the said burner-base B, either horizontal or otherwise suitably disposed so as to completely cut off all communication from the lower part of the chamber B to the upper part thereof, except through the central slot or opening D', the size and shape of which latter correspond to the form of the burner.

D² D² are flanged plates or strips secured to the under side of the division D to serve as guides by which the top of the burner C is brought into the correct position beneath the aperture D', or these guides D² may be dispensed with and the burner C guided on the bottom thereof and made to fit up close under the aperture D' in the division-plate or partition D.

E E are air-admission holes, by which the air can freely pass from the exterior of the lower part of the chamber B into the interior thereof (besides passing in at the aperture through which the burner is inserted, or said opening may be closed by a suitable cover) below said division-plate D.

F is the outside wall or casing, which, in the case illustrated in Figs. 1, 2, and 3, is formed double, *i. e.*, with a lining such as F^x, between which and the outer wall F a water-jacket or water-tight annular space G is thereby formed; or said casing F may be single, as shown in Fig. 4, the advantage of the former arrangement being that loss of heat or radiation is prevented or greatly reduced.

H is a cylindrical chamber or vessel, which we will term the "water-holder," arranged concentrically within the said casing F. The turned-over edge H' of said water-holder H rests on the top edge of the cast-iron or other suitable rim or flange U, which latter fits down, as shown, on the upper edges F' of the outer casing F, where it is permanently retained when the water-holder H is secured in position, as hereinafter explained. In the case illustrated in Fig. 1 such water-holder H is supported or held in position within the casing F by the tubes O, as also by the connection Q, as hereinafter described, while in the case illustrated in Fig. 4 said water-holder H is held in position at the lower part thereof by the connecting-pipe H^x, which conducts

the water from the lower part of said water-holder H to the draw-off cock Z, or short stays, tubes, or rods may also be used, as in Fig. 1.

F² F² are a row of vent holes or apertures, through which the products of combustion escape from the interior of the apparatus.

I is a suitable lid or cover of any suitable ornamental or other design, (either perforated or solid,) having a circular lip or flange I' thereon, which latter fits within the top of the water-holder H, or other suitable form of lid may be used.

The bottom edge F³ is advantageously formed, as shown in Figs. 1 and 4, in such manner as to be adapted to rest on the upper edge B' of the cylindrical base B.

J J are pipes (advantageously three) leading from the bottom of chamber H to the shallow closed chamber K in the form of a flat ring, this ring-shaped hollow chamber K having a central opening or passage K' through same, through which the products of combustion pass, as hereinafter described. From this shallow chamber K three (or other suitable number of) pipes L connect the former to a second shallow disk-like chamber M, arranged above the chamber K over the passage K' and concentric therewith. N is a pipe or connection from said disk-like chamber L, leading into the water-holder, H a little above the bottom thereof. O, Figs. 1 and 2, are pipes or connections (which also serve the purpose of stay-bars) between the water-jacket G and the under side of said shallow ring-like chamber K.

Q, Fig. 1, is a short tube or connection leading from the upper part of the water-jacket G to the upper part of the interior of the water-holder H, or several such connecting-pipes Q' may be used at different heights, if desired.

X, Fig. 1, is a plug closing a draw-off outlet, (in the lowermost part of the water-jacket G,) which may be provided or not, as desired, for the purpose of completely emptying all water out of the apparatus.

Y is an annular space between the inside of the casing and the outside of the water-holder, up which annulus or passage Y the products of combustion pass and thence escape into the atmosphere through the aforesaid apertures F².

Z is a draw-off cock, which may be as shown or of any other suitable construction, as desired.

The operation is as follows: The flame or heat (or products of combustion) coming from the burner C passes up through the aperture D', and such flame or the heat therefrom strikes against the under side of the ring-like lowermost shallow chamber K and is spread thereby, and part of such flame, &c., can pass around the outer edge or periphery of said ring K. The main body passing through the passage K' comes directly against the under side of the second shallow chamber M and is spread thereby. Thus both these chambers,

as well as the tubes or connections J, L, and O, are intensely heated, and the flame or heat (or products of combustion) thence passes up the annular passage Y, thus heating not only the bottom of the water-heater H, but all the way up the sides of same, and also at same time intensely heat the water in the water jacket or space G, (when same is used as in Fig. 1,) the products of combustion finally escaping out of the apparatus at F², as aforesaid. The water contained in the lowermost shallow chamber K being very small in quantity, owing to the shallowness of said chamber, is consequently very quickly heated and passes up the passages L into the second shallow chamber M, where it is again further heated, and thence rises through the pipe N into the water-holder H, while the water of the lower temperature in the water-holder H, which will naturally descend to the bottom thereof, will pass down the pipes J into the chamber K, and thus rapid heating of the water and circulation thereof are insured.

In the arrangement shown in Fig. 1 the tap Z draws off the water from the water-jacket G, into which latter the water from the holder H can rapidly pass either through the connections O or Q, so that the level of water is maintained in said water-jacket equal with that in the water-chamber H. In the event of the formation of steam in said water-jacket G same can easily escape through the connection Q into the water-holder H, and thence out of the top thereof, if necessary.

An important feature of this invention is that, owing to the special arrangement of the water-heating chambers K, M, and H and the connections between same, as well as the peculiar arrangement of the burner with the partition or division-plate D in the burner-base, consequently no water of condensation (or practically none) is formed on the heating-surfaces in this apparatus, this being a great desideratum in water-heating apparatus of this character.

The use of the division-plate D dispenses with the necessity of any separate chimney or shaft for the burner, and the special arrangement of this said division-plate D with respect to the rest of the apparatus forms a very important and essential feature in this invention.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent of the United States, is—

1. A water-heating apparatus consisting of an outer casing an inner and smaller vessel arranged concentrically inside said casing and forming the water-holder, a vertical annular passage up which the products of combustion pass between said outer casing and water-holder, a shallow closed-in chamber or chambers arranged horizontally below said water-holder, and connected therewith, a division-plate or partition below said hollow chambers entirely dividing the upper part of the interior of the apparatus and water-con-

taining devices from the lower part and all inlets for admitting air, an opening in said partition of a size and so arranged with respect to the burner or burners as to only permit the flame or flames thereof to pass through said opening and thereby prevent cold air reaching the water holder or chambers to be heated, as also prevent the formation of water of condensation on the surfaces to be heated of said water-holder or shallow chambers substantially in the manner and for the purposes hereinbefore described.

2. A water-heating apparatus consisting of the combination with a double casing such as F and F^x forming a water-jacket such as G, of a water-holder such as H within said casing and forming an annular passage such as Y for the products of combustion to pass up between said water-jacket G and water-holder H, shallow water-heating chambers such as K and M below said water-holder, and connected by suitable connections thereto and to the water-jacket, a burner or burners such as C arranged below said water-holding devices, and a horizontal division-plate or partition such as D between said water-holding devices and the burner C with an opening such as D' therein corresponding to the size, and fitting closely over the burner and through which the flame passes, all arranged

and acting substantially in the manner, and for the purposes hereinbefore described with reference to Figs. 1 to 3 of the drawings hereunto annexed.

3. A water-heating apparatus, consisting of the combination with a single casing such as F of a water-holder such as H within said casing and forming an annular passage such as Y for the products of combustion to pass up between said casing and water-holder H, shallow water-heating chambers, such as K and M below said water-holder, and connected by suitable connections thereto, a burner or burners such as C arranged below said water-holding devices, and a horizontal division-plate or partition, such as D between said water-holding devices and the burner C with an opening such as D' therein, corresponding to the size, and fitting closely over the burner, and through which the flame passes, all arranged and acting substantially in the manner, and for the purposes hereinbefore described with reference to Fig. 4 of the drawings hereunto annexed.

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