(No Model.)

# W. CALVER.

## WATER LENS FOR SOLAR HEATERS.

No. 290,852. Patented Dec. 25, 1883.

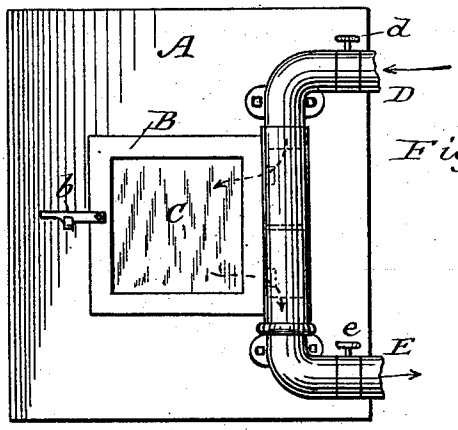



Fig. 1

Fig. 2

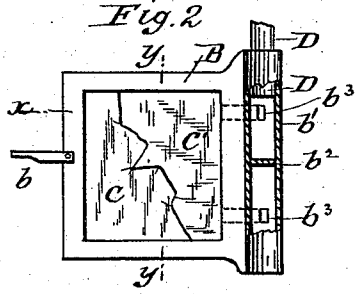



Fig. 3.

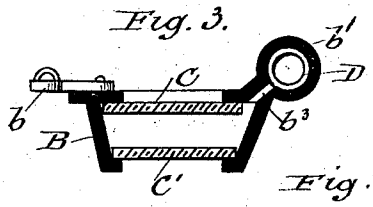



Fig. 4.

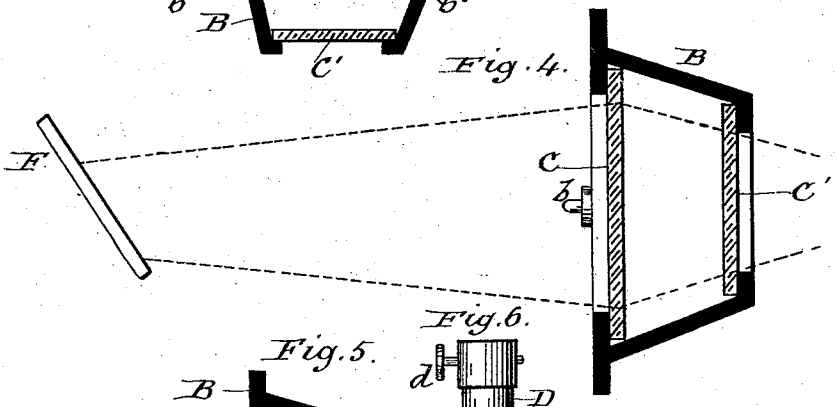



Fig. 5.

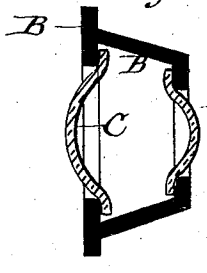
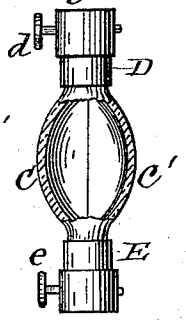



Fig. 6.

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# UNITED STATES PATENT OFFICE.

WILLIAM CALVER, OF WASHINGTON, DISTRICT OF COLUMBIA.

## WATER-LENS FOR SOLAR HEATERS.

SPECIFICATION forming part of Letters Patent No. 290,852, dated December 25, 1883.

Application filed April 25, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM CALVER, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Water-Lenses for Solar Heaters, of which the following is a specification, reference being had therein to the accompanying drawings.

The object of this invention is to provide a transparent medium through which the heat-rays of the sun can pass or be directed by means shown in the patent granted me July 4, 1882, without injury to the medium; and my invention consists in certain features hereinafter described, and specifically set forth in the claims. The intense heat produced by the method and means disclosed in my said patent necessitates the provision of improved devices for directing and storing or retaining the same, and I therefore employ a refrigerative liquid or gas, or it may be merely atmospheric air, to cool the transparent medium, which may be of glass, mica, or any other suitable material. Ordinary water-lenses will not answer the desired purpose, by reason of the very high heat to be controlled, which would instantly convert the inclosed and confined liquid into steam under high pressure, and shatter the lens into atoms. The function of retaining heat is brought into action when a refractor or lens is embodied in or constitutes the door of a heat supplying or receiving orifice in a heat-storage device or chamber, in which case the escape of heat therefrom is practically prevented. I therefore illustrate my improved lens as adapted to such a use, as well as to perform the function of a lens or refractor only.

In the drawings, Figure 1 illustrates my lens as applied to a heat-receiver and as constituting the door thereof. Fig. 2 is an elevation, partly in section, of the door detached. Fig. 3 is a section of the same on the line *x x*, Fig. 2. Fig. 4 is a section on the line *y y* of Fig. 2, and Figs. 5 and 6 are modifications.

Like letters refer to like parts in all the figures.

A represents an outer wall of a solar-heat receiver, which may be of any desired construction. Over or within the heat-receiving orifice or passage of the receiver a door or frame, B, is arranged to close the same. The door or frame B may be wholly removed, if desired, or, as in this instance, hinged to the wall of the receiver and provided with any suitable fastening, as *b*, and its conformation and mechanical construction may be such as shown, or otherwise, the requisite features of construction being capability of supporting within the heat-receiving opening or passage two walls of transparent material, C C′, and an inlet and outlet for a refrigerative substance located between said walls or communicating with the chamber or space between them. The contour of the walls may be plane, convex, concave, or any other shape in cross-section, for purposes hereinafter stated.

As shown in Figs. 1, 2, and 3, the hinge of the door or frame is formed as a pipe or tube, *b′*, having a central plug or partition, $b^2$, and a passage or port, $b^3$, each side of said partition, which ports communicate with the space between the walls C C′.

To the wall of the receiver are secured two pipes, D E, having valves *d e*, each pipe entering an end of the hinge-pipe *b* of the door or frame B, the former serving as an inlet and the latter as an outlet.

By the construction thus far described it will be seen that any suitable refrigerative substance supplied by the pipe or inlet D passes through one of the ports $b^3$ into the space between the walls C C′, and from thence out through the other port $b^3$ and pipe or outlet D, and this whatever be the position of the door or frame—that is, whether it be open or closed. Other arrangements of the means for supplying and delivering a refrigerant may be employed; but this construction is advantageous, as it is located at a side of the path of the heat-rays, and is therefore less liable to injury therefrom. Solar rays, although usually spoken of as being parallel, are, in fact, slightly divergent, and therefore, when changed in direction by any reflector, as F, Fig. 4, the divergence of the rays still exists. When the door is in the field of the reflector D some of the rays approach and come in contact with it at an angle substantially as shown by dotted lines, and these rays are, by using a liquid refrigerant or any other having the quality of refraction, refracted and directed toward the

main body of the solar beam passing into the receiver, and thus tend to increase the heat produced therein. This operation takes place when the walls C C′ are plane, and concentration of the rays may be further produced by giving the necessary convexity to said walls, as shown in Figs. 5 and 6. When the door or frame B is made to be wholly removed from the receiver, the pipes D E may serve as or constitute the wall-supporting-frame, and, if desired, they may be merged into or jointed to an annular frame adapted to hold the walls, so that any particular form may be employed in the conformation of the walls.

As thus constructed the lens may be employed either in connection with a heat-receiving or a heat-storing device, and for concentration, diffusion, or refraction of solar rays for the purpose of practical use.

I do not herein broadly claim the application of a refrigerant to a lens or reflecting device, as that feature is made the subject-matter of a separate patent.

Having described my invention and its operation, what I claim is—

1. A door or frame provided with transparent flat walls of uniform thickness, and an inlet and outlet communicating with the space between said walls, substantially as and for the purpose set forth.

2. The combination, with a heat-receiver, of a door or frame having transparent walls of uniform thickness, and an inlet and outlet arranged between said walls, substantially as specified.

3. The combination of an inlet-pipe, an outlet-pipe, transparent walls of uniform thickness, forming a communicating passage from one to the other of said pipes, and controlling-valves, substantially as specified.

4. The combination of the pipes D E, transparent walls C C′, frame B, and hinge-pipe *b*, having the partition $b^2$ and ports $b^3$, with the heat-receiver A, substantially as shown and described.

5. The combination of a reflector, as F, a frame, as B, having an inlet and an outlet, and transparent walls, as C C′, substantially as specified.

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

WILLIAM CALVER.

Witnesses:
E. B. STOCKING,
M. P. CALLAN.