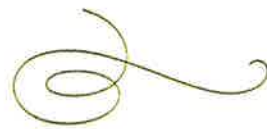


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*To Promote the Progress*

*of Science and Useful Arts*

*The Director*

*of the United States Patent and Trademark Office has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.*

*Therefore, this United States*

**Patent**

grants to the person(s) having title to this patent the right to exclude others from making, using, offering for sale, or selling the invention throughout the United States of America or importing the invention into the United States of America, and if the invention is a process, of the right to exclude others from using, offering for sale or selling throughout the United States of America, products made by that process, for the term set forth in 35 U.S.C. 154(a)(2) or (c)(1), subject to the payment of maintenance fees as provided by 35 U.S.C. 41(b). See the Maintenance Fee Notice on the inside of the cover.

*Andres Ibanez*

DIRECTOR OF THE UNITED STATES PATENT AND TRADEMARK OFFICE



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(12) **United States Patent**  
**Whetstone et al.**

(10) **Patent No.: US 10,052,569 B2**  
(45) **Date of Patent: Aug. 21, 2018**

(54) **DE-AERATOR FOR A WATER HEATING SYSTEM**

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(71) Applicants: **Stanley Whetstone**, Selby (GB);  
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(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 421 days.

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(21) Appl. No.: **14/271,210**

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(22) Filed: **May 6, 2014**

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(51) **Int. Cl.**  
**B01D 19/00** (2006.01)

(57) **ABSTRACT**

(52) **U.S. Cl.**  
CPC ..... **B01D 19/0042** (2013.01); **B01D 19/0057** (2013.01)

A de-aerator for removing dissolved gasses from water in a water heating system and a water heating system comprising such a de-aerator are disclosed. The de-aerator includes a vessel defining a chamber for receiving water which has been heated by a primary water heater, an inlet through which water can be supplied into the chamber and an outlet through which the water can exit the chamber; and a vent through which gas can exit the chamber. A diameter of the chamber decreases in a direction from the inlet towards the outlet. The chamber side wall being curved and having a non-constant radius of curvature, the radius of curvature being smaller near the outlet than near the inlet, so that water supplied into the chamber is accelerated as it flows from the inlet towards the outlet, to thereby promote de-aeration of the water. De-aeration gasses exit the chamber through the vent.

(58) **Field of Classification Search**  
CPC ..... B01D 19/0042; B01D 19/0057; B01D 19/00-19/0495  
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See application file for complete search history.

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**19 Claims, 10 Drawing Sheets**

