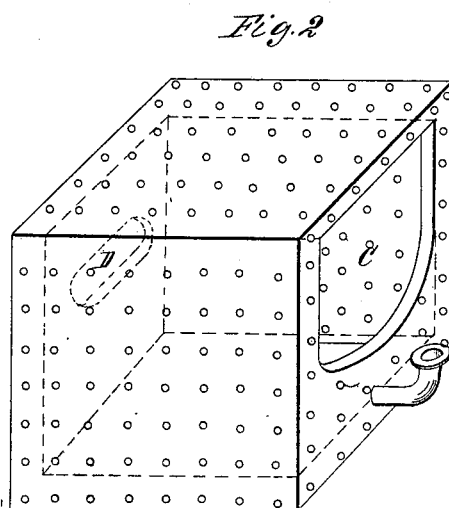
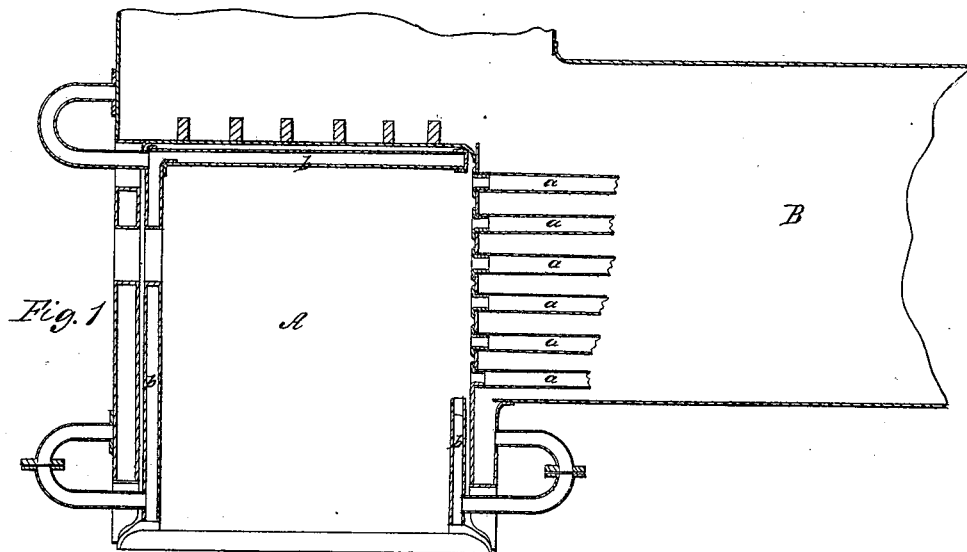


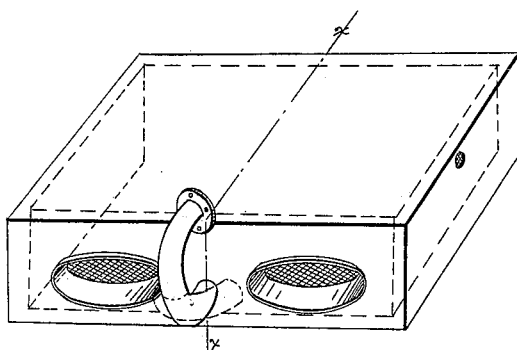
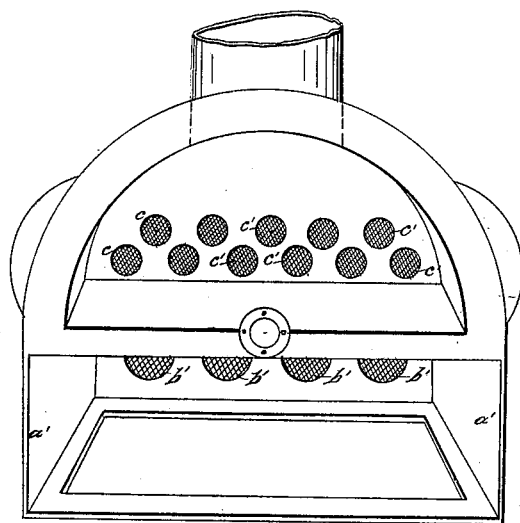
2 Sheets Sheet 1.

*J. J. De Haven,*  
*Steam-Boiler Furnace.*  
*N<sup>o</sup> 6768.                      Patented Oct. 2, 1849.*



*J. J. De Haven,* 2 Sheets, Sheet 2.  
*Steam-Boiler Furnace.*  
*N<sup>o</sup> 6,768.* *Patented Oct. 2, 1849.*

*Fig. 3*



# UNITED STATES PATENT OFFICE.

JOHN J. DE HAVEN, OF READING, PENNSYLVANIA.

## REMOVABLE WATER-LINING FOR THE FIRE-BOXES OF STEAM-BOILERS.

Specification of Letters Patent No. 6,768, dated October 2, 1849.

*To all whom it may concern:*

Be it known that I, JOHN J. DE HAVEN, of Reading, in the county of Berks and State of Pennsylvania, have invented a new and useful Improvement in Steam-Boilers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form part of this specification.

My invention consists in the application of a removable water lining, either in separate sections, or united so as to form a complete false fire-box, for the purpose of protecting the main boiler from the intensity of the fire.

In the accompanying drawings Figure 1 represents a longitudinal section of a locomotive boiler, A being the fire box, and B the cylindrical shell containing the tubes *a, a, a*. To the interior of the fire box I adapt the water lining *b, b*, either in separate sections of which each side forms one, or all united so as to form a complete false fire box, double throughout its whole extent and properly stayed, as represented in perspective in Fig. 2. (The red lines showing the contour of the interior of the fire box) C being the opening through which the flame passes to the tubes, and D the opening corresponding to the outer door of the boiler. The whole is attached to the main boiler by bolts, and is connected with it by pipes to allow of the escape of all the steam which may be generated within the lining and of a free circulation of water between it and the main boiler.

Fig. 3, represents a perspective view of a marine boiler with my improvement applied thereto the lining or false fire box is withdrawn and represented in Fig. 4. It is unnecessary that these boilers should have water legs extending outside of the lining, and their place is occupied by sheets of iron *a', a'*, to which the lining is attached and which support it in its proper position. *b', b'*, (Fig. 3) are the lower or direct flues

and *c', c'*, the upper or return flues. The lining may be either in separate sections, or all united so as to form a complete false fire box, as represented in Fig. 4; this again may be common to all the furnaces, or may be divided at the red line *x, x*, into sections each appropriated to a separate furnace, as may be found most convenient in practice. The lining in all cases is connected with the main boiler by pipes in a manner similar to and for the same purposes as those described for locomotive boilers, and represented in Figs. 1 and 2.

In locomotive and marine boilers the fuel lies in direct contact with the fire box, which being exposed to the most intense heat combined with the chemical action of the gases evolved, quickly deteriorates and is totally unfit for service long before the strength of the rest of the boiler is materially impaired, and as in the usual methods of constructing boilers, the fire-box is made part and portion of the boiler, it is impossible to remove and replace it without great loss of time and heavy outlay. In my improved construction, on the contrary, the fuel lies in contact with the lining upon which the most intense heat is spent; and as this lining is entirely independent of the main boiler, excepting the steam and water communications, it can be easily removed and replaced by a new set, without incurring any serious delay or expense.

What I claim as my invention and desire to secure by Letters Patent is—

A removable sectional or continuous water lining or false fire box, made and arranged substantially in the manner and for the purpose herein set forth.

In testimony whereof I have hereunto subscribed my name this eleventh day of April 1849.

JOHN J. DE HAVEN.

Witnesses:

E. S. RENWICK,  
P. H. WATSON.