

(No Model.)

C. W. McDANIEL.  
FEED WATER HEATER.

No. 552,136.

Patented Dec. 31, 1895.

Fig. 1.

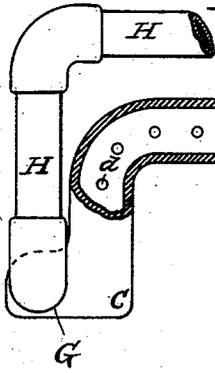
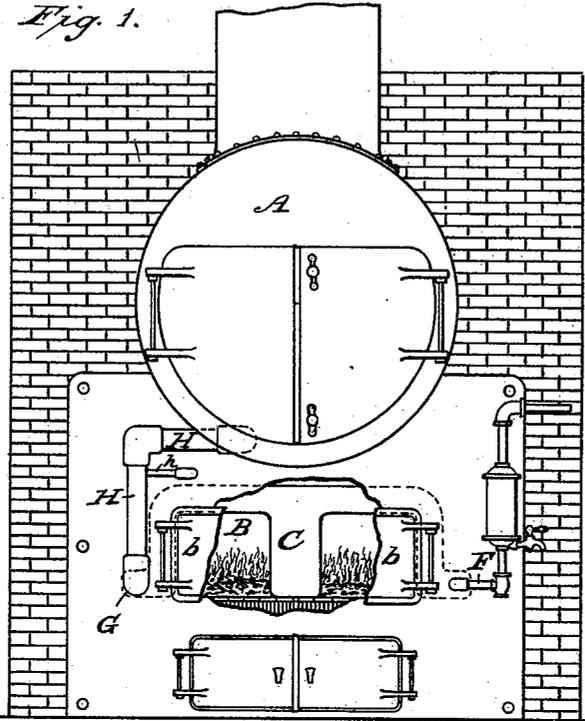


Fig. 2.

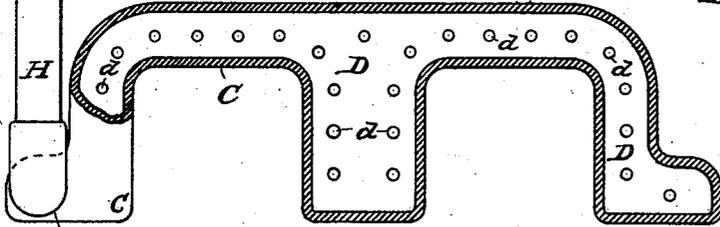


Fig. 3.

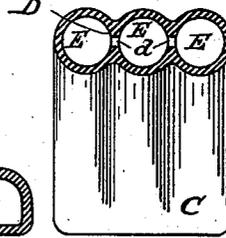
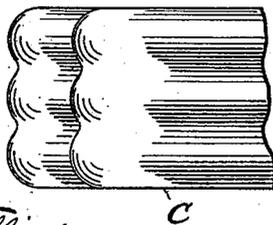


Fig. 4.

Fig. 5.



Witnesses

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Inventor

Chas. W. McDaniel  
By his Attorney J. S. Thurston

# UNITED STATES PATENT OFFICE.

CHARLES W. McDANIEL, OF LACONIA, NEW HAMPSHIRE.

## FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 552,136, dated December 31, 1895.

Application filed May 8, 1895. Serial No. 548,520. (No model.)

*To all whom it may concern:*

Beit known that I, CHARLES W. McDANIEL, a citizen of the United States, residing at Laconia, in the county of Belknap and State of New Hampshire, have invented certain new and useful Improvements in Feed-Water Heating Apparatus for Steam-Boilers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in the construction of feed-water heating apparatus for steam-boilers, and to the connection of such apparatus to the boiler, whereby the proper circulation is obtained. Among the many and various devices which have been heretofore put into practical use for this purpose difficulties have been encountered—such, for instance, as unequal expansion and superheating, the first named causing the apparatus to crack and the second to seriously interfere with if not to wholly destroy the circulation. These difficulties prompted subsequent inventors to turn their attention to constructions which, while in a more or less degree overcoming the defects above cited, added increased cost to such apparatus, which itself is an element to be avoided. Hence the objects of my present invention are to produce a feed-water heater or furnace-mouth protector in which the expansion or contraction shall be as nearly as possible equal throughout, and to simplify the boiler connection and provide for the circulation in such manner as to avoid any trouble arising from the making of steam in any portion of said apparatus.

The invention will be readily understood by reference to the following specification and claims, and to the drawings accompanying and forming a part of the same, of which—

Figure 1 is a broken elevation showing an end of a boiler, its furnace, and my improved feed-water heater or furnace-mouth protector in proper position. Fig. 2 is a longitudinal section of my improved heater as when detached, Fig. 3 being a cross-section of the

same. Fig. 4 is a plan view of the construction shown in Fig. 2, and Fig. 5 is a modified form of construction showing lateral corrugations.

Similar letters of reference denote corresponding parts in all the views.

A represents a steam-boiler, and B a steam-boiler furnace having two feed-doors *b*, and C is my improved feed-water heater or furnace-mouth protector, which is supported in the usual manner, and which, of course, in the present instance is of a form adapted to a double-door furnace; but my improvements are equally well adapted to furnaces having a single door.

This improved feed-water heater may be made of wrought or cast metal, as may be preferred, the essential features in its construction being its corrugations longitudinally or laterally or both combined, or, in other words, its corners are all to be rounded, thus providing that its metal will be at all points as nearly as possible equal in thickness in order to equalize its expansion and contraction.

The heater C is provided with one or more partitions D, which run longitudinally, and when formed of cast-iron these partitions represent the metal between the cored portions, and a cross-section of the heater so formed has the appearance of pipes arranged parallel and attached together, as seen in Fig. 3, each chamber or passage E being connected with another by perforations at intervals, as at *d*, Figs. 2 and 3, formed for the purpose in the partitions D. The supply to the heater may be taken at either end at or near its bottom, as seen at F, and at a similar point at the opposite end, as at G, I attach a large pipe H, which in service combines the discharge and the boiler circulation and forms a single connection between the feed-water heater and the boiler. By making this single connection H sufficiently large it will readily take care of not only the water-circulation but the steam which might form in the heater when the pump is shut off as well. However, by connecting the heater C at a point near its top with the pipe H by a small

pipe *h* any extraordinary accumulation of steam will rise through the pipe *H* and find its way to its place in the boiler.

It is essential, in order that the circulation  
5 may be as nearly as possible uniform throughout the chambers or passages *E*, that the perforations *d* shall be in alignment or opposite to each other, especially so with relation to those nearest the supply-pipe or opening,  
10 thus increasing the efficacy of my improved apparatus.

Having described my improvements, what I claim is—

1. A furnace mouth protector or feed-water  
15 heater having a corrugated surface, and one or more partitions running longitudinally therein, means substantially as described whereby circulation is maintained between said  
20 water-ways, an opening at or near the bottom at one end for the supply and one simi-

larly located at the opposite end for the discharge, and a pipe connecting the latter with the boiler.

2. A furnace mouth protector or feed-water  
25 heater having a corrugated surface, rounded corners, and partitions running longitudinally therein, water-ways formed by said partitions, perforations in the latter whereby  
30 the water may freely circulate from one to another of the said water-ways, an opening at or near the bottom at one end for the supply and one similarly located at the opposite  
35 end for the discharge, and a pipe connecting the latter with the boiler.

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

CHARLES W. McDANIEL.

Witnesses:

J. B. THURSTON,  
GEORGE I. MCALLISTER.