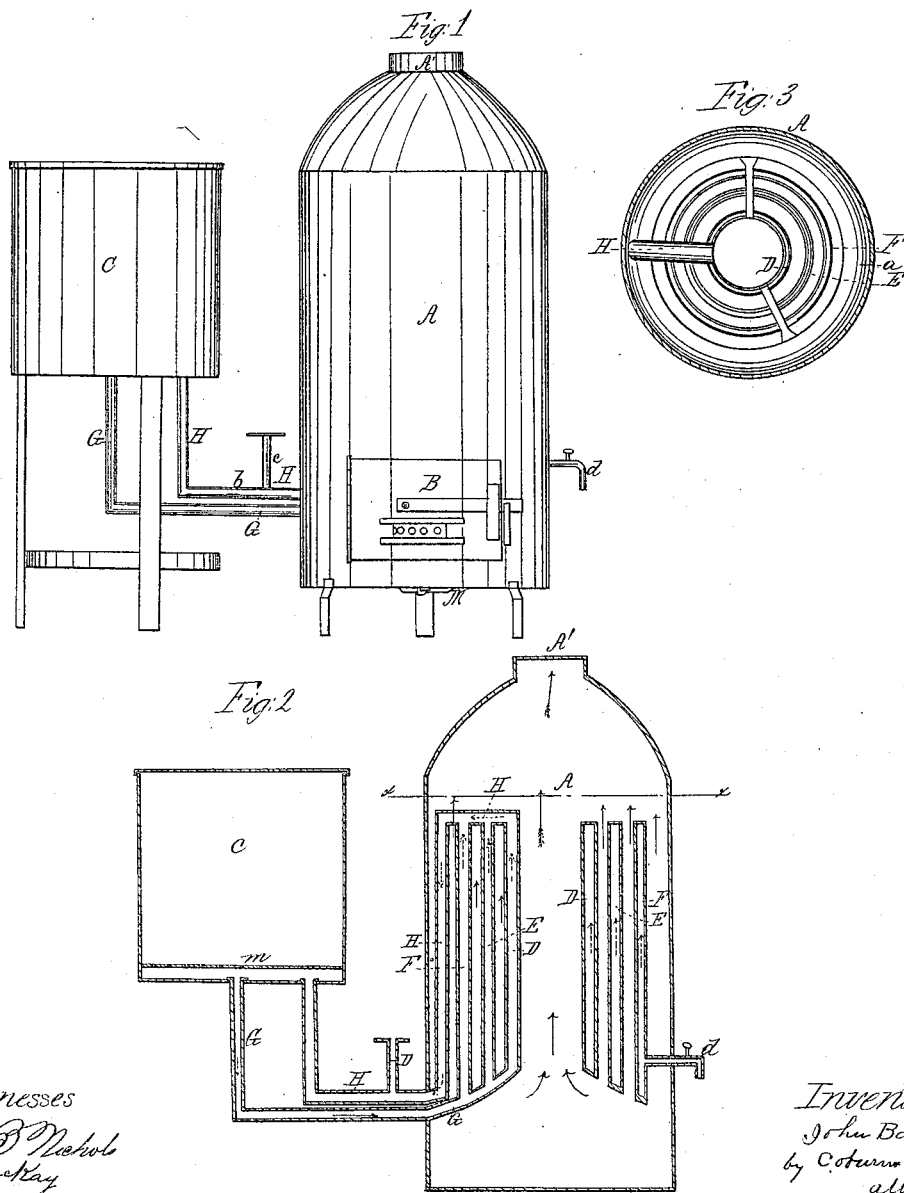


*J. Badger,*  
*Steam-Boiler Water-Tube.*  
*N<sup>o</sup> 51,788.                      Patented Jan. 2, 1866.*



*Witnesses*  
*E. B. Nichols*  
*J. McKay*

*Inventor:*  
*John Badger*  
*by C. O. Harris*  
*attorneys*

# UNITED STATES PATENT OFFICE.

JOHN BADGER, OF CHICAGO, ILLINOIS.

## IMPROVEMENT IN STEAM-GENERATORS.

Specification forming part of Letters Patent No. 51,788, dated January 2, 1866.

*To all whom it may concern:*

Be it known that I, JOHN BADGER, of Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Steam-Boilers; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, and the letters and figures marked thereon, which form part of this specification.

The nature of my said invention consists in constructing a steam-boiler in such a manner that the chamber or chambers containing the water are wholly surrounded by the fire and heat employed for generating steam, and are of such a nature that the water is presented to the action of the heat in thin or shallow masses, so as to be readily and quickly converted into steam, and which are constantly supplied with feed-water from any suitable reservoir, substantially as hereinafter described, effecting a very important economy in fuel, and producing a given quantity or pressure of steam with much less fuel than is required in any of the steam-boilers now in use.

To enable those skilled in the art to understand how to construct and use my invention, I will proceed to describe the same with particularity, reference being made in so doing to the aforesaid drawings, in which—

Figure 1 represents a front elevation of my invention; Fig. 2, a vertical central section of the same; and Fig. 3 a plan or top view thereof, in section, at the line *x* in Fig. 2.

Similar letters of reference in the several figures denote the same parts in my invention.

A represents a cylindrical metallic casing or furnace inclosing the water-chambers or boiler, provided at its lower part with the door B, through which fuel is introduced, A' representing the part to which the funnel or pipe is attached which conveys off the smoke and induces the fire-draft.

C represents the feed-water reservoir, connected with the boiler by the pipes G and H, as hereinafter mentioned.

D E F represent a series of concentric annular chambers or water-spaces, arranged vertically within the fire-chamber or furnace A, as shown, being held in position and attached to the inclosing-cylinder by any suitable metallic stays, so that the fire, heat, and smoke

produced by the combustion in the furnace readily passes up through the circular passage within the water-space F and the annular concentric passages between said series of water-spaces and the cylindrical inclosure A, and passes off at A'.

*a a* represent one or more circular flanges or deflectors attached to the inner side of the furnace-wall, to deflect the heat in upon the water-space D. The lower end of the inner water-space D is high enough to allow a sufficient space below for the fire, while each exterior water-space successively extends lower down, as shown. The pipe G, leading from the reservoir C, is connected with each of said water-spaces at their lower ends, as shown, and is the means whereby the boiler is supplied with water. The pipe H, connected with the said water-spaces at their upper ends, is the conduit through which the steam escapes and is conveyed to its appropriate uses. As represented, the said pipe leads into the reservoir C, for the purpose of heating the water therein, *m* representing a false perforated bottom to prevent any impurities from finding their way into the boiler through the pipe G.

L represents a branch pipe, through which, by closing a stop-cock at *c* and opening one at *b*, the steam may be conveyed to any other place, to be used for any other purpose.

*d* represents a stop-cock, for drawing off the water from the boilers when it may be desired.

M represents a hinged bottom arranged beneath the grate, hinged at its rear side or edge, and held up by a bar and catch or any other suitable device, so that by lowering said bottom the air may be freely admitted, so as to produce a uniform combustion in all parts of the fuel.

By the arrangement herein described it will readily be seen that a much larger heating-surface is obtained than is afforded in steam-boilers of the ordinary construction, and by arranging the water in thin sheets, as it were, the same is converted into steam much more rapidly by a given amount of heat than when the water is in large boilers, as is usual in steam-boilers.

The cylindrical form of the furnace and the annular form of the water-spaces are obviously immaterial, as the principle is the same whether said water-spaces are annular, as shown, or

rectangular, or are in form of a parallel series of shallow pans, provided they are arranged so as to allow the heat to surround the same, substantially as herein described.

This invention may obviously be applied to all classes of steam-generators, whether for locomotive or stationary steam-engines, or for heating purposes, by appropriate adaptations of the parts.

Having described my invention, I will now

specify what I claim and desire to secure by Letters Patent—

The series of water-chambers D E F and the reservoir C, when connected by the water-pipe G and steam-pipe H, and all constructed and arranged substantially as and for the purposes herein specified.

Witnesses:

JOHN BADGER.

W. E. MARRS,

J. M. MARSHALL.