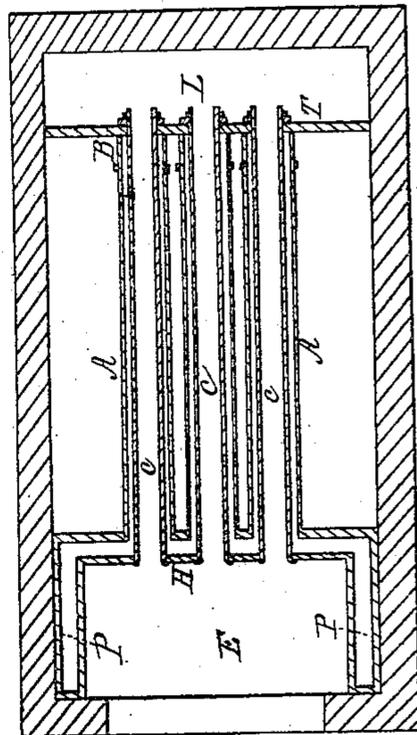
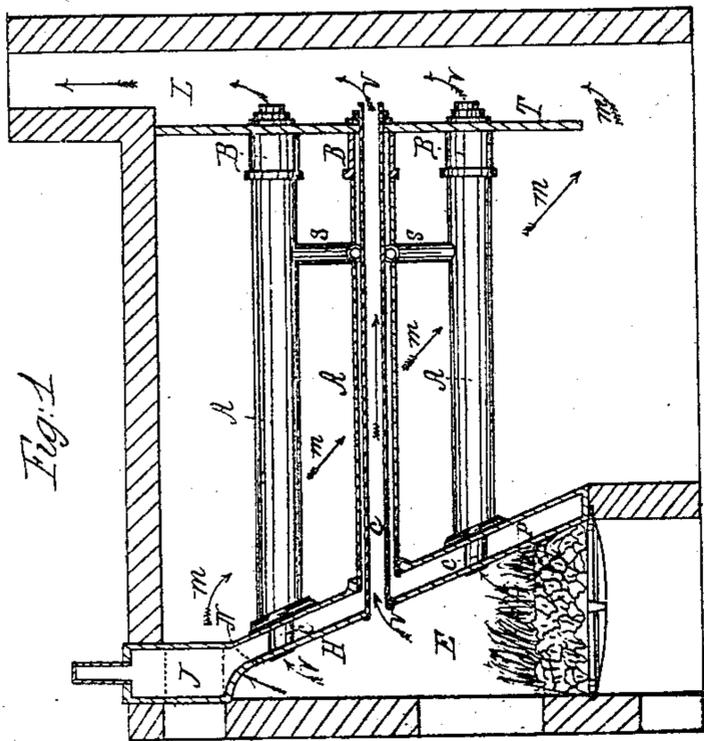
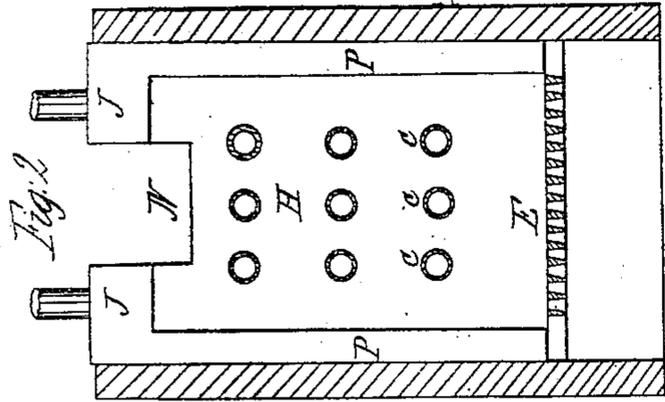


E. BOURNE.  
STEAM GENERATOR.

No. 64,479.

Patented May 7, 1867.



Witnesses:  
Josiah W. Ellis  
W. H. Seitch

Inventor:  
Edward Bourne

# United States Patent Office.

EDWARD BOURNE, OF PITTSBURG, PENNSYLVANIA.

Letters Patent No. 64,479, dated May 7, 1867.

## IMPROVEMENT IN STEAM GENERATORS.

The Schedule referred to in these Letters Patent and making part of the same.

### TO ALL WHOM IT MAY CONCERN:

Be it known that I, EDWARD BOURNE, of the city of Pittsburg, in the county of Allegheny, and State of Pennsylvania, have invented a new and useful improvement in Steam Generators; and I hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming part of this specification, and to the letters of reference marked thereon.

My invention consists in enclosing the smoke-tubes of a steam generator, each within a separate tube or cylinder, somewhat larger in diameter, so as to form a shallow water space between the two, and so arranging and combining them with relation to the fire-box and the water space therein as that the smoke or products of combustion not only pass through the internal tubes, but can at the same time be made to pass around the outside of and between the external tubes or surrounding cylinders, whereby a larger amount of heating surface is obtained in the same area than in the ordinary manner of constructing boilers.

To enable others to understand, make, and put in operation my improved steam generator, I will proceed to describe its construction, by reference to the annexed drawings, wherein—

Figure 1 represents a longitudinal vertical section.

Figure 2, a front elevation.

Figure 3, a transverse longitudinal section, illustrating my invention.

All the drawings are lettered, and similar letters denote corresponding parts in the several views.

I first construct a fire-box or combustion chamber, E, of cast or wrought iron, and with double walls, so as to leave a space, P, between for the circulation of water on three sides of the fire, in a manner similar to those now in use; but instead of the back H of the fire-box E being carried up in a vertical line, as is usual in such cases, I give the plates, and thereby the water space P forming the fire back, an inclination forward, or set it at an angle of about forty-five degrees, which is found in practice to be the best mode of construction. This inclination is continued to the top of the fire-box E, when from this point it ascends vertically, the space P between the plates being enlarged so as to form a steam receiver, J, at each upper end of the back H, leaving between them an opening, N, answering the purpose of a flue. Through the plates forming the fire-back H are drilled, or otherwise made, a series of horizontal holes, into which a corresponding number of tubes are inserted and secured, the holes in the front plate being about one inch and a half in diameter, and support the ends of the small tubes C C, while those in the back plate, although on the same line, are made some two inches larger, into which are fitted, by screw or otherwise, the forward ends of the outside tubes A A. It will be seen by reference to fig. 1 that the forward ends of the small tubes C C are united to the front plate, and pass through the water space P, while the larger ones are slipped over them and are secured to the back plate, leaving an opening for the passage of water from the space P between the plates composing the fire back H into the space between the tubes C and A. The opposite ends of these tubes are held in place by passing through a heavy partition plate, T, at the rear end of the furnace. The joint between the tubes at this point and the method of securing them to the partition plate T is accomplished by means of "reducing sockets" B B, a plan well understood by mechanics. To insure a perfect and lively circulation of water, and thereby prevent foaming, &c., I have connected the spaces between the tubes C and A by means of short vertical pipes, S S, which is found to be the best means adopted for this purpose and to work well in practice. The boiler or generator so constructed is to be enclosed in a brick wall, built in the usual manner, or surrounded by a cast-iron frame lined with brick, at the option of the builder, and provided with the necessary doors for firing, cleaning out the ashes, flues, &c., as the case may require.

The operation is as follows: A fire having been lighted in the furnace, as combustion takes place, a portion of the flame and heat will enter and pass through the tubes C C in the direction of the arrows V V V, shown in fig. 1; but as the heat increases the remaining portion of heat will ascend, pass through the flue N at the top of the fire back H, taking from thence a diagonal downward direction, indicated by the arrows m m, passing in its way down around the outside of the large tubes A A, and under the lower edge of the partition plate T ascend the main flue L, or by a system of dampers properly arranged the whole of the heat generated may be made to pass through the tubes C C or over the fire back H, and around the outside of the tubes A A.

Having thus described my invention, I claim—

So arranging and combining the tubes with relation to the fire-box and the water space therein, as that the smoke or products of combustion not only pass through the internal tubes, but can be made to pass around the outside of and between the external tubes or surrounding cylinders, substantially as herein shown and set forth.

EDWARD BOURNE.

Witnesses:

JOSIAH W. ELLS,  
W. H. LEITCH.