

(No Model.)

2 Sheets—Sheet 1.

J. MILLER & D. HOWARTH.  
STEAM GENERATOR.

No. 273,579.

Patented Mar. 6, 1883.

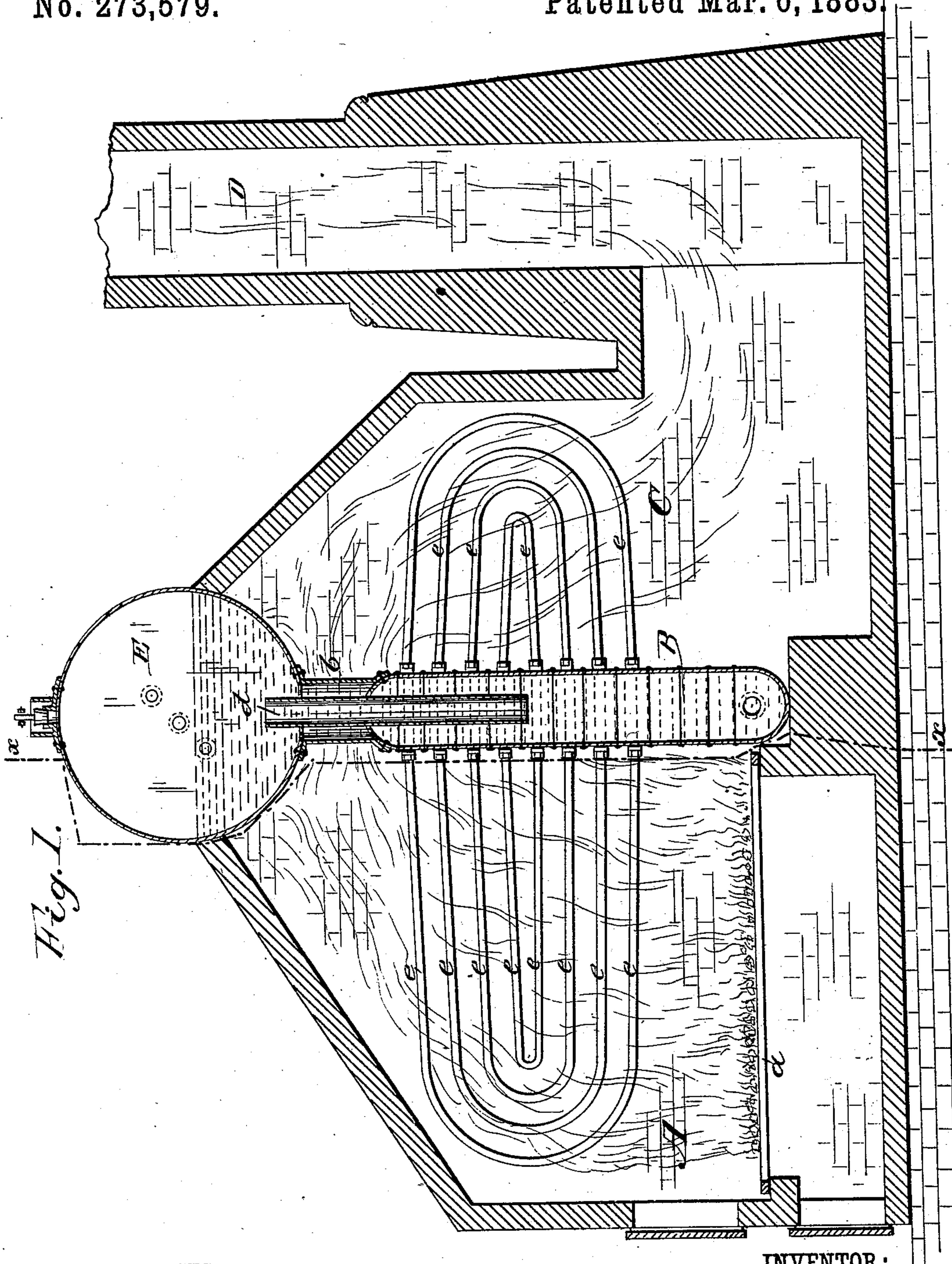


Fig. 1.

WITNESSES

*Wm. P. Beyer*  
*C. Sedgwick*

INVENTOR:

*J. Miller*  
*D. Howarth*  
BY *Mum & Co*  
ATTORNEYS.



(No Model.)

2 Sheets—Sheet 2.

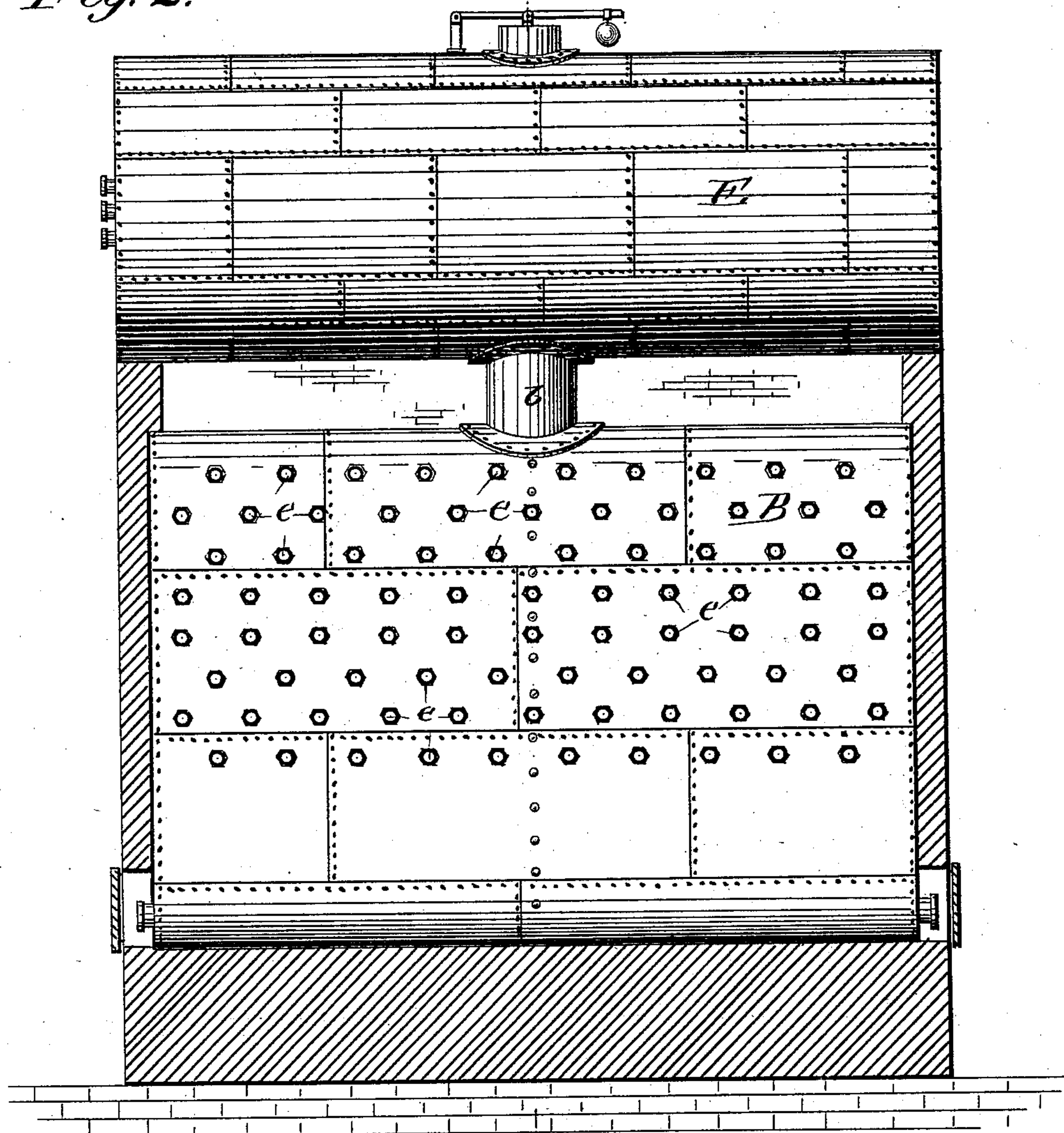
J. MILLER & D. HOWARTH.

STEAM GENERATOR.

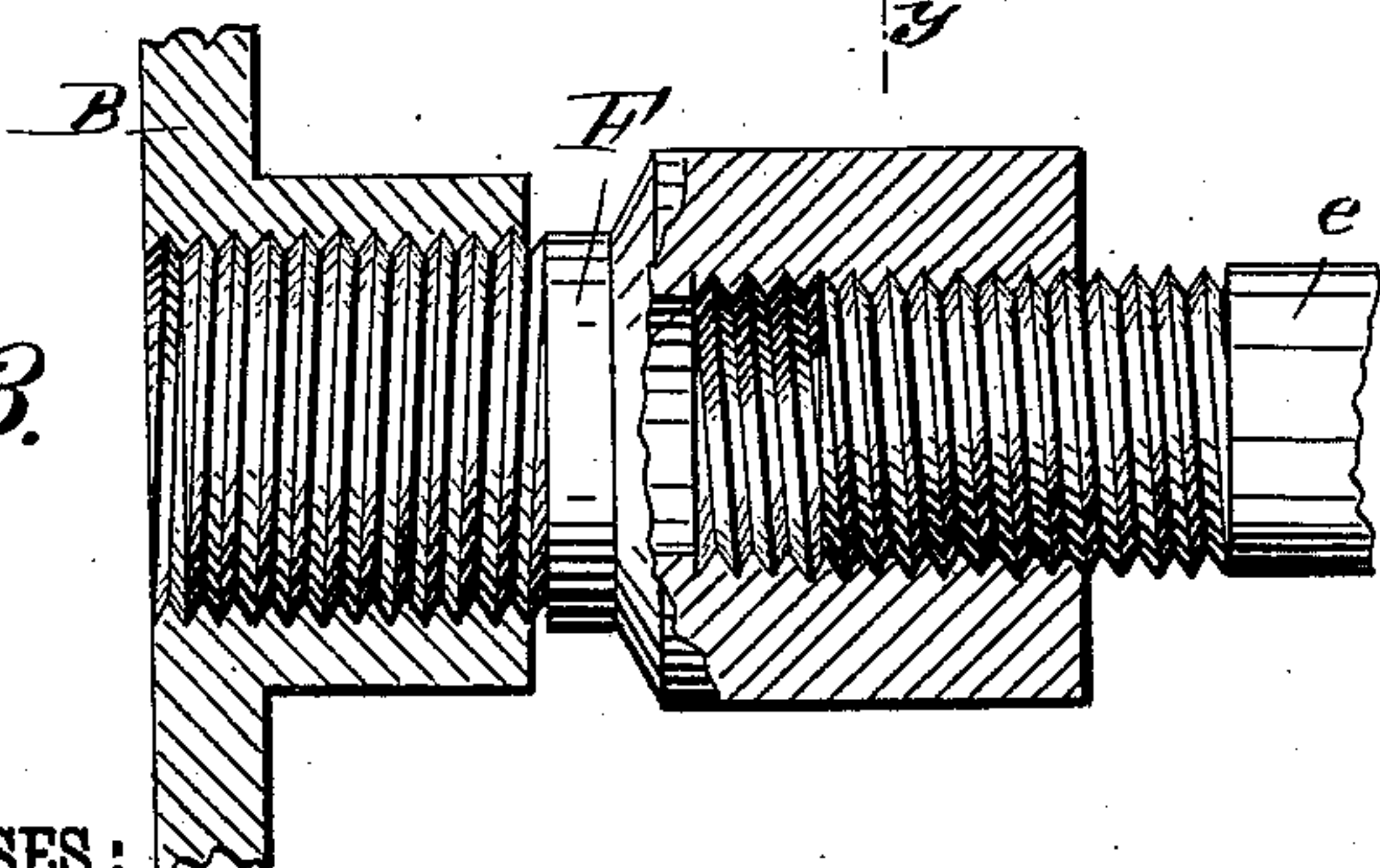
No. 273,579.

Patented Mar. 6, 1883.

*Fig. 2.*



*Fig. 3.*



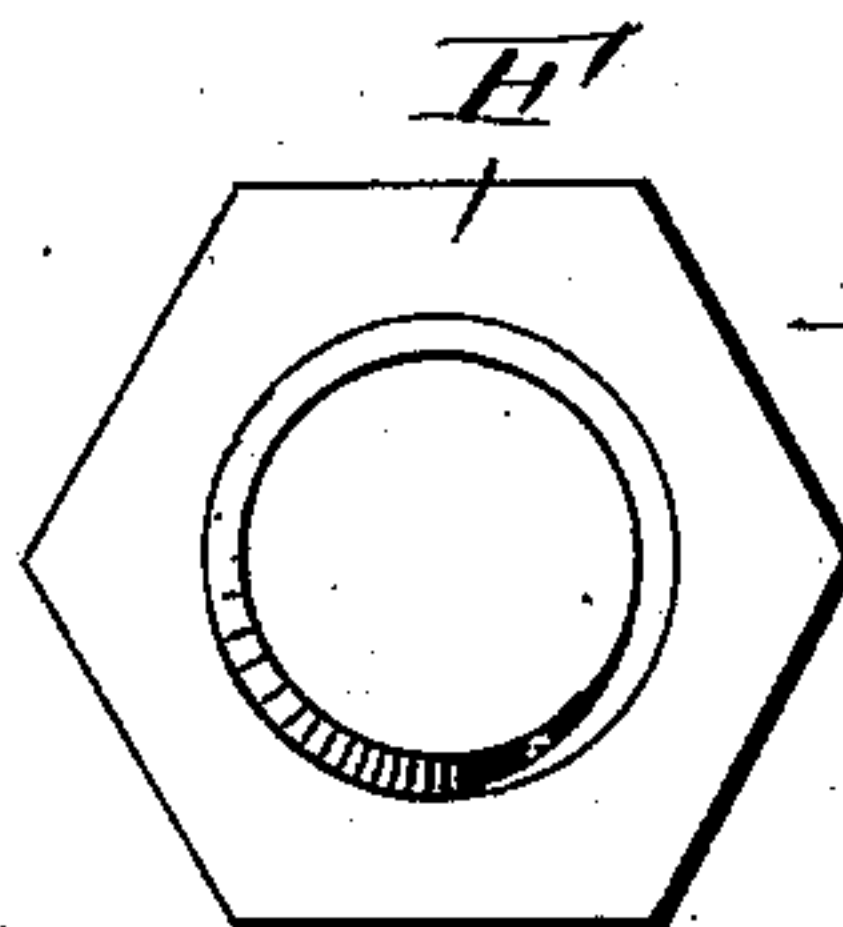
WITNESSES:

*O. H. Beyer*  
*L. Sedgwick*

INVENTOR:

*J. Miller*  
*D. Howarth*  
BY *Mum & Co*  
ATTORNEYS.

*Fig. 4.*





# UNITED STATES PATENT OFFICE.

JOSEPH MILLER AND DANIEL HOWARTH, OF OLEAN, NEW YORK, ASSIGN-  
ORS OF ONE-HALF TO MILLS W. BARSE, OF SAME PLACE.

## STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 273,579, dated March 6, 1883.

Application filed October 18, 1882. (No model.)

*To all whom it may concern:*

Be it known that we, JOSEPH MILLER and DANIEL HOWARTH, of Olean, in the county of Cattaraugus and State of New York, have in-  
5 vented certain new and useful Improvements in Steam-Generators, of which the following is a full, clear, and exact description.

The object of our invention is the construction of a durable steam-boiler for the rapid  
10 generation of steam and by economical use of fuel.

To that end our invention consists in a water-chamber placed to form the back or bridge wall of the furnace and provided with circulation-  
15 tubes, which extend into the fire-box and combustion-chamber, as hereinafter described and claimed.

Reference is to be had to the accompanying drawings, forming part of this specification, in  
20 which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a longitudinal section of a boiler of our improved construction. Fig. 2 is a transverse section of the same on the line  $x x$   
25 of Fig. 1. Fig. 3 shows the connection of the tubes to the shell of the water-chamber. Fig. 4 is an end view of the connecting-tube.

A is the fire-box, provided with grate-bars  $a$ , and having its upper side formed at an in-  
30 clination, as shown.

B is the boiler or water-chamber, placed at the back of the fire-box, and extending into the side walls at its ends.

C is the combustion-chamber at the back of  
35 the boiler B, and D is the chimney.

E is the steam-drum, which extends transversely of the fire-box and above the boiler, being supported by the side walls of the fire-box; but the drum may, if desired, extend  
40 lengthwise of the stack. The position of the drum is such that there is a space between the upper edge of the boiler B and the under side of the drum, so that the products of combustion from the fire-box may pass freely over.

45  $b$  is a tube connecting the drum E and boiler B, and  $d$  is an interior tube, which extends down to or near the middle portion of the water-chamber B. It is to be supported

in any suitable manner, and serves to prevent disturbance of the equilibrium of the water  
50 by the steam passing to the drum.

The water-chamber or boiler B is made of long and flat form, so as to form a bridge-wall at the back of the fire-box. To the sides of the water-  
55 chamber B the tubes  $c$  are connected by both ends to the shell of the boiler, and they project, those on one side into the fire-box A, and those at the other side into the combustion-  
60 chamber C. They are also placed alternately, so that the heat and products of combustion passing through between them shall be caused to come more intimately in contact with the  
65 tubes. The tubes are attached by the unions F, (shown in Figs. 3 and 4,) which are formed at one end with a right-hand thread to receive the tube, and at the other end with a reverse  
70 thread for entering the shell of the boiler. They are to be made of steel or malleable iron, and are formed with an angle-faced portion, which allows attachment of a wrench. The  
75 tubes  $c$  may be placed on one or both sides of the water-chamber, and as they are all attached with one end of each higher than the other a circulation of water through them is  
80 secured.

This construction furnishes a safe, inexpensive, and durable boiler of compact form, not liable to become injured by expansion and contraction. It is to be observed that each tube  
85 is independent, so that each one is free to expand and contract, according to the heat it may receive, without affecting the others. There will be a continual circulation of the water through the tubes, which will cause sediment to fall to the bottom of the water-chamber B,  
90 where hand-holes are provided for its removal.

Having thus fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. The combination, with the furnace having chimney D, of the transverse steam-drum E, partly in the furnace, the bridge-wall boiler B, having on each side the pipes  $c$ , connecting therewith at both ends, and the connecting-pipe  $b$ , whereby the products of com-  
95 bustion will come in contact with the drum,

both sides of the boiler and the pipes on each side of the boiler, as described.

5 2. The combination, with the boiler, steam-drum, tube *b*, and furnace, all arranged substantially as described, of the pipes *c*, curved successively around one another and secured at both ends to the boiler, and the tube *d*, having its upper end in the steam-drum and its

lower end in the boiler, below the upper end of each pipe *c*, as shown, to operate as described. 10

JOSEPH MILLER.  
DANIEL HOWARTH.

Witnesses:

M. W. BARSE,  
E. C. HOWARD.