

(No Model.)

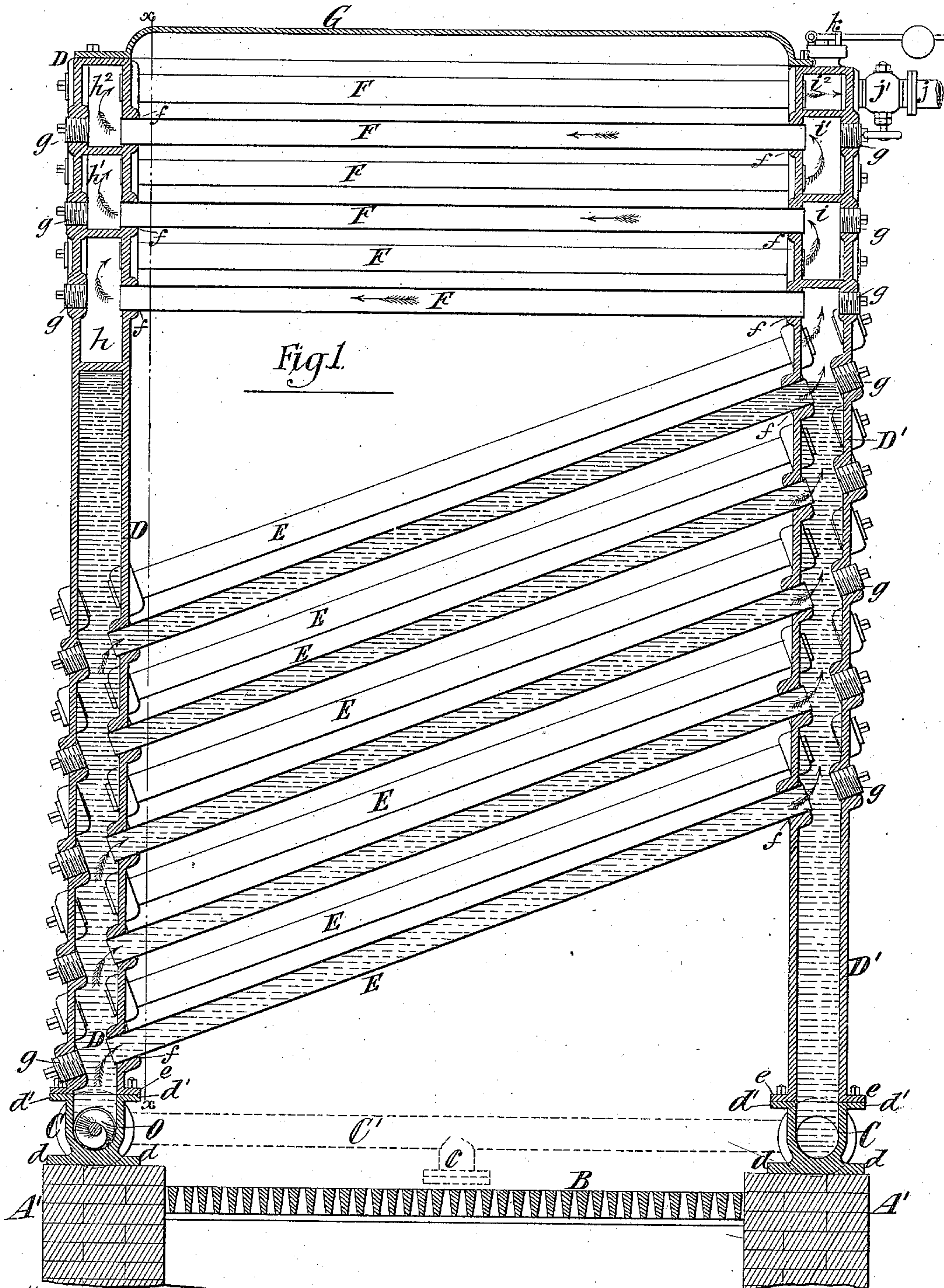
2 Sheets—Sheet 1.

B. T. BABBITT.

STEAM GENERATOR.

No. 309,282.

Patented Dec. 16, 1884.



Witnesses:-  
Louis M. F. Whitehead.  
Harry Bogert

Inventor:-  
Benjamin T. Babbitt  
By his Attorneys  
Brown & Hall



(No Model.)

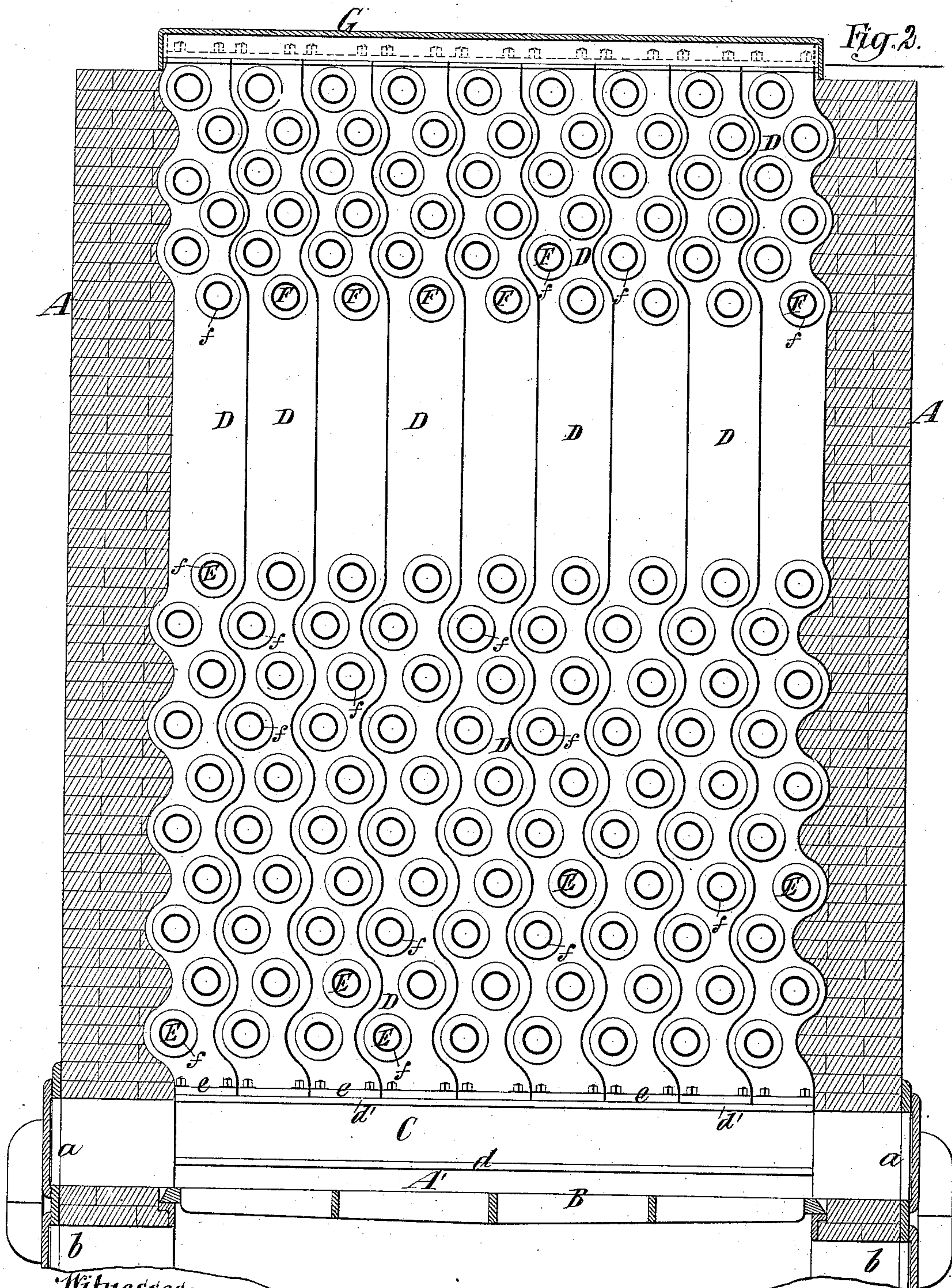
2 Sheets—Sheet 2.

B. T. BABBITT.

STEAM GENERATOR.

No. 309,282.

Patented Dec. 16, 1884.



Witnesses:

Louis M. Whitehead.

Harry Bogert

Inventor:

Benjamin T. Babbitt  
by his Attorneys  
Brown & Hall



# UNITED STATES PATENT OFFICE.

BENJAMIN T. BABBITT, OF NEW YORK, N. Y.

## STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 309,282, dated December 16, 1884.

Application filed March 8, 1884. (No model.)

*To all whom it may concern:*

Be it known that I, BENJAMIN T. BABBITT, of the city and county of New York, in the State of New York, have invented a new and useful Improvement in Steam-Generators, of which the following is a specification.

My invention relates to sectional steam-generators in which two series of headers forming two opposite upright walls of the generator are connected by water-tubes, which all extend from one series of headers upward and across to the other series; and it further relates to generators in which the steam, after escaping from the headers above described, is made to pass back and forth between oppositely-arranged series of headers, whereby it is thoroughly superheated.

The invention consists in novel features in the construction and manner of supporting and connecting the headers and supplying them with feed-water, all of which are hereinafter described, and set forth in the claims.

In the accompanying drawings, Figure 1 is a vertical section of a generator embodying my invention, taken in a plane lengthwise of the tubes; and Fig. 2 is a vertical section in a plane at right angles to the plane of Fig. 1 and on the dotted line *x x*.

Similar letters of reference designate corresponding parts in both figures.

Two opposite walls of my improved generator are formed of brick-work A, in which are fire-doors *a a* on opposite sides and above the grate B, and ash-pit doors *b b* below the fire-doors, as shown in Fig. 2. The other two opposite side walls are formed of brick-work, A', to a point slightly above the grate B, as shown in Fig. 1, and on the brick-work A' rest horizontally-extending headers C, which are connected at their ends by a pipe, C', (shown dotted in Fig. 1,) and with which the feed-pipe *c* communicates, as also shown dotted in Fig. 1. The horizontal headers C are approximately U-shaped in transverse section, as shown in Fig. 1, and at their under sides are provided with base-flanges or feet *d*, on which they stand and are supported, while they have continuous flanges *d'* at the tops. These horizontal headers are exposed to the direct action of the fire on the grate B. Upon the top of the horizontal headers C are erected two series of upright headers, D D', which are

of cast metal, the headers in each series being arranged side by side, as shown in Fig. 2, so as to form an approximately tight wall. At the lower ends of the upright headers are flanges *e*, whereby they are bolted to the horizontal headers C. The headers D D' of the two opposite series are connected by water-tubes E, which extend at a steep inclination from the headers D upward and across to the opposite headers, D', as best shown in Fig. 1. The headers are formed with oblique tube holes or hubs *f*, into which the tubes E are expanded, and with opposite holes or screw-threaded sockets which are closed by plugs *g*. The tubes E are set at such a steep inclination that there is no chance for sediment to lodge in them, and it will all pass to the headers D at the lower ends of the tubes. The above-mentioned flanged ends *e* of the headers D D' are entirely open, and hence there is a free communication between the horizontal headers C, and all the upright headers and all sediment will settle in the said horizontal headers, which may be cleaned with the greatest ease by simply taking off their heads at opposite ends. The tubes E are arranged in vertical tiers, as best shown in Fig. 2, the tubes in each tier being arranged in zigzag or staggered relation to each other, and each header D or D' receives into it the tubes of one vertical tier. In order to so receive the tubes when they are in zigzag relation to each other, the said headers are given a serpentine form, as shown in Fig. 2, and they match together, so as to form a practically tight wall. From the horizontal headers C water passes upward freely into the upright headers D D', and from the headers D water circulates through the tubes E to the headers D'. There are no cross-partitions in the headers D or D' below the topmost tube E and hence the water can freely enter the whole series of tubes E from the headers D, and can pass freely upward through the tubes E. Owing to the steep inclination of the tubes E, the steam in them will be afforded a free passage upward, and when once in the headers D' it can rise easily to the surface of the water therein. Some steam of course is generated in the headers D D', and can freely escape from the water, but the larger part of the steam is generated in the tubes E, and as the water circu-



lates upward through said tubes it passes down the headers D' to the header C, and thence across through the pipe C' to the opposite header, C, and upward through the headers D.

So far as the steam-generating portion of the apparatus is concerned the above description is complete, and I may employ any superheater for the steam. A very desirable superheater is produced by extending the headers D D' upward considerably above the tubes E and connecting them by tubes F, which are horizontally arranged, as shown in Fig. 1. The tubes F are also expanded into the headers D D' in the holes *f*, and said headers have opposite holes closed by plugs *g*.

As before stated, the headers D D' are unobstructed by partitions to a point above the tubes E; but their upper portions are divided by transverse partitions, so as to form in the headers D chambers *h h' h<sup>2</sup>*, and in the headers D' similar chambers or chests, *i i' i<sup>2</sup>*.

The circulation of the steam in the superheater is clearly shown by arrows in Fig. 1. From the upper part of the space in the headers D' the steam passes through the lower tube F to the chamber *h*, then through the next tube back to the chamber *i*, then across to the chamber *h'* and back to the chamber *i'*, then across to the chamber *h<sup>2</sup>* and back to the chamber *i<sup>2</sup>*, from which the superheated steam passes by a pipe, *j*, under control of the valve *j'*. As here shown, a safety-valve, *k*, is applied to the chamber *i<sup>2</sup>*. By the passage of steam and any water carried over with it back and forth across the generator under the influence of the heat all such water is converted into steam, and is thoroughly superheated before passing to the supply-pipe *j*. The top of the generator is covered by a plate or cap, G, which may be metal, and the smoke-pipe may lead from this covering-plate or through the upper part of one of the walls A.

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

1. The combination, with the opposite walls A' and the grate B, near the top thereof, of the horizontal headers C, open at their upper sides, connected at their ends, and supported upon the walls A', the upright headers D D', arranged in two series, open and flanged at their lower ends, and secured in close contact side by side upon the headers C C, the headers C C and D D', forming opposite walls of the generator and being exposed to the direct heat of the fire, and the water-tubes E, all extending from one series of headers, D, across and upward at an inclination to the other series of headers, D', all organized and adapted for operation substantially as herein described.

2. The combination, with the grate B, of a generator having its opposite walls composed of horizontal headers C, connected at their ends, and two series of upright headers mounted upon and communicating with said headers C, and tubes E, all extending from one series of headers at an upward inclination to the other series of headers, said tubes being arranged in vertical tiers and in staggered or zigzag relation to each other in each tier, and the upright headers being of serpentine form, so as to severally receive the tubes of one vertical tier, substantially as herein described.

3. The combination of the grate B, the horizontal headers C, at opposite sides thereof, the pipe C', connecting the ends of said headers, upright headers D D', open at the lower ends, and having superposed chambers in their upper portions, water-tubes all extending from the headers D at an upward inclination to the headers D', and the tubes F, connecting the superposed chambers in said headers and forming a superheater, substantially as herein described.

B. T. BABBITT.

Witnesses:

C. E. SABIN,  
L. STAMM.