

(No Model.)

F. D. ALTHAUSE.
SECTIONAL STEAM GENERATOR.

No. 354,172.

Patented Dec. 14, 1886.

Fig. 2.

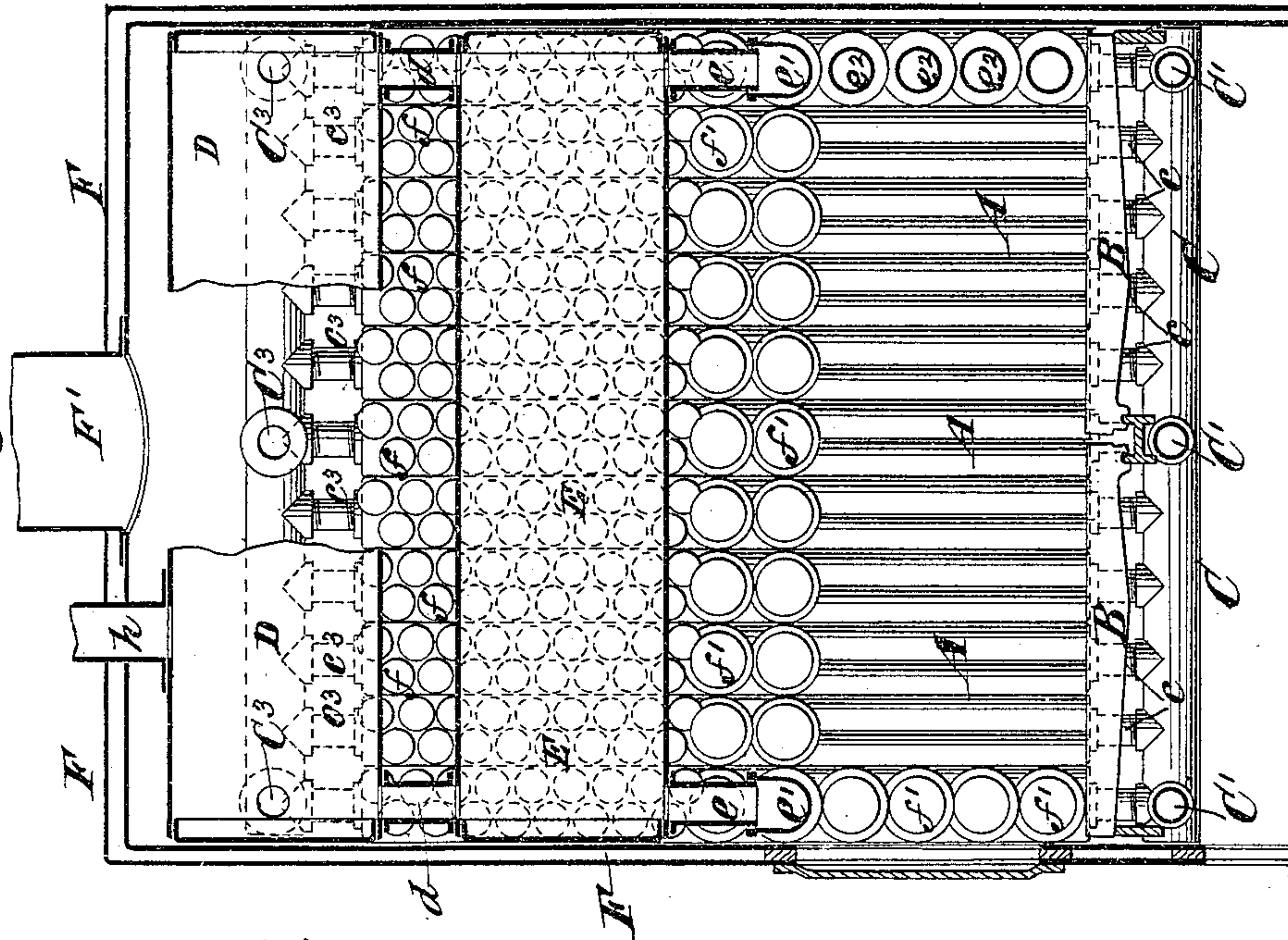


Fig. 3. Fig. 4.

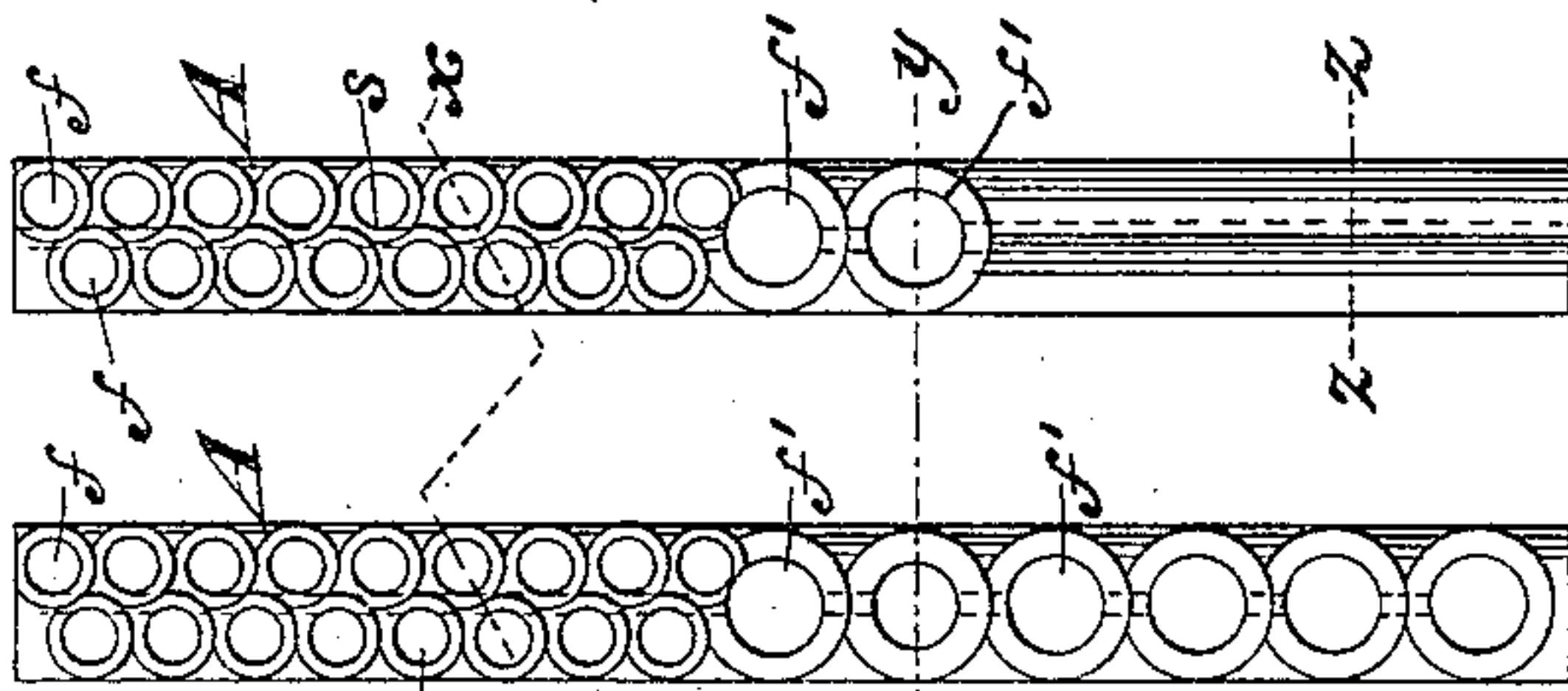


Fig. 7.

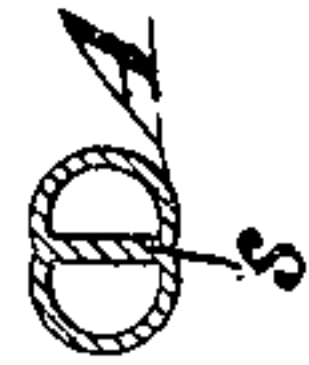
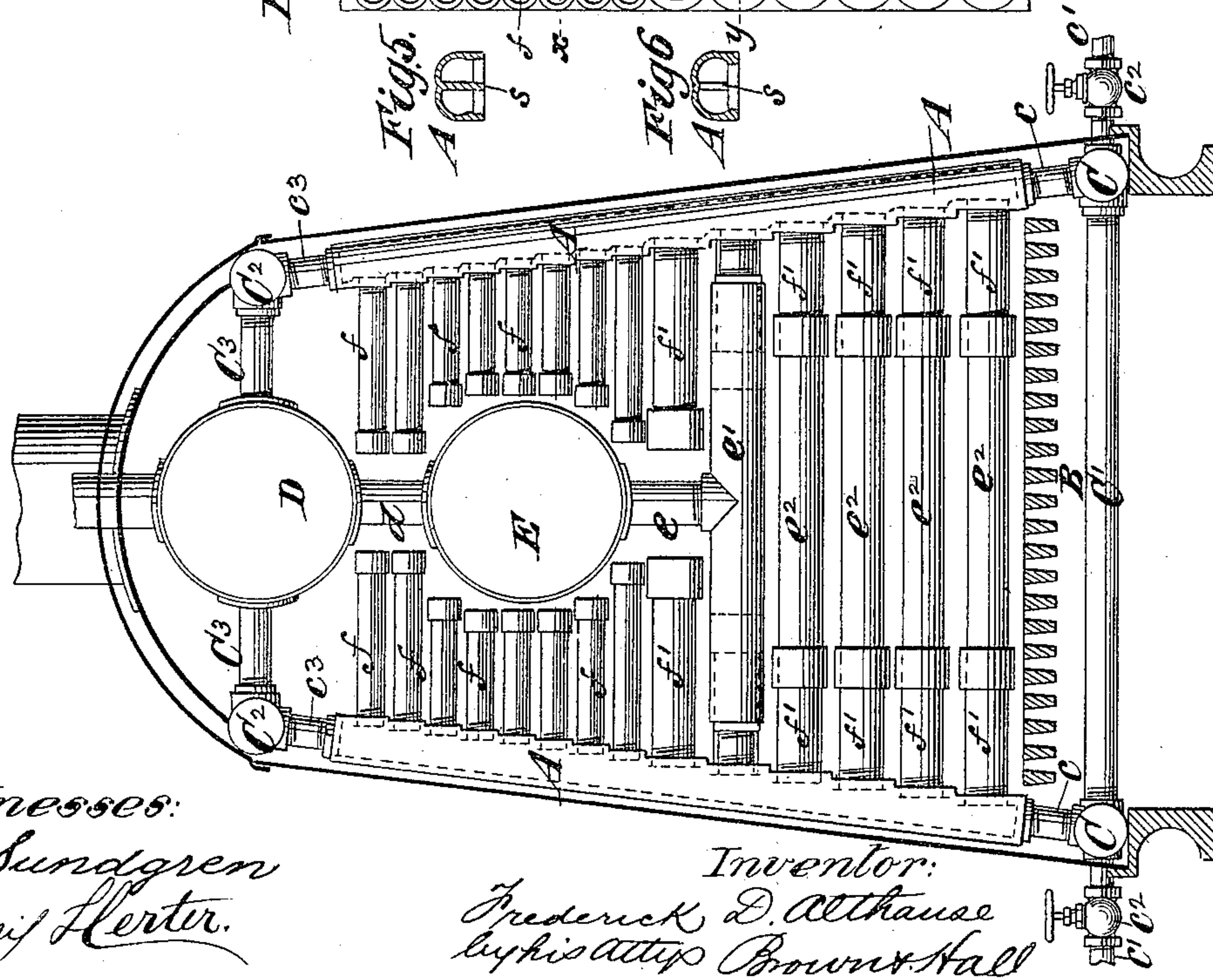


Fig. 1.



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UNITED STATES PATENT OFFICE.

FREDERICK D. ALTHAUSE, OF NEW YORK, N. Y.

SECTIONAL STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 354,172, dated December 14, 1886.

Application filed October 9, 1886. Serial No. 215,770. (No model.)

To all whom it may concern:

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

My invention relates to that class of sectional or portable steam generators in which the water-space and heating-surface are largely composed of or formed by headers or manifolds and tubes extending therefrom, the generator, with the exception of the drums which may be employed, being composed of comparatively small parts, readily renewed in case of becoming worn out or of breakage, and which can be easily transported from place to place and set up.

The object of my invention is to provide a boiler having a large heating-surface, as compared with the space occupied, and in which the parts forming the heating-surface are so arranged and proportioned as to secure the economical generation of steam and its free escape from the water contained in the generator.

My improved generator is composed, principally, of two series of substantially upright headers or manifolds arranged side by side at opposite sides of the generator and horizontal tubes or branches extending inward from the headers or manifolds and closed at their inner ends. The headers or manifolds of each series at each side of the generator may be connected at their upper and lower ends by equalizing-pipes, and the two series may be connected at the bottom by cross-pipes, and at the top they may be connected with a steam-drum. A water-drum may also be arranged below the steam-drum and between the two series of headers or manifolds, and the horizontal tubes or branches extending from the headers or manifolds may be extended inward as nearly as practicable to the water-drum. A sufficient number of the horizontal tubes or branches, which are at the lower ends of the headers or manifolds, may be omitted, so as to provide ample space for the furnace, and the opposite headers, which are at the back of the generator, may be connected by cross-pipes arranged one above another in their lower portions, so

as to substantially close the back of the furnace. The horizontal tubes or branches which extend from the upper portions of the headers or manifolds may be of smaller diameter than those which are at the lower portions of the headers or manifolds, so that in the tubes or branches which are subjected to the most intense heat of the fire a comparatively large volume of water is exposed to a comparatively small heating-surface, while in the tubes or branches which extend from the upper portions of the headers or manifolds a smaller volume of water is exposed to a comparatively large heating-surface. By this proportion of parts the water which is highly heated in the lower or larger tubes or branches is converted into steam in the upper and smaller tubes or branches. Each header or manifold may have in its upper portion two vertical tiers of smaller tubes or branches, each closed independently at its inner end, and between which the header is divided by a vertical partition, and in the lower portion of each header or manifold there may be but a single tier of tubes or branches.

The invention consists in novel features of construction and combinations of parts, hereinabove referred to, and hereinafter more fully described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a vertical section of a generator embodying my invention in a plane transverse to the length of the water and steam drums. Fig. 2 is a vertical section in a plane at right angles to the plane of Fig. 1. Figs. 3 and 4 are elevations of headers which are employed in the generator. Figs. 5 and 6 are transverse sections taken respectively upon the planes indicated by the dotted lines *x x* and *y y*, Figs. 3 and 4; and Fig. 7 is a horizontal section upon the plane indicated by the dotted lines *z z*, Fig. 4.

Similar letters of reference designate corresponding parts in all the figures.

A designates substantially upright headers or manifolds, which are arranged in two series at opposite sides of the generator, the headers in each series being placed closely together, side by side, so as to form substantially close side walls for the furnace and generator. Between the two walls of headers or manifolds A,

and at their lower ends, I have represented the grate B, which, as shown in Fig. 2, extends the entire length of the generator.

At the lower ends I have shown the headers or manifolds A of each series as connected by an equalizing-pipe, C, and branches c , and these equalizing-pipes C may be connected by one or more cross-pipes, C' , three such pipes being represented in Fig. 2. The equalizing-pipes C' have smaller pipes c' , provided with valves c^2 , connected with them, and these smaller pipes and valve $c' c^2$ may, by suitable connections, be made to serve both as feed and blow-off pipes at the will of the engineer. By the equalizing-pipes C and cross-pipes C' the circulation through the headers or manifolds of each series and between those of both series is equalized and made more nearly uniform.

At the upper ends of the headers or manifolds A, I have shown those in each series as connected by branches c^3 with equalizing-pipes C^2 , and the equalizing-pipes C^2 pertaining to each series of headers or manifolds may be connected by cross-pipes C^3 with the steam-drum D, arranged in a plane about midway between the two series of headers or manifolds, but slightly above them. The equalizing-pipes C^2 and cross-pipes C^3 , of which three are shown on each side in Fig. 2, serve to equalize and render uniform the circulation between the drum D and the headers or manifolds of each series.

At a little distance below the steam-drum D, and between the two series of headers or manifolds, I have represented a water-drum, E, and which may be connected by one or more throats or passages, d , with the steam-drum D and by pipes $e e'$ with oppositely arranged headers in the two series.

I have in Fig. 2 shown the drums D E as connected near each end by a throat or passage, d , and the drum E as connected by a pipe, e , at each end with a cross-pipe, e' , which extends between opposite headers at the front and rear of the generator. I have also shown those headers which are arranged opposite each other at the rear of the generator as connected in their lower portions by pipes or tubes e^2 , which are arranged near together, one above another, and substantially close the back of the furnace.

The headers or manifolds A, having extending inward from them horizontal tubes or branches $f f'$, each of which is closed independently at its inner end, extend as near as practicable to the drum E. Those headers which are at the front of the generator have tubes or branches f' extending inward at intervals entirely to their lower ends; but these latter tubes or branches are of little length between their inner ends and space is left of sufficient width to form a door, as shown in Fig. 1.

I have shown the tubes or branches f , which extend inward from the upper portions of the headers A or from the portions above their middle, as of considerably smaller

size than the tubes or branches f' , which extend inward from the lower portions of the headers or manifolds A. If the tubes or branches at the lower portions of the headers were of smaller size, the heating-surface which they expose as compared to the volume of water which they contain would, perhaps, cause the water to be driven out of them by the heat, and I therefore make the lower tubes or branches, f' , larger in size, so that they will expose less heating-surface as compared to the volume of water which they contain. The water will then be highly heated in the lower tubes or branches, f' , and will be generated into steam in the upper tubes or branches. The smaller upper tubes or branches are arranged in two tiers projecting from each header, as shown in Figs. 3 and 4, while the lower and larger tubes or branches, f' , are arranged in a single tier in each header, as also shown in Figs. 3 and 4. Each header is divided between the two vertical tiers of smaller tubes f by a vertical partition, s , and this partition may be continued downward to the bottom, save at the points opposite the openings in which the branches f' are secured. The two opposite headers, which are at the extreme front and the extreme rear of the generator, have the openings or sockets for the horizontal tubes f' and the cross-pipes e^2 extending clear to their lower ends, while all the intermediate headers have their lower portions left bare of tubes or branches f' for a considerable distance from their lower ends upward, so as to afford furnace-space, as shown in Fig. 2.

Although I have spoken of the headers or manifolds A as "upright," it will be understood that they may be truly upright or inclined slightly inward, as is shown in Fig. 1; but in the latter case they will be upright in a plane transverse to the axis of the drum E. Although I have referred to the tubes or branches $f f'$ as "horizontal," it will be understood that they are not necessarily truly horizontal, but may be slightly inclined. The tubes or branches $f f'$ may be connected with the headers or manifolds A by screw-threaded joints or otherwise, and they may be closed at their inner ends either by screw-threaded caps or in any other suitable manner.

I have here represented the entire generator as inclosed by a casing, F, which may be made of double walls, so as to form a dead-air space or jacket to prevent loss of heat by radiation. The smoke-pipe F' may extend from this casing. The steam may be delivered from the upper drum, D, through the pipe h .

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

1. The combination, with two series of upright headers or manifolds arranged side by side at opposite sides of the generator and forming two opposite sides or walls of the furnace, of horizontal tubes or branches extending inward from the headers or manifolds and closed at their inner ends, and the fire-door

arranged in a side or wall of the furnace which connects the two series of headers or manifolds, substantially as herein described.

2. The combination, with two series of upright headers or manifolds at opposite sides of the generator, and equalizing-pipes connecting the headers or manifolds of each series at top and bottom, of horizontal tubes or branches independent of each other, extending inward from the headers or manifolds and closed at their inner ends, substantially as herein described.

3. The combination, with two series of upright headers or manifolds at opposite sides of the generator, of horizontal tubes or branches independent of each other, extending inward from the headers or manifolds and closed at the inner ends, the tubes or branches being of increased diameter at the lower portion of the headers or manifolds, substantially as herein described.

4. The combination, with two series of upright headers or manifolds at opposite sides of the generator, and a drum, of equalizing-pipes whereby the headers or manifolds of each series are connected at their upper ends with each other and with the drum, and horizontal tubes or branches independent of each other, extending inward from the headers or manifolds and closed at their inner ends, substantially as herein described.

5. The combination, with two series of upright headers or manifolds at opposite sides of a generator, of horizontal tubes or branches independent of each other, extending inward from the headers or manifolds and closed at their inner ends, and tubes extending between and connecting the lower portions of opposite headers or manifolds which are at the rear end of the generator, substantially as herein described.

6. The combination, with two series of upright headers or manifolds at opposite sides of the generator, of horizontal tubes or branches independent of each other, extending inward from the headers or manifolds and closed at

their inner ends, a drum arranged between the opposite series of headers or manifolds, and cross-tubes connecting headers or manifolds which are opposite in the two series and connected with the drum, substantially as herein described.

7. The combination, with the two series of oppositely-arranged headers or manifolds, of the water and steam drums E D, connected together, pipes connecting the drum E with the headers or manifolds below their upper ends, and pipes connecting the upper ends of the headers or manifolds with the drum D, and horizontal tubes or branches independent of each other, extending inward from the headers or manifolds and closed at their inner ends, substantially as herein described.

8. The combination, with two oppositely-arranged series of headers or manifolds, A, of two vertical tiers of horizontal tubes or branches, *f*, extending inward from the upper portion of each header or manifold, each tube or branch being independently closed at its inner end, and a single tier of similar but larger tubes or branches, *f'*, extending from the lower portion of each header or manifold and closed at their inner ends, substantially as herein described.

9. The combination, with two series of oppositely-arranged headers or manifolds, A, having vertical partitions, of two vertical tiers of horizontal tubes or branches, *f*, extending inward from the upper portion of each header or manifold on opposite sides of the vertical partition therein, each tube or branch *f* being independently closed at its inner end, and a single tier of similar but larger tubes or branches, *f'*, extending inward from the lower portion of each header or manifold and closed at their inner ends, substantially as herein described.

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Witnesses:

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