

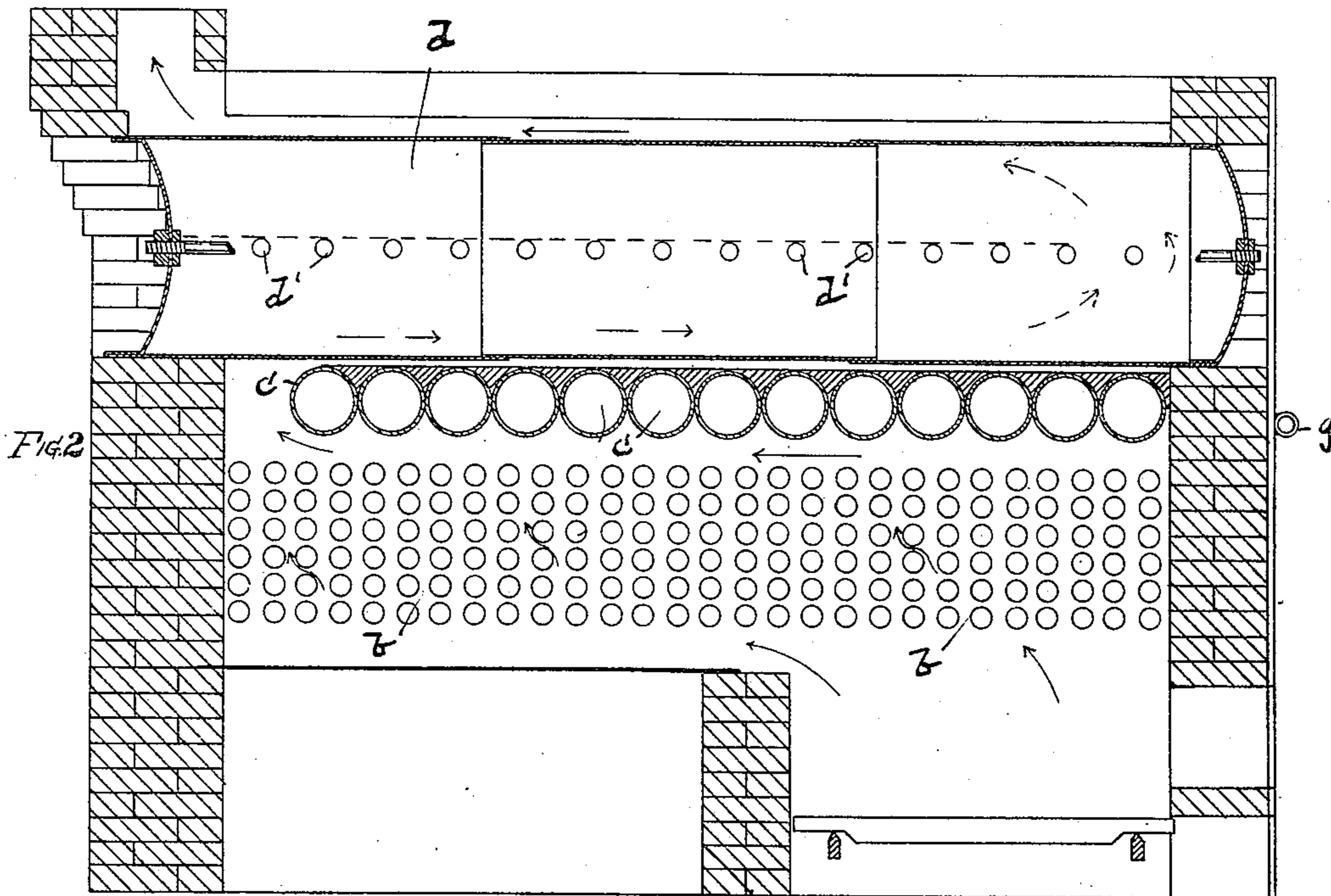
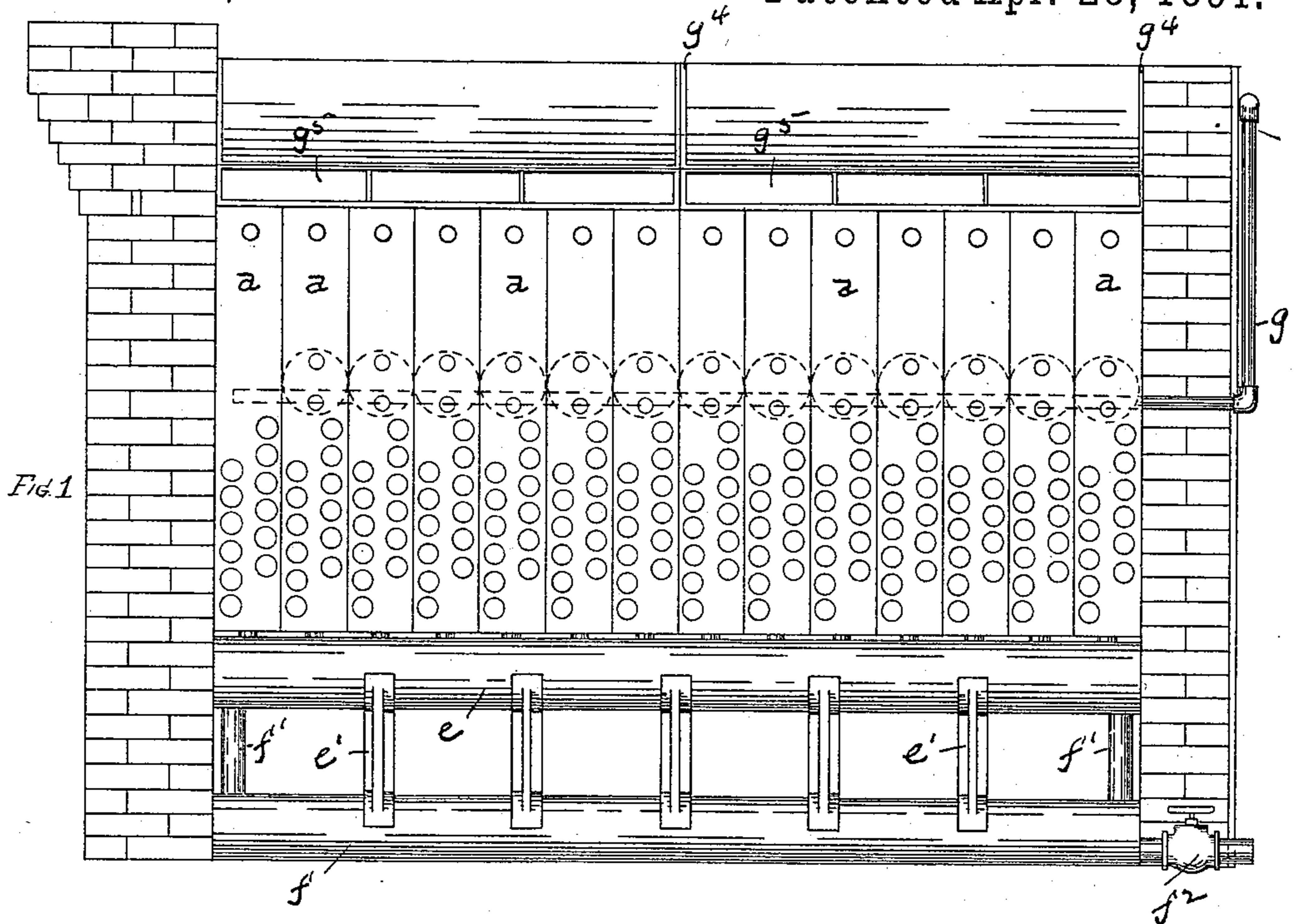
(No Model.)

2 Sheets—Sheet 1.

C. C. WEBBER.
SECTIONAL STEAM GENERATOR.

No. 451,094.

Patented Apr. 28, 1891.



Witnesses:
William H. Quidway
J. E. Chapman

Inventor:
C. C. Webber.
By James Chapman
Attorneys.

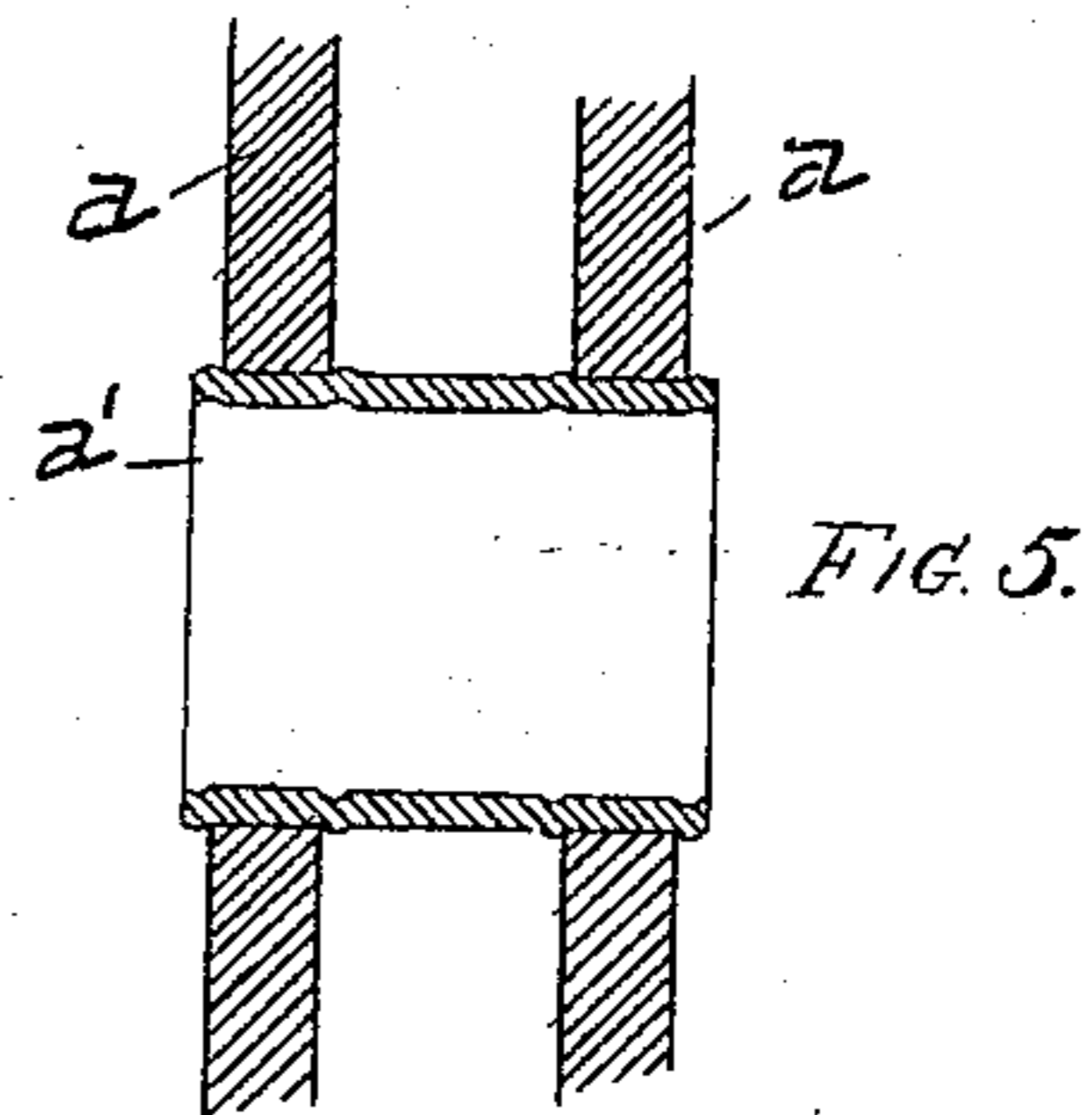
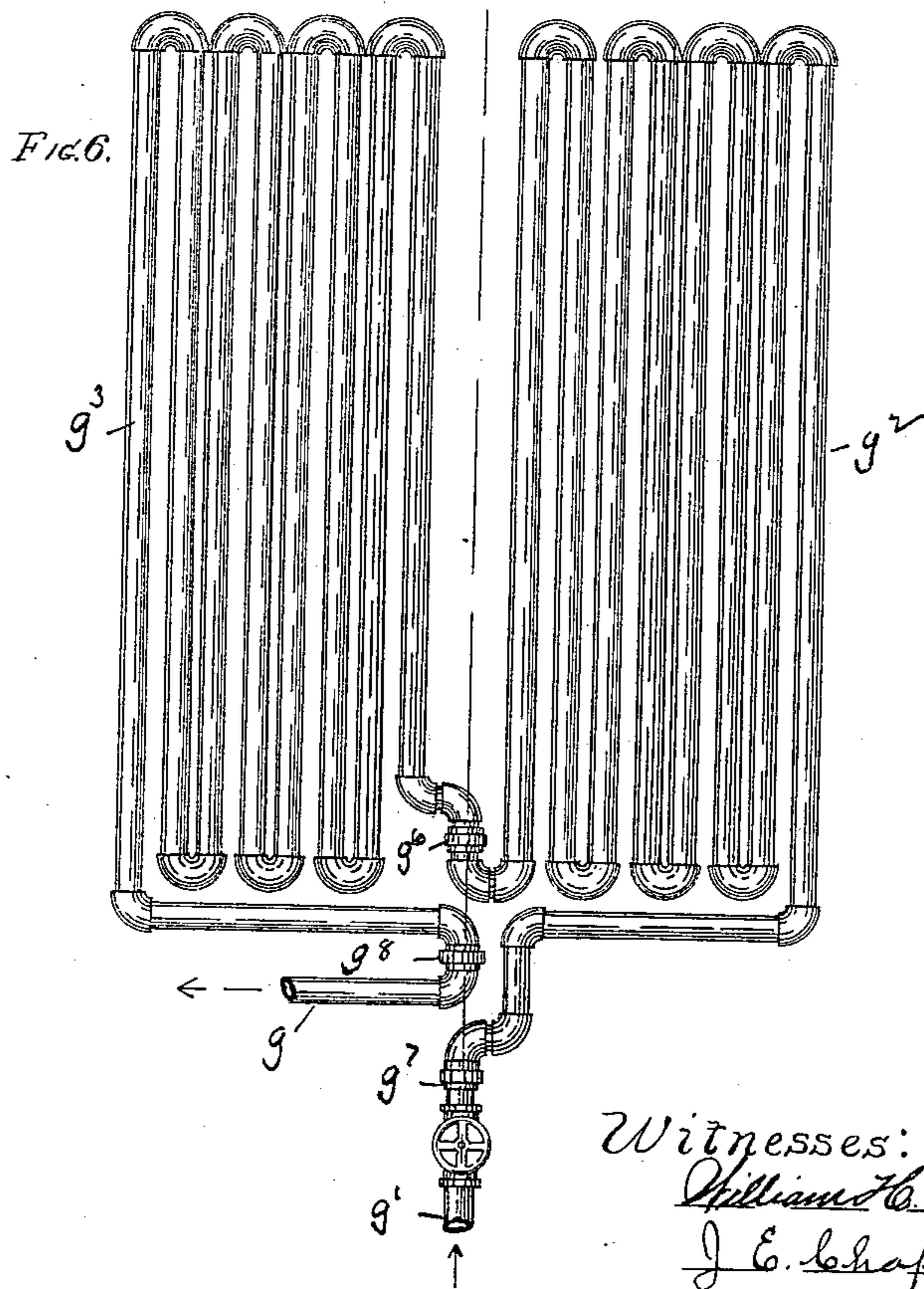
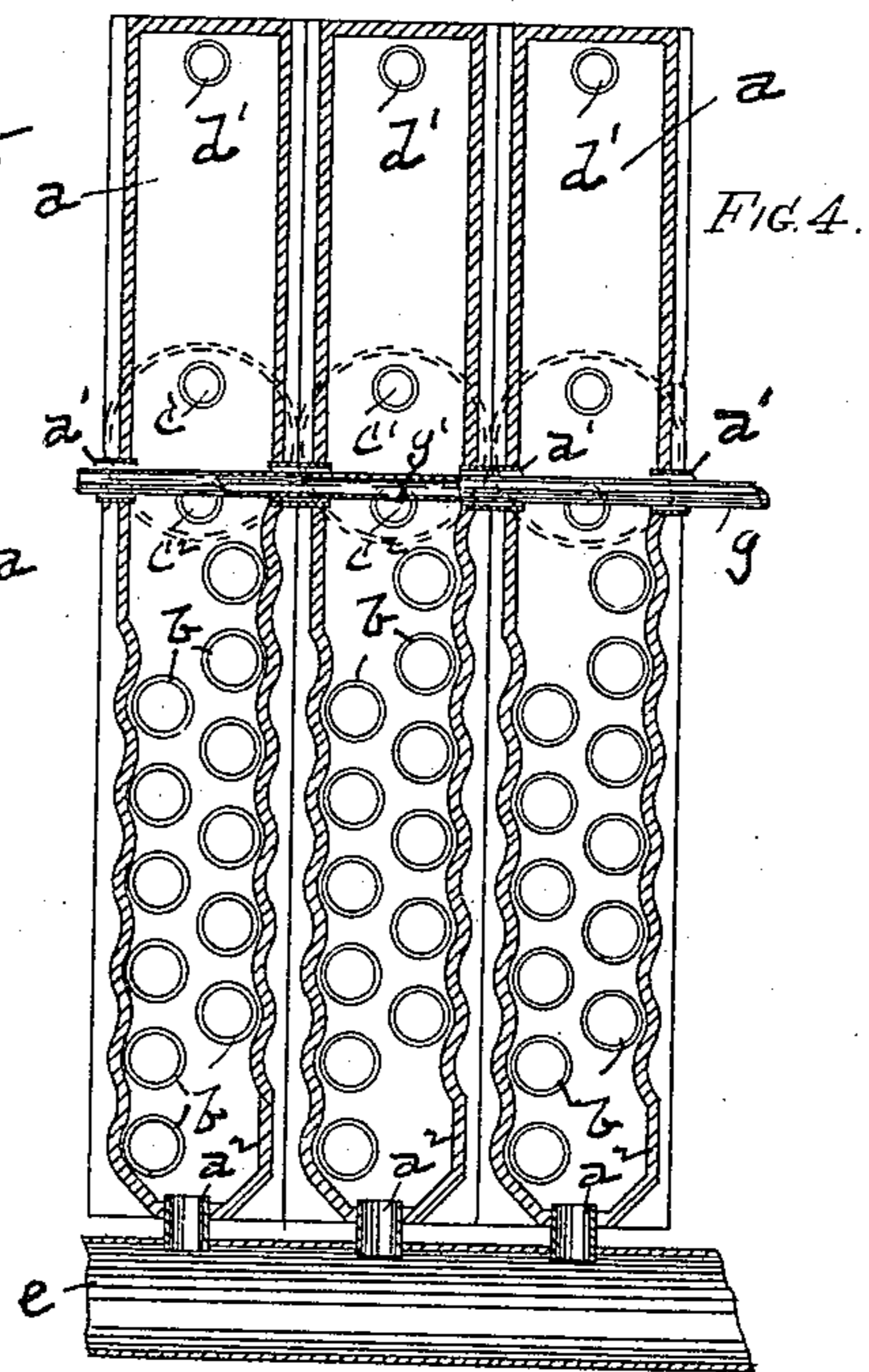
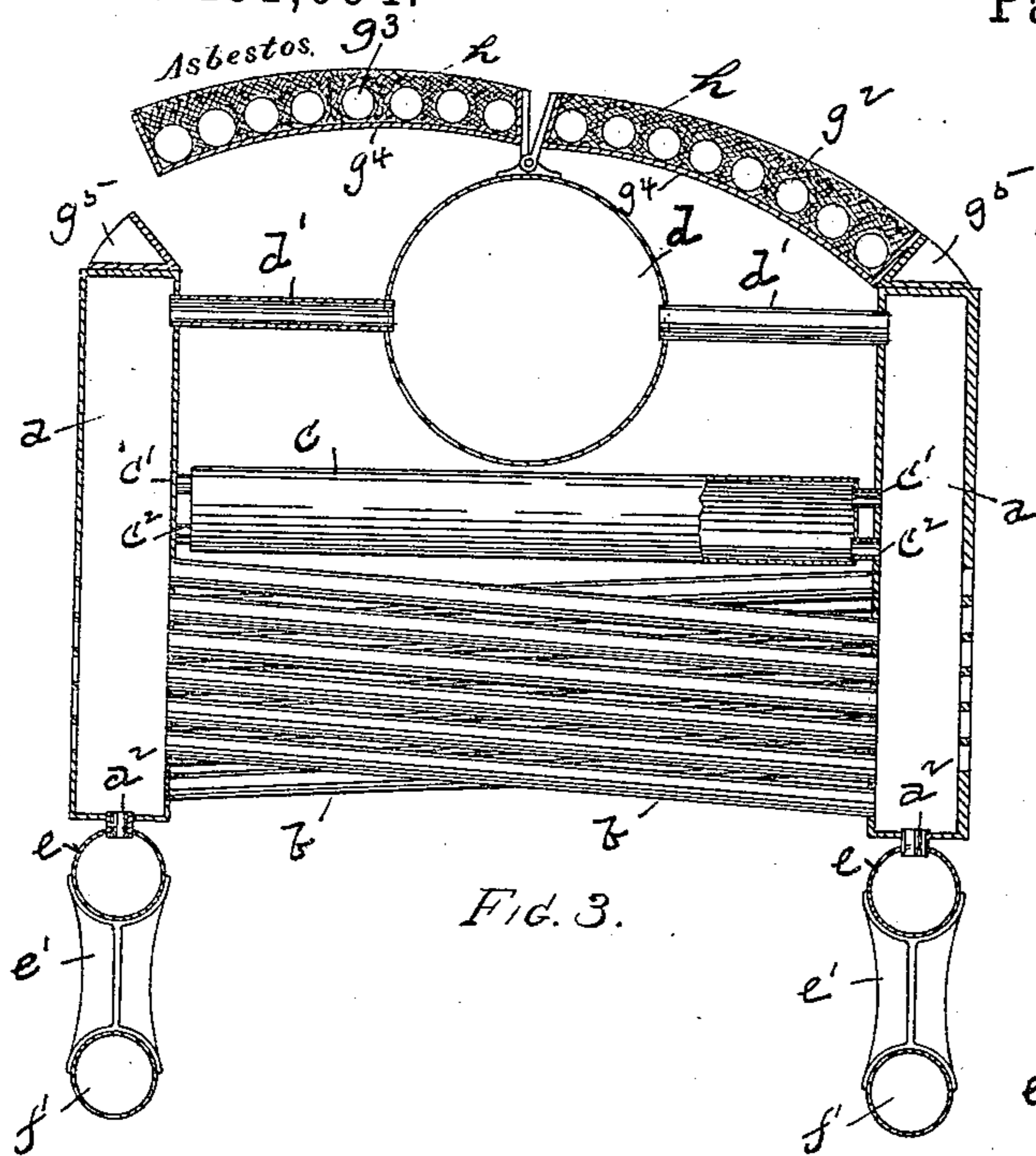
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UNITED STATES PATENT OFFICE.

CHARLES C. WEBBER, OF SPRINGFIELD, MASSACHUSETTS.

SECTIONAL STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 451,094, dated April 28, 1891.

Application filed September 3, 1890. Serial No. 363,844. (No model.)

To all whom it may concern:

Be it known that I, CHARLES C. WEBBER, of Springfield, in the county of Hampden and State of Massachusetts, have invented a new and useful Improvement in Sectional Steam-Generators, of which the following is a specification, reference being had to the accompanying drawings, forming part thereof.

My invention relates to the class of steam-generators comprising a series of independent sections, forming the sides of the combustion-chamber, intermediate connecting-tubes, and a steam-drum, which is shown and described in United States Letters Patent No. 108,333, dated October 18, 1870, and No. 177,223, dated May 9, 1876, to Densmore.

The object of the invention is to improve the construction of this class of steam-generators with a view to remedying certain defects that have been found to exist therein, and to increase their capacity for rapidly and economically generating steam.

To this end the invention consists in the steam-generator constructed and operating as hereinafter fully described, and particularly pointed out in the claims.

Referring to the drawings, in which like letters designate like parts in the several figures, Figure 1 is a side elevation of a steam-generator embodying my invention. Fig. 2 is a central longitudinal section thereof. Fig. 3 is a cross-section thereof. Fig. 4 is a vertical section of three of the independent sections. Fig. 5 is a sectional view, upon an enlarged scale, of one of the connections between the sections. Fig. 6 is a plan view of the feed-water-heating pipes.

The letters *a a a* designate the series of independent sections which form the sides of the combustion-chamber, which are preferably made from cast-iron, and the outer side of which projects beyond the body thereof upon each side, as represented in Fig. 4, so that when said outer sides of the several sections are placed flush with each other a space will be formed between the body portions thereof to facilitate the application of heat thereto.

The letter *b* designates the series of inclined tubes extending between the sections upon opposite sides of the combustion-chamber,

there being preferably two rows of such tubes connecting each pair of sections, thereby securing a free circulation of water between the latter and maintaining the water at the same level in each.

The letter *c* designates a series of larger tubes extending between the oppositely-located sections, above the tubes *b*, which are connected to their respective sections at each end by two nipples *c' c''*, the former being located near the upper side of the tube and providing for a free circulation of steam, and the latter being located near the lower side of the tube and providing for a free circulation of water. By thus providing said tube *c* with two nipples at each end I materially increase the capacity for a rapid generation of steam of this class of generators, since with the construction heretofore employed, in which said tube has but one nipple at each end, one of which is located near the top of the tube and the other near the bottom thereof, neither the water nor the steam could circulate freely through said tubes, the normal level of the water being about midway between the top and bottom of said tubes.

The letter *d* designates the steam-drum, which is located above the tubes *c*, and *d'* a series of pipes connecting each of the sections *a* with said drum. As heretofore constructed, the sections *a* terminate at their upper ends substantially upon a level with the tubes *c*, and are connected by nipples with a tube extending parallel with the steam-drum, which tube is connected by pipes with said drum. The indirect passage for the steam thus afforded not only lessens the pressure-producing capacity of the generator, but renders the production of superheated steam a practical impossibility, which latter is a vital objection in view of the more general use of triple and quadruple expansion engines at the present time. To overcome these defects I extend the sections *a* upwardly to a point above the plane of the center of the steam-drum and lead the pipes *d'* directly from each section to said drum, as represented in Fig. 3, thereby not only obviating the use of the intermediate tube and securing a direct passage for steam from the sections to the drum, but, by reason of the increased area of the

sections above the water-line, securing a superheating-surface which enables me to produce superheated steam.

The sections a are directly connected with each other by nipples a' , located below the water-line, and at their lower end are connected by nipples a^2 with two large tubes e , which extend beneath the two rows of sections, whereby provision is made for a free circulation of water through the series of sections and tube e upon each side of the generator in addition to the transverse circulation through the tubes b . The nipples a' and a^2 are what are known as "safe ends," and they are connected to the parts which they unite by being expanded at their ends within openings in said parts, as represented in Fig. 5, thereby forming a joint the tightness of which is not affected by unequal expansion or contraction of said parts and which prevents all leakage, an objection to which this class of generators has heretofore been particularly subject. The nipples connecting tubes c with the sections and the ends of the tubes b and pipes d' will preferably be connected to their respective parts in the same manner, openings in the outer sides of the sections opposite the ends of tubes b being provided, as shown in Fig. 3, to admit the expanding tool, which openings are then closed by suitable caps or plugs. The tubes e rest upon chairs or braces e' , which may be of any suitable form, and which, as herein shown, are supported upon tubes f , extending parallel with tubes e . The tubes f are connected with tubes e by means of pipes f' at the extreme ends of said tubes, whereby a circulation of water is permitted through the tubes f , which thus form mud-drums to receive the sediment in the water, and are provided with blow-off cocks f^2 to facilitate cleaning the same.

As heretofore constructed the water has been fed to the sections a at one end of the generator, passing successively from each section to the adjoining one, and an unequal expansion and contraction of the sections was caused thereby, which soon resulted in a looseness of the joints and leakage. I overcome this defect by feeding the water simultaneously to all of the sections, and, as herein shown, I accomplish this result by means of a feed-pipe g , which extends through the series of sections upon each side of the generator, the same preferably lying within the nipples a' , as shown, and which is provided with a vent g' within each section, whereby the water is permitted to pass from said pipe into all of the sections simultaneously. I thus not only prevent unequal expansion and contraction of the sections, but I materially lessen the time required to make steam and economize in fuel. At one end of the generator said feed-pipe g is turned upwardly and extends to the level of the top of steam-drum d , at which point I have devised a novel form of feed-water heater consisting

of two systems of coils g^2 g^3 , extending parallel with the steam-drum, but above and upon opposite sides of the vertical center of the latter, as shown in Fig. 3. The coils g^2 g^3 are suitably supported at their ends in frames g^4 , which frames are hinged at their inner side to the steam-drum or to an independent support extending parallel with the axis of said drum, and at their outer side rest upon angle-blocks g^5 , extending over the top of the sections a in such manner as to make a tight joint therewith when said frames are in their closed position. The coil g^2 is connected with coil g^3 by a turn or swivel coupling g^6 and at its opposite end with the water-inlet pipe g' by a turn or swivel coupling g^7 , while coil g^3 is connected with feed-pipe g by a similar turn or swivel coupling g^8 , the couplings g^6 g^7 g^8 being in alignment with each other and with the hinge or pivotal point of the frames g^4 , as indicated by the broken line in Fig. 6. The inlet-pipe g' leads from the source of water-supply, being provided with a suitable valve, and the water passes from said pipe through coil g^2 , and from thence through coil g^3 and from the latter through pipe g to the sections a . As the water circulates through the coils g^2 g^3 at the top of the combustion-chamber, it becomes heated in such manner as to greatly increase the capacity of the generator to quickly generate steam. The upper side of the coils g^2 g^3 is covered with a packing of asbestos or other suitable material, as indicated at h in Fig. 3, so that they form the top of the combustion-chamber. To enable said coils to be readily cleaned I hinge the frames g^4 to the steam-drum or other support, as before described, and connect the coils together and to their respective pipes by turn or swivel couplings, whereby either of said frames and the coil carried thereby can be raised to the position shown at the left in Fig. 3, whereupon the soot adhering to the coil can be easily removed with a brush. Said coils being thus readily kept clean, the application of heat to the water upon its way to the sections a is much facilitated. It is obvious that this feature of my invention is readily applicable to other forms of generators, and that by thus utilizing the surplus heat of the combustion-chamber as a feed-water heater a considerable economy in fuel will be secured.

The generator thus constructed will be provided with the usual fire-box and grate, as shown. In practice I prefer to omit one of the tubes c at the rear end of the combustion-chamber, and to provide a covering for the remaining tubes, as shown in Fig. 2, and to place a deflecting-plate upon the tubes d' upon each side of the steam-drum, as indicated by the broken line in said Fig. 2, thereby compelling the products of combustion in their passage to the smoke-flue at the rear end of the chamber to traverse the length of the steam-drum three times, as indicated by the arrows. It will also be provided with

the usual steam and water gages and other appurtenances common to all steam-generators.

5 The generator constructed as herein described, besides having the capacity to quickly and economically generate steam, is comparatively inexpensive in structure and very strong and durable.

10 Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a steam-generator of the kind herein described, a series of independent sections forming the two sides of the combustion-chamber, each of which sections has two nipples or similar passages for the circulation of water communicating with its adjoining sections and located below the water-line thereof, a steam-drum, and connections between each 15 of said sections and said drum for conducting steam from the former to the latter, combined and operating substantially as and for the purpose set forth.

2. In a steam-generator of the kind described, the combination, with the series of sections located upon opposite sides of the combustion-chamber and the series of inclined tubes extending between the same, of a series of horizontally-disposed tubes located 25 above said inclined tubes, each of which is connected at each end to one of said sections by two nipples or similar devices, one of which is located above and the other below the water-line of said tubes, whereby a direct circulation of both water and steam through said horizontal tubes is secured, substantially as set forth.

3. In the steam-generator herein described, the combination, with the series of side sections and their inclined and horizontal connecting-tubes, of a steam-drum having its center located substantially in the plane of the upper ends of said sections, and a series of substantially horizontal tubes or pipes connecting each of said sections with said drum, substantially as described, whereby an extended area of said sections above their water-line for the production of superheated steam is provided.

50 4. In the steam-generator herein described,

the combination, with the series of side sections, of a tube extending beneath the sections upon each side of the combustion-chamber and having open communication with each of the sections above it, and a tube forming 55 a mud-drum located beneath each of said first-mentioned tubes and having open communication therewith at or near each end thereof, substantially as and for the purpose set forth. 60

5. The combination, with a steam-boiler and its combustion-chamber, of one or more coils of pipe extending from end to end of said chamber above the boiler and forming the top of the chamber, said coil or coils communicating at one end with the feed-water-supply pipe and at the opposite end with the boiler, and a suitable covering of asbestos or similar material applied to the upper side of said coil or coils, substantially as and for the 65 purpose described. 70

6. In a steam-generator, the combination, with the boiler thereof, of a combustion-chamber the top of which is composed of one or more coils of pipe supported in a suitable 75 frame, which is hinged to its supports in such manner that it can be raised for the purpose of cleaning said coil or coils, substantially as set forth.

7. In the steam-generator herein described, 80 the combination, with the series of side sections, their connecting-tubes, and the steam-drum located centrally between said sections, of two frames extending between the center line of said drum and the upper ends of the 85 sections upon each side of the latter, said frames having their adjacent sides hinged to a suitable support, a coil of pipe supported within each of said frames, said coils being connected with each other at one end by a 90 turn or swivel coupling and having their free ends connected by similar couplings with the water-supply pipe and the feed-pipe for said sections, respectively, substantially as and for the purpose set forth.

CHARLES C. WEBBER.

Witnesses:

W. H. CHAPMAN,
J. E. CHAPMAN.