

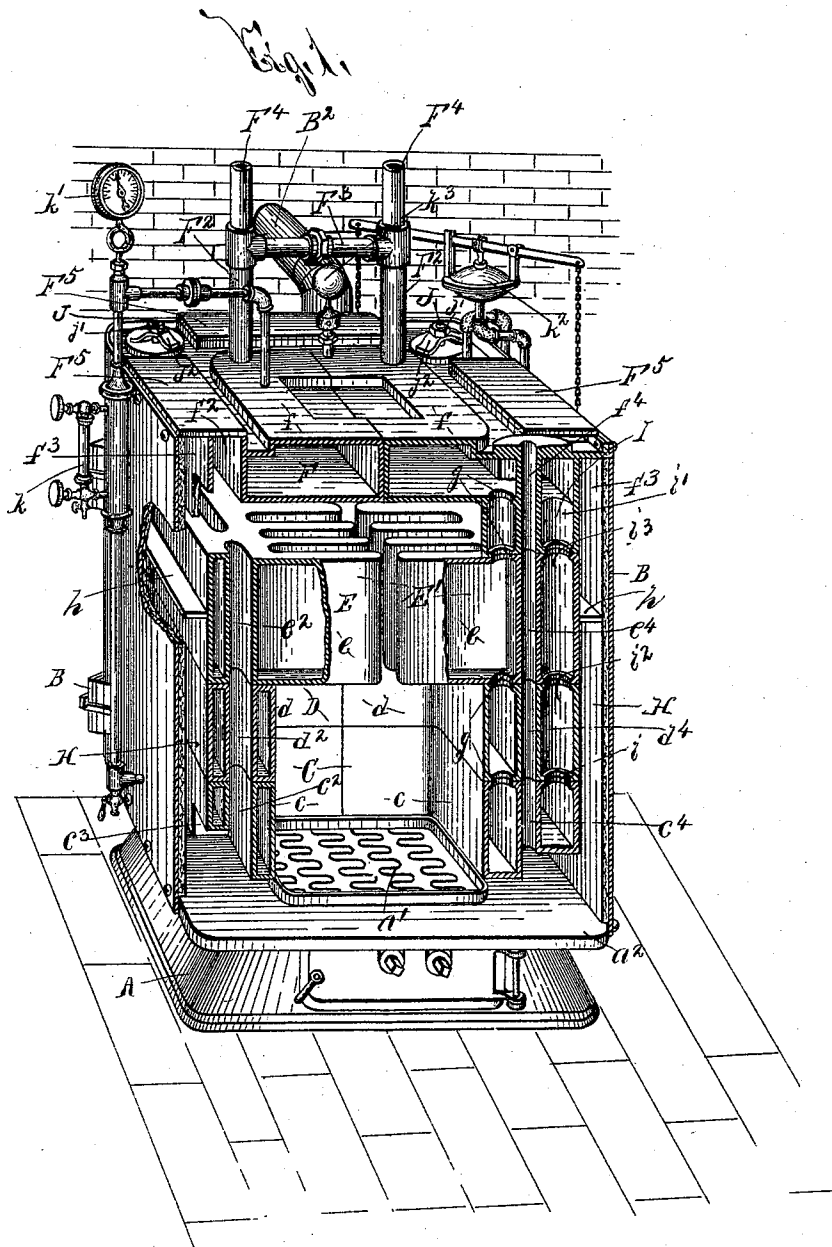
(No Model.)

3 Sheets—Sheet 1.

E. P. WAGGONER.
GENERATOR.

No. 534,459.

Patented Feb. 19, 1895.



WITNESSES:

W. B. Phares,
C. Schmeck,

INVENTOR

Edward P. Waggoner

BY

Wm. H. Wilkinson & Parsons
ATTORNEYS,

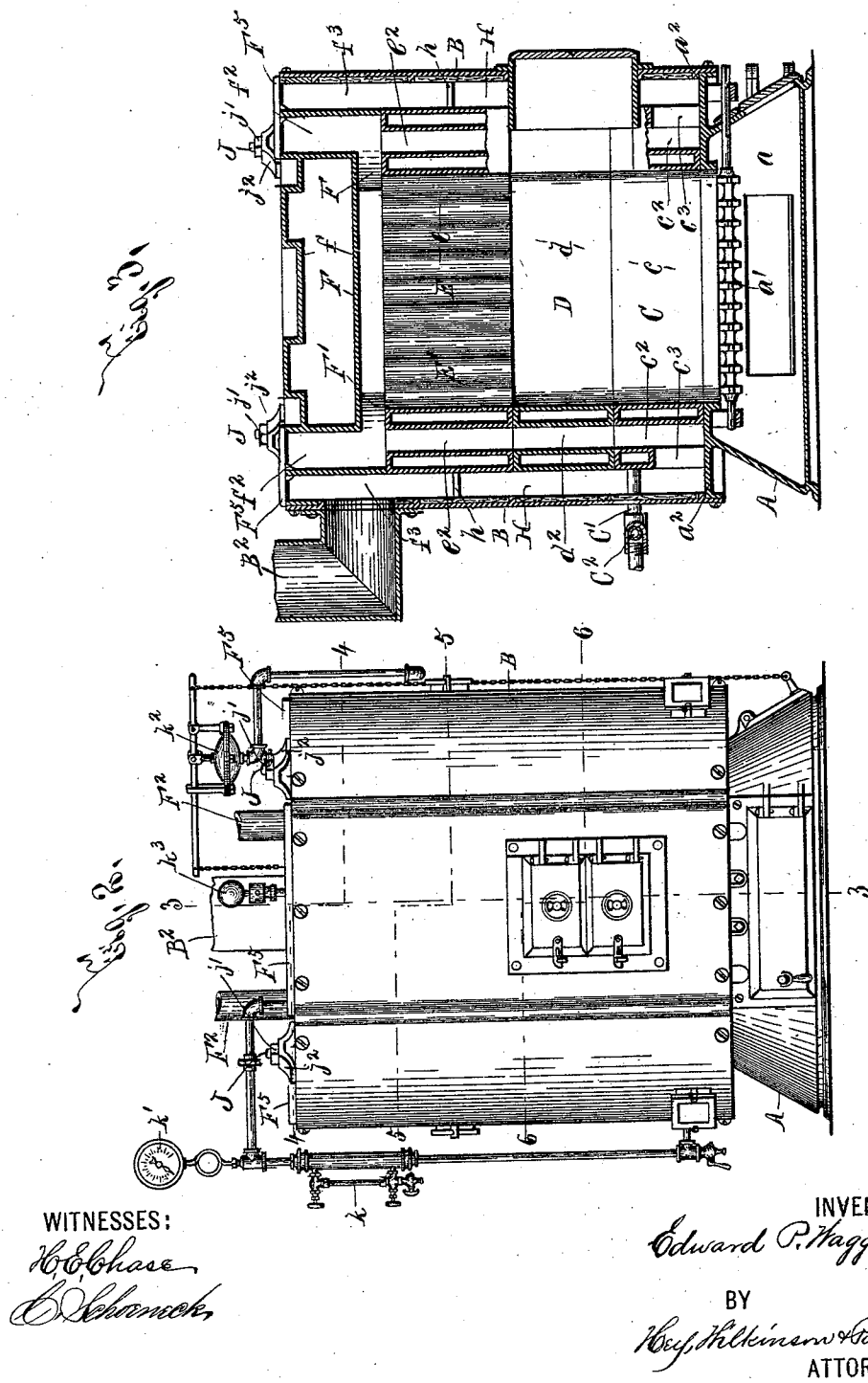
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3 Sheets—Sheet 2.

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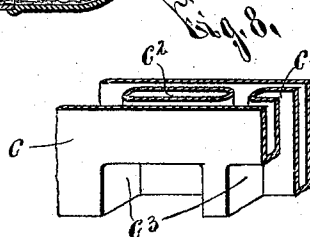
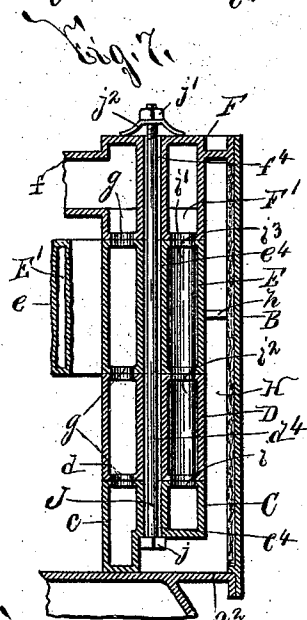
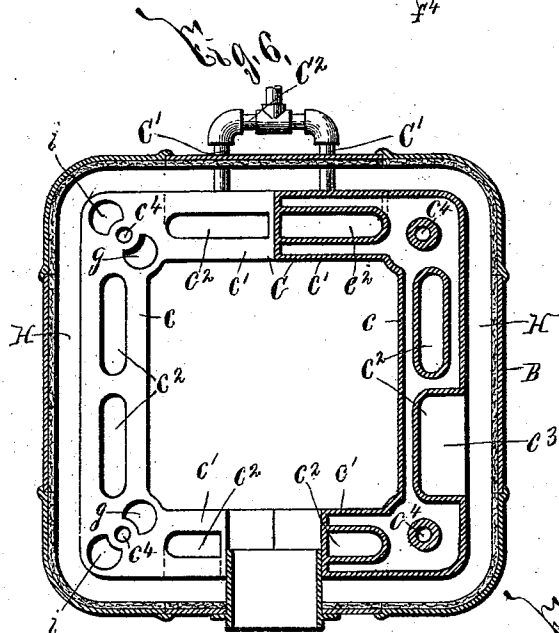
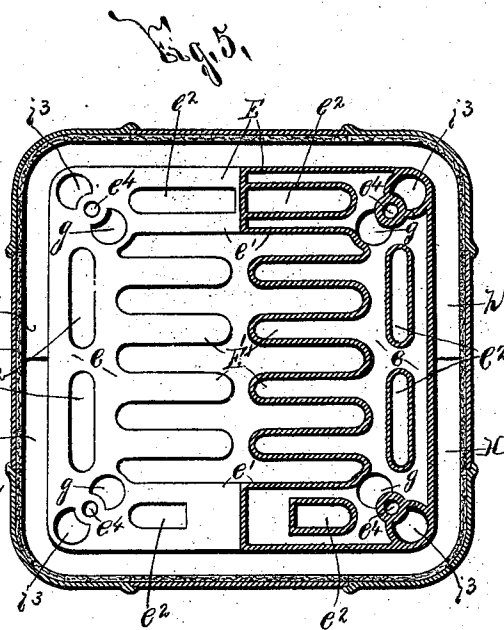
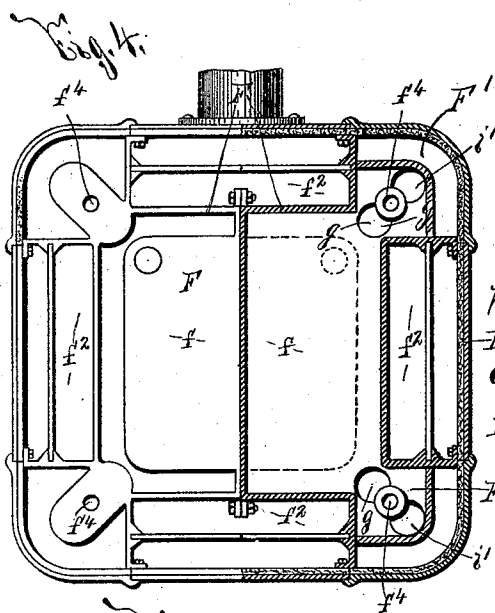
(No Model.)

3 Sheets—Sheet 3.

E. P. WAGGONER.
GENERATOR.

No. 534,459.

Patented Feb. 19, 1895.



WITNESSES:

Hobhouse,
O. Schenck

INVENTOR

INVENTOR
C. Edward P. Haggomer

BY

51
Hoyt Wilkinson Parsons
ATTORNEYS

UNITED STATES PATENT OFFICE.

EDWARD P. WAGGONER, OF SYRACUSE, NEW YORK.

GENERATOR.

SPECIFICATION forming part of Letters Patent No. 534,459, dated February 19, 1895.

Application filed April 4, 1894. Serial No. 506,268. (No model.)

To all whom it may concern:

Be it known that I, EDWARD P. WAGGONER, of Syracuse, in the county of Onondaga, in the State of New York, have invented new and useful Improvements in Generators, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

My invention relates to improvements in generators, particularly applicable for heating dwellings and other buildings by steam, and has for its object the production of a device, which is simple in construction, economical in manufacture, produces a positive circulation of the water within the same, is capable of considerable expansion and contraction without liability of leakage, and is highly efficient and durable in operation; and to this end it consists, essentially, in a series of hollow sections of angular cross section arranged one above the other and connected together, one or more of said sections consisting of opposite connected divisions.

The invention also consists in generator sections provided with upright flues, the lower section having cut-outs or branch flues extending laterally from said flues, downflow passages having their opposite extremities connected to the chambers of the upper and lower sections and their intermediate portions unconnected with the chambers of the interposed sections, and inclosed bolt receiving passages unconnected with the chambers of the sections, securing bolts passed through said inclosed chambers of the sections, and yielding washers provided upon said bolts for permitting expansion and contraction of the generator without impairment of the connection between its sections and consequent liability of leakage.

The invention furthermore consists in the detail construction and arrangement of the parts, all as hereinafter more particularly described and pointed out in the claims.

In describing this invention, reference is had to the accompanying drawings, forming a part of this specification, in which like letters indicate corresponding parts in all the views.

Figure 1 is an isometric view, partly in section, of my improved generator, Fig. 2 is a

front elevation of the generator. Fig. 3 is a longitudinal vertical sectional view, taken on line 3—3, Fig. 2. Figs. 4, 5, and 6 are horizontal sectional views, taken respectively, on lines 4—4, 5—5, and 6—6, Fig. 2. Fig. 7 is a detail vertical sectional view, representing one of the securing bolts of my generator and the adjacent portions of the water-containing sections and the outer casing; and Fig. 8 is an isometric perspective of a lower portion of the bottom section of the generator.

A is a suitable base provided with an ash chamber *a*, and any desirable construction of grate *a'*, and B is an outer casing suitably secured to or mounted upon a flange *a*² at the upper extremity of the base A.

The outer casing B, which may be provided with suitable cleaning doors, is preferably of angular cross section as my improved generator is of similar form and the upper edge of the casing is secured to the top section of the generator presently described.

C D E F are the sections of my generator, which are preferably arranged one above the other, and are connected together by waterways *g* consisting, preferably, of apertures formed in corresponding portions of adjacent walls of said sections. For facilitating their handling and assemblage, the sections C D E F preferably consist of opposite divisions *c c*, *d d*, *e e*, and *f f*, each provided with an independent chamber, but it is evident that each of said sections may consist of a single chamber.

The sections C D E are constructed in the form of a hollow square, and consequently the opposite extremities of their divisions *c d e* are formed with similar hollow arias *c' d' e'* arranged with the outer faces of opposite arms in close proximity to each other. The inner faces of the sections C D are substantially smooth and form the upright walls of the combustion chamber.

Opposite sides of the section E are provided with hollow heating chambers *E'* of less thickness than width, which project above the combustion chamber to substantially the central portion thereof, so that adjacent faces of opposite heating chambers *E'* are in close proximity to each other. The products of combustion impinge against the lower walls of the

heating chambers E', and then pass readily between the same. A great amount of heating surface is thus subjected to the action of the products of combustion, and the peculiar construction and arrangement of the heating chambers E' tend to effect a positive circulation of the water within the generator.

The top section or dome F of the generator consists of a substantially flat hollow plate or body and the adjacent faces of its opposite divisions are arranged in close proximity to each other. The corners of the top section F are provided with depressed portions F' resting upon the section E, and the remaining portion of the lower face of said section F is substantially flat and is considerably separated from the top face of the section E. The lower wall of the section F thus forms additional heating surface subjected to the action of the products of combustion passed between the heating chambers E', and the space between the adjacent faces of the sections E F forms a flue or chamber for receiving the products of combustion and conducting the same to downwardly extending flues, presently described.

In order to equalize the passage of the return water to the opposite divisions of the section C which inclose the upper chamber of the generator and the pressure within the divisions of the section F, which inclose the lower chamber of the generator the divisions *c c*, and *f f*, of said sections are connected together by projecting pipes C' C', F² F², and connecting pipes C³ F³. The pipes F² F² extend upwardly from the section F, and steam pipes F⁴ F⁴ extend upwardly from the opposite ends of the pipe F³ and form continuations of the pipes F² F².

The sections C D E F are formed with upright flues *c² d² e² f²* aligned with each other, and these flues are preferably formed of greater width than thickness. Each side of the sections C D E is formed with two independent flues, and each side of the section F is formed with a single flue of a width exceeding the combined width of the corresponding flues in the former sections. The lower section C is provided with a series of cut-outs or branch flues *c³* extending upwardly from its lower edge and laterally from the flues *c²* for permitting the escape of the products of combustion therefrom to a heating chamber H interposed between the outer walls of the sections C D E and the inner face of the casing B. The chamber H is provided with one or more baffle plates *h h* for directing the path of the products of combustion and the outer casing B is formed with an outlet opening from which extends a smoke or draft pipe B². It is thus apparent that the products of combustion pass from the chamber or space interposed between the sections F E downwardly through the flues *c² d² e²*, outwardly through the cut-outs or branch flues *c³* into the chamber H, and thence outwardly through the pipe B². The flues *f²* in the chamber F

receive a portion of the products of combustion, but are mainly used for the purpose of facilitating the entrance of a cleaning brush or tool through the chamber F into the flues in the underlying sections. It is also desirable to clean the adjacent faces of the sections C D E and the casing B, and consequently the section F is formed with suitable flues *f³* arranged at the outside of the flues *f²*. Each of the flues *f²* and the adjacent flue *f³* are covered by a cap F⁵ of sufficient width.

As previously stated, the peculiar construction and arrangement of the heating chambers E' tend to produce a circulation within my improved generator, but I render this circulation positive and effective by providing the generator with one or more downflow passages I having their upper and lower extremities connected to the chambers of the upper and lower sections of the generator and their intermediate portions unconnected with the interposed sections. These downflow passages are preferably arranged in the corners of the sections of the generator at the outside of the water connections thereof, and consist, essentially, of openings *i i'* in the upper and lower walls of the sections C F, and passages *i² i³* formed in the sections D E and aligned with said openings. The passages *i² i³* are, as previously stated, unconnected with the chambers of the sections D E, and consequently any water within the section F passes positively and quickly down the downflow passages and into the lower section C, thus producing a positive and effective circulation of the water within my improved generator. This result is evidently auxiliated by the peculiar arrangement of the downflow passages at the corners of generator sections of angular cross section.

The separate sections of my improved generator are secured together in any desired manner, but I preferably secure the same by upright bolts J passed through said sections and provided at opposite ends with suitable shoulders *j j'*, one of which is adjustable toward and away from the other. A yielding washer *j²* is interposed between one of the shoulders, and the adjacent face of the corresponding section of the generator, and consequently the generator is free to expand and contract without impairment of the connection between its sections or undue straining of the parts or liability of leakage, since the washer *j²* yields to permit of expansion, and assumes its normal position when the parts contract.

It is extremely desirable to protect the bolts J from the corrosion, which would inevitably result were they passed directly through the water-containing chambers of the sections of the generator, and consequently these sections are provided with passages or apertures *c⁴ d⁴ e⁴ f⁴* unconnected with the chambers of the sections and aligned one with the other for receiving said bolts J. The chambers *c⁴ d⁴ e⁴ f⁴* are interposed between the correspond-

ing water connections *g*, and downflow passages *H* for facilitating the ready construction of the generator sections.

At Figs. 1 and 2 I have shown my improved generator as provided with a water glass *k*, a steam gage *k'*, a pressure regulator *k''*, and a safety valve *k'''*, but these parts obviously form no part of my present invention, and it is unnecessary to further illustrate or describe the same.

The operation of my invention will be readily perceived from the foregoing description and upon reference to the drawings, and it will be particularly noted that the same consists of a series of parts, which are cheaply manufactured, easily transported and readily assembled, is simple in construction, produces a positive and effective circulation of its contained water, presents a great amount of advantageously located heating surface, is not liable to become unduly strained, or leak when subjected to expansion and contraction, and is highly efficient and durable in use.

My improved generator may be used for hot water heating, and the exact detail construction and arrangement of its parts may be considerably varied without departing from the spirit of my invention, and hence I do not herein specifically limit myself to such exact detail construction and arrangement.

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

1. A generator of angular cross section, comprising a series of hollow sections of angular cross sections arranged one above the other, and connected together, one of said sections consisting of opposite divisions, substantially as and for the purpose described.

2. A generator of angular cross section, comprising a series of hollow sections of angular cross sections arranged one above the other and connected together, one of said sections consisting of opposite divisions formed with projecting hollow arms at their extremities, forming portions of opposite sides of said section substantially as and for the purpose specified.

3. A generator of angular cross section, comprising a series of hollow sections of angular cross sections arranged one above the other and connected together, the lower section consisting of opposite connected divisions and being provided with an upright flue, and a cut-out or branch flue in its lower edge extending laterally from the flue through the adjacent portion of the outer wall of said section, substantially as and for the purpose set forth.

4. A generator of angular cross section, comprising a series of hollow sections of angular cross sections arranged one above the other and connected together, one of said sections being formed with integral upright heating chambers of less thickness than width projecting from its inner face above the combustion chamber and formed with substantially parallel side walls, substantially as set forth.

5. A generator of angular cross section, comprising a series of hollow sections arranged one above the other and connected together, one of said sections consisting of opposite corresponding divisions and being formed with upright heating chambers of less thickness than width projecting from opposite inner walls of said divisions above the combustion chamber and having their inner faces arranged comparatively close together, substantially as specified.

6. A generator of angular cross section, comprising a series of hollow sections arranged one above the other and connected together, one of said sections consisting of opposite divisions formed with projecting hollow arms at their extremities and with heating chambers interposed between said arms and projecting from the inner wall of one of the divisions above the combustion chamber, substantially as described.

7. A generator comprising a series of hollow sections connected together, one of said sections being formed with a substantially flat lower heating wall, and consisting of opposite divisions having their adjacent faces in close proximity, substantially as and for the purpose described.

8. A generator comprising a series of hollow sections connected together, the lower section consisting of opposite divisions formed with projecting hollow arms at their extremities, and an upper section being formed with a substantially flat lower heating wall and consisting of opposite divisions having their adjacent faces in close proximity, substantially as and for the purpose specified.

9. A generator comprising a series of hollow sections connected together, the lower section consisting of opposite divisions formed with projecting lower arms at their extremities, an upper section consisting of opposite divisions and being formed with heating chambers of less thickness than width projecting from the inner wall of one of the divisions above the combustion chamber, and the second upper section being formed with a substantially flat lower heating wall arranged above and separated from the upper faces of the heating chambers and consisting of opposite divisions having their adjacent faces in close proximity, substantially as and for the purpose described.

10. In a generator, the combination of a series of hollow sections connected together, the lower section consisting of opposite divisions formed with projecting hollow arms at their extremities, an upper section being formed with a substantially flat lower heating wall and consisting of opposite divisions having their adjacent faces in close proximity, and connections between the opposite divisions of the lower and upper sections, substantially as set forth.

11. In a generator, the combination of upper and lower chambers, and interposed upright heating chambers projecting above the

combustion chamber and connected to the former chambers for effecting an upward circulation within the generator, and a downflow water passage arranged at the outside of said heating chambers and connected at its opposite ends to the upper and lower chambers of the generator for effecting a downflow circulation within the same, substantially as described.

12. In a generator, the combination of a series of upright heating chambers of less thickness than width projecting above the combustion chamber from opposite sides of the generator and having their adjacent faces in close proximity, and downflow passages arranged at the outside of said chambers and connected at their opposite ends to the water space of the generator, substantially as specified.

13. In a generator, the combination of a frame or body of angular cross section provided with upper and lower chambers and inner heating chambers connected to the former chambers for effecting an upward circulation within the generator, and downflow passages formed in corners of the frame or body and having their opposite ends connected to the upper and lower chambers of the generator for effecting a downflow circulation within the same, substantially as specified.

14. In a generator, the combination of a frame or body consisting of a series of horizontal sections arranged one above the other, said frame or body being provided with upper and lower chambers and heating chambers projecting above the combustion chamber and connected to the former chambers for effecting an upward circulation within the generator, water connections between the sections arranged at the outside of the heating chambers, and downflow passages arranged at the outside of the water connections for said sections and connected at their opposite ends to the upper and lower chambers for effecting a downflow circulation within the generator, substantially as and for the purpose described.

15. In a generator, the combination of a series of sections of angular cross section connected together and provided with inner heating surfaces, heating chambers projecting from one of the sections above the combustion chamber, and downflow passages formed in corners of the sections and having their opposite ends connected to the water space of the generator, substantially as and for the purpose specified.

16. In a generator, the combination of a series of horizontal sections formed with up-

right passages therein unconnected with the water spaces thereof and aligned with each other, and bolts passed through said passages for securing the sections together, substantially as and for the purpose set forth.

17. In a generator, the combination of a series of horizontal sections formed with upright passages therein unconnected with the water spaces thereof and aligned with each other, and water connections at the inside of said passages, downflow passages formed in said sections at the outside of said passages and connected at their opposite ends to the water space of the generator, and bolts passed through said upright passages for securing the sections together, substantially as and for the purpose described.

18. In a generator, the combination of a series of horizontal sections formed with upright passages therein unconnected with the water spaces thereof and aligned with each other, bolts passed through said passages for securing the sections together, and a yielding washer interposed between a face of one of the sections and a shoulder of the bolt, substantially as and for the purpose set forth.

19. In a generator, the combination of a series of horizontal sections formed with upright flues therein aligned with each other, the upper section being formed with a single upright flue aligned with the flues of the corresponding portions of the lower sections, and a cap supported upon the upper face of the upper section for closing the upper end of the flue in the upper section and permitting access thereto, substantially as described.

20. In a generator, the combination of a series of horizontal sections of angular cross section formed with upright flues therein aligned with each other and arranged at the sides of the combustion chamber, the upper section being formed with a single upright flue in each side aligned with the flues of the corresponding sides of the lower sections, and a series of caps arranged at substantially right angles with each other and removably secured upon the upper face of said upper section for closing the upper ends of the flues in the upper section and permitting access thereto, substantially as and for the purpose set forth.

In testimony whereof I have hereunto signed my name, in the presence of two attesting witnesses, at Syracuse, in the county of Onondaga, in the State of New York, this 31st day of March, 1894.

EDWARD P. WAGGONER.

Witnesses:

CLARK H. NORTON,
K. H. THEOBALD.