

**No. 704,588.**

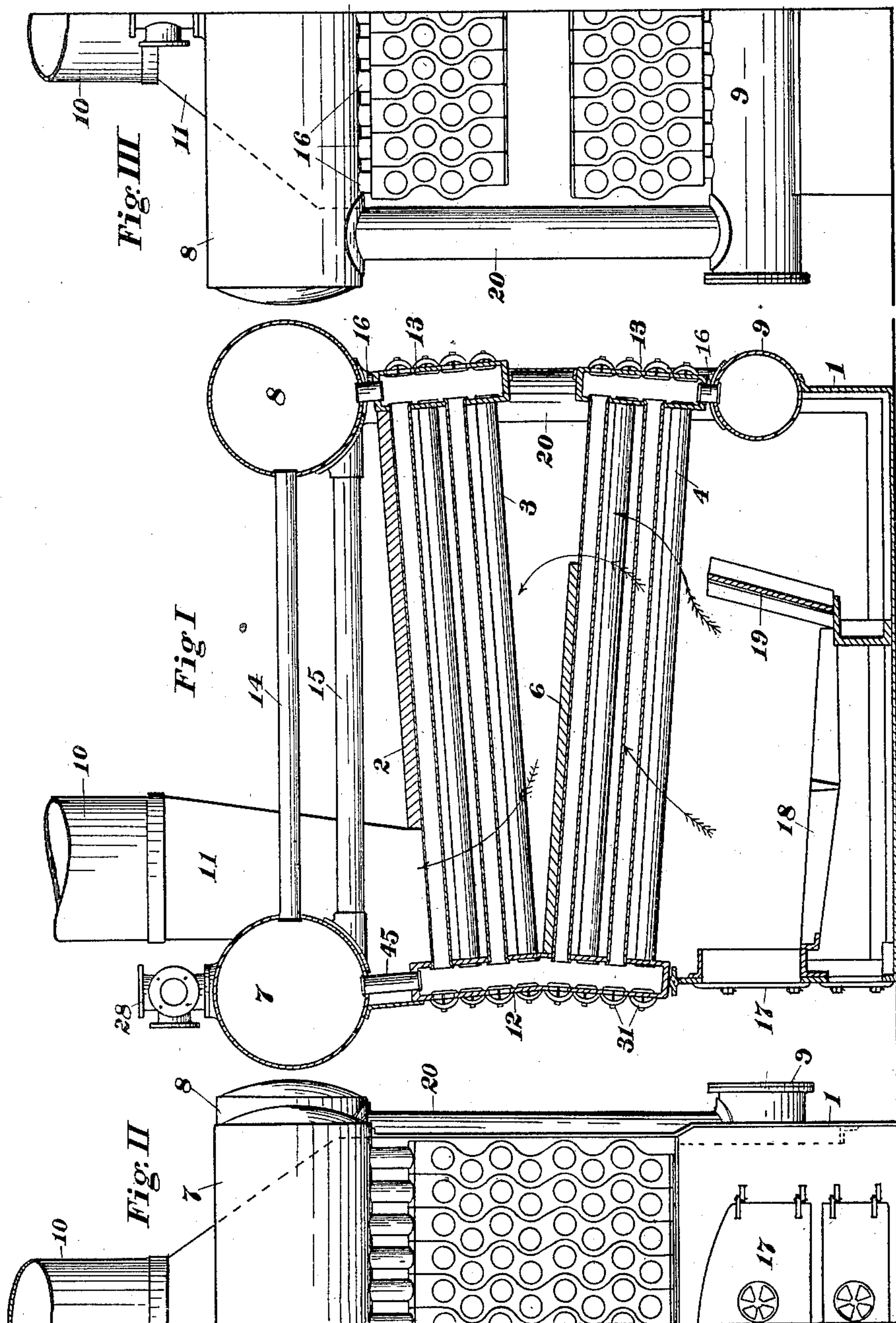
**Patented July 15, 1902.**

**J. P. SIMMONS.**  
**STEAM BOILER.**

(Application filed Feb. 26, 1902.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES:  
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George Manuel.

INVENTOR:  
John P. Simmons.  
By J. Richards & Co.  
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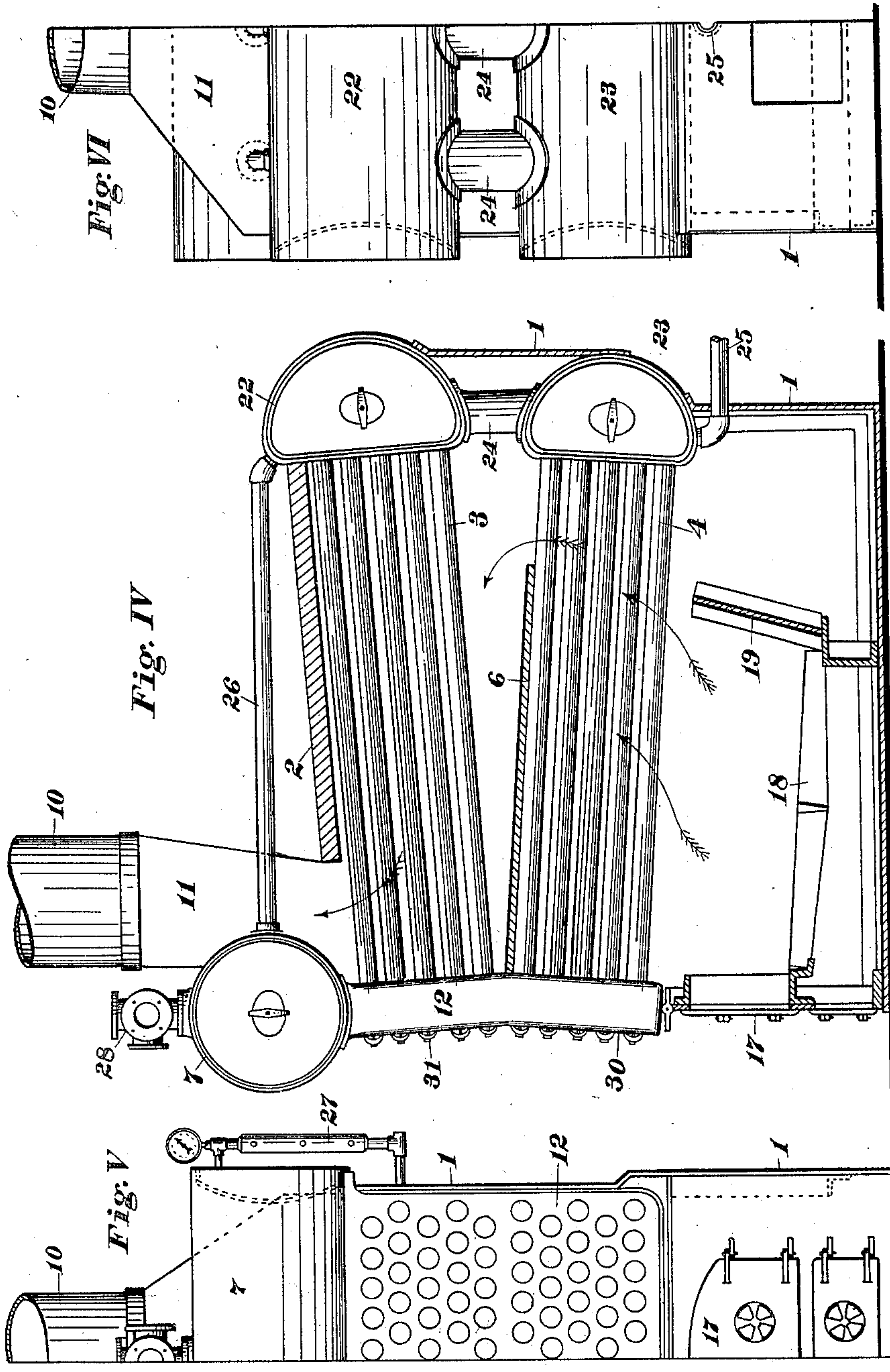
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# UNITED STATES PATENT OFFICE.

JOHN P. SIMMONS, OF SAN FRANCISCO, CALIFORNIA.

## STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 704,588, dated July 15, 1902.

Application filed February 26, 1902. Serial No. 95,750. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN P. SIMMONS, a citizen of the United States, residing at San Francisco, county of San Francisco and State of California, have invented certain new and useful Improvements in Steam-Boilers; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification.

This invention relates to certain improvements in steam-generating apparatus of the type known as "water-tube" boilers.

My improvements consist in a disposition and construction of parts consisting, essentially, of two or more groups of generating-tubes having alternately-opposite inclination, superimposed and provided with the usual header connections that permit a continuous circulation right and left through the groups of tubes; also provides for their full exposure to the furnace-heat.

The object of my invention is to obtain within a limited length and in a compact space an extensive heating-surface; also to apply the hot gases of combustion throughout the whole effective range of the tubes, and to attain other useful results of a constructive and operative nature that will be hereinafter explained by the aid of the drawings herewith, forming a part of this specification.

Referring to the drawings, Figure I is a side elevation, mainly in section, of a steam-generator embodying my improvements arranged for land or stationary purposes. Fig. II is a partial front view of Fig. I. Fig. III is a partial rear view of Fig. I. Fig. IV is a side elevation of a steam-generator of the same type arranged for marine purposes and occupying less space than the one shown in the previous figures. Fig. V is a partial front view of Fig. IV, and Fig. VI is a partial rear view of the same.

To attain the required range of the fire or hot gases and their efficient application within a limited space and at the same time secure the required slope to cause circulation and a free flow of the water and steam, I dispose the parts as now to be referred to, like numerals of reference being applied to corresponding parts in the several figures of the drawings.

Referring first to Figs. I, II, and III, the in-

closing furnace 1 can be of metal with refractory lining where exposed to high temperature or can be of masonry when the weight, room, and other circumstances permit. 2 represents refractory covering-plates, and 6 a deflecting-plate, between the series of generating-tubes 3 and 4. 7 and 8 are steam-drums preferably set transversely, as shown in the drawings, but in the case of narrow boilers can be disposed longitudinally. 9 is a sediment or mud drum, and 10 the chimney, with the usual breeching or collecting chamber 11 at the bottom.

Referring to Figs. I, II, and III, 12 and 13 are front and rear combining chambers or headers. The front ones, 13, are preferably in sections and of sinuous form, as shown in Fig. II, and are connected by the nipples 45 to the drum 7. The rear combining chambers or headers 13 are connected, respectively, to the steam-drum 8 and sediment-drum 9 by nipples 16, as shown in Fig. I, and the cycle of circulation is completed by the pipes 14 and 15, that connect the drums 7 and 8, as seen in Fig. I. 17 is the fire-door, 18 the grates, and 19 the bridge-wall, all of the usual construction and not requiring description. The front combining chamber or header 12 (shown in Fig. IV) is made slightly angular in a vertical plane, so its face will be normal to the lines of the generating-tubes 3 and 4, other reverse-bends being required when a boiler has more than two groups of tubes. The front wall of this chamber 12 is supported by stays in the usual manner and is provided with hand-hole plates 31 to permit access to the ends of the tubes 3 and 4. At the rear end of the boiler and from each end of the drum 8 are downtake-pipes 20, connecting to the drum 9, providing for the downflow of water that circulates through or is converted to steam in the tubes 3 and 4, such as is not evaporated ascending to the drums 7 and 8, where the water-level is maintained by the pipe 15.

Referring next to Figs. IV, V, and VI, representing a marine modification of my improved steam-generator, the cross steam-drum 7 and the two rear drums 22 23 are provided with concave or inwardly-curved heads and are thus made short enough so the lateral width of the structure will not much exceed that of the furnace 1. The rear drums 22 and



23 serve as combining chambers or headers for the generating-tubes 3 and 4 and are connected by nipples 24, so the top one, 22, acts in part as a steam-chamber and the bottom one, 23, as a sediment or mud drum, to which a blow-off pipe 25 connects. These drums 22 and 23 are made of segmental form in cross-section, as shown in Fig. IV, the flat sides being stayed by the tubes 3 and 4, that at the front connect to the chamber or header 12, which is, however, in this case a single oblong chamber attached directly to the drum 7. Supply-water can be furnished at any convenient part of the boiler, preferably where the heat is least intense, as in the drums 9 or 23. 27 is the water-gage, and 28 a stand to receive a steam-pipe, safety-valve, and the usual fittings.

In operating the lower group of tubes 4 receive the most intense heat, and steam generated therein causes a rapid flow toward the front combining-chambers 12. In these chambers the steam formed in the tubes 4 rises directly into the drum 7, and the water not evaporated passes into the upper group of generating-tubes 3, where it is further converted to steam, that rises through the chambers 13 in Fig. I or the nipples 24 in Fig. IV and enters the drums 8 or 22 and passes through the pipes 14 or 26 to the steam-drums 7, while the circulating water flows down the pipes 20 or the nipples 24. In this manner it will be seen that the length of the generating-tubes 3 and

4 is divided in two parts, or if three groups of tubes were used they would be divided into one-third the length required by single or continuous tubes of equal length and the whole structure be shortened accordingly, and that is so if some arrangement of the generating-tubes 4 and 5 permits the free escape of steam and guards against the complete evaporation of the water in these tubes when exposed to intense heat and circulation is rapid.

Having thus explained the nature and objects of my invention and the manner of its application in practice, what I claim as new, and desire to secure by Letters Patent, is—

In a steam-generator, an inclosing furnace, a header arranged at the front end thereof, and two headers, one above the other, arranged at the rear end thereof, superimposed groups of generating-tubes longitudinally arranged in said furnace and connecting said headers, said groups being set at oppositely-sloping angles, and steam-drums arranged at opposite ends of said furnace, directly connected with said headers at the water-spaces of said drums, substantially as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN P. SIMMONS.

Witnesses:

ALFRED A. ENQUIST,  
P. W. J. LANDER.