

No. 881,057.

J. M. CLARK.

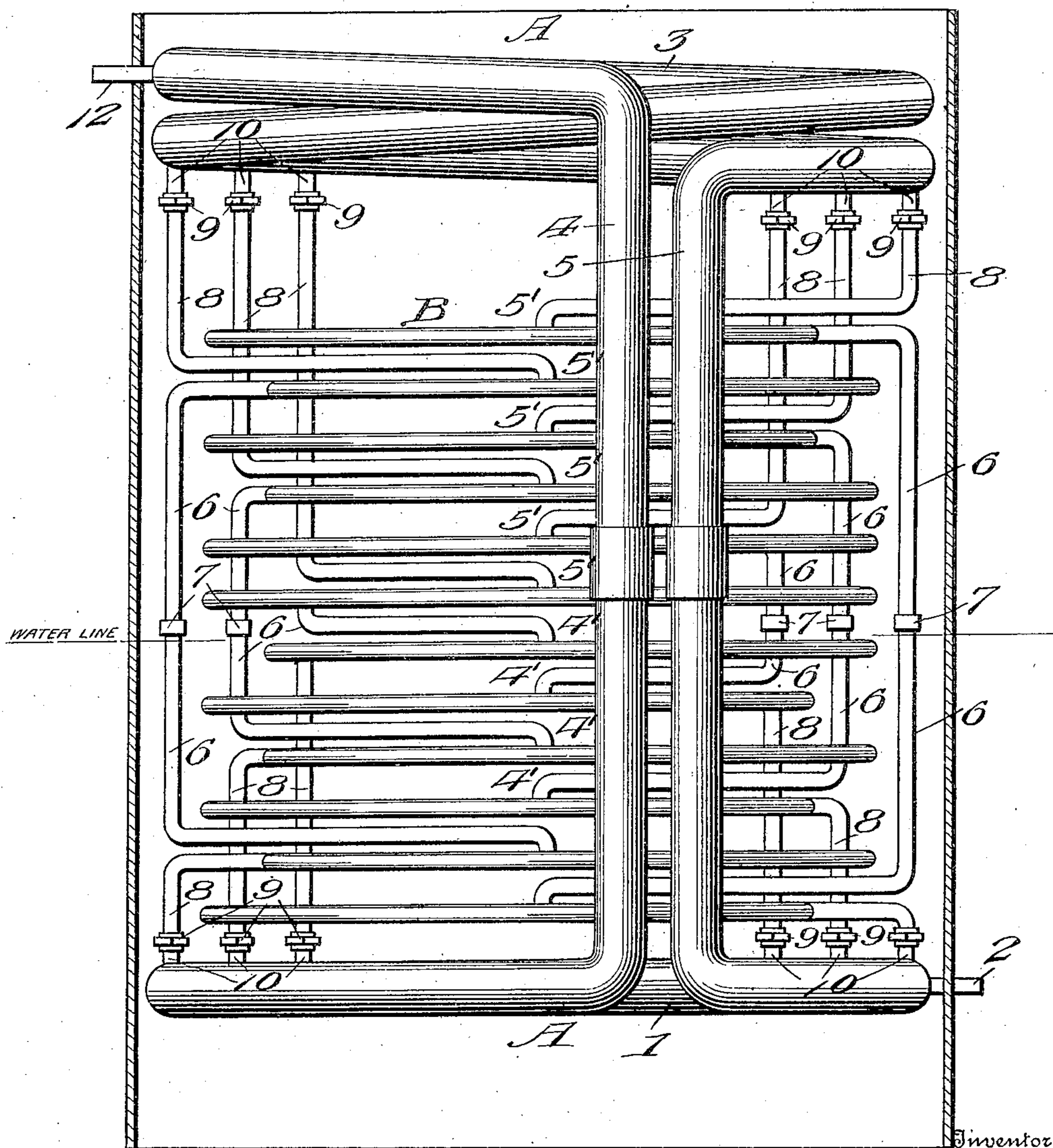
PATENTED MAR. 3, 1908.

STEAM GENERATOR.

APPLICATION FILED MAR. 12, 1907.

4 SHEETS—SHEET 1.

*Fig. 1.*



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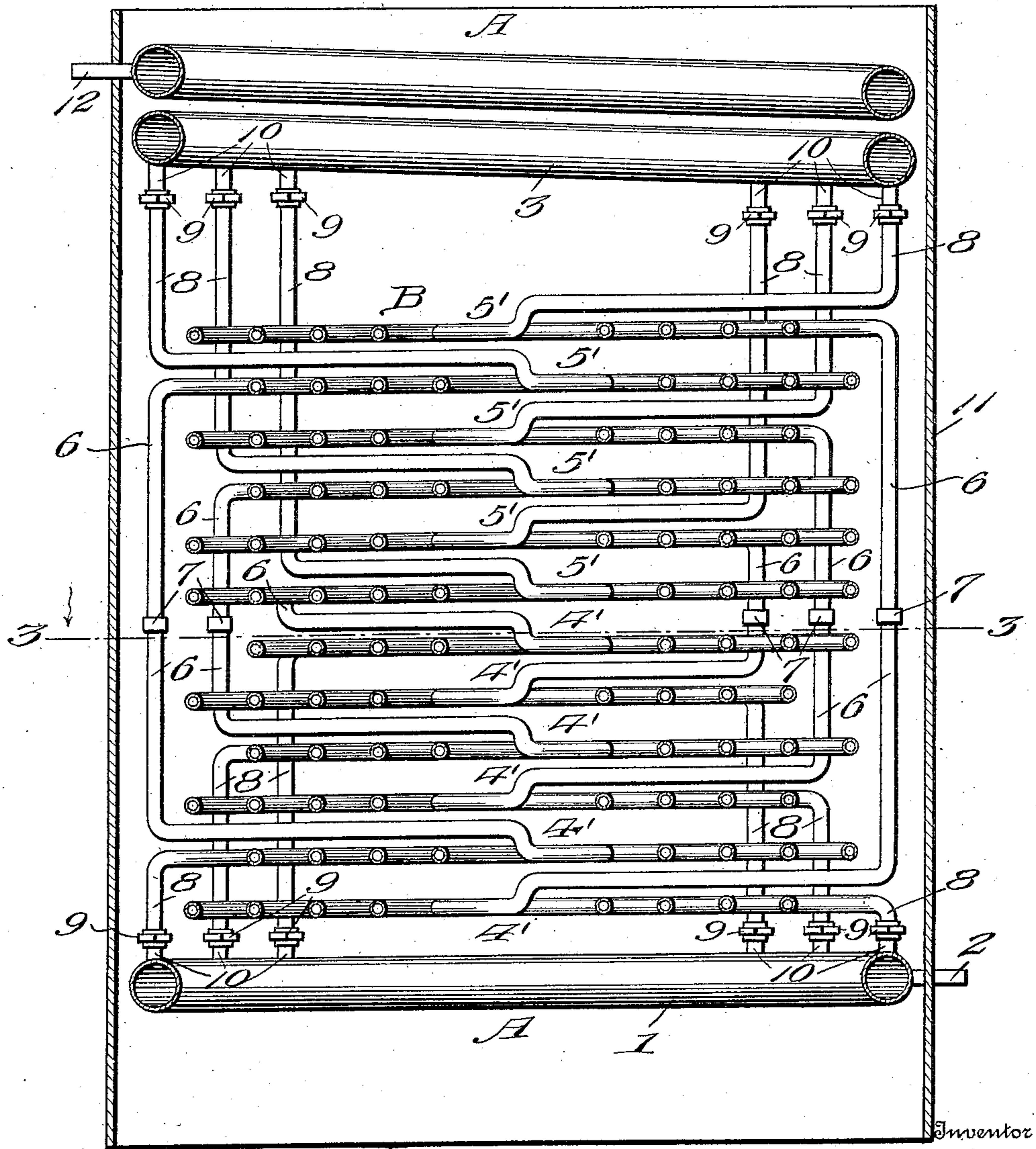
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4 SHEETS—SHEET 2.

*Fig. 2.*



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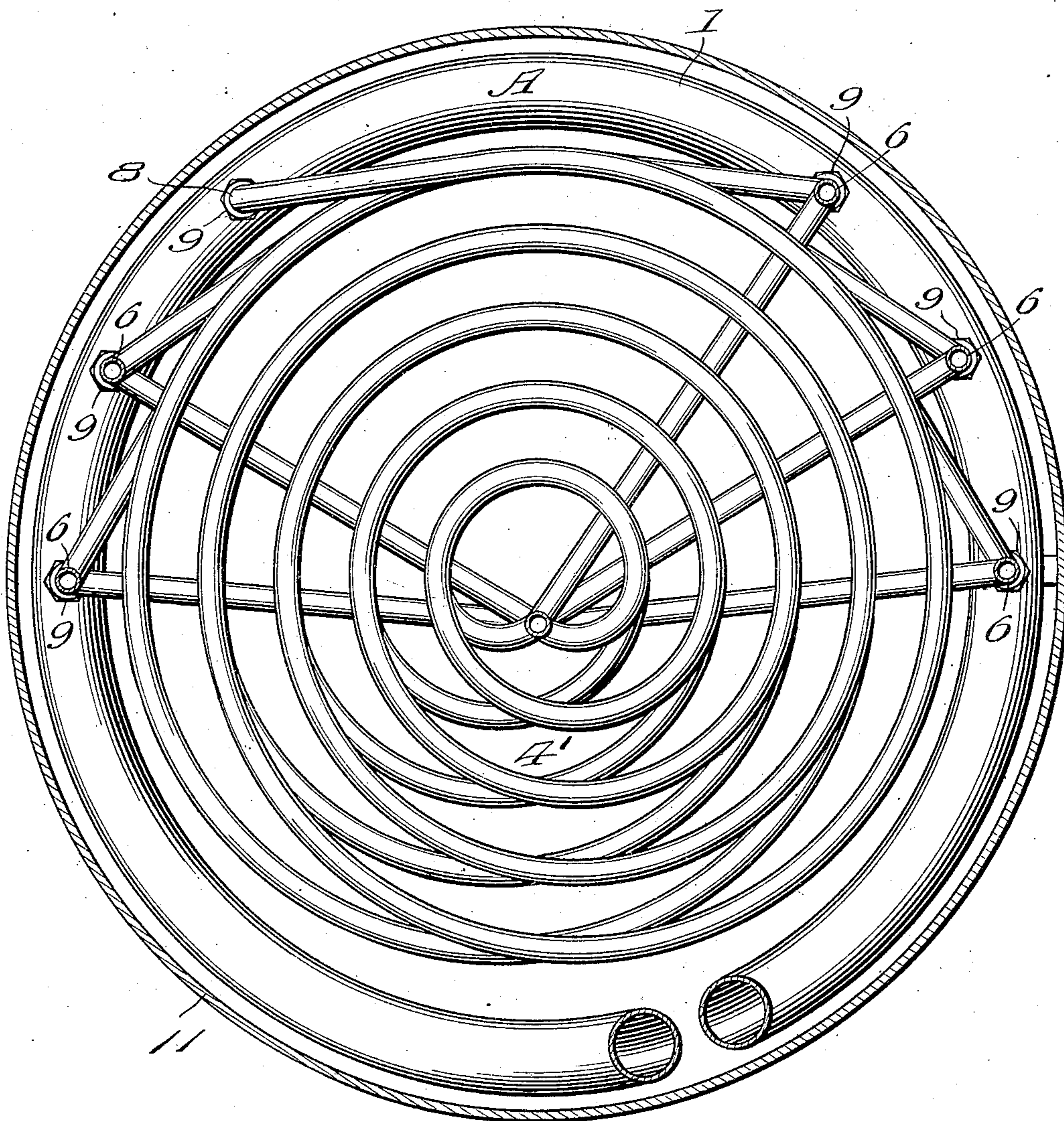
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4 SHEETS—SHEET 3.

*Fig. 3.*



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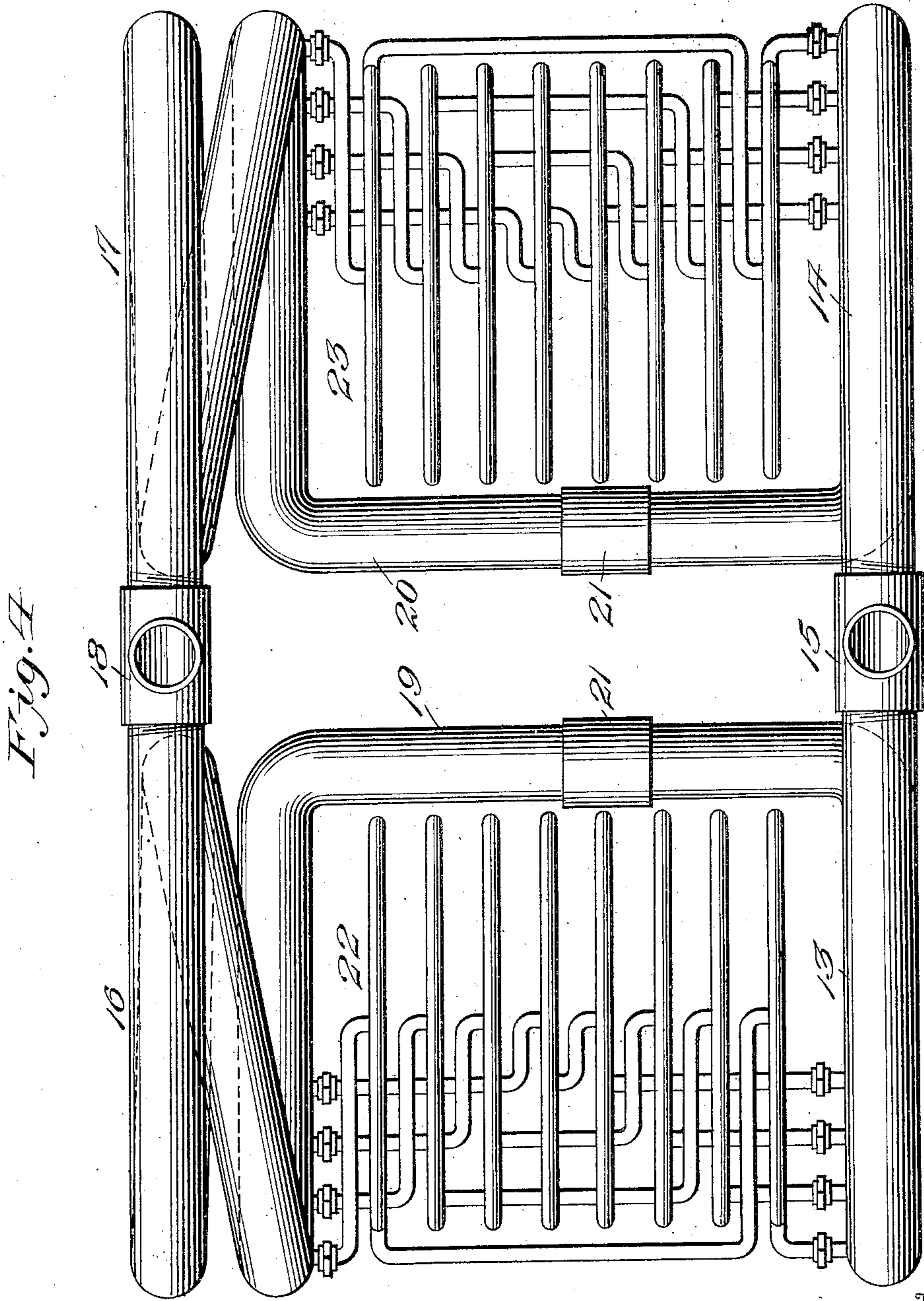
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4 SHEETS—SHEET 4.



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# UNITED STATES PATENT OFFICE.

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## STEAM-GENERATOR.

No. 881,057.

Specification of Letters Patent.

Patented March 3, 1908.

Application filed March 12, 1907. Serial No. 362,025.

*To all whom it may concern:*

Be it known that I, JOHN MERRITT CLARK, a citizen of the United States, residing at Whitestone, Long Island, in the county of Queens and State of New York, have invented new and useful Improvements in Steam-Generators, of which the following is a specification.

The invention relates to an improvement in steam generators and particularly to a construction adapted for the safe generation of the maximum steam pressure and in which the parts are so arranged as to be conveniently and independently separable when desired for removal.

The main object of the present invention is the production of a generator or boiler comprising a water coil and steam coil connected for circulation, and an intermediate series of coils arranged in connected pairs and in open communication with the water and steam coil, the respective coils of each pair being disposed in the same relative relation to the water and steam coils and to be readily and independently connected to or disconnected from said coils for removal.

The preferred embodiment of the details of structure of the present invention will be described in the following specification, reference being had to the accompanying drawings, in which:—

Figure 1 is a view in side elevation of a generator constructed in accordance with my invention, the casing therefor being shown in section, Fig. 2 is a vertical central section through the same, Fig. 3 is a section on line 3—3 of Fig. 2, Fig. 4 is an elevation of a slightly modified form of generator.

Referring particularly to the drawings, wherein similar reference numerals indicate like parts throughout the several views, my improvement is directed primarily to a series of independent generators comprising main and auxiliary generators, each of said generators comprising spaced coils one of which forms a water coil and the other a steam coil, the main generator coils being in respective communication with the water supply and steam service pipes, the respective coils of each auxiliary generator being in communication with the similar coils of the main generator.

In detail structure the main generator A

comprises a coil 1, forming a water leg or water coil, in communication with the water supply pipe 2, and a steam coil 3, the terminals of the respective coils 1 and 3 being in communication through pipes 4 and 5, whereby a complete circulation is maintained between the coils 1 and 3. By preference the coil 1 comprises a single convolution, while the coil 3 comprises a series of convolutions, preferably arranged in superimposed order and approximately of the same diameter. The pipes 4 and 5 are of such length as to space the coils 2 and 3 a sufficient distance apart to include between them the desired number of auxiliary generators, it being understood that said auxiliary generators, so far as the purposes of the present invention are concerned may be in any number, limited only by the purpose for which the boiler is designed.

The auxiliary generators B are of identical construction, each comprising a lower or water coil 4' and an upper or steam coil 5'. One terminal of each of the coils 4' and 5' is extended to form a pipe connection 6, which pipes are terminally joined by a right and left coupling 7, whereby to provide communication between the respective coils 4' and 5'. The remaining terminal of each coil is projected beyond the coil in the form of a pipe section 8, said sections being respectively connected through the medium of unions 9 to nipples 10 leading to the coils 1 and 3 of the main generator. Each auxiliary generator thereby includes a water coil and a steam coil arranged in open communication with each other and also in open communication with the water and steam coils of the main generator. The coil proper of each of the auxiliary generators is of peculiar form, as more particularly illustrated in Fig. 3. From this figure it will be seen that each coil of the auxiliary generator is formed by projecting the pipe of said coil in a series of approximately concentric convolutions arranged in the same plane, so that one terminal of the coil alines with the outermost convolution, while the other forms practically the center of the coil. It is to be understood in this connection that I do not desire to limit myself specifically to this particular method of forming the coils, the main essential for the purposes of the present invention

being that said coil must be arranged in a horizontal plane, so as to present practically the thickness of the coil pipe only.

Another material feature of the present invention is the relative disposition of the respective auxiliary generators, so as to maintain as nearly as possible an equal temperature in each generator. For this purpose the respective water and steam coils of each auxiliary generator are disposed the same distance from the respective coils of the main generator, that is to say the water coil 4' of one auxiliary generator will be disposed immediately adjacent and above the water coil 1 of the main generator, while the steam coil 5' of the same auxiliary generator will be disposed immediately below and adjacent the steam coil of the main generator. The second auxiliary generator of the series will have its water coil arranged immediately above the water coil of the first generator, while its steam coil will be arranged immediately below the steam coil of the first generator. By this construction and arrangement the temperature is more nearly equalized, as that auxiliary generator having its water coil nearest the water inlet, and hence of comparatively the lowest temperature will have its steam coil disposed in the plane of maximum heat, the intervening auxiliary generators having their water coils further removed from the inlet and their steam coils equally removed from the point of maximum heat. The average of temperature of the respective coils of the auxiliary generators is thus maintained throughout the series.

The pipe connections 6 and 8 from the respective auxiliary generators are arranged beyond the planes of the coils of said generators, so that by proper operation of the unions 9 and couplings 7 any auxiliary generator may be entirely removed from the boiler structure without in any way interfering with the remaining generator.

The respective generators are preferably arranged in a casing 11, designed to confine the heating medium, and a steam service pipe 12 is arranged to convey the steam from the steam coil of the main generator to the point of use.

In Fig. 4 I have illustrated a slightly modified form of boiler structure in which a series of main and auxiliary generators are coupled. In this instance the main generators comprise independent water coils 13 and 14 connected through a coupling 15 particularly constructed to provide for the connection of the water service pipe thereto, said coils 13 and 14 projecting in opposite directions from the coupling. The main generator includes steam coils 16 and 17 disposed respectively above the coils 13 and 14, one terminal of each of the coils 16 and 17 being connected through a coupling 18, also ar-

65 ranged to provide for the connection of the steam service pipe. The remaining terminals of the coils 16 and 17 are in communication with the terminals of the coils 13 and 14 through pipe sections 19 and 20, each of said sections preferably comprising two 70 pipe lengths connected by a coupling 21, to provide for convenient separation of the coils.

As thus constructed and arranged the main generator comprises a plurality of water coils in communication with each other, 75 and a plurality of steam coils in communication with each other and with the water coils, the medium of communication providing for a complete circulation throughout the 80 coils. Two sets of auxiliary generators 22 and 23, each practically identical in construction and arrangement with the auxiliary generators of the preferred form, are arranged 85 between the water coils and steam coils of the main generator, each set of the auxiliary generators being disposed between and in communication with one water coil and one steam coil of the main generator.

The modified form provides in effect a series of generators each duplicating the unitary form shown in Figs. 1 to 3 inclusive, the main generators being connected in multiple, and the auxiliary generators being without 95 connection other than through their own main generator. In this connection it is to be understood that, while showing the coupling of but two series of generators, any number may be so connected to meet the requirement of any particular service. 100

In the use of the improved boiler the water level is to be maintained with due regard to the auxiliary generators, that is so that each water coil of said generators will carry a supply of water, the invention contemplating the use of such auxiliary devices as may be necessary for gaging purposes, such as steam pressure gages and water level gages, and similar accessories, these parts not being 105 illustrated as their connection in the system is obvious and their use well understood. 110

In a generator constructed in accordance with my invention, it will be found that a reserved capacity is provided for the steam owing to the large steam space, that a low water level may be maintained owing to the comparatively large water capacity, that an excessive steam pressure can be safely carried as the pipe construction practically prevents rupture under such pressure, and that 120 by displacing the casing 11 any one or more of the coils may be conveniently and expeditiously removed for repair or renewal by the simple manipulation of the couplings and unions. 125

While preferring the detailed construction and arrangement of parts described it is to be understood that various changes and modi-

fications may be resorted to without materially affecting the function or advantages of the present construction, and it is to be understood, therefore, that I consider as within the spirit of the present invention all changes and modifications as may fall within the scope of the appended claims.

Having thus described the invention what is claimed as new, is:—

10 1. A boiler comprising a main generator including spaced coils arranged in circulatory communication, and an auxiliary generator including spaced coils in communication with each other and in communication with  
15 the respective coils of the main generator, the respective communication between the coils comprising pipe sections and coupling members connecting said sections, whereby the auxiliary generator may be disconnected

from the main generator and the respective coils of said generator disconnected from each other. 20

2. A boiler comprising a main generator including a water coil and a steam coil in circulatory communication, and an auxiliary generator comprising a steam coil and a water coil in communication with each other and respectively in communication with the steam coil and water coil of the main generator, each coil of the auxiliary generator comprising a series of concentric pipe convolutions disposed in the same plane. 25 30

In testimony whereof, I affix my signature in presence of two witnesses.

JOHN MERRITT CLARK.

Witnesses

CLINTON T. ROE,  
JOSEPH MALONE.