

No. 699,102.

Patented Apr. 29, 1902.

W. CHESTERMAN.
STEAM GENERATING SYSTEM.

(Application filed July 5, 1901.)

(No Model.)

Fig. 1.

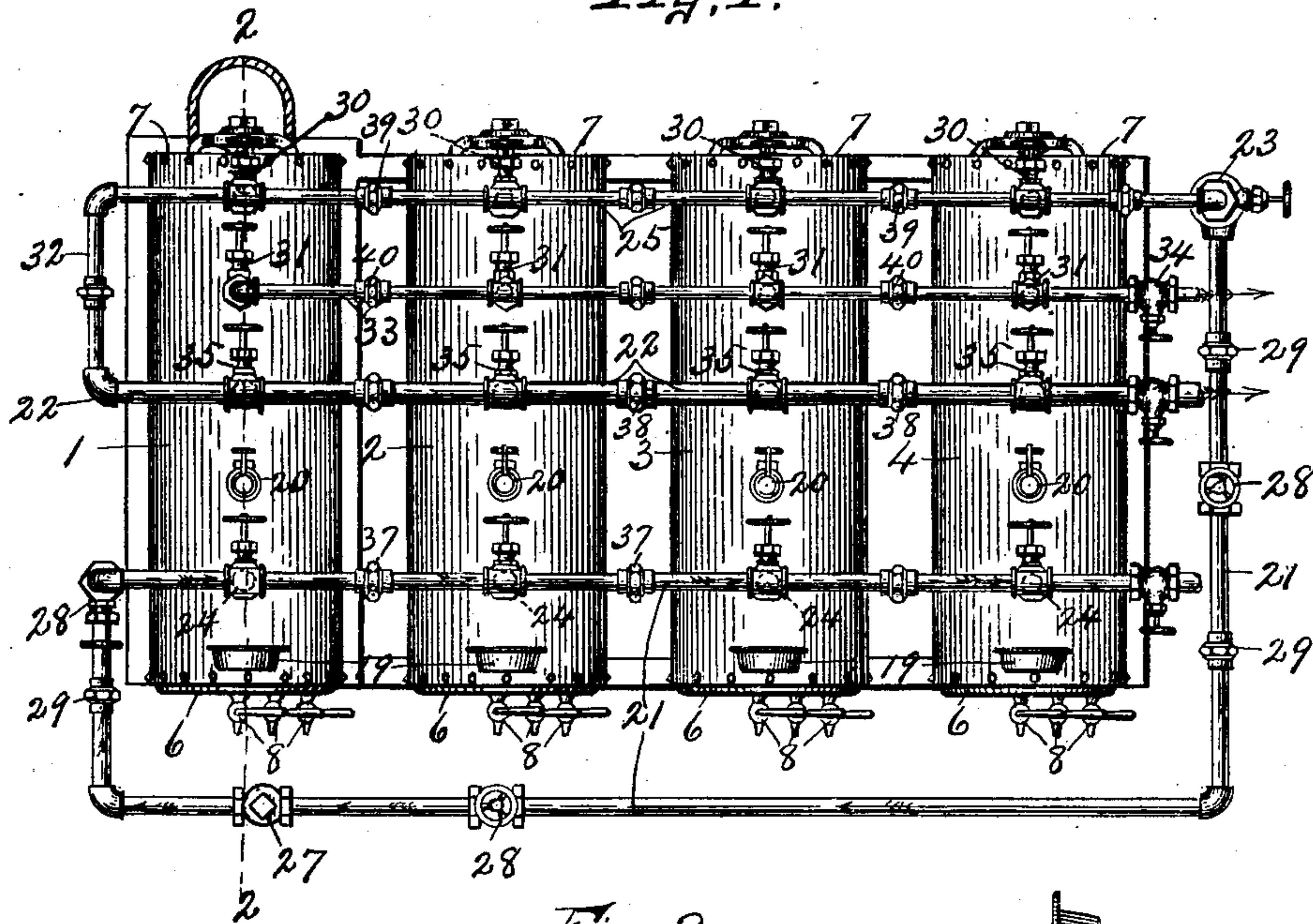
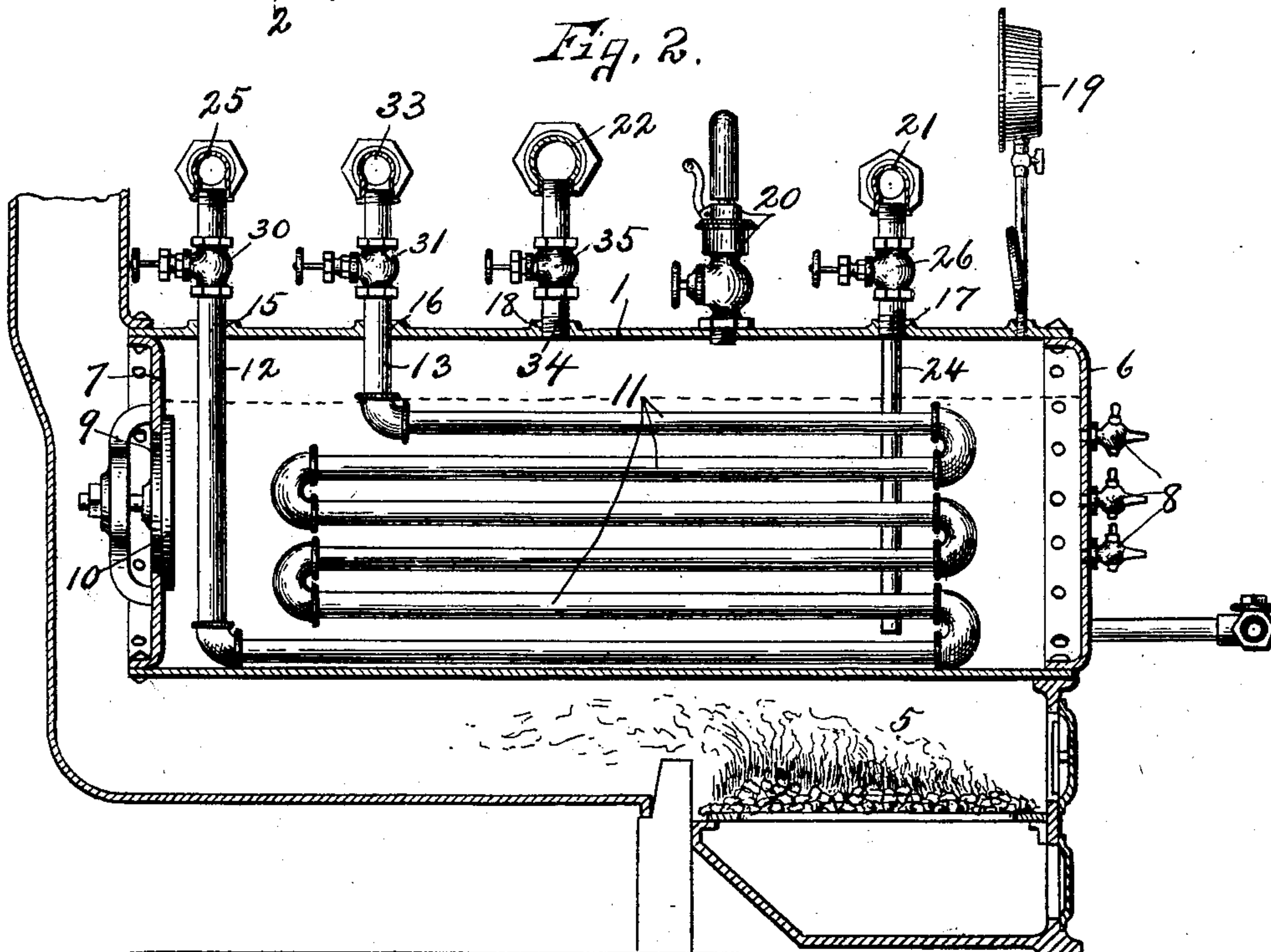


Fig. 2.



WITNESSES:

F. Arthur,
H. C. Chase,

INVENTOR

William Chesterman

BY

Smith & Brinson
ATTORNEYS.

UNITED STATES PATENT OFFICE.

WILLIAM CHESTERMAN, OF WALSTON, PENNSYLVANIA, ASSIGNOR OF
TWO-THIRDS TO ALEXANDER HUSTON AND RAYMONT HUSTON,
OF WALSTON, PENNSYLVANIA.

STEAM-GENERATING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 699,102, dated April 29, 1902.

Application filed July 5, 1901. Serial No. 67,161. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM CHESTERMAN, of Walston, in the county of Jefferson, in the State of Pennsylvania, have invented new and useful Improvements in Steam-Generating Systems, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

My invention relates to improvements in steam-generating systems.

The object of this invention is to provide means whereby steam may be generated in a battery of boilers from a single source of heat, or, in other words, the object, briefly stated, is to utilize the steam from a primary generator for converting the water in one or more secondary boilers into steam and to thereby obtain a maximum degree of steam efficiency with the consumption of a minimum quantity of fuel.

A further object is to connect to several boilers so as to supply steam from the primary boiler to the steam-heaters of the secondary boilers successively and to collect the steam generated in the several boilers into one common steam-supply conduit, which may be connected to an engine or other device requiring power or steam heat.

A still further object is to provide the water and steam connections with suitable valves, whereby the primary generator may be used individually or collectively with one or more of the secondary generators.

To this end the invention consists in the combination, construction, and arrangement of the parts of a steam-generating system as hereinafter fully described, and pointed out in the claims.

Referring to the drawings, Figure 1 is a top plan of a steam-generating plant embodying my invention. Fig. 2 is a sectional view taken on line 2 2, Fig. 1.

Similar reference characters indicate corresponding parts in both views.

In the ordinary method or process of generating steam it is well known that a considerable degree of heat energy is necessarily dissipated or lost by reason of the escape of the products of combustion through a draft or smoke flue, that even under the most favor-

able conditions after the fuel is well ignited a large percentage of the heat is thus diverted through this channel, and that when a battery of the several steam-boilers with independent sources of heat is employed this loss of energy is proportionately increased according to the number of generators used. It is therefore evident that if the water in a series of boilers could be successfully converted into steam from a single source of heat a large saving in fuel, labor, and bunker-space or a considerable increase in the volume of steam from a given quantity of fuel would result. My invention is designed to accomplish this result in the manner above mentioned, and in order to clearly illustrate the principle of my invention I have shown a battery of four water-containing shells or boilers 1, 2, 3, and 4, one of which, as 1, is superimposed above a suitable combustion-chamber or other source of heat 5 and constitutes the primary steam-generator, while the remaining shells 2, 3, and 4 receive the heat from the primary generator and will be hereinafter designated as "secondary" generators. The primary and secondary boilers are preferably identical in construction, each consisting of a cylindrical shell having front and rear end heads 6 and 7, the front heads 6 being provided with suitable water gages or valves 8, and the rear heads are provided with hand or man holes 9 and plates 10 for closing said holes and permitting access to the interior of the boilers when desired to clean the same or for any other purpose. I also preferably provide each of the boilers 1, 2, 3, and 4 with a tortuous steam-conduit 11, usually consisting of a series of loops or pipes connected to each other to form a continuous conduit. The tortuous portion of each is generally submerged in the body of water of its respective boiler, and the opposite ends or legs of said conduit are extended outwardly through suitable openings 15 and 16 in the upper wall of the shell. Each of these shells is also provided with water-inlet and steam-outlet openings 17 and 18, a steam-gage 19, and a safety-valve or equivalent device 20, all of which extend through the upper wall of the shell, the water-inlet openings of the several shells being con-

5 nected to each other by a water supply or feed conduit 21, and the steam-outlet openings are connected by a pipe or conduit 22, adapted to receive steam from either or all of the generators.

10 The water and steam conduits 21 and 22 are connected to any desired form of steam inspirator or injector, as 23, by which water may be supplied through the conduit 21 to the several generators simultaneously. The operation of the inspirator or injector 23 being well understood by those skilled in the art, it is believed to be unnecessary to further illustrate or describe the same. This conduit 15 21 preferably extends transversely above the primary and secondary boilers, being arranged to discharge first into the primary generator 1 and then successively through the secondary boilers 2, 3, and 4, and is provided 20 with a series of depending branches 24, extending downwardly through the openings 17 of the several boilers 1, 2, 3, and 4 to a point in proximity to the bottom walls of said boilers.

25 In order that the attendant may be enabled to use the primary generator individually or either one of the secondary boilers in connection with the primary generator, I provide each of the branches 24 with a suitable valve 30 26, whereby water may be supplied to either of said primary or secondary generators independently or simultaneously with the others. I also provide the water-supply conduit 21 with a suitable check-valve 27 and additional 35 valves 28, whereby the water may be shut off either between the inspirator and check-valve or between the check-valve and the primary generator 1 when it may be desired to disconnect any portion of the water-feed conduit 40 between the inspirator and the primary generator, suitable unions 29 being also provided in the water-feed pipe for facilitating the disconnecting of the several sections of the water-supply conduit.

45 The steam-heaters or tortuous conduits 11 are preferably submerged in the water of their respective boilers, and the number of loops or ribs thus submerged may be increased or diminished according to the size of the boiler or 50 to meet the requirements necessary to produce the highest degree of efficiency.

As previously stated, the opposite ends or legs 12 and 13 of the steam-heater 11 are extended downwardly through the openings 15 55 and 16 in the upper wall of the boiler and are each provided with a suitable valve 30 and 31, the leg 12 being connected to the lower end of the tortuous conduit 11, and the outer ends of each of the legs 12 of the several boilers are connected to each other by a conduit 60 25 and to the main steam-conduit 22 by an additional connection 32.

65 The conduit 25 extends transversely above the boilers 1, 2, 3, and 4 and terminates in the inspirator or injector 23 for supplying steam thereto and by which the water is forced or drawn from a suitable well or other water-res-

ervoir through the water-supply conduit 21. The other leg of the steam-heater 11 is connected to the upper loop 13 of the steam-heater 70 11, extends outwardly through the opening 16, each of said legs 13 being provided with a valve 31 and are connected to each other by a conduit 33, which receives the steam successively from the steam-heaters 11 of the several boilers 1, 2, 3, and 4 and is arranged to 75 discharge into a suitable separator or condenser, if desired, said conduit 33 being provided at its outer end with a suitable valve 34 for controlling the flow of said steam to the 80 condenser, it being understood that this steam may be conducted from the condenser (not illustrated) back to the water-supply reservoir.

The steam-conduit 22 forms the main steam-conduit for receiving the steam generated in 85 the several boilers 1, 2, 3, and 4, said conduit 22 being provided with a series of depending branches 34, extending downwardly through the openings 18 in the upper walls of said boilers, these branches being provided with 90 valves 35, by means of which the steam may be supplied either from the primary boiler 1 individually or from one or more of the secondary boilers in conjunction with the primary boiler. Each of the conduits 21, 22, 25, 95 and 33 are provided with suitable unions 37, 38, 39, and 40, whereby the several sections of said conduits may be readily detached from each other when desired to disconnect the boilers one from the other. 100

In the operation of my invention the steam is generated in the primary boiler 1 by means of the products of combustion in the chamber 5, which steam passes from the boiler 1 into the main steam-pipe 22, outwardly through 105 the conduits 22, 32, and 25, through the several loops of the tortuous conduit 11 of each of the generators, and thence into the conduit 33, from which it may be discharged through a suitable separator or condenser, 110 previously mentioned and not necessary to herein illustrate or describe. This discharge of the steam through the several steam-heaters converts the water of the secondary boilers into steam and also facilitates the generation 115 of steam in the primary boiler. It is obvious, however, that, if desired, the steam coil or heater 11 may be dispensed with in the primary generator and used only for the generation of steam in the secondary boilers; 120 but in practical operation I have found it to be a decided advantage to have one of these heaters in the primary generator.

During the first firing or generation of the steam in the primary boiler the valves 35 in 125 the secondary boilers may be closed, thereby diverting all of the steam from the primary boiler through the several steam-heater coils. After the steam begins to form in the secondary boilers the valves 35 of these boilers 130 may be opened, thereby admitting the steam from the secondary boilers to the main conduit 22, which of course mingles with the steam generated first in the primary boiler

and augments the generating of steam in all of the boilers.

The main steam-conduit 22 extends beyond the last secondary boiler 4 and may be connected to an engine or other device requiring steam, this main steam-conduit forming the power-supply and is adapted to receive the steam either from all or any one of the generators in the manner previously described.

When desired to supply one or more of the generators with water, steam is admitted through the conduit 21 from the inspirator 23, which is manipulated in the usual manner for drawing water from the supply-reservoir and forcing the same through the conduit 21, the water first entering the primary boiler 1 and is then successively admitted to each of the boilers 2, 3, and 4. It is apparent, however, that either of these boilers may be supplied with water independently of the others by simply closing the valves 26 of all but the one which it is desired to supply with water.

The safety-valves 20 of each of the boilers may be of any desired construction and may be arranged in the form of an alarm, if desired, and the steam-gages 19 may also be formed of any desired construction for indicating the pressure of steam within each of the boilers independently of the others. These safety-valves or alarms and the steam-gage being well understood, it is thought to be unnecessary to further illustrate or describe the same.

The operation of my invention will now be readily understood upon reference to the foregoing description and the accompanying drawings, and it will be noted that the essential feature of this invention is to provide a series of boilers with steam-coils connected to a primary steam-generator, whereby the steam generated in the primary steam-generator serves to generate steam in the secondary boilers, and that the construction of the steam-heaters and the connections between the several generators may be varied somewhat without departing from the spirit of my invention.

Having thus described my invention, what

I claim, and desire to secure by Letters Patent, is—

1. In a steam-generating system, the combination with a primary generator, a furnace or other source of heat therefor, and a steam-conduit within the said primary generator, of a series of secondary generators each having a steam-conduit therein and in communication with the steam-conduit in the primary generator whereby steam is generated in the secondary generators by the steam supplied from the primary generator, a steam-delivery conduit common to all of the generators, and a water-feed conduit common to all the generators having a series of depending branches extending into the respective generators and discharging in close proximity to the bottom wall of said generators, substantially as described.

2. In a steam-generating system, the combination with a primary generator, and means for supplying heat to said primary generator, of a plurality of secondary generators each having a steam-conduit located therein and connected to the primary generator whereby steam is generated to the secondary generators solely by the aid of the steam supplied from the primary generator, a water-feed conduit for supplying water to each of the generators simultaneously, and a steam-delivery conduit common to all the generators, substantially as described.

3. In a steam-generating system, a primary generator supplied with heat from a suitable source, and a plurality of secondary generators each having a tortuous steam-conduit therein connected to the primary generator; a water-feed conduit connected to each generator so as to supply water to all simultaneously, and a steam-delivery conduit common to all the generators, substantially as described.

In witness whereof I have hereunto set my hand this 18th day of June, 1901.

WILLIAM CHESTERMAN.

Witnesses:

WILLIAM S. DAVENPORT,
H. P. DENISON.