P. A. TALBOT.

STEAM GENERATOR.

APPLICATION FILED JULY 17, 1905. RENEWED APR. 12, 1907.

1,038,024. Patented Sept. 10, 1912.

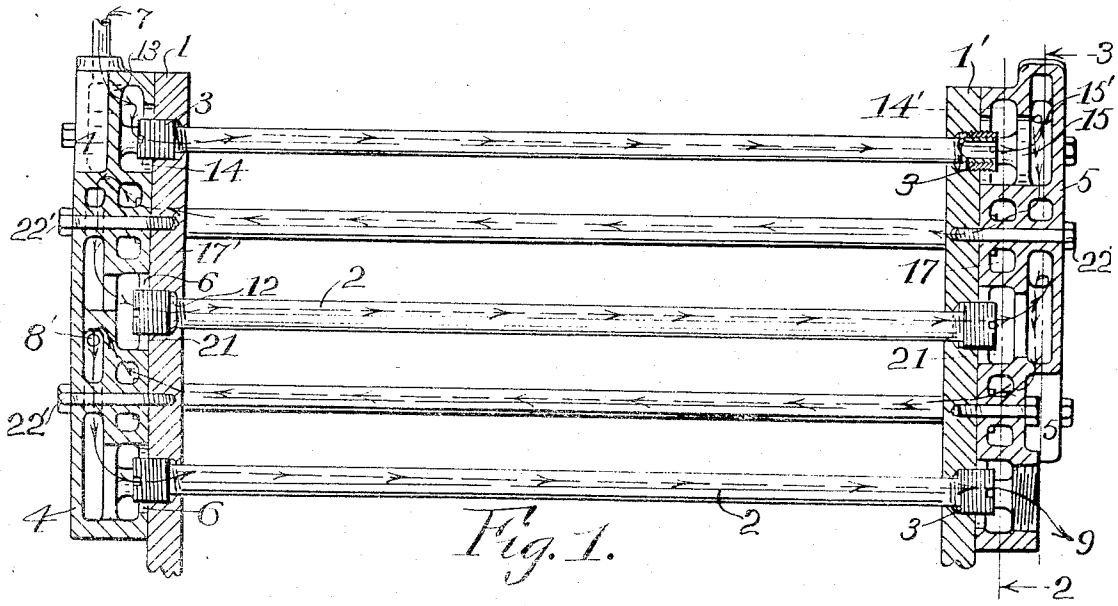

Fig. 1.

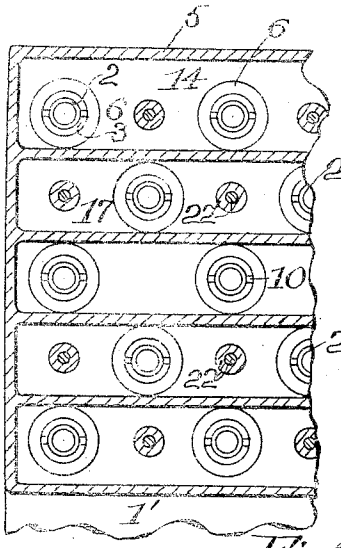

Fig. 2.

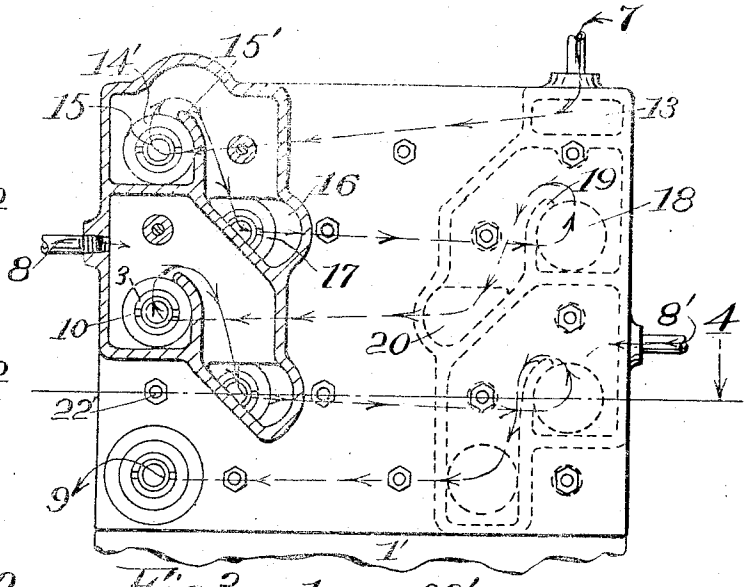

Fig. 3.

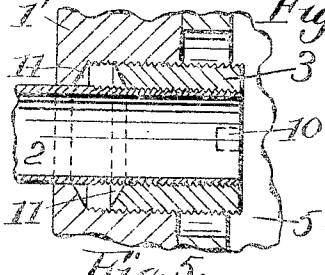

Fig. 5.

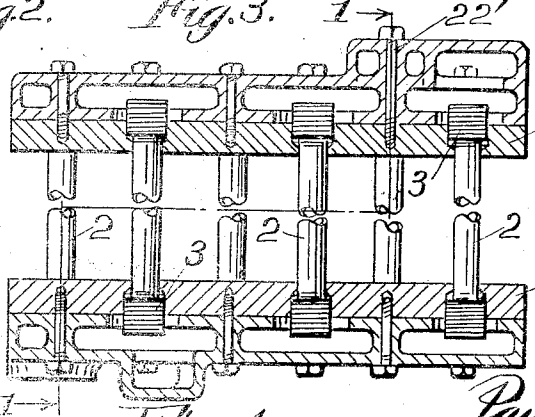

Fig. 4.

WITNESSES

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STEAM-GENERATOR.

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Application filed July 17, 1905, Serial No. 269,948. Renewed April 12, 1907. Serial No. 367,871.

To all whom it may concern:

Be it known that I, PAUL A. TALBOT, a citizen of the United States, residing at Seattle, in the county of King and the State of Washington, have invented a new and useful Steam-Generator, of which the following is a specification.

My invention relates to an improvement in steam generators and comprises the novel parts and combinations of parts which will be hereinafter described and more particularly pointed out in the claims.

The object of my invention is to improve and simplify steam generators and particularly generators of that type of the water-tube generators which are sometimes called "flash boilers."

In the accompanying drawings I have shown my invention embodied in the form which is now preferred by me.

Figure 1 is a vertical section of my generator taken lengthwise the tubes. Fig. 2 is a fragmentary vertical section taken on the line 2 of Fig. 1. Fig. 3 is a section taken on the line 3, Fig. 1. Fig. 4 is a sectional plan on line 4 of Fig. 3. Fig. 5 is a sectional detail showing the means employed for securing the tubes in the headers.

One of the objects sought to be attained by my invention is to produce a steam generator which shall partake of the advantages in light weight, safety, little care needed and good steaming qualities of that type of generators which are usually called flash boilers, and to obtain with this a design in which straight ordinary commercial pipe may be employed and the repairs and cleaning needed may be accomplished with ordinary tools and by ordinary mechanics. With this idea in view I have shown ordinary commercial pipe, although in cases where light weight is especially desired, special steel pipe may be employed.

The tubes 2 are connected at opposite ends with tube sheets 1 and 1. The form of connection preferred is shown in Fig. 5. The opening through the tube sheet 1 is large enough on its inner side to snugly fit the tube 2 and permit its free insertion and removal. This opening is enlarged in its outer part and is threaded to receive a sleeve or ferrule 3 which is threaded both exteriorly and interiorly. The exterior threading fits the threading of the hole in the tube sheet 1 and the interior threading fits the threading which is placed upon the end of the tube 2. The inner end of this ferrule and the bottom shoulder of the hole in the tube sheet are oppositely inclined so as to form a space 11 which may receive a compressible packing material, such as asbestos, if desired or necessary. The ferrule 3 may be provided with notches 10 to be engaged by a special wrench whereby it may be turned.

The tubes are arranged at successive elevations and are provided with circulating connections forming an open circuit in which each tube in the circuit is at either a higher or a lower level than the one adjoining it. In such a circuit the water will flow by gravity from each tube to the next tube in the circuit in one direction. By an open circuit I mean a circuit in which the ends are not connected. In such a circuit water is introduced at one end and steam is drawn off at the other, there being no return connection to make the circuit complete and circular. In such a circuit, as I contemplate it, there may be a single tube, or a series of tubes at each level. In the latter case I prefer that there be a single circulating connection between the successive sets of tubes. I may, however, employ a plurality of circuits in one generator, said circuits being usually disconnected except at their ends.

In the drawings I have shown the tubes 2 arranged in tiers or horizontal layers, each tier entering its respective headers, the latter consisting of horizontal chambers in the heads 4 and 5. Such of these chambers or headers are connected as may be necessary to form the circulating circuit desired, by means which retain the upper tubes substantially full of water, while permitting any overplus to flow freely by gravity to the next lower tube or tubes. Such means preventing gravity drainage of the tubes insures that the upper tubes will have water in them even if the water in the lower tubes has all been evaporated. It makes the water contents of the upper tubes or sets of tubes independent of the water level in the lower tubes.

The water connections between the sets of tubes are shown in section in Fig. 3. These consist of a series of chambers, 15, located outside of the heads and each connecting by openings 14 and 16 with two adjacent tiers of tubes. In each of these chambers is a barrier or dam in the form of a partition

15′ or 19 over which the water must flow in passing from the upper to the lower set of tubes. The upper edge of this barrier is at a level, substantially even with or higher than the top part of the upper set of tubes, from which it follows that these tubes must completely fill before any water will pass to the lower set of tubes.

The water supply is introduced through the pipe 7 to the upper set of tubes and flows through the various tiers or sets of tubes alternately in opposite directions, as indicated by the arrows, until it reaches the bottom, at which point the steam discharge connection 9 is located. I have shown what I call pass-over pipes or connections, 8, 8′ with the various headers whereby, if I should desire, cold water may be introduced directly into the different tubes.

It is obvious that the upper portion of my device when in operation acts as a water heater and the central portion acts as a boiler while the lowermost tubes, or those next to the hottest gases of combustion act as a super-heater. By this construction economy of fuel is gained as the temperature of the smoke stack may be reduced without loss to the temperature of the feed water. The combustion is also made more complete as the tubes adjacent the furnace are hottest.

In starting the boiler a small quantity of water may be first admitted to the lower portion which normally acts as the superheater thus when heat is applied pressure is readily attained before the normal circulation of water is begun. The passover connections are useful in admitting the first charge of water as the boiler is often nearly empty when shut down.

The headers as shown in the drawings are connected with the tube sheets by bolts 22. This, as well as the exact construction of the headers, the circulating connections, barriers or dams, and the construction of the tubes with the headers are capable of almost an infinite variation. Those which are herein described are given only to show some concrete means for carrying out my invention and not with any idea of limiting my invention thereto.

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

1. A header adapted for connecting boiler tubes lying at different levels having a circulating passage with its bottom elevated in its middle portion to a level higher than the upper part of the upper tube.

2. A header or circulating connection for tubes of a water tube boiler lying at different levels, having a single circulating passage and being provided with a diaphragm extending across said passage and from its bottom to a level as high as the upper portion of the upper tube section with which it is connected.

3. A steam generator comprising a plurality of sets of straight water tubes, said sets being disposed at different levels, a header connecting all the tubes of each set, circulating connections between the headers of successive sets permitting the passage of the water only when the set preceding it in the circulating system has been completely filled, and means for producing a circulation of both water and steam through the system in the direction coinciding with gravity.

4. A steam generator comprising a plurality of sets of straight water tubes lying at successive levels and connected in an open series, said series having a water supply connection at its upper end and a steam discharge at its lower end, and means connecting successive tubes, each having a single circulating passage, and a dam or diaphragm extending to a level substantially equal to that of the uppermost part of the tubes connected therewith.

5. In a steam generator, a plurality of evaporative members arranged in tiers, a water inlet to the uppermost tiers of evaporative members, a steam outlet for the lowermost evaporative members, traps between the tiers of evaporative members whereby the upper evaporative members are filled before a supply of water is admitted to the tiers of evaporative members below, and means for admitting water direct to the lower evaporative members independent of the water inlet to the upper evaporative members.

6. In a generator, the combination of an inlet for liquid at the upper part thereof, an outlet for vapor at the lower part thereof, and means forming a channel connecting said inlet and outlet, said means including a plurality of substantially horizontal straight tubes arranged at different levels and means connecting tubes of successive levels in series, adapted to prevent water from passing from a higher level of said channel to a lower level thereof except when the portion of the channel at said higher level is full of liquid.

7. A steam generator comprising a plurality of sets of straight water tubes lying at successive levels and connected in an open series, said series having a water supply connection at its upper end and a discharge at its lower end, means connecting successive tubes, and a diaphragm or dam extending to a level substantially equal to that of the uppermost part of the tubes connected therewith.

8. In a steam generator, a plurality of evaporative members arranged in tiers, a water inlet to the uppermost tier of evaporative members, a steam outlet from the lowermost evaporative members, traps be-

tween the tiers of evaporative members whereby the upper evaporative members are filled before a supply of water is admitted to the tiers of evaporative members below.

9. In a generator, the combination of an inlet for liquid at the upper part thereof, an outlet for vapor at the lower part thereof, and means forming a channel connecting said inlet and outlet, said means including a plurality of substantially straight tubes arranged at differenet levels and means connecting the tubes of levels above to the tubes of levels below, to prevent the contents in said tubes from passing from a higher level of said channel to a lower level thereof except when the portion of the channel at said higher level is full of liquid.

10. In a steam generator, a plurality of straight water tubes, a water inlet to the uppermost water tubes, a steam outlet to the lowermost water tubes, a trap preventing water from gravitating from the upper tubes to the lower tubes until said trap is overflowed by the admission of additional water, and a header connecting said water tubes in series and adapted to detachably connect said tubes.

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

PAUL A. TALBOT.

Witnesses:
ADELAIDE HINE,
CARL F. ORTH.