(No Model.)

J. J. BUSH.

STEAM GENERATOR.

No. 419,634. Patented Jan. 21, 1890.

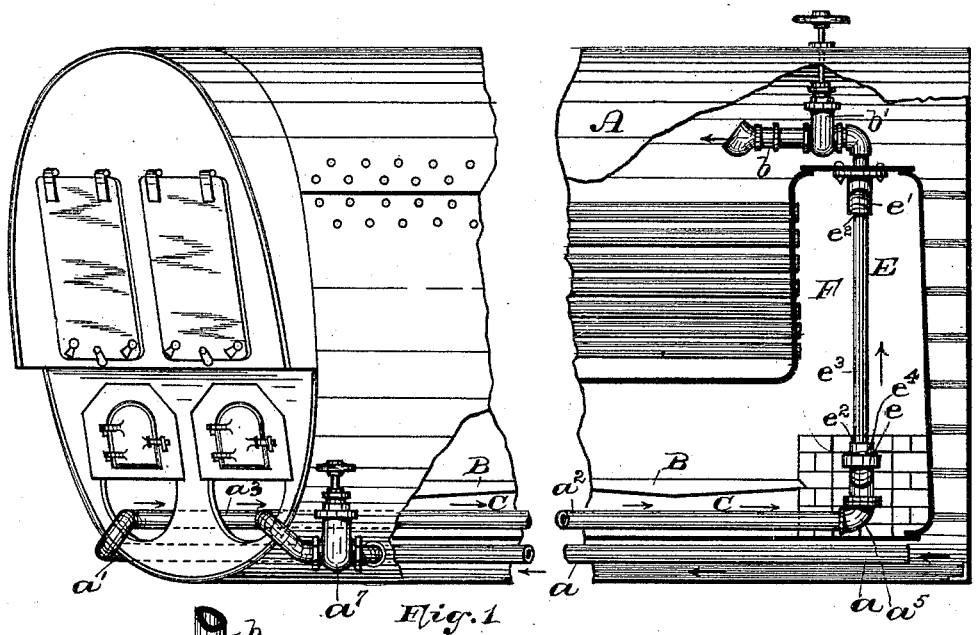

Fig. 1

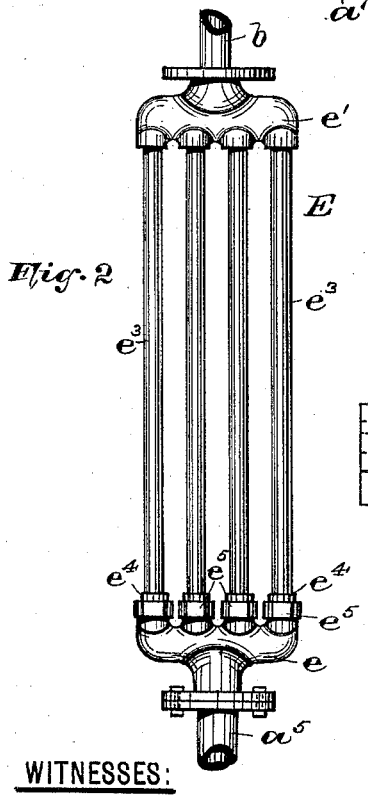

Fig. 2

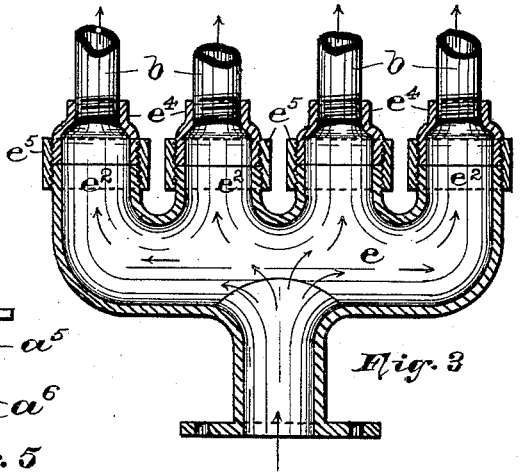

Fig. 3

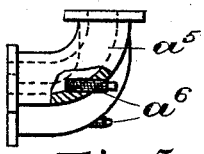

Fig. 5

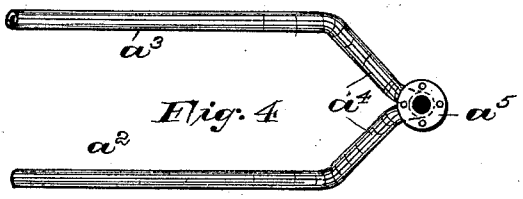

Fig. 4

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UNITED STATES PATENT OFFICE.

JAMES J. BUSH, OF NEWARK, NEW JERSEY.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 419,634, dated January 21, 1890.

Application filed July 19, 1889. Serial No. 318,004. (No model.)

To all whom it may concern:

Be it known that I, JAMES J. BUSH, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Steam-Generators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

The herein-described invention relates to improvements in steam generators and circulators, and is designed to provide an effective and simply-constructed device, the primary objects of the invention being to prevent incrustation of the shell of the boiler and to produce a constant circulation of the water through the same, and also to heat the water before it enters the boiler.

In the accompanying sheet of drawings, in which similar letters of reference are employed to indicate corresponding parts in each of the several views, Figure 1 represents the steam-generating device as applied to a marine boiler, the same being represented partly in perspective and partly in section to illustrate more clearly the application of the steam-generating device thereto. Fig. 2 is a front elevation of the water-heater used in connection with my invention, and Fig. 3 is an enlarged vertical section of the lower section-joint of the heater illustrated in said Fig. 2. Fig. 4 is a plan view of part of the connecting-pipes arranged underneath the boiler, and Fig. 5 is a side elevation of a two-way elbow-joint.

In the above-described views, A indicates a boiler, which may be of any desirable construction, either a marine, locomotive, horizontal, or other boiler. In the bottom of the boiler A are arranged the take-in pipes a and a', which extend from the rear end thereof to the front or forward part and pass through the shell of the boiler near the front on opposite sides and around the outside of the front, and thence back into the ash-pit C, underneath the grate B, as will be clearly seen from Fig. 1. Return-pipes a^2 and a^3 are connected with said pipes a and a', and pass into the ash-pit and into the bridge-wall D, and are connected with the water-heater E, arranged within the flame-chamber or "back uptake" F in the manner shown, the top of said water-heater E being connected with a pipe b, leading into the boiler, provided with a funnel-shaped discharge-opening arranged, preferably, above the water-line.

The water-heater E, in which the water is heated before entering the boiler, is arranged within the flame-chamber, as has been stated, and consists, essentially, of the section-joints e and e', secured to the pipes a^2 and a^3 and the pipe b, respectively. The joints e and e' are provided with any desirable number of projecting portions having opening e^2, and into the upper section-joint e' is tapped the pipe e^3, while the openings in the lower section-joint e are provided with expansion-joints e^4, into which the opposite ends of the pipes e^3 are secured. The joints e and e' are constructed, preferably, as shown in the drawings, with a single opening placed centrally on one side, and the opposite side of the joints being provided with a series of openings, all of which are arranged in a line and in the same plane with the plane through the single opening. The body portion of the joint is curved at its ends, as illustrated, thus facilitating the flow of the water therethrough, and the section-joint arranged on the upper ends of the pipes e^3 acts like an injector, causing the water to be forced into the pipe leading into the upper part of the boiler and thereby rapidly increasing the velocity of the water, as is evident.

The return-pipes a^2 and a^3, arranged within the ash-pit, may be provided with bends a^4, as illustrated in Fig. 4, which are screwed into the two-way elbow-joint a^5, (shown in Fig. 5,) upon which the water-heater E is secured, as shown in Figs. 1 and 2; or the pipes a^2 and a^3 may be straight, not connecting with each other at the back of the boiler, and having a water-heater arranged on each end of the pipes, as will be understood. In the latter case the boiler is provided with an independent system of pipes and water-heaters on each side of the boiler, thus caus-

ing a greater circulation and a quicker means of generating steam.

If desirable, the elbow-joints a^5 may be provided with plugs a^6, which can be removed to enable the removal of any sediment or dirt that may have collected in the pipes.

Owing to the arrangement of the generating device or heater in the flame-chamber, where the combustion of the gases takes place, an important advantage is attained in that the flames freely surround and encircle the pipes e^3, the water in the pipes being easily heated, due to the large heating-surface derived in this arrangement, and also the rapidity of circulation of the water is thereby greatly increased.

As will be noticed from Fig. 1, the intake-pipes a and a' are arranged in the lowest part of the boiler, thus taking the water therefrom which is coldest, the water being caused to pass through the pipes in the direction of the arrows and being thoroughly heated in the heater or generator E before passing into the boiler A.

The pipes a^2 and a^3 being arranged underneath the grate and below the fire, the great danger of the burning of said pipes, which is so common in generators as heretofore made, is thereby avoided.

In order to protect the lower section-joint e and its expansion-joints from contact with the flames, the expansion-joints are arranged within the bridge-wall, as shown in Fig. 1, thus avoiding the possibility of the joints being ruined by contact with the flames. As thus constructed a constant current of water is caused to flow through the pipes and the water-heater from the lowest part of the boiler, and which, after passing through the pipes, is forced back into the boiler, as will be understood, thereby preventing the dirt in the water from being deposited on the boiler-sheets, and said boiler and the pipes are kept perfectly clean.

As indicated in Fig. 1, gate-valves a^7 may be arranged in the pipes a and a' on the outside of the boiler, on opposite sides thereof, and also a similar valve b' in the pipe b, the valve-stem of which extends up through the top of the boiler and is provided with a hand-wheel on the outside of the boiler. By this arrangement of the valves a^7 and b' the system of pipes may be shut off from the boiler in case of an accident to one of the pipes or the water-heater without disabling the boiler itself from further use. This arrangement is of great advantage when the generator is used on marine boilers, and where it is necessary to keep up steam in order to reach the destination of the ship.

As illustrated more particularly in Fig. 3, the pipes e^3 are secured at their lowest ends in a union e^4, which is screwed into a collar e^5, and which collar is screwed fast upon the projecting portions, in which is arranged the opening e^2. Thus I have obtained a water-tight joint, which allows the expansion of the pipes e^3 without the danger of wrenching the joints and causing the leakage of water therethrough.

The feed-water is fed into the boiler in the usual manner, as will be understood.

Having thus described my invention, what I claim is—

1. The combination, with a boiler, of a steam-generator consisting of pipes arranged in the bottom of the boiler and projecting and leading out therefrom, and connected with pipes arranged within the ash-pit below the grate, and connected at the back of the boiler with a series of smaller pipes communicating and connected with said pipes arranged below the grate by a section-joint, as and for the purpose set forth.

2. The combination, with a boiler, of a steam-generator consisting of pipes arranged in the bottom of the boiler and projecting and leading out therefrom, and communicating and connecting with pipes arranged below the grate, and connected at the back of the boiler by a series of smaller pipes arranged between two section-joints e and e', one of said joints being provided with expansion-joints, into which said pipes are screwed, as and for the purposes set forth.

3. The combination, with a boiler, of a steam-generator consisting of pipes a and a', arranged in the bottom of the boiler and projecting and leading out therefrom, valves a^7 in said pipes, pipes a^2 and a^3, arranged beneath the grate and connected with said pipes a and a' at the front of the boiler, a water-heater E, consisting, essentially, of a series of pipes e^3 of smaller diameter, secured at their lower extremities into a section-joint e, communicating with the pipes a^2 and a^3, said pipes e^3 also being secured at their upper extremities into a section-joint e', and a pipe b, attached to said joint and projecting into the boiler, and provided with a discharge-opening and a valve b' in said pipe, all of said parts being arranged substantially as and for the purposes set forth.

4. The combination, with a boiler, of a steam-generator consisting of pipes arranged in the bottom of the boiler and projecting and leading out therefrom and communicating with and connecting with pipes arranged below the grate, said pipes being connected at the back of the boiler by means of an elbow-joint, as shown, having plugs therein, a section-joint arranged and secured on said elbow-joint, a series of pipes of smaller diameter secured in said section-joint, and a second section-joint arranged on the opposite ends of said pipes and communicating with the boiler, as and for the purposes set forth.

5. The combination, with a boiler, of a steam-generator consisting of pipes leading from the bottom of the boiler and therebeneath to the front thereof, pipes connecting with said pipes at the front of the boiler and leading back underneath the grate, a section-joint arranged in said pipes, a series of pipes

of smaller diameter secured in said section-joint, a second joint arranged on the opposite ends of said pipes, and a pipe provided with a discharge-opening connected with said joint and projecting into the boiler, for the purposes set forth.

6. The combination, with a marine boiler, of a steam-generator consisting of pipes arranged in the bottom of the boiler and projecting and leading out therefrom on opposite sides of the boiler near the front thereof, valves in said pipes, pipes connected with said valves and extending toward and leading into the front of the boiler and arranged beneath the grate, a water-heating device arranged in the flame-chamber of the boiler, a section-joint *e*, as set forth, for securing said water-heater to the pipes underneath the grate, a second section-joint *e* and a pipe *b* connected therewith and leading into the boiler, and a valve in said pipe, as and for the purposes set forth.

7. The combination, with a boiler, of a steam-generator consisting of pipes leading from the bottom of the boiler and therebeneath to the front thereof, valves in said pipes, pipes connecting therewith and leading back from the front underneath the boiler to the back thereof, a two-way elbow-joint having removable plugs therein connecting said pipes, and a section-joint arranged on said elbow-joint, a series of pipes secured in said section-joint, a second joint arranged on the opposite ends of said pipes, a pipe connected with said joint and projecting into the boiler and provided with a discharge-opening, and a valve in said pipe, the stem of which projects through and out of the top of the boiler, for the purposes set forth.

In testimony that I claim the invention set forth above I have hereunto set my hand this 18th day of July, 1889.

JAMES J. BUSH.

Witnesses:
FREDK. C. FRAENTZEL,
FREDK. S. RICE.