

(No Model.)

T. L. & T. J. STURTEVANT.
STEAM GENERATOR.

No. 539,967.

Patented May 28, 1895.

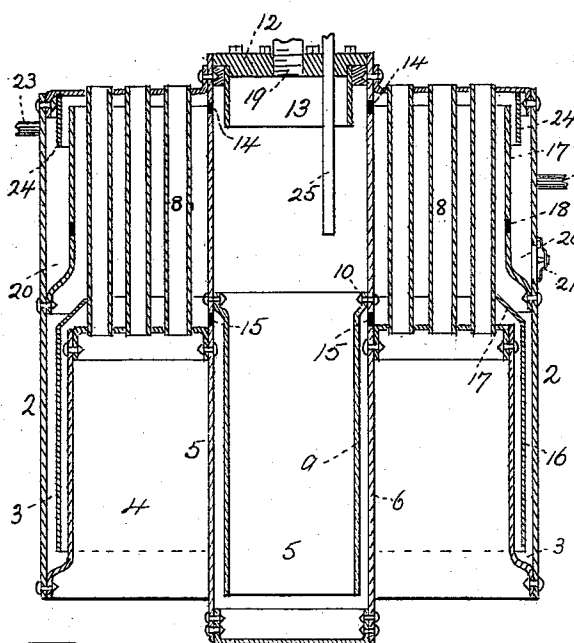


Fig. 1.

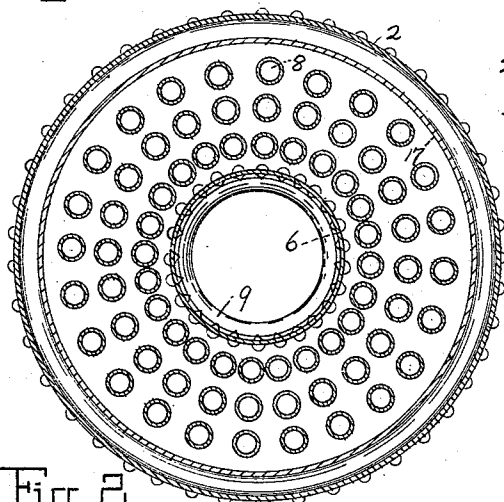
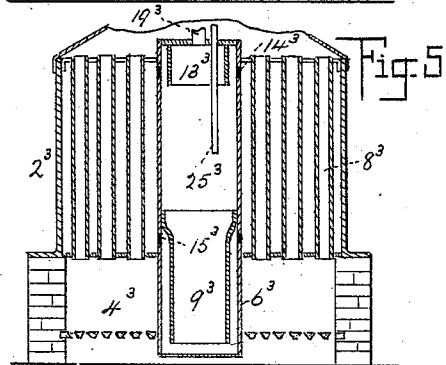
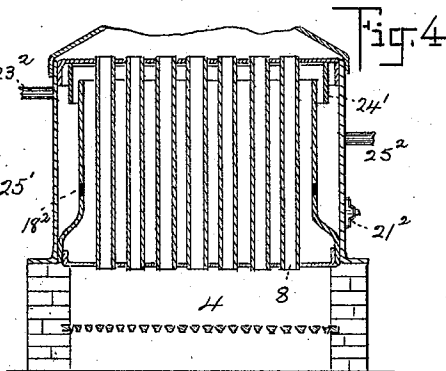


Fig. 2.

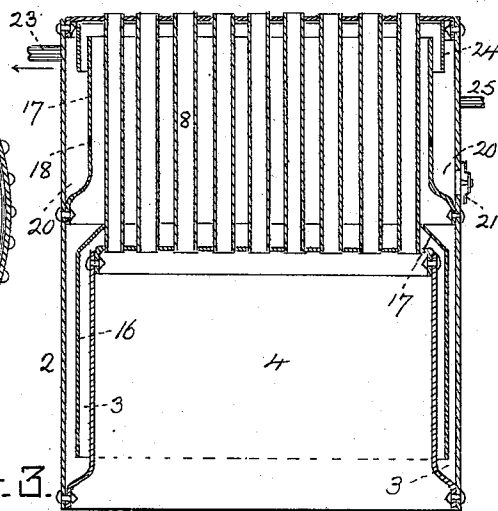


Fig. 3.

WITNESSES.

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UNITED STATES PATENT OFFICE.

THOMAS LEGGETT STURTEVANT, OF QUINCY, AND THOMAS JOSEPH STURTEVANT, OF FRAMINGHAM, MASSACHUSETTS.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 539,967, dated May 28, 1895.

Application filed April 4, 1895. Serial No. 544,481. (No model.)

To all whom it may concern:

Be it known that we, THOMAS LEGGETT STURTEVANT, residing at Quincy, in the county of Norfolk, and THOMAS JOSEPH STURTEVANT, residing at Framingham, in the county of Middlesex, State of Massachusetts, citizens of the United States, have invented certain new and useful Improvements in Steam-Generators; and we 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 figures of reference marked thereon, which form a part of this specification.

This invention relates to steam generators, more particularly such as carry a water level and contain an assemblage of heating tubes arranged to subdivide the water space.

The objects of this invention are, first, to deposit sediment in places where it is the least detrimental and from which it can be removed; second, to form a feed water heater; thirdly, to produce increased circulation, and, lastly, in providing a separator to enable the steam generator to be delivered in a dry state.

Briefly, our invention consists in several partitions, which subdivide the water space, as likewise the steam space of the generator. The purpose and functions of said partitions are to increase the water circulation, separate the steam from the water, and furthermore to act as repositories or mud collectors and thus by purifying the water prevent incrustations at points where they are most detrimental in the operation of steam generators.

The drawings represent, in Figure 1, a diametrical vertical section of a steam-generator containing a central feed-water heater and embodying our invention. Fig. 2 is a horizontal section on line 2 2 in Fig. 1. Fig. 3 is a diametrical vertical section of a tubular steam-generator provided with a water-leg. Fig. 4 represents a vertical central section of a generator without a water-leg and embodying our invention. Fig. 5 is a similar section of a generator without a water-leg, but equipped with a central feed-water heater.

In said drawings, 2 represents the shell or outer casing of the generator, in the present

example furnished with a water leg 3, which serves as the walls of the fire chamber 4.

In Fig. 1 the central portion of the generator is provided with a cylindrical feed water heater 5. This heater usually extends the full length of the generator, and comprises an outer shell 6, which perforates the tube plate 7, as shown, while the flues or tubes 8, grouped about the upper part of the said heater, extend through the tube plate and the top of the generator and serve to carry off the products of combustion from the fire chamber.

To accelerate the circulation both in the heater and the generator proper a pendent partial partition 9 is located in the lower part of the heater being secured at 10. This partition does not extend quite to the base of the heater in order to permit of water circulation about its lower end. The upper end of said heater is fitted with a removable cap plate 12, while another pendent partial partition 13 is secured thereto or otherwise, as may be preferred. In order to interconnect the water space of the heater with the water and steam space of the generator, two groups of holes or apertures 14 15 are formed in the shell of the heater, one group 14 at a point above the lower end of the partial partition 13, while the other group is located at a point below, where the partial partition 9 joins the shell 6, but above the tube plate. This being the construction the fluid circulation produced by these co-operating parts is as follows: The centrally heated water ascends through the space between the shell 6 of the heater and the lower partial partition 9, passes through the openings 15 and enters the water space of the generator. The commingled steam and water which are carried to the top of the generator enter the openings 14, strike the partial partition 13 and are thereby separated. Such steam as enters here is discharged through the pipe 19, while the water returns through the lower partition 9, and flows around the lower end of said partition, joins the upward moving water and repeats the circuit. Such sediment and foreign substances as are contained in the water, which enter the central feed heater and are precipitated by the heating of said water, gravitate and accumulate at the bottom of

the heater, which acts as a mud drum. By removal of the cap plate easy access is had to the interior of the heater and the sediment there deposited can be readily removed. In connection with this internal circulation an external circulation is frequently used; the two circulations co-operating to direct the water over the tube plate, from both the central and outside water spaces.

Concentrically within the water leg in order to form an inner and outer water space is placed a partial partition 16 which permits of circulation about both ends. The top portion is preferably bent inwardly at 17 in order to direct the hot water centrally and bring it in contact with the heat generating tubes 8. Co-operating therewith is a second partial partition or mud separator 17. This element is secured to the outer shell 2 of the generator and does not extend quite to the top of said generator in order to allow for circulation thereabout. A series of apertures 18 are created to permit of water circulation, while a dead space 20 is produced where sediment may collect, to prevent it falling to the bottom of the heater with detrimental results and where from greater exposure to the heat, bakes on and is removed with difficulty. Removal of this sediment is had by means of the hand hole 21. A steam discharge is shown at 23, while a pendent partition 24 serves to separate the water from the steam, which here can also escape in a dry or anhydrous condition. The outer circulation created by this assemblage of co-operating parts is as follows: The heated water rises in the inner water space and is directed inwardly among the tubes. Thence a portion passes over the top of the partition 17 where the steam and water are separated, the steam escaping through the discharge 23, or through the discharge 19, or both, while the water gravitates and flowing through the opening 18 in said partition 17 enters the outer water space in the water leg. From here it passes beneath the lower end of the partition 16 and again enters the interior water space.

In Fig. 1 the feed water is preferably discharged within the central heater, as indicated by means of the pipe 25. However, we do not desire to be limited to such precise location of the feed pipe, since it may be entered elsewhere and produce favorable results. Frequently it is entered at 25' and becoming heated most of the sediment is deposited in the dead space 20.

In carrying out our invention we do not desire to be limited to the exact constructions as shown in Figs. 1 and 3, wherein the generator is equipped with a water leg. Thus in Fig. 4 a generator is shown of the usual upright tubular type fitted with a mud collector embodying our invention and operating precisely after the manner hereinbefore described. The steam supply pipe is at 23³ and the feed at 25².

In lieu of the construction illustrated in

Fig. 4 a similar type of generator is shown in Fig. 5, but in this is placed a central feed water heater. In this generator the base of this heater serves as a mud collector. Hence those shown in the generator proper in Fig. 4 are omitted. The various other co-operating elements act as have been hereinbefore described, the circulation being outwardly in the lower portion of the central heater, and inwardly in the upper portion thereof. The water feed is at 25³ and the steam discharge at 19³.

What we claim is—

1. In a steam generator, the combination with an inclosing shell, of a partition secured at one end to the interior of said shell so as to form a water tight joint and being unsecured and non-contiguous to said shell at its other end, thereby forming an annular water space between said shell and partition, the said partition having perforations there-through for water circulation.

2. In a steam generator, the combination with an inclosing shell, of a partition secured by a tight joint at one end to the interior of said shell, the other end of said partition being free and non-contiguous to said shell and of lesser diameter than the latter so as to form a water space, said partition having a series of circumferential perforations at a point below the water level of the boiler for water circulation.

3. In a steam generator, the combination with an apertured partial partition secured at one end to the shell of said generator with the opposite free end unsecured and non-contiguous thereto, of an imperforate partition overlapping said unsecured end of the apertured partition for the passage of steam and water, substantially as described.

4. In a steam generator, an apertured partial partition secured at one end to the shell of the generator at a point above the tube plate; the opposite free end of said plate being unsecured and non-contiguous to the shell of the generator combined with an imperforate partition adapted to overlap said unsecured end, the two overlapping portions to form a passage for steam and water, substantially as explained.

5. The combination with a steam tight vessel, an apertured partial partition united at one end by a sealed joint with said vessel, and having the opposite unsecured end of less diameter than the diameter of said vessel, of a second imperforate partial partition arranged with respect to the vessel to permit uninterrupted circulation about either end, the two partitions adapted to cooperate, substantially as set forth.

6. In a steam generator having a water leg, an exterior shell and a series of flues, a partial apertured partition united at one end with a sealed joint with the shell of the generator, the opposite end being unsecured for circulation thereabout, an imperforate partition arranged for circulation about one end

only and overlapping the apertured partition, and a second imperforate partial partition arranged to divide the water space of the water leg and adapted for circulation about both ends, substantially as stated.

7. In a steam generator, the combination with the inclosing shell, the heating tubes therefor, an imperforate partial partition for circulation about both ends, an apertured partition attached to the shell and with circulation about one end only, and a pendent partition overlapping the apertured partition, of a central feed heater apertured for circulation; and two partial partitions arranged to cooperate with said apertures, substantially as explained.

8. In combination with a steam generator, and a central feed heater therefor having two groups of perforations, two partial imperforate partitions interiorly of said heater and so arranged and united with said heater, that the circulation in the lower portion of said heater is outward from the heater to the generator, while in the upper portion the circulation is from the generator inwardly to the heater, substantially as described.

9. The combination with a steam generator, having a water space, and heating tubes,

of a central feed water heater having an upper and lower group of perforations, an imperforate partial partition attached by a sealed joint to the heater at a point above the lower group of perforations, and a pendent partial partition arranged to overlap the upper group of perforations but non-contiguous thereto, substantially as specified.

10. A steam tight vessel having a removable cap plate, and two groups of perforations, combined with two partial partitions the lower partition affixed to the walls of the heater above the lower perforations, the upper partition arranged to overlap the upper perforations, and a cooperating inclosing generator, the circulation being in the lower portion from the steam tight central vessel into the generator and in the upper portion from the generator into the steam tight central vessel, substantially as set forth.

In testimony whereof we affix our signatures in presence of two witnesses.

THOMAS LEGGETT STURTEVANT.
THOMAS JOSEPH STURTEVANT.

Witnesses:

W. H. ELLIS,
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