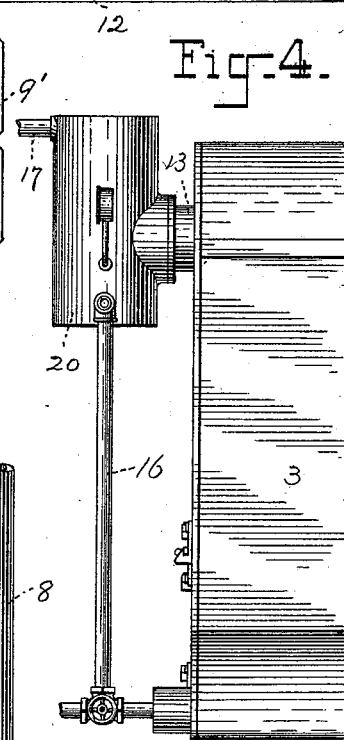
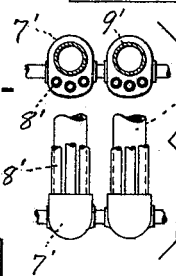
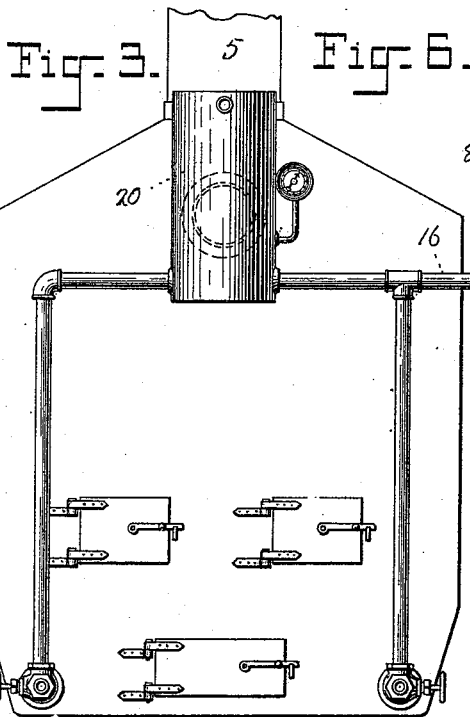
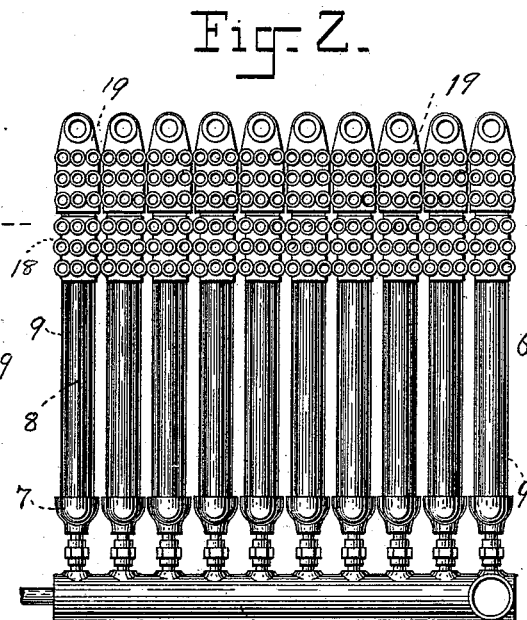
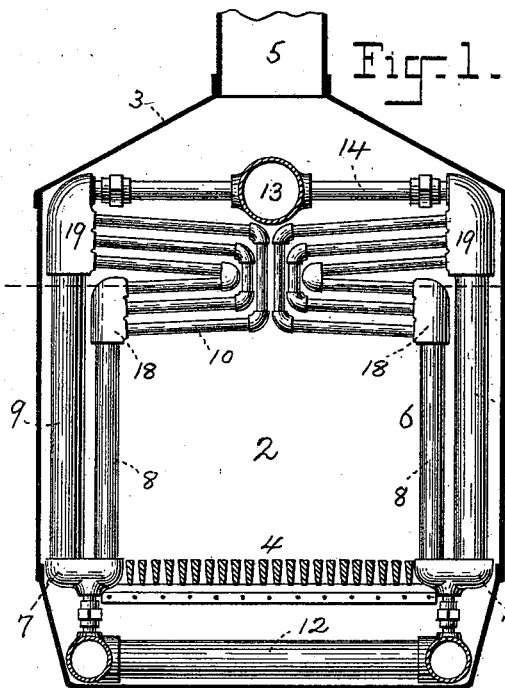


(No Model.)

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

No. 523,447.

Patented July 24, 1894.

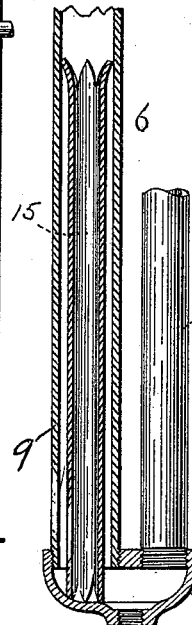


Witnesses.

John F. Nelson.

Francis C. Woodward

Fig. 5.



Inventors

Thos. L. Sturtevant.

Thos. J. Sturtevant.

By H. L. Lodge Atty.

UNITED STATES PATENT OFFICE.

THOMAS L. STURTEVANT AND THOMAS J. STURTEVANT, OF QUINCY,
MASSACHUSETTS.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 523,447, dated July 24, 1894.

Application filed September 19, 1893. Serial No. 485,867. (No model.)

To all whom it may concern:

Be it known that we, THOMAS L. STURTEVANT and THOMAS J. STURTEVANT, citizens of the United States, residing at Quincy, in the county of Norfolk and State of Massachusetts, 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 particularly that class in which the generator proper is composed of tube sections, the tubes forming the walls of the fire-box.

This invention may be considered as relating to an improvement upon that shown in United States Letters Patent No. 487,792, issued in our names on December 13, 1892.

The characteristic features in our improved generator consist in providing a larger combustion chamber with more heating surface, which is exposed in the most effective way to wit: about the fire-box. The heating surface above the fire is nearly all in horizontal or slightly inclined pipes exposed most effectively to the hot rising gases. Further the quick upflow of the water in the inner water tubes, and its short circuit back to the return pipe insure rapid circulation.

Other features and operating elements will be further described hereinafter.

The drawings represent in Figure 1 a side elevation of one of the steam generating sections. Fig. 2 is an inside edge view of a group of sections, the bent tubes being omitted. Fig. 3 is a front elevation of the generator as an entirety. Fig. 4 is a side elevation in part. Fig. 5 is a vertical sectional elevation of a part of a generating pipe, the return pipe and its inner circulating tube. Fig. 6 is a horizontal cross-section and elevation of a modified construction of a section.

In said drawings 2 represents a steam-generator, as an entirety preferably inclosed by sheet iron casing 3 or otherwise, with grate bars at 4, and a stack at 5. The steam gen-

erating portions comprise separate pipe sections 6 adapted for multiplication and preferably connected in series, as shown. Each section is made up of a casting or fitting 7, which serves as a water leg, and from which rise two pipes 8, 9, respectively an inner one adapted to serve as a steam generating pipe and forms the side walls of the fire-box, and an outer larger return pipe, so called, which acts in part to generate steam but chiefly to serve as a return for water carried over by the generating pipe. To unite these two pipes 8, 9 at the top and to provide for a short circuit in such manner that the steam and water may be quickly separated, a series of pipes 10 are provided which form the upper wall of the fire-box, being bent upon themselves, and extending inwardly above the fire-box, as shown in the drawings. In the present instance these pipes are three in number but they may vary in number or size as circumstances demand, and enter headers 18, 19.

Beneath the water legs and united therewith is a pipe 12 termed a water drum. This is preferably situated in the ash-pit, and extends about its walls on three sides, being omitted in front to provide for removal of ashes.

To obtain the steam in a dry condition just prior to its discharge through the main supply, a steam collecting pipe 13 is extended lengthwise of the generator, centrally between the sections, and is united with each section by pipes 14. In large generators this steam collecting pipe may be in the form of a drum.

In Fig. 5 a section of the return pipe is shown; in this pipe is located a circulating tube 15 by means of which it is made certain, that however hot the fire may be, the water shall not rise into the steam space. It will be noticed that the return pipes and the parts connected therewith are in a position to be somewhat protected from the fire. This also insures a cool casing. The water supply pipe is shown at 16 and the steam discharge at 17. Frequently in generators of this class a steam receiver 20 is located in front as shown in Figs. 4 and 5 for convenience in attaching the steam gage and in leading out distributing pipes to various sources.

In Fig. 6 are shown fragmentary views—horizontal section and side elevation—of a modification in the steam generating section. This consists in substituting several small pipes 8' for the single large pipe 8; furthermore in omitting the water-drums, and in lieu thereof uniting the water legs 7' of the several sections. These fittings 7' when so connected serve the same purpose as the water-drum.

The operation of this generator presuming the proper amount of water has been supplied is as follows: Exposure of the steam generating tubes to the direct action of the heat in the fire-box causes rapid production of steam, which rises, passing upward through the bent pipes 10, and escapes into the upper end of the return pipe. The water carried over by the steam is here separated and passed down the return pipe, while the steam is discharged into the steam collecting pipe or drum 13. Such steam as may be created in the return pipe is enabled to escape readily by aid of the inner circulating tube 15. In this way steam may be generated in large quantities and at the same time delivered in a dry condition. Further superheating may occur, since the steam collecting pipe being exposed to the hot gases escaping into the stack is kept hot and the steam is thus rendered very dry, and in the best condition for immediate use.

What we claim is—

1. In a steam generator, the combination with a water drum, of a water leg, a vertical steam generating pipe and a return-pipe connected with said leg, a steam and water separator supported by said return pipe, and a series of inwardly projecting steam generat-

ing tubes connecting said vertical steam generating pipe and said separator, substantially as described.

2. In a steam generator, the combination with a water drum surrounding the fire box on three sides, of a series of vertical steam generating pipes, in proximity to the combustion chamber, a series of return pipes in the rear of said steam generating pipes, circulating tubes within said return pipes, steam and water separators supported by the latter, water legs common to both generating and return pipes and connecting them with the water drum, and a series of inwardly projecting U-shaped steam generating tubes connecting the upper ends of said vertical steam pipes with the steam and water separators, substantially as described.

3. In a steam generator section, the combination with a water drum, of a water-leg mounted thereon, a plurality of vertical steam generating tubes rising from the water leg in proximity to the combustion chamber a return pipe rising from said water leg directly in the rear of said generating pipes, a steam and water separator carried by said return pipe, a series of bent tubes extending inwardly over the fire-box and connecting said generating pipes and said separator, and a pipe connecting said separator with a steam drum, substantially as described.

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

THOS. L. STURTEVANT.

THOMAS J. STURTEVANT.

Witnesses:

H. E. LODGE,

FRANCIS C. STANWOOD.