

(No Model.)

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

No. 547,045.

Patented Oct. 1, 1895.

Fig. 1.

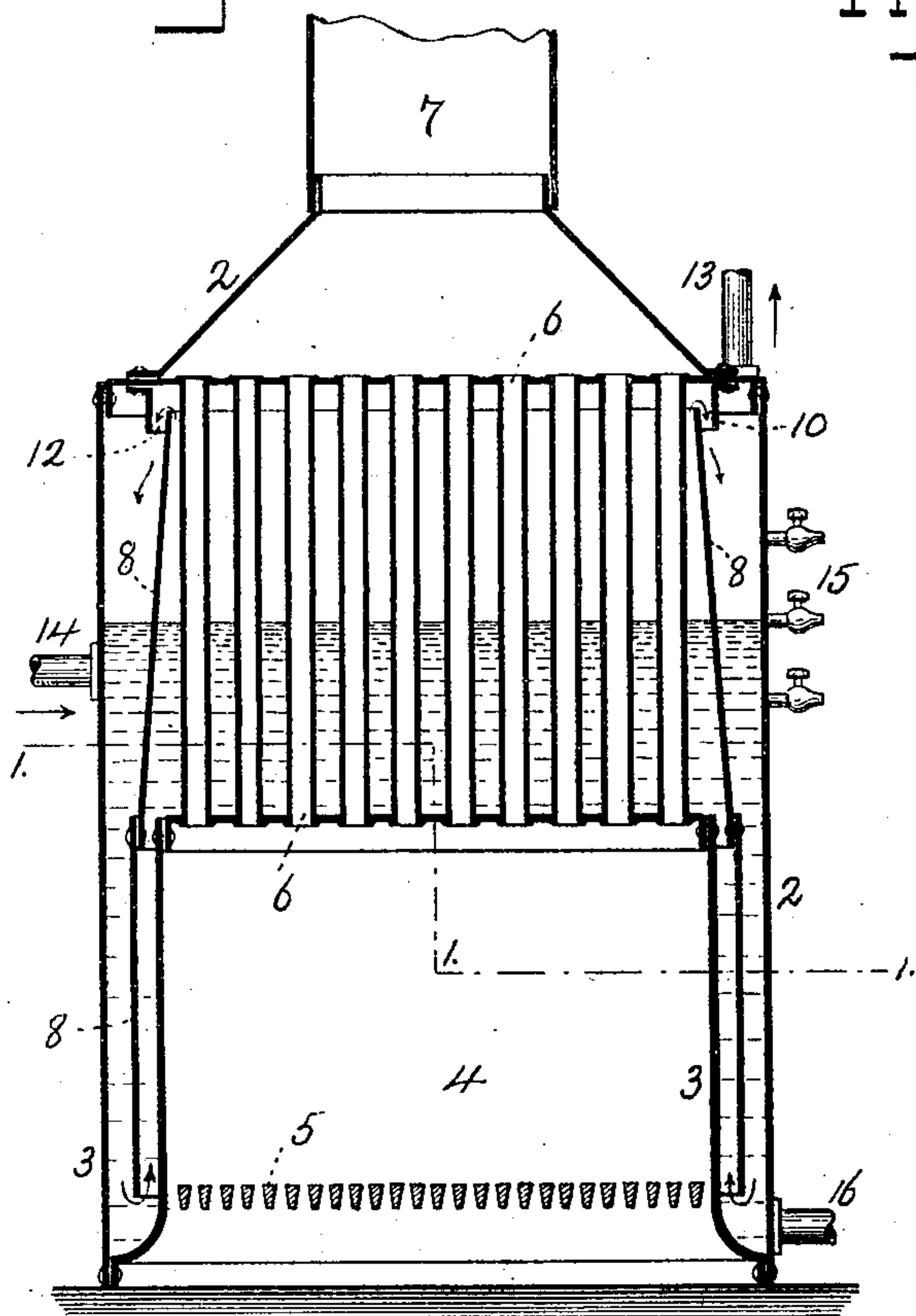


Fig. 3.

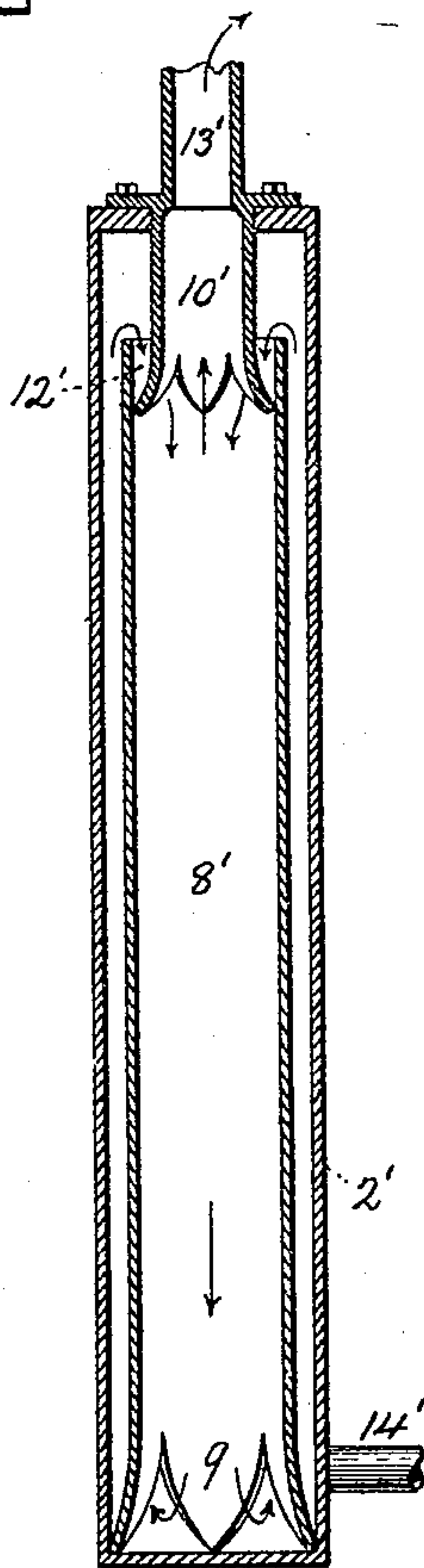


Fig. 4.

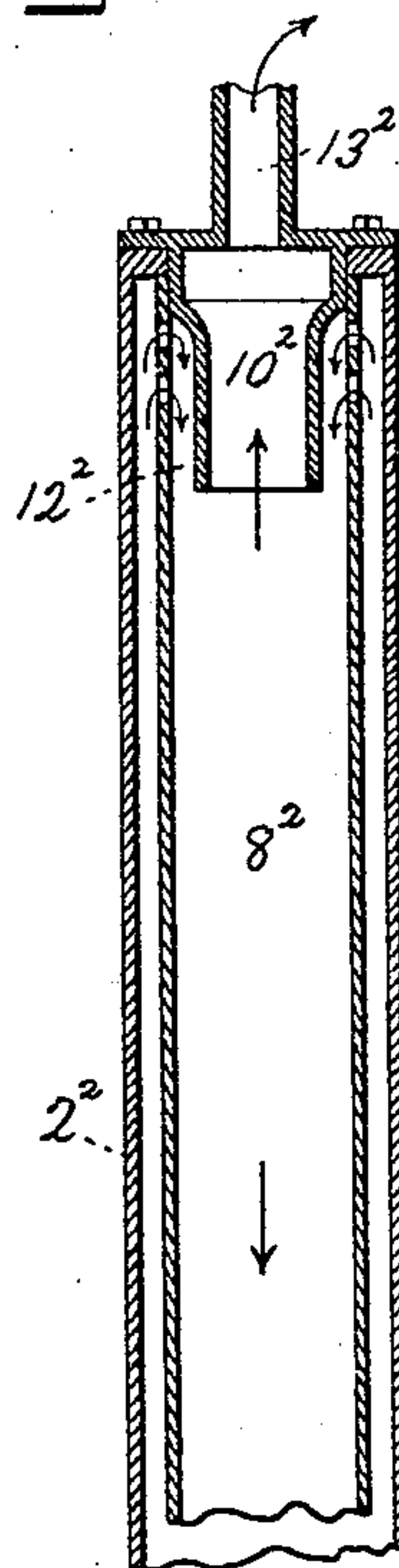


Fig. 2.

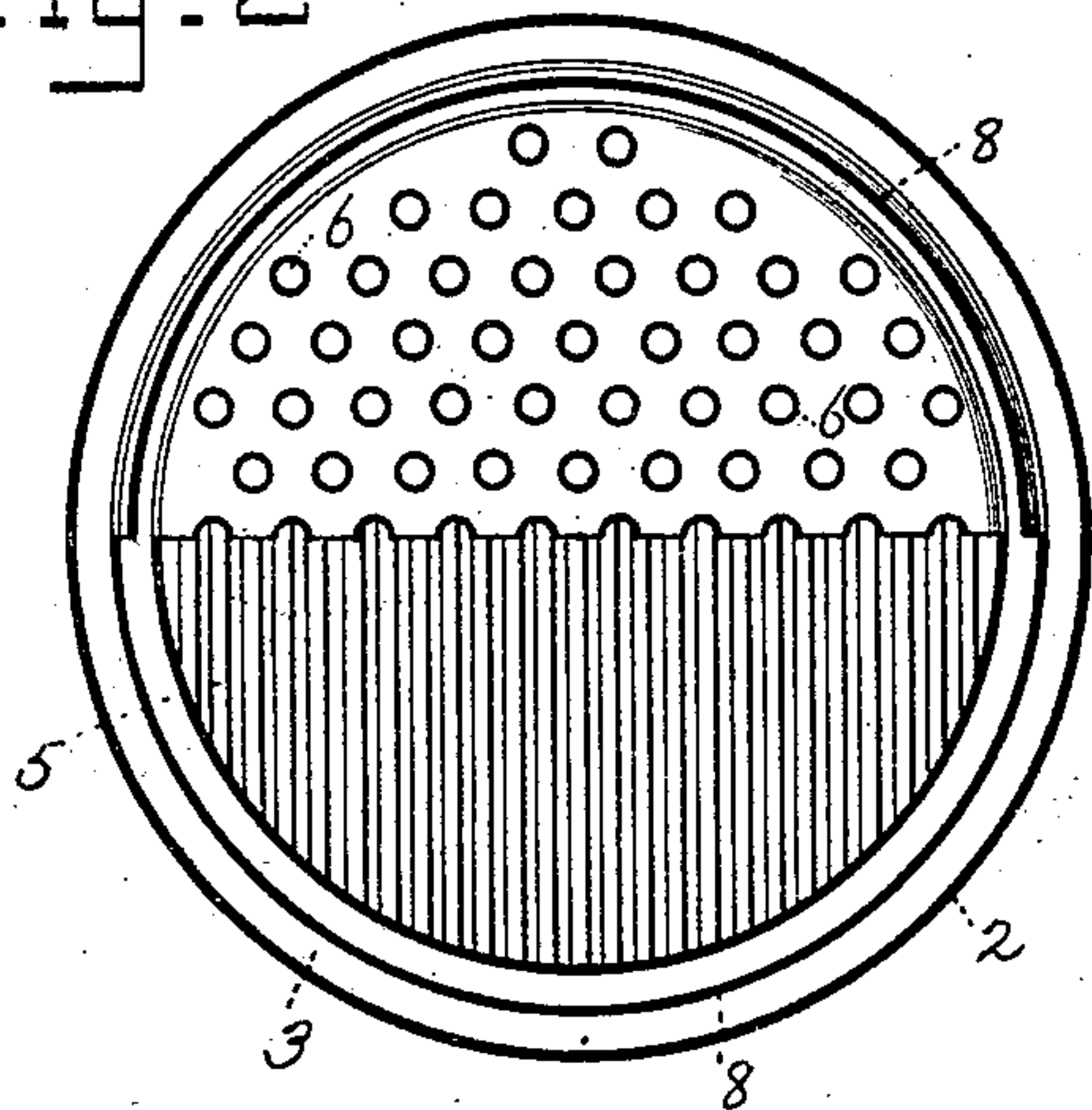
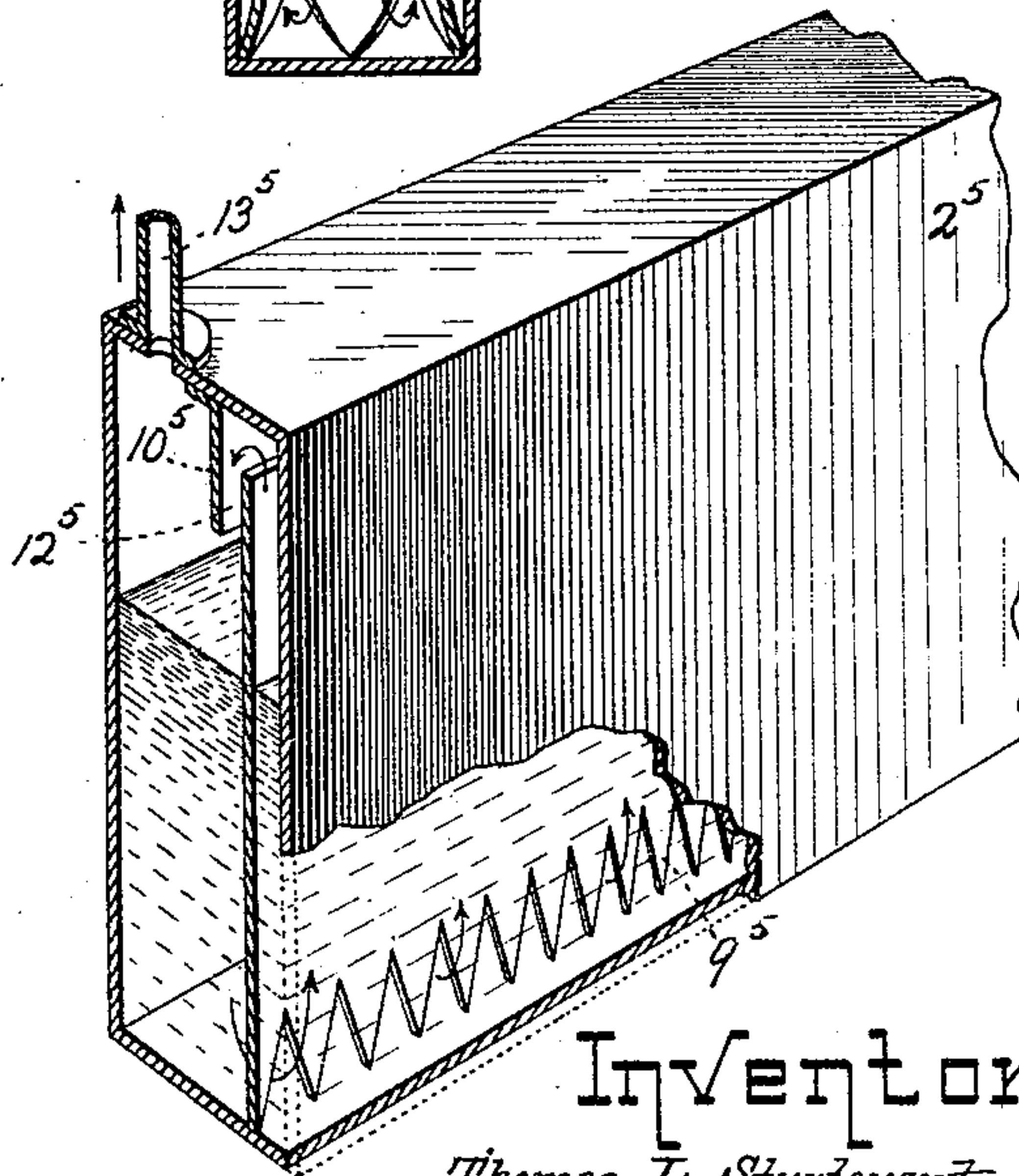


Fig. 5.



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# UNITED STATES PATENT OFFICE.

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## STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 547,045, dated October 1, 1895.

Application filed February 18, 1895. Serial No. 538,866. (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 and steam-generator sections, particularly those classes where the water-level is such that certain parts above said water-level are subjected to heat and are liable to be impaired or burned out.

The purpose of this invention is, primarily, to compel the water, with the steam generated therefrom, to be passed upwardly through such parts as are exposed to heat and are above the water-level, and thereby obviate any danger which may arise from the absence of water; secondly, to separate the steam from the water after the latter has performed its duty of protecting the parts exposed to heat above the water-level and thus obtain dry steam; and, thirdly, in the arrangement of said devices for the carrying out of our invention in such manner that a rapid and effective circulation is continuously maintained.

Our invention is embodied in the arrangement of two overlapping but non-contiguous partitions located within and subdividing the water-space of a boiler, steam-generator, or tube-section of a generator, such partitions being adapted to compel the water, together with the steam, to flow through or about such portions of the generator which are exposed to the fire above the water-level and thus liable to overheating. Further, these partitions are so overlapped that the passage created by such overlap shall be located on the side of the main partition where the movement of the water escaping over the top of said main

partition is downwardly directed. These peculiar characteristics and advantages will be hereinafter fully set forth and explained.

The drawings accompanying this specification represent, in Figure 1, a vertical central sectional elevation of a boiler containing our invention. Fig. 2 is a horizontal sectional plan on line 1 1 in Fig. 1. Fig. 3 is a longitudinal central section of a steam-generating tube. Figs. 4 and 5 are modified types of construction.

In said drawings, in Fig. 1, is shown a vertical type of boiler, comprising an exterior shell 2, with a pendent hollow flange 3 as a water-leg, and which serves as the wall for the combustion-chamber indicated at 4, while the grate-bars are at 5. The flues which lead from the combustion-chamber are shown at 6 and the stack at 7. In this class of boiler the water-level is generally carried as indicated, thereby leaving the upper ends of the flues exposed, and thus rendering them very liable to become overheated and injured or completely burned out. The purpose and object of our invention is to reduce this danger of overheating of parts to a minimum and to so construct the boiler that in the circulation which naturally occurs in the employment of the boiler the water shall be compelled during violent ebullition to rise up with the steam, from which it is separated and is then returned by gravity. Thus, in its circulation, it passes over certain exposed surfaces above the water-level, cooling the same and thereby preventing overheating of such portions, and subsequently returns to the general water-level of the generator. To compel such circulation as is above described, a main partition 8 is disposed within the water-space of the boiler, and when the latter is cylindrical said partition is circular (see Fig. 2) and is located preferably midway of the water-leg. Said partition is intended to permit of a flow of water about either end, and more generally is formed with a serrated lower edge at 9, as in Figs. 3 and 5, thus permitting the partition to rest on the bottom of the leg. However, it may have a smooth lower portion and be supported or attached to the boiler-shell in various ways, in order to permit of water-circulation. The upper end of this main partition extends



nearly to the top of the boiler and is overlapped by a secondary or shorter partition 10 of similar shape. Said overlap is established on that side of the main partition where the water passing thereover is downwardly directed, said partitions being adjacent, but non-contiguous, in order that a passage may be created for the flow of steam and water. Thus it will be seen that the duty of the main partition is to compel the steam to escape in a certain designated direction, and as a consequence water is carried up along with it, said water serving to protect those exposed portions of the generator above the water-level, and which are liable to become overheated. When the steam and water reach the top of the main partition their direction is reversed and subsequently the separation of the steam from the water takes place, and this constitutes the second feature of our invention. This act is accomplished as follows: The commingled steam and water, after rising over the top end of the main partition, are turned back and rush through the space or passage 12, established by the overlap of the two partitions. The water, unable to turn upward when the steam escapes toward the steam-supply pipe 13, drops to the quiet-water level, which is located on the opposite side of the main partition from that where the greatest heat exists and where violent ebullition is taking place. Thence said water passes down to the base, turning upward under said partition into the interior space of the water-leg and rises to take the place of the water heated by near contact with the hot fire-box plate. In Fig. 1 the main partition 8 converges toward the top, thereby increasing the steam and water separating capacity in that portion or that space between the said partition and the shell 2 of the boiler. This arrangement of partitions not only produces perfect separation of the steam and water, but only dry steam can pass out of the steam-pipe when a proper water-level is carried, and moreover practically submerges the tubes of an ordinary vertical boiler and consequently adds to its durability, effectiveness, and safety. In the completion of this boiler for active service, a feed-pipe is shown at 14 as entering the shell outside the partition 8, in order that the incoming water may join that which is passing down in the boiler. The try-cocks are at 15 and the blow-off pipe at 16.

In Fig. 3 is shown a tube-section embodying our invention and adapted for multiplication in a steam-generator. In said drawings, 2' indicates the exterior walls of the section, in which is disposed the circulating partition 8, which, in the present instance, is of

tubular form and is serrated at the lower end, which rests upon the bottom of the section. Said partition terminates a short distance below the top of the section and co-operates with the second partition 10, likewise of tubular form, which extends into the bore of the top portion of the main partition and is pendant from the generator-section.

In Fig. 4 a modified construction appears, in which the main partition is perforated at the top and securely affixed to the section. The above constructions are preferably adopted where the section is of tubular form.

In Fig. 5 is represented such an arrangement as is adapted to sections of rectangular shape, where the front wall 2<sup>5</sup> is supposed to be nearest the fire. Hence, the circulation is as indicated, while the partitions are flat metallic sheets, which extend within the section in the manner shown and permit of the desired circulation, attended with the separation of the steam and water, as has been hereinbefore fully described.

What we claim is—

1. A steam generator pipe comprising an outer retaining shell, and an interior circulating tube arranged to permit uninterrupted circulation about either end, combined with a tube adapted to serve as a steam reservoir and outlet and extending in part within the top of said circulating tube, and a feed water supply, substantially as specified.

2. In a steam generator, a main apertured partial partition secured to the top of the generator the lower end extending to a point near the bottom and adapted for circulation thereabout, combined with a second partial partition likewise secured to the generator and non-contiguous to the main partition extending within the latter in part, and a removable cap for the generator, substantially as described.

3. In a steam generator adapted for outside firing, the combination of an inclosing shell, a main internal partition which creates a thin water space between said partition and the generator shell, and a second partial partition non-contiguous to and projecting within the main partition, whereby an upward inward circulation is created, and the walls above the water level are protected after firing, as set forth.

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

THOMAS LEGGETT STURTEVANT.  
THOMAS JOSEPH STURTEVANT.

Witnesses:  
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W. H. ELLIS.