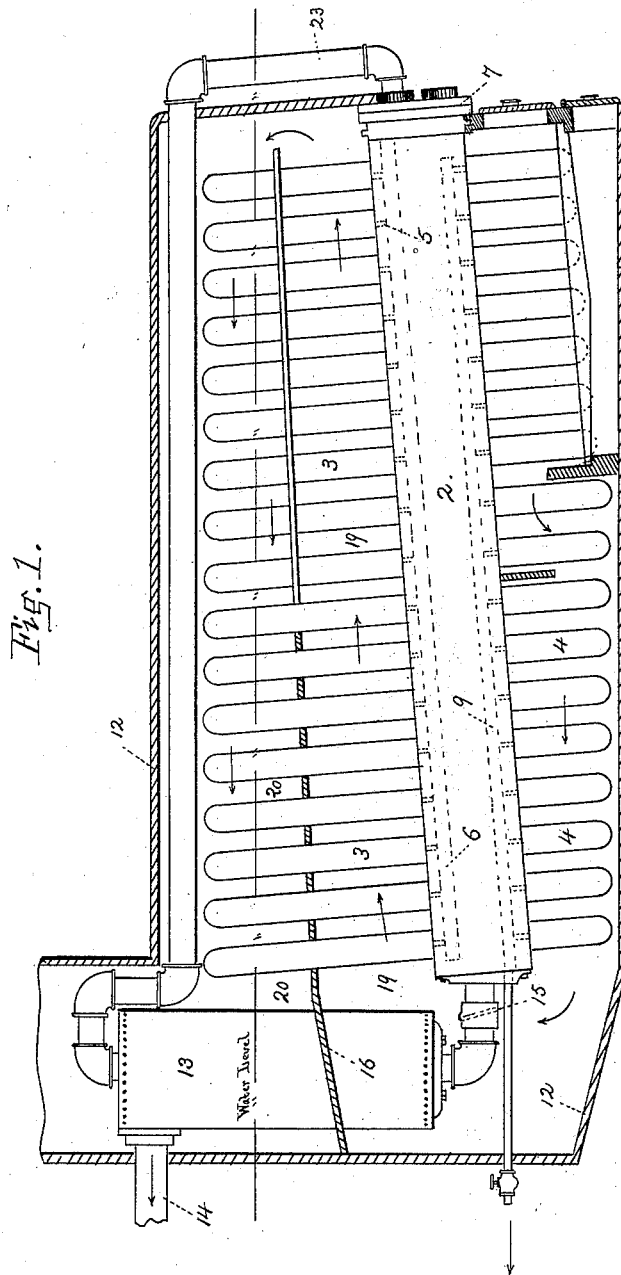


T. L. & T. J. STURTEVANT.  
BOILER.

No. 422,995.

Patented Mar. 11, 1890.



Witnesses.

Francis C. Stanwood  
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by H. C. Lodge Atty.

(No Model.)

2 Sheets—Sheet 2.

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Fig. 2.

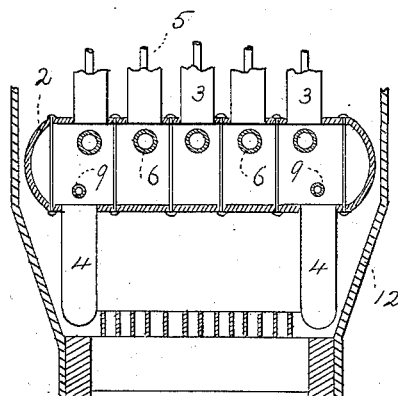
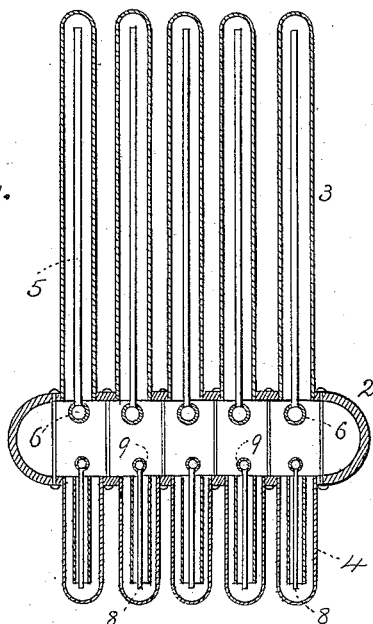


Fig. 3.

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# UNITED STATES PATENT OFFICE.

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

## BOILER.

SPECIFICATION forming part of Letters Patent No. 422,995, dated March 11, 1890.

Application filed November 9, 1889. Serial No. 329,829. (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 Framingham, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Boilers; 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 boilers, particularly that class provided with hollow tubes closed at one end and connected with the boiler-shell exteriorly of the latter, such tubes being generally termed "water-legs."

The essential feature of our invention is in connection with a series of erect or rising water-legs, as likewise a series of pendent water-legs.

In the upright series our invention provides for a free escape of steam at the closed ends of said tubes, and thus facilitates the circulation, while in the pendent water-legs a similar arrangement permits the closed end of said water-legs to be freed from sediment or other deposits which tend to collect at such points.

Our invention further consists in the general arrangement of parts, the novel and advantageous features of which will be more fully hereinafter explained.

The drawings represent in Figure 1 a longitudinal vertical sectional elevation. Fig. 2 is a vertical cross-section. Fig. 3 is a vertical cross-section showing omission of water-legs at a point directly over the grate-bars.

The object of our present invention is to produce a boiler of that class as above premised, in which a constant water-level is to be maintained, one which consequently has a free circulation. This boiler also is one of large steam-generating surface. To this end we have formed a boiler or water-reservoir proper 2, of any desired shape, preferably as shown, or rectangular in cross-section, with convex or rounded sides and suitably stayed

or bolted. This water-reservoir may be a cylinder or consist of one or more tubes arranged in series. Said boiler, preferably, is not set horizontally, but inclines upwardly toward the grate-bars. Such deviation from the horizontal is to enable the series of water-legs with which it is to be furnished to be set at right angles in the boiler-shell and at the same time have them present the best possible surface for heating, as likewise the best position for active circulation. These water-legs consist in the present instance of two series of tubes—an upright set 3 and a pendent set 4—all connected with the boiler-shell and communicating therewith, but closed at the outer ends. Furthermore, said tubes are arranged in rows transversely of the boiler its entire length.

Heretofore an upright closed water-leg could not be employed, for the reason that there was no escape for the confined air and steam. To overcome such objections, we have disposed longitudinally within each water-leg of the upright series 3 a small pipe 5. The latter are open at their upper ends and are united with a steam-conveying pipe 6, closed at the rear end. Said pipe extends nearly the entire length of the boiler-shell there-within, and connects with a hollow casting 7, from which the steam-pipe 23 leads. Thus the longitudinal rows of water-legs interconnect with a common steam-discharge by the series of conveying-pipes 6. Consequently, as the water in the boiler is heated and steam is generated therein, as likewise in the water-legs, said steam is free to rise and escape at once by way of the individual outlet-pipes 5 and series of pipes 6; hence it is evident that the circulation can be rapid, since no steam exists to retard it. Moreover, since the steam-conveying pipes 6 are interiorly of the boiler, the pressure is balanced and very thin light tubing can be used. Similarly, but for a different purpose, the pendent water-legs 4 are fitted with tubes open at both ends, termed "Field tubes," each of the latter being provided with pipes 8 interiorly and open at their lower ends. Said pipes extend upwardly and join a series of pipes 9. These pipes are the same in number as the water-legs, taking the transverse rows, and

unite with a common blow-off or discharge-pipe, or they may discharge separately. In this way we provide a ready way for cleansing the end of each pendent water-leg, since by opening the discharge-pipes 9 water and steam rush from the water-legs up and into the pipes 8 through the pipes 9, and thence escape, sucking up and carrying off all sediment which may have collected at the closed ends of said tubes.

By employing a small pipe 8 in lieu of the Field tube as a blow-off, which idea has been shown in a previous application now on file in the Patent Office, we obtain the same result—cleansing of the tubes—but with a very much less loss in steam and water than if the Field tubes were used for such purpose. The small blow-off pipes 8 are shown within the Field tubes; but we do not desire to be limited to this exact construction, since in many instances they can be located in the space between the pendent leg and the Field tube, and work nearly as well.

The steam-discharge pipe is shown at 23, and, as before stated, leads from a hollow casting 7, in which all the steam-conducting pipes 6 from the water-legs 3 terminate. Said pipe 23 extends above the upright water-legs within the boiler-casing 12. A separator 13, wherein the steam is freed from any moisture which it may contain, may be situated at the rear of the boiler. The upper part of such separator is connected by the main supply 14 to the engine or other source to be provided with steam, while the lower end is united by a pipe with the boiler proper, a check-valve 15, being located within this pipe to prevent steam from passing into the separator, which might occur in some cases.

A small portion of the upper end of the upright tubes, since a water-level is to be maintained, will be necessarily free from water. To prevent such tubes from being highly heated and thus burning out, we have arranged above the water-reservoir of the boiler proper a longitudinal diaphragm or partition 16, through which the upright water-legs extend, forming two flues, direct and return, respectively 19 20. Thus the hot gases from the fire are obliged to pass first below the boiler proper, thence they return above the latter, but beneath the partition 16, coursing about the upright tubes by way of the flue 19; but only over such portions of these tubes as always contain water. The gases, when they reach the front of the boiler, are now permitted to return above the partition through the flue 20, passing about the upper extremities of the water-legs; but since the heat is here

very much diminished no harm occurs to the said water-legs.

By reference to Fig. 3 it will be seen that to permit the fire to be brought within a suitable distance of the boiler proper we have omitted the pendent water-legs for a space equal to the grate-surface, leaving, however, two rows, one on either side of the fire. By such arrangement of the upright tubes and by maintaining a water-level therein water-swashing within the boiler is prevented a—much-desired result in marine boilers.

What we desire to claim is—

1. The improvements in steam-boilers, consisting, in combination with a water-reservoir, of a series of upright water-tubes in which a water-level is to be maintained, said tubes being closed at their upper ends and provided with steam-outlets, a pipe running the length of the water-receiver and connected to said outlets, and a hollow casting at the end of said water-receiver into which said pipe discharges, substantially as stated.

2. The combination, with a central reservoir and a series of rising and pendent tubes closed at their outer ends, of a series of pipes, one within each closed tube, those within the upright tubes serving as steam-outlets, those within the pendent tubes as blow-off pipes, substantially as herein specified.

3. In steam-generating apparatus, a central water-reservoir, a series of pendent exterior tubes closed at one end and provided with tubes, combined with a pipe interiorly of the water-reservoir, and a series of blow-off pipes to the main discharge of the boiler, substantially as described.

4. A steam and water reservoir, a series of pendent tubes, closed at one end, a series of tubes open at both ends, one within each closed tube, combined with pipes, open at their outer ends, and a series of blow-off pipes 9, in which the individual pipes 8 terminate, substantially as herein specified and set forth.

5. In combination with a steam and water reservoir 2, the series of upright and pendent tubes, as described, the partition 16, through which the upright tubes extend; a steam-discharge 23, the separator 13, the pipes 5, 6, 8, and 9, and the inclosing-casing 12, as specified.

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.