

(No Model.)

2 Sheets—Sheet 1.

J. W. WALTERS.

TUBULAR EXPANSION BOILER.

No. 372,346.

Patented Nov. 1, 1887.

Fig. 1.

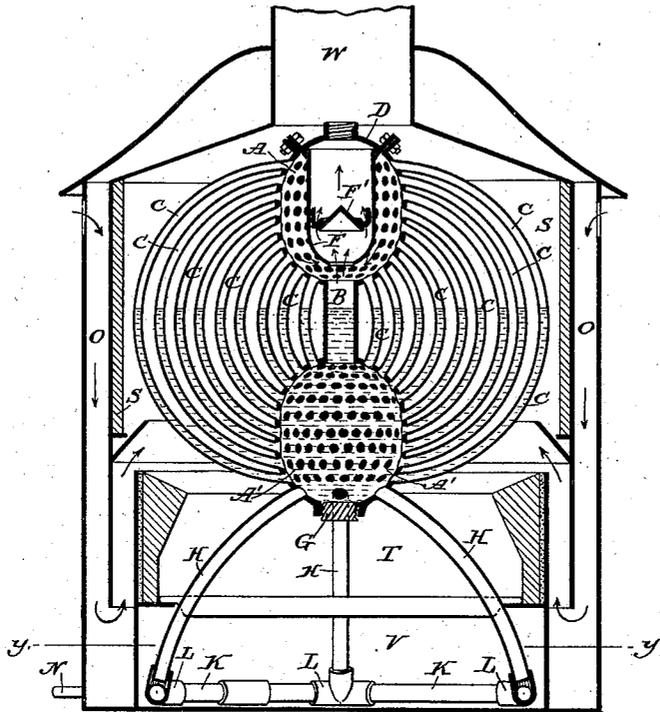
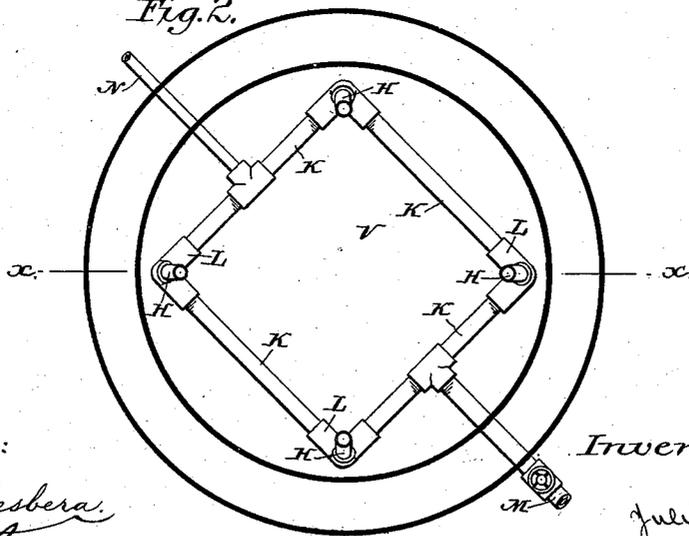


Fig. 2.



Attest:

A. H. Jesbera
S. H. Starnes

Inventor:

Julius W. Walters
 By *David A. Burr*

Atty.

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Fig. 3.

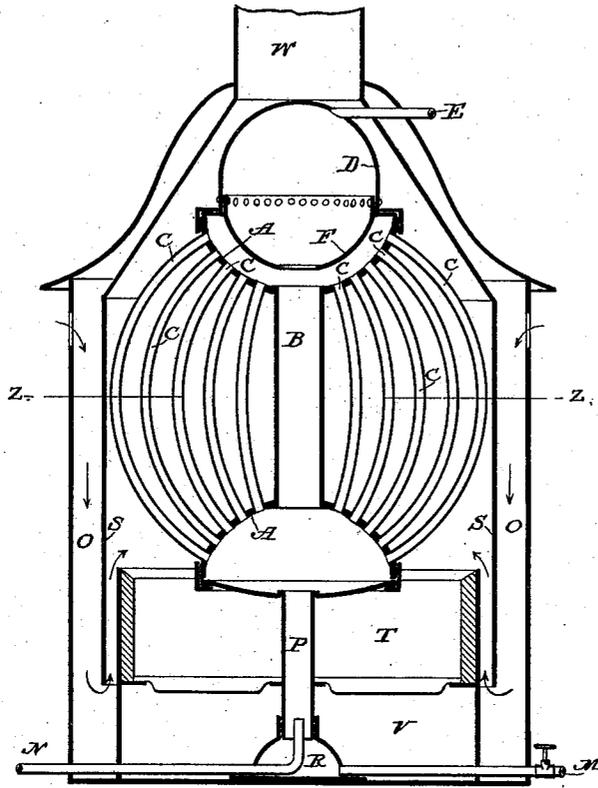
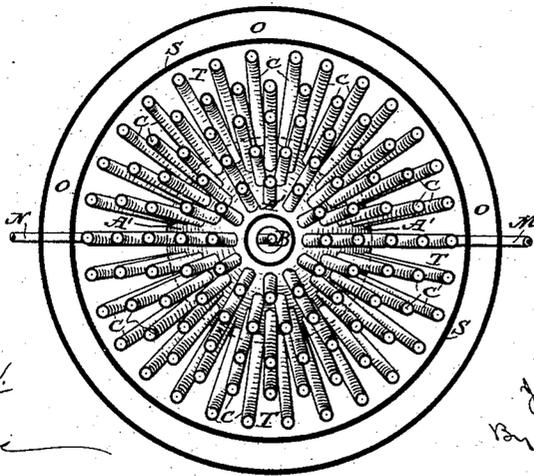


Fig. 4.



Attest:

A. N. Jesbera
P. A. Starce

Inventor:

Julius W. Walters
By David A. Burr
Atty.

UNITED STATES PATENT OFFICE.

JULIUS WM. WALTERS, OF PORT RICHMOND, NEW YORK.

TUBULAR EXPANSION-BOILER.

SPECIFICATION forming part of Letters Patent No. 372,346, dated November 1, 1887.

Application filed August 14, 1886. Renewed April 6, 1887. Serial No. 233,924. (No model.)

To all whom it may concern:

Be it known that I, JULIUS WILLIAM WALTERS, of Port Richmond, Richmond county, State of New York, have invented a new and useful Improvement in Tubular Expansion-Boilers; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, making a part of this specification, in which—

Figure 1 is a vertical central section of my improved steam-boiler in line *xx* of Fig. 2. Fig. 2 is a transverse section in line *yy* of Fig. 1; Fig. 3, a central vertical section illustrating a modification in the construction of the boiler, and Fig. 4 a transverse section in line *zz* of Fig. 3.

My invention relates to the construction of tubular expansion-boilers, and has for its object to simplify the same and greatly increase the heating-surface within a given compass, so as to obtain a more compact, efficient, and economical steam-generator than those now in use, and which shall be especially adapted for use in steam-yachts.

It consists in the combination, with two hollow spheroidal heads united by a single straight water-tube, of a series of curved open-ended tubes, of graduated lengths, secured at each end to said heads in concentric rows, and in mounting the heads and tubes over the furnace upon one or more tubular supports connecting the lower head with a hollow base placed below the furnace-grate bars, the upper head being closed to constitute a steam dome or chamber; also, in combining with the upper head deflecting-flanges fitted within the same, in front of the ends of the tubes, to promote a circulation of the water in the boiler and prevent it from passing up with the steam into the dome or steam-chamber.

In the accompanying drawings, A A', Fig. 1, represent two spheroidal heads, preferably made of steel and joined together by a single straight communicating tube, B, made fast by upsetting each open end of the tube in a suitable aperture pierced through the smaller end of each head. A uniform series of smaller apertures are pierced concentrically in the wall of each head in close proximity to each other, and the counterpart apertures in the upper

and lower heads are connected by a tube, C, whose open ends are upset in the customary manner to form a close steam-tight joint with the wall of each head by means of a suitable upsetting tool or punch introduced through the open end of the head. In this manner the two spheroidal heads A A' are connected, not only by the central straight tube, B, but by a multitude of small curved tubes, C C C, arranged in concentric rows, and which, increasing in length from the inner to the outer row, likewise increase in curvature, so that the outermost tubes present, in connection with the heads to which they are connected at top and bottom, as described, a spherical form, as illustrated in Figs. 1, 3, and 4, while a free unrestricted circulation for the hot air and inflammable gases from the furnace is afforded around each tube along its entire length.

The upper end of the spherical multitubular boiler thus constructed is closed by a suitable cap or cover, D, which may be either flanged or firmly bolted upon the open end of the upper head, as shown in Fig. 1, or screwed down thereon, as shown in Fig. 3, or otherwise made fast with a secure steam-joint in any well-known manner, and to which a steam-delivery pipe, E, (see Fig. 3,) is fitted as usual.

By preference, an inwardly-projecting flange, F, inwardly curved and contracted at its lower end, is formed and fitted to the inner face of the covering-plate D of the upper head. The office of this flange is to deflect and throw back any particles of water carried up with the steam through the tubes C C, leaving the steam to pass up dry into the steam dome or chamber through the contracted opening formed by the flange. A second conical deflecting-plate, F', may, if required, be also inserted within the circular deflecting flange F, as illustrated in Fig. 1.

The lower end of the boiler may be closed by means of a plug, G, Fig. 1, screwing into the opening in the lower spheroidal head, A', and be fitted with two or more tubular curved water-legs, H H, fitted with a tight joint to said lower head, and extending thence to a mud-drum or water-chamber of any suitable form fixed under the ash-pit V. By preference, this lower water-chamber or mud-drum may be constructed of pipes K K, of suitable

lengths, coupled by elbows L L (see Fig. 2) to form a continuous rectangular reservoir, to which the lower ends of the curved water-legs H H are fitted, as shown in Fig. 1. This rectangular mud-drum or water-chamber is fitted with a blow-off cock, M, and a water-supply pipe, N. Instead, however, of supporting the boiler upon the curved water-legs H H and the tubular base or mud-drum K L, I contemplate mounting it upon a single central straight hollow tube or water-leg, P, projecting upward from the crown of a mud drum or chamber, R, having a wide base, to which the water-supply pipe N and blow off pipe and cock M are fitted.

The spherical multitubular boiler is completed for use by inclosing it within a suitable outer furnace wall or casing, S, in which a fire-chamber is formed immediately beneath the lower head, A', its grate-bars being supported above the mud drum or water-chamber, to which the supporting water leg or legs are connected, so that the mud-drum shall lie under or within the ash-box. The upper end of the furnace is connected with a smoke-stack, W, and the hot air and gases and all products of combustion in the fire-chamber pass directly up, over, between, and around each of the several boiler-flues C C and their connected heads A A', so as to subject them to the immediate action of the fire in the most effective manner, while the peculiar arrangement of the flues insures an active constant circulation of water therein, all sediment being quickly deposited in and delivered through the water-legs to the mud-drum at the base.

An auxiliary supply of hot air is admitted to the furnace through an air space or flue, O, formed around the inner wall of the furnace, to extend from top to bottom thereof, the upper end of said air-space being made to communicate with the outer air and the lower end thereof with openings into the fire-chamber near the lower end of the boiler; but as this and similar devices for increasing the intensity of the heat and perfecting the combustion of the gases in the furnace are in common use, they need not herein be more fully described.

In the use and operation of this multitubular spherical boiler, the water-legs, lower head, and curved connecting-tubes are filled with water to about one half the height of the tubes, and the supply is maintained from the supply-pipe N in the customary manner. A fire being kindled on the grate-bars, the hot air, flames, and gases will flow up around the tubes and heads of the boiler, with the effect

of readily and continuously generating steam to be delivered into the upper head or steam-dome, the water carried upward with the steam being arrested and turned back by the deflecting plates and flanges F F', against which the steam impinges as it leaves the tube C C.

The sediment from the water, settling to the bottom of the water-legs, is readily blown out by opening the blow-cock M.

The curved form and arrangement of the tubes C C permit of an equal extension and contraction of the boiler without any strain upon the joints to loosen them.

I claim as my invention—

1. The combination, in a multitubular boiler, of the spheroidal heads and the concentric series of curved arched tubes of different lengths connecting them, substantially in the manner and for the purpose herein set forth.

2. The combination, in a multitubular boiler, of two spheroidal heads, a series of arched tubes of different lengths connecting them, one or more water-legs entering the lower head, and a mud-drum with which the water-legs are made to communicate, all substantially in the manner and for the purpose herein set forth.

3. The combination, with the spheroidal heads and the series of curved tubes connecting them, of an inwardly-contracted circular deflecting-flange fitted within the upper head to extend in front of the openings in the tube, substantially in the manner and for the purpose herein set forth.

4. The combination, with the spheroidal heads connected by a series of arched tubes opening into each, a mud-drum or water-supply chamber, and one or more water-legs connecting the lower head with said dome or chamber, of a furnace wall or casing inclosing said tubes and heads, and the water leg or legs connected therewith, and a fire-chamber and ash-pit formed beneath the lower head and above the drum or water-supply chamber, whereby the heat and products of combustion are carried from the furnace up, over, and between the two heads and the several arched connecting-tubes, all substantially in the manner and for the purpose herein set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JULIUS WM. WALTERS.

Witnesses:

A. N. JESBERA,
S. A. STAVERS.