

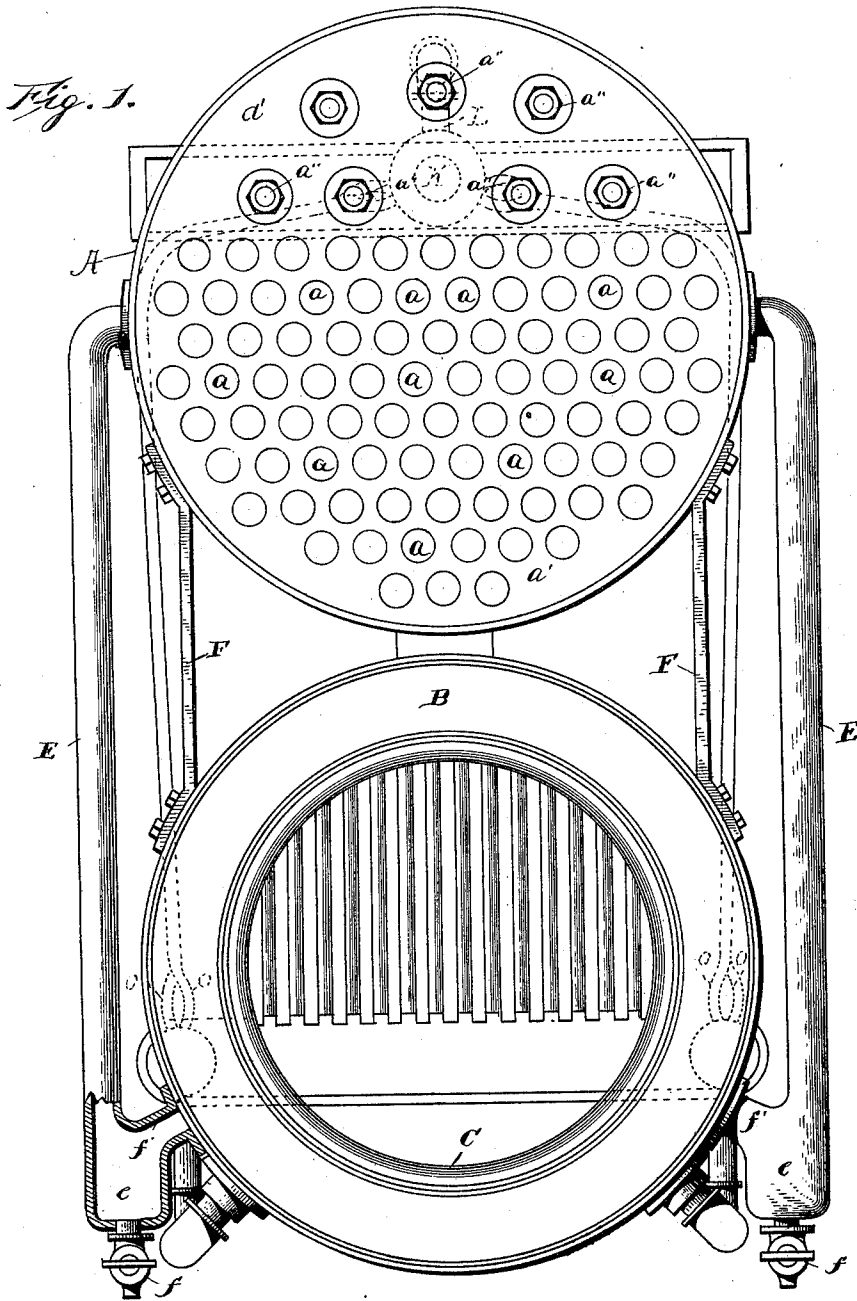
(No Model.)

4 Sheets—Sheet 1.

S. D. THURSTON.
STEAM BOILER.

No. 600,461.

Patented Mar. 8, 1898.



Witnesses.

F. C. Berry
E. C. Ruffey

Inventor.

S. D. Thurston
per C. E. Dobby

Attorney.

(No Model.)

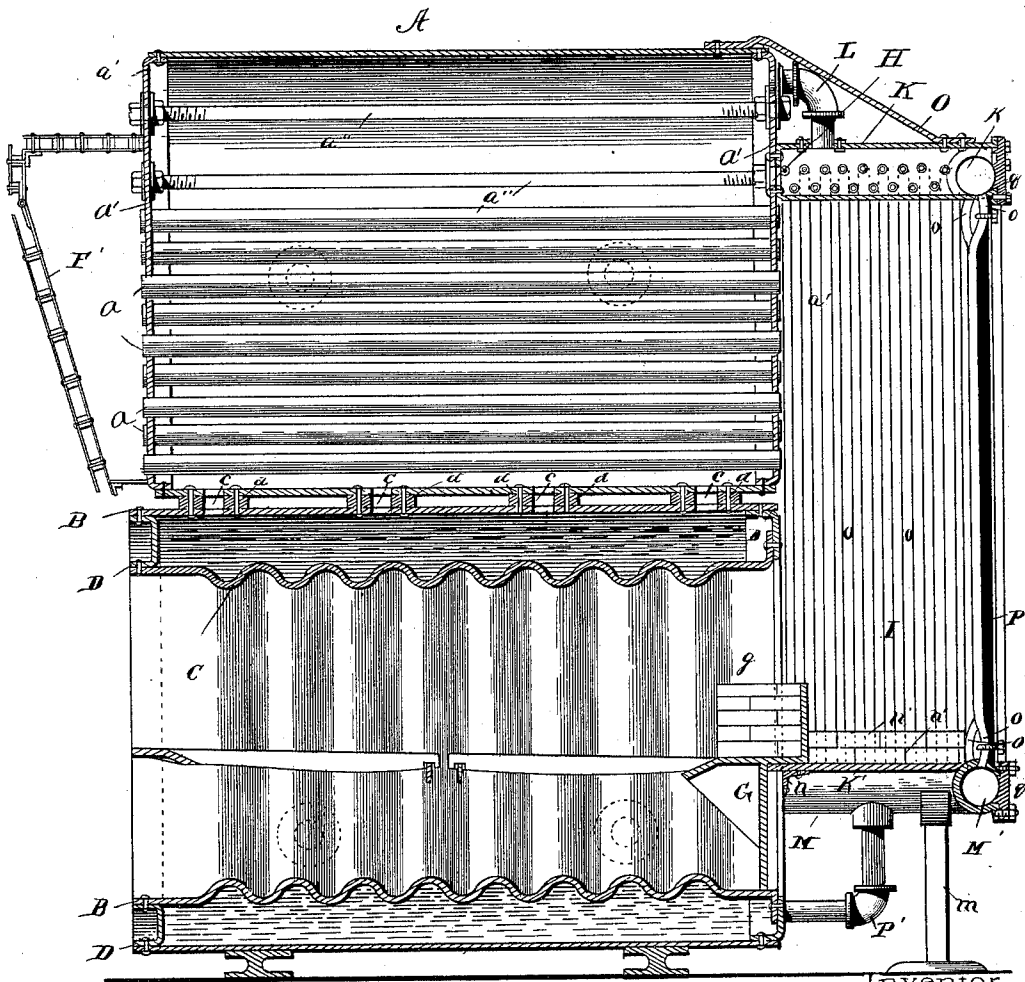
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Fig. 2.



Witnesses.

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(No Model.)

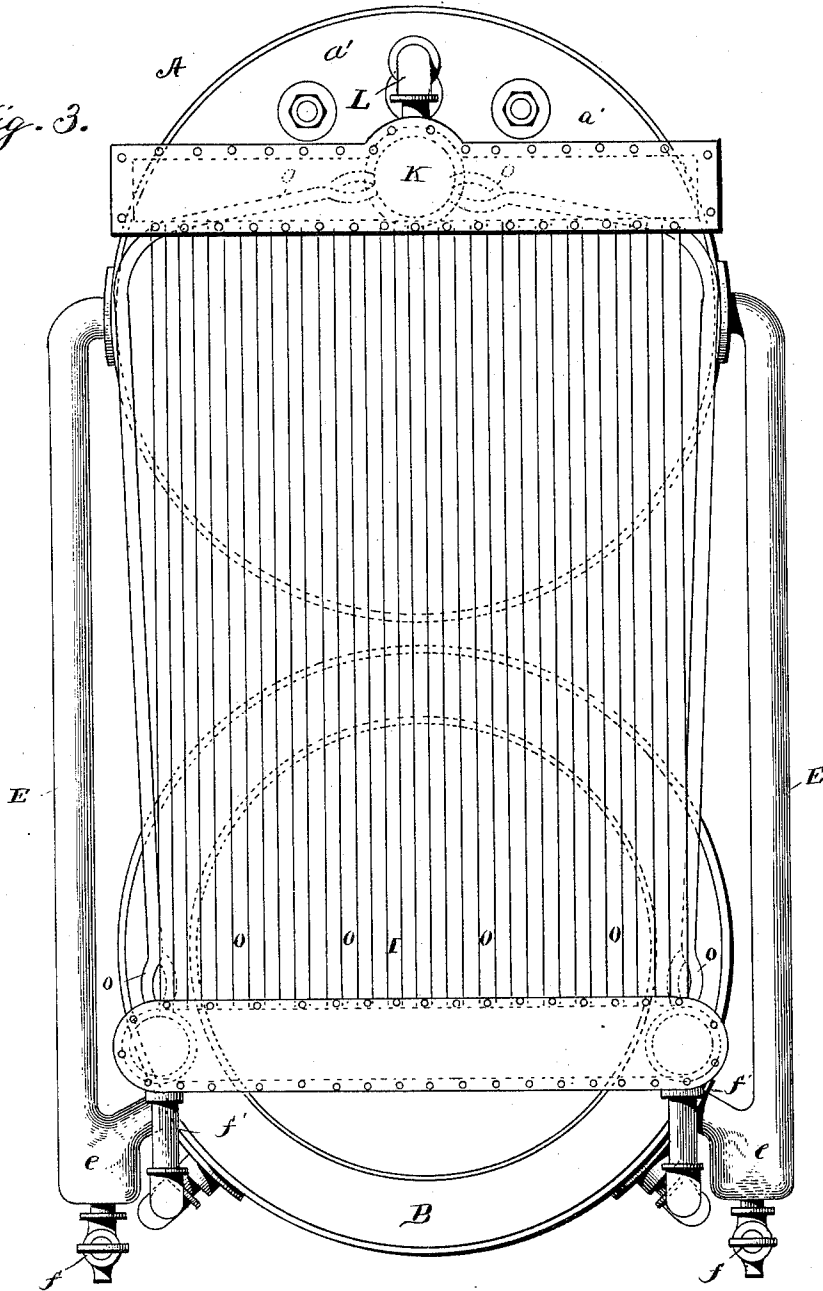
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Fig. 3.



Witnesses.

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Fig. 4.

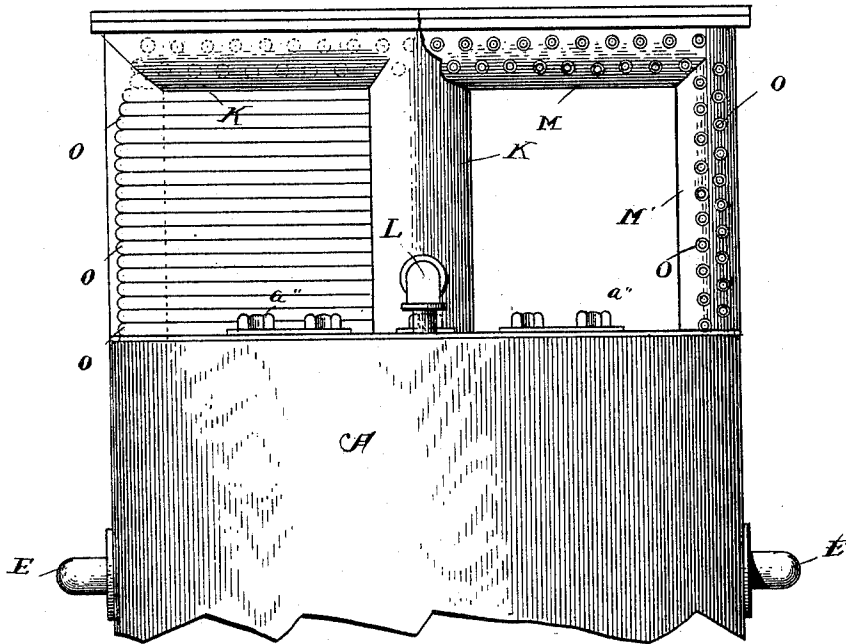
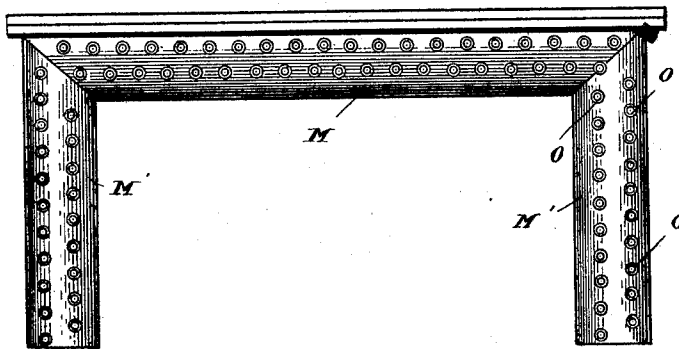


Fig. 5.



Witnesses.

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UNITED STATES PATENT OFFICE.

SPENCER D. THURSTON, OF CAMDEN, NEW JERSEY.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 600,461, dated March 8, 1898.

Application filed October 1, 1897. Serial No. 653,732. (No model.)

To all whom it may concern:

Be it known that I, SPENCER D. THURSTON, of Camden, in the county of Camden and State of New Jersey, have invented certain new and useful Improvements in Steam-Boilers; and I do hereby declare that the following is a full, clear, and exact description of the invention, which 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 the letters of reference marked thereon, which form part of this specification.

This invention relates to certain new and useful improvements in steam-boilers, and more particularly to that class which are composed of fire and water tubes, and the arrangement and connection of the water-tubes to the manifolds or headers and the connection of the latter to the main boilers, since there are two, an upper and lower boiler.

It also relates to the circulation of the water through the different sections of the boiler and means for collecting the sediment during the circulation of the same.

My invention, further, has relation to marine boilers for marine engines. Heretofore such boilers have been made very heavy and mostly put together before being put into the hull of a vessel. This when the boilers are to be replaced is very objectionable and almost impossible without tearing up the decks, which is very costly, as well as causing great delay and consequent loss of time.

To this end my invention consists in forming my boiler in several sections of different constructions and so arranged that each section can be passed through the ordinary hatchway of a ship's hold, and when passed through each section when placed in its proper position will form an essential part of the whole boiler, in which the steam is economically generated, circulation is provided for. The cleansing of the boiler from sedimentary deposit is assured. The relative quantity of water for full generation of abundant steam without unnecessary bulk or weight is determined and superheating is accomplished. It must be borne in mind that the boiler of a marine engine is not under the same conditions as that of a land boiler. In the first place the water-level is not preserved, for the

violent pitching and rolling of the ship produces its effect on the level of the water-surface. As the vessel pitches the water rises violently and acts on the steam. So suddenly does this take place that the water is driven up into the steam-space and produces what is known as "foaming," very greatly saturating the steam. To see how this applies we have to take a simple case. Let, for instance, the ship supposed to be on her beam ends, so that the top of the boiler instead of being horizontal is vertical. It is plain that the water would pass out instead of steam to the engine with evil consequences, and when the ship rolls and the boiler made to revolve still farther would the water rush into the steam-space. Now to produce a boiler embodying the foregoing improvements and avoiding the evil effects just mentioned are objects of my invention.

Advantages of the invention will appear in the following description, and the novel features thereof will be pointed out in the appended claims.

Figure 1 is a front end view of my boiler. Fig. 2 is a vertical longitudinal section through the same. Fig. 3 is a back end view, and Fig. 4 is a top view of the back end of the boiler with the right side of the tubes and a part of the upper manifold removed. Fig. 5 is a top view of the lower manifold removed.

A is the upper boiler or cylinder, provided with the fire-tubes *a*, secured to each head *a'* from the bottom to about two-thirds of the distance from the top. This forms the steam-space and in which a proper number of stay-bolts *a²* for the boiler-head is placed, the fire-tubes staying in the other part of the heads.

Below the cylinder A is the cylinder B, with the corrugated flue C, secured to the flanged heads D, which in turn are secured to the cylinder B. These cylinders are connected at the openings *c c c c* by flanged tubes *d d d d*, thus permitting the steam and circulating water to ascend from the lower boiler or cylinder.

On each side of the cylinders A and B, extending from below the water-line in A and outside of the casing described farther on, are the circulating-tubes E, which connect with the cylinder B near its bottom. These tubes terminate in receptacles *e e* and are provided with cocks or valves *f f* for blowing off sedi-

mentary deposits collected therein, the tubes being joined to the cylinder B above the receptacle at *f'*.

Braces F attach the cylinders A and B to make them more rigid when used as a marine boiler; but when used as a stationary boiler bricks (not shown) in the form of a wall at the forward end of the boiler will answer the same purpose.

The flue or furnace C is closed at its lower forward portion by an iron bracket G, which supports the bridge-wall *g*.

On the front of the cylinder A, opposite the tubes *aa*, is formed the front connection or up-tubes F, leading to the smoke-stack, which is not shown. The back connection or auxiliary combustion-chamber I is formed as follows by the T-shaped manifold or header K K', connected at right angles to each other. The portion K is attached to the back head of cylinder A above the tubes *aaa*, and it, as well as the head, has an opening *h*. A pipe L also leads out of the top of the header K into the top of cylinder A.

Beneath the header K K' and just below a line at the bottom of the bridge-wall is the manifold M M' M', which is supported by the posts *mm*. This manifold forms a square when placed against the boiler, and when the plate is supported by the manifold and the brackets *n* are secured to the boiler, it forms with the two layers of bricks *n' n'* the bottom of the manifold. A brace O, made fast to the manifold K and cylinder A, also assists in supporting the same.

The sides of the back connection are formed by placing water-tubes *ooo* in close connection, the top end of the side-wall tubes being connected to the manifold M' M', ascending straight until they reach the upper manifold, where they are bent and extend over and secured in the sides of manifold K, thus forming the top of the back connection. The back wall of the back connection is formed by the tubes extending from the manifolds K' to M.

The ends of the tubes *ooo* near the manifolds are bent in opposite directions, so as to have enough metal between each inserted tube by which to secure it to the manifold.

The tubes on their outside are covered with asbestos P or other heat non-conducting material and held in place by sheet metal or canvas. The whole boiler may be covered with the same material.

The manifolds M' M' are connected to the water-space of the cylinder B under the furnace by the pipe P.

The manifolds K' and M are open their whole length in the side, said opening being closed by a cap *q q*, which permits of ready access to expand or cut out the tubes.

In operation the heat from the furnace

passes into the back connection impinging against the tubes, thereby heating the water which ascends with the steam and passes into the cylinder A through the opening H. Should the water temporarily close the opening H when the vessel is rolling, the steam generated in the tubes could escape into cylinder A by means of one pipe L. The water and steam in cylinder B ascends into cylinder A through openings *cccc*, and the water is returned by way of pipe L. It will then be seen that a constant circulation is maintained, which is ever necessary to the economical generation of steam. The sediment passing over with the water is collected in receptacle *e* is periodically blown off. I thus produce a boiler at once simple in construction, cheap in first cost, easily repaired, and requiring but little space for a comparatively powerful boiler. When more than one boiler is required, they may be arranged in batteries and connected together in the usual manner; also, that the boiler described may be constructed of any size or dimension without impairing its safety from explosion.

It is evident that certain modifications and alterations may be made in the arrangement of the several parts without departing from the spirit and scope of my invention, and I therefore desire not to be confined to the exact form of construction shown and described.

Having thus described my invention, what I claim is—

1. In a steam-boiler the combination of an upper and lower cylinder provided with tubes and a flue or furnace with a back connection consisting of a T-manifold connected to the upper cylinder, a three-sided manifold at the bottom cylinder, tubes extending up from the lower manifold and bending over and extending to the center of the upper manifold to form the top of the back connection.

2. In a steam-boiler the combination of the upper and lower cylinders with the circulating-tubes, a three-sided manifold at the bottom cylinder, tubes extending up from the lower manifold and bending over and extending to the center of the upper manifold to form the top of the back connection, and the receptacles at the end of the tubes for collecting the sediment.

3. In a steam-boiler the combination of the manifold with the tubes connecting them, of manifold-plates extending the whole length of the manifolds.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

SPENCER D. THURSTON.

Witnesses:

ROBERT C. THURSTON,

PERRY K. THURSTON.