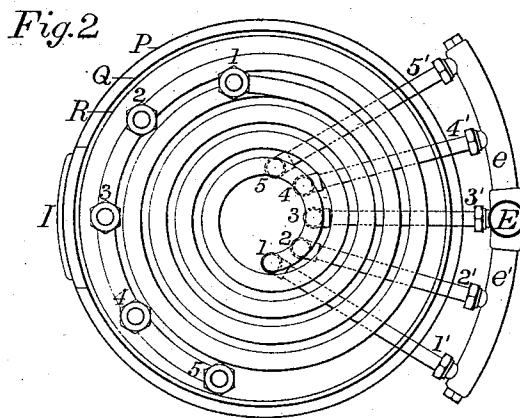
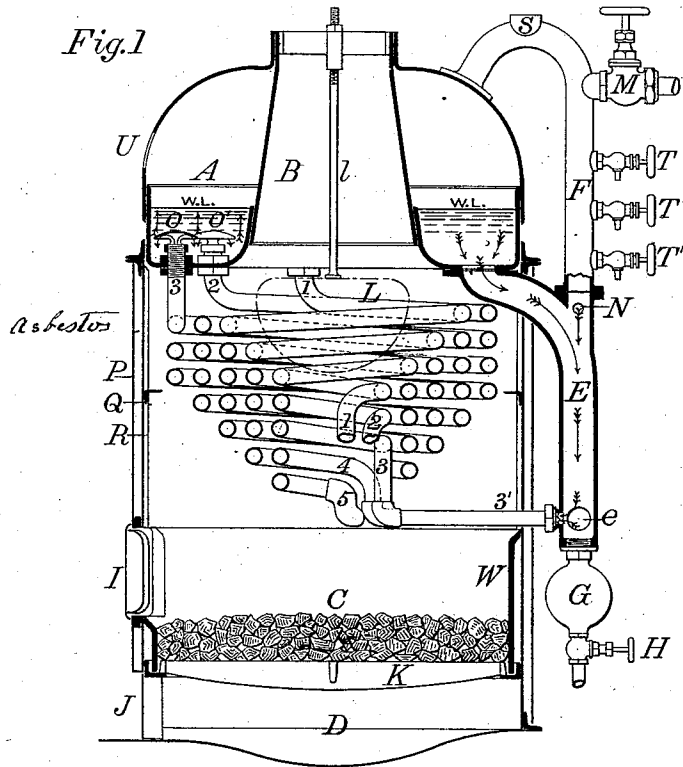


(No Model.)

J. A. SVEDBERG.  
STEAM BOILER.

No. 324,430.

Patented Aug. 18, 1885.



Witnesses:  
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Inventor:  
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# UNITED STATES PATENT OFFICE.

JOHN A. SVEDBERG, OF WASHINGTON, DISTRICT OF COLUMBIA.

## STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 324,430, dated August 18, 1885

Application filed September 19, 1884. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN A. SVEDBERG, a subject of the Czar of Russia, residing at Washington, in the District of Columbia, 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.

This invention relates to that class of steam-boilers known as "water-tube" boilers, and it is especially adapted for use on steam-launches, or vessels generally where lightness, strength, durability, and quick steaming qualities are essential elements. I attain these objects by subjecting the water to the action of heat in a cono-helical coil-tube of such a form as to secure a quick and rapid circulation without the aid of a pump or any artificial means.

In the drawings, Figure 1 represents a vertical section, and Fig. 2 a horizontal section, of my invention, similar letters of reference referring to similar parts.

The boiler is composed of a water and steam drum, A. Through its center passes a conical uptake or smoke-flue, B. From the base of the drum descends a water-circulating pipe, E, also pendent cono-helical coils 1, 2, 3, 4, and 5, which at their lower extremity join the circulating-pipe E by means of the radiating-tubes 1', 2', 3', 4', and 5', and the curved pipe *e e'*. A mud vessel or drum, G, and blow-off valve H, are also attached to the lowest end of pipe E. From the upper part of steam-drum A there is a curved pipe, F, connected with a branch on E. Said pipe F is used for the attachment of safety-valve at S, steam stop-valve M, and try-cocks I I' I''.

C is the furnace with its door I, grate-bars K, ash-pit D, and door J. The furnace and coils are surrounded by a double cylindrical casing, P and Q, with asbestos lining R. The upper ends of coils are threaded and fastened steam-tight to the steam-drum A by means of a nut on each side of the plate, while the extremity has a deflector, O', attached to it. The steam-drum A is provided with necessary hand-hole U. Through the smoke-stack passes a rod, l, to which a damper, L, is attached, adjustable by means of a thread and nut.

The operation of this boiler is as follows: Feed-water enters at opening N, descends through circulation-pipe E into pipes *e* and *e'*, through radial arms 1', 2', 3', 4', and 5', to coils 1, 2, 3, 4, and 5, which it fills and overflows into drum A to the water-line W L. Fire being started and some heat being generated, the water in the coils begins to rise and a natural circulation commences in the right direction, for as soon as the coils, with their contents, become gradually heated, in the same proportion the heated water will rise through the coils, and the cooler water from the steam-drum, together with the cold water from the feed-pipe at N, will descend through the pipe E to fill its place at the base of the coils, and the circulation thus established will continue as long as there is water in the boiler and heat in the furnace. The steam that is generated from water in the coils has no time to gather and lodge in the coils, but is borne along with the ascending water with such rapidity and violence that the deflectors, as at O and O', are advisable to prevent the water being blown up in spray into the steam-space. It will be readily seen that the particular shape of these coils and their connections, as arranged in this boiler, are the best possible for natural circulation. For example, it is well known in practice that if a horizontal "water-tube" be heated the water and steam generated will remain nearly stationary and by and by the tube will be injured by overheating. It is further well known that by raising one end of the water-tube the water is heated unequally, and the hot water being of less specific gravity than the cold, its equilibrium is disturbed and movement to restore it takes place.

In my cono-helical coil there is a gradual rise from base to top, and there is also a gradual increase of diameter of the coil, and a consequent increase of curvature, both of which tend to lessen the resistance to the upward movement of the water, and this particular form of coil is the only one possible which combines both these qualities, and both properties are essential to produce a natural and rapid circulation.

There have been many forms of coil-boilers devised. Thus there are plano-helical coils depending upon increased curvature for circulation, cylindro-helical, depending upon in-

creased elevation, and cono-helical, where the diameter of the coils decreases and where there is no natural circulation. Any or all of these forms will work more or less imperfectly; but from the stagnation of the flow the tubes soon overheat and are destroyed, and pumps are necessarily added to overcome the defects of an unnatural system. As compared with an upright tubular boiler, this form weighs only about two-thirds, consequently costs much less, is much more durable, gets out of order less, has a less number of joints, is more easily repaired, is a quicker and more rapid steamer, and excels it in every good and essential quality.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A coiled water-tube for steam-boilers generated on the frustum of an inverted cone, the coil thus formed having a uniform increase in diameter, and a uniform pitch or rise, thereby producing a natural and perfect circulation without artificial helps, substantially as described.

2. In a water-tube coil-boiler, the combination of a series of several coiled tubes, the upper coils of shorter and varying length of pipe, and consequently smaller diameter of coils, than the lower ones, thereby occupying the entire available heating capacity of the fire-box, substantially as described.

3. In a steam-boiler, the combination of one or more cono-helical coils generated on the frustum of a cone, the large diameter turned up and connected with water and steam space, the lower end connected with feed and water circulation tube, substantially as described.

4. In a steam-boiler, the combination of the steam and water drum A with the cono-helical water-tubes, the larger diameters of said coils turned upward, provided with feed-water and circulation-pipes E and *e e'*, substantially as described.

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Witnesses:

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