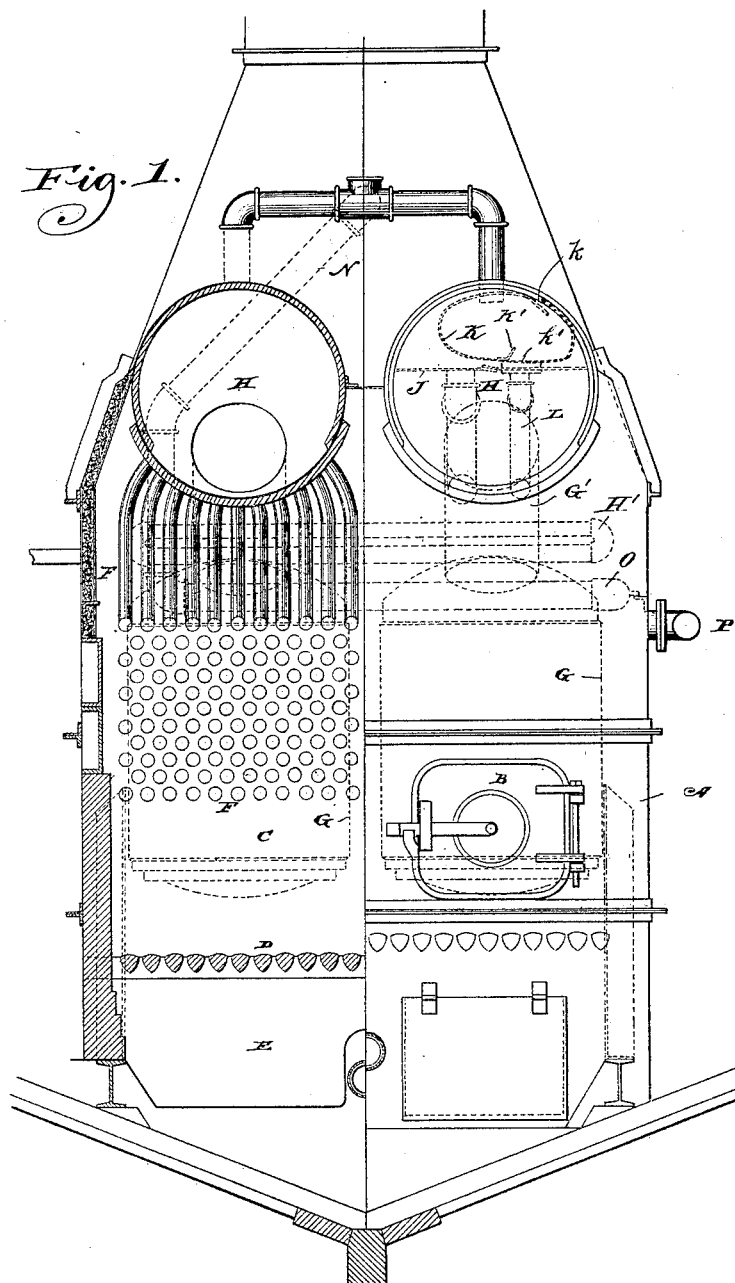


G. & J. N. WARRINGTON.
STEAM BOILER.

No. 459,028.

Patented Sept. 8, 1891.



Witnesses,
J. M. Mann.
Frederick Goodwin

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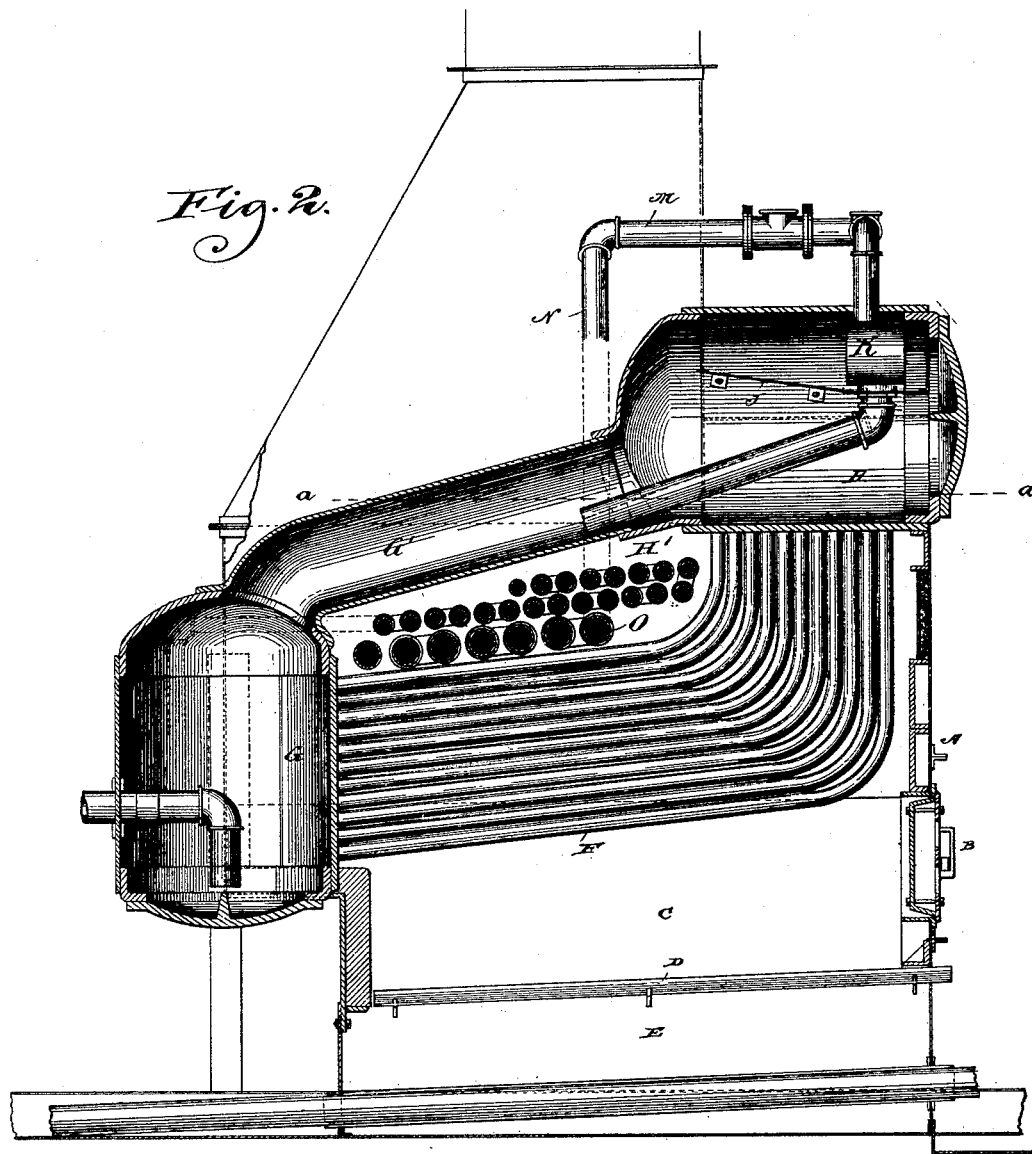
(No Model.)

5 Sheets—Sheet 2.

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5 Sheets—Sheet 3.

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Fig. 3.

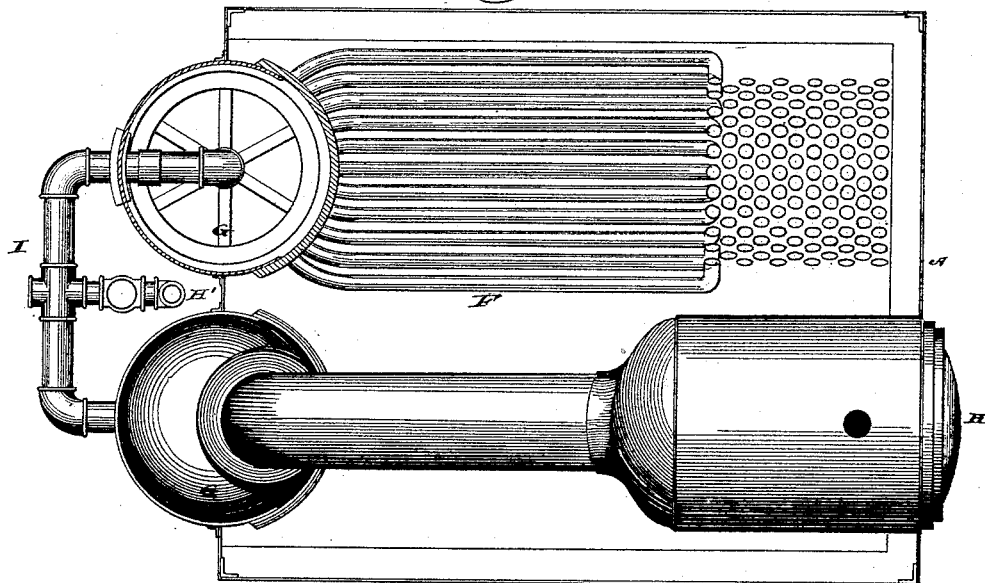
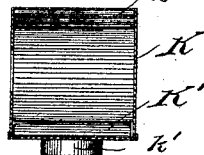


Fig. 7.



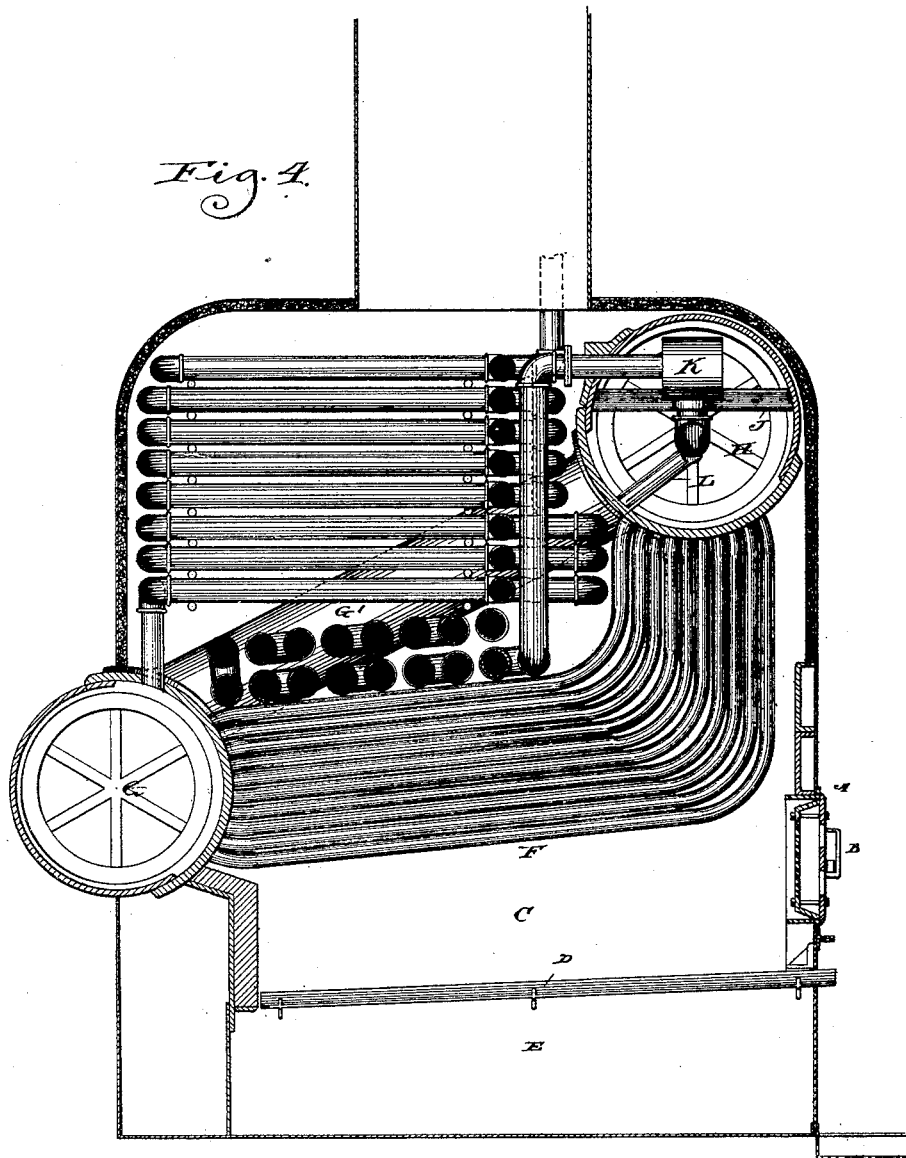
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Fig. 5.

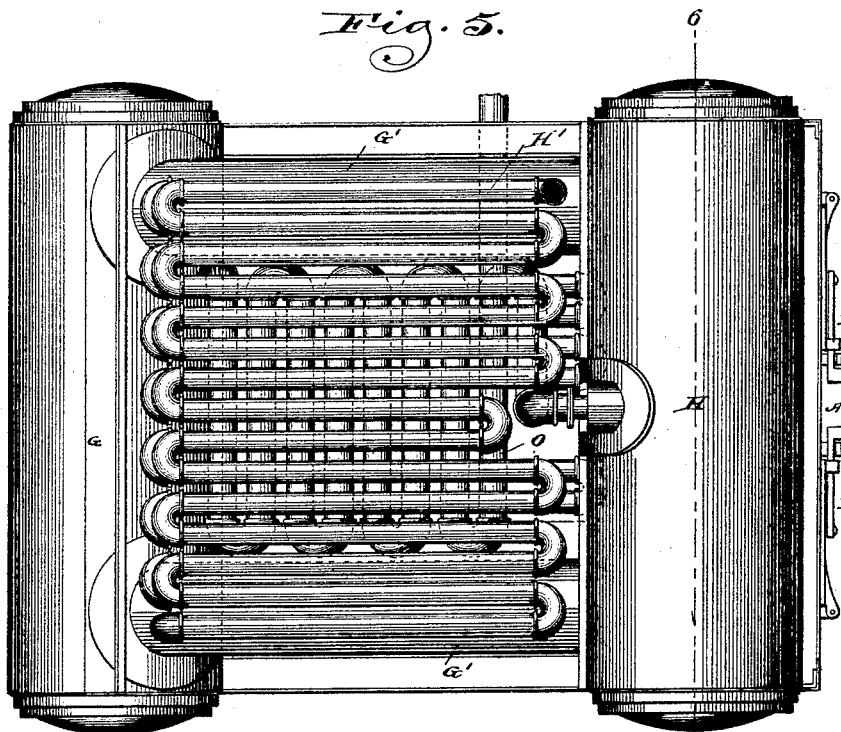
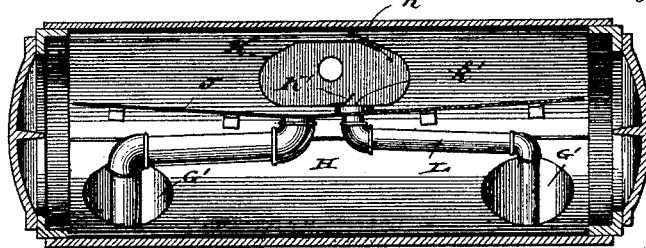


Fig. 6.



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UNITED STATES PATENT OFFICE.

GEORGE WARRINGTON AND JAMES N. WARRINGTON, OF CHICAGO, ILLINOIS.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 459,028, dated September 8, 1891.

Application filed October 14, 1890. Serial No. 368,080. (No model.)

To all whom it may concern:

Be it known that we, GEORGE WARRINGTON and JAMES NELSON WARRINGTON, citizens of the United States, residing at Chicago, Illinois, have invented certain new and useful Improvements in Steam-Boilers, of which the following is a specification.

Our invention has for its object to improve the construction of steam-boilers in such manner as to secure a more perfect circulation of the heating-water and the complete separation and superheating of the steam, and also to provide an improved construction of parts to this end.

Our invention is more particularly applicable to marine boilers, and we have shown in the accompanying drawings two boilers of like construction connected together. Our invention is applicable to a single boiler or a battery of boilers.

In the accompanying drawings, Figure 1 is a front view of two boilers and their accessories, the left of the figure being in vertical section and the right in elevation, some of the parts in each shown in dotted lines. Fig. 2 is a longitudinal vertical section centrally of one of the boilers, some of the pipes being shown in elevation and the grate-bars in elevation. Fig. 3 is a plan view, part of the figure being in longitudinal section. Fig. 4 is a sectional elevation of a steam-boiler of modified construction but embodying our invention. Fig. 5 is a plan view thereof, and Fig. 6 is a longitudinal sectional elevation on the line 6 6 of Fig. 5 and showing the internal construction of the steam-drum and of a separator therein; and Fig. 7 is a transverse sectional elevation of the separator.

In the drawings, A represents the casing surrounding the boiler and having in its front the fuel-doors B, with the fire-chamber C having therein the grate-bars D, beneath which is the ash-pit E. Above the fuel-pot are located tubes F, which are preferably bent into an elbow form, as shown, the rear ends of the tubes being expanded into the tube-sheet of the water-drum G and the upwardly-extending ends in the tube-sheet of a steam-drum H.

The preferred form of construction is shown in Figs. 1, 2, and 3 of the drawings, wherein two boilers of like construction are coupled and in which the water-drums are located

side by side and in a vertical position, while the steam-drums are similarly located and horizontally arranged at an elevation above the water-drums. The steam and water drums are connected by the return-pipes G', which form a passage for the water not evaporated. The feed-water is preferably introduced through a coil of pipes H', connected to the header I, which discharges into the water-drum. The drum, tubes, and return-pipes are filled with water, the water-line being indicated at *aa* in Fig. 2. When the fire is kindled and the temperature of the water reaches the boiling-point, the steam rises in the steam-drums, and in order to effect its partial separation we provide in said drums the baffle-plates J, which extend from the front wall to near the back wall and from side to side of the drums, so as to provide a narrow passage only around their rear ends. The circulation of water is established through the tubes, the lower portion of the steam-drum, the return-pipe, and the water-drum, and in order to completely separate the steam from its entrained water we conduct it through a separator. (Particularly shown in Fig. 7 of the drawings.) This separator consists of the shell or casing, preferably of the form shown and marked K, having a peripheral slit *k*, the walls overlapping but not in contact to provide such slit. This construction provides a tangential inlet for the steam, and in conjunction with the curved walls imparts to it within the separating-chamber a gyratory or rotary motion, the entrained water being thrown to the walls of the chamber and arrested by the ledge K', at the base of which is an aperture *k'*, through which the water escapes and is discharged through the pipe L into the return-pipe G' below the water-line. The dry steam escapes from the top of the separator and is conducted by a branch pipe M into a steam-pipe N, which delivers to a superheating-coil O, located above tubes F and under the feed-coil H'. The steam after being superheated is delivered outside the boiler, as at P, Fig. 1, and is conducted thence to the engine.

We prefer to arrange the parts above described within the casing, so as to provide for the complete envelopment of the boiler with the products of combustion.

The modified construction shown in Figs. 4, 5, and 6 is the same in principle as the construction above described, the same reference-letters being applied to corresponding parts 5 and the only differences consisting in the arrangement of the steam and water drums and feed and superheating coils.

Our improved boiler constructed and arranged as above described is adapted to the 10 rapid and economical generation of steam at high pressure, and we secure these results mainly by the improved construction and combination of parts, and particularly in the combination and arrangement of parts where- 15 by the springing of the tubes and the consequent early destruction of the boiler is obviated.

It will be observed that the water-tubes are of elbow form, and they are so made in order 20 to provide for their expansion and contraction in use without springing at the tube-sheet, the flexure being exerted at the angle or bend of the tube without disturbance of the joint. The parts are also so arranged as to secure 25 and maintain a perfect circulation of the water and effective separation and superheating of the steam.

We claim—

1. In a boiler of the type described, a water- 30 drum located at the back of the furnace, a steam-drum at the furnace-front above the fire-box, a connection between said drums below the water-line, and a steam-generator composed entirely of a plurality of independent 35 pipes having curved bends therein above the fire-box and having their horizontal portions independently joined directly to the water-drum, the latter having an area as great or

greater than the combined areas of the inlets to the several generating-pipes and said pipes 40 having their upright portions independently joined directly to the steam-drum below the water-line, substantially as described.

2. In a water-tube boiler, the combination, 45 with a water-drum of a steam-drum and water-tubes connecting said drums below the water-line, of a return-pipe also connecting the water and steam drums below the water-line, a steam-separator placed within the steam- 50 drum and comprising a separating-chamber formed by a casing having a slitted peripheral wall to provide a tangential inlet for the steam with its entrained water and having a ledge to separate the water from the steam, 55 and suitable outlets for the dry steam and water, substantially as described.

3. In a water-tube boiler, the combination, with the water-drum of a steam-drum and water-tubes connecting said drums below the 60 water-line, of a return-pipe also connecting the water and steam drums below the water-line, a steam-separator placed within the steam-drum below the water-line, said separator consisting of a chamber formed of a cir- 65 cular casing, said casing having a slit therein and the walls of said slit being overlapped to provide a tangential inlet, an internal ledge on the wall of the casing to separate the water 70 from the steam, and suitable outlets for the steam and water, substantially as described.

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Witnesses:

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