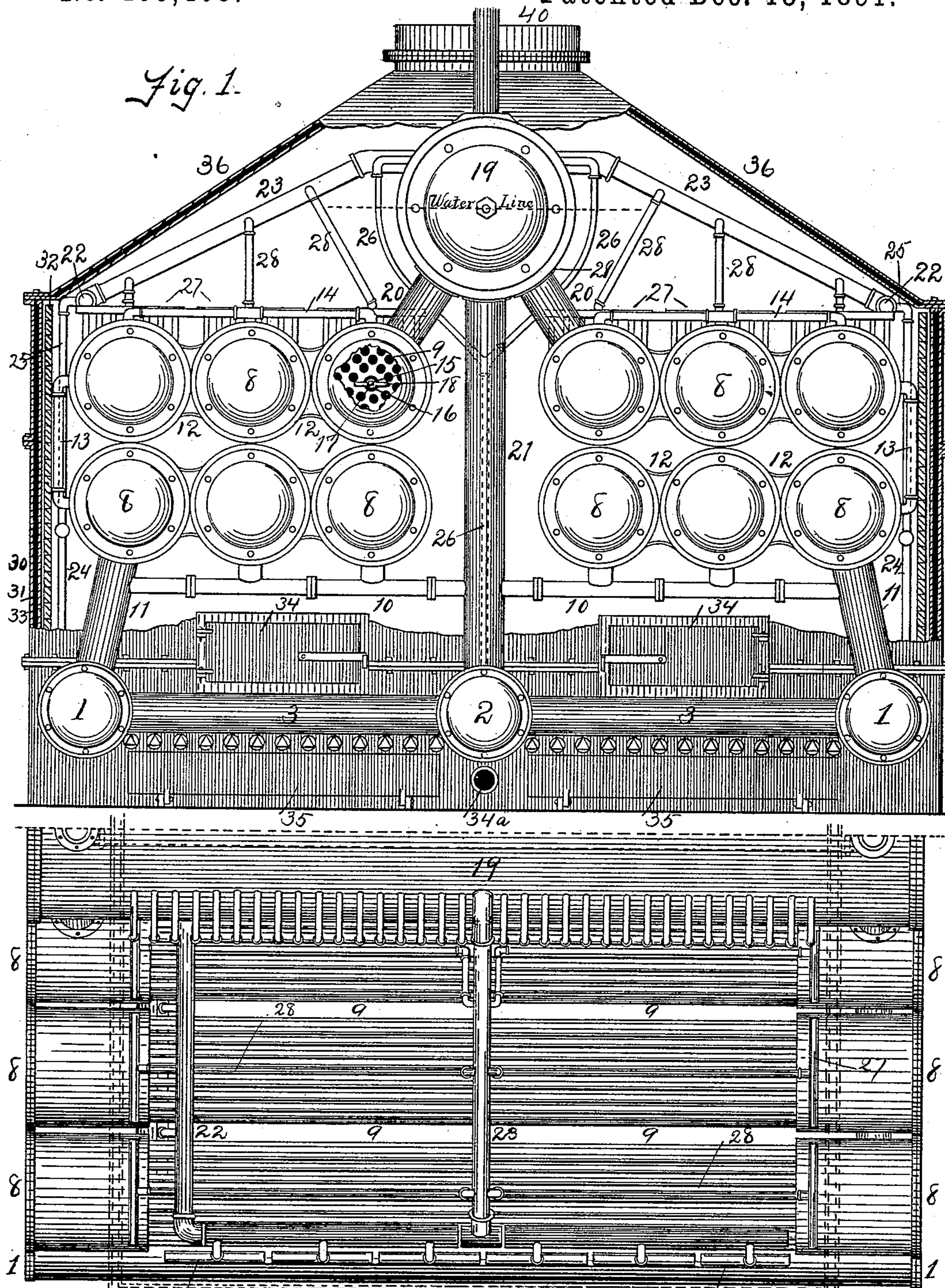


E. A. JOHNS.
WATER TUBE STEAM BOILER.

No. 465,408.

Patented Dec. 15, 1891.



Witnesses.
John F. Merrill.
Geo. W. Morris

Fig. 2.
Inventor.
Ernest A. Johns.
By *[Signature]* Attorney.

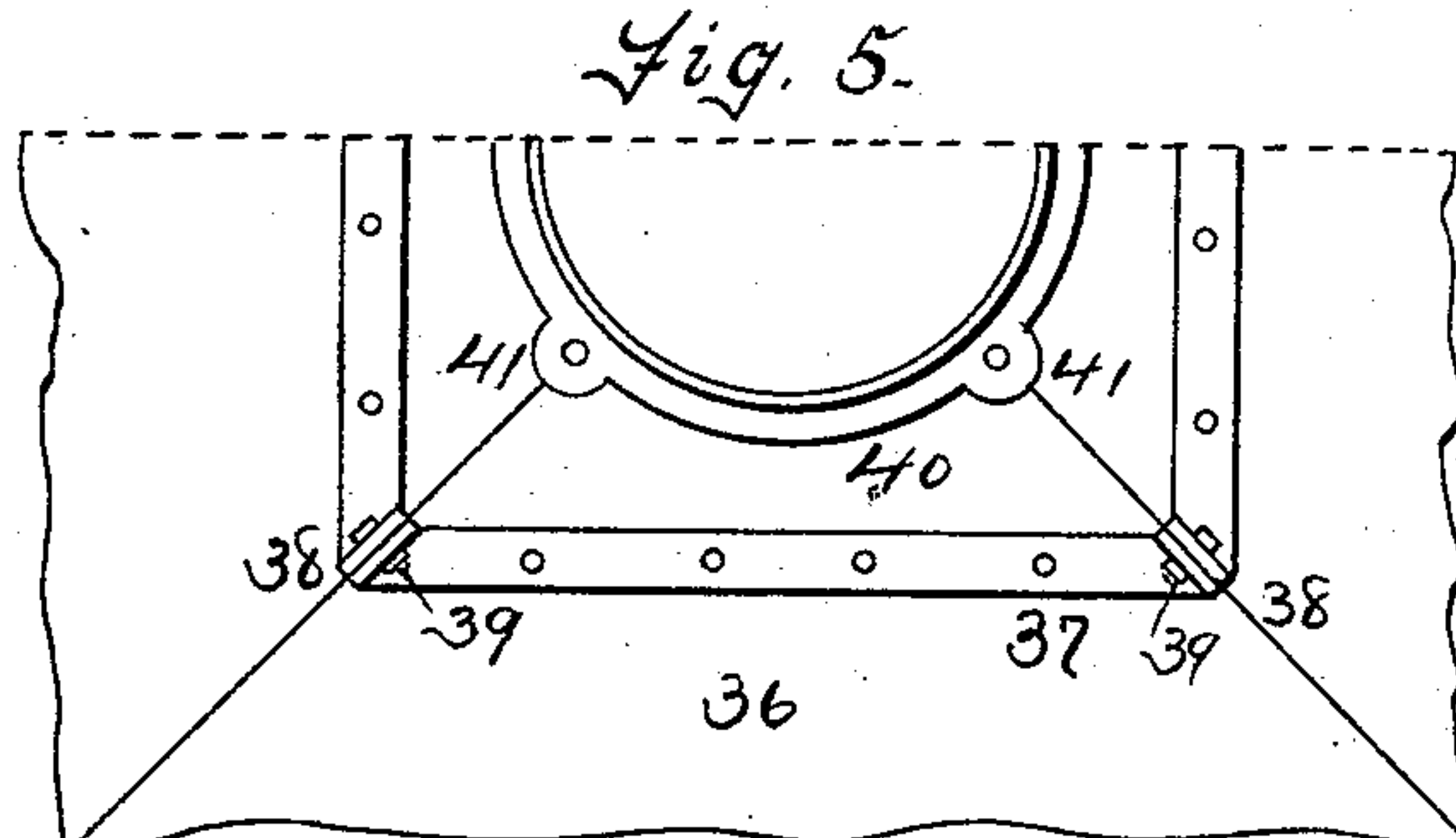
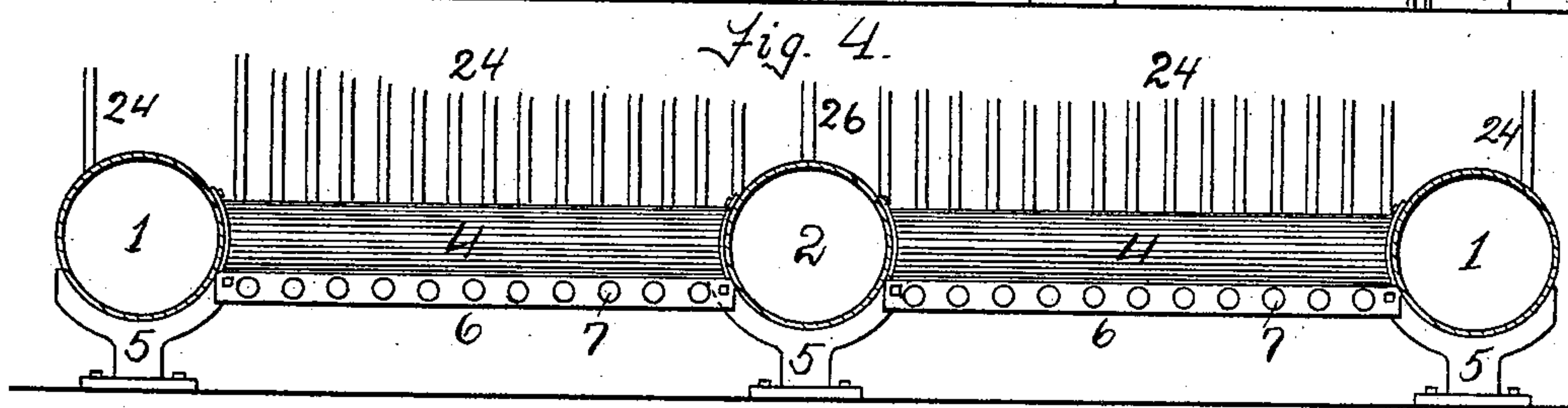
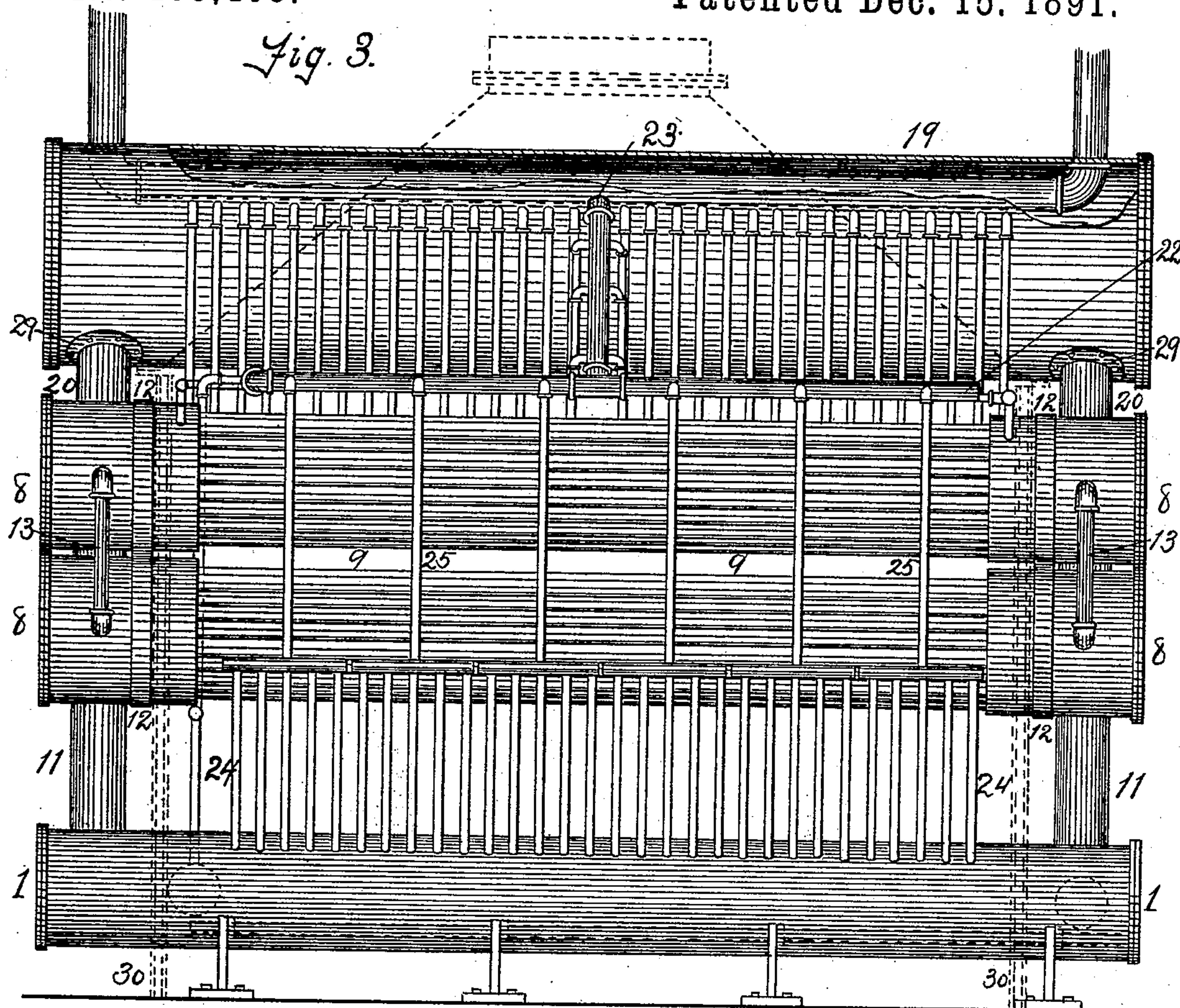
(No Model.)

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UNITED STATES PATENT OFFICE.

ERNEST AUGUSTUS JOHNS, OF NEW YORK, N. Y.

WATER-TUBE STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 465,408, dated December 15, 1891.

Application filed July 2, 1891. Serial No. 398,282. (No model.)

To all whom it may concern:

Be it known that I, ERNEST AUGUSTUS JOHNS, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Water-Tube Steam-Boilers; and I do 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 or steam-generators of that class commonly known as "water-tube boilers;" and the object of the invention is to produce a generator of light weight and low center of gravity, which shall have a large amount of generating-surface so arranged as to be effectively acted upon by the fire to raise steam in less time than is ordinarily required.

A further object is to so arrange the parts as to admit of repairs to any portion without disturbing other parts of the boiler and with little expenditure of time or labor.

The invention consists, principally, in a series of generators, each consisting of two short drums connected by a series of tubes or pipes so arranged that the greater portion of the drums shall be outside the shell of the boiler and the pipes extend horizontally over the fire-chamber in position to be directly acted upon by the heat. These generators may be of any desired number and are generally arranged in batteries of three or four generators each upon each side of the middle of the boiler and one, two, or more batteries in height. The inner drum of the upper battery upon each side is connected at front and rear ends with a main steam-drum located above the generators, and the outer drum of each lower battery is connected with a water-drum or manifold extending along the side of the lower part of the fire-chamber. These side manifolds are also connected with each other and with a center manifold by pipes extending along the front and rear of the fire-chamber, the center manifold being also directly connected with the main steam-drum by stand-pipes at front and rear. The sev-

eral batteries of generators upon each side are connected, so that when the water-line is brought up to its proper point the center of the main steam-drum, the manifolds, generators, and connecting-pipes are completely filled. Series of steam-pipes also connect the bottom manifolds and water-drums of the generators with the steam-drum above the water-line to carry off the steam generated therein.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a front view of my improved boiler, a portion of the shell and hood being broken away to show the interior arrangement of pipes. Fig. 2 is a top view of one-half the same; Fig. 3, a side view of the boiler, showing the arrangement of the steam-pipes; Fig. 4, a partial cross-sectional view through the fire-chamber, showing the steam-pipes of the rear manifold and the supports for the bottom manifolds and grate-bars; and Fig. 5 is a detail showing the manner in which the several hood-sections are removably united.

The base of the boiler is formed of two side manifolds or water-drums 1 1, extending the entire length of the boiler from front to rear and defining the side limits of the fire-chamber, and a similar drum 2, midway between the two. The several manifolds are connected at front and rear by connecting-pipes 3 and 4, respectively, generally of about one-half the diameter of the manifolds. The manifolds are supported upon forked standards or saddles 5, and to the inner arms of the outer saddles and the adjacent arm of the saddle supporting the middle manifold are secured the grate-bar bearers 6. The saddles may vary in number according to the depth of the boiler or length of the manifolds, and the bearers 6 are provided with apertures 7, through which the grate-bars are passed, thus supporting the latter at several points, but allowing their free removal from the front. The bars should project outwardly a short distance in front of and underneath the front manifold or connecting-pipe 3, in order to admit of the turning or removal of the bars. By the side and middle manifolds and their connecting-pipes at front and rear are thus defined two fire-chambers, the manifolds forming to some extent the side walls of the

same, thus bringing a large body of water in immediate contact with the fire. Above each fire-chamber as thus defined are placed one or more batteries or series of generators, according to the desired capacity of the boiler. Each battery consists of two or more generators, and each generator is composed of two water-drums 8 8, at front and rear connected by a series of pipes or tubes 9, whose ends are rolled into the inner head of the drum. The several drums are connected at front and rear by means of pipes 10, preferably made in sections, as shown, so as to be easily removable, and with the side manifolds by means of stand-pipes 11 at front and rear. The several drums of each battery or series are strapped together by a metal strap 12. The pipes of the generators thus extend from front to rear horizontally over the fire-chamber, and for the purpose of increasing the capacity of the boiler there may be two or more batteries, one above the other, over each fire-chamber, two batteries upon each side being shown in the drawings. In this construction the two batteries upon each side are connected by a pipe 13, and the generators of the upper battery are also connected in the same manner as those of the lower by pipes, 14, communicating with each drum. In addition to the support furnished by the pipes, the opposite drums of each generator are held together by a stay-bolt 15, which passes through a central tube or pipe 16 of larger diameter, and provided with a screw-thread and nut 17 at each end, acting against a frog 18, bearing upon the inner head of the drum.

Above the upper batteries of generators and centrally located with reference to the batteries upon each side is located the main steam-drum 19 in connection with the water-drums of the generators at each end by means of stand-pipes 20 and directly with the middle base-manifold 2 by upright stand-pipes 21 at front and rear, with which, also, the connecting-pipes 10 of the generators are in connection. A perfect circulation of water is thus provided for from the main steam-drum to the base-manifolds through the several generators. A water-line being preserved at the center of the main steam-drum, the generators, base-manifolds, and connecting-pipes are necessarily filled with water and in a position exposed to the direct action of the heat.

For the purpose of conveying the steam generated in the base-manifolds and the water-drums of the generators more directly to the steam-drum they are directly connected with the steam-drum at a point above the water-line by smaller steam-pipes. A receiving-pipe 22 runs around the sides and rear of the boiler, which is connected with the steam-drum upon each side by means of a pipe 23, entering the drum above the water-line. With this main receiving-pipe are connected small steam-pipes 24, entering each side manifold near its highest point; but for convenience these pipes are arranged in groups of four or

five pipes, as shown in Figs. 2 and 3, each group having a single pipe 25 leading to the main 22. In the same manner the rear manifold is connected with the steam-drum, and the center base-manifold has a series of similar small pipes 26, leading directly therefrom to the steam-drum and entering the same above the water-line. The steam-pipes 24 and 26 are placed closely together, and thus define three sides of each fire-chamber with a wall of upright pipes, further assisting in the rapid generation of steam, while at the same time the surface-steam generated in the base-manifolds and the water-drums 8 is conveyed to the steam-drum without passing through the whole body of water in the boiler. The drums 8 8 are similarly connected with the steam-drum by groups of pipes 27, having a connecting-pipe 28 leading to the pipe 23 in both front and rear. The several stand and large connecting pipes are connected with the several water-drums by means of flanges, as 29, riveted in the ordinary manner.

The shell 30 of the boiler is preferably constructed in several horizontal sections for convenience in taking apart for repairs and the like, and is composed, generally, of two thicknesses of metal with an intermediate packing of asbestos 31 or other similar non-conducting material. The interior around the fire-chambers is lined up with a wall of fire-brick 32, preferably perforated, and so arranged as to leave an air-space 33 between the same and the shell. The front is provided with the furnace and ash-pan doors 34 and 35 in the ordinary manner. By leaving the ash-pan doors open it will generally be found practicable to raise steam on natural draft, owing to the great area of generating-surface and its proximity to the fire at all points; but in case of necessity a blower may be connected, as at 34^a.

The shell of the boiler is so placed, as indicated in dotted lines in Figs. 2 and 3, as to leave the greater part of the drums 8 of the generators outside the same and a corresponding portion of the base-manifolds, including also the several connecting-pipes. It will be observed, therefore, that no riveted part of the boiler comes in contact with the fire, thus materially increasing its durability.

The hood 36 is constructed in a manner similar to the shell, but is made in sections for convenience of removal. The several sections may be united by means of a strap 37, having lugs 38 at the meeting points, through which may be passed bolts 39. A ring or collar 40, having lugs 41 for attaching a stack, supports the sections at the top. Thus any one section of the hood may be removed for the purpose of repairing any portion of the boiler without the necessity of separating the whole structure.

The boiler as herein described is intended for and especially applicable to marine purposes, in which it is required to have a boiler of light weight, large capacity, low center of

gravity, and capable of maintaining a steady water-line. It may be constructed with a single battery of generators or a larger number than herein specified and the capacity and form indefinitely varied according to circumstances. It is preferably built entirely of steel, and is intended to carry steam at two hundred pounds pressure.

I claim as my invention—

10 1. A steam-boiler having a series of water-drums surrounding the fire-chamber and forming the lower portion of the walls of the same, a series of generators located above said fire-chamber, each consisting of a drum
15 or water-head in front and rear and a series of tubes nested therein, and pipes connecting said water-heads with said lower drums and with each other, substantially as and for the purpose specified.

20 2. A steam-boiler having a series of water-drums surrounding the fire-chamber and forming the lower portion of the walls of the same, a series of generators located above said fire-chamber, each generator consisting
25 of a water-head in front and rear and a series of tubes nested therein, a main steam-drum located above said generators, water-pipes connecting said lower drums with said water-heads and main drum and said water-heads
30 with each other outside the shell of the boiler, and a series of small tubes inside the shell, connecting said lower side and rear drums with said main drum and forming the side and rear limits of the fire-chamber, substantially as and for the purpose specified.

35 3. A steam-boiler having a series of water-drums surrounding the fire-chamber and

forming the lower portion of the walls of the same, a series of tubular generators located above the fire-chambers, a main steam-drum
40 located above said generators, pipes connecting said lower drums and main steam-drum outside the shell of the boiler, and a series of small pipes inside the shell communicating with the upper part of said side and rear lower
45 drums and with said main drum above the water-line, forming the side and rear walls of the fire-chamber, substantially as specified.

4. In a steam-boiler, a series of generators consisting of communicating water-drums
50 wholly or partially outside the shell in front and rear, a series of tubes extending from front to rear over the fire-chamber and connecting corresponding drums, water-drums in communication with said generator-drums
55 surrounding and defining the fire-chamber, a main steam-drum located above said generators and having stand-pipes connecting the same with said generators and lower drums, a series of small pipes connecting the upper
60 part of said side and rear lower drums with said main drum above the water-line and forming the side and rear walls of said fire-chamber within the shell, and pipes connecting the upper part of said generator-drums
65 with said main drum above the water-line, substantially as and for the purpose herein specified.

In testimony whereof I affix my signature in presence of two witnesses.

ERNEST AUGUSTUS JOHNS.

Witnesses:

JEAN W. WHEATON,
F. W. LANE.