

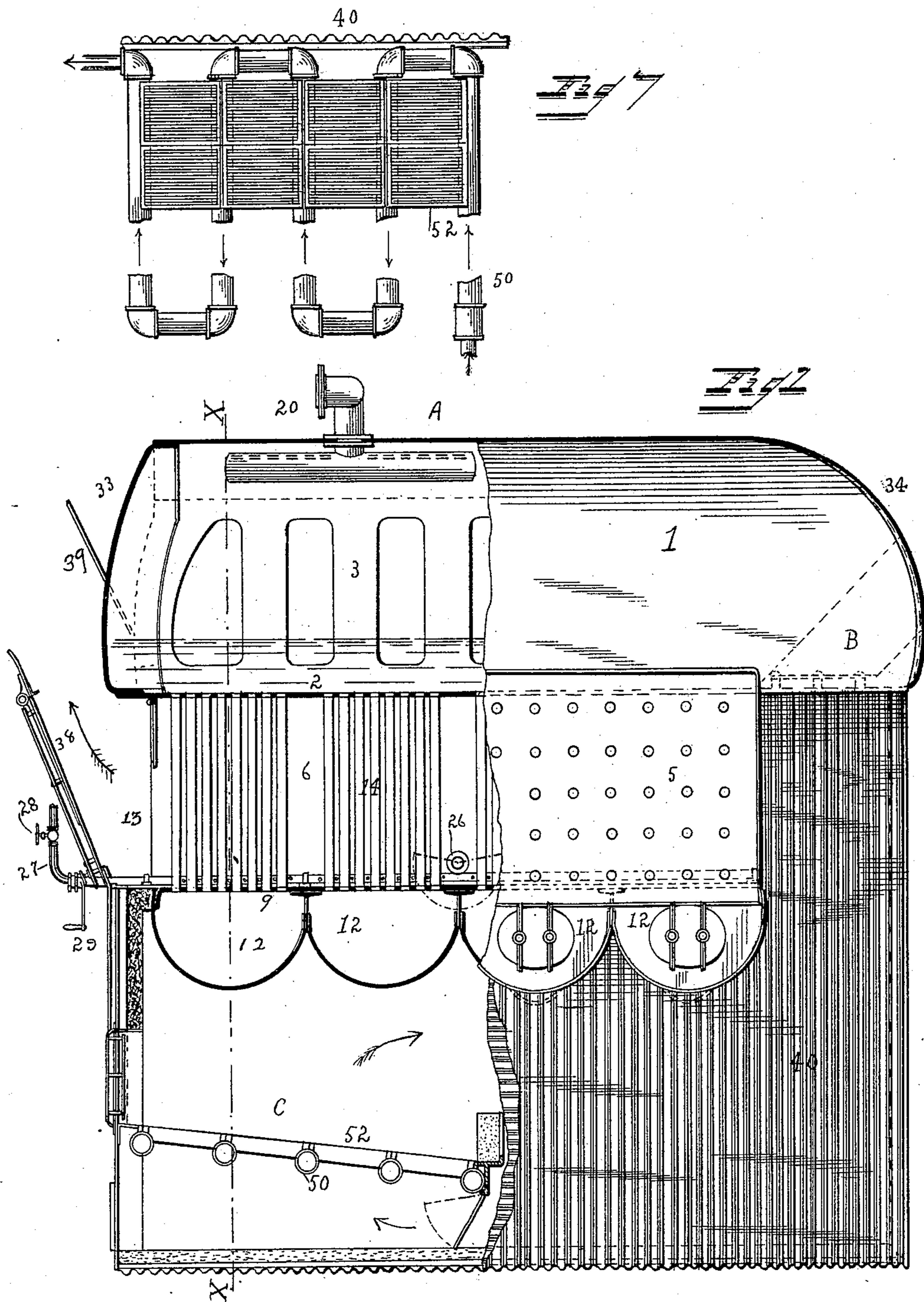
(No Model.)

3 Sheets—Sheet 1.

N. B. CLARK & F. B. KING.  
STEAM BOILER.

No. 404,825.

Patented June 11, 1889.



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J. J. J. J.

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Attorney

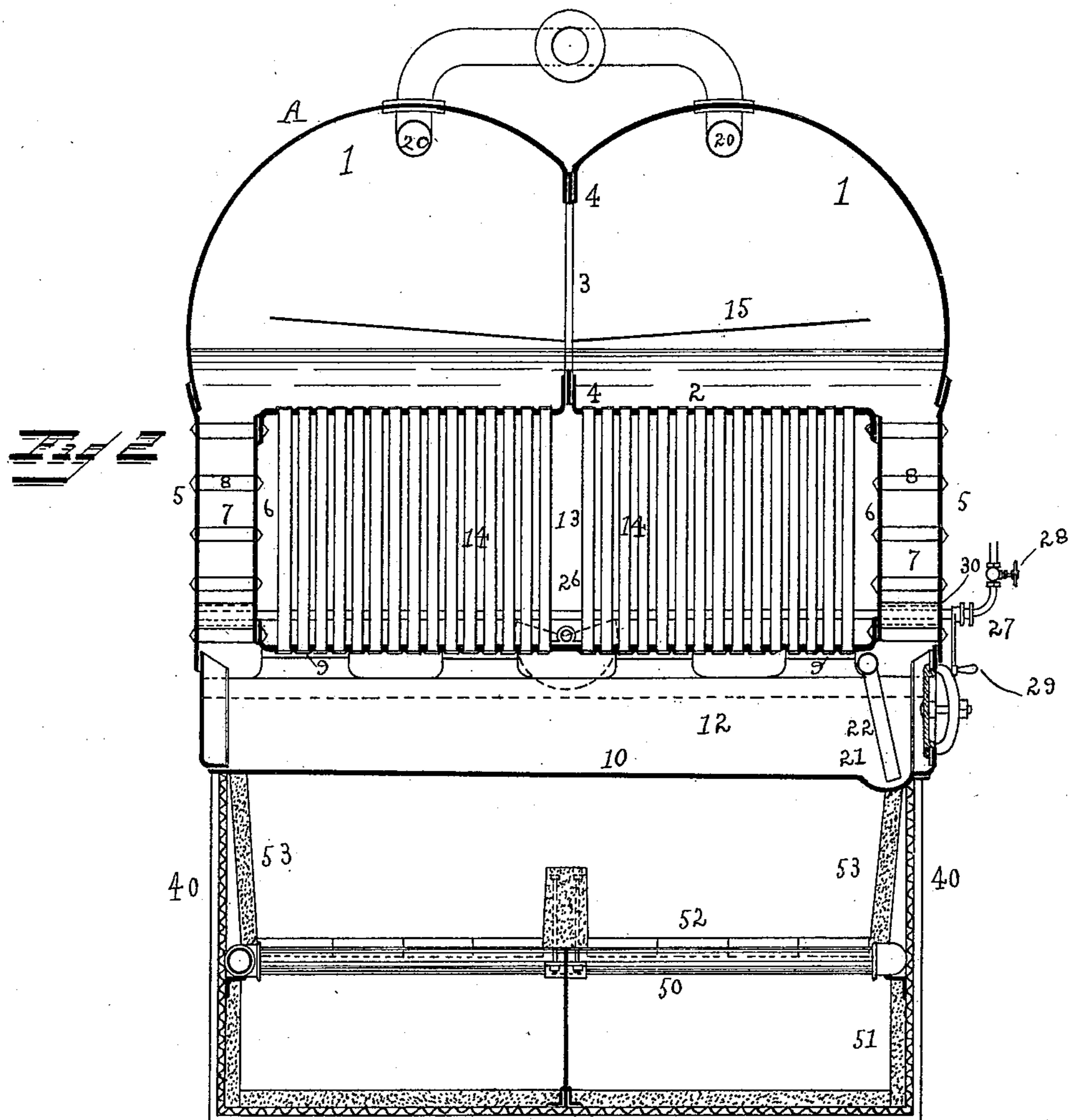
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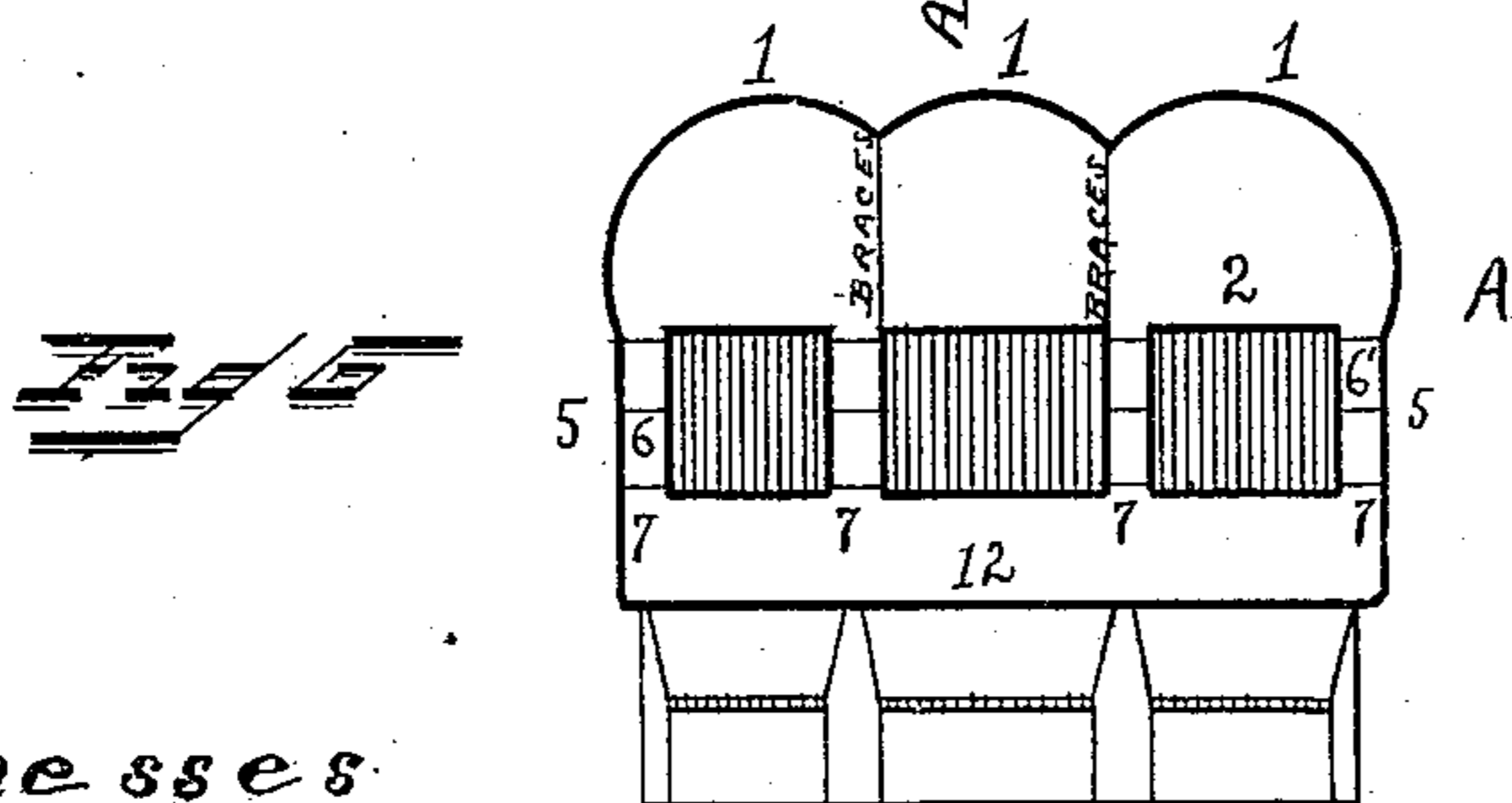
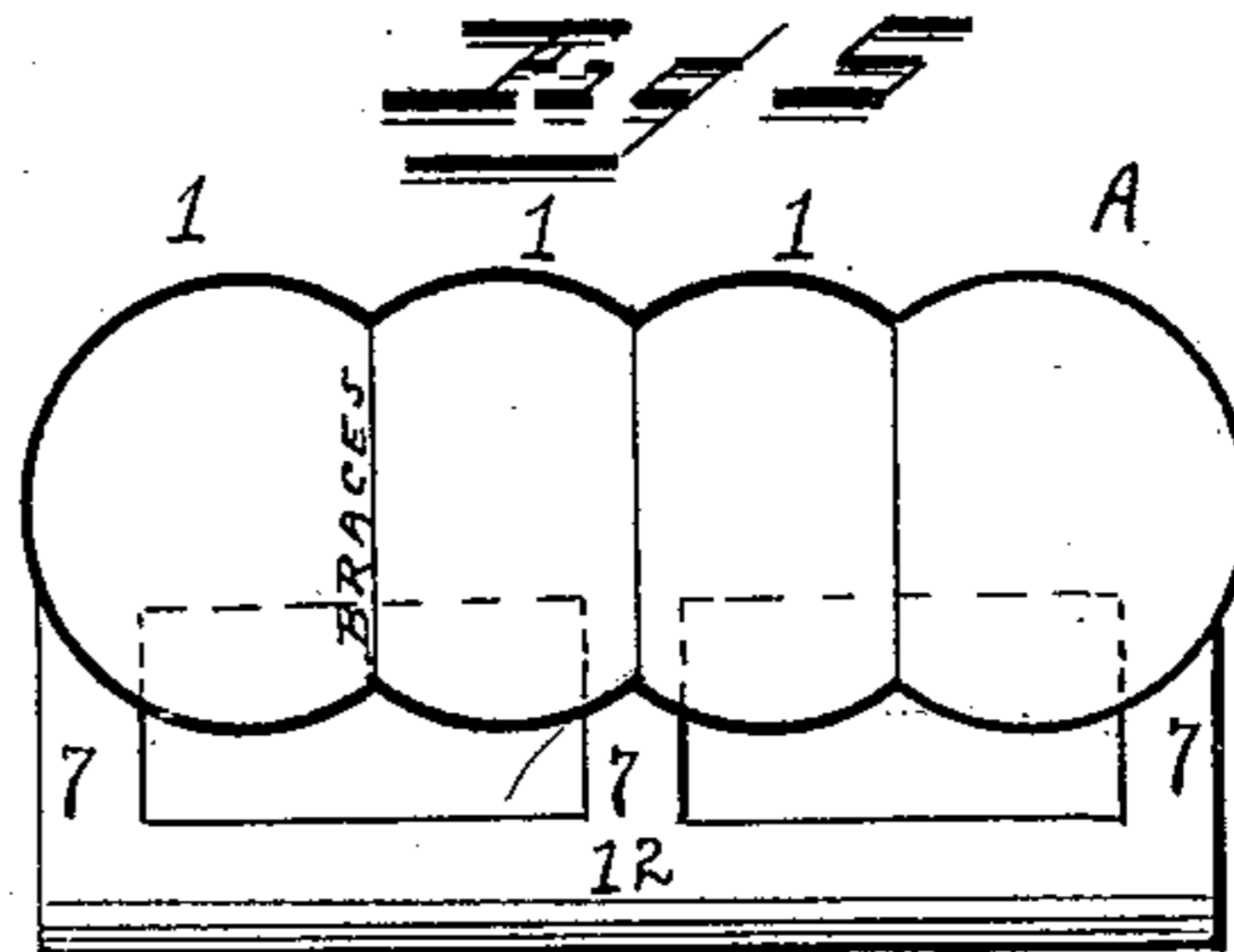
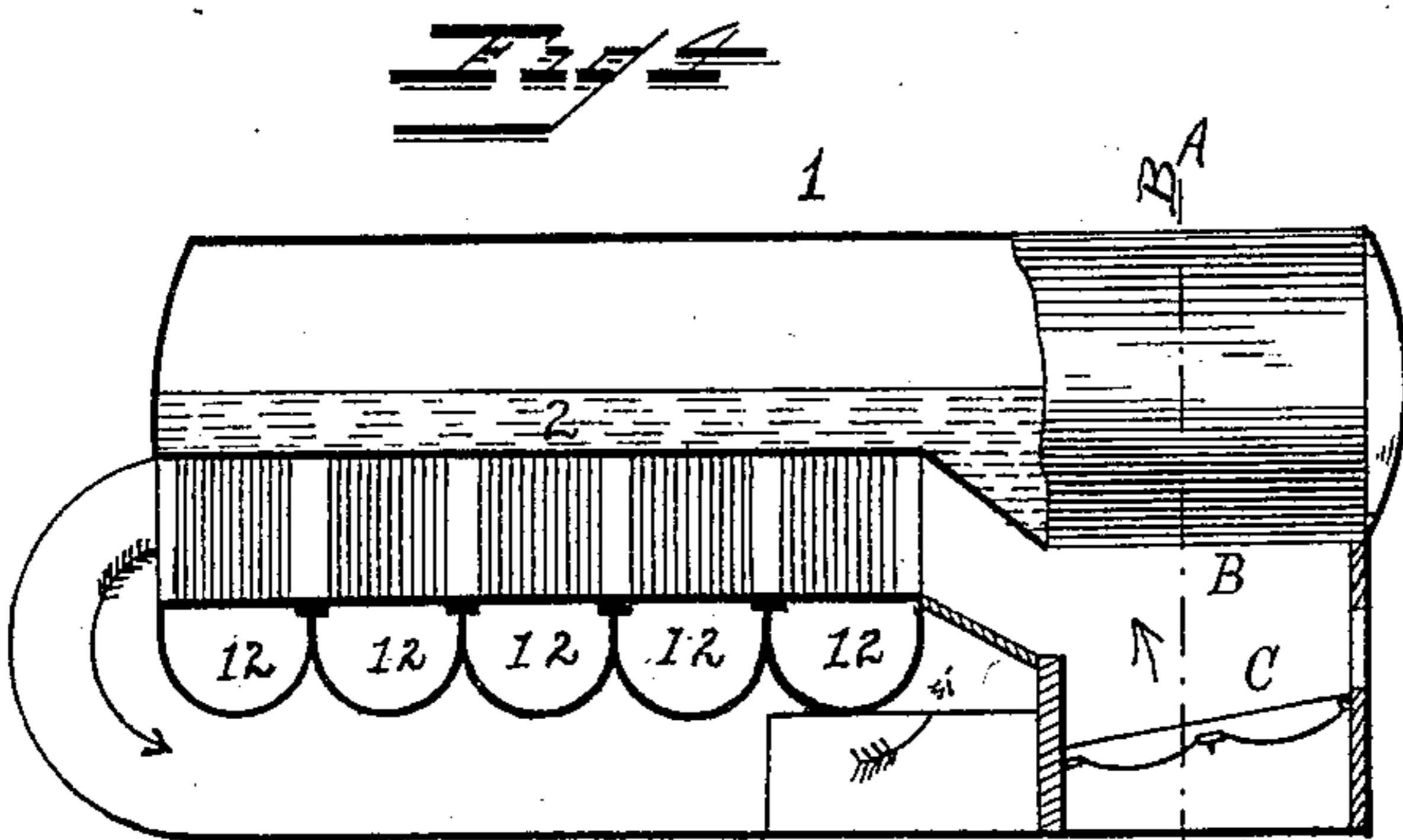
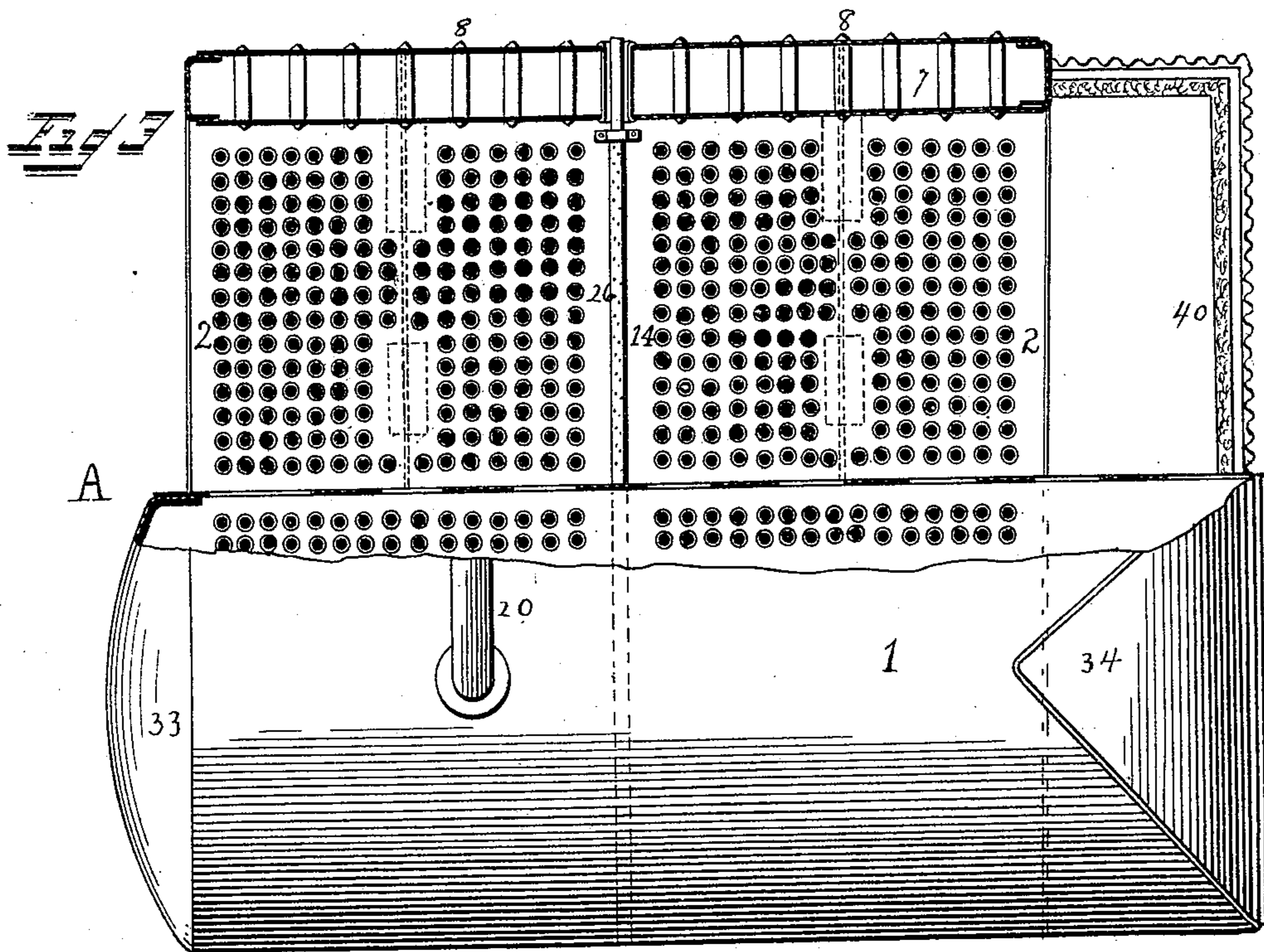
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3 Sheets—Sheet 3.

N. B. CLARK & F. B. KING.  
STEAM BOILER.

No. 404,825.

Patented June 11, 1889.



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# UNITED STATES PATENT OFFICE.

NATHAN B. CLARK, OF WASHINGTON, DISTRICT OF COLUMBIA, AND FRANK B. KING, OF BALTIMORE, MARYLAND.

## STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 404,825, dated June 11, 1889.

Application filed June 27, 1888. Serial No. 278,381. (No model.)

*To all whom it may concern:*

Be it known that we, NATHAN B. CLARK, of Washington, District of Columbia, and FRANK B. KING, of Baltimore, Maryland, have invented certain new and useful Improvements in Steam-Boilers, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to steam-boilers intended especially for floating structures, but in part capable of use for general purposes.

The object of the invention is to provide a compact boiler of light weight in which high steam-pressure may be carried and maintained with small consumption of fuel, and in which a large development of steam per square foot of grate-surface may be had by reason of rapid combustion caused by forced draft.

The invention consists in certain novel constructions, combinations, and details hereinafter explained, and in general related to our former patents of July 24, 1888, Nos. 386,526 and 386,527.

Figure 1 is a side elevation, partly in vertical longitudinal section, of a boiler illustrating the invention. Fig. 2 is a cross-section on line *x x*, Fig. 1. Fig. 3 is a plan, partly broken away to show the tube-sheet, tubes, downcast trunk, and casing at one side of the boiler. Fig. 4 is a partial longitudinal section and partial elevation of a slight modification designed for light-draft gunboats. Fig. 5 is sectional view of Fig. 4 on line A B. (The tubes not shown.) Fig. 6 is a similar view to Fig. 2 of a boiler having three longitudinal top arches and three tube-boxes. Fig. 7 is a broken plan view of water-grate.

The boiler-sections A consist of segmental portions 1, forming an arched shell. The shells are connected to flat tube-sheets 2 by a stay or stays, as by a perforated plate 3, which is riveted or otherwise secured to flanges 4 on the arched plates and tube-sheets. The arches 1 are also connected to side plates 5, which with inner plates 6 form the inclosing walls of a water leg or trunk 7. (See Fig. 2.) Where a number of segments are united there may be any desirable number of these water-trunks, which serve as downflow-pipes, the water tending down therein by reason of their large area and small heating-surface.

The plates 6 are tied to plates 5 by bolts 8, or in other usual manner, and firmly fastened to flanges on plate 2 and at the lower edge to a corresponding tube-plate 9. The lower edges of plates 5 are bolted, riveted, or otherwise secured to the heads of segmental water-shells 12 12. These segments 12 may run in a direction at right angles to the segments 1, and are held to tube-plate 9 by suitable fastenings, preferably by flanging and riveting to the tube-sheet. The boiler-shell then has the general appearance shown in the drawings, a number of segmental shells running lengthwise at the top, a number of similar shells at the bottom running lengthwise or crosswise, and approximately flat tube-plates forming the top and bottom of a space between said members, the side walls of said space forming water connections or trunks. These water-trunks and the flat faces of the segments inclose what may be called the "tube-box" of the boiler. The space between the tube-sheets 2 and 9 contains a large number of small water-tubes 14. These tubes are inserted from inside the top arches and the ends expanded to hold them in place.

A shield 15, extending out over the tubes and a little distance above the upper ends thereof, may be used to prevent priming. Steam-pipes 20 connect with the top of the steam-spaces in the arches 1. Each lower segment or shell 12 has a mud-cup 21, which is a depression in the walls of the shell. The tube 22 opens in proximity to the mouth of this cup. The tubes 14 are surrounded by flame and smoke and are liable to become foul. To clean them, we provide what may be called a "steam-brush," consisting of tubes 26, extending across the boiler and provided with frequent perforations. These tubes 26 rest in bearings and can rotate therein. The tubes have swiveled connection with pipes 27, which are controlled by valves 28. A handle 29 serves to rotate or oscillate each tube 26 on its axis. By turning handle or cranks 29 the tube 26 may rotate. A jet of steam, water, or air passing from pipes 27 through the pipes 26 and perforations will be thrown against the surface of tubes 14 to cleanse them, and the rotation of the pipes 26 will throw the jets in all directions.

One end 33 of arched section 1 may be spherical. The other end 34 may be a portion of an arch placed at a right angle to the arch 1 itself. Either arrangement obviates the use  
5 of braces to the end. By preference, the top member 1 overhangs the bottom members 12 12, to give free entrance to the gases between the tubes 14.

The door or deflector 38 and the deflecting-  
10 plate 39 form part of the trunk which leads the gases away from the boiler to the inter-changer.

There may be any number of top segments in combination with any number of inverted  
15 bottom segments disposed either parallel to or at right angles to each other, with any number of tube-chambers with intervening down-cast water-conduits; but if more than two bottom segments are used we prefer to run them  
20 at right angles, in order to secure unobstructed circulation of water.

In Fig. 1 the overhang B of the top segment is at the rear of the boiler and the furnace-grate C is at the front. The direction of the  
25 currents to and from the grate is indicated by arrows.

In Fig. 4 the overhang is at the grate end, and the direction of the currents is somewhat different.

30 It is evident that the same principle of construction can be applied to various numbers of contiguous segments.

A considerable variation in location, number, and direction of the tubular jets 26 may  
35 be allowed.

The tube 22, opening in the vicinity of the pocket 21, is to be used as a blow-off pipe for the boiler.

What we claim is—

40 1. A steam-boiler consisting, essentially, of a number of connected segments running longitudinally, a number of reversed segments running transversely thereof, and a series of water-tubes connecting these segments.

2. A steam-boiler consisting, essentially, of 45 a number of connected top segments running in one direction, a number of reversed bottom segments running in a direction at a right angle thereto, but of less width than the length of the top segments, and tubes connecting the 50 flat sides of the segments.

3. The combination, in a steam-boiler, of a water-tube box serving as a flue for the products of combustion, a pair of arched sections connected together at their edges, and a stay 55 connecting these edges to the tube-box, substantially as described.

4. The combination, in a boiler, of a series of top segments and a series of bottom segments connected therewith, as described, each 60 bottom segment having a depressed pocket, and a pipe extending into the interior of and opening inside the segment in proximity to the pocket.

5. The combination, in a steam-boiler, of a 65 series of water-tubes connecting the larger members and a movable perforated pipe extending between said tubes, said pipe having connections, substantially as described, whereby a jet of steam, air, or water may be con- 70 veyed to spaces between the tubes to clean the same, substantially as described.

6. The combination, with a boiler consisting of top section and bottom section and connecting-tubes, of a rotary perforated pipe 75 between said tubes, a connecting-pipe leading to the same, and a handle whereby said perforated pipe may be rotated, substantially as described.

In testimony whereof we affix our signatures 80 in presence of two witnesses.

NATHAN B. CLARK.  
FRANK B. KING.

Witnesses:

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JOHN R. FARNUM.