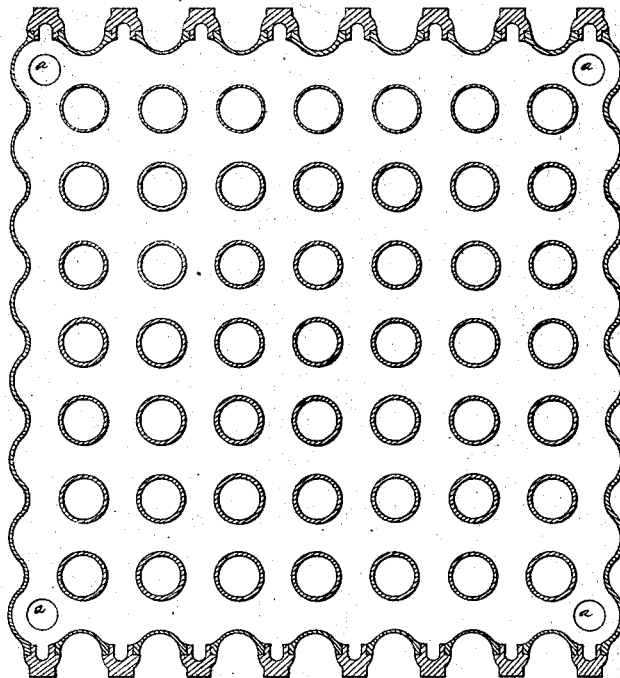


J. HARRISON, Jr.  
STEAM GENERATOR.

No. 49,263.

Patented Aug. 8, 1865.



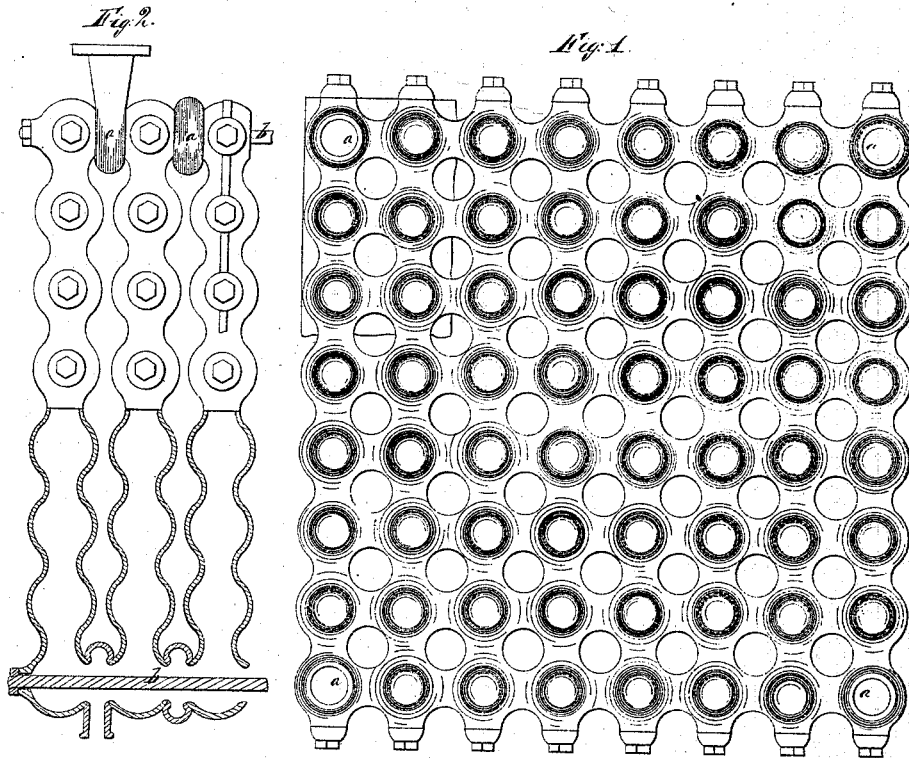
Witnesses:  
J. J. Boulton  
Wm. Harrison

Inventor:  
J. H. Harrison

J. HARRISON, Jr.  
STEAM GENERATOR.

No. 49,263.

Patented Aug. 8, 1865.



Witnesses:  
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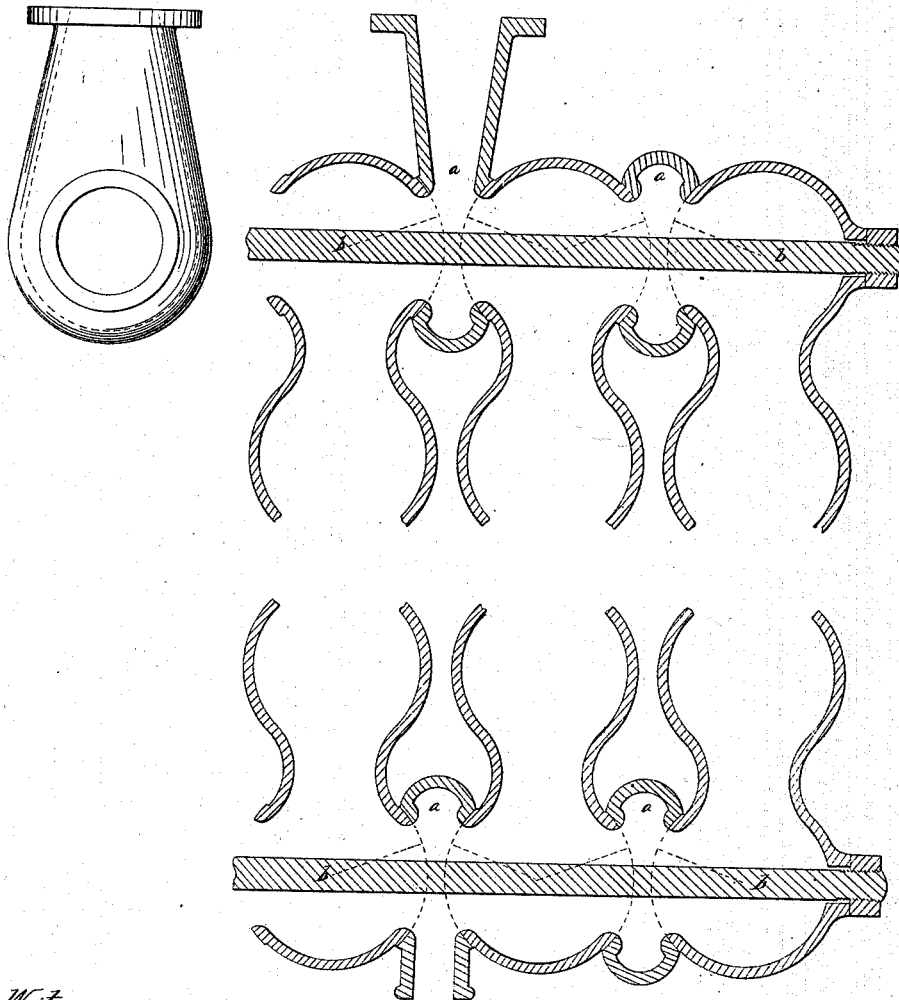
Inventor:  
J. C. Harrison

J. HARRISON, Jr.  
STEAM GENERATOR.

5 Sheets—Sheet 3.

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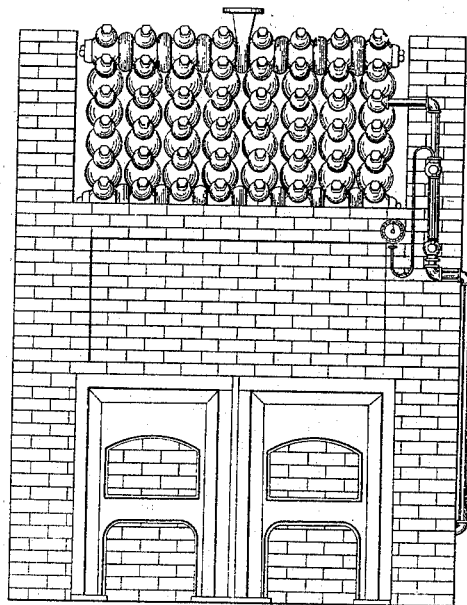
Witnesses:  
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Inventor:  
J. E. Harrison

J. HARRISON, Jr.  
STEAM GENERATOR.

No. 49,263.

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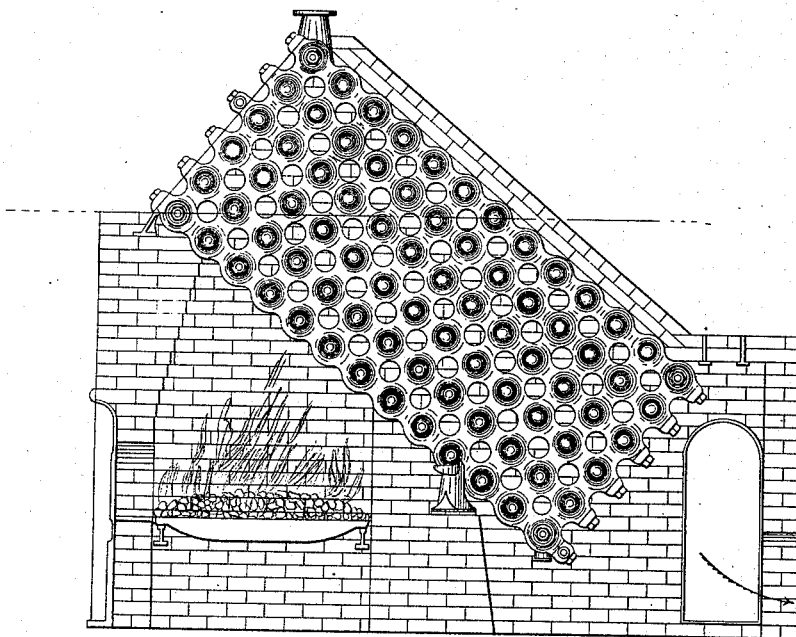
*Witnesses:*  
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*Sam. C. Harrison*

*Inventor:*  
*Joseph Harrison Jr.*

J. HARRISON, Jr.  
STEAM GENERATOR.

No. 49,263.

Patented Aug. 8, 1865.



Witnesses:  
Wm. D. Sullivan  
Jm. Harrison

Inventor:  
J. H. Harrison

# UNITED STATES PATENT OFFICE.

JOSEPH HARRISON, JR., OF PHILADELPHIA, PENNSYLVANIA.

## IMPROVEMENT IN STEAM-GENERATORS.

Specification forming part of Letters Patent No. 49,263, dated August 8, 1865.

### *To all whom it may concern:*

Be it known that I, JOSEPH HARRISON, Jr., of the city of Philadelphia and State of Pennsylvania, have invented a new and Improved Mode of Constructing Steam-Generators, with the object of making them more safe from explosion and more economical in first cost, in repairs, and in fuel consumed than those generally in use.

To enable others skilled in the art to make and use my invention, I do declare that the following is a full and exact description, to wit:

Referring to the drawings and specification of a patent granted to me from the United States Patent Office, dated October 4, 1859, upon which this is an improvement, I in that case take any number of spherical chambers or other analogous form cast in groups, connected by curved necks, their joints held together by tie rods or bolts. In the present instance I omit the tie rods and joints altogether or in part; and for the purpose of making what I call a "slab" or "section" of a boiler I ordinarily make the entire slab in one piece, either by casting or otherwise, as I may deem best.

Drawing No. 1 shows in section a slab or section of a boiler of sixty-four hollow spheres, each of about eight inches exterior diameter, and of any required thickness, made in a single piece. At both ends of the slab are openings closed by caps, as shown, these openings being needed in casting for supporting and venting the cores, and also for cleaning the boiler when in use. *a a a a* are transverse openings through the slab, hereinafter to be explained.

Drawing No. 2, Figure 1, shows the exterior form of a slab, of which Drawing No. 1 is a section cut through its plane, and shows also openings at *a a a a*, and caps closing the openings in the ends of the slabs, as in Drawing No. 1.

Drawing No. 2, Fig. 2, shows an end view of three slabs, part in section, and shows also the mode of connecting the slabs together for forming a steam-generator. Any number of these slabs may be set vertically edgewise beside each other, and in any required position as to their lengthwise direction. Between the slabs at one or more corners or at any other points

are to be placed the castings *a a a a*, against the openings described in Drawing No. 1 and in Drawing No. 2, Fig. 1. These castings are fitted to the slabs so that when drawn together by the bolts *b b* the joints become tight and the intervened castings form a steam-connection at or near the top and a water-connection at or near the bottom of the series of slabs, and can be also used for other water and steam attachments by branches that may be affixed.

In practice, rigidity is found objectionable in the cross-connections for water and steam between the slabs, for the reason that unequal expansion of the different parts tends to impair the tightness of the joints when rigid.

By reference to Drawing No. 3, which is made about one-half the working size, it will be seen that the joints on the slabs and intermediate pieces *a a a* have a curved or spherical line struck with radii that proceed from *b b*, the centers of the spheres, by means of which a slight variation in the slabs resulting from unequal expansion is accommodated, for, although there may occur some movement of the surfaces at the joints, they would still remain tight.

For stationary purposes I prefer setting my improved boiler in brick-work, in a manner adapted to its peculiar form, but in combining the above-described slabs or series of spheres into forms suitable for marine or locomotive purposes I propose, for the exterior slabs, to close up the spaces between the spheres and around the margins by means of thin webs cast on the slabs by proper joinings at the edges of these webs on the slabs to form tight metal walls at the outside of any combination of slabs, dispensing thereby in part or altogether with the use of a brick covering.

On Drawing No. 2, Figs. 1 and 2, is shown in red lines and color the mode of arranging these webs.

Drawings Nos. 4 and 5 show side and end views of ordinary mode of setting my improved boiler, in which it will be seen that the interior of the spheres and their connecting-necks are filled with water up to the water-line, while that portion of the spheres above the water-line in each slab constitutes the steam-chamber, the slabs being connected, as above explained, by water and steam communications

common to the whole series combined into one boiler. The gases from the fire ascend into the spaces between the spheres, circulating through them, and in part giving heat to the upper spheres, thereby superheating the steam contained therein, and, that the largest amount of water surface may be brought into contact with the heat generated in the furnace, the gases before entering the chimney are made to pass out of the slabs at their lowest point, as shown by the arrow at the outlet in Drawing No. 5.

In putting the slabs together to form a steam-generator, I intend to combine them in such manner and to strengthen them by such means as may best suit the peculiar circumstances of the case, whether made up into a compact mass or in chambers or flues forming in their combination an efficient steam-generator.

Should single slabs be required containing a greater number of spheres than can be cast or handled with facility in one piece, then I propose to make such slabs in parts as large as may be most convenient, the parts to be formed into entire slabs by means of joints and bolts, as described in the specification of patent granted to me by the United States October

4, 1859, or other devices, as may be best suited to the purpose.

What I claim as new in the above specification is—

1. The manufacture of the slabs of my steam-generator in sections, cast or formed of one or more pieces, omitting wholly or in part the tie rods or bolts and the joints described in specification of patent granted to me from the United States Patent Office October 4, 1859.

2. The manner of making the cross-connections at one or more corners or other points of the slabs for water and steam, by the use of intermediate castings having spherical or curved surfaces at the joints, in the mode and for the object set forth, or in any other manner substantially the same for accomplishing the like purpose.

3. The manner of combining the thin web with the spheres, as described, for the purpose of making a tight wall or casing for boilers, in the setting of which it is desired wholly or in part to dispense with brick-work.

JOSEPH HARRISON, JR.

Witnesses:

SAML. HARRISON,  
I. WALTER MURPHEY.