J. HARRIS.

Sectional Steam-Boilers.

No. 135,910. Patented Feb. 18, 1873.

Fig. 2.

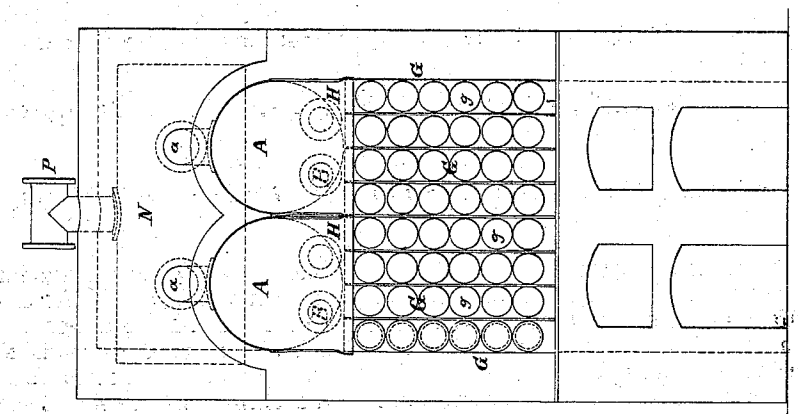


Fig. 1.

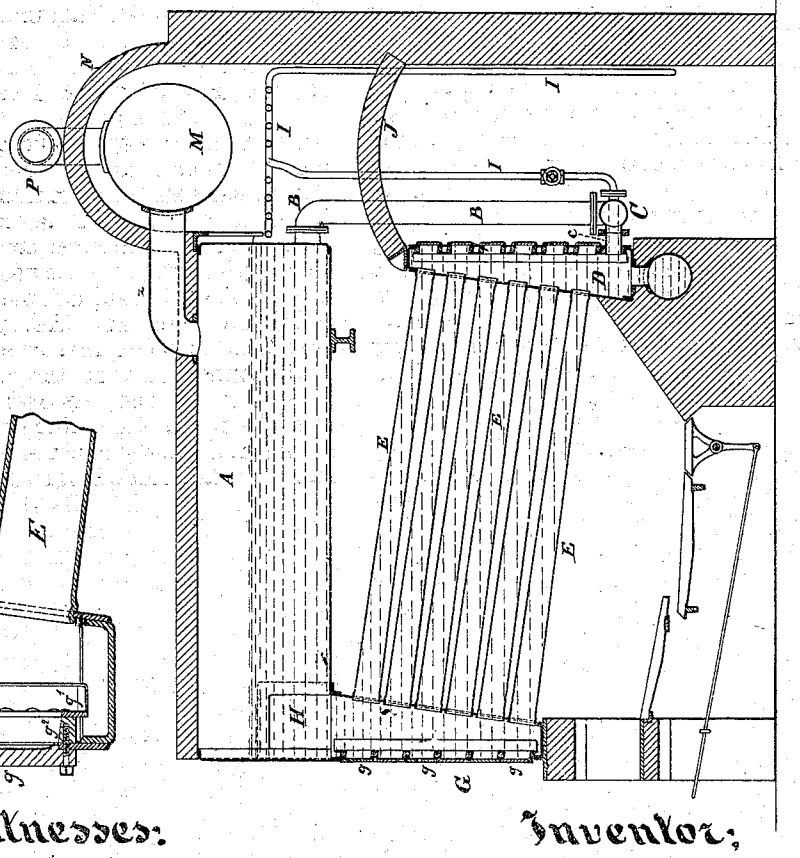
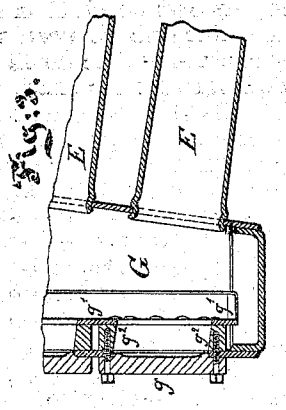


Fig. 3.



Witnesses:

Arnold Hörnemann

Wm. C. Dey

Inventor:

John Harris

by his Attorney F. D. Stetson

UNITED STATES PATENT OFFICE.

JOHN HARRIS, OF BALTIMORE, MARYLAND.

IMPROVEMENT IN SECTIONAL STEAM-BOILERS.

Specification forming part of Letters Patent No. **135,910**, dated February 18, 1873.

To all whom it may concern:

Be it known that I, JOHN HARRIS, of Baltimore, Maryland, have invented certain Improvements relating to Steam-Boilers, of which the following is a specification:

It is an improvement in the construction of that class of boilers in which the steam is mainly generated in nearly horizontal tubes, through which the water moves, being delivered at the raised end mingled with steam, which separates from the water in a return-chamber, above which it is less directly exposed to the heat.

Many styles of such boilers have been heretofore constructed, but in none has the same provision been made for the increased volume of the current of water when it is heated and changed into steam. I provide in my invention an area nearly corresponding with the volume at each point, so that the motion through the tubes and connections shall be nowhere too violent, nor again be anywhere too sluggish. My boiler nowhere involves any great excess of weight of water or of metal above that required to supply the circulation and allow a proper resting place in which the mud may deposit itself at the lowest point.

The following is a description of what I consider the best means of carrying out the invention. The accompanying drawing forms a part of this specification.

Figure 1 is a longitudinal section, and Fig. 2 is a front elevation. Fig. 3 is a longitudinal section of a portion at the front on a larger scale.

Similar letters of reference indicate like parts in all the figures.

A A are cylindrical vessels, of boiler-iron or other suitable material, in which the steam is allowed to separate from the water. B B are pipes through which the water is allowed to descend into a cross-pipe or chamber, C, from whence it is delivered by a series of short connections, *c*, into peculiarly-formed back connections D, which extend up and down, being fixed at their bases and narrowing toward their upper ends, as represented. The water rises in these back connections and is discharged into the tubes, so that the volume rising in the back connections grows less as it rises, and near the top becomes very small. Thus the wedge-shaped form of the back connections D is exactly adapted to accommodate the current and make it nearly uniform at all points. E E are the nearly horizontal tubes. They are formed tapering, the ends joined to the back connections D being smallest, and the opposite and higher ends being largest. The increase in cross-sectional area allows for the increase of volume due to the generation of steam on the passage. The water enters at the lower end of each tube in a highly-heated condition, but without any considerable quantity of steam mingled therewith. It emerges at the higher ends profusely filled with particles of steam, the presence of which greatly increases the volume of the mixture. G G are the front connections. They extend up and down, being also wedge-shaped, but with the widest end uppermost. The mixture of water and steam delivered into the front connections rises therein. The lower portion receives only the current from the lowest tubes. As the current rises it is augmented by the accession from each tube, and the upward current is consequently much greater near the top of the front connection, and the volume altogether, in any given front connection G, is greater than in the corresponding back connection D, so that the front connection is, and should be, larger at its middle height than the back connection at its middle height. The front face of each front connection G is provided with hand-holes or covers, marked *g*, which are in line with the tubes. I prefer to make the hand-holes of such size as to not only allow the introduction of an expanding tool to set the front ends of the corresponding tube, but also large enough to allow the insertion of a new tube when it shall be necessary. I re-enforce the front side of the front connections G by providing a double thickness, held a little distance apart by thimbles and bolts or rivets. The interior plate or thickness is represented by g^1, and the rivets and thimbles by g^2. The thickness of the outstanding plate, and also of the inside plate g^1, may be made as great as is necessary, and by means of the two thus mounted and connected I produce a strongly-trussed construction, which allows my front to bear a high pressure of steam even without staying. I provide for a free circulation of the water through the space between the true front and the internal front g^1. The

upper end of each front connection G is fitted tightly to a saddle-piece, H. Each of these latter pieces embraces the lower half of the front end of a corresponding separating-chamber, and affords a free opening in which the large volume of mingled water and steam rising in the front connections G may pass freely into and commence to flow backward in the interior of the separating-chamber. The interiors of the saddles H, and the interiors of all the other parts, may be braced and stayed in any approved manner to insure strength.

The steam separated in the chamber A rises through the steam-connection *a* into the drum M, which extends across the back ends of the several separating-chambers, and is immersed in the partially-cooled gases rising from the furnace. It is covered at a little distance by an arch of brick, N, and the steam is thoroughly dried in this drum, and rises through the discharge-pipe P in a proper condition for use for power or for other purposes.

The wedge-shaped front connections G and back connections D may be of such width as to each receive all the tubes which correspond to a separating-chamber, A; or they may be of less width, so as to divide the tubes into sections, as shown. There are advantages and disadvantages in each plan. I incline to prefer the exact construction shown.

The feed-water may be supplied directly into almost any convenient point in the boiler, either with or without previous heating by steam or hot gases. I prefer to heat it by steam, in any ordinary or suitable manner, and then to further heat it by exposure to hot gases before presenting it to the boiler.

I represents my feed-pipe bringing water from a pump, not shown, and coiled around to expose a large surface to the active current of hot products of combustion in the uptake or chimney below the drum M. After being well heated there, and, under some conditions, a portion changed into steam, the water, or mingled water and steam, flows down into the connection C and mingles with the currents in the interior of the boiler.

J is an arch of brick, which excludes the gaseous products of combustion from the back face of the back connection D, and from the pipes and other parts adjacent.

I provide hand-holes and covers on the back face of the back connection, and re-enforce that face to increase its strength in the same manner as has been described for the front face of the front connection, but it is not as necessary, because the hand-holes need not occupy so large a proportion of the whole area.

If it be found too expensive to produce the tapering tubes described, either generally or in any particular instance, I propose to use common cylindrical tubes to stand in the places and perform as well as may be the functions of the tubes E. In such case, only the other parts will allow the gradual increase of area of passage, as the generation of steam and the increase of currents require it.

I claim as my invention—

1. The wedge-shaped front connections G and back connections D, in combination with suitable nearly horizontal tubes E and separating-chambers, and means for allowing a continuous current through the combined parts, the whole constituting a boiler providing for the changes of bulk of fluid at the different points in the circuit, as herein specified.

2. The saddle-formed connecting part H, in combination with the chamber A, front connection G, and suitable tubes and back-connecting parts, as herein set forth.

In testimony whereof I have hereunto set my hand this 23d day of December, 1872, in the presence of two subscribing witnesses.

JOHN HARRIS.

Witnesses:

WM. C. DEY,

ARNOLD HÖRMANN.