2 Sheets—Sheet 1.

C. D. SMITH.

STEAM BOILER.

No. 190,093. Patented April 24, 1877.

Fig. 1.

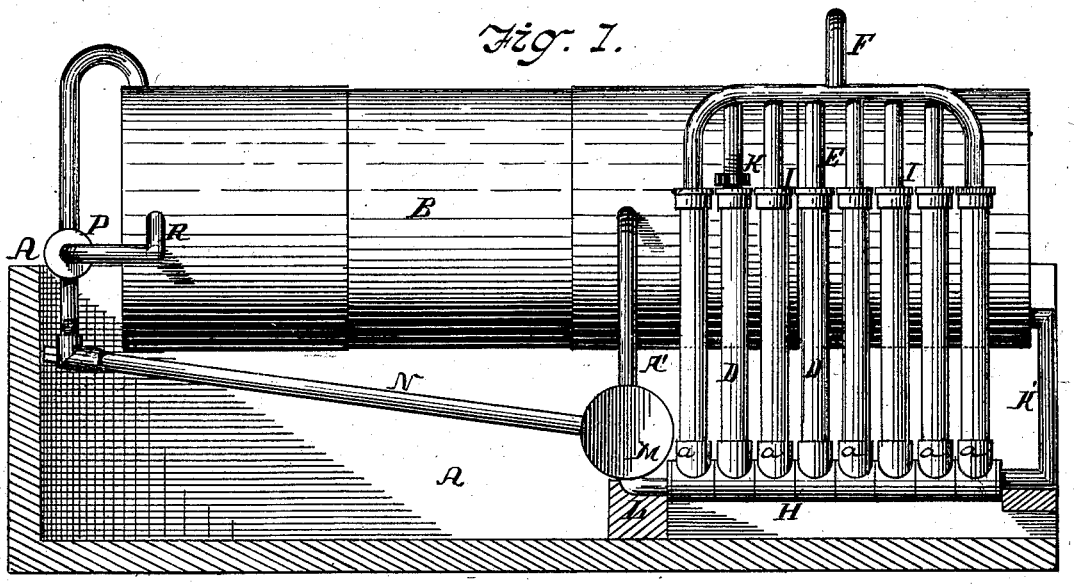
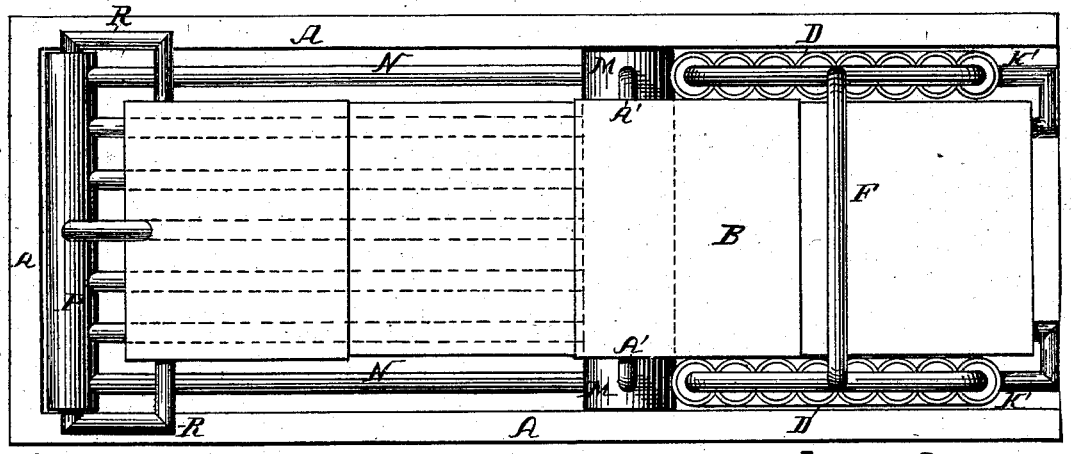


Fig. 2.



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2 Sheets—Sheet 2.

C. D. SMITH.

STEAM BOILER.

No. 190,093. Patented April 24, 1877.

Fig. 3.

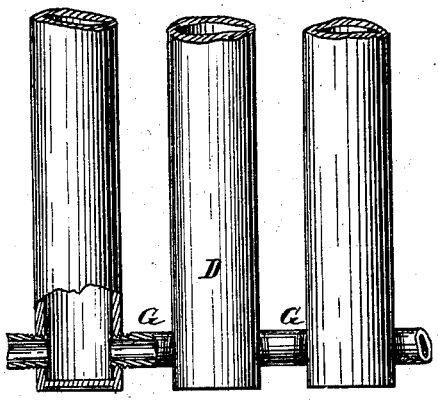


Fig. 4.

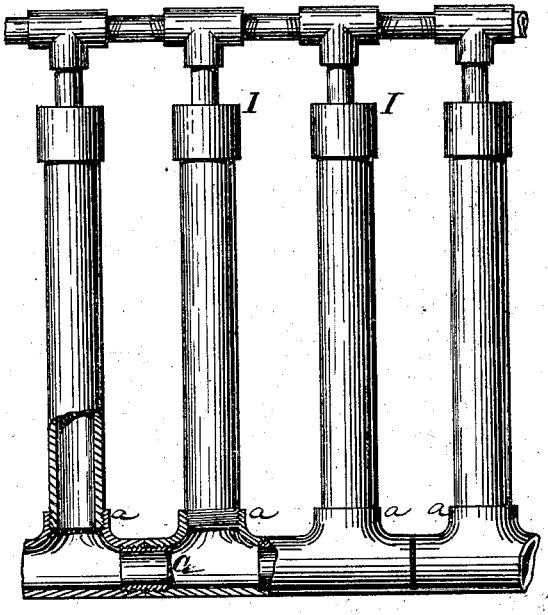


Fig. 5.

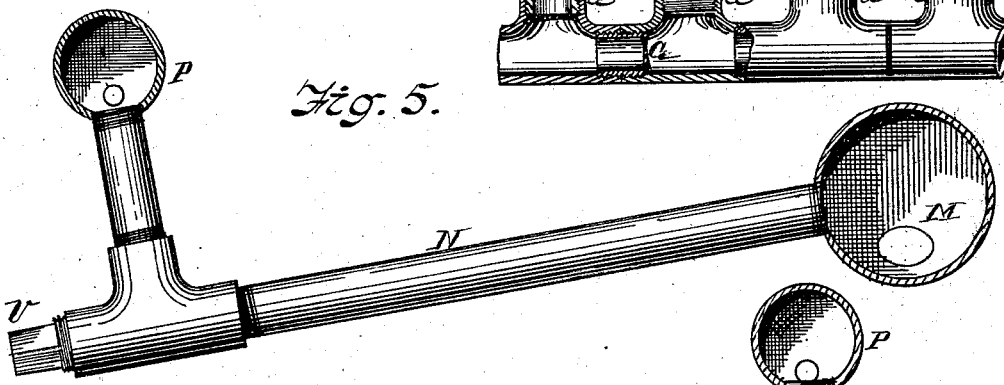
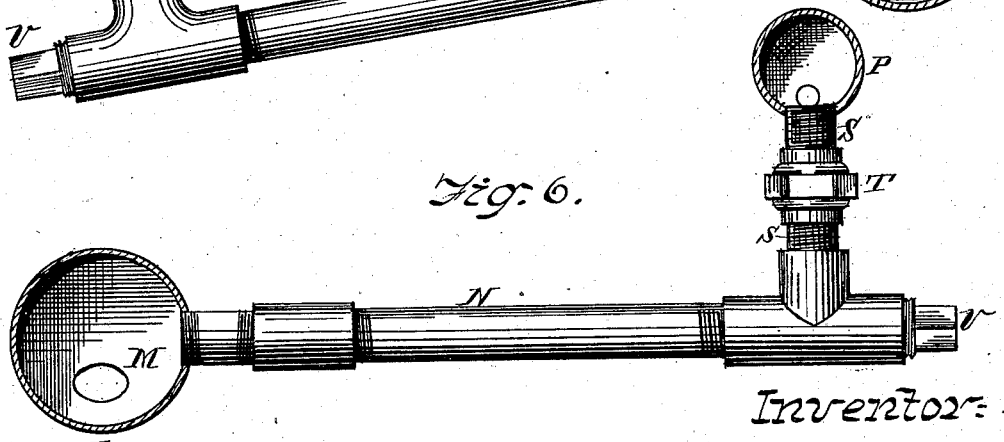


Fig. 6.



Witnesses:

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Inventor:

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UNITED STATES PATENT OFFICE.

CHARLES D. SMITH, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN STEAM-BOILERS.

Specification forming part of Letters Patent No. **190,093**, dated April 24, 1877; application filed December 12, 1876.

To all whom it may concern:

Be it known that I, CHARLES D. SMITH, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Furnaces for Steam-Boilers, of which the following is a specification:

This invention relates to certain improvements in the construction of steam-boilers, and the furnaces for the same, its object being to utilize the heat of the fire-box to the greatest possible extent, in order to economize fuel.

This I accomplish by means of a heater, or series of heaters, consisting of a series of columns and tubes, which form the interior walls of the furnace, thus saving and utilizing the heat usually carried off and wasted by said lining.

My invention consists of a novel combination of parts, the construction and arrangement of which will be fully hereinafter described, a preliminary explanation being, therefore, deemed unnecessary.

In the drawing, Figure 1 is a longitudinal vertical section through the brick-work of the furnace, showing the boiler and heating devices in elevation. Fig. 2 is a view of the apparatus with the top removed, showing the boiler and heaters. Fig. 3 represents a detached view of one of the side heaters, showing a method of connecting the columns together. Fig. 4 represents a detached view of a modification of the side columns and method of securing the same together. Fig. 5 represents a detached view of one of the pipes, to which the fire-bridge and steam-drum are secured together; and Fig. 6, a similar view of modifications thereof.

In the drawing, the letter A represents the outer walls of the furnace, which may be constructed of brick-work or other material, in the usual manner. The letter B represents the boiler, which may be of any approved construction, in the present instance consisting of the horizontal cylindrical pattern. The letter D represents the side heaters, consisting of a series of upright hollow columns connected together at the bottom, and communicating at the top by means of a series of tubes, E, with a tube, F, leading into the upper part or crown of the boiler. Said columns may be connected at the bottoms by means of short horizontal nipples G, as indicated in Fig. 3, or by means of a series of T-sections, secured by similar connecting-nipples G, as shown in Fig. 4, but are preferably connected together by means of a hollow horizontal section or manifold, H, provided with a series of vertical branches, *a*, at suitable intervals, which are tapped for the insertion of the columns, the same being secured therein in any convenient manner. The tubes E are secured within the upper sides of the columns by means of the caps I, secured to the extremities of said columns by means of screw-threads, or otherwise. Said caps are provided with screw-threaded apertures, in which the ends of said tubes E are secured, the same being screw-threaded for the purpose, in order that they may be properly adjusted therein. The letter *k* represents a series of lock-nuts secured to the screw-threaded ends of the pipes E above the caps I, for the purpose of confining a packing around the pipe to prevent the escape of steam. The letters *k'* represent pipes leading from each manifold to the lower part of the boiler, to provide for the circulation of the water when the feed-pumps are not in operation. The heaters D are located at each side of the furnace in the fire-box, and communicate by means of the pipes L with a hollow cylindrical fire-bridge, M, located at the back of the grate-bars of the furnace, in the usual position. From said fire-bridge extend, in an upwardly-inclined direction toward the rear of the furnace, a series of tubes, N, which communicate with a manifold, P, at the rear of the boiler, which, in turn, communicates with the boiler by means of the pipes R at each end. The tubes N may be connected permanently with the said drum, as shown in Figs. 1 and 2, but are preferably formed with a vertical branch, S, constructed in two sections, provided with right and left screw-threads, and connected by means of a coupling-joint, T, so that they can be detached when required, for the purpose of cleaning or removing sediment from the drum and tubes. The said tubes N may also be provided with removable plugs V at their rear ends, as shown in Figs. 5 and 6, by means of which an instrument may be inserted for cleaning.

The fire-bridge also communicates directly with the steam-boiler at each end by means of the pipes A′, for the purpose of maintaining complete circulation of the water through the boiler and heater, and is provided with pipes at each end, communicating with the feed-water pumps, through which said feed-water is pumped into the heater and boiler.

The operation of my invention will be readily understood from the foregoing description. It will be perceived that the columns and tubes of the heater take the place of the brick or tubular lining of the furnace, as ordinarily constructed, and as a circulation of water is kept up constantly through said tubes and the boiler, much of the effective heat that was previously absorbed and carried off by said bricks is saved and utilized, resulting in the greatest economy of fuel.

My furnace as thus constructed possesses many advantages over previous furnaces of this class, owing to the peculiar method of securing the parts together, and connecting the same with the boiler, rendering the apparatus much more compact and durable and effective in operation.

What I claim, and desire to secure by Letters Patent, is—

1. The horizontal manifold H, having projections *a* and vertical columns D, in combination with the drum *m*, manifold P, connected with the drum, and pipes R and K′, connecting the manifolds P and H with the top and bottom of the boiler, whereby a circulation of the water is maintained through said manifolds and drum, substantially as and for the purpose described.

2. The combination, with the drum M and manifold P at the rear of the boiler, of pipes N, connecting said drum and manifold together, the said manifold communicating with the steam-space of the boiler, substantially as described.

3. The combination of the fire-bridge wall and drum M, the manifold H, vertical columns D, pipe L, connecting the bridge-wall and manifold, and pipe A′, connecting the bridge-wall and boiler, substantially as described.

In testimony that I claim the foregoing I have hereunto set my hand in the presence of the subscribing witnesses.

C. D. SMITH.

Witnesses:
JAMES L. NORRIS,
ALBERT H. NORRIS.