2 Sheets—Sheet 1

C. D. SMITH.

Steam-Boiler Furnace.

No. 208,209. Patented Sept. 17, 1878.

Fig. 1.

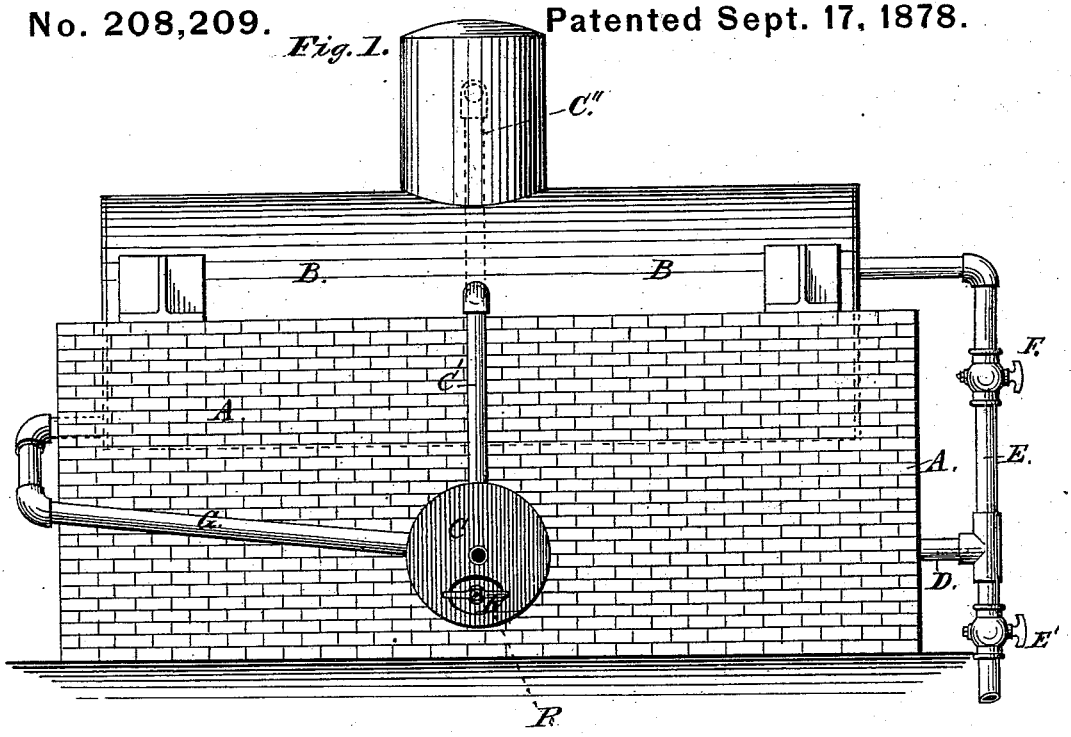
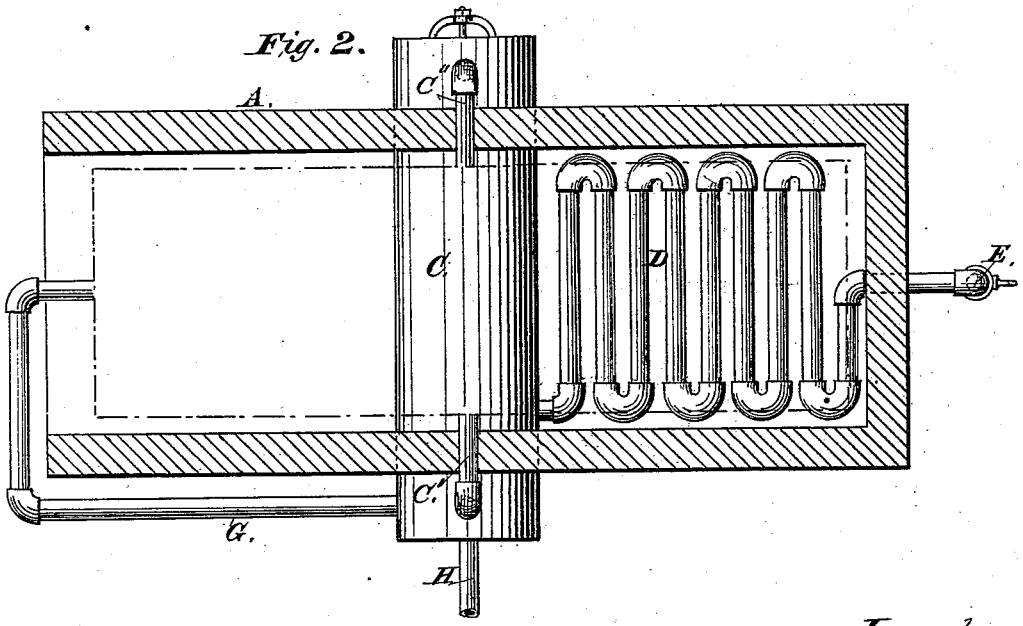


Fig. 2.



Witnesses:
W. Beale Hale.
J. A. Rutherford.

Inventor:
Charles D. Smith.
By James L. Norris,
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2 Sheets—Sheet 2.

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Steam-Boiler Furnace.

No. 208,209. Patented Sept. 17, 1878.

Fig. 3.

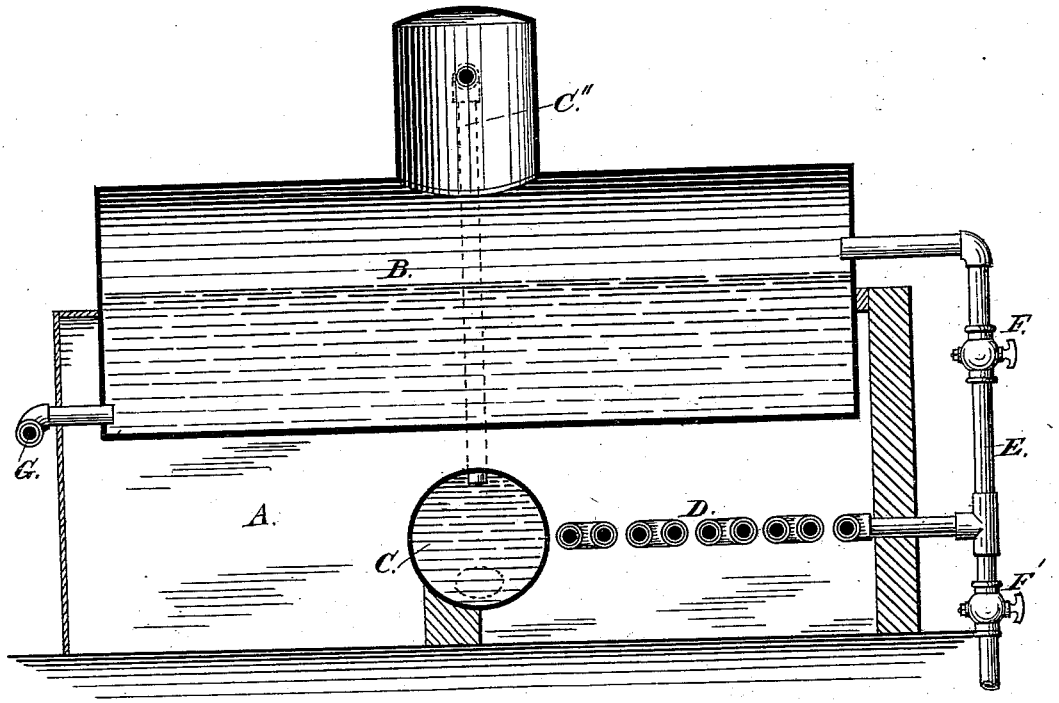
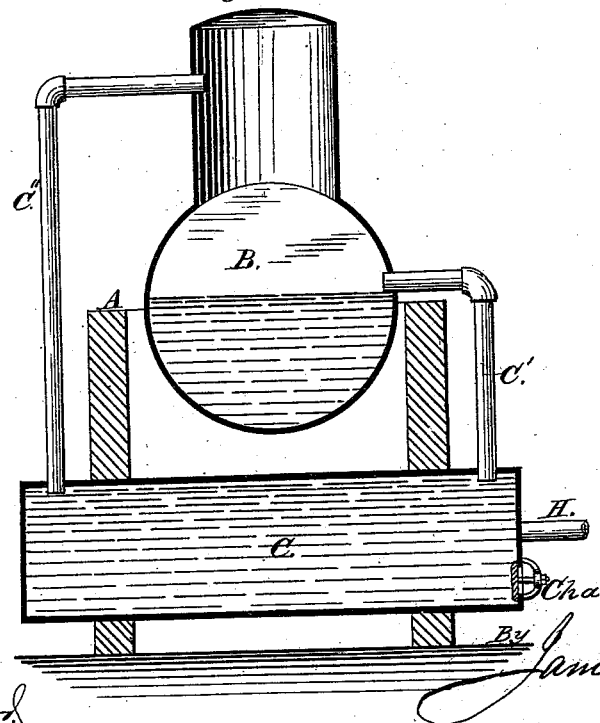


Fig. 4.



Witnesses:
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Inventor:
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By James L. Norris.
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UNITED STATES PATENT OFFICE.

CHARLES D. SMITH, OF NEW YORK, N. Y.

IMPROVEMENT IN STEAM-BOILER FURNACES.

Specification forming part of Letters Patent No. **208,209**, dated September 17, 1878; application filed September 2, 1878.

To all whom it may concern:

Be it known that I, CHARLES D. SMITH, of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Steam-Boiler Furnaces, of which the following is a specification:

This invention relates to certain improvements in steam-boiler furnaces, its object being to utilize the waste heat of the furnace for heating the feed-water, and to increase the capacity of the boiler and remove scale or sediment therefrom.

To this end my invention consists of a coil of pipe, located at the rear of the bridge-wall of the furnace, extending from side to side of the furnace in a line parallel with the bridge-wall, and connected with the bridge-wall at one end and with the upper part of the boiler at the other, the bridge-wall consisting of a hollow chamber, into which the feed-water is admitted, and communicating directly with the upper and lower parts of the boiler by means of suitable pipes, whereby the feed-water is heated previous to its entrance to the boiler, and a constant current of water is automatically circulated through the boiler and heating-coil, as more fully hereinafter described.

In the drawing, Figure 1 represents a side elevation of my invention. Fig. 2 represents a top view of the furnace with the boiler removed, showing the bridge-wall, the coil at the rear of the same, and the pipes which connect said bridge-wall and coil with the boiler. Fig. 3 represents a longitudinal vertical section through the furnace, bridge-wall, boiler, and coil of pipes; and Fig. 4 represents a transverse vertical section on the line *x x* of Fig. 3.

The letter A represents the furnace, constructed of brick-work or other suitable material, in the ordinary manner, and B an ordinary horizontal cylindrical boiler, set in the furnace as usual. The letter C represents a drum, consisting, preferably, of a cylindrical metallic chamber of sufficient strength to withstand the full pressure of steam within the boiler, and resting upon the bridge-wall. Said drum extends transversely across the furnace directly at the rear of the fire-box.

The letter D represents the heating-coil, located at the rear of the bridge-wall in the combustion-chamber of the furnace. Said coil consists of a series of pipes traversing back and forth transversely across the combustion-chamber, one end of said coil being connected to the upper part or steam-space of the boiler by means of a vertical pipe, E, at the rear of the furnace, which is provided with a suitable valve, F, by means of which the flow of the steam may be shut off when the coil *d* is to be blown out for the removal of sediment which may have collected in the same, the valve L being opened to permit the discharge. The said pipe extends downwardly, and is provided with a valve, E′, in order that it may serve as a blow-off to discharge scale and sediment from the boiler through the drum and heating-coil when desired.

The drum is connected with the boiler by means of a pipe, C^1, on one side, and with the steam-dome by means of a pipe, C^2, on the other side. It is also connected with the lower part of the boiler by means of a pipe, G, extending along one side of the furnace to the front of the boiler, where it enters the same.

The letter H represents the feed-water induction-pipe, which enters the feed-water heater at either side, and R a hand-hole for cleaning the drum.

The heating-coil before mentioned may be formed of one continuous pipe, bent back and forth at proper intervals, or it may be constructed of a series of short pipes joined together by return-bends or elbows, or it may be cast in sections and the whole joined together by flanges and bolts, or by any suitable coupling.

The operation of my invention is as follows: The heated products of combustion pass over the bridge-wall, traversing the combustion-chamber at the rear of the same, circulating freely around the coil located therein, heating the water in the drum and coil, thus utilizing the heat, which would otherwise be absorbed by the brick-work and lost. The steam generated in the coil escapes through the pipe at the rear into the steam-space of the boiler, while its place is supplied with water from the drum, which receives its water from the boiler by means of the pipes extending from the

front of the boiler and the short vertical pipe extending from the side of the boiler. The steam generated in the drum escapes into the steam-dome through the pipe on one side leading from the drum into said steam-dome.

It will be perceived that as thus constructed increased boiler capacity is obtained, and the heat usually absorbed by the walls and wasted is utilized. Moreover, by conducting the water in the heating-coil from the drum into the rear of the furnace overheating of the coil will be effectually prevented, as the drum serves as a reservoir, which constantly supplies the pipes with water at their hottest portions instead of at their coolest portions, as has heretofore been practiced.

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

1. In combination with a steam-boiler, a circulating coil of pipe, located at the rear of the bridge-wall, extending back and forth transversely in the combustion-chamber at the rear of said bridge-wall, and connected with the drum at one end and with the boiler at the other, substantially as specified.

2. In combination with the drum and transversely-circulating coil, the pipes connecting said drum and circulating-coil with the boiler, arranged substantially as specified.

3. In combination with a steam-boiler, a circulating coil of pipe, located at the rear of the bridge-wall, traversing back and forth transversely in lines parallel with the bridge-wall, whereby the respective bends of the coil are carried directly across the path of the escaping gases and caused to effectually absorb the heat of the same, for the purposes specified.

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

CHAS. D. SMITH.

Witnesses:
EDMUND H. MARTINE,
GEO. MCLEAN.