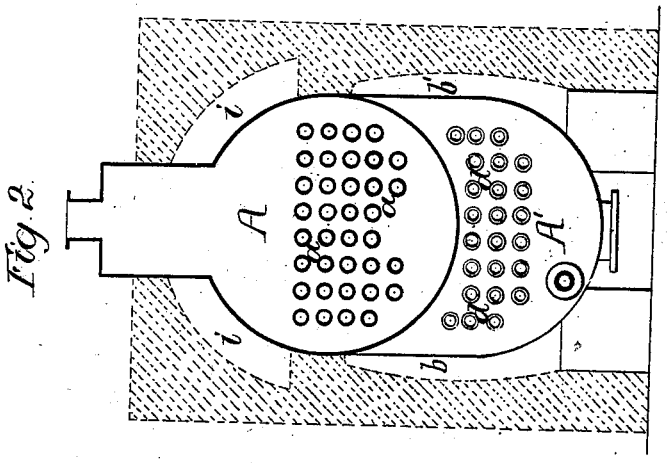
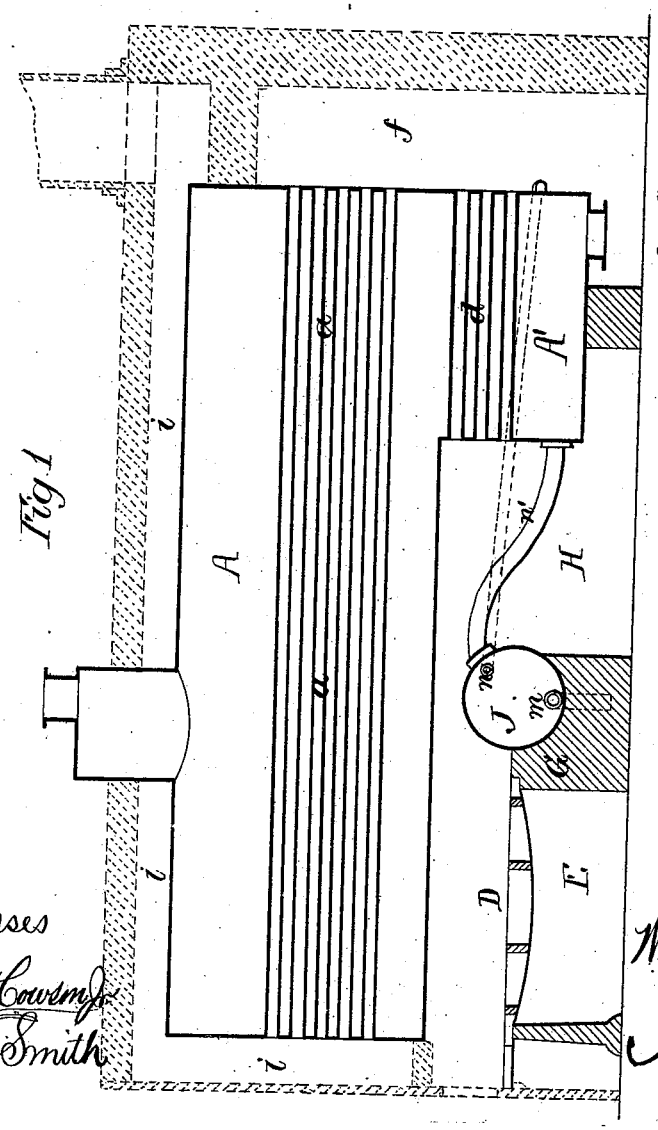
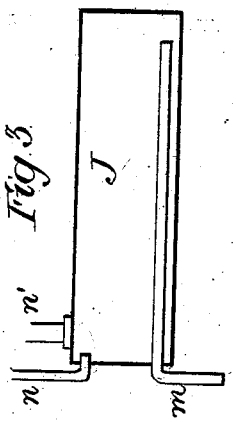
W. T. BATE.

Steam-Generator

No. 207,940. Patented Sept. 10, 1878.







Witnesses
Henry Howson Jr.
Harry Smith

Inventor
William T. Bate
by his Attorneys
Howson and Son

UNITED STATES PATENT OFFICE.

WILLIAM T. BATE, OF CONSHOHOCKEN, PENNSYLVANIA.

IMPROVEMENT IN STEAM-GENERATORS.

Specification forming part of Letters Patent No. **207,940**, dated September 10, 1878; application filed November 7, 1877.

To all whom it may concern:

Be it known that I, WILLIAM T. BATE, of Conshohocken, Montgomery county, Pennsylvania, have invented a new and useful Improvement in Steam-Generators, of which the following is a specification:

The object of my invention is to construct an economical steam-boiler, in which steam can be rapidly generated and water maintained in a constant state of circulation; a further object of my invention being the thorough heating of the feed-water and the prevention of accumulations of sediment in the boiler.

In the accompanying drawings, Figure 1 is a vertical section of my improved generator; Fig. 2, a transverse vertical section on the line 1 2, and Fig. 3 a section of the feed-water heater.

A is the main cylindrical body of the boiler, from end to end of which extend a series of tubes, *a*.

On the under side, at the rear end of the body, is the leg A′, of the same width as and communicating with the main body, the said leg being semi-cylindrical at the bottom, and the opposite flat sides *b b′* being strengthened with suitable transverse stays passing between the series of tubes *d*, which extend from front to back of the leg.

The main body A of the boiler is situated directly above the furnace, which has the usual grate-bars D, ash-pit E, and bridge G, so that the lower portion of the main body A is exposed to the products of combustion as they pass toward and over the bridge into the flue H at the rear of the same.

The direct course of the products of combustion is abruptly interrupted by the leg A′, the main portion of which is below the level of the bridge, and hence the leg is subjected to greater heat than any other part of the boiler.

The products of combustion, after passing through the tubes of the leg, and through flues *f* between the leg and the walls, return through the tubes *a* in the body of the boiler to the front of the same, whence they are conducted through flues *i i* to the chimney. I have found in practice that by this arrangement of the leg A′ and its tubes at the rear of the boiler, and by its location in the flue at the rear of and below the top of the bridge, so that the leg shall be the hottest part of the boiler, two important results are attained—namely, the rapid generation of steam and the constant and free circulation of water in the boiler.

I am aware that steam-boilers have been so constructed that the products of combustion shall pass first through one set of tubes in a lower part of the boiler, and return through another set of tubes in an upper part of the same; but steam-boilers of this class have heretofore been self-contained—that is, with water-spaces at the sides of the fire-place, and with shells of such a character at the rear (where the lowest set of tubes occur) as to demand an expensive system of stays, whereas the shell of my improved boiler consists simply of a long cylinder, united by flat sides to a short leg having a semi-cylindrical base, and can be much more economically constructed than ordinary boilers of the class to which it relates.

A water-heater, J, is built in, and, in fact, forms the upper part of, the bridge, G, the water being introduced into this heater through a pipe, *m*, which extends nearly to one end of the heater, and is conveyed from the latter through two pipes, *n n′*, near the opposite end, the said pipes communicating with the leg A′ of the boiler, so that a constant circulation of water through the heater J is insured.

The heater consists of a vessel made of steel plates, and preferably of cylindrical form. Steel will effectually resist the intense heat to which the heater must be subjected, and which would rapidly destroy a heater made of wrought-iron plates.

I have found that by forcing the heated water into the leg of the boiler the accumulation of sediment in the body A of the boiler is prevented, owing to the fact that the heat of the water in the leg A′ causes the deposit of the impurities as soon as the feed-water enters the boiler, the sediment being thus caused to accumulate on the bottom of the leg A′, where it is below the line of great heat, and consequently does not tend to hasten the burning out of the boiler-plates.

I claim as my invention—

1. The within-described steam-boiler, consisting of a cylindrical body, A, having a series of horizontal tubes, *a*, and a leg, A′, communicating with the said body, and containing a

series of horizontal tubes, in combination with a grate arranged below and independently of the body, and in front of the leg, all as set forth.

2. The combination of the leg A′ of the boiler, the heater J, forming part of the bridge, and the pipes *m* and *n n′*, all as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM T. BATE.

Witnesses:

RICHARD L. GARDINER,

HARRY SMITH.