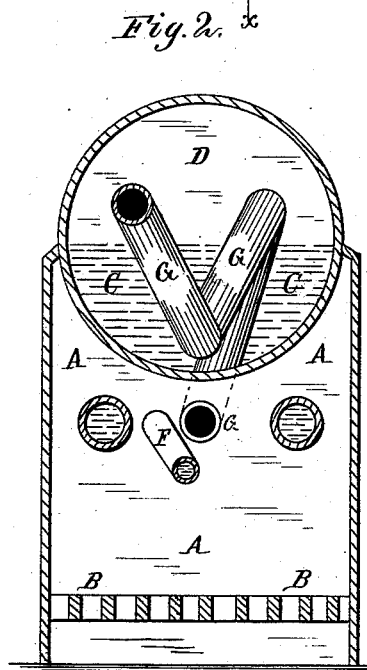
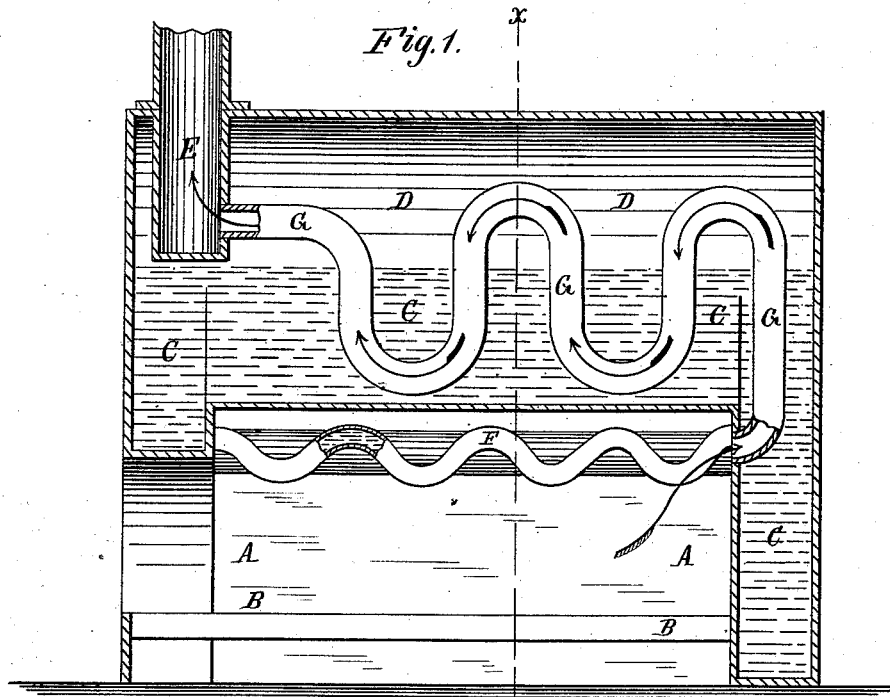


P. S. FORBES.  
Tubular-Boiler.

No. 216,667.

Patented June 17, 1879.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

PAUL S. FORBES, OF NEW YORK, N. Y.

## IMPROVEMENT IN TUBULAR BOILERS.

Specification forming part of Letters Patent No. **216,667**, dated June 17, 1879; application filed February 17, 1879.

*To all whom it may concern:*

Be it known that I, PAUL S. FORBES, of the city, county, and State of New York, have invented a new and useful Improvement in Tubular Boilers, of which the following is a specification.

Figure 1 is a vertical longitudinal section of a tubular boiler to which my improvement has been applied. Fig. 2 is a vertical cross-section of the same, taken through the line *xx*, Fig. 1.

Similar letters of reference indicate corresponding parts.

The object of this invention is to furnish steam boilers or generators which shall be so constructed as to generate steam faster and with less fuel than boilers constructed in the usual way.

The invention consists in a steam-boiler provided with serpentine fire-flues, so arranged that their bends or coils may pass alternately through the upper part of the water-space and the lower part of the steam-space, as hereinafter fully described.

A represents the fire-chamber, B the fire-grate, C the water-space, D the steam-space, and E the smoke-stack, of the boiler.

The boiler may be so constructed as to have a water-space, C, at its ends and sides, or only at its ends, as may be desired.

F are tubes, which pass through the fire-chamber A of the boiler, and the ends of which are connected with the water-space C at the ends of the boiler. The tubes F are made in spiral or serpentine form, so that the water in passing through them may be heated

more quickly and to a higher temperature, and with less fuel, than when boilers of the ordinary construction are used.

The products of combustion pass from the fire-chamber A to the stack E through a series of flues, G, only one of which is shown in the drawings. The flues G are bent into serpentine or spiral form, so that their bends or coils may pass alternately through the upper part of the water-space C and the steam-space D, as shown in Figs. 1 and 2.

With this arrangement the products of combustion, while on their way from the fire-chamber A to the stack E, will part with their heat to the water and steam, heating the water to a higher temperature, and superheating the steam.

With this construction steam will be generated faster and with a less quantity of fuel than when boilers of the ordinary construction are used.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

The serpentine fire-flues G, having their upper bends or coils bent alternately to the right and left from a vertical line passing through their lower bends or coils, and communicating with the fire-box A and the smoke-stack E, substantially as and for the purpose described.

PAUL S. FORBES.

Witnesses:

JAMES T. GRAHAM,  
C. SEDGWICK.