# S. P. Ruggles,

## Flue and Tubular Boiler.

No. 54,780. Patented May 15, 1866.

Fig: 1

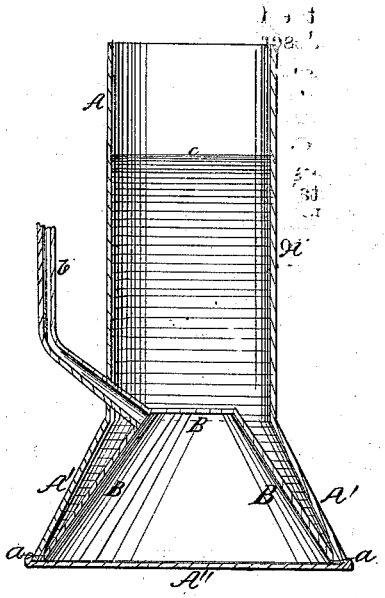
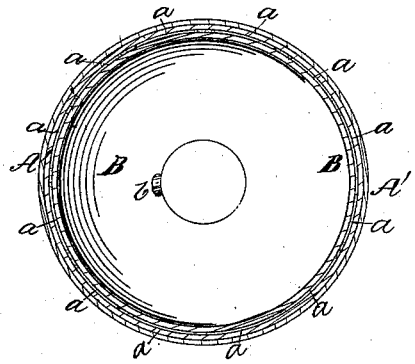



Fig: 2




Witnesses:

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# UNITED STATES PATENT OFFICE.

STEPHEN P. RUGGLES, OF BOSTON, MASSACHUSETTS.

## IMPROVEMENT IN STEAM-GENERATORS.

Specification forming part of Letters Patent No. **54,780**, dated May 15, 1866.

*To all whom it may concern:*

Be it known that I, STEPHEN P. RUGGLES, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Steam Boilers or Generators; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 represents a vertical section taken centrally through the boiler or steam generator, and Fig. 2 represents a horizontal section through the same near the base thereof.

Similar letters of reference, where they occur in the separate figures, denote like parts of the boiler in both of the drawings.

A leading characteristic in my steam boiler or generator is that it is open and not closed, as boilers invariably are.

The steam-chamber is at the bottom of the boiler and under the column of water, and the steam taken therefrom as fast as it generates without rising up through the column of water or becoming saturated with water, which very much impairs its elastic force.

Another characteristic of my boiler or generator consists in the fact that I produce steam of a quite appreciable force from a portion of a column of water in an open boiler or reservoir, while the remaining portion of the same column is not even in a state of ebullition; and my invention consists in combining with an open boiler, reservoir, or column of water a steam-generator at or near the bottom of the column, communicating with the body of water by a contracted opening or openings, by which the water from the main supply enters the generator in thin films, and is converted into steam and carried out without passing up through the column of water, as will be explained.

A represents a vertical cylindrical boiler or reservoir of water, open at its top, and which may be supplied from any tank or main that is open at its source.

The lower part of this boiler or reservoir, as at A′, is expanded by a conical-shaped base, for the purpose of admitting in its inside a conical-shaped generator, B, which is united to the shell or bottom A″ of the boiler, but so as to leave contracted spaces *a* or a contracted space between the water in the boiler or reservoir and the generator. The effect of these thin, narrow, or contracted spaces is to admit the water from the main supply or source into the generator in thin films, and thus be quickly converted into steam and carried out through the steam-pipe *b* without compelling it to rise through the column of water in A.

I find, in practice, that sand or small particles of metal sprinkled or laid over the bottom of the inside of the boiler facilitates, or seems to do so, the making of steam, as small steam-bubbles would form on all parts of the surface of such particles and rise rapidly into the chamber above.

I do not limit myself to the shape, height, or size of the boiler or generator, as it may be enlarged or diminished in size or changed in form, the only condition annexed to the invention being that the boiler or reservoir shall be open and the generator placed at or near the bottom of the column of water and communicating with it by narrow or contracted water-spaces at or near the bottom of the generator.

The fire is placed underneath the bottom A″, which bottom is common to the boiler or reservoir and to the generator B within it.

The water in the reservoir may stand at or near the water-line *c*, as therein shown, and though this height of water would seemingly keep the generator entirely full, yet in practice, when making steam, there is sufficient steam-space in its upper portion for all purposes.

The pipe *b* for carrying off the steam should rise to the height to which it is desirable to keep the water in the reservoir or boiler.

No collapse or explosion of this boiler can take place, for if the steam is not used as fast as it is made the steam-chamber becomes entirely filled, which forces out all of the water from it, and then the steam will escape through the openings at the bottom of the generator and pass up through the water and escape from the top of the reservoir or boiler or condense therein, and so continue to do so long as water remains to be evaporated.

Having thus fully described my invention, what I claim is—

Combining with an open boiler or reservoir of water a steam-generator within said boiler and at or near the bottom of the column of water therein, substantially as and for the purpose herein described.

STEPHEN P. RUGGLES.

Witnesses:

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