2 Sheets—Sheet 1.

G. B. N. TOWER.

Steam-Generator.

No. 211,118. **Patented Jan. 7, 1879.**

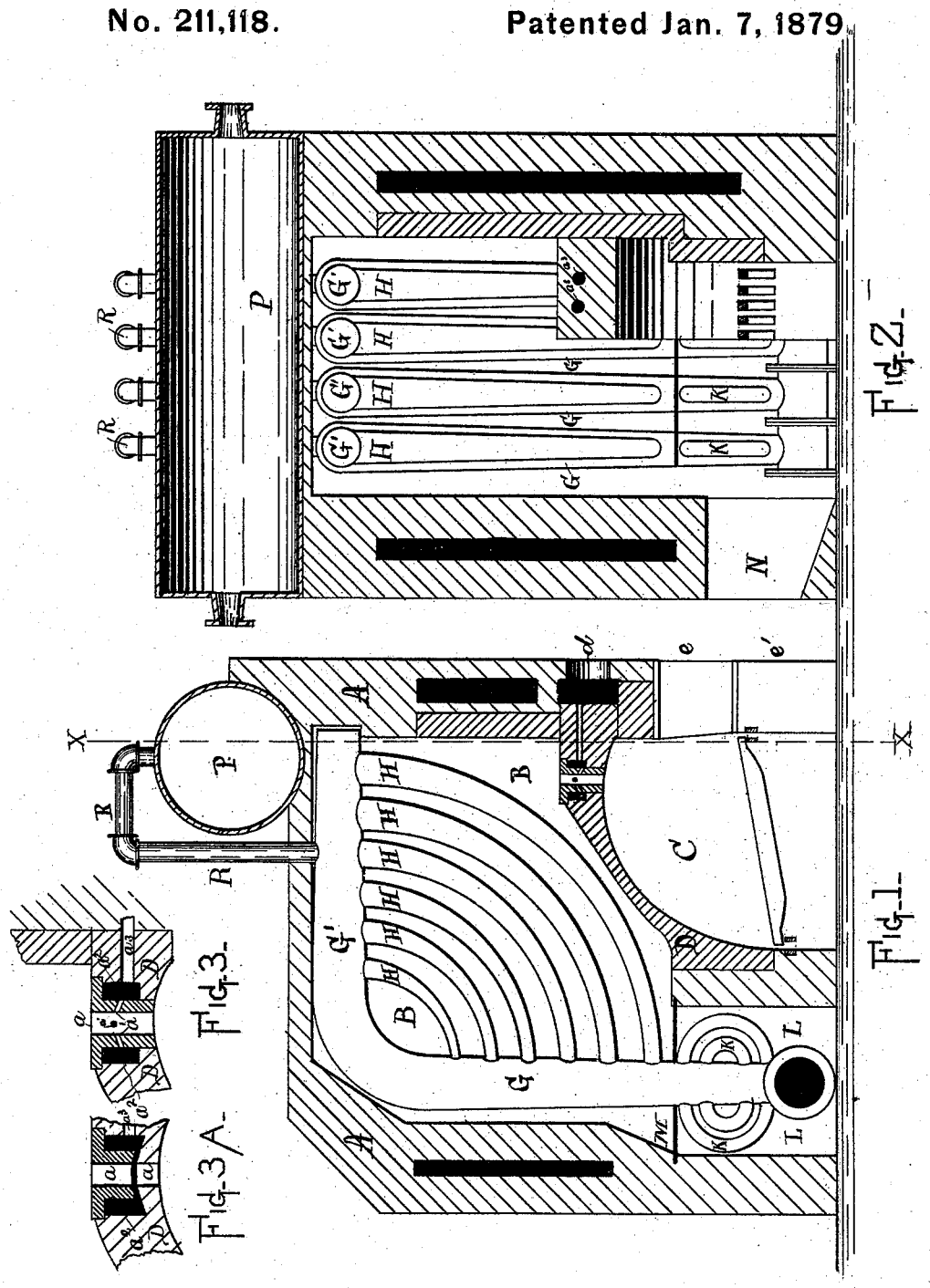

Fig. 2.

Fig. 1.

Fig. 3.

Fig. 3A.

WITNESSES.

Chas. F. Sleeper.

Wm. Jettel

INVENTOR.

G. B. N. Tower

2 Sheets—Sheet 2.

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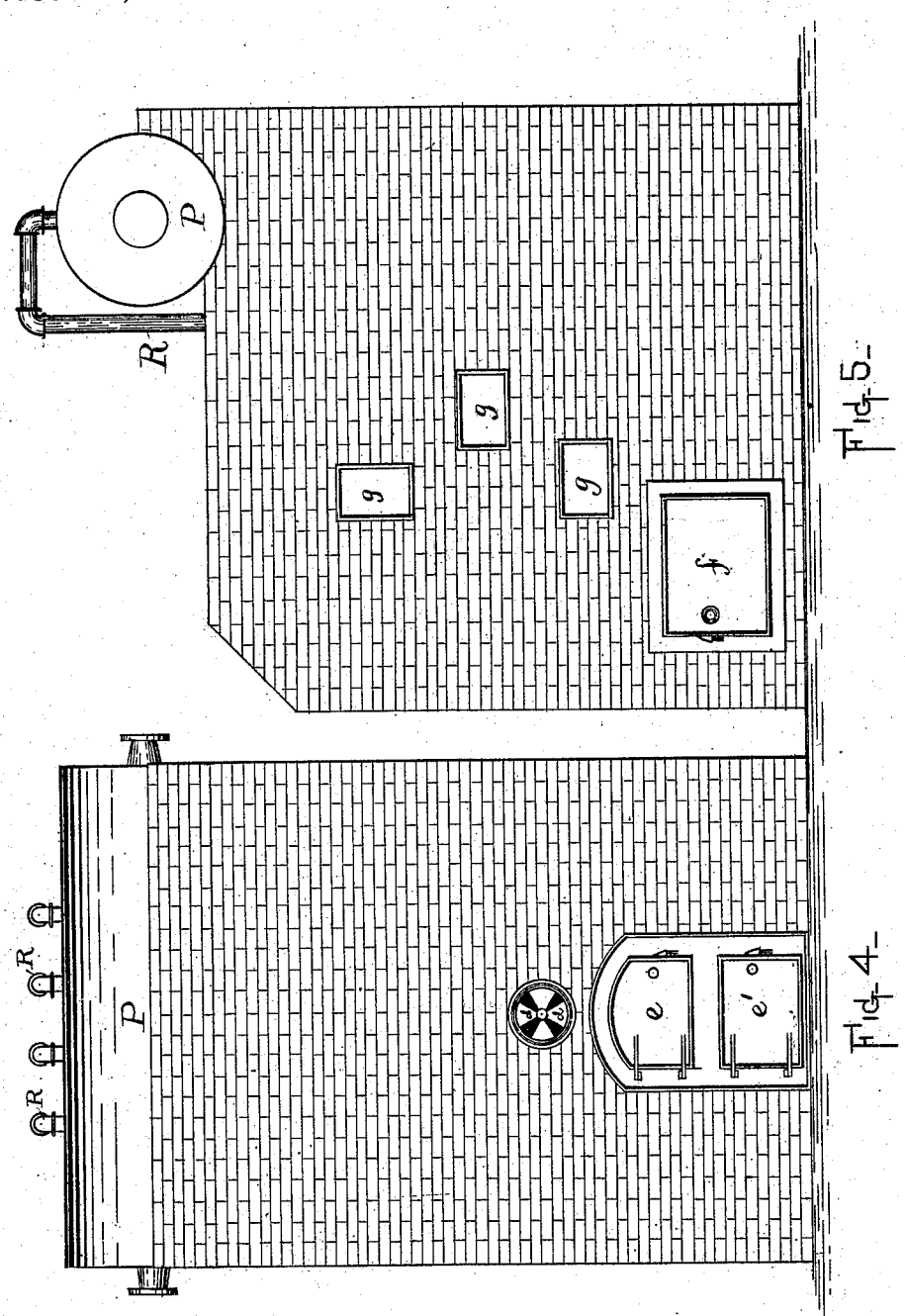

WITNESSES.
Chas. F. Sleeper.
Wm. Fittel.

INVENTOR.
G. B. N. Tower

UNITED STATES PATENT OFFICE.

GEORGE B. N. TOWER, OF CAMBRIDGE, ASSIGNOR OF ONE-HALF HIS RIGHT TO LYDIE F. RENSHAW, OF COHASSET, MASSACHUSETTS.

IMPROVEMENT IN STEAM-GENERATORS.

Specification forming part of Letters Patent No. **211,118**, dated January 7, 1879; application filed December 17, 1877.

To all whom it may concern:

Be it known that I, GEORGE B. N. TOWER, of Cambridge, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Steam-Generators, which improvements are fully set forth in the following specification and accompanying drawings.

My invention consists in an improved construction of steam-generators and the furnaces connected therewith, to accomplish a rapid and economical generation of steam, as follows:

First, in arranging within the outer walls of a furnace sections of boilers constructed of conical tubes, as shown.

Second, in the peculiar form of the sections, they being made with an upright conical pipe, smallest at its lower end, where it connects with the feed-water pipe, and enlarging till near the top of the boiler-chamber, when it turns and passes across the top of the boiler-chamber, diminishing in size until it reaches and rests upon the inner wall of the chamber. This pipe has leading from it a series of curved conical pipes, smallest at their junction with the upright pipe, and increasing in size till they connect with the horizontal pipe. This portion of my invention is an improvement upon the sectional steam-generator patented to Lydie F. Renshaw October 3, 1876, numbered 182,773.

Further, in placing within a flue at the rear of and below the boiler-chamber a series of pipes curved from and to the original pipe, to receive the waste heat from the boiler-chamber and partially warm the water before it reaches said chamber.

In the drawings, Figure 1 shows a view of the general arrangement of the pipes and furnace, one of the side walls being removed. Fig. 2 shows a section through the line *x x*, a portion of the furnace-wall and grate being removed. Figs. 3 and 3^{A} are details of a part of the furnace-wall. Fig. 4 is a front elevation, and Fig. 5 a side elevation.

A represents the outer wall or casing to the boiler; B, the boiler-chamber; C, the furnace-chamber; D, the wall between the furnace and boiler chambers; *a*, the outlet for gases from the furnace-chamber to the boiler-chamber; a^1, openings from the chamber a^2, through which the air passes in small jets to the outlet *a*; a^3, inlets to the chamber a^2 from a chamber in the wall *a*, which chamber is supplied with the necessary quantity of air through the register *d*. G G′ are the upright and horizontal pipes, and H H are the curved pipes, which form a section in connection with the pipes G G′ and the feed-pipe J. K K are curved pipes within the flue L, to warm the feed-water. M is a plate placed below the pipes H H, to form the flue L by preventing the gases from passing down between the pipes G, and only allowing them to pass into the flue at the ends of the plate, as shown in Fig. 2. N is the opening to the chimney. *e* and *e′* show the grate and ash-pit doors. *f* is a door through which the flue may be cleaned. *g g g* are doors through which to clean the interior pipes. P is the steam-chest, and R R are steam-pipes rising to it from each section.

My reverberatory furnace is arched over at the top, causing the gases to roll along its upper wall until they reach the outlets *a* near the front, through which they are forced, in an unconsumed state, to the boiler-chamber B, where, having been mixed with air in their passage from one chamber to the other, they burn with a greater or less heat throughout the chamber and around the sections, according to the quantity of air with which they are charged, and being retained by the plate M in the chamber, and only allowed to pass from it at the ends of said plate, they must impart their heat very rapidly to the water in the boiler, and have little left to pass out of the chimney.

The peculiar form of my pipes (conical) and their arrangement, as described, enables me to obtain more evaporating-surface within a given space than can be done with pipes of an equal diameter throughout. The current of water passing through the pipes H must necessarily move more slowly at their upper portions, where the heat to which they are exposed is greatest, and any possible tendency to priming would be prevented by the increased body of water in said upper portions, from which the steam is discharged into the pipe G′. The bottom of the pipe G′ has a

slant toward the pipe G, and allows the water to return freely through that pipe to the lower ends of the pipes H, to be again acted on by the fire. I have shown the pipe G′ with its smallest end resting on the wall; but for some purposes it might be advisable to enlarge that end, but still to retain the slant toward the pipe G.

I have shown in Fig. 3ᴬ a means by which air may be thrown into the outlet *a* in thin sheets instead of jets, as in Fig. 3, the outlet *a* having an aperture around it from the chamber a^1, through which the air is admitted.

I claim as my invention—

1. The combination of the frusto-conical curved pipes H with the upper water-body, G′, and rising pipes G, substantially as described.

2. The combination of the pipes G G′, H, and J with the boiler-chamber B, reverberatory chamber C, arched roof D, and connection *a*, constructed and operating as described.

3. In combination with the flue L, the curved pipes K upon the pipe G and the feed-water pipe J.

G. B. N. TOWER.

Witnesses:
CHAS. F. SLEEPER,
WM. ZITTEL.