

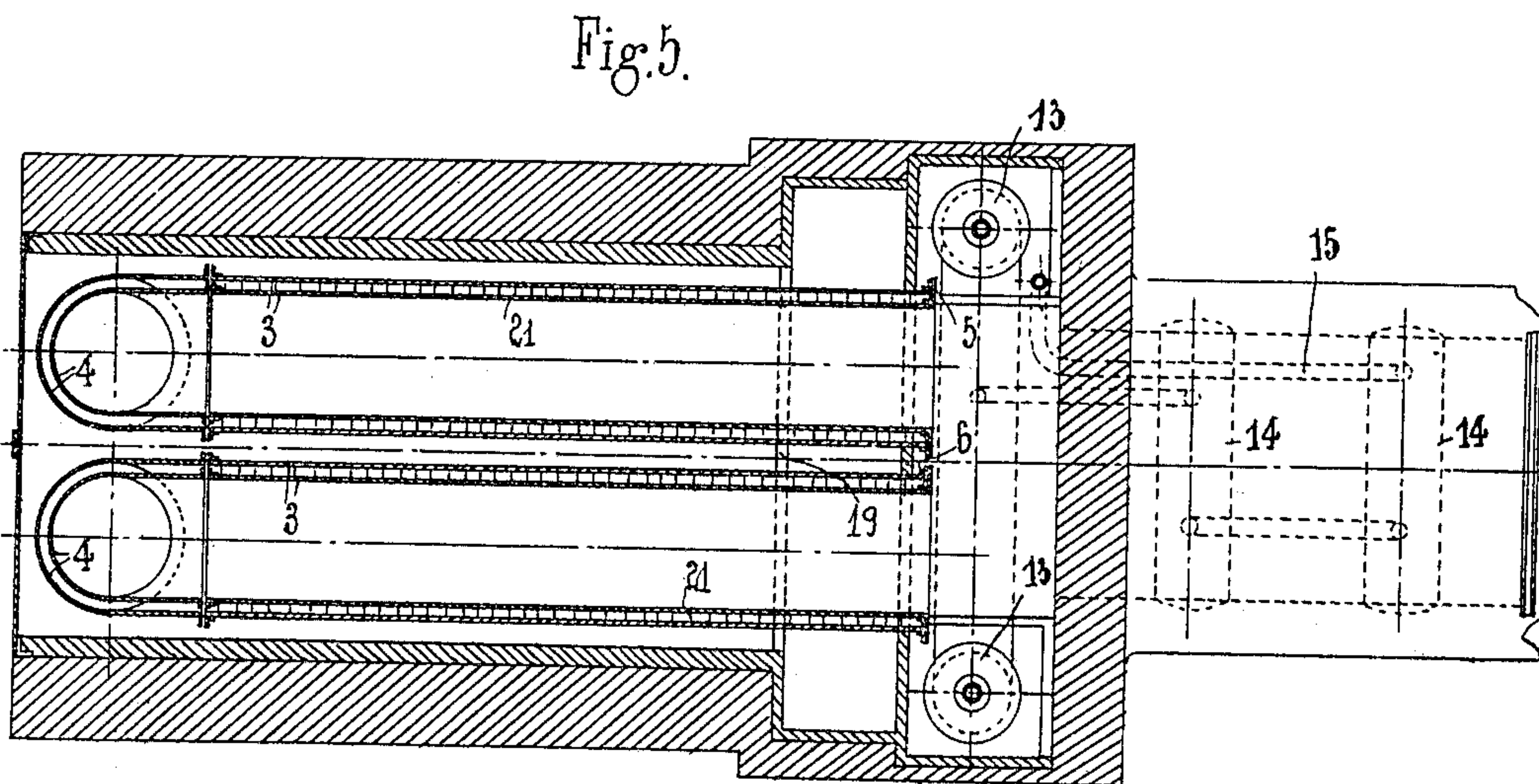
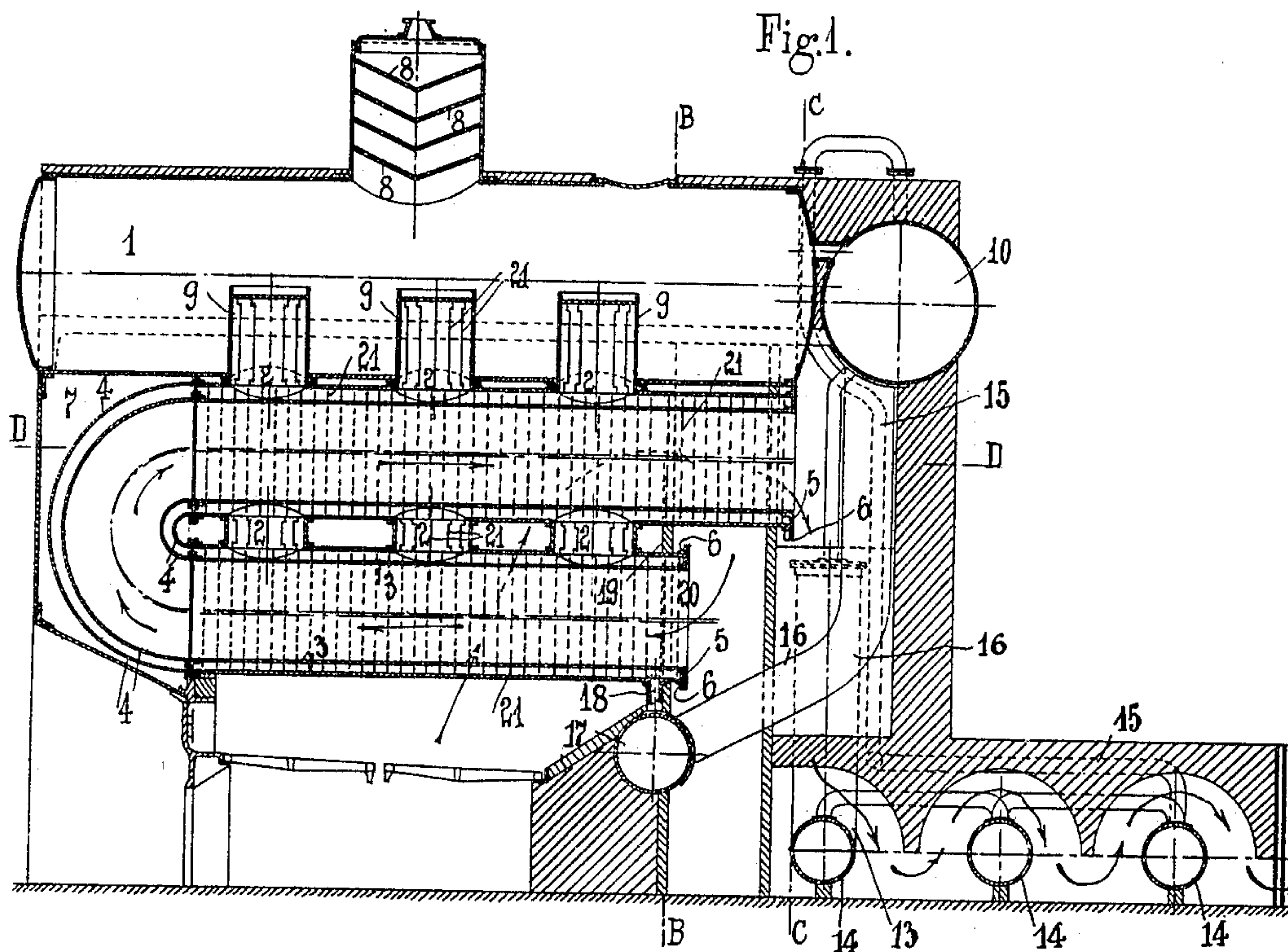
No. 818,948.

PATENTED APR. 24, 1906.

F. FROMONT.
STEAM GENERATOR.

APPLICATION FILED DEC. 30, 1904. RENEWED FEB. 7, 1906.

2 SHEETS—SHEET 1.



WITNESSES.

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2 SHEETS—SHEET 2.

Fig.3.

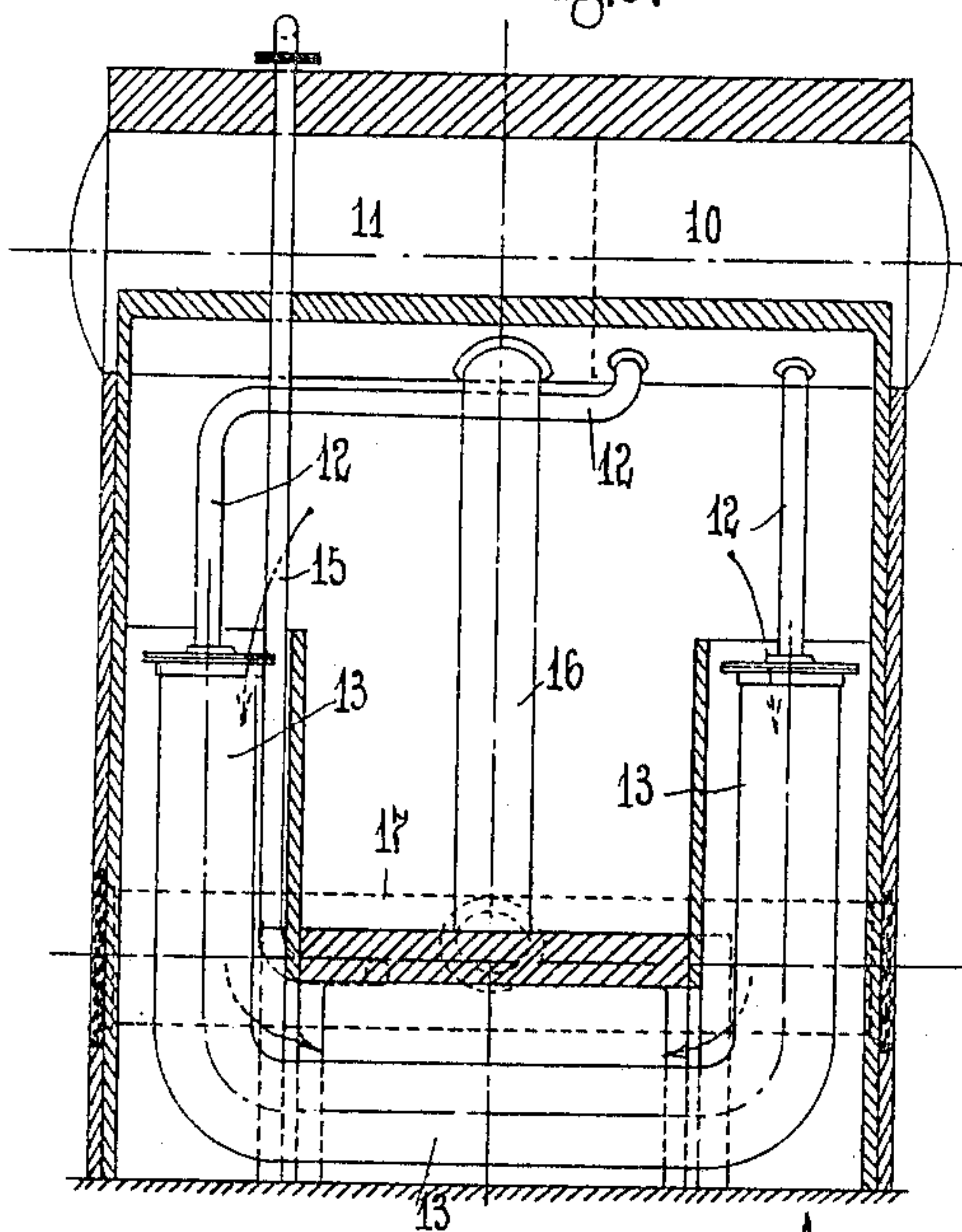


Fig.2.

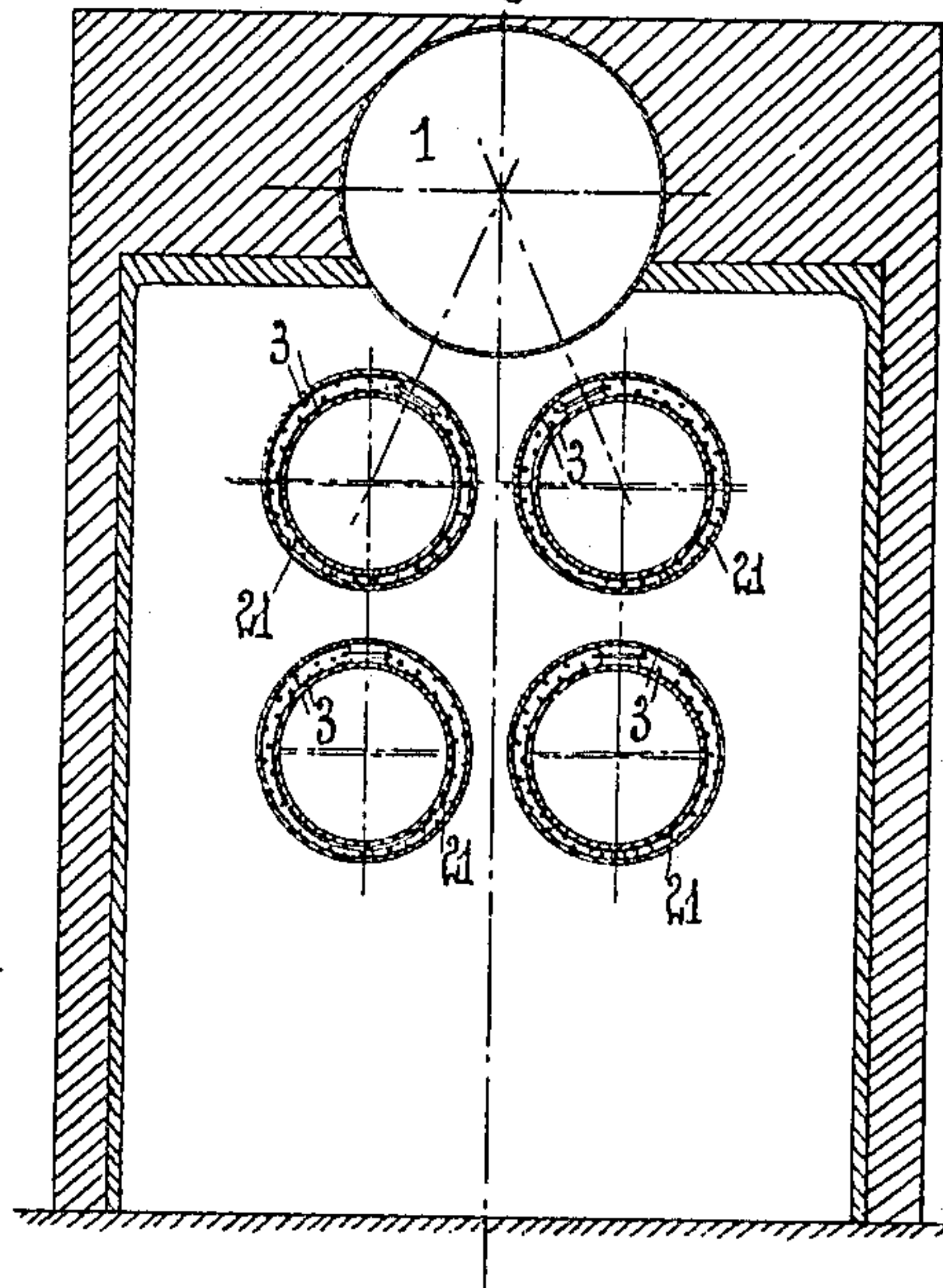
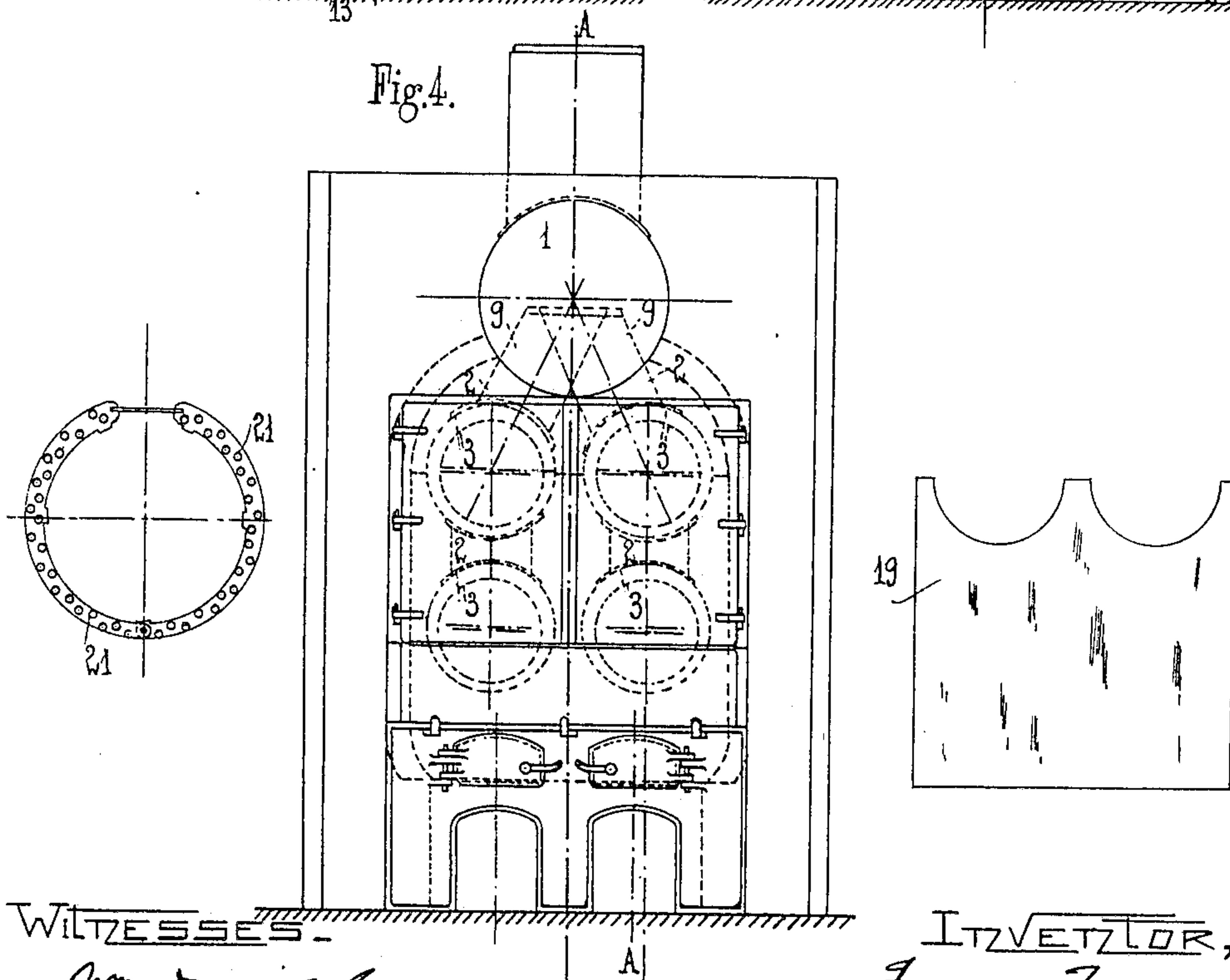


Fig.4.



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UNITED STATES PATENT OFFICE.

FERNAND FROMONT, OF MOLENBEEK, NEAR BRUSSELS, BELGIUM.

STEAM-GENERATOR.

No. 818,948.

Specification of Letters Patent.

Patented April 24, 1906.

Application filed December 30, 1904. Renewed February 7, 1906. Serial No. 299,950.

To all whom it may concern:

Be it known that I, FERNAND FROMONT, manufacturer, a subject of the King of Belgium, residing at Molenbeek, near Brussels, Belgium, have invented a new and useful Improvement in Steam-Generators; and I do hereby declare the following to be a full, clear, and exact description of the same.

My present invention relates to steam-generators, the object thereof being to provide an improved generator with eccentrically-arranged heating-tubes and means whereby the free expansion of the several parts is permitted.

Another object of my invention is to provide means in the boiler-dome to retain the water mixed with the steam, and means for leading the steam-bubbles into the main body of the generator.

With these and other objects in view my invention consists of the construction, arrangement, and combination of parts fully described and claimed hereinafter.

In the accompanying drawings, Figure 1 is a longitudinal section on line A A of Fig. 4. Fig. 2 is a cross-section on line B B of Fig. 1. Fig. 3 is a cross-section on line C C of Fig. 1. Fig. 4 is a front elevation, and Fig. 5 is a horizontal section on line D D of Fig. 1.

The improved generator comprises a cylindrical body 1, having a dome and connected to the heating-tubes 3 by means of tube-sections 2. (In the drawings I have shown a generator with four heating-tubes.) The heating-tubes 3 are eccentrically arranged within each other, so as to provide an annular water-space between them, the width of said space being selected in accordance with the power of the generator and degree of purity of the available feed-water. By reason of the eccentric arrangement of said tubes the annular space between the tubes is larger above than below the same for the purpose of facilitating the vaporization. The generator comprises, furthermore, one or more curved tube-sections 4, connecting the lower and upper heating-tubes 3 at the front of the generator. At the rear ends the heating-tubes are closed by means of annular plates 5, riveted on the inner tubes and forming joints with the angle-irons 6, secured to the outer tubes. Arranged at the front of the generator is a smoke-box 7. The dome is provided with a separator 8, formed of a number of perforated conical plates serving to prevent water from being carried away

with steam. Extending into the main body 1 are tube-sections 9, extending from the upper tube-sections 2 through the water contained in the main body 1 to a small distance above the water-level for the purpose of facilitating the discharge of steam-bubbles into the steam-chamber of said main body 1 without stirring the water contained in the generator.

Arranged within the annular spaces between the heating-tubes 3, the tube-sections 2, and the tube-sections 9 are groups of very thin apertured and perforated sheet-metal plates 21 for the purpose of guiding the steam bubbles. (A steam-bubble moves preferably along a wall.) The steam-bubbles formed preferably at the lower parts of the heating-tubes just above the firing move immediately along said plates 21 through the lower tube-sections 2 into the upper heating-tubes 2, whence the steam-bubbles pass through the upper tube-sections 2 and the tubes 9 to the surface of the water.

The improved steam-generator also comprises a feed-water reservoir divided into two compartments 10 11 and arranged at the rear of the generator, the one, 10, of which is connected, by means of two pipes 12 12, to the water-reheating pipes 13, which in turn are suitably connected to the regenerating-tubes 14 14 14, whence a return-pipe 15 extends to the compartment 11 of the feed-water reservoir. Extending downwardly from said compartment 11 is a pipe 16, connecting the same to the base-drum 17, which in turn is connected, by means of two pipes 18, to the heating-tubes 3.

The feed-water is brought into the generator as follows: The water admitted into the compartment 10 of the reservoir 10 11 flows downwardly through the pipes 12 into the reheaters 13 and the regenerators 14, whence it flows upwardly through the pipe 15 and a suitable injector into the compartment 11 of said reservoir. Said compartment 11 is connected to the steam-chamber of the generator for the purpose of admitting steam into the same. The reheated feed-water flows then downwardly through the pipe 16, made of a large cross-section, into the base-drum 17, whence the water passes through the tubes 18 into the generator.

The hot combustion-gases flow along the outer walls of the outer heating-tubes 3 and the bottom part of the main body. Then said gases pass behind the partition 19, enter

the lower heating-tubes 3, pass through the curved sections 4, the upper heating-tubes 3, and the flues along the reheaters 13, and regenerators 14 into the chimney.

5 In practice my improved generator is preferably made of welded steel tubes—that is, the main generator-body, dome, outer and inner heating-tubes, connecting-tubes, reservoir, reheating and regenerating tubes, base-
10 drum are welded and have no riveted seams.

Having fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a steam-generator, the combination
15 with the main generator-body, of upper and lower groups of heating-tubes, the tubes of each group arranged eccentrically within each other, means for securing said tubes together and allowing the free expansion there-
20 of, curved sections connecting the front ends of said heating-tubes, and means for closing the rear ends thereof, substantially as set forth.

2. In a steam-generator, the combination
25 with the main generator-body, and the dome thereof, and a number of conical perforated sheet-metal plates within said dome, of upper and lower groups of heating-tubes, the tubes of each group arranged eccentrically
30 within each other, means for securing said tubes together and allowing the free expansion thereof, curved sections connecting the front ends of said heating-tubes and means for closing the rear ends thereof, substan-
35 tially as set forth.

3. In a steam-generator, the combination with the main generator-body, of upper and lower groups of heating-tubes, the tubes of

each group arranged eccentrically within each other, means for securing said tubes to- 40
gether and allowing the free expansion thereof, curved sections connecting the front ends of said heating-tubes, connecting-tubes between the water-spaces of the lower and up-
45 per heating-tubes, tube-sections registering with said connecting-tubes and extending into the main generator-body above the water-level, and means for causing the hot
50 gases to flow first along the outer walls of the heating-tubes and afterward through the lower and upper groups of heating-tubes, substantially as set forth.

4. In a steam-generator, the combination with the main generator-body, of upper and lower groups of heating-tubes, the tubes of 55
each group arranged eccentrically within each other, means for securing said tubes together and allowing the free expansion thereof, curved sections connecting the front ends of said heating-tubes, connecting-tubes be- 60
tween the water-spaces of the lower and upper heating-tubes, tube-sections registering with said connecting-tubes and extending into the main generator-body above the water-level, thin apertured and perforated 65
sheet-metal plates within the annular water-spaces between the heating-tubes, the connecting-tubes and said tube-sections, substantially as set forth.

In testimony whereof I have signed my 70
name to this specification in the presence of two subscribing witnesses.

FERNAND FROMONT.

Witnesses:

CHARLES HOWARD,
MAURICE GERBEAULT.