No. 877,343. PATENTED JAN. 21, 1908.

W. L. JONES.

STEAM GENERATOR.

APPLICATION FILED OCT. 15, 1906.

2 SHEETS—SHEET 1.

Fig. 1.

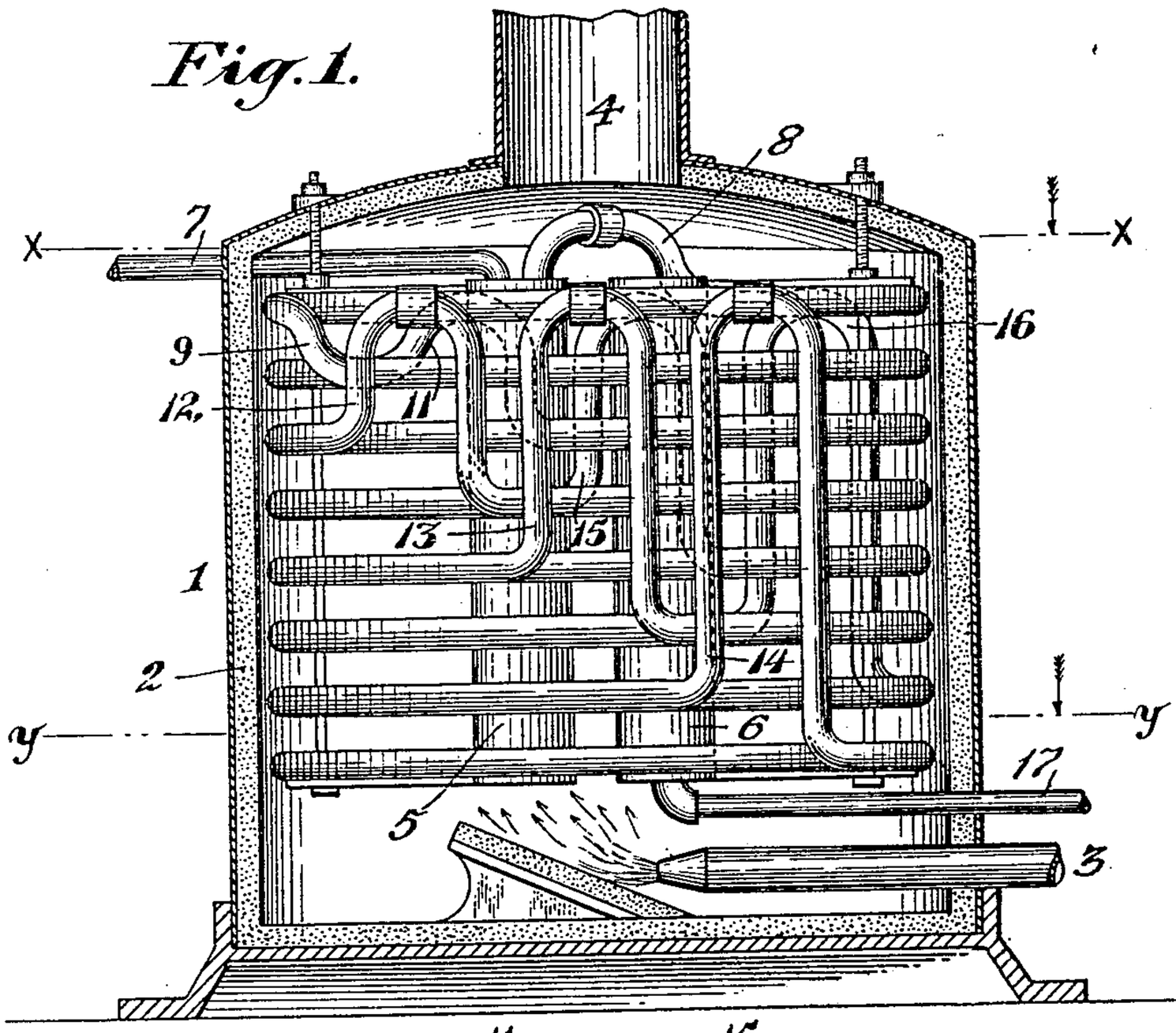
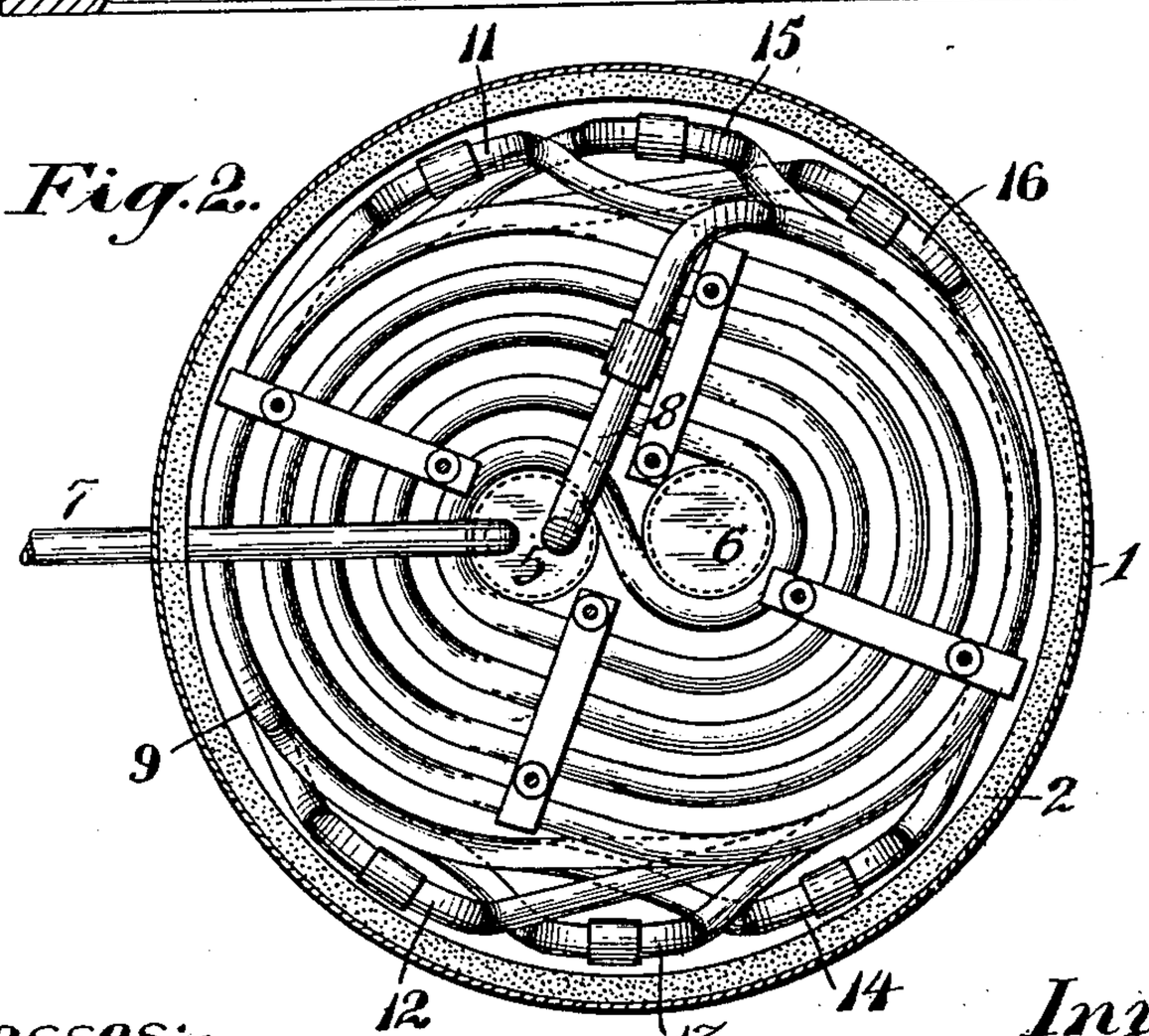


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

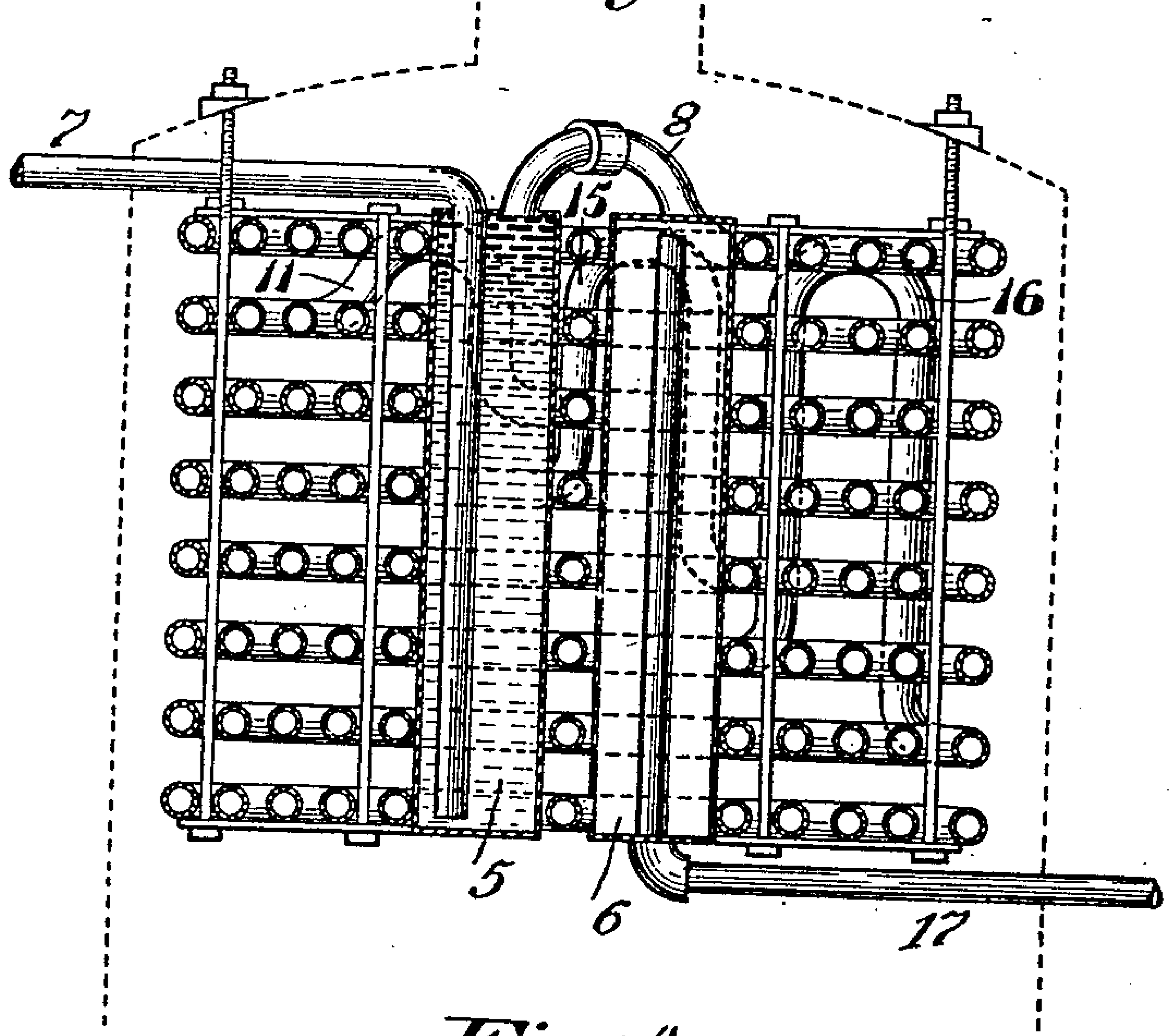
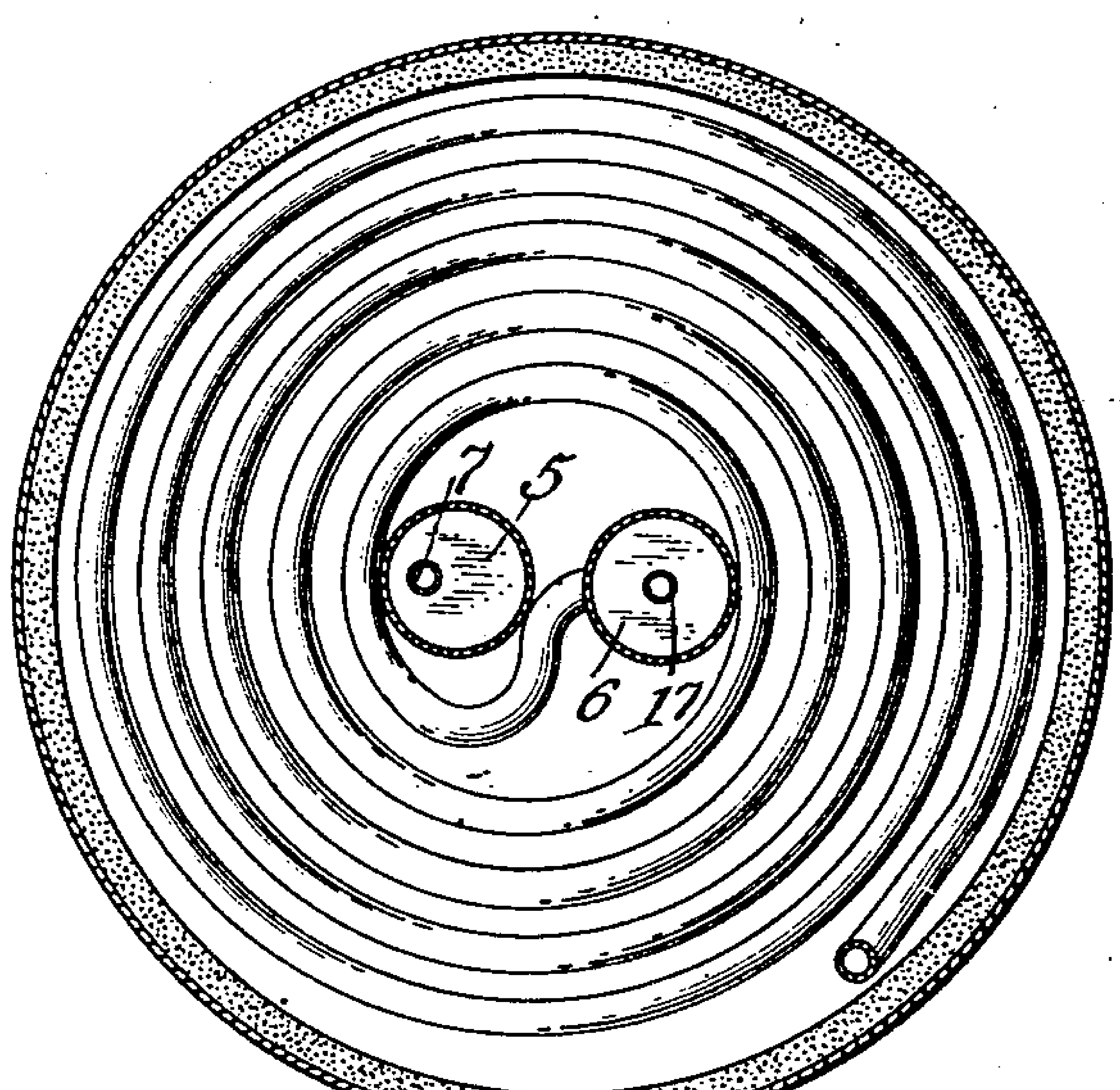


Fig. 4.



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UNITED STATES PATENT OFFICE.

WILLIAM L. JONES, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR OF ONE-HALF TO SAMUEL M. SNYDER, OF SAN FRANCISCO, CALIFORNIA.

STEAM-GENERATOR.

No. 877,343. Specification of Letters Patent. Patented Jan. 21, 1908.

Application filed October 15, 1906. Serial No. 339,040.

To all whom it may concern:

Be it known that I, WILLIAM L. JONES, a citizen of the United States, and a resident of the city and county of San Francisco, State of California, have invented certain new and useful Improvements in Steam-Generators, of which the following is a specification.

My invention relates to that class of steam generators, which are especially adapted to furnishing power to motor-cars, motor boats and the like; in which the object is to provide a great amount of heating surface and steam generating capacity in the smallest possible space. This object is accomplished by the close coiling of very small tubes, in which the steam is generated. A boiler of this type is shown in Letters Patent No. 808,286 granted to me December 26, 1905; and the present invention is in some respects an improvement upon that shown in said Letters Patent.

One object of the present invention is to provide a construction by which the water is caused to flash into steam immediately, or at least very soon after entering the tubing. In boilers of this type as heretofore constructed, cold water enters the tubing with the result that the upper coils of the tubing are not really a steam generator at all, but merely a water heater, the actual generation of steam not taking place until the water has passed through a considerable portion of the coil. Thus, while the whole coil is normally assumed to be a steam generator, such is actually not the case; it being evident that in the constructions referred to the upper coils only perform the function of a water heater. I overcome this objectionable feature by means contained in and forming a part of the apparatus itself, by which the water receives a preliminary heating before it can reach the coils; whereby no cold water ever reaches the coils, with the result that the whole, or nearly the whole of the tubing is actually a steam generator.

Another object of the invention is to admit water from the top, and by a peculiar construction of coils and their connections to provide that such water cannot be allowed to flow directly by gravity to the bottom and collect there, but must, by a series of traps or bends in the tubing, be compelled to follow a course which will require it to rise as it passes from coil to coil; so that, under no circumstances can the upper tubes be left comparatively empty while the lower tubes are full. In this way I accomplish my object of making the whole series of coils a practical steam generator, instead of requiring a considerable part of such tubing to perform the function of a mere water heater.

I have shown in the accompanying drawings, one practical embodiment of my invention.

Figure 1, is a vertical section of the casing, showing an elevation of the tubing. Fig. 2, is a horizontal section on the line x—x of Fig. 1, looking downwardly. Fig. 3, is a central vertical section of the tubing. Fig. 4, is a horizontal section on the line y—y of Fig. 1, looking downwardly.

The generator casing is shown at 1, and is preferably double-walled and provided with any suitable heat-resisting filling 2. Near the bottom of the casing enters the oil-burner 3, which I have shown as a suitable means of affording heat, although any other means for that purpose can be used instead. The casing is provided with an escape or stack 4, for the products of combustion, which pass upwardly through the casing and around and about the tubing contained therein.

Within the casing and in close proximity to each other, and near the center as shown in Figs. 2 and 4, are two reservoirs, 5, 6, which are placed as closely as possible together, provided that a space is left for the coils of tubing to pass between them as shown. The water supply pipe 7 enters the top of the reservoir 5, and, preferably, extends to near the bottom of the same; although as a matter of practical construction such feed pipe might discharge at or nearer the top of said reservoir. It should be observed that this reservoir 5 is exposed to the direct heat; and therefore while it may be better to bring the supply pipe 7 down near the bottom and hottest part of said reservoir, such construction is not absolutely essential. The point to be considered is that the water instead of entering the tubing while cold, first enters a reservoir exposed to direct heat; and that this reservoir, if not in itself a literal steam generator, delivers hot water instead of cold water into the pipe 8 which is connected to the coils.

No cold water ever enters the tubing, and hence as the coils are fully exposed to the direct action of heat from below, the water will flash into steam very quickly, and a much larger part of the tubing will be utilized as an actual steam generator.

The water leaves the hot water reservoir 5 through the bent pipe 8, which is in communication with the upper coil of the boiler. It will be necessary in order to understand this system of tubing, to compare Figs. 1 and 2 in connection with the vertical section shown in Fig. 3. The coupled connection 8 which is in communication with the upper coil of the boiler supplies hot water directly to said coil. The course of this coil is best shown in Fig. 2 in connection with Fig. 3. It is coiled horizontally from its connection with the pipe 8, and passes in a substantially S-shaped form around and between the two reservoirs 5 and 6, returning in the same plane with similar coils.

Since the hot water in the reservoir 5 escapes from it at the top, means must be provided to prevent said water from simply descending by gravity to the bottom and accumulating there. I have therefore provided a series of rising bent tubes, connections or traps which carry the water upwardly from each coil before it enters the succeeding coil below. These traps are best shown in Figs. 1 and 2. The water can run directly from the upper or first coil into the next horizontal coil below it, as shown at 9 in Fig. 1; but between the second coil and the third coil is a trap shown at 11 in Figs. 2 and 3, which trap is a bent tube, that like all the others carries the water up to substantially the level of the upper coil before it is permitted to descend. As each coil is wound inwardly and then outwardly returning upon itself, it is evident that such traps will occur upon opposite sides of the generator as they are shown in the plan view, Fig. 2, and in full and dotted lines in Fig. 1. Thus we see in Figs. 1 and 2, a trap 15 between the fourth and fifth coils, a trap 13 between the fifth and sixth coils, a trap 16 between the sixth and seventh coils, and a trap 14 between the seventh and eighth coils, all rising to substantially the level of the upper coil. This is as far as the present illustration extends. Of course such an assemblage of steam connections might be extended indefinitely, due regard being had to practical conditions in operation.

As shown in the drawing, the last or bottom coil, which is the eighth coil in the present illustration, leads into the bottom of the reservoir 6, which is a reserved steam space auxiliary to the coils and from which, and at its bottom, steam is delivered through the discharge pipe 17 for any purpose desired. This steam reservoir 6 is a simple cylinder with the steam pipe 17 leading from it in order to supply power to any kind of engine or motor adapted to be driven by steam power.

In this construction I believe that I have utilized to the utmost the steam generating power of a coil boiler of the class referred to; and it must always be borne in mind that my generator is particularly adapted to situations which do not permit of the external preliminary heating of feed-water; and that within the usual and ordinary compass of a generator of this type, I provide means for heating the feed-water before it enters the coils, so that it will flash into steam quickly after its entrance; and also provide a reserve steam space, independent of the coils, which contains a constant supply of steam in excess of the quantity necessary for practical operation.

I do not limit myself to the exact constructions and arrangements herein described and shown, as I desire to avail myself of such modifications and equivalents as fall properly within the spirit of my invention.

What I claim is:

1. In a steam generator, a casing tubular coils arranged in a horizontal progressively descending series, a water reservoir inclosed by said coils and connected directly to the upper coil of the series, a water supply pipe entering said reservoir, a curved pipe extending from each coil to the coil immediately beneath it, all of such pipes having their highest points at substantially the level of the upper coil, and means for heating said coils and said reservoir.

2. In a steam generator, a casing, tubular coils arranged in a substantially horizontal progressively descending series, a water reservoir inclosed by said coils and connected to the upper member of the series, a water supply pipe entering said reservoir, a curved pipe extending from each coil to the coil immediately beneath it all of such pipes having their highest points at substantially the level of the upper coil, a reserve steam reservoir also inclosed by said coils and entered by the lower member of the series, a steam outlet pipe leading from said steam reservoir, and means for heating said coils and said reservoirs.

3. In a steam generator, a casing, heating means, a series of connected tubular coils arranged in substantially horizontal planes and extending progressively downwardly, traps connecting the members of the series whereby the water in passing from one member to the next is compelled to rise substantially to the level of the upper member of the series, a water reservoir and a steam reservoir both inclosed by said coils, a water supply pipe entering the top of the water reser-

voir and extending toward the bottom of the same, a pipe leading from the top of the water reservoir and connected to the upper member of the coils, and a steam outlet pipe leading from the steam reservoir; the lower member of the coil entering said steam reservoir.

In testimony whereof I have hereunto affixed my signature on this 26th day of September, 1906, in presence of two witnesses.

WILLIAM L. JONES.

Witnesses:
L. W. SEELY,
W. S. BOYD.