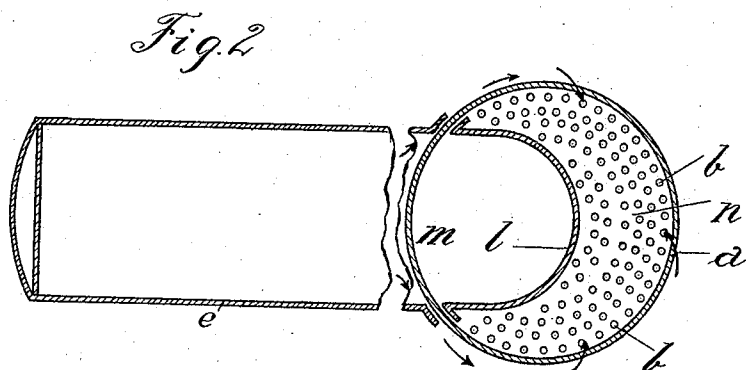
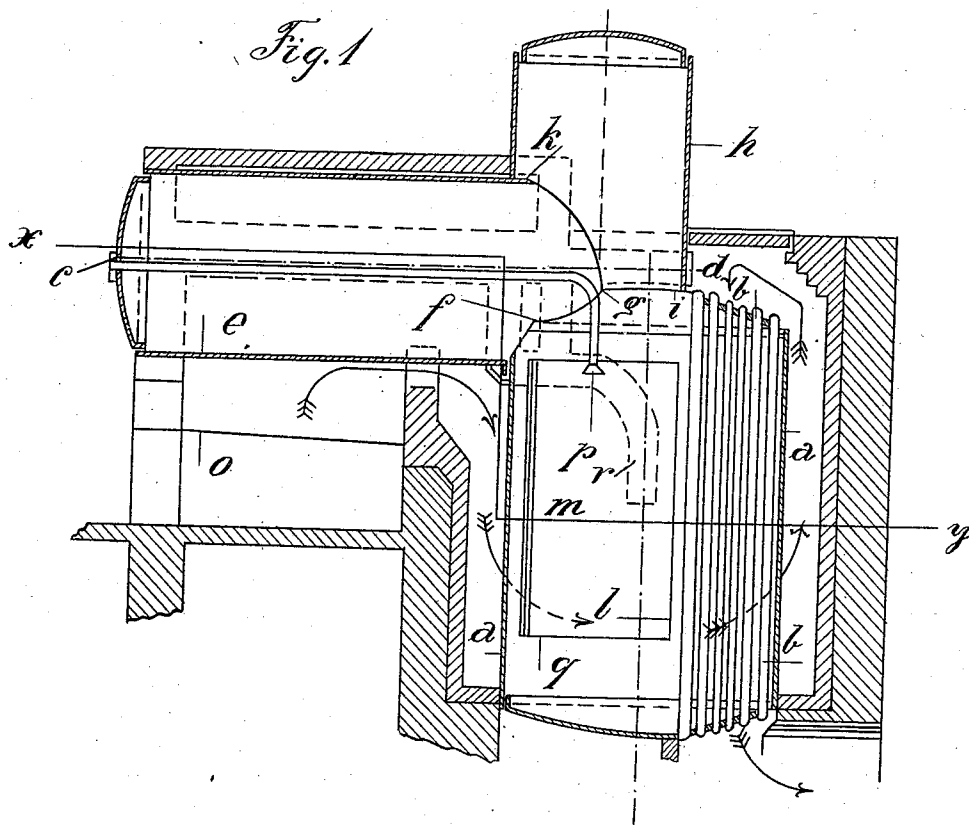


No. 877,334.

PATENTED JAN. 21, 1908.

F. HECHT.
STEAM GENERATOR.
APPLICATION FILED MAR. 18, 1907.



Witnesses:
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UNITED STATES PATENT OFFICE.

FRANZ HECHT, OF TEGEL, GERMANY.

STEAM-GENERATOR.

No. 877,334.

Specification of Letters Patent.

Patented Jan. 21, 1908.

Application filed March 18, 1907. Serial No. 362,906.

To all whom it may concern:

Be it known that I, FRANZ HECHT, engineer, a subject of the German Emperor, residing in 51 Brunow street, Tegel, near Berlin, Germany, have invented certain new and useful Improvements in Steam-Generators, of which the following is a specification.

My invention relates to a steam-generator consisting of a vertical tubular boiler connected directly with a horizontal boiler. In the case of such steam-generators hitherto known the tubular boiler is not completely filled with water so that the space above the water level serves as a space for the collection of steam. Such an arrangement suffers from the defect that very hot furnace-gases cannot be led through the heating-tubes as the parts of the tube-walls in contact with the steam would become red-hot. This defect is done away with by the present invention by connecting the wall of the tubular boiler with the wall of the longitudinal boiler below the lowest water-level in the longitudinal boiler.

Figure 1 shows the new steam generator in longitudinal section and Fig. 2 in transverse section on the line $x-y$ Fig. 1.

The vertical tubular boiler a is illustrated with the upper openings of its tubes b 10 cms. below the line $c-d$ which indicates the lowest water level in the longitudinal boiler. Above the tubular boiler a steam-dome h is arranged, which is connected on the one hand with the cover i of the tubular boiler and on the other hand with the upper wall $g-k$ of the horizontal boiler, whereby both boilers are united to form a single body. The steam dome h is entirely open at the bottom. The three boiler parts, the horizontal boiler e , the vertical tubular boiler a and the steam dome h are so connected with each other that the steam dome in part rests upon the cover i of the tubular boiler a , and another part connects in the line $g-k$ with the horizontal boiler e ; the horizontal boiler also connects in the line $f-g$, which is below the lowest water level $c-d$, with the tubular boiler a . Thus it will be seen that all three boiler parts are connected together.

In the case of this new steam-generator the tubes of the tubular boiler are consequently entirely surrounded by water so that furnace-gases can pass through them at any temperature however high without the danger of them becoming red-hot.

The evaporating-capacity of the new

steam-generator is accompanied by the provision of means for producing a powerful circulation of the water and for depositing fur and the like at a part where such deposition will not damage the boiler. For this reason a U-shaped circulation-wall l is fitted vertically inside the tubular boiler a , said wall inclosing with its side portions a space m at the end of the horizontal boiler e , which space is connected above and below with the outer crescent-shaped or sickle-shaped space n . This space n alone is traversed by the tubes b .

The furnace-gases given off from the grate o first pass along the horizontal boiler e , are then by means of the baffle wall or tongue r led downwards round the one half of the tubular boiler shell a , then rise up passing along the other half of the shell, then pass into the upper ends of the tubes b and pass out of the latter and so out of the boiler at the lower ends of said tubes. The course followed by the furnace-gases is indicated by arrows.

As a consequence of the furnace-gases following this course and as a result of the arrangement of the wall l the water circulates in the following manner. The feed-water fed through the pipe p into the space m in the tubular boiler sinks down in said space and in a somewhat pre-heated condition passes through the lower outlet q of the space m to the lower portions of the tubes b where it is heated to a higher temperature and rises in a direction opposite to that in which the furnace gases flow. The hottest water now mixes with the water which is being evaporated in the horizontal boiler where it is likewise evaporated, while the colder water mixes with the feed-water and the circulation is maintained. As only hot water which has already repeatedly participated in the circulation passes into the horizontal boiler, it follows that here, where the furnace-gases are at their highest temperature, a deposition of fur will be avoided, because it will separate out in the form of sludge at the lower parts of the tubes, that is, at a place where the furnace-gases leave the boiler.

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

1. Steam-generator having a vertical tubular boiler connected directly with a horizontal boiler, characterized by the wall of the tubular boiler being connected with the wall

of the horizontal boiler below the lowest water-level in said horizontal boiler in combination with the provision of a steam-dome common to the horizontal boiler and to the tubular boiler and in combination with a U-shaped circulation-wall (such as *l*) being vertically fitted inside the tubular boiler, said circulation-wall inclosing by means of its sides a space (such as *m*) at the end of the horizontal boiler, into which space the feed-water is delivered, the tubes of said tubular boiler being located in the space outside of said wall.

2. In a steam generator, the combination with a horizontal cylindrical boiler, of a fire grate located beneath said horizontal boiler, a vertical tubular boiler arranged adjacent to the end of said horizontal boiler, and having its tubes arranged at its side farthest from said horizontal boiler, and having an open space extending from end to end in communication with the interior of the horizontal boiler, means for supplying feed water to said open space, a steam dome connecting with said boilers at their adjacent portions, and means for conveying the furnace gases from the grate down one side of said tubular boiler and up the other side for passage downwardly through the tubes of said boiler.

3. In a steam generator, the combination with a horizontal boiler, of a fire grate located beneath said horizontal boiler, a vertical boiler arranged adjacent to and in communication with the said horizontal boiler, and having a top plate below the normal water level in the horizontal boiler, tubes arranged in one portion of said vertical boiler and opening through said plate, a circulation plate extending from the said top plate nearly to the bottom of said vertical boiler and between said tubes and said horizontal boiler, means for supplying feed water to said vertical boiler on the side of said circulation plate open to the horizontal boiler, an open space extending from end to end in communication with the interior of the horizontal boiler, and means for conveying the furnace gases from the grate down one side of said tubular boiler and up the other side for passage downwardly through the tubes of said boiler.

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

FRANZ HECHT.

Witnesses:

HENRY HASPER,
WOLDEMAR HAUPT.