R. D'EQUEVILLEY-MONTJUSTIN.

SODA STEAM GENERATOR.

APPLICATION FILED MAR. 20, 1909.

1,003,095. Patented Sept. 12, 1911.

Fig. 2.

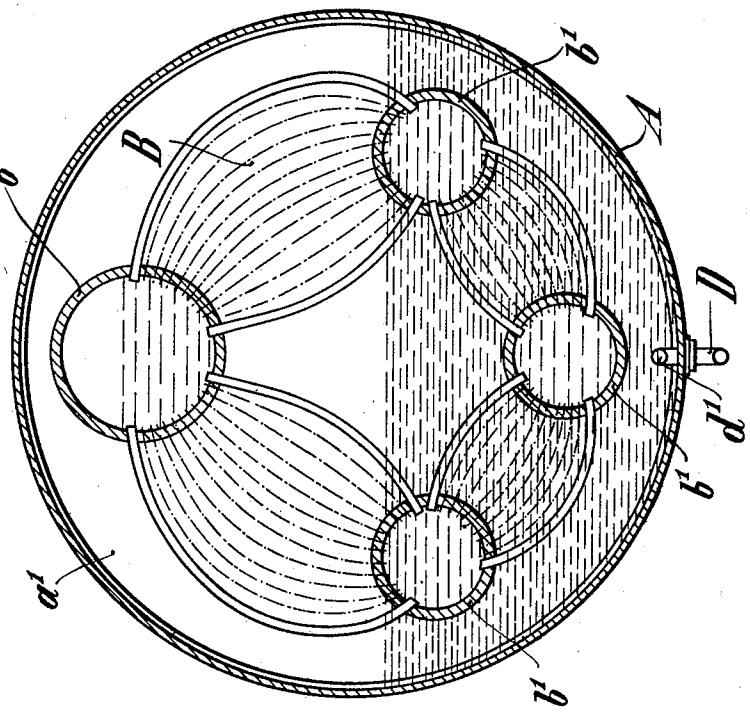
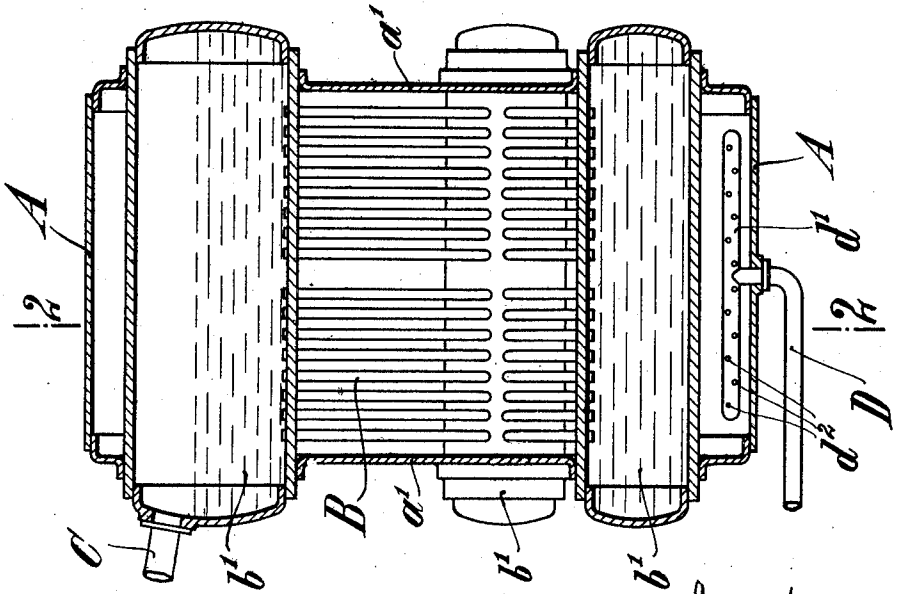


Fig. 1.



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UNITED STATES PATENT OFFICE.

RAYMOND D'EQUEVILLEY-MONTJUSTIN, OF KIEL, GERMANY.

SODA STEAM-GENERATOR.

1,003,095. Specification of Letters Patent. **Patented Sept. 12, 1911.**

Application filed March 20, 1909. Serial No. 484,771.

To all whom it may concern:

Be it known that I, RAYMOND D'EQUEVILLEY-MONTJUSTIN, a resident of Kiel, in the Province of Schleswig-Holstein, Kingdom of Prussia, Germany, have invented certain new and useful Improvements in Soda Steam-Generators, of which the following is a specification.

The subject matter of this invention is a soda steam generator for submarine boats, with the steam generator erected in a soda container of circular cross section.

The invention resides in having the contained steam generator composed of a boiler similar in kind to the narrow tube ships water-tube boiler, which is composed of at least two water-containers with horizontal, symmetrically lying longitudinal axes and pipe connections between these water containers, terminating in their longitudinal walls; the steam generator being so constructed that the soda boiler is of a short build, light weight, great heating surface and easy of access to its inner parts, all requirements essential for a well constructed steam generator for submarine boats.

The invention is illustrated in the accompanying drawing, in which,

Figure 1 shows the soda steam generator in vertical longitudinal section; and Fig. 2 in section on the line 2—2 of Fig. 1, seen from the left.

The soda steam generator consists essentially of a cylindrical container A, which is designed to receive an absorption medium (caustic soda or the like) and a water-tube boiler B, arranged within the said container, and comprising a plurality of cylindrical water containers b^1 (four being shown) of known construction, connected together by four groups of curved water-tubes, and extend through at least one and preferably both of the two end-walls a^1 of the soda container. In the end-walls of the soda container A and of the water-containers b^1, manholes—not shown in the drawing—are to be provided. From the end-wall of the uppermost water container b^1 a live steam pipe C extends to the (not illustrated) steam engine. At the under side of the soda container A is arranged a T-shaped steam pipe D, d^1, through which the exhaust steam of the engine can be introduced into the caustic soda. The horizontally extending portion d^1 of the pipe D is provided with small openings d^2.

At the beginning of the operation, the caustic container A is filled with concentrated soda up to the height indicated by short hatching and the water-tube boiler B is filled with hot water up to the level indicated by long hatching. If exhaust steam of the engine to be driven is conducted through the channel D, d^1, d^2 into the caustic soda, it will be absorbed by the latter. The caustic soda gives off its heat to the water to be vaporized in the water-tube boiler and produces live steam therein, which can be conducted through the pipe C to the steam engine.

As compared with the previously known stationary soda steam generators or those used as locomotive boilers, in which a water-tube boiler is located within a cylindrical soda container, the soda steam generator above described offers essential technical advantages for submarine boats. These advantages arise, on the one hand from the use of the specially formed, though previously known, water-tube boiler as a container for the water to be evaporated and on the other hand from the peculiar disposition of this evaporating water-container in the soda container.

The selected form of the evaporating water-container B insures in the first place a good utilization of the space available in the cylindrical soda-container A. Especially does the disposition of the water tubes in the direction of the periphery of the soda container insure a large heating surface in comparison with the known soda boilers referred to, in which the heating pipes extend parallel to the axis of the cylindrical soda container.

With equal heating surface, therefore, the boiler forming the subject matter of this invention can be made essentially shorter than one of the known boilers, a circumstance which is of especial importance with the restricted space available in a submarine boat. The arrangement of a plurality of water containers b^1 further insures the use of short water tubes, and this permits of replacing the water tubes in the boat itself, in case of need, in spite of the restricted available space fore and aft of the boiler when erected in a submarine boat. In addition to

these technical advantages resulting from the form of the evaporating water-container, further technical superiority results from the peculiar installment of the water tube boiler in the cylindrical soda container. Inasmuch as no part of the walls of the soda container A forms any part of the wall of the evaporating water-container B, the wall strength of each of the two containers can be determined in accordance with the pressures imposed upon them in use. Thus it becomes necessary only to make the evaporating water container B with strong walls, while the soda container A, in which only comparatively low pressures will occur, can be made with thin walls. This circumstance, naturally, very favorably affects the total weight of the steam generator, and renders the boiler especially appropriate for erection in submarine boats. Furthermore, since the water containers b^1 of the water tube boiler B extend through the end-walls a^1 of the soda container, they are all readily accessible from the outside, through the manholes, without necessity of disturbing the soda container. This accessibility of the water containers b^1 is absolutely necessary, as otherwise the frequently required examination of the interior of the boiler, as well as the cleaning out and repairing (tightening of the tubes) could not be effected. Especially is the last named possibility of readily expanding the water-tubes of great importance, because the caustic soda readily escapes at high temperatures, through leaky metallic parts. With insufficient accessibility of the water-containers b^1, the soda, in consequence of the looseness between the tubes and the walls of the containers b^1, might readily escape into the evaporating water and reach the generated steam, in which case its erosive effect would shortly produce serious interference with the operation.

The properties set forth; to wit: Short construction, light weight, great heating surface and easy accessibility of the inner parts render the described steam generator appropriate for use as a boiler for submarine boats, in an especially high degree.

I claim:

1. A soda steam generator for submarine boats, provided with a steam generator of circular cross-section built into a soda container, said steam generator being constructed similarly to a ship's water-tube boiler, with narrow tubes, and comprising a plurality of water containers, horizontally disposed, and with their axes parallel to each other and to the axis of said soda container; said curved narrow tubes adapted to connect the water containers; opening into the sides thereof and being disposed in groups; and said water containers projecting through at least one end of said soda container.

2. A soda steam generator for submarine boats comprising a soda container, and a steam generator therein, composed of a plurality of evaporating water-containers, disposed with their longitudinal axes parallel to the axis of the soda container and with their ends protruding from the soda container, and groups of tubes entering the cylindrical walls of and connecting said water containers.

The foregoing specification signed at Kiel, Germany, this 4th day of February, 1909.

RAYMOND D'EQUEVILLEY-MONTJUSTIN.

In presence of—

JULIUS ROJIKE,

PAUL POPPENDIECK.