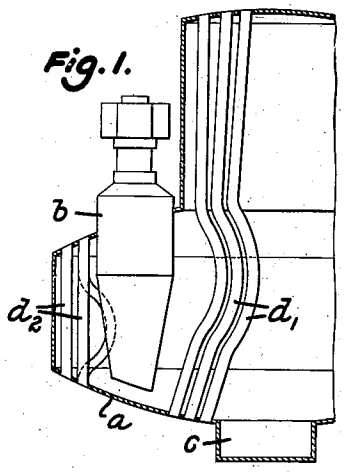
Jan. 22, 1946. A. LANG 2,393,390

RECTIFIER

Filed Jan. 30, 1942

Fig. 1.



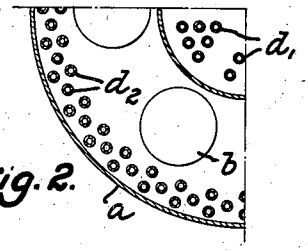
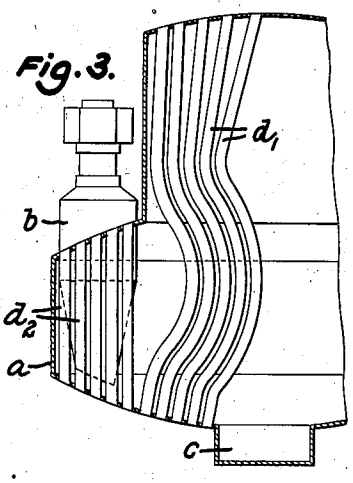


Fig. 2.

Fig. 3.



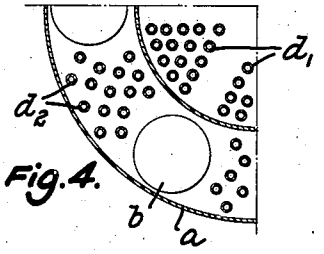


Fig. 4.

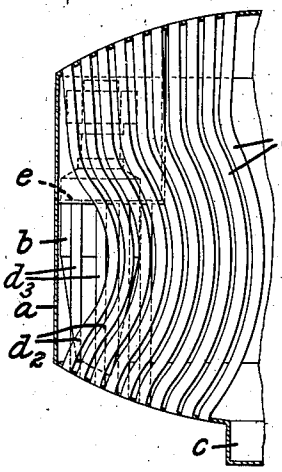


Fig. 5.

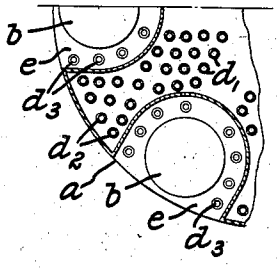


Fig. 6.

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UNITED STATES PATENT OFFICE

2,393,390

RECTIFIER

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Application January 30, 1942, Serial No. 428,931
In Switzerland January 20, 1941

2 Claims. (Cl. 250—27.5)

It is known to condense the vapour rising from the cathode of a rectifier as soon as possible after it occurs and to prevent it from reaching the anode. This is for instance achieved by means of cooling devices located inside the rectifier chamber, these devices forming a system of tubes through which a cooling medium circulates or around which a cooling medium flows. Gas, air or liquid can serve as the cooling medium. Cooling devices of this kind can either be suspended from the cover or fixed to the floor of the rectifier chamber. With rectifiers in which the anodes are arranged in circular groups, the cooling devices which are located inside the anode circle are provided with cooling parts which extend radially into the intermediate spaces between the anodes. It has also been proposed to extend the cooling tubes lying inside the anode circle from the floor to the cover of the rectifier chamber and to fix them in this position. Particularly for air-cooled rectifiers it has also been suggested to provide a central air shaft passing through the rectifier chamber. It is also known to employ devices by means of which cooling air is supplied in a definite sequence to the cathode, anodes and condensing chamber. All these known cooling arrangements are, however, unsuitable for removing in a satisfactory manner the heat which occurs in metal chamber rectifiers when a high load or large currents have to be dealt with, due consideration having also to be given to the fact that as the size of the rectifier increases the voltage drop in the arc and therefore also the heating losses increase.

The present invention concerns a rectifier with cooling tubes passing from the floor to the cover of the rectifier chamber in the space inside the anode circle and where the desired object is achieved according to the invention by providing means which cool the space in the casing outside of the anode circle and/or in the anode circle between the anodes.

Constructional examples of the invention are illustrated diagrammatically in Figs. 1 to 6 of the accompanying drawing where a number of rectifiers with bowl cathodes are shown in elevation and plan, all details which are not essential for an understanding of the invention having been omitted from the drawing.

In the drawing:

Fig. 1 is a fragmentary sectional elevation, and Fig. 2 is a fragmentary horizontal section, of a rectifier embodying the principles of the invention;

Fig. 3 is a fragmentary sectional elevation, and Fig. 4 is a fragmentary horizontal section, of a modified embodiment of the invention; and

Fig. 5 is a fragmentary sectional elevation, and Fig. 6 is a fragmentary horizontal section, of a further modification of the invention.

In all figures a denotes the metal rectifier chamber in which the anodes b are distributed round a circle in the usual manner; c is the cathode. The anodes can be provided with arc guiding sleeves and control grids. The cooling tubes are welded into the floor and cover of the chamber and a stream of cooling medium flows through them so that the vapour which is produced by the cathode during the operation of the rectifier condenses on these tubes and flows back to the cathode bowl. The cooling tubes lying inside the anode circle are designated by d_1 and those outside the anode circle and between the anodes by d_2. The cooling tubes are so shaped and grouped that there is sufficient space available for the development of vapour at the cathode and a free discharge to the anodes. It is an advantage if the cooling tubes are bent at least once along their length, the bend being directed inwards towards the axis of the rectifier casing.

In the embodiment shown in Figs. 1–2 the shorter cooling tubes d_2 are arranged opposite to the cooling tubes d_1 lying inside the anode circle and are grouped concentrically to the anode circle. As indicated, both groups of cooling tubes can be curved.

In Figs. 3 and 4 a rectifier is shown having a recess at the upper circumference of the chamber for the reception of the anode circle, and where in addition to the long cooling tubes d_1 inside the anode circle, shorter cooling tubes d_2 are also provided between the anodes in the anode circle. Also in this case tubes d_2 can be curved.

Figs. 5 and 6 show a rectifier where the anodes are distributed around the circumference of the casing and recesses e are provided in the casing for the anode leads and cooling. In this embodiment the entire chamber space is inside the anode circle and cooling tubes of approximately equal length pass between the anodes in the anode circle, these tubes extending from the floor to the cover of the chamber. Additional cooling tubes d_3 are located in the vicinity of the anodes b in such a manner that they fit into the recesses e and serve the purpose of cooling the anode leads.

Instead of the concentric cooling tube circle d_2 shown in Figs. 1 and 2, cooling ribs or cooling pockets can be provided at the periphery of the chamber. It is advantageous to use air as the cooling medium, the air being supplied by a fan

and entering the tubes either at the top or bottom end. If desired the rectifier chamber can also be surrounded by a casing to direct the air flow. Instead of air it is of course possible to employ another gaseous or liquid cooling medium. The rectifier can also possess a ring cathode instead of a bowl cathode. In the former event it is expedient to provide cooling tubes which pass through the space bounded by the ring cathode.

I claim:

1. In a vapor electric rectifier including a container, a cathode in the lower central portion of said container, and a plurality of anodes spaced in a circle in the peripheral portion of said container, conduits for the substantially vertical flow of cooling fluid through said container including conduits for the substantially vertical flow of cooling fluid through the portion of said container immediately adjacent the anodes, said conduits being curved inwardly at least a portion of their length.

2. In a vapor electric rectifier including a container, a cathode in the lower central portion of said container, and a plurality of anodes spaced in a circle in the peripheral portion of said container, conduits for the substantially vertical flow of cooling fluid through said container including conduits for the substantially vertical flow of cooling fluid through the portion of said container circumferentially between and immediately adjacent the anodes, said conduits being curved inward toward the axis of the container in at least a portion of their length.

ANDRÉ LANG.