June 24, 1930. R. C. JACQUELET 1,767,367

ALTERNATING CURRENT RECTIFIER

Filed April 1, 1927

Fig. 2

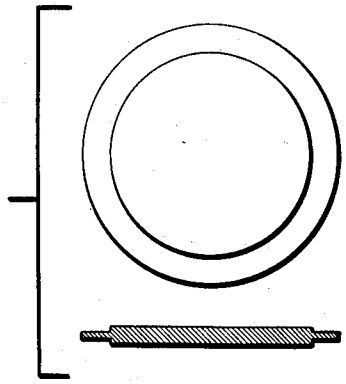


Fig. 1

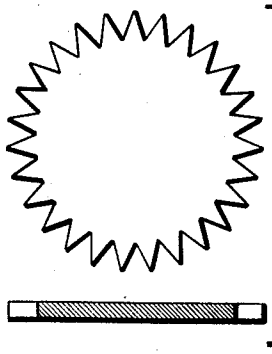
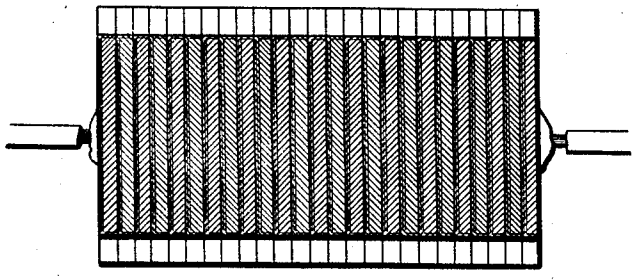


Fig. 3



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UNITED STATES PATENT OFFICE

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ALTERNATING-CURRENT RECTIFIER

Application filed April 1, 1927. Serial No. 180,280.

This invention relates to electrical rectifiers or valves adapted to change an alternating current into a substantially unidirectional current, and to the method of manufacturing them. The invention particularly relates to rectifiers of the dry type wherein the rectification is obtained by the asymmetric association of a demi-conductor between conductors.

Rectifiers of this type are the subject matter of the applications of Samuel J. M. Allen, namely, "Rectifying units and process of making same," Serial No. 164,375; "Electrical resistance unit," Serial No. 164,376; and "Alternating current rectifier," Serial No. 178,136.

This invention particularly relates to the last enumerated application which discloses a current rectifying unit comprising a copper element having thereon a coating of copper oxides, the center portion of the surface which is reduced to copper to provide facile electrical contact and the margin of which remains black copper oxide to prevent leakage about the edge of the disc. According to the disclosure of the Allen applications, a copper plate or disc is oxidized by being heated in air and the top of the oxide layer transformed to metallic copper by application of a reducing agent when the disc is at a temperature below the temperature at which it was oxidized. As disclosed in the last enumerated Allen application the margin of the copper plate may be protected or may be precooled to non-reducing temperatures before reducing the central portion of the disc.

The object of this invention is to provide a particular method of pre-cooling the margin of a plate coated with copper oxides, said method providing uniform results on a plurality of plates.

Another object of this invention is to provide copper oxide coated plates adapted to be uniformly and properly reduced for assembly and use as rectifying elements.

Reference is made to the drawings which form a part hereof. In these drawings, Figure 1 shows in elevation and section one of my rectifier plates having a peripheral heat radiating formation.

Figure 2 shows in elevation and section a rectifier plate having a somewhat different type of peripheral radiator.

Figure 3 shows a rectifier built up of a plurality of such plates as are shown in Figure 1.

This invention provides plates coated or adapted to be coated with layers of copper oxide, preferably red and black in the order named, said plates provided with configurated heat radiating margins adapted to cool more rapidly than the interior of the plates so that the margins will be at non-reducing temperatures when the interior of the plates are at proper reducing temperatures. At this temperature the interior of the copper oxide surface is reduced to metallic copper. As disclosed, this radiator margin can be a plurality of projections as in Figure 1 or a periphery of reduced thickness as in Figure 2. Either the projections or the reduced periphery constitute radiating elements adapted to cool the margin of the disc to the extent necessary to prevent a marginal zone of the copper oxide on the plate from being reduced. These plates having radiator margins therefor are oxidized by being heated in air to about 1900° F., and are reduced by contact with oil or hydrogen gas when the centers are at a copper reducing temperature and the margins below copper reducing temperatures. Such rectifying elements have a very high efficiency, as disclosed in the Allen application, Serial No. 178,136, and also each plate is subject to similar reduction thereby providing uniform rectifying units.

Figure 3 discloses a rectifier built up of a plurality of these units such as disclosed in Figure 1, said units serially disposed, each plate oxidized on one side and having the central portion of the outer layer of copper oxide reduced to metallic copper to insure proper electrical contact with the adjacent plate. This rectifier generates heat while in use, and the radiator margins of the plates function while in use to dispose of this heat rapidly which is a very desirable thing since the inverse current flow of such a rectifier increases with temperature. The radiation can be increased by disposing the projections on the plates out of alignment to increase the exposed surface.

Having described my invention, I claim:

1. A unit for rectifying alternating current, comprising, a plate coated with copper oxides, a contact forming area of reduced copper on the surface of the outer oxide layer, a margin of unreduced black oxide surrounding said reduced oxide, and a heat radiating plate periphery.

2. The method of securing uniform reduction of copper oxide rectifying units of the class described, comprising, constituting the periphery of the rectifying unit a heat radiator adapted to cool the margin of the unit to a non-reducing temperature when the interior of the unit is at a reducing temperature.

3. The method of manufacturing rectifying units, comprising, the steps of oxidizing the surface of a copper element at elevated temperatures and reducing the surface of the copper oxide to copper at temperatures below said elevated temperature, and the provision of a radiator periphery on each unit, said radiator adapted to cool the margin of the unit to a non-reducing temperature.

4. The process of manufacturing rectifying units of the class described, comprising, the step of configurating the periphery of each unit into a radiator, the step of oxidizing a surface of each unit at elevated temperatures, the step of cooling each unit to a temperature at which the marginal zone of the copper oxide surface is relatively unreducible and the central portion of said copper oxide surface is relatively reducible, and the step of reducing the interior of said copper oxide surface.

In witness whereof, I hereunto subscribe my name.

ROBERT C. JACQUELET.