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ADMIRALTY CONDENSER TUBE

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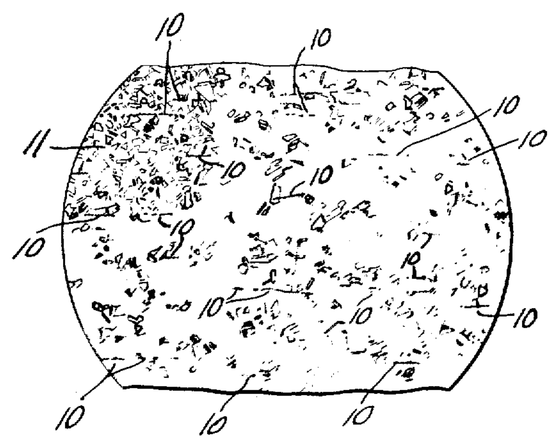


Fig. 1.

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ADMIRALTY CONDENSER TUBE

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Application April 13, 1936, Serial No. 74,156

3 Claims. (Cl. 138—47)

This invention relates to admiralty condenser tubes, and more particularly to the elimination of longitudinal streaks or defects in these tubes which apparently are the starting points for corrosion of these tubes which cause their failure in operation.

For many years so called admiralty condenser tubes for steam engine condenser purposes for both marine and land station installation have been made from an alloy of copper, tin and zinc. This alloy is generally known as "admiralty" and has approximately the composition of copper 71 percent, tin 1 percent, and remainder zinc. Of course commercial variations from these figures must be expected in practice. Thus for example the copper may vary plus or minus about 2 percent from that given, tin plus or minus about .5 percent, and the zinc plus or minus about 2 percent, or principally comprising the balance. Other elements may also be present in small amounts in the form of impurities which may occur in the copper, tin and zinc. Sometimes a small amount of arsenic is added to retard corrosion and dezincification.

There is a certain microscopic defect which occurs in tubes made of this alloy and which may be seen under a microscope in the form of longitudinal streaks which are thought to be the starting point for corrosion of the tubes in use and which cause their failure. It is a well known fact that condenser tubes usually fail as a result of corrosion and therefore the longer their life the more valuable they are because of reducing the expense for repair and renewal, and reducing the time in which the condenser is out of operation for such purposes.

It is therefore an object of the present invention to greatly reduce and eliminate these defects in the admiralty metal tubes consequently greatly prolonging their life and reducing the liability of corrosion and consequent failure.

In Fig. 1 of the accompanying drawing is shown a portion of a photomicrograph taken of a longitudinal section of an annealed admiralty condenser tube taken at a magnification of about 75 diameters. The longitudinal streaks or defects above mentioned appear as dark streaks or broken lines at 10, and it will be seen they are distributed throughout the metal. In this drawing no attempt has been made to show the outline of all the grains in the metal, only a few of the more prominent being indicated, except at the upper left hand portion of the figure indicated at 11 in which a large proportion of the grains have been outlined. In the actual photomicrograph these are carried in a somewhat similar manner throughout the entire section. The drawing is intended however primarily to indicate the so-called longitudinal streaks or defects 10 which it is the object of this invention to eliminate.

It is not generally known of exactly what these defects consist but it has generally been supposed that they were dross inclusions or drossy areas in the casting which were elongated into streaks in the finished tube distributed throughout the cross section. As these are not found in copper-zinc alloys or alloys not containing tin they have been attributed as being tin dross areas, although as indicated above it is not definitely known whether such is the case. Attempts have been made for many years to eliminate these defects without success.

However, after extended experimentation and research I have found that these defects or streaks can be greatly decreased or completely eliminated by adding to the metal while molten a small amount of a deoxidizer which has a greater affinity for oxygen than has either tin or zinc. This therefore can be termed a superdeoxidized admiralty condenser tube, or that is, what I term a superdeoxidized admiralty condenser tube is one in which the admiralty alloy of which the tube is composed has been deoxidized by a deoxidizer having a greater affinity for oxygen than either tin or zinc has.

As a specific example the addition of about 0.5 percent of manganese to the molten metal completely eliminated for all practical purposes the longitudinal streaks or defects described above. Photomicrographs of condenser tubes made of admiralty metal to which the manganese had been added as described failed to show these defects, and they had a much longer life in operation. The amount of the manganese however may vary, the 0.5 percent being preferred, although practically the same results are secured with from about 0.25 percent to about 0.75 percent, which is the preferred range and is ordinarily sufficient. Sometimes even less than 0.25 percent, down to .01 percent, is sufficient, and an excess of over 0.75 percent and up to about 5% may be used, but ordinarily is not necessary. The manganese can replace a portion of either the copper or the zinc.

There are other deoxidizers or degasifiers which accomplish practically the same results as the manganese, but they should be elements which have an affinity for oxygen or gases greater than zinc or tin have. Such deoxidizers in addition to the manganese include calcium, lith-

ium, beryllium, phosphorus, silicon, etc., and may be used in the approximate proportions above specified. It can be said that these improved tubes are superdeoxidzed admiralty or admiralty metal condenser tubes in that the admiralty alloy of which they are composed has been deoxidized with a deoxidizer or deoxidizers having a greater affinity for oxygen than has either tin or zinc.

Having thus set forth the nature of my invention, what I claim is:

1. A drawn metal condenser tube formed from an alloy comprising about 71% copper, 1% tin, and balance substantially zinc in which certain microscopic defects have a tendency during the process of drawing to perceptibly elongate thereby forming points having a tendency to be attached by corrosion, in which such defects have been reduced by the addition to the molten metal of a small proportion of a deoxidizing and degasifying agent which has greater affinity for oxygen and absorbed gases than that possessed by any of the metals of the alloy.

2. A drawn metal condenser tube formed from an alloy comprising from 69% to 73% copper, 0.5% to 1.5% tin, and balance substantially zinc in which certain microscopic defects have a tendency during the process of drawing to perceptibly elongate thereby forming points having a tendency to be attacked by corrosion, in which such defects have been reduced by the addition to the molten metal of from 0.01% to 5% manganese.

3. A drawn metal condenser tube formed from an alloy comprising about 71% copper, 1% tin and balance substantially zinc in which certain microscopic defects have a tendency during the process of drawing to perceptibly elongate thereby forming points having a tendency to be attacked by corrosion, in which such defects have been reduced by the addition to the molten metal of from 0.25% to 0.75% manganese.

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CERTIFICATE OF CORRECTION.

Patent No. 2,131,437. September 27, 1938.

HERBERT C. JENNISON.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, first column, line 4, for "superdeoxidzed" read superdeoxidized; line 16-17, claim 1, for the word "attached" read attacked; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 13th day of December, A. D. 1938.

Henry Van Arsdale

(Seal)

Acting Commissioner of Patents.

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