One of these substances, namely, $FCCl_3$, has already been measured by Brockway[1]. His values (in A.) are :

Cl–Cl = 2·91 ± 0·03 ; Cl–F = 2·56 ± 0·04 ; F–C = 1·40 ± 0·04 ; C–Cl = 1·76 ± 0·02.

Thus they are very close to those found by us. The results show : (1) that the distance C–F remains very nearly constant in both compounds ; (2) that the distance C–Cl shows the same value in all compounds containing $C–Cl_3$ with the exception of $C–Cl_4$; the same conclusion is valid for C–Br ; (3) going from $FCCl_3$ to $FCBr_3$, the pyramid CX_3 expands with a factor 1·088. A factor 1·075 may be used in passing from $HCCl_3$ to $HCBr_3$, and also in passing from $HSiCl_3$ to $HSiBr_3$ [2].

A more extended discussion of these data will be published elsewhere.

J. WOUTERS.
M. DE HEMPTINNE.

Physical Laboratory,
University, Louvain.

[1] Brockway, L., *J. Phys. Chem.*, **41**, 2, 185 and **41**, 5, 747 (1937).
[2] de Hemptinne, M., and Wouters, J., NATURE, **138**, 884 (1936). Wouters, J., de Hemptinne, M., and Capron, P., *Ann. Soc. Scient. Brux.*, **57**, 25 (1937).

A New Type of Structure in the α-Copper-Zinc Alloys

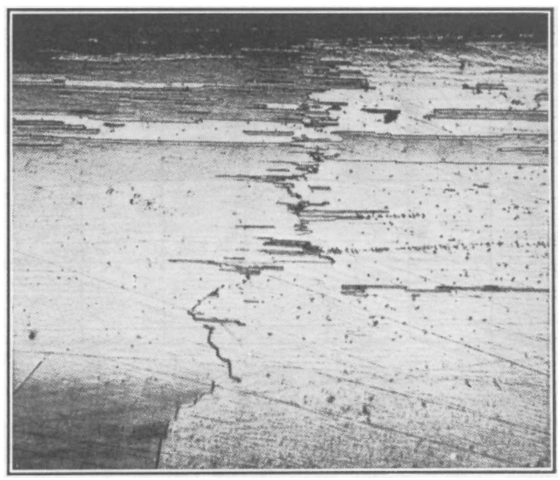
CERTAIN banded structures seen in cast α-brass after annealing have been identified by several investigators as true twins. Recently we have made an observation which suggests that there may exist structures that appear to be twins, but that are not twins. The observations were made upon two large cast copper crystals joined at a natural boundary which lay almost perpendicular to the external surface of the sample. Into this bicrystal, zinc was diffused by exposing it to the vapour from α-brass turnings at a temperature of 775° C. The system was enclosed in an evacuated silica tube. Zinc penetrated to a uniform depth over the entire surface of the specimen and gave a layer of perhaps half a millimetre of yellow brass.

Upon examination of a cross-section of the bicrystal, it was found that the grain boundary of the copper crystals had been disturbed within the zone of zinc penetration. In some regions along the original boundary, local recrystallization had occurred ; but in others a peculiar type of grain growth appeared with the complete absence of new crystal formation. In the latter case the two grains were seen to have grown into each other in long parallel finger-like bands, greatly resembling twins (see accompanying photomicrograph), and leaving a much lengthened boundary running back and forth in zig-zags nearly parallel to the external surface of the sample. The breadth of the fingers thus formed was irregular, but in general was seen to be least near the surface of the sample and greatest at the limit of the yellow brass zone, beyond which the original boundary remained undisturbed.

It was at first surmised that this remarkable structure might have resulted from the highly improbable occurrence of the two grains of the bicrystal in a mutually twinned relationship, with their orientations such that a twinning plane lay parallel to the external surface. This situation could conceivably permit the two crystals to grow into one another in long bands by the simple operation of twinning. By means of an X-ray determination of the orientations of the two crystals, it was shown that they did not bear a mutually twinned relationship. In fact, the nearest approach of octahedral planes (twinning planes) between the two crystals was eight degrees. The bands, therefore, are not twins, but simple projections of one crystal into the other.

In all probability this displacement of the grain boundary can be traced to a periodic crystal growth induced by the strains set up within successive layers of the copper by the expansion required to accommodate the inwardly diffusing zinc. Presumably, the direction of growth is a matter of chance in each successive step, for the projections are distributed about equally on the two sides of the original boundary. Upon the basis of this hypothesis, it is to be expected that the bands would be narrowest near the surface of the sample, because in that region the concentration gradient of the zinc would be the steepest.

To the foregoing observations it may be added that in the present studies recrystallization and grain growth resulting from diffusion have been observed adjacent to flat surfaces and at sharp corners, but not in samples having convex surfaces.



IRREGULAR BOUNDARY OF A COPPER BICRYSTAL IN THE ZONE OF ZINC PENETRATION. MAGNIFICATION 100. ETCHED WITH AMMONIA AND HYDROGEN PEROXIDE. NOTE : THE LONG BANDS NEAR THE SURFACE EXTEND BEYOND THE FIELD OF THE PICTURE. THE ISOLATED BANDS ARE BELIEVED TO BE SECTIONS OF TONGUES COMING FROM ABOVE OR BELOW THE PLANE OF THE PICTURE.

The banded structures have been found in a number of different samples. Whether or not its occurrence requires the existence of special orientation relationships between the participating crystals could not be determined from the few data at hand. Although it seems likely that the diffusion occurring during the homogenization of cast α-brass could establish conditions similar to those existing in the bicrystals, this structure has not yet been definitely identified by us in a polycrystalline brass. Some of the bands seen in technical homogenized α-brass may well be this structure !

F. N. RHINES.
A. M. MONTGOMERY.

Metals Research Laboratory,
Carnegie Institute of Technology,
Pittsburgh. Jan. 10.