SURFACE TOPOGRAPHY. The purpose of electrical contacts is to allow electrons to flow freely from the atomic lattice of one contact member to the atomic lattice of another member. This flow of electrons takes place in a manner that can best be visualized by considering the topography of the surfaces involved.

First we must recognize that practical surfaces are quite rough when compared to atomic or molecular dimensions. Metals have atomic dimensions of only a few å (Angstroms), at most about 10^-8 inches. Obviously, a surface smoothness in this order of magnitude does not exist in the mechanically produced surfaces in engineering use today. Even if it were possible to produce such smoothness, it would be destroyed the first time two such surfaces were forced together and then separated or subjected to sliding.

A magnified metallic surface, ideally clean, will appear as shown in Fig. 1-1. In visualizing this surface, please notice that the vertical magnification is ten time that of the horizontal. This means that the actual slopes on the hills and the valley are more gradual than pictured. But the hills and valleys are very real, so that when two surfaces similar to this are brought together, they will first touch on just a few asperities, as pictured in Fig. 1-2. Even as the asperities deform due to localized high pressures as force between the members is increased, the majority of the space at the contact interface is occupied by air or the gas of the local environment.

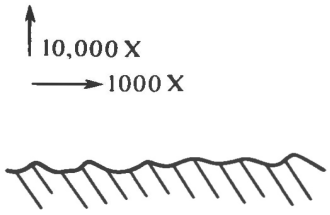

Fig. 1-1. Magnified cross section of metallic surface.

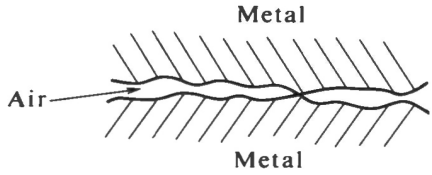

Fig. 1-2. Touching surfaces.