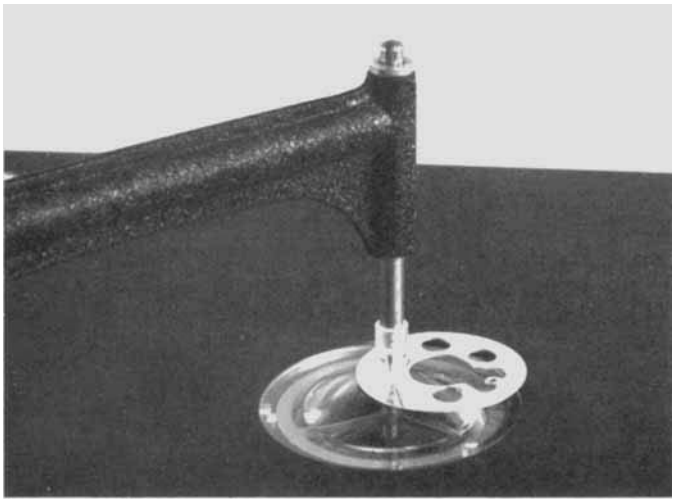

Fig. 4 A close-up view of the measuring head being used to determine the thickness of a rhodium electrodeposit on nickel

contact applications, can be measured, but because the atomic numbers of rhodium and silver only differ by one the unit cannot distinguish between them.

A fuller account of the development of this equipment and of its applications not only to the platinum group metals but also to other metals will shortly be published elsewhere (2).

References

1 B. S. Cooper and W. Westwood, *B.P. Appln.* 5942/65

2 S. P. G. Melrose and B. S. Cooper, *Trans. Inst. Metal Finishing*, in the press

Osmium-coated Tungsten Cathodes

Thermionic valves, and a number of related devices such as klystrons and magnetrons, depend for their operation on the control of a stream of electrons generated by a thermionic emitter. A common form of emitter consists of a porous tungsten substrate in association with a reservoir of barium calcium aluminate which, by mutual reaction, provides a supply of barium to the emissive surface.

The total work function of the assembly depends on the work functions of both the substrate and the adsorbate and on the degree of surface adsorption and, as it is considered that no better adsorbate than barium exists, attention has been directed in recent years towards alternative substrates.

Recent theoretical work led to the prediction that, paradoxically, a higher work function of the substrate could lead to a reduction in the total work function of the whole system and, in a recent paper by P. Zalm and A. J. A. van Stratum, of the Philips Research Laboratories (*Philips Tech. Rev.*, 1966, **27**, (3/4), 69–75), results are given for systems in which rhenium, ruthenium, iridium and osmium were investigated, the metals being applied as thin coatings to the tungsten substrates. It was confirmed that the work function of the emitter decreased as the work function of the substrate coating increased and more detailed investigation of the most promising assembly containing osmium revealed that the reduction in work function was so marked that, for example, at 800°C a current density ten times that of a normal cathode was possible.

It is considered that the use of osmium cathodes with their higher performance will be of considerable practical advantage in magnetrons, reflex klystrons and disc-seal triodes and further, as a consequence of the lower operating temperature for a given performance, these cathodes may find application where the expense of initial purchase and replacement is an important consideration.

During this investigation the work functions of iridium and osmium have been determined as 5.50 ± 0.005 V and 5.93 ± 0.05 V respectively, and although the work function of ruthenium was not determined it is known to be in excess of that of tungsten at 4.54 V.

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