I have tried many experiments, such as leaving exposed and unexposed films in contact under pressure, but have not been able to detect any sign of mutual interaction, though it seems not impossible that some action of the kind may take place in the closer contact between adjacent particles of bromide in the same film.

The great size of the developed patch compared to that of the 'spurious disc,' should be borne in mind when attempting to determine the position of a star from photographs or gelatine plates. A somewhat parallel case would be to attempt to determine the centre of a blank target six feet across to within half an inch, by taking the mean position of a group of shots fired at six hundred yards. The result might be right by accident, but it would show want of judgment to found any conclusion on it which depended on, or assumed an accuracy of, the order referred to.

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Laboratory Uses of Monel Metal.

MONEL metal is an alloy containing approximately 67 per cent nickel, 28 per cent copper, and 5 per cent other metals, which is made from a natural ore mined in Ontario, Canada. It is of great utility in cases where resistance to corrosion is important. Its chief properties and commercial uses are described in a booklet issued by G. and J. Weir, Ltd., Cathcart, Glasgow. Now, although monel metal is a well-known article of commerce, it does not appear to have found particular application in physical laboratories, and the object of this letter is to direct attention to its possibilities in this connexion.

In the first place, monel metal is ferromagnetic and possesses such a low magnetic critical temperature that it may conveniently be used for a laboratory experiment to illustrate the loss of ferromagnetism with rise in temperature. The magnetic critical temperature varies from specimen to specimen, and is stated to lie between 100° and 150° C. This appears to apply to specimens in the form of the stout bars supplied commercially, but specimens in the form of anchor rings of diameter 10 cm. and 1 cm. thickness supplied to us possess critical temperatures of 70° C. The induction of such an anchor ring may be measured by the ballistic method at different temperatures, the ring being immersed in a bath of B.P. paraffin, and good results are obtained if the magnetising current is not allowed to heat the specimen. The student must possess a certain amount of skill in order to obtain a satisfactory hysteresis curve by the ballistic method, as the temperature of the specimen must be kept constant. The retentivity of our anchor ring specimens was 670, and the coercive force 1·8 gauss.

Monel metal is also very satisfactory in the following experiment. The weight of a drop of liquid falling from the lower side of a horizontal flat circular tip may be represented by the equation $m=KrT$, where m is the weight of the drop, r is radius of the tip, and T is the surface tension of the liquid. It is well known that K is not a constant for any given liquid, but varies with r. The variation of K with r for a given liquid may be investigated by using tips of different radii. This was done by Rayleigh and others, and very carefully by Harkins and Brown (*Jour. Amer. Chem. Soc.*, vol. 41, p. 499; 1919), who used a series of brass tips and one tip of monel metal. The experiment forms an excellent demonstration of the fact, very often not made clear in text-books, that the shapes of drops hanging from tips of different radii are widely different.

Tips of monel metal can be prepared without much trouble, whereas glass tips require great care in grinding, and other metals suffer corrosion. A useful series of tips consists of seven with the following radii: 0·94, 0·87, 0·75, 0·60, 0·45, 0·30, and 0·13 cm. The hole in the middle of the horizontal face may conveniently be of 1 mm. diameter. As water does not wet polished monel metal, the surface must be suitably roughened. Harkins and Brown ground their metal tips with medium carbonundum powder, but the monel metal surface may be very rapidly prepared by immersing it for a few seconds in concentrated nitric acid, washing it in water for a few minutes, and then placing it in chromic acid, which attacks it slowly. The surface is then free of grease, and the liquid to be investigated should spread over the face of the tip but not upon its sides. The liquid is fed into the tip at such a rate that drops are not formed more quickly than about one in two minutes. It should be possible to level the tip, for its lower face must be accurately horizontal, particularly if the tip is large. Precautions should be taken against evaporation and the drops should be collected in a weighing bottle. The smooth curve reproduced here (Fig. 1) was obtained with water; for comparison, the

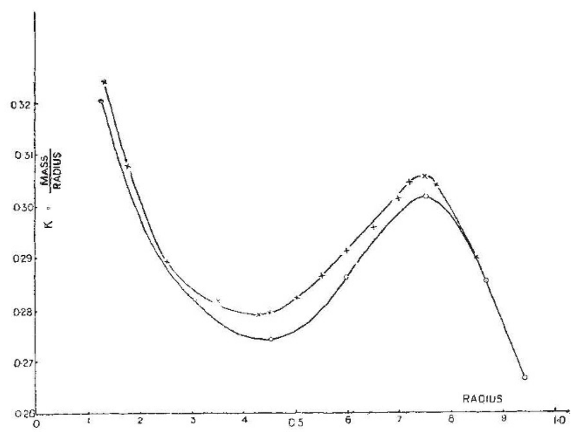

FIG. 1.

results of Harkins and Brown are also reproduced by the broken curve, the point common to both curves being obtained with their monel metal tip. Different liquids, of course, give curves of different shapes.

Monel metal may further be used in making jets for the determination of surface tension by Jaeger's method. It is particularly useful with mercury and molten metals which do not amalgamate with it. If glass is used, one is usually forced to rely upon a happy fracture in obtaining a satisfactory jet, but monel metal may be drilled and turned to any dimensions with precision. After a few bubbles have been released, the pressure required to release a bubble becomes quite constant in the case of mercury at air temperature, a value of 477 dynes per cm. being obtained for the surface tension, assuming that the bubble is formed on the outer edge of the jet. This value agrees well with that obtained by other observers using the same method. Moreover, it is possible with a monel metal jet to investigate the behaviour of the surface tension with temperature up to the boiling-point of the mercury.

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