Map Reproduction.

MAPS published by the Survey of India are usually printed in several colours. Lettering, railways, boundaries and non-perennial water features are printed in black; towns, villages and communications in red; perennial water in blue; vegetation in green; cultivated areas in yellow; contours in brown; stump-shading to show up hill features in grey; boundary ribands in various colours. Each of these colours has to be printed separately on to one sheet of paper, and it is obviously essential that each colour should be in its correct relative position with regard to the other colours; known technically as being " in register ".

In the method at present used in the Survey of India correct registration of the more important detail is ensured by inking up on one sheet of drawing paper all the black, red and blue detail, in *black*. This is the " outline original ".

Three identical photographic negatives of the outline sheet are prepared. The black, red and blue detail appear on this as clear lines on a black background. From each of these negatives the detail referring to two of the colours is painted out, or "duffed ". That is, on the black negative all the detail which will finally be printed in red and blue is duffed out; on the red negative all detail which will be printed in black and blue is duffed: and so on. This process is called " colour separation ". From these negatives printing plates are prepared, one for each colour. As these have been prepared from identical negatives registration is exact.

Separate originals are drawn in black for the contours, vegetation, etc., and printing plates are prepared from these and all the detail is then printed, each in its own colour, to produce the finished map.

Another method of carrying out colour separation is to make three identical printing plates with a temporary image from a negative of the outline sheet. A litho draftsman then inks up one plate for each colour, using the temporary image as a guide. This method is used in the Ordnance Survey Offices in England.

An alternative method is to ink up in black on blue prints showing all the detail, a separate original for each colour to be printed, photograph these and prepare printing plates, one for each colour. This would avoid having to carry out colour separation, which is a long and laborious process by either of the methods described above. The disadvantage of having separate originals is inherent in the qualities of drawing paper. Paper expands and contracts under different climatic conditions, and the detail on the separate negatives and printing plates prepared from separate originals would be distorted, and correct registration of the different colours would be extremely difficult in printing. If, however, the separate originals can be drawn on some non-distorting material separate originals can be used and the operation of colour separation could be eliminated. A further advantage would be obtained by the use of separate originals drawn on non-distorting material when dealing with new editions of maps. Corrections for new editions are carried out on the originals on drawing paper. The corrections may affect only some of the printing plates, but owing to further distortion of the paper since the previous plates were prepared, the fresh plates will not fit the old plates, and a complete new set of plates has to be prepared, involving the carrying out of colour separation again. If a separate original for each colour were available on non-distorting material, only the plates referring to the particular colour to be corrected would have to be made again.

The first great essential, therefore, to the speeding up of the reproduction processes and the quick reproduction of new editions is to find a non-distorting material on which separate originals can be drawn. Drawing paper in addition to distorting, is liable to turn yellow with age, and its surface does not stand constant erasures required for making corrections for new editions.

All survey departments all over the world are interested in this problem. In Canada all their originals are mounted on zinc sheets and on the West Coast of Africa they are mounted on 3 ply-wood. The extremes of the Indian climate, heat, cold and damp, rule out these methods for use in India. There are some originals in Calcutta mounted on zinc that are about 20 years old and they have gone nearly black owing to some action between the metal and the impurities in the paper. 3 Ply-wood warps badly in some cases in this climate.

The Agfa Company has produced a photographic paper which has a base of aluminium foil and which is free from distortion. So far as it goes this is excellent but we have been unable to get a similar paper with a suitable drawing surface. Experiments have therefore been carried out in mounting paper on aluminium. It was for a long time impossible to get any adhesive to stand up to the extremes of climate occurring in India. Two fairly satisfactory ones have now been found but one of these fails in the heat and the other is liable to cause corrosion of the metal. The paper makers blame the adhesive for this corrosion and the aluminium manufacturers blame the paper-makers. Further adhesives are still under trial and some firms are also attempting to produce a suitable material.

Even when the paper has been satisfactorily mounted on the metal only the distortion has been eliminated and the drawbacks of the paper itself remain.

Experiments are now being carried out both here and in the Ordnance Survey in Southampton, in drawing on the metal itself or on an enamel surface on metal. These seem very promising but no finality is in sight. Enamel may turn yellow and also it may strip off the metal. The surface of the metal may corrode, if direct drawing is done on it.

What the map-maker aims at is one original for each colour printing plate, drawn on some non-distorting material and with a surface on which corrections can easily be made.