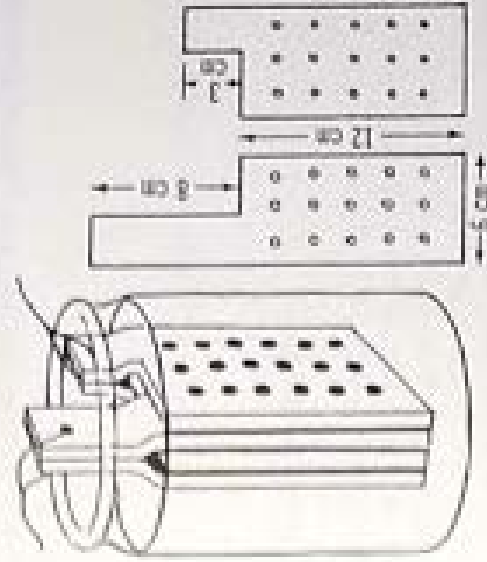


Separators of wood, about 5 mm thick, the same as before but with holes drilled in them, will be required.



Assemble the plates by fastening the two negative plates together and holding in the separators, etc., by a rubber band, or a piece of string. Insert the whole into a jam jar filled with dilute sulphuric acid (S.G. 1.5), so as to just cover the plates.

The cell should be charged as before. When charged, the positive plate will be a red-chocolate colour, and the negative plate a light grey.

7 Electro-plating nickel and copper

Electro-plating is now familiar to everyone. It is done by forming a layer of metal on the object which is used as a cathode in a voltameter containing a salt of the metal to be deposited. To get lasting results the object must be carefully cleaned and degreased; the correct anode must be used, and the solution must be carefully prepared and used at a temperature of about 50°C. The copper anode used for copper plating and the nickel anode for nickel plating need only be degreased. The following baths have proved satisfactory.

Copper	Nickel
Cupric sulphate 200 g	Nickel sulphate 240 g
Sulphuric acid 60 g	Nickel chloride 54 g
Water up to 1000 ml	Boric acid 30 g
	Water up to 1000 ml

Copper plating. Pour the electrolyte into a jar and immerse in it a strip of copper which serves as an anode. Clean a sheet of brass with fine emery cloth, and degrease it with a mixture of magnesia and water on a wad of cotton wool. Rinse it in water, immerse it in the bath and connect it to the negative terminal of a 3-volt torch battery.

solution to serve as an anode, facing the mould. Connect to a 3-volt torch battery through a small rheostat and leave it overnight. The next day a good strong layer of copper will have been deposited. Strip this from the

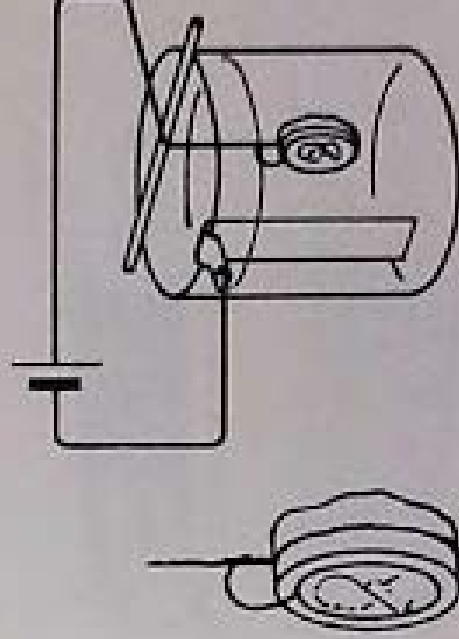
Complete the circuit by joining the anode to the positive pole of the battery. Note the deposit of copper produced. Too heavy a current may result in a spongy deposit; the correct value for a hard deposit is 4 amperes per 100 cm² of area.

Nickel plating. Use a strip of copper as a cathode, cleaning and degreasing it as before. A nickel spatula can be used as an anode, but if this is not available a strip of lead may be used; this will mean that the electrolyte becomes weaker during use. Join up to the battery as before, when a good deposit of nickel will be obtained. The surface, after washing, can be polished using jewellers' rouge or cigarette ash on a piece of soft cloth.

8 To copy a scout badge or medal by electrolysis

This process, called electrotyping, is much used in industry. A mould is made of the object to be copied. This is then made conductive by various methods and a shell of this impression is made by depositing copper on it electrolytically. The object is removed from the mould, and the copy is strengthened by pouring typemetal into it.

First warm the badge in a clean bunsen flame and make an impression on the end of a short piece of candle or alkathine rod. Make the surface of the mould conducting by scraping some lead from a pencil over it, or by coating it with colloidal graphite. Another way to do this is to scatter some iron filings over it after moistening it with copper sulphate; the copper will displace the iron and cover the surface of the mould with a layer of copper. Now heat a piece of copper wire and press it into the wax in such a way that connexion is made to the conducting surface without disfiguring the shape. Use the wire to hang the mould in a copper-plating bath. Also suspend a strip of copper in the



mould, and if necessary strengthen it by pouring molten solder into the back of the shell. Trim the badge with a pocket knife and solder a safety pin to the back. If desired it can now be plated as in the last experiment.