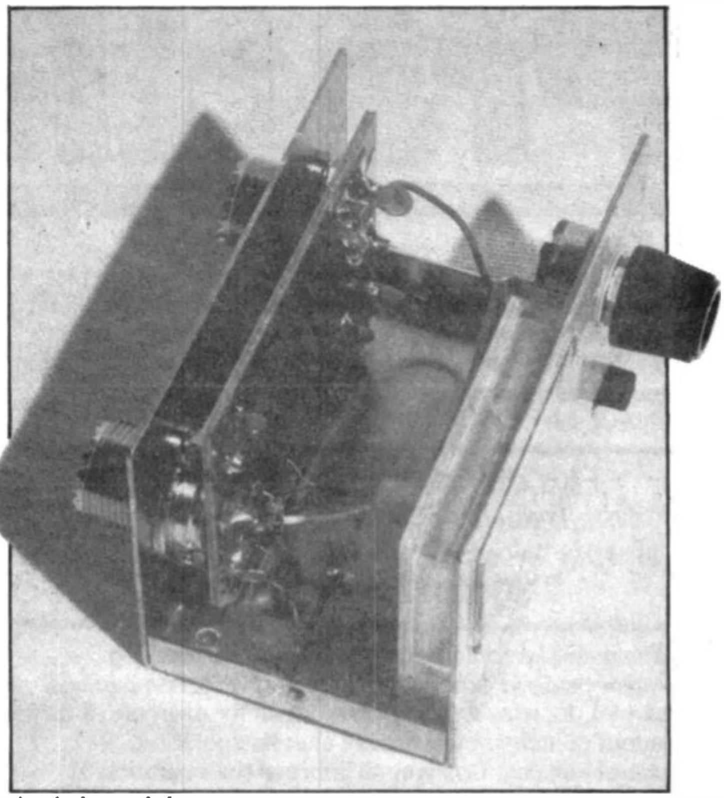
ferric chloride will start to etch under the etch resist! The etch resist or 'dope' can then be removed by gently using a Brillo pad, which will also clean the surface of the copper. If there are any areas that cannot be cleaned using a Brillo pad then nail varnish remover may be used. The board is now ready to be drilled and then used. For most component locating holes a 1mm or number 60 drill is suitable.

If a double sided board is used then the upper side can be used as an earth plane. If this is to be done then the whole of the upper surface must be protected from being etched. When the component holes are drilled they should be countersunk slightly on the earth plane side so that the component leads do not short onto it. Very often when one is to use a double sided board the circuit will involve RF and screening between the different stages becomes advisable. Screens can very easily be put onto a double sided board as shown in **Fig.1**. A section of double sided board is cut to size and soldered onto the main board. The screen should be soldered both sides and along the total length of the joint. This provides a screen which is both electrically well bonded to the board earth and mechanically strong.

The results I have obtained using this method have been quite satisfactory, especially when constructing VHF equipment — when the earth plane is especialy useful. It should be said that the results will not look quite as pretty as if the 'professional' photographic method had been used but it does make a very good second best — and at a fraction of the equipment outlay.



Ian's bargain!

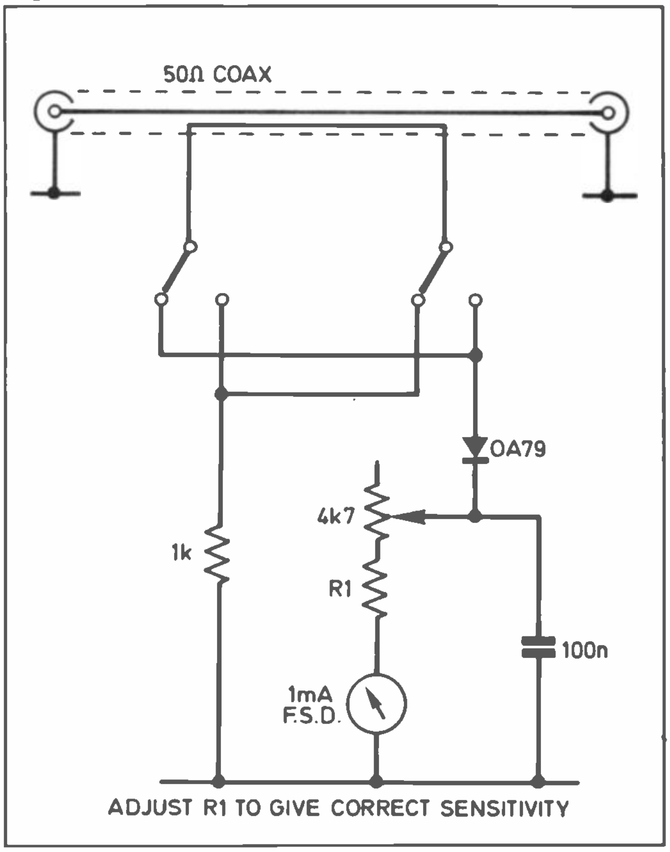
Economy SWR Meters

Some time back I was looking for a cheap SWR meter just to get my HF station up and running. The cheapest ones that I could find from the amateur outlets were around the £10 mark or more. However I did notice in a CB shop one day a meter for around £7. A quick look at the specification showed that it would work satisfactorily on all the HF bands and so I bought it. Since then, I have used from 10 metres down to 80 metres with my 100 watts output passing through it with no problems, although I would not like to pass much more through it. Therefore, it is worth bearing in mind that some CB equipment can be pressed into amateur service — if a little care is taken to ensure that the specifications are suitable.

It is probably worth mentioning at this point some of the limitations of the cheaper SWR meters. The most obvious limitation will be the sensitivity. Owing to the fact that the cheaper SWR meters are of the 'reflectometer' type of design their operation will be found to be very frequency dependent. As the sensitivity of SWR meters falls off with decreasing frequency trouble may be experienced, on 160 metres for example, when trying to obtain full scale deflection whilst remaining within the legal limit!

The second and less obvious limitation will be the accuracy. A typical circuit for an SWR bridge is shown in **Fig.2** and this particular circuit provided good service a few years back when I used it at VHF. However, without delving into the operation of these meters which is quite complicated, they do become very inaccurate at SWR levels of greater than 2 or 3 to 1.

Fig.2. Circuit of a simple VSWR meter.



Despite these disadvantages a cheap SWR meter can be put to very good use, as their accuracy is sufficient for most uses especially if their limitations are known. I have not found the need to spent £40 or more on one of the deluxe models. If however one is interested in greater accuracy a type of meter which is frequency independent and known as a "reflected power meter" should be used, but these are considerably more expensive to buy.