over contacts A, A[1] of a two-way multi-contact switch TWM, whilst the – end is connected to the break contacts of the same switch. The terminal G*d* which is to be connected to the grid of the valve under test, is connected to the movable contact A*x* of this set of contacts in a manner such that when the switch is thrown in one direction, marked MC, the + end of L*s*3 is connected to G*d*, when the switch is in the central position the – end is connected to G*d* and the + end disconnected, and when the switch is thrown to the position marked INS the end will be connected to G*d* over the make contact associated with contact A and the – end will be disconnected. Consequently, by means of this winding and set of contacts, the phase of the voltage impressed on the grid may be reversed at will. One volt A.C. is applied to the grid of the valve initially out of phase with the other electrode voltages. This will give rise to uni-directional anode current which is measured on the D.C. milliammeter ME. This current is then backed off to zero by means of a set zero control V described later. When the grid phase is reversed its potential is changed from 1 volt out of phase with the anode voltage to 1 volt in phase with the anode voltage. This gives rise to a change in D.C. anode current similar to that obtained when D.C. grid potential is used, and works in a perfectly satisfactory manner.

The value chosen gives an all round accuracy of mutual conductance reading which completely fulfils the requirement of the instrument.

The fourth winding L*s*4 is connected across a resistance V1 of a variable resistance V, the purpose of which will be described later. One end of this secondary winding is also connected through the central contact B*x* of the set of contacts B the two-way switch TWM, resistance *ma*/*v* of a potentiometer MA/V, a resistance V*x* of suitable value (say 40 ohms), the DC milliammeter ME, to the central contact D*x* of the contact set D operable by the two-way switch. These last named elements are all in series. The central contact B*x* of the set B normally closes a circuit to the movable contact of the rotary switch A*n*. The said movable contact can be connected by the front contact B*y* of the set B and through a condenser of, say, 0.05 MF, to a contact 75 of the screen multi-contact rotary switch S*c* and to a tapping 75 of the winding M*s*. The contacts of the switch S*c* are supplied with current from the winding M*s* for connection to the valve screen. The voltages selected on this switch are such that the R.M.S. A.C. potential supplied to the screen is numerically equal to the normal required D.C. voltages therefor, except that for an L.F. pentode screen the A.C. voltage applied will be 1.4 times normal D.C. voltage. The central contact D*x* of set D is in one position normally connected through its contact D*s* to one end of the resistance *ma*/*v* whilst through its front or make contacts D*y* it can be connected through a resistance D*o* of, say 0.1 megohms to the end 0 of the secondary winding L*s*1 and to the terminal LT –.

When the initial potential for example—1 volt D.C. or 1 volt A.C. in phase opposition is applied to the grid and the anode current is given on the meter, it is desirable to balance out or " back off " this current so that the meter pointer is brought back to zero and the reading given when the second potential, for example + 1 volt D.C. or 1 volt A.C. in phase is applied to the grid will then be the difference in anode currents. In order to provide this " backing off " between $\frac{1}{4}$ *m*/A and 80 *m*/A with a constant 20 volt supply, a single variable resistance, if used, would have to be variable from 250 ohms to 80000 ohms, and from the curve (Figure 4) it will be seen that $\frac{3}{4}$ of the angular rotation of a contact arm for varying it would then be taken up with a variation of only 1000 ohms, allowing only $\frac{1}{4}$ of the angular rotation for the remaining 79000 ohms.

To obtain a constant " backing off current/angular rotation " ratio a device has been provided in which although the characteristic is not quite linear, is near enough for ease of handling and allows the use of components which are comparatively easy and cheap to manufacture. The desired steep change in slope is obtained by using a variable series resistance element, the resistance of which per degree of angular rotation increases rapidly, coupled to a variable voltage source element such as a potentiometer the voltage/angular rotation characteristic of which decreases as the variable resistance increases. The two elements are coupled in a manner to be explained later and are called the "set zero " control.

In the embodiment shown in the drawings current is taken from the winding L*s*4. The variable resistance V comprises a potentiometer element V1 and adjacent thereto a second resistance winding V2 both traversed by a sliding element V3 pivoted at V*s*. The potentiometer winding is shaped so that the increase in resistance is not linear as the slider is moved but so that the rate of change of volts becomes greater as the backing off current is increased. V2 is also shaped so that the change of resistance per degree of