



LXXIII. The use a triode valve in registering electrical contacts

G.A. Tomlinson B.Sc.

To cite this article: G.A. Tomlinson B.Sc. (1922) LXXIII. The use a triode valve in registering electrical contacts , Philosophical Magazine Series 6, 44:263, 870-872, DOI: [10.1080/14786441208562560](https://doi.org/10.1080/14786441208562560)

To link to this article: <http://dx.doi.org/10.1080/14786441208562560>



Published online: 08 Apr 2009.



Submit your article to this journal [↗](#)



Article views: 1



View related articles [↗](#)

LXXIII. *The Use of a Triode Valve in registering Electrical Contacts.* By G. A. TOMLINSON, B.Sc.*

A THREE electrode valve can be applied with advantage to certain forms of apparatus in which use is made of electrical contacts. A common case is that of a relay in which it is usual to cause a feeble movement of one instrument to make a contact and close the circuit of a second comparatively powerful instrument supplied from an independent source. An improvement in several respects can be made if the first contact is placed in the grid circuit of a valve, and the second instrument is connected in the anode circuit and is operated by the anode current.

An arrangement used by the writer is shown in fig. 1.

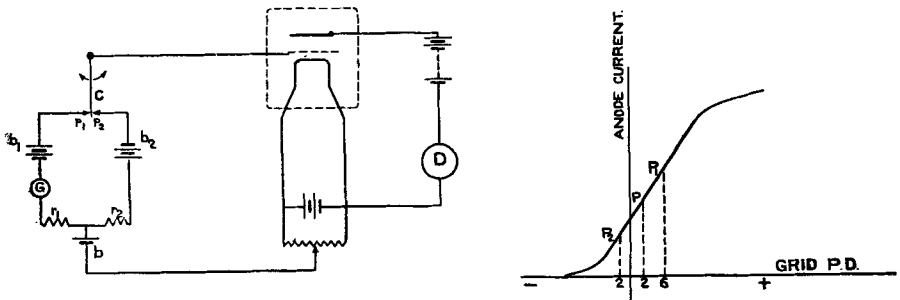


FIG 1

A small tongue of platinum C is moved by the first instrument between two platinum points p_1 and p_2 , and on making contact either raises or lowers the potential of the grid by about 4 volts by introducing the batteries b_1 or b_2 .

The reaction on the anode current, which is illustrated by the diagram of the valve characteristic, operates the instrument D. Thus the points P_1 and P_2 show the anode current when the tongue is in contact at p_1 and p_2 , the difference being the range of current available, which is about 3 milliamperes. The actual values of the grid potential are adjusted by the battery b to vary between -2 and $+6$ volts, to obtain the best range of anode current.

In this particular case the relay is required only to detect small angular movements of an instrument in either direction from the zero position, and the instrument used in the anode circuit is a pivoted moving-coil galvanometer.

* Communicated by the Director of the National Physical Laboratory.

The resistances r_1 and r_2 in the circuit enable a fine adjustment of the points p_1 and p_2 to be made. These points can be advanced by micrometer screws until both just touch the platinum tongue. This contact can be observed by temporarily inserting the galvanometer G in the circuit. The E.M.F.'s of the batteries b_1 and b_2 act in the same direction in this local circuit, and with suitable resistances r_1 and r_2 a small local current flows when p_1 and p_2 are both in contact. The points can then be separated by any desired amount. The resistances r_1 and r_2 also prevent a short circuit if an accidental contact is made from p_1 to p_2 .

A relay of this type has several advantages. The current to be transmitted through the contacts is very small, being only the grid current of the valve. Variation in the resistance of the contact within wide limits has no effect on the action, owing to the great resistance already in the circuit between the grid and the filament. The amplification of mechanical power, which is the function of a relay, is provided for by the electrical amplifying properties of the valve. A further advantage, that may be important in some cases, is that this relay may be operated by much weaker forces than could be used with an ordinary relay. In the latter type the contact is placed directly in the circuit of the second instrument, and a certain contact pressure is necessary to ensure the passage of sufficient operating current. With the valve relay an extremely light contact between clean platinum surfaces is sufficient to charge the grid of the valve, and very weak forces will therefore work the relay in a satisfactory way. Thus it has been found that a contact force of 0.000001 grm. is quite sufficient to charge the grid and produce the required change in the anode current. Since there is practically no current transmitted by the contacts, there is no objectionable coherence of the surfaces, and the movement of the contact tongue can be reduced to a very small amount if desired. For example, the relay has been operated with the travel of the tongue only about 1/1000 mm.

Certain modifications to meet different requirements may be suggested. If the contact is for any reason intermittent, a comparatively steady current may be obtained in the anode circuit by connecting a suitable condenser across the grid and filament. A high-resistance grid-leak may be used if it is desirable for the anode current to assume its normal value immediately the contact in the grid circuit is broken.

The writer has also made some experiments, using an electrical contact in the way described for quite a different

purpose, namely as an indicator for precise measurement. A compound lever with a magnification of about 600 was arranged to be moved by a micrometer at the one end, and carried the contact at the other end. Using this to measure the thickness of a parallel slip-gauge with the lower face resting on three steel balls and the contact on the upper face, it was found that repetition of observations could easily be obtained with variations not exceeding 0.5×10^{-6} inch. These experiments indicate that the advantages obtained by making contact in the grid circuit of a valve may eliminate some of the difficulties hitherto experienced in this method of measurement.

This method appears to have advantages in connexion with the reception of feeble wireless signals with the aid of a relay ; and it is also proposed to try it, on account of its freedom from sparking at the grid-circuit contact, in connexion with the location of the height of the mercury surface in the vacuum space of a standard barometer.

July 1922.

LXXIV. *Radiative Equilibrium : the Insolation of an Atmosphere.* By E. A. MILNE, M.A., Fellow of Trinity College, Cambridge*.

§ 1. *INTRODUCTION.*—The generally accepted theory of the existence of the earth's stratosphere was put forward in 1908 by Gold†. Gold showed that when radiation processes were taken into account the continued existence of an adiabatic gradient to indefinitely great heights was impossible ; for the upper portions of such an atmosphere, being very cold, would radiate very little, but on the other hand, being backed by an extensive cushion of warmer air besides the warm surface of the earth, would be subjected to low-temperature radiation of considerable intensity, and the consequent excess of absorption over emission would raise their temperature and so disturb the adiabatic gradient. Such upper portions, however, could not exchange heat with the rest of the atmosphere by convection, for they would tend to rise, not fall. Consequently

* Communicated by the Author.

† "The Isothermal Layer of the Atmosphere and Atmospheric Radiation," Proc. Roy. Soc. 82 A. p. 43 (1909). A preliminary announcement was made at the British Association meeting in 1908 ; see 'Nature,' vol. lxxviii. p. 551 (1908). See also Geophysical Memoirs, No. 5 (Met. Office), vol. i. p. 65 (1913).