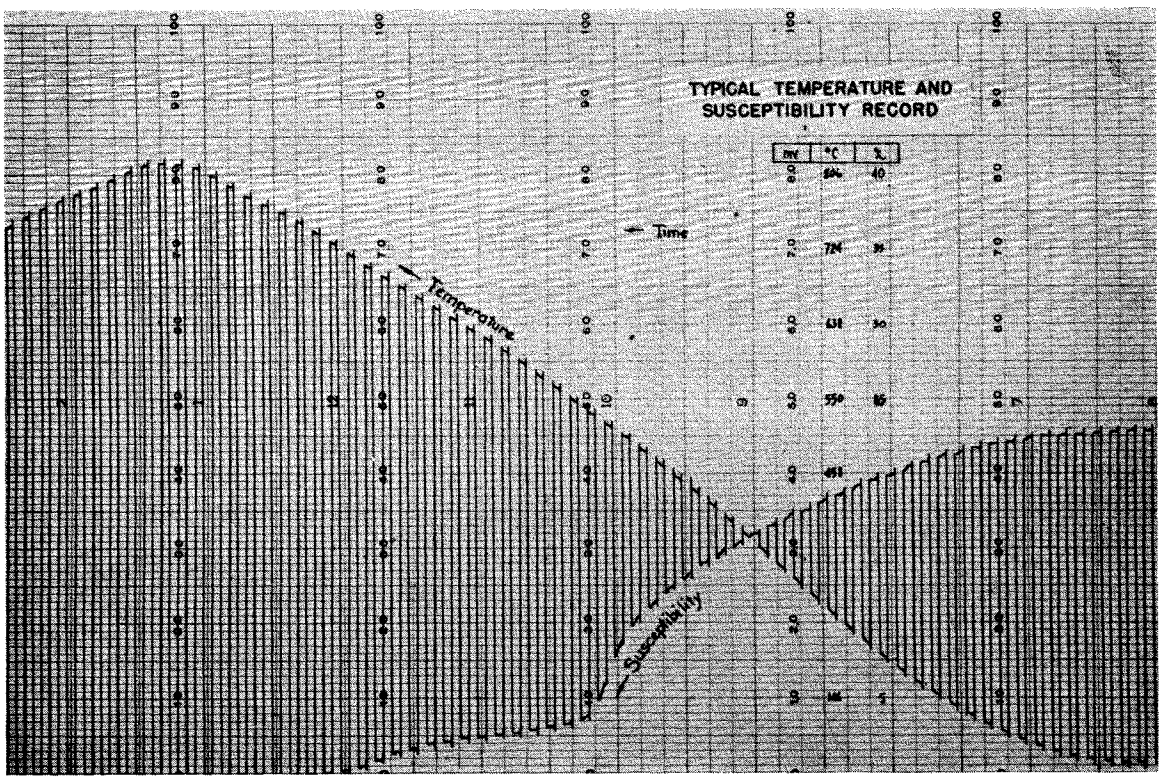

FIG. 3.

justable resistor R_1. Since the susceptibility of a sample in a constant magnetic field is proportional to the force it experiences, the output voltage of the helical potentiometer, the voltage across r, is made to bear a simple relationship to the magnetic susceptibility by adjusting the resistance R_1 until $Er/(R+R_1)=10^{10}\chi$ millivolts for a sample having a susceptibility χ.

This output voltage and the output voltage of a platinum *vs.* platinum-rhodium thermocouple in contact with the sample are alternately recorded by a single-point pen recorder.[2] This is accomplished by two microswitches operated in unison as a DPDT snap switch by a two-lobed cam attached to an electric clock motor. The circuit diagram is shown in Fig. 2.

A continuous line two-point record is obtained as the pen swings from one voltage to the other. Two smooth curves, the curves of the time variation of temperature and of susceptibility, are obtained by joining the points of maximum deflection and the points of minimum deflection. Points on the temperature curve can be correlated with corresponding points on the susceptibility curve to yield the usual plot of susceptibility against temperature. When the temperature of the sample is increased at a uniform rate, the susceptibility curve has the same shape on the recorder tape as on the subsequent susceptibility plot which facilitates the interpretation of the data as they are recorded. Figure 3 shows a typical record obtained from a mixture of iron and magnetite.

[1] Beckman Helipot, The Helipot Corporation, Pasadena, California. The Helipot has a linearity of 0.5 percent.
[2] Brown High Speed "Electronik" Recorder, Brown Instrument Company, Philadelphia, Pennsylvania.

A Cell-Type Gamma-Counter

J. R. BEYSTER AND M. L. WIEDENBECK
Department of Physics, University of Michigan, Ann Arbor, Michigan
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A MULTICELLULAR gamma-counter has been described previously by J. W. M. DuMond[1] and D. A. Lind.[2] Each cell consisted of two parallel plate disks for the cathode and an assembly of radial tungsten wires between these disks for the anode. The cells were stacked together to form the counter. In this arrangement all radial wires were attached to a central rod which extended through a hole at the center of the parallel disks. Four such cells were used at one time. The limiting number of cells is probably determined by the difficulty of aligning

the plates and wires so that each cell will have nearly the same threshold.

We have recently constructed several cell-type counters of twelve sections each. An assembled counter and one free section are shown in Fig. 1. The cathode of each cell consists of two disks, four inches in diameter, separated by a brass ring one-half-inch high and one-eighth-inch thick. The anode is a ten-mil wire bent into a circle two inches in diameter. The tungsten wire is supported by two glass

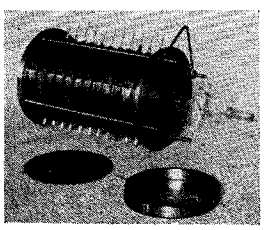

FIG. 1.

tubes which are waxed into holes in the brass ring. Electrical connection is made to the tungsten anode by means of a heavy tungsten lead which is sealed into one of the glass tubes. A rubber gasket on each side of the brass ring forms a vacuum seal between the ring and disk. These cells can then be stacked up in any desired number without difficulty, since each anode can be independently aligned. A hole one-eighth-inch in diameter is drilled through the center of each plate for the evacuation and filling of the counter. The details of assembly can be seen in Fig. 2.

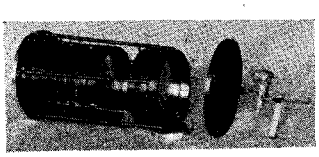

FIG. 2.

The counter has been used with a conventional scale of sixty-four circuit. Separate inputs to the scaler were provided for each cell. Each input consisted of a one-megohm resistance from the cell to the high voltage supply and a fifty-micromicrofarad condenser from the cell to the grid of the discriminating stage in the scaler.

The plateau of such a counter is of the order of one-hundred volts, and the starting potentials of the individual cells do not vary by more than twenty volts when reasonable care is given to construction. The efficiency of the twelve-section counter is approximately ten times that of the usual gamma-counter.

In order to test the sensitivity of this geometry, a one-cell counter was constructed with a window in the front plate so that collimated beta-particles could be shot into any region. The counter was found to be uniformly sensitive, as shown in Fig. 3.

Measurements have been made on the delay in the initiation of the discharge in the counter. For particles

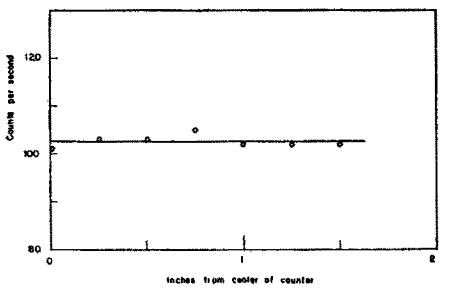

FIG. 3.

passing near the center of the anode the delay can be quite large, but on the whole, for a gamma-ray source, it appears that not more than ten percent of the discharges are delayed more than 0.5 microsecond. We have successfully used these counters in coincidence experiments in which the resolving time of the coincidence circuit was between 0.5 and 0.9 microsecond.

Since the background counting rate is less than two counts per second per section without shielding, it would seem that such a cell could also be used as a thin window beta-counter in applications where a large window area and low background are required.

[1] Jesse W. DuMond, Rev. Sci. Inst. **18**, 626 (1947).
[2] D. A. Lind, Bull. Am. Phys. Soc. **23**, No. 5, 17 (1948).

Optical Method of Determining Thickness of Geiger Tube Windows

F. W. BROWN, III AND A. B. WILLOUGHBY
Naval Radiological Defense Laboratory, San Francisco Naval Shipyard, San Francisco, California
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AN interference technique for determining the thickness, and therefore weight in mg/cm², of mica for thin window counters has been in use in this laboratory, and we think it will be of interest to other workers in the field. The method is an adaptation of the procedure for determining the thickness of thin films as described by Wood[1] in his text on physical optics. The mica is illuminated with an incandescent lamp such as a microscope lamp at an angle of incidence of 10°, and the reflected light is observed with a pocket direct vision spectroscope. The

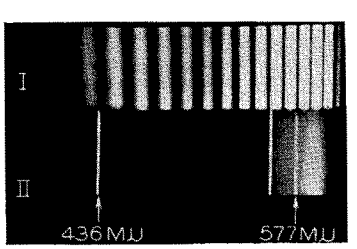

FIG. 1. Photograph taken through a direct vision spectroscope of the fringes from a piece of mica of weight 1.56 mg/cm² with comparison spectra of a white fluorescent light with mercury as lines indicated.