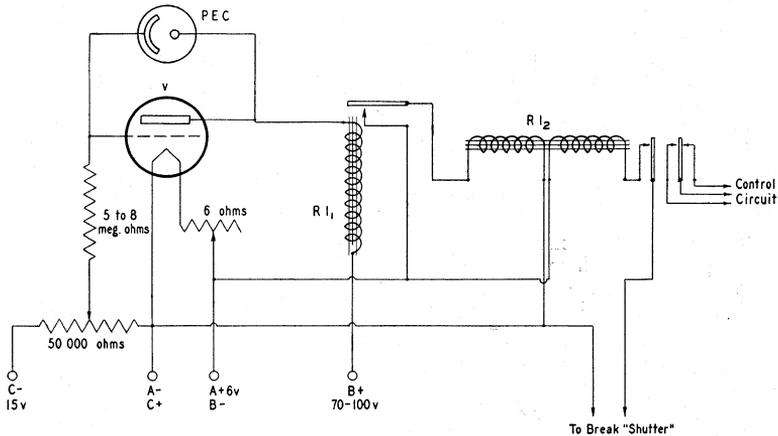


## PHOTO-ELECTRIC CELL DEMONSTRATION

*Andrew Hilderbrand*

The demonstration apparatus shown diagrammatically in the accompanying drawing was assembled as part of a physics exhibit for Engineer's Day. Essentially it is a photo-electric cell relay device using a one stage vacuum tube amplifier.

The purpose of the apparatus is to turn on and off an ordinary Mazda lamp connected to the 110 volt commercial line. When a burning match is held in front of the photo-electric cell the lamp is lighted. The lamp circuit may then be opened by blowing against the break "shutter".



A gas filled caesium photo-electric cell, P.E.C., and a type '01-A vacuum tube, V, are used. The cell is partially shielded from light by placing it in a small wooden block with a hole bored in one side. R1 and R2 are telephone relays. R1 is in the plate circuit of the vacuum tube. It is adjusted to make and break at about 6 and 3 milli-amperes, respectively.

The anode of the photo-electric cell is connected to the plate of the vacuum tube, and the cathode to the grid. An increase in the intensity of the light falling on the cathode of the photo-electric cell causes a larger number of electrons to escape. The grid of the tube is therefore charged less negatively and the plate current increases, causing the contacts of R<sub>1</sub> to close.

The relay R<sub>1</sub> has two coils and two pairs of contact points. If a current flows in either coil both pairs of contacts are closed. When the contacts of R<sub>1</sub> are closed one of the coils of R<sub>1</sub> is energized by means of the filament battery. One pair of the contacts closing completes a circuit through the other coil, the filament battery and the break "shutter" thus holding both pairs of contacts closed until the circuit is broken by the break "shutter". The second pair of contacts is used to control the lamp circuit.

The break "shutter" is a piece of cardboard rocking on a horizontal axis. The connection to the battery ends in a contact point normally resting against a similar point near the lower edge of the card board through which the circuit is completed to the relay coil. The contact points may be separated by blowing against the card board.

No adjustments are very critical except the grid bias, which may be varied by means of the 50,000 ohm potentiometer.