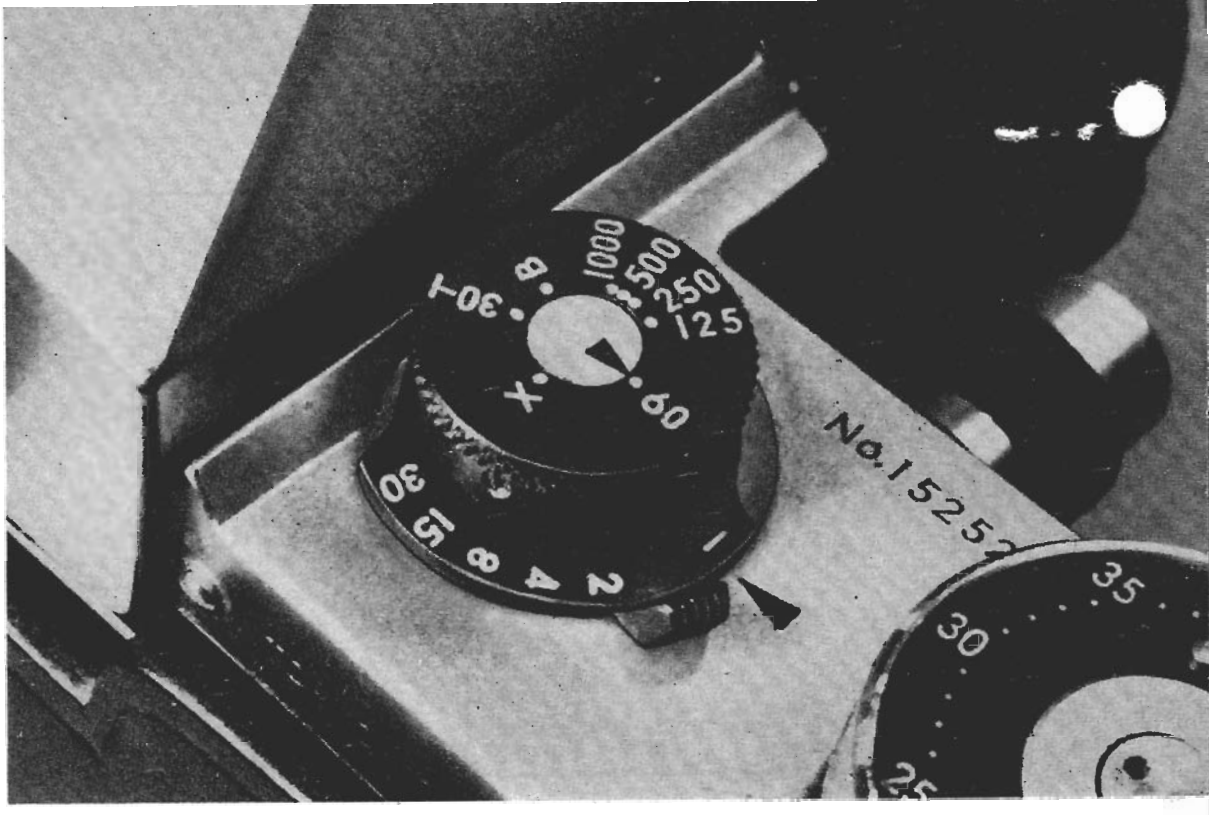

Assembling a Camera Shutter Speed Meter

ONE TO ONE-THOUSANDTH MEASUREMENTS WITH REASONABLE ACCURACY

A peak-reading voltmeter activated by a phototransistor is calibrated for the range between 1.0- and 0.001-second shutter speeds. The voltmeter circuit uses a high-quality capacitor and a MOSFET. The builder can make his own meter coincide with the scale illustrated through manipulation of the various internal calibration controls.

HOW OFTEN have you wondered whether the shutter speeds marked on your camera are correct? Have you ever missed an important, unrepeatable shot because of over- or under-exposure and considered whether your camera's shutter was at fault?

If you have, you probably took your camera to the repair shop to have it checked. For little more than it cost for that one check-up you can build your own Shutter Speed Meter so that you can check your camera anytime you have a suspicion that it is not performing properly. You can also use this device to check your camera for cold-weather operation.

Shutter speed ranges are 1 to 1/10 sec, 1/10 to 1/100 sec, and 1/100 to 1/1000 sec. In measuring shutter speed, the camera is placed on the pickup unit with a light source over the camera. Then the RESET button is pushed and the shutter is released; shutter speed is read directly from the single-scale meter. Any camera may be checked, whether it has a focal-plane or between-the-lens shutter. The meter

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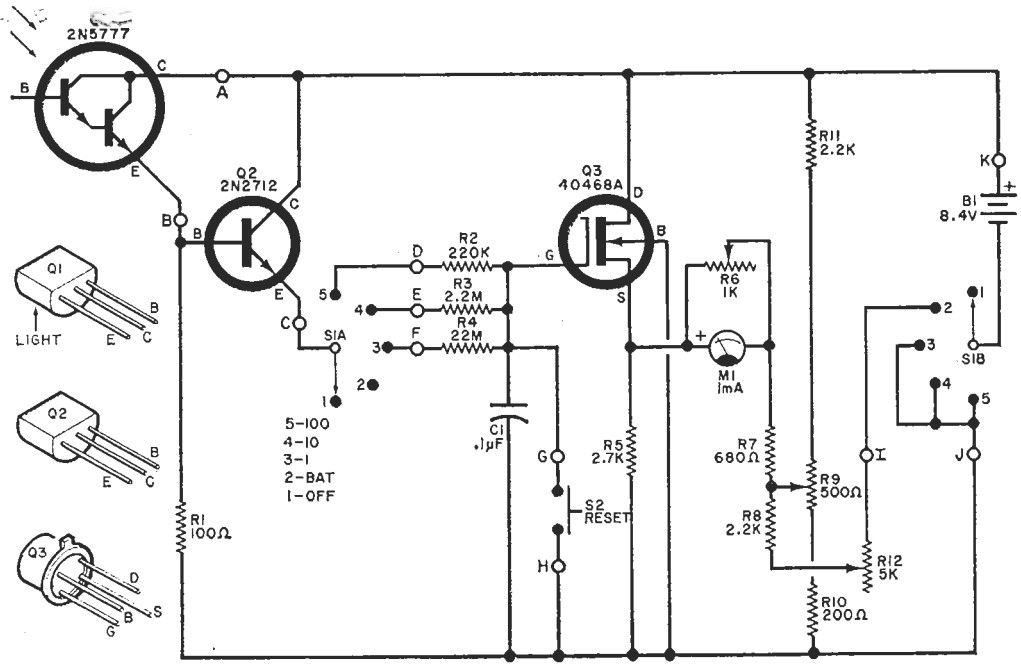

Fig. 1. The circuit is essentially a very high input resistance d.c. voltmeter with a MOSFET. It measures charge on capacitor C1, which is a function of how long light is applied to Q1.

retains a reading for several minutes, depending on the quality of the components used.

Construction. The Shutter Speed Meter consists of two physically separate sections: a light-sensitive transistor in its own case and an electronics package on which the meter readout is mounted.

The schematic of the circuit is shown in Fig. 1. A foil pattern for a printed circuit board and component mounting layout are shown in Fig. 2. The printed circuit board was designed to mount directly on the meter terminals. If you do not want to use the PC board, assemble the circuit on perforated board following the same layout. Note that 5% resistors are used for *R2*, *R3*, and *R4* to obtain nominal accuracy. For greater accuracy use 1% resistors. It is also important that capacitor *C1* be hermetically sealed (glass or ceramic with metal) and of high quality. If you use the foil pattern, the potentiometers specified in the Parts List cannot be substituted.

A silicon transistor with low leakage must be used for *Q2*. Transistor *Q3* is a MOSFET and must be carefully handled. The MOSFET is shipped with a shorting ring around its four leads to prevent the possibility of elec-

PARTS LIST

B1—8.4-volt mercury battery
C1—0.1-μF, hermetically sealed capacitor (Sprague 96P-10491 or similar)
M1—0-1-mA, d.c. meter (Calectro D1-912 or similar)
Q1—Phototransistor (G.E. 2N5777)
Q2—2N2712 transistor
Q3—MOSFET (RCA 40468A)
R1—100-ohm
R2—220,000-ohm, 5%
R3—2.2-megohm, 5%
R4—22-megohm, 5%
R5—2700-ohm
R7—680-ohm
R8, R11—2200-ohm
R10—200-ohm
All resistors ½-watt
R6—1000-ohm potentiometer (Clarostat U39 or similar if PC board is not used)
R9—500-ohm potentiometer (Clarostat U39 or similar if PC board is not used)
R12—5000-ohm potentiometer (Clarostat U39 or similar if PC board is not used)
S1—2-pole, 5-position rotary switch (Calectro E2-163 or similar)
S2—Momentary pushbutton switch
Misc.—Plastic cases (Lafayette 99E62721 and 99E80722 or similar), printed circuit board, battery holder, transistor socket, felt, wire, solder, etc.

SHUTTER SPEED METER

(*Continued from page 77*)

the camera back and place the camera on top of the phototransistor unit. Make sure that *Q1* is directly under the center of the space occupied by the film.

Place a strong light source (such as a high-intensity lamp) over the camera not more than a couple of inches away from the lens. A camera with a between-the-lens shutter may be placed with the lens up or down, while types with focal-plane shutters are placed with the back down.

To read the shutter speed, turn on the lamp, select the shutter speed and cock the shutter. Momentarily depress the RESET button and note that the meter indicates zero. Then operate the shutter release. The meter pointer will rise to the correct shutter speed and remain steady. Over a period of several minutes, the meter pointer will slowly drift upscale.

Besides checking the shutter for accuracy, you can also check its consistency. Take several readings at each shutter speed and note how closely the readings agree. A slight variation is normal; but if one or more readings differ greatly, the shutter's mechanical operation should be checked.

If you make photographs in cold weather, you can get some useful information by running a series of temperature tests. Place the camera in a refrigerator (or outside if it is cold) for a couple of hours to allow all moving parts to get cold. Then make a series of shutter-speed tests before the camera has had time to warm up. You may have to remove the lens so that moisture condensation will not block the light—or you can use a stronger light source. You will probably find that the shutter slows down somewhat at low temperatures; but if it becomes inoperative, special low-temperature lubrication must be used.

If, at any time, you find that your shutter is not operating properly, do not attempt to repair it yourself unless you are expert at the job. Take it to a professional and save time and money. -30-