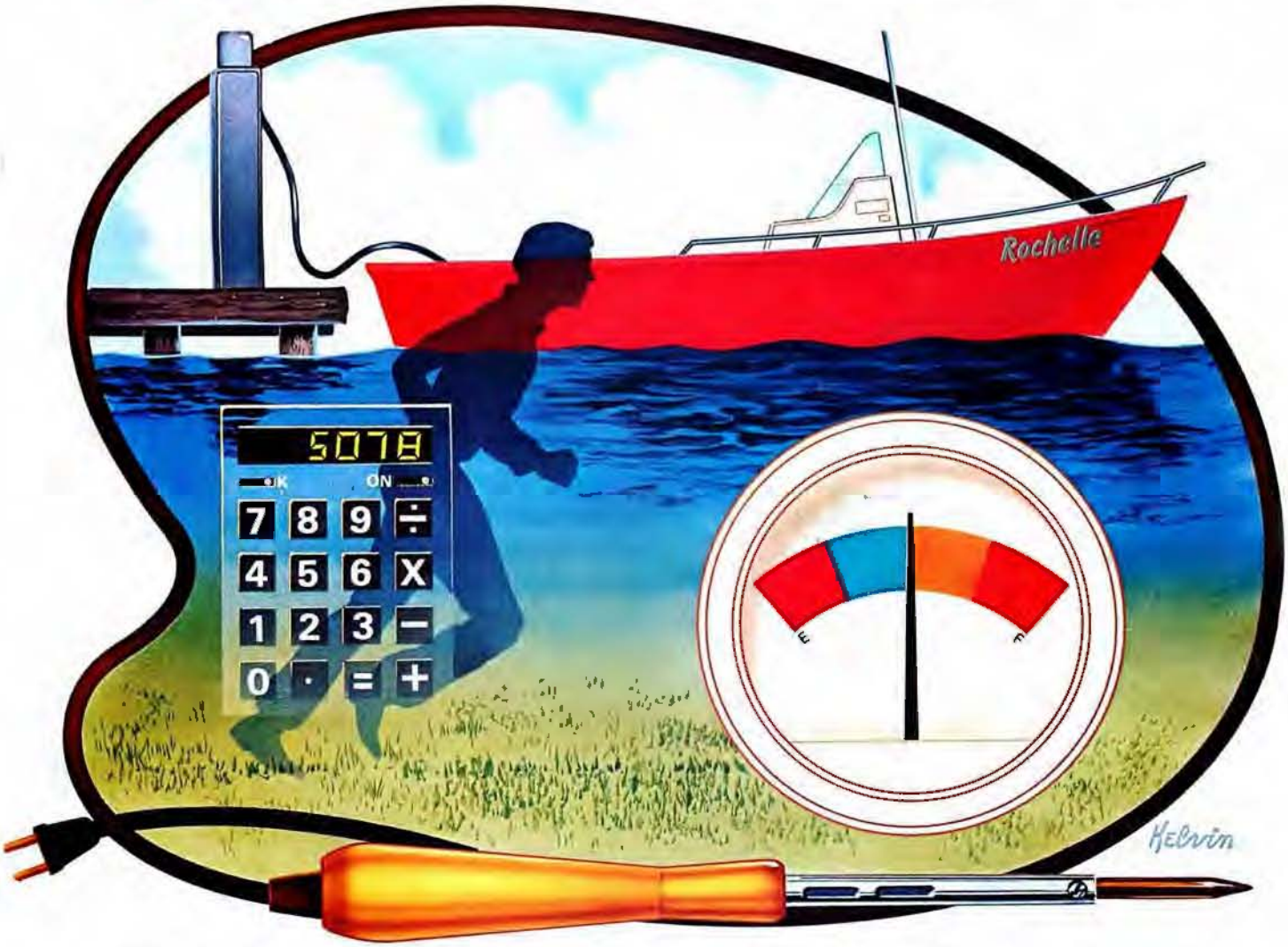
Popular Electronics®

WORLD'S LARGEST-SELLING ELECTRONICS MAGAZINE AUGUST 1979/$1.25

New, Exciting Low-Cost Projects

- For Joggers: Electronic Pedometer
- For Motorists: Low-Fuel Warning Buzzer
- For Boating: Portable Gas-Leak Meter
- For Basements: Sump Pump Switch/Alarm



Tested In This Issue

Fisher ST460 Speaker System
Shure M95HE Phono Cartridge
Compucolor II Model 4 Personal Computer

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Popular Electronics

By Cass Lewart

3. Portable gas leak meter

Ultra-sensitive instrument gives quantitative indication of natural gas, propane, fuel vapors, etc.

TOXIC and explosive gases are an ever-present danger in our modern society. They include natural gas, propane, fuel vapors, and invisible and odorless carbon monoxide.

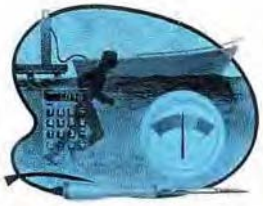
The ultra-sensitive gas-leak detector presented here indicates the quantitative presence of these gases and enables one to track down and pinpoint the *source* of a gas leak by observing the unit's meter indication. Moreover, it is a portable, battery-powered model for use in boats, automobiles, at campsites, or in any other location where ac power is not available. (An ac-operated noxious gas detector with an audible alarm for preset gas levels was described in a project that appeared in POPULAR ELECTRONICS, August 1976.)

Circuit Operation. The gas sensor, *GS1* in Fig. 1, consists of an electrically heated tin-oxide pellet that changes resistance when exposed to carbon monoxide, hydrogen, propane, alcohol, gasoline vapor, and other oxygen-reducing gases. Power for the circuit can be obtained from either six D cells, preferably rechargeable, connected in series or from an optional 9-volt battery eliminator. Regulator *IC1* reduces the available 9-volt level to the 5 volts required by the circuit. Optional *LED1* is a 9-volt power-on indicator.

Current from the regulator heats gas sensor *GS1*'s semiconductor pellet. The sensor, *R4*, *R7*, and *R8* are arranged in a bridge configuration. The null indicator consists of *M1* and *R6*, while *D1* and *D2* serve as protection for *M1*. Overall circuit sensitivity is determined by the value of resistor *R5*, while *S2* provides a BATT. TEST function.

Once the bridge is balanced, by NULL potentiometer *R8*, any change in the resistance of *GS1* will create an unbalanced condition. When this occurs, the meter's pointer swings up-scale, by an amount proportional to the change in resistance of *GS1*.

Construction. With the exception of *GS1*, *J1*, *M1*, *B1*, *R8*, *S1*, and *S2*, the circuit can be assembled on a piece of perforated board. Select an enclosure large enough to accommodate the board and all off-board components, including *B1* and its holder.



Mount the meter movement on one side of the enclosure's front panel, the remaining off-board components (except *B1* and *J1*) on the other side of the panel. The battery holder and optional battery-eliminator/charger jack *J1* are best mounted on the rear wall of the enclosure. If desired, *GS1* can be mounted either directly on the front panel or in a separate housing, the latter fitted with a cable to connect it to the main enclosure. The sensor itself takes a miniature 7-pin tube socket.

After the project is assembled, install a fresh set of D cells in the battery holder, set *S1* to ON and *S2* to BATT. TEST, and make a note of the point on the meter's scale at which the pointer comes to rest. Turn off the power and carefully remove the cover from the meter's face. Use a felt marker to identify the battery-test point on the meter's scale.

PARTS LIST

B1—Six D cells in series
D1,D2—Germanium diode (1N34A or similar)
GS1—Model 812 gas sensor
IC1—5-volt regulator (Radio Shack No. 276-1770 or similar)
J1—Normally closed miniature phone jack (Radio Shack No. 274-281 or similar)
LED1—Red light emitting diode
M1—50-μA meter (Radio Shack No. 22-051. No substitute)
R1—1000-ohm, ½-W, 10% resistor
R2—22,000-ohm, ½-W, 10% resistor
R3,R7—4700-ohm, ½-W, 10% resistor
R4—15,000-ohm, ½-W, 10% resistor
R5—2700-ohm, ½-W, 10% resistor
R6—2200-ohm, ½-W, 10% resistor
R8—10,000-ohm linear potentiometer
S1—Spst switch
S2—Dpdt switch
Misc.—7-pin miniature tube socket; battery holder; enclosure; 9-volt dc calculator-type ac adapter (optional); machine hardware; hookup wire; solder; etc.

*Available for $7.50 postpaid from Southwest Technical Products Dept., PE-2, 219 W. Rhapsody, San Antonio, TX 78216

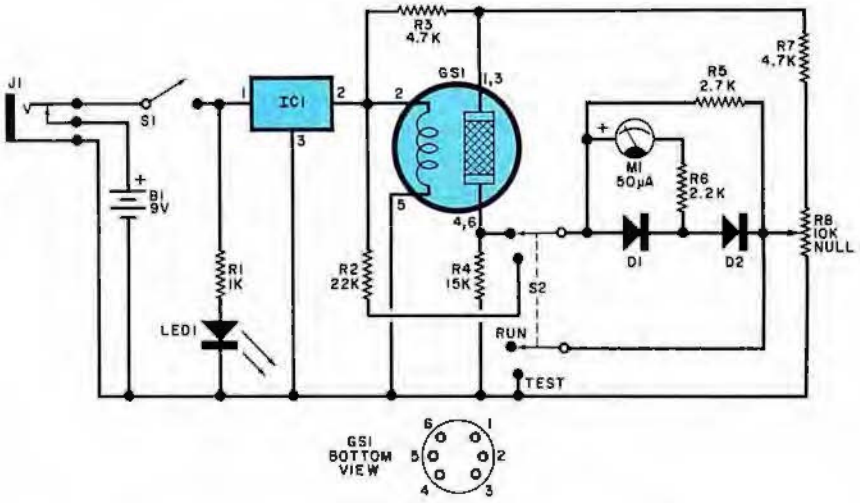


Fig. 1. The gas sensor forms one arm of a Wheatstone bridge. Pins 1, 2 and 3 can be interchanged with pins 4, 5 and 6. Once bridge is balanced by R8, a change in resistance of GS1 will cause meter pointer to swing upscale.

Operation. Set *S1* to ON and allow the sensor to heat up for about two minutes. Set *S2* to BATT. TEST and check that sufficient voltage is available from the battery. (A set of fresh D cells will last about 20 hours. An external 9-volt battery-eliminator/charger can be used.)

After the sensor has warmed up, set *S2* to RUN and, in a neutral atmosphere, adjust NULL control *R8* until the meter indicates zero. Now, place a drop of alcohol or gasoline on a finger and approach the sensor. The meter pointer should swing up-scale. Move the finger away from the sensor; it will take a minute or so for the sensor to settle back for the next measurement. Readjustment of *R8* may be necessary occasionally. If setting time is too long, change *R7* to 1000 ohms.

When looking for a gas leak, note locations where the meter swings upscale to narrow down the location. ◇