Flasher Beacon for Your Boat or Car

Its high-intensity flash can be seen through fog—or over vast distances on clear nights

By RONALD M. BENREY

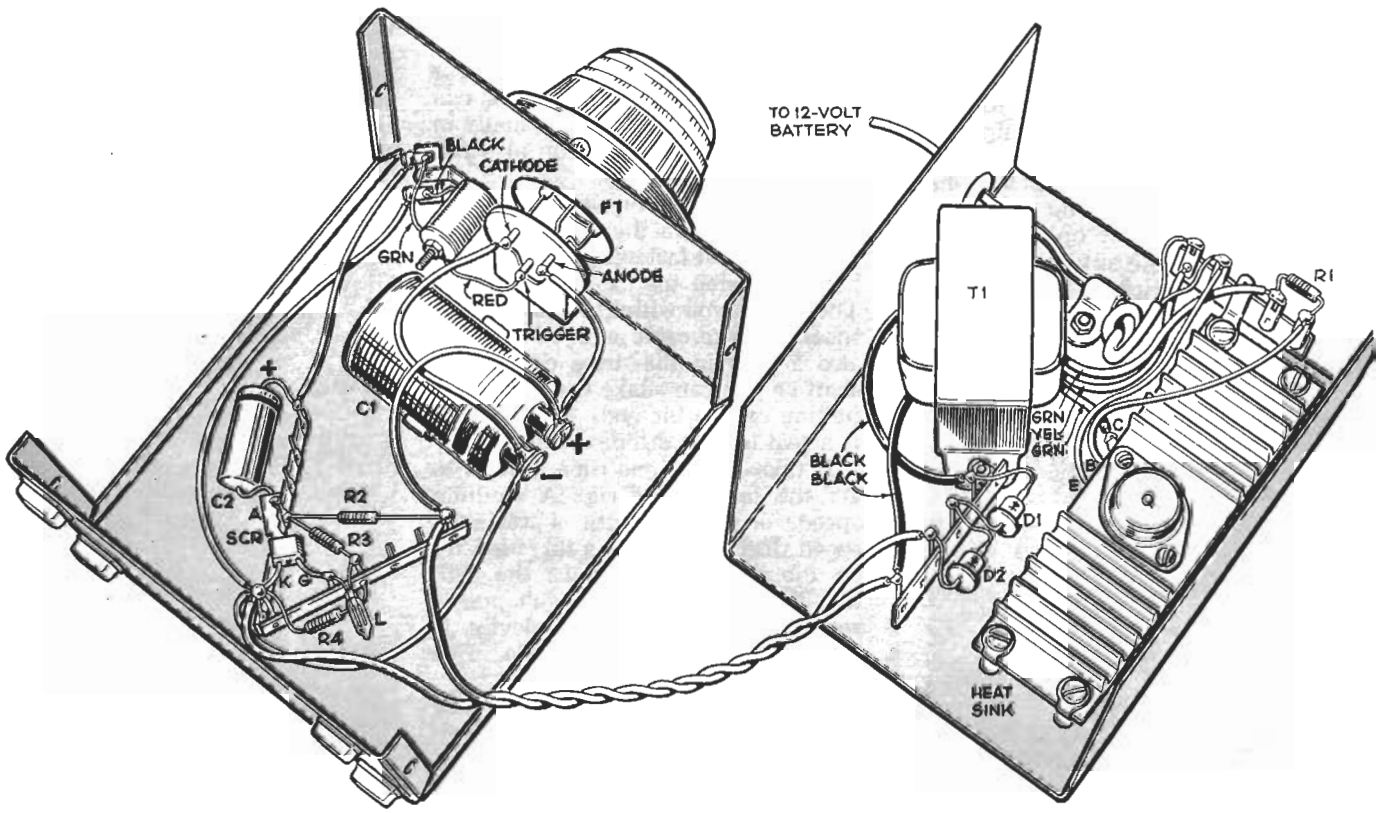
Here's the next best thing to your own personal lighthouse—a high intensity xenon-flash beacon that's visible for *miles* on a clear night. In haze or fog, too, this electronic flasher will outshine all conventional emergency lights on the market.

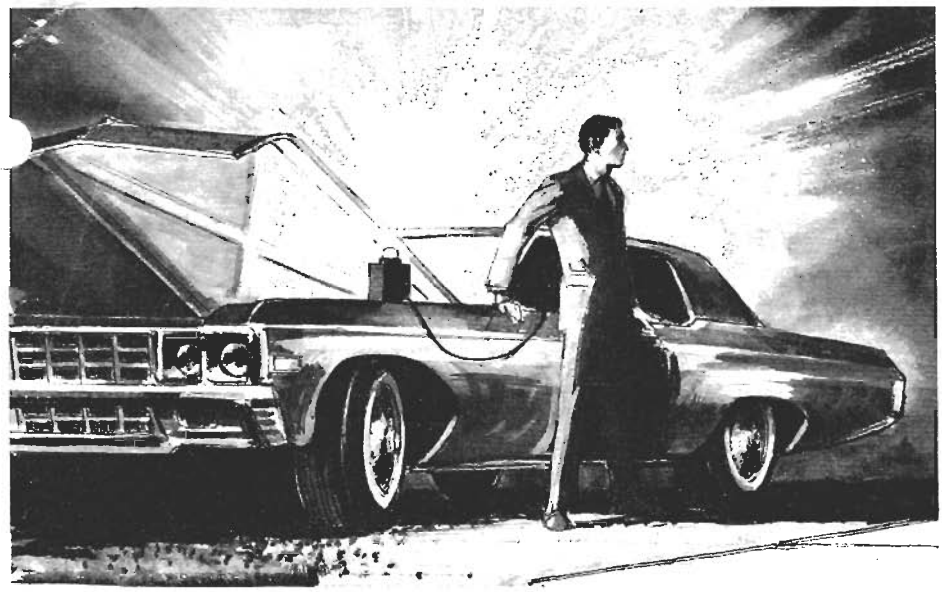
A xenon photoflash tube—a high-power type used in the electronic flashguns of pro cameramen—does the job. Electronic circuitry flashes the lamp about once a second, each flash a short, intense burst of white light. You can use a red or amber lens on the lamp, but you get maximum brightness of the blue-white light with a clear lens.

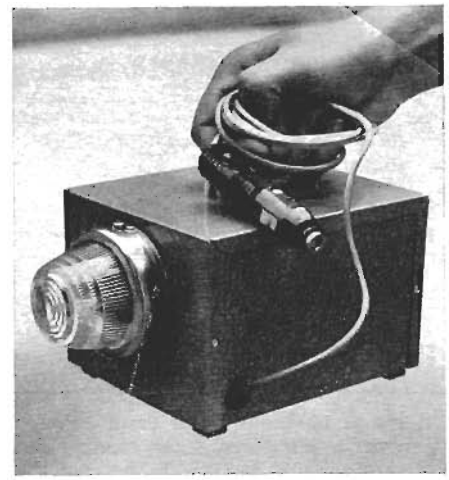
Since the flasher is battery-powered, it can be used with any 12-volt battery or DC electrical system.

How it works. The flasher utilizes the same basic strobe-light principle used to build the superbright flashing beacons for modern aircraft. Its circuit consists of four stages:

- A DC-to-DC converter, built around power transistor Q and filament transformer T1. This stage converts the battery's low-voltage DC to the 450 volts required to flash the flashtube. The transistor functions as an oscillator in conjunction with the low-voltage windings on T1. The generated signal is boosted by the transformer into a high-voltage wave form, which is rectified by silicon rectifiers D1 and D2 to produce a high-voltage direct current.
- Energy-storage capacitor C1—a







Whether you're stalled in dense fog (far left) or in a remote area (left), this emergency flasher will bring help quickly. It plugs into the dashboard cigar lighter.

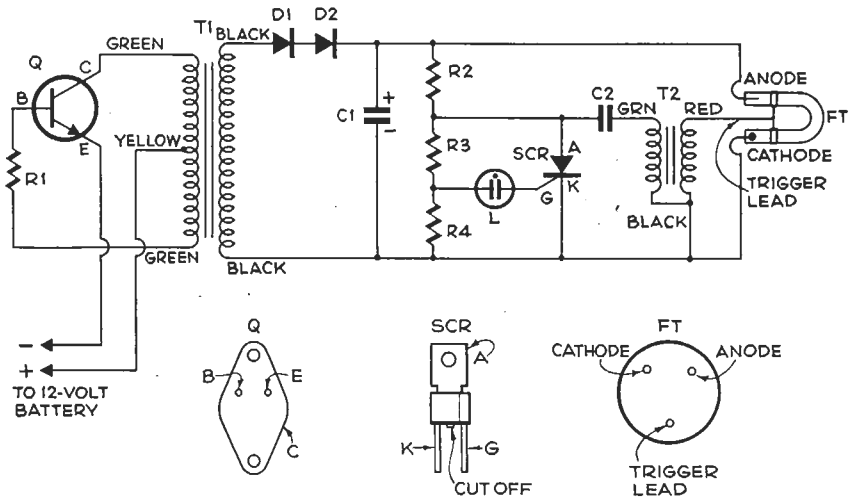
computer-grade electrolytic capacitor that is charged to a high DC voltage (approximately 450-volts). The stored energy produces the flash.

- A trigger circuit, built around silicon-controlled rectifier SCR and trigger coil T2. This stage delivers a very-high-voltage trigger pulse (about 5,000 volts) to the flashtube once a second to activate the lamp. (We'll explain how, later.)
- The xenon photoflash tube—a glass envelope with electrodes at each end, and filled with xenon gas at low pressure. It's wired directly across the energy-storage capacitor.

When the high-voltage trigger pulse is applied to the flashtube's trigger electrode, the xenon gas inside suddenly converts from a good electrical insulator to an excellent conductor. Instantly, C1's stored energy discharges through the tube, producing its burst of light. The xenon gas then reverts to its insulating state, permitting C1 to be recharged for the next flash.

The trigger circuit that sparks the flashtube operates in much the same way as a modern car's capacitive-discharge ignition system. The SCR functions as an electrical switch that dumps the stored charge in capacitor C2 through the primary winding of trigger coil T2. This causes a high-voltage pulse at T2's secondary winding, which is routed to the flashtube's trigger electrode.

The SCR is automatically tripped, roughly every second by neon bulb L.



PARTS LIST

R1—1,000-ohm, ½-watt carbon resistor
R2—4.7-megohm, ½-watt carbon resistor
R3—1.5-megohm, ½-watt carbon resistor
R4—1.0-megohm, ½-watt carbon resistor
C1—40-mfd., 450-volt "computer-grade" electrolytic capacitor (Mallory CG41T450A1)
C2—.33-mfd., 200-volt plastic-film capacitor
T1—Stancor P-8130 12-volt filament transformer
T2—Stancor P-6426 photoflash trigger coil
Q—RCA 2N3772 power transistor
D1, D2—RCA SK3016 silicon rectifier
SCR—GE C106B1 silicon-controlled rectifier
FT—GE FT-118 Xenon flashtube (see text)
L—NE-2 neon bulb
Misc.: Aluminum minibox, 1½"x5" finned aluminum heat sink drilled for TO-3-type power transistor; silicone heat-sink compound; terminal strips; high-voltage insulated wire; automotive utility-light housing with additional lenses; automotive accessory plug for cigar lighter. Parts available from Newark Electronics Corp., 500 N. Pulaski Rd., Chicago 60624.

Building the beacon. It's housed in a 4"-by-5"-by-6" aluminum minibox. Circuit wiring is done on a group of terminal strips that support the small components and serve as wiring points for the leads of larger ones. Since the device is for outdoor use, perhaps in wet weather, limit the number of bolts or other fasteners that penetrate the case. Instead, use epoxy cement to hold internal components.

The aluminum box is *not* used as an electrical ground, so good electrical connection between brackets and case isn't necessary. If you follow the parts layout suggested in the photos and diagram, you'll have only six bolt holes through the minibox.

The xenon flashtube is sold at most photo supply shops, and by the Edmund Scientific Co., Barrington, N.J. 08007. As supplied, it consists of a spirally wound flashtube on a wafer base. In the flasher, the tube simply protrudes through a hole cut in the top of the case. Make an L bracket of scrap aluminum, cement the tube's wafer base to it, and cement the bracket to the minibox.

Make a protective cover for the lamp—*a necessity*—from a standard automotive utility-light housing. Pry out the lamp socket crimped into the bottom of the housing, enlarge the hole, and cement the housing atop the minibox.

Note also that the flashtube is electrically polarized. Its cathode electrode (the larger-size one) must be connected to the negative (—) side

[*Continued on page 116*]

Make a Flasher Beacon

[Continued from page 87]

of the electrolytic capacitor C1. Make sure that it is.

Similarly, double-check the polarity and lead connections to the electrolytic capacitor, silicon rectifiers, SCR, and power transistor. Mistakes here may ruin these components.

Use high-voltage insulated test lead wire to connect the converter to the electrolytic capacitor. Ordinary insulated hook-up wire can be used for other interconnections.

Because of the heat dissipated by power transistor Q when the circuit is operating, Q must be mounted on a heat sink. Apply a film of silicone heat-sink compound to transistor and sink before you bolt them together. This is critical; it helps insure proper heat transfer between them.

Use insulating washers or spacers to electrically insulate the heat sink from the aluminum minibox when mounting it. During operation, heat sink and transformer T1 get quite warm to the touch. This is normal.

When the circuit is operating, you will hear a high-pitched whine that varies in volume and tone in between flashes. Vibrations in the lamination of transformer T1 cause this. If you hear the whine but see no flashing, when the completed unit is turned on, there are two probable causes:

1) The electrolytic capacitor C has become slightly "deformed." The high-voltage supply will automatically reform it in a minute or two, and flashing will commence. (Deforming may also occur when the flasher has not been operated for some time.)

2) If flashing doesn't begin within two minutes, reverse the connections to the black transformer leads (the primary winding of T1).

A few precautions. When charged, the electrolytic capacitor C can deliver a painful—possibly harmful—electric shock. For your safety:

- Never operate the flasher with the case-halves open.
- Never operate the flasher without the flash lamp surrounded by a plastic filter and the lamp housing screwed on. (It's possible for electronic flashtubes to explode in use.)
- When power is shut off, allow five minutes for the capacitor to discharge before you open the case.
- As soon as you open the case, bridge a hefty screwdriver blade (one with insulated handle) across the two terminals to discharge any residual energy, and be prepared for the spark, and the "zap" you'll hear.
- If you will be using the flasher in damp or dirty areas, apply a thin bead of silicone bathtub sealer to the flanges of the minibox. PS