

**WANT TO  
KEEP YOUR MYTHICAL  
BEASTS AT BAY?  
WHAT COULD BE BETTER  
THAN AN**

# **ELECTRIC FENCE**

BY LYMAN E. GREENLEE

**O**NE OF LIFE'S lesser pleasures is hearing your neighbor's cat or dog upset your metal garbage can—at four in the morning! Or, worrying about those expensive new evergreens the landscaper planted that afternoon. Or, listening to snooping animal sounds outside your summer cottage. Or, trying to think of a way to keep that frisky horse, cow, or lamb in its pasture.

With an electric fence, you can forget about any or all of these problems. Presented here is an inexpensive electronic system\* that will deliver a disturbing (but harmless) electrical sting to any animal or person touching the item to be pro-

\*This project is a solid-state version of the "Electric Fence Charger" which appeared in POPULAR ELECTRONICS, December, 1964.

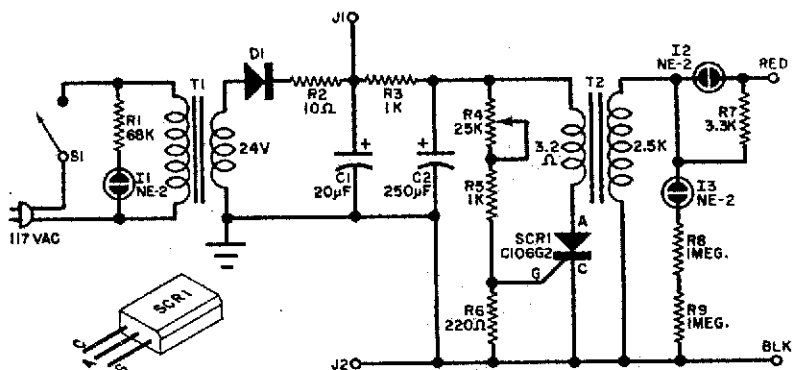


Fig. 1. The device can be powered either from an a.c. power line or from a conventional 45-volt "B" battery. There are no critical parts or adjustments.

### PARTS LIST

C1—20- $\mu$ F, 50-volt electrolytic capacitor  
 C2—250- $\mu$ F, 50-volt electrolytic capacitor  
 D1—Silicon rectifier, 100 PIV,  $\frac{1}{2}$  ampere  
 I1, I2, I3—NE-2 neon lamp (without resistor)  
 J1, J2—Banana jack (one red, one black)  
 R1—68,000-ohm,  $\frac{1}{2}$ -watt resistor  
 R2—10-ohm,  $\frac{1}{2}$ -watt resistor  
 R3, R5—1000-ohm,  $\frac{1}{2}$ -watt resistor  
 R4—25,000-ohm, screwdriver-adjust potentiometer  
 R6—220-ohm,  $\frac{1}{2}$ -watt resistor  
 R7—3300-ohm,  $\frac{1}{2}$ -watt resistor  
 R8, R9—1-megohm,  $\frac{1}{2}$ -watt resistor (do NOT use a single 2-megohm resistor)  
 S1—S.p.s.t. switch

SCR1—Silicon-controlled rectifier (GE C106G2, or similar)  
 T1—Power transformer, 24-volt secondary,  $\frac{1}{2}$  ampere  
 T2—Output transformer, 2500 ohms to 3.2 ohms  
 Misc.—Metal or plastic case, aluminum front panel to fit case, terminal strips, snap-in plastic neon lamp holders (one red, one orange—see text), lengths of red and black insulated test prod flexible wire, hookup wire, solder, hardware, etc.

A complete kit of parts, including drilled panel, is available from Lyman E. Greenlee, P.O. Box 1036, Anderson, Indiana 46015. Order kit FC-2, \$24.95.

ected—or making contact with a simple single-wire fence surrounding the area to be protected.

The fence charger has other applications as well. Since it is capable of flashing a conventional fluorescent lamp bright enough to be seen some distance at night, it can be used as a temporary emergency obstruction light. Or it can serve as a homing light—when placed on a fishing dock, for example. And, because it can be powered by a conventional 45-volt "B" battery, the project can be used anywhere, regardless of the presence or lack of a power line.

**Construction.** The circuit, diagrammed in Fig. 1, can be built in a metal or plastic utility box. Parts layout is not critical, and all components can be affixed to the front metal cover as shown in Fig. 2. This type of construction makes for easy assembly, wiring, and troubleshooting—in the event that it should ever become necessary. If a metal box is

chosen, make sure that none of the components touches the metal to cause a possible short circuit.

Use a heat sink (long-nose pliers on each lead) when soldering the SCR, and toothed lock washers and soldering lugs for all chassis connections. For ease in output identification, use a red-insulated wire for the high-voltage lead and a black-insulated wire for the ground lead (see Fig. 1). "Power on" indicator *I1* should be housed in a red plastic holder, while "operation" indicator *I2* should have some other color plastic holder (orange, for example). Lamp *I3* is contained within the box and requires no plastic mounting.

**Operation.** Make sure that the far end of the red output lead is not touching anything, then turn on the a.c. power (via *S1*). "Power on" indicator *I1* should glow. When the power is applied for the first time, wait for a few minutes to allow the filter capacitors to form proper-

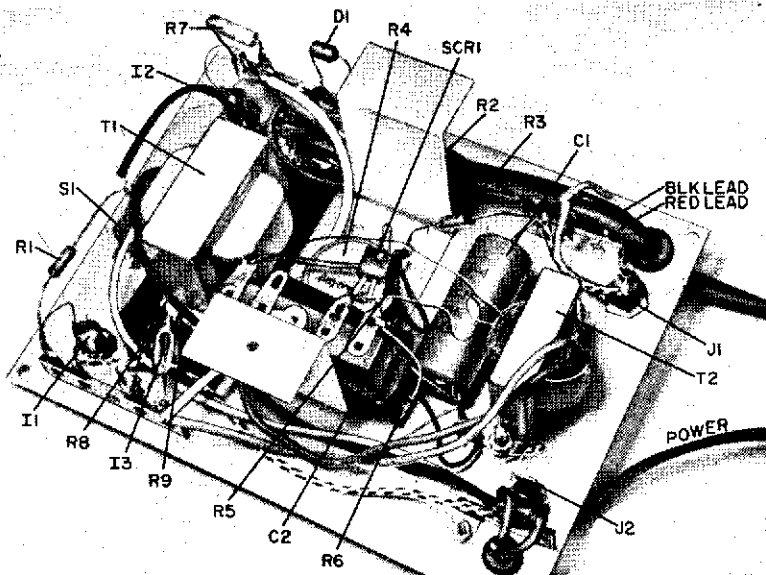


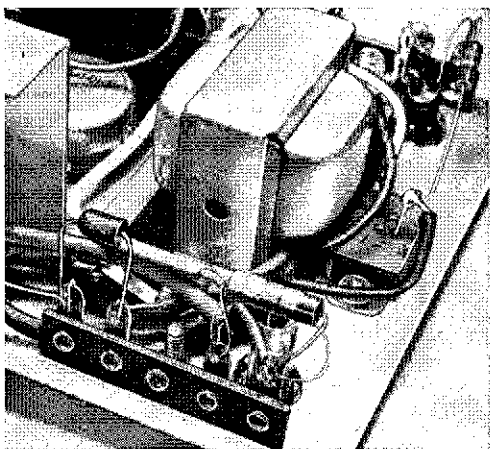
Fig. 2. All of the parts can be mounted on the rear of the enclosure cover plate.

ly. During this initial forming period, the charger will not operate.

After a few minutes, turn off the a.c. power and connect the red and black output leads to a fluorescent lamp (20 watts or more is preferred). Turn the power back on and you will see that the lamp will flash each time the circuit fires. Adjust  $R_4$  until the lamp blinks at between 30 and 40 times per minute. This rate is about right for general operation. The rate will vary with temperature, but such variation is not important

since the pulse frequency is not critical.

A 45-volt, heavy-duty "B" battery can be used to power the charger in remote applications far from commercial power lines. Connect the battery positive terminal to  $J1$  and the negative terminal to  $J2$ . Because power on/off switch  $S1$  will not control the device in this mode, you should disconnect the battery when the device is not actually in ser-

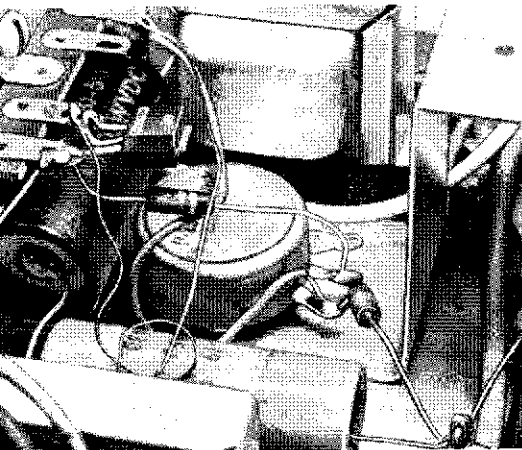


Terminal strips are used to support components and also act as tie points for the point-to-point wiring.

### HOW IT WORKS

Isolation transformer  $T1$  steps the input line voltage down to 24 volts, which is rectified by  $D1$  and filtered by the combination of  $R2$ ,  $C1$ ,  $R3$ , and  $C2$  to produce about 45 volts d.c. This voltage would be applied across the 3.2-ohm winding of  $T2$  if it were not for the nonconducting SCR which acts as an open switch. As  $C2$  charges, the voltage across the SCR gate network ( $R4$ ,  $R5$ , and  $R6$ ) builds up. When the SCR gate receives the required trigger voltage, the SCR fires to discharge  $C2$  across the  $T2$  primary. As soon as this discharge occurs,  $C2$  has essentially no voltage across it, the SCR returns to its nonconducting state, and the cycle repeats itself. Triggering rate is determined by the setting of  $R4$ .

The turns ratio of transformer  $T2$  is such that several hundreds of volts are generated across the secondary for each primary current pulse. This voltage spike is passed, via  $I2$ , to the main high-voltage output (the red terminal). Neon lamp  $I2$  will flash each time a load appears across the high-voltage output and ground (black terminal). Although disturbing to both animals and humans, the generated shock pulse will cause no damage and is safe due to its very short duration.



The U-shaped metal pan acts as a support for the front panel to prevent panel distortion.

vice. In these remote applications, make sure that both the battery and the charger are kept within a water-proof container at all times.

You can check the operation of the power supply portion of the circuit during power line operation by means of *J1* and *J2*. Connect a 50-volt voltmeter positive lead to *J1* and the voltmeter common to *J2*. The meter should indicate about 45 volts.

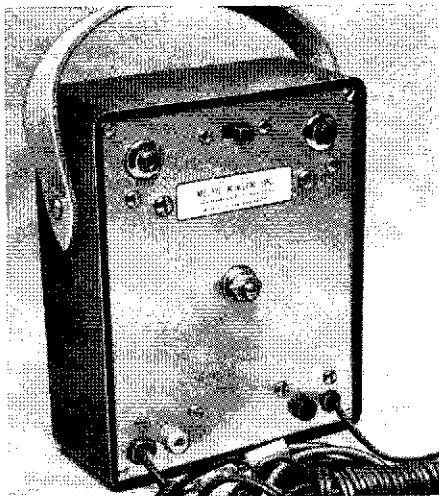
**Installation.** To keep a metal garbage can from being raided, place a small piece of insulating material (plastic, dry wood, or cardboard) under the can to insulate it from the ground. Then connect the red lead from the charger to the can proper, and connect the black lead to a good ground stake near the can. If the ground near the can is slightly moist, the device will work better.

If the can is usually kept on a dry cement or gravel walk, first lay down a piece of metal screen a couple of feet larger in diameter than the garbage can to serve as the ground. Then insulate the can from this ground with a piece of plastic, dry wood, etc. Connect the red lead to the can, and the black lead to the screen. In both cases, ALWAYS be sure that the charger is turned off before a garbage collection—or you may have another kind of trouble!

Any metal object can be protected in the same manner, provided that it is insulated from the ground, and that an intruder must stand on the ground (or a metal screen) in order to touch the metal object.

To make an electric fence, mount a series of electrical standoffs, one to each fence post, along the area to be protected. The height above ground is dependent on the animal you want to keep out (or in), and should be about knee to chest high for most applications. Then run a bare metal wire through the insulators with the far end terminated with an insulator (do not ground this end or any point along the wire), and the near end connected to the red output terminal (high voltage). Drive a metal rod into the ground for the black (ground) lead. A metal fence post or waterpipe can also be used.

Almost any arrangement can be employed to protect various areas, as long as you remember to have the high-voltage lead (red) connected to a bare wire (supported off ground by insulators), and have a good ground connection for the black lead. In very dry soils, it may



The author's unit is mounted within a black plastic case fitted with a carrying handle.

be necessary to provide some form of moisture to insure a good ground contact.

To use the charger as an emergency lamp flasher, simply connect the red and black output leads to each side of a fluorescent lamp (pins not important). A 20-watt lamp can be seen for miles at night.

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