***Here's an easy way to put out a signal from a small piece of property using unique trap construction.***

# A Mini Multi-Band Antenna for Mini Real Estate

**BY KEN CORNELL, W2IMB**

The following article will not reveal any revolutionary new ideas for an antenna design, as it is only a description of how one amateur solved his antenna problems living in a bungalow on a small lot, and obtaining a fairly efficient multi-band antenna, including 160 meters, using practical and proven means of construction.

Many amateurs are faced with the problem of wanting to operate on the lower frequency bands, but have insufficient property to contain the normal type of doublet or inverted "V" antenna configuration, and quite often end up using a vertical.

A vertical can be an excellent antenna, but if not located over an efficient "ground plane," the results can often be quite disappointing. A ground plane is normally formed by installing wire radials, like the spokes of a wheel, with the antenna located at the hub. The length of these radials should be slightly over a ¼ wavelength at the lowest frequency, so this could be an insolvable problem for small property sizes.

After 40 years as an active amateur living with property sizes that offered no serious problems as to antenna lengths, I suddenly found myself living near the ocean where property prices dictate that a 50 by 100 foot lot is a sizeable estate.

The first item of importance after getting settled, was to string up an antenna. Since 160 meters is one of my favorite bands, an antenna for same, was most important, as well as using the antenna on the other bands.

My first thought was to put up the longest piece of wire that the propery would accommodate and use this with an antenna tuner. The simplicity of just stringing up a piece of wire was offset by the complications involved with purchasing or constructing a good tuner, plus the nuisance value of constantly "fussing" with the various L/C functions to obtain proper transmitter loading and minimum s.w.r. when changing bands or moving around in same. This gave me reason to think otherwise.

Using a tape measure and an eye-ball estimate of the house size, garage and their relationship, I figured that if I started the antenna at the basement shack window at the front of the house and ran it up to a stick mounted on the front roof eave, then over the roof to a stick on the garage peak and down to the far side of same, I could get up about 120 feet of wire in an inverted "U" shape.

This length is close to a ¼ wave on 160 meters and I could use it working against the town water supply system for a ground. To eliminate the need for an antenna tuner for multi-band operation, I decided to install traps for 40 and 80 meters.

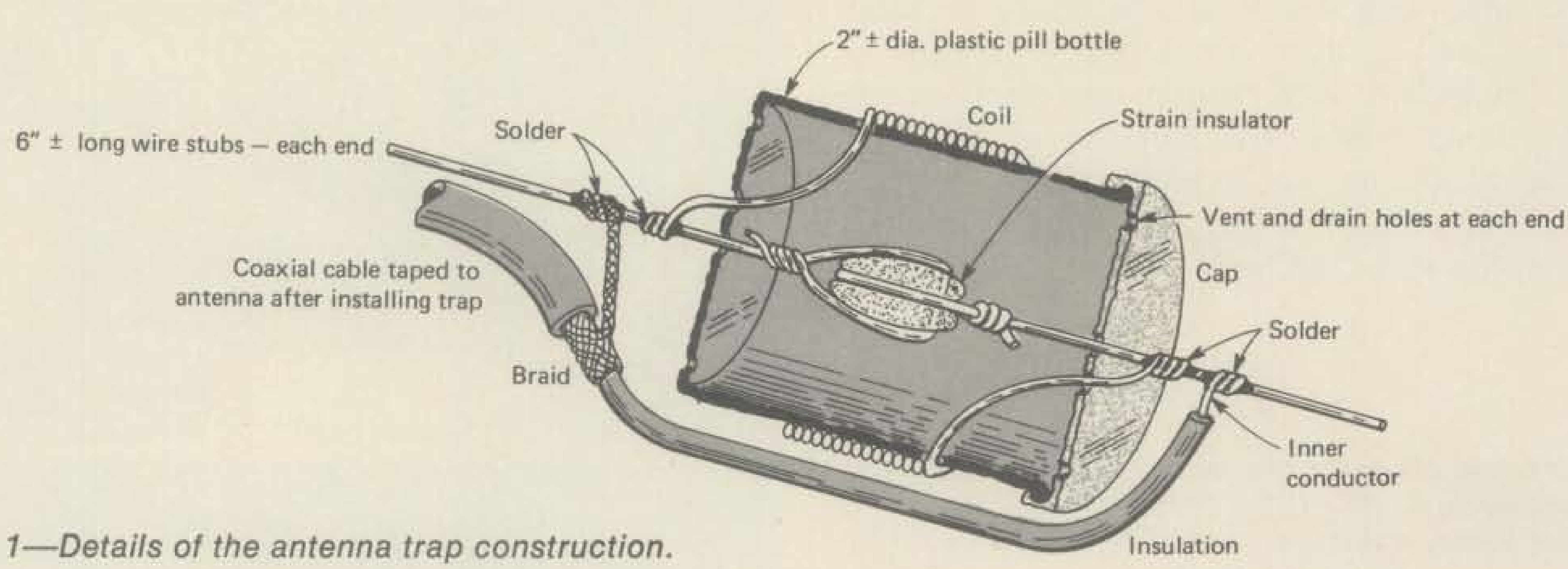


*Fig. 1—Details of the antenna trap construction.*

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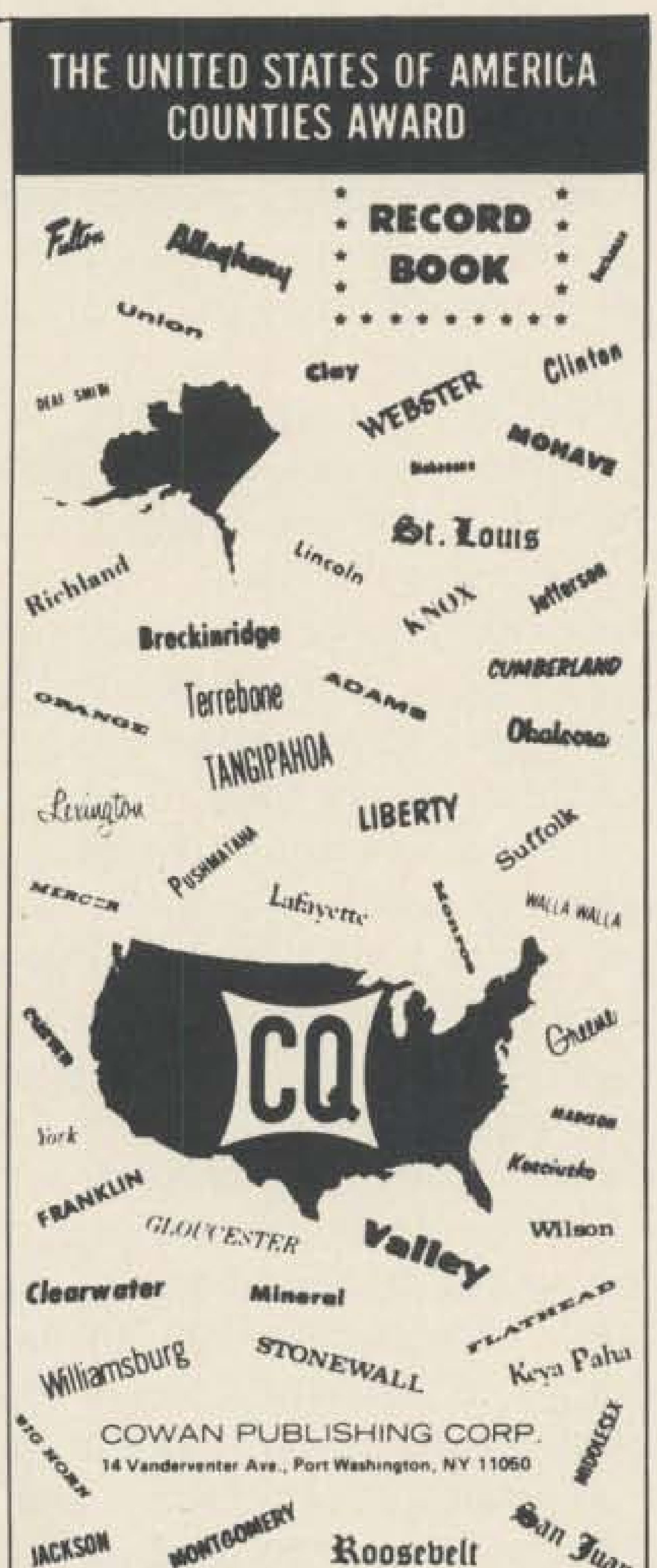


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A trap is nothing more than a coil with a capacitor across same, and when placed in an antenna it will act as an insulator at its resonant frequency. Most all of the commercial tri-band beams and multi-band verticals use traps in one form or another.

An antenna trap in an antenna when operated off its resonant frequency will act as a loading coil and this will shorten the total antenna length required for its lowest frequency, which in my case was desirable.

My experience with trap-type antennas in the past, was eventual trap failure, due to weathering, so the first order of business was to build a durable trap for 40 and 80 meters. Since a trap operated at its resonant frequency is located at the highest r.f. voltage point in the antenna, the construction of same is most important to eliminate chances of arc-over, leakage and general deterioration from the weather.

I decided to wind my trap coils on 2" diameter plastic pill bottles that I obtained from a local drug store and wind the coils with #18 wire that had a heavy Teflon insulation. This would take care of possible wire corrosion as well as providing dielectric stability.

The next problem was the selection of a durable (weather-wise) capacitor, that could stand up to high r.f. voltages. I decided to use coaxial cable for the capacitor for several reasons. There have been many articles published in the past on making home-brew traps, but as I recall, they used a fixed capacitor and the coil required pruning and fussing with, to achieve resonance. All coaxial cables exhibit a capacity between the inner conductor and the shield and by using the proper length of cable to provide the necessary capacity, the inner conductor is connected to one side of the trap coil and the shield to the other. The cable also offers ideal weathering constants as well as being able to stand up to high r.f. voltages.

Approximate capacity value per foot for common Coaxial cables are as follows:

| | |
|---|---|
| RG-58 | 28 pf |
| RG-59 | 21 pf |
| RG-8 | 29 pf |
| RG-11 | 20 pf |

Structural construction of the traps is most important. I used a common egg shaped strain insulator and fashioned two 6" long antenna wire stubs, that would permit soldering the finished traps into the antenna.

I drilled a hole in the center of the pill bottle cap and bottom to pass the antenna wire stubs, and a few extra small holes around the periphery of same for drainage. With the cap removed, the insulator with its stubs was inserted into the bottle and the cap replaced.

My ARRL L/C/F slide rule calculator, based on a capacity of 75 pf, indicated that I would need some 24 turns for 80 meters and 10 turns for 40 meters. The coils were wound in normal fashion and the wire ends were dressed thru appropriate holes and soldered to the antenna wire stubs. I checked the finished coils using a fixed capacitor and my grid dip meter indicated I was in "target" range.

I don't run high power, so I decided to use RG-58 cable for the capacitor, and cut a piece of cable about two feet longer than required. The attachment of the cable to the trap is important, as we don't want it to hang down from the trap and fly around in the wind. I removed the cable jacket and peeled back the shield to suit the length of the coil form. The inner conductor is now placed on the outside of the coil parallel with the coil axis and is soldered to the antenna wire stub. The shield is now trimmed and is soldered to the other wire stub. When the traps are inserted into the antenna, the loose end of the cable is taped to the antenna to secure same.

The next step is to trim the cable length to provide the proper capacity for each trap to resonate it at the desired frequency in the 40 and 80 meter bands. If a grid-dip meter is available, this is no problem, however another method can be used. The antenna trap can be installed in series with the receiver antenna, as close as possible to the receiver, and it will act as a "wave trap" and attenuate a received signal at its resonant frequency. By tuning the receiver to the desired portion of the band for trap resonance, the cable is trimmed to achieve maximum attenuation. If a strong signal or background noise is not present, a signal generator can be used.

Since the cable length, to start with, is cut deliberately longer than required, it is a simple process of nibbling away to achieve the necessary capacity. After each cut, be sure that the shield does not short-circuit the inner conductor. The final trimming is done by pruning the shield only, as this will leave an insulated space to prevent arcing. The cable ends are then protected with coil dope.

I used #14 copper-weld wire for the antenna and starting at the transmitter feed point, I soldered the 40 meter trap into the antenna at 32 feet and the 80 meter trap at 60 feet, and then added another 50 feet, making the total length 110 feet. After I installed the antenna, I used a length of coaxial cable to feed same and grounded the shield.

I fired-up the transmitter and checked the s.w.r. on all bands. 80, 40 and 15 meters looked very good and for some reason, 10 and 20 meters were acceptable, but 160 meters was high. I clipped a 4 foot length of wire on the end of the antenna, but the s.w.r. indicated that I was going the wrong way. I finally ended up removing several feet and ended up with the best s.w.r. on 1815 kHz with some 108 total feet of antenna.

I have been using this antenna for over a year and while I do not consider it a "DXer", it does keep me on the air and permits me to keep in touch with many friends and various Nets. Considering the fact that the horizontal portion averages only some 25 feet high and only consumes 70 feet of real estate, I am very pleased with its performance. By increasing the height of the vertical portions at each end, this will in turn reduce the horizontal length requirement. The inverted "U" configuration that I use was only to suit my particular situation. Other arrangements such as an inverted "L" or "V", etc. can be used.

In conclusion, I would like to mention that several months after erecting this antenna, I put up a 47 foot vertical with a trap for 40 meters at 32 feet. I use the same ground system and for 80 and 160 meters, I use base loading. Using both antennas in many contacts, the inverted "U" won almost 90% of the time as to signal strength.

A final note, is to mention the fact that there are many occasions where a capacitor is required in an antenna feed circuit that is exposed to the weather such as a beam antenna driven element using a "gamma" or "T" match, etc., where coaxial cable could be used instead. ■

***No more overcharging***
***Longer battery life***
***Simple to make***

# Battery Charge Monitor

**BY MITCHEL KATZ, W2KPE**

With so much electronic, photographic and other equipment using Nicad batteries for power these days, keeping the batteries fully charged can become quite a nuisance. Most instruction manuals specify a 14 to 16 hour charge time to fully revitalize these batteries. They also caution against overcharging them.

At first a G.E. Automatic Timer clock was used and set up for a 16 hour on-off duty cycle. This worked fine but once due to unavoidable circumstances the a.c. was not disconnected from the charger during its off time. Later the batteries went on charge for another 16 hour period! To prevent a recurrance of this the Charge Monitor was built and now this problem has been resolved.

The Monitor plugs into the a.c. socket on the timer clock, however three outlets are provided on the monitor unit so that you can plug in your 2 meter transceiver, electronic flash gun, and whatever else may require charging all at one time. To operate the battery charge monitor, advance the clock dial so that you just trigger the clock *On* switch. One of the monitor neon lamp indicators should light at this time indicating the presence of a.c. into the unit. To start the charge cycle press the *Start* button on the monitor. This will pull in the control relay and charging will begin. A set of latching contacts on the relay will hold it in position until the 16 hours are up and the clock switches *Off*. Once the clock has switched off this will break the

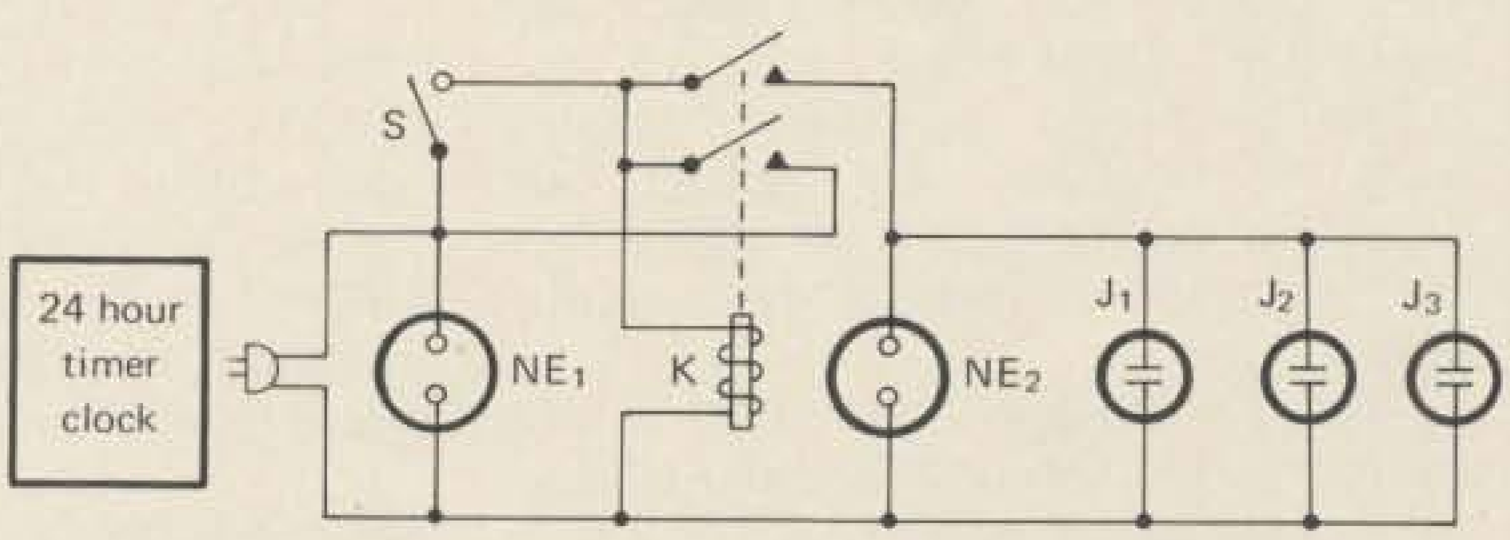


*Fig. 1—Circuit of the battery charge monitor. K is a d.p.s.t. a.c. relay. S is a s.p.s.t. momentary push button switch and J1-J3 are chassis mounted a.c. outlets.*

latching circuit of the relay causing it to drop out. No further charging can take place until the *Start* button is pressed again. During the charge period a second neon lamp on the monitor will be lit indicating that a.c. is being fed through to the equipment plugged in for charging. Setting the timer clock for *On* at 12 noon and *Off* at 4 a.m. (16 hours) provides a convenient method to tell how much time remains until a full charge is reached.

Construction of the monitor is straightforward. Precautions should however be taken to prevent shock due to the potential involved. The use of a plastic enclosure is recommended but if a metal case is used, do not permit any wiring to come in contact with the case. If a ground lead is available on the a.c. line this should be attached to the case.

This very simple unit has proven a great convenience in caring for all those Nicad battery devices ■