



San Diego Ship Modelers' Guild

Vol. 4 Number 4

April 10, 1980

Notes From the March Meeting

Forty people attended the March meeting, which is good attendance for what was an excellent meeting and program. David Braderly, Assistant Curator of the Maritime Museum, was introduced to the membership by Bill Benson. He will be making a presentation at the April meeting. More about that later. Bob Brady brought up the Langley project and the fact that the lines are done and the work has started. Doug McFarland is attempting to contact Jack White of Channel 10, for a file film of the Langley which we would like to present at a future meeting. Art Yeend, who presently works for Campbell Industries, who have produced many tuna boats, made a marvelous presentation on the tuna boat. With Art, were Joe Silva and Tom Hutton who are Naval architects for Campbell Industries. Joe has built many of the tuna boats models that you may have seen around town. Art had a film on the operations of a tuna boat and afterwards fielded questions dealing with the workings of the boat and its' machinery. Later the three dealt with Naval drawings and scales. Joe Silva explained a system of re-drawing a plan to any desired scale, which I will attempt to explain later.

Models present:

Joe Silva	Eveline du Rosa 1200 ton Tuna Boat	scratch
Ted Pugh	Oliver Cromwell	scratch-plank
Royce Privett	Constitution	Kit-Bluejacket
Bill Benson	Monterey Fisherman	scratch-plank
Bill Benson	Carousel I - Grand Banks 36	scratch
Lew Harmeling	Banks Dory	scratch
Lew Harmeling	Harbor Tug- Duke	scratch RC
Dick Little	Rattlesnake	Kit
John Burnett	Fair American	kit
Doug McFarland	Norske Love	kit
John McDermott	Franklin - 74 gun ship	scratch
John Dahms	Cutty Sark	kit
John Woodard and Bob Crawford	Groch Foch - Bark	Kit
Vic Crosby	Great Eastern	scratch in a bottle

April Meeting

Dave Braderly, Assistant Curator of the Maritime Museum, will make a slide presentation on the Crabtree collection. If you are not familiar with this collection of models suffice it to say that one model recently sold for \$200,000. and this man just recently died. His miniatures are masterpieces of detail.

Al L'Heureux has a copy of the rules and a sample gun from the latest craze in RC combat. Ship to ship running gun battles.

San Diego Ship Modelers Guild Static Display Contest

Bring your models to the meeting for registration and participate in our first annual Static Display Contest. The show will be on the Berkely and will run from the 19th to the 26th of April. There will be a \$2.00 entry fee per entry or collection. The categories are, sail, power (merchant, civil, pleasure) power (Naval) with an award to each and an award to the Best Overall. Registration will be at the April meeting and Saturday morning 10-1pm. Judging will begin at 1:30. Models must be picked up by 4:00pm Saturday April 26th.

MAC Show

Included in the Newsletter please find two discount tickets for the MAC Show. If you'd like a enjoyable morning of family browsing, ship models aircraft, needlework, cars, dollhouse, trains, live steam locomotives, operating RC boats, planes, cars, helicopters, rockets and other associated hobbies, arts and crafts, DON'T MISS IT. See the show in the morning and do Disneyland in the afternoon. If you need more tickets contact me at the shop. 225-1333. Car-pool it with some other members and have a day of it. The Crawfords recommend the Belgium Waffles at Ports-of-Call to wind up the day. April 26th and 27th, Long Beach Convention Center.

New Members- Welcome Aboard

John R. McDermott /
redacted/

Nelson E. Farwell /
redacted/

SAN DIEGO SHIP MODELERS GUILD
Elected Officers
1980

Master	Doug McFarland	/redacted/
Masters Mate	Al Lheureux	/redacted/
Logkeeper/Purser	Bob Crawford	/redacted/
Steering Committee	Doug McFarland	/redacted/
	Al Lheureux	
	Bob Crawford	
	John Woodard	/redacted/
	Bob Ross	/redacted/
	Earnie Jimenez	/redacted/

Meetings: 3rd Friday of each month at 8:00 PM aboard the Star of India -Orlop deck.

Membership: \$6.00 per year for members of the Maritime Museum Association of San Diego, \$12.00 for all non-members. Out-of-state residents may join for \$6.00.

The Guild was founded in 1971 by Bob Wright and the late Russ Merrill.

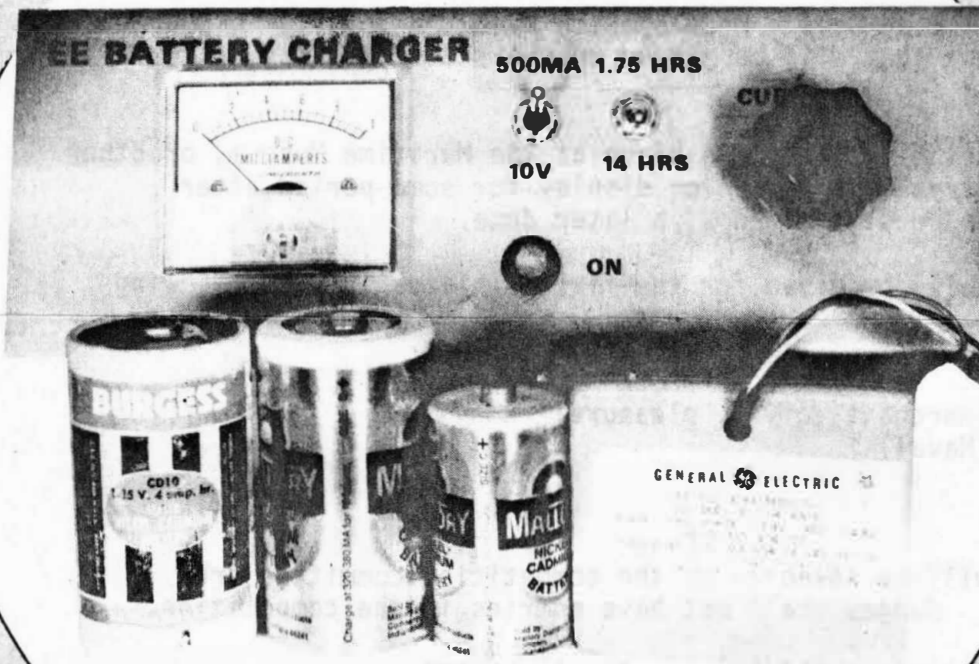
The following is a copy of the rules for the static display show to be held aboard the Berkeley the week following the April 19th meeting.

Conduct of Static Display Competition

1. Static Display only. Models which have the ability to operate may be entered, but they will be judged on the static display criteria only.
2. The competition will take place at the Maritime Museum, or other public place. Entrys will remain on display for some period after the competition to be detirmined at a later date.
3. Awards will be given for the first 5 places in the following catagories:
 - Over all
 - Sail
 - Power (merchant, civil, pleasure)
 - Power (Naval)
4. Judges will be selected by the competition committee from Guild membership. Judges shall not have entries in the competition.
5. The competition will be open to all comers.
6. Judging will be based on the following major criteria
 - Documentation
 - Accuracy of scale
 - Finish and appearance

With the exception of Documentation, the judging criteria is felt to be self explanitory. Documentation, however, covers a multitude of sins, and very well could be the determining factor in consideration for the top awards. Of course, the ideal documentation would consist of the original lines for the prototype, the ships history from conception to scrap, original drawings for ships equipment, and photos/ pictures etc. depicting the prototype. The ideal is impossible. Most ships of historical nature existed befor photography, the drawings have been destroyed, or are for numerous reasons unobtainable, and history may be limited to one liners in books on a larger subject. Since ideal documentation is impossible in the vast majority of models, the judging will be based on the best available documentation which can range from simply kit plans and drawings to the above described ideal.

SUPERCHARGER



Build this wide range NiCad battery charger with built-in automatic cut-off timer!

by C. R. Lewart

PROLIFERATION of portable electronic gadgets such as calculators, tape recorders, walkie-talkies, radios, etc., gave a big boost to sales of rechargeable batteries. This article should bring your knowledge on the rechargeable battery up-to-date and tell you about a truly universal charging circuit with an electronic timer which you can build.

Rechargeable sealed batteries, besides many other advantages, make the operation of portable equipment quite inexpensive. Do you still remember the high cost of B and filament batteries for portable tube radios? But even with transistorized equipment, the cost of "cheap" throw-away batteries may be quite high. For example, a portable calculator or a radio using four AA throw-away cells needs battery replacement about once a week if it is used for 2 to 3 hours each day. This comes to about \$50 per year. A set of four rechargeable AA-size Nickel-Cadmium (NiCad) batteries costs around \$8 and with proper care should last 3 to 5 years or more. The cost of electricity used for recharging comes to only about 10 cents per year. Quite a difference in cost!

What Proper Care? We mentioned that a rechargeable NiCad battery will last for many years if proper care is exercised. Our charger described in this article will give your rechargeable batteries such proper care. There are three rules to observe when handling rechargeable batteries. They are all expressed in terms of battery capacity in milliampere hours

(mAh). This value is usually given by the manufacturer on the battery label. If no battery capacity is given, some common values are shown in this table.

However, watch for the figures given by the manufacturer. For example, you may find a sub C cell in a D cell package.

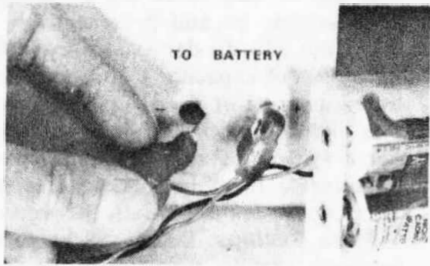
Battery Size	Capacity (mAh)	10-Hour Rate (mA)	5-Hour Rate (mA)
AA	450	45	90
sub C	1000	100	200
C	1500	150	300
D	3500	350	700

Rule 1. Do not discharge continuously at more than the hourly rate (450 mA for AA cells). Whether this rule is satisfied depends on the kind of equipment you are using. This rule will seldom be violated. Just don't try to run your electric power mower on a bunch of AA cells!

Rule 2. Do not continue discharging when the battery voltage is 0 volt (cell reversal). If you have several batteries in series, one will always have slightly smaller capacity than the others. When that battery is completely discharged, the other batteries will still pump current through it. The only way to avoid this condition is to turn off your appliance immediately when the total series battery voltage drops significantly (by more than 1 volt). You will notice it when, for example, your radio starts distorting. Turn it off immediately.

Rule 3. Do not charge at more than the 10-hour rate

e/e SUPERCHARGER



Phone tip jacks shown here can be replaced with five way binding posts or, if you're handy enough, eliminated altogether and replaced with battery holders built right into the supercharger case. Remember, too, that you must remove the AC power cord from the AC outlet to "reset" this timer.

(45 mA for AA cells) and do not continue charging at that rate beyond full capacity for more than a few hours. Slightly higher charging rates of up to the 5-hour rate are permissible as long as the battery is still discharged. To satisfy this rule, you need to control the charging current and the charging time as is provided by this charger. Some so-called universal battery chargers put either a too-high or a too-low current into your batteries. As a result either the battery will be damaged and its life shortened or it will not get fully charged in a reasonable amount of time.

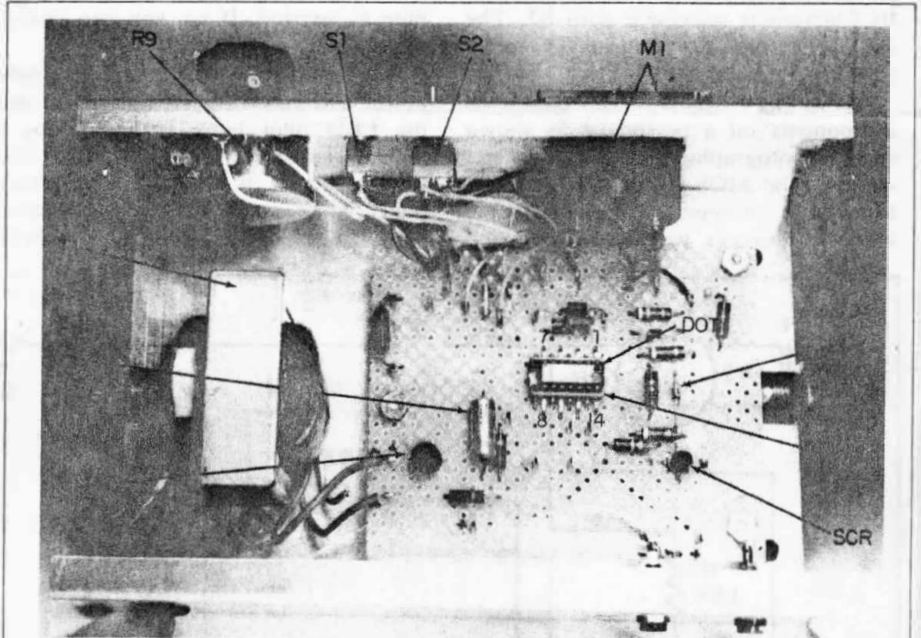
These are general and safe rules. Specially-constructed batteries (for example, the so-called quick-charge batteries) may let you break one or more of these without causing permanent damage. However, unless the battery manufacturer assures you to the contrary you better stick with our three rules; otherwise permanent damage may result. Either the battery will fail (go dead) immediately or its life-span and capacity will be shortened.

Battery Charger. This charger is capable of charging one to six cells from AA to D size. It lets you control the charging current and the charging time. You turn the charger on, set the current to the 10-hour rate for a full charge or 5-hour rate for a quick boost, and forget it. After 14 hours (or 1¾ hours for a quick boost) the charger will turn itself off. In other words, we pump in 140 percent of battery capacity to charge it fully (40 percent is the typical loss in the charging process). For a quick boost of 1¾ hours when the battery is completely or partially discharged, we can go up to the 5-hour rate to obtain about one-quarter full battery capacity. For special quick-charge batteries follow manufacturer's recommendations.

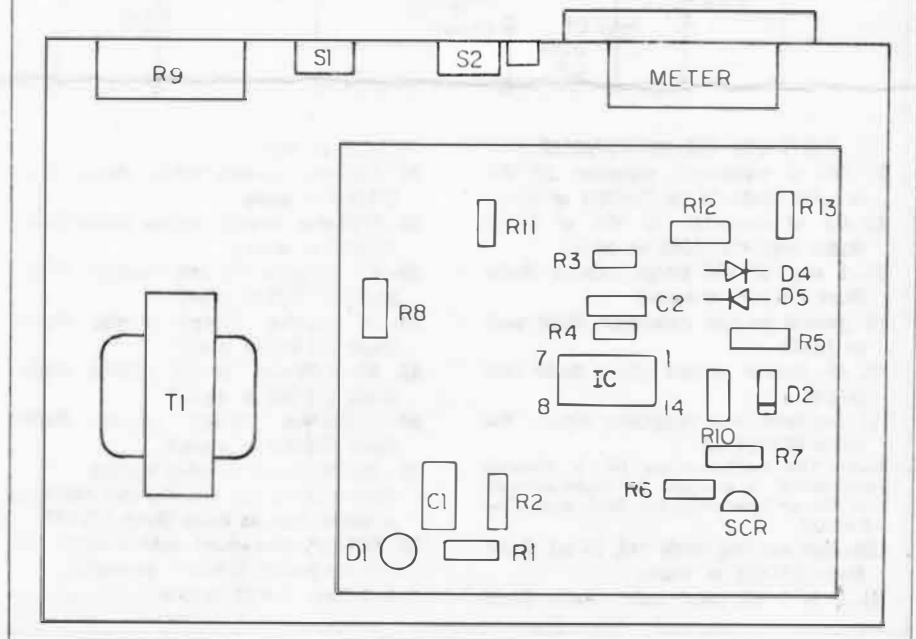
The charger makes use of a newly-developed integrated circuit which combines a built-in oscillator (similar to the 555-type) and a frequency divider of up to 65,536 (2^{16}). This way we can choose a basic oscillator frequency of 0.77 Hz which can be obtained with reasonable resistance and capacitance values and divide it by 2^{16} to obtain timing values of up to 14 hours. The basic frequency, f , is determined by C2, R3, and R4. The frequency

$$f = \frac{1}{2 \times R3 \times C2}$$

where $R4 = 2 \times R3$. The IC is connected in such a way that the timer resets itself when the circuit is first turned on. When its timing interval is up, it will turn the SCR off permanently until the circuit is first removed from, then connected to the power line again. The rest of the circuit is straightforward. The output of the IC (pin 8) controls the gate of the SCR and lights up the LED. The charging current is controlled by the variable resistor R9. The current range with the values shown is between approximately 40 and 500 mA for up to 6 cells. Switch S1



With our photographer and artist both on the job, you should have little difficulty locating parts on your supercharger perf board. While it is possible to build this unit in a much smaller area if you wish, beginners will find the extra room a benefit.



selects the IC divider output of either 2¹⁶ or 2¹³.

The lowest divider ratio the IC is capable of, 256, is particularly useful during the charger calibration. To select this counting/dividing mode, disconnect pins 12 and 13 from S1 and temporarily connect pin 12 to pin 14 and pin 13 to pin 5. When you have finished the test, reconnect pins 12 and 13 to S1 after removing your temporary connection. In this mode the timer should turn itself off after 3 minutes 17 seconds plus or minus 10 seconds. The meter M1 is used as a volt meter (0 to 10 volts) across the batteries or as a charging current milliamp meter of 0 to 500 mA. Its function is selectable with S2. The diodes D1 and D2 protect the meter from overload.

Put It Together. You can mount all components on a perfboard as shown in the photographs. The wiring is not critical. The MOS integrated circuit is internally protected against static charges, however we still recommend

using a 14 pin socket. Do not insert the IC until you are (1) finished with the wiring, (2) have checked all connections, (3) and made sure the power is off.

If you plan to charge the batteries outside your equipment, then you must provide battery holders for various size batteries which you want to connect to the charger. Under certain conditions, you may be able to connect the charger directly to your appliance without removing the batteries, usually via the "adapter" jack. You may have to look at the schematic of your radio or walkie-talkie to find out if the "adapter" jack is connected to batteries when a plug is inserted. If so, you can charge the NiCads in the unit.

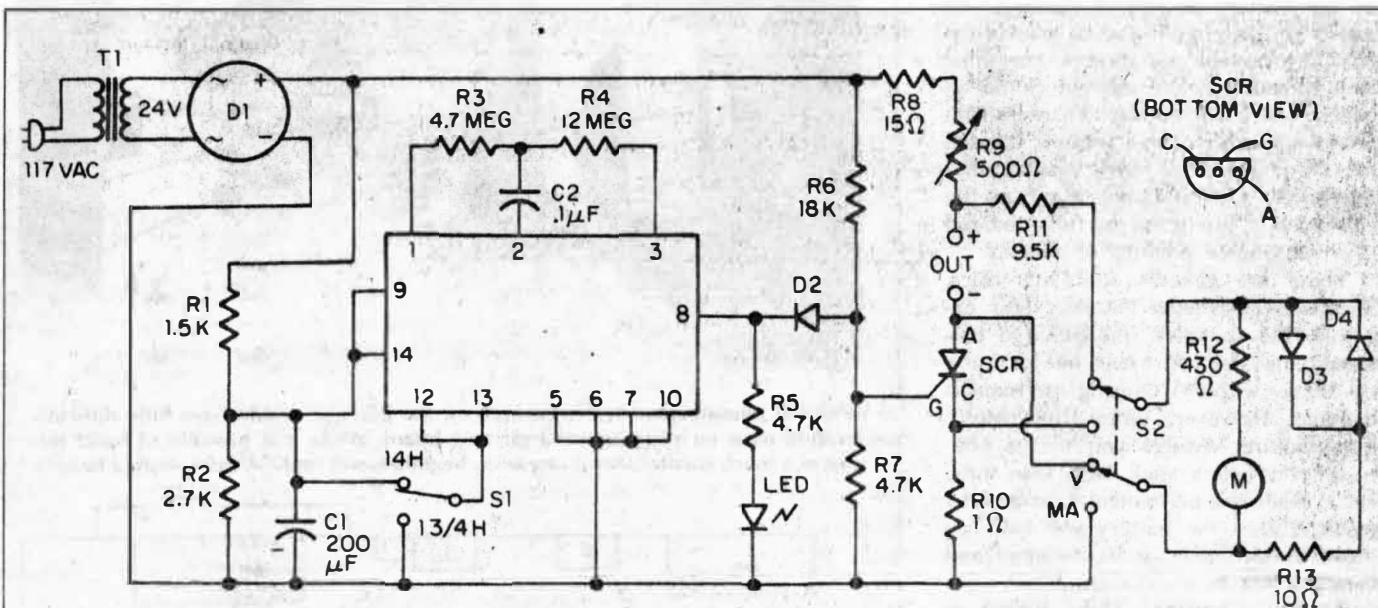
Once construction is complete, apply power and check to see whether or not the LED pilot lamp is on. If so, it should remain on for either one and three quarters of an hour or fourteen hours, whichever time you have selected with the *time select* switch. To check

the correct operation of the timing circuit in less time, you can make the following temporary connections to enable the divide by 256 function. Connect pin 12 and 13 of the IC temporarily to pins 14 and 5 respectively to select the 256 divider ratio. Try different values of capacitor C2 till you get a timing interval of approximately 3 minutes and 17 seconds. Of course, this is not a critical parameter, but it should be accurate to at least 3 minutes and 17 seconds plus and minus 30 seconds.

More Savings. Besides rechargeable batteries, regular throw-away zinc-carbon batteries can also be recharged under certain conditions. Those conditions follow.

- Battery should not be completely discharged (battery voltage should stay above 1 volt).
- Battery should not be leaking.
- Battery should be used soon after being recharged.

Other popular "throw-away" batteries are alkaline and mercury batteries. Mer-



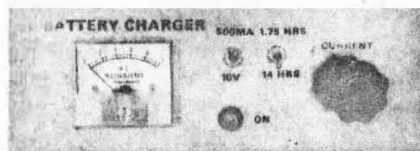
PARTS LIST FOR SUPERCHARGER

C1—200 uF electrolytic capacitor, 20 VDC or better (Radio Shack 272-1017 or equiv.)
 C2—0.1 uF capacitor, 12 VDC or better (Radio Shack 272-1069 or equiv.)
 D1—1 amp, 50 VDC bridge rectifier (Radio Shack 276-1151 or equiv.)
 D2—general purpose germanium diode such as 1N34A
 D3, D4—general purpose silicon diode such as 1N914
 IC1—oscillator-timer integrated circuit, Motorola MC14541CP
 Note—The oscillator-timer IC, a Motorola MC14541CP, is available for \$3.50 postpaid from Circuit Specialists, Box 3047, Scottsdale, AZ 85257.
 LED—light emitting diode, red, 20 mA (Radio Shack 276-041 or equiv.)
 M1—0 to 1 mA panel meter (Radio Shack

22-052 or equiv.)
 R1—1500-ohm, ½-watt resistor (Radio Shack 271-000 or equiv.)
 R2—2700-ohm, ½-watt resistor (Radio Shack 271-000 or equiv.)
 R3—4.7 megohm, ½-watt resistor (Radio Shack 271-000 or equiv.)
 R4—12 megohm, ½-watt resistor (Radio Shack 271-000 or equiv.)
 R5, R7—4700-ohm, ½-watt resistor (Radio Shack 271-000 or equiv.)
 R6—18,000-ohm, ½-watt resistor (Radio Shack 271-000 or equiv.)
 R8—15-ohm, 3-watt or better resistor
 Note—You can use two 7½ ohm resistors in series such as Radio Shack 271-147.
 R9—500-ohm wire-wound potentiometer (Allied Electronics 875-4041 or equiv.)
 R10—1-ohm, ½-watt resistor

R11—9500-ohm, ½-watt resistor, 5%
 R12—430-ohm, ½-watt resistor, 5%
 R13—10-ohm, ½-watt resistor (Radio Shack 271-000 or equiv.)
 S1—spdt switch (Radio Shack 275-326 or equiv.)
 S2—dpdt switch (Radio Shack 275-1546 or equiv.)
 SCR—.08 to 1 amp, 100 volt silicon controlled rectifier, G.E. C103 (Radio Shack 276-1059 or equiv.)
 T1—power transformer, 117 V primary to 24 V secondary @ 1 amp (Radio Shack 273-1480 or equiv.)
 Misc.—perf board, hardware, push-in clips, case approx. 6 x 4 x 3-in. (Radio Shack 270-252 or equiv.), 14-pin IC socket, output terminals such as Radio Shack 274-724 phone tip jacks, wire, solder, etc.

e/e SUPERCHARGER



Notice there's no on-off switch. That is a function handled by the power cord. Plug it in for on—pull it out for off! Why? It's cheaper to build, for one. For another, all counter reset signals are automatically generated each time the AC power is applied. This no power switch arrangement makes it easier to operate without accidentally resetting the counter timer integrated circuit.

cury batteries are used where high energy concentration in low volume is required. A camera or a hearing aid is a prime example of such an application. The mercury cell has three to five times the capacity of a carbon-zinc cell of the same size but it costs five to ten times as much.

Non-rechargeable alkaline batteries have about twice the capacity of a comparable carbon-zinc cell at approximately three times the price. Mercury and alkaline cells have similar nearly constant discharge voltage and low internal resistance characteristics as the NiCad cells. However, they are not leakproof and should be removed from equipment if not in use. We strongly discourage you from trying to recharge mercury or non-rechargeable alkaline batteries. Gases generated by the recharging process in the sealed cell may cause an explosion and spread the caustic electrolyte.

You may also run across rechargeable alkaline batteries. They are not as popular as NiCad batteries, but are slightly cheaper and have similar characteristics to NiCad batteries. They are not, however, as long-lived. Many other excellent types of batteries are used in military and commercial applications. They did not yet find their way to the consumer market because of high cost.

From this short description, you may deduce that the NiCad battery is the most cost-effective battery in many applications where the appliance is in frequent use.

On the Inside. A NiCad battery consists of layers of sintered cadmium and sintered nickel separated by fiber soaked in potassium hydroxide electrolyte.

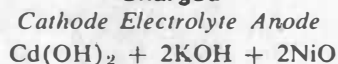
Sintering consists of baking a powdered metal to the consistency of a solid. A sintered material is highly porous. Its active area is several hundred times larger than that of a solid plate of the



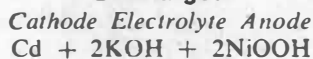
All commercially available nickel-cadmium batteries for consumer use will (or, certainly should) have some indication of what its charge rate and/or ampere hour rating is. The Burgess CD10 cell (far left) does not specifically mention charging rate, but its ampere hour rating is shown on the label. You can, therefore, use the rule of thumb which says charge for 14 to 16 hours at one tenth the battery rating or, in this case, 400 mA. This compares favorably with a 4 Ah Mallory cell.

same dimension. The basic chemical reaction in a NiCad battery is as follows:

Charged



Discharged



This reaction does not generate any gases. However, during the latter part of the charging cycle, during overcharging and during high discharge, hydrogen, oxygen and electrolyte fumes are being generated. These gases will normally reach an equilibrium condition reacting with each other and with the porous electrodes. Sealed cells also have a safety venting mechanism (activated above 100 PSI) assuring that the cell will not rupture under extreme conditions. Repeated venting however, causes loss of the electrolyte and subsequent battery deterioration. For this reason controlled charging is beneficial to NiCad batteries.

Other Advantages. A major advantage of NiCad cells, in particular when used for portable radios and walkie-talkies, is a nearly constant voltage during the discharging cycle. Regular zinc-carbon batteries lose their voltage at a fairly constant rate and thus affect the performance of the equipment they are powering; however, rechargeable batteries keep their voltage nearly constant until they nearly completely discharge. For example, the voltage of a carbon zinc battery drops by approximately 0.3 volts per cell when it is 50 percent dis-

charged. The voltage of a NiCad battery drops by only 0.1 volt during the same period. Another important feature of NiCad batteries is the low internal resistance on the order of about 30 milliohm (AA cells)—about ten times less than for a comparable zinc carbon battery. This feature is particularly important for class B type audio circuits which require more power during peaks of speech or music. Batteries with a low internal resistance can supply the sudden surges of power required for good, low distortion sound. Another important feature of NiCad batteries, as compared to zinc carbon, is that they can be stored in a charged or discharged state and are virtually leakproof.

For additional information about batteries in general and/or NiCad batteries in particular, refer to the following material. "More Staying Power for Small Batteries", *Machine Design* magazine, December 13, 1973; *Nickel-Cadmium Battery Application Engineering Handbook*, General Electric publication number GET-3148; *Nickel-Cadmium Battery Application Engineering Handbook Supplement*, General Electric-publication number GET-3148-S1; *RCA Battery Manual*, RCA publication BDG-111B; *Eveready Application and Engineering Data Book*.

From flashlight to photoflood, from toys to 2-way, NiCads are in widespread use. Everyone is ready to save a buck these days; from a money-saving standpoint, NiCad batteries have some definite advantages. Maybe, if you are a heavy battery user, NiCad rechargeable batteries can help you. Why not check it out?