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MAY 1966

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PAGE 52

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ABOUT
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ABOUT
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- Van de Graaff Machines
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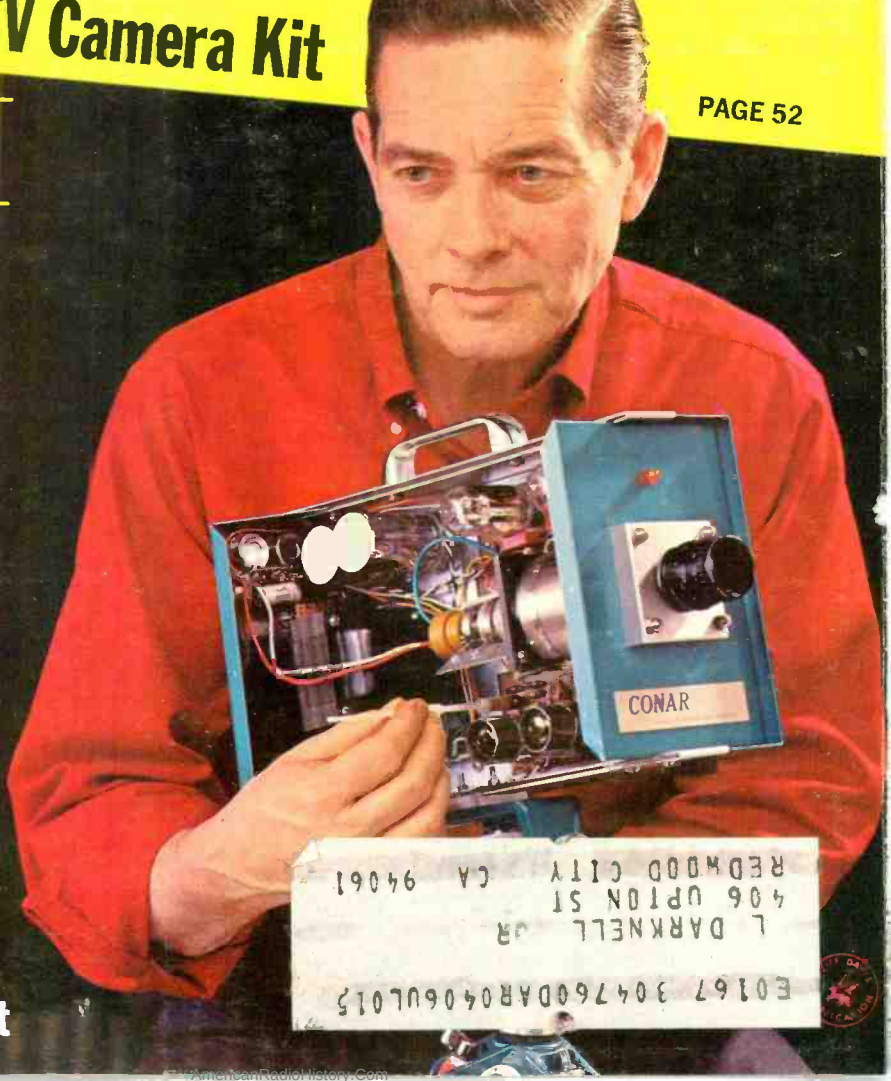
REPORT:
- 25" Color TV Kit



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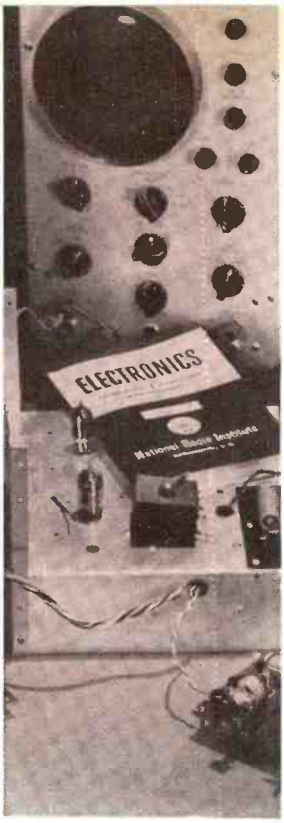

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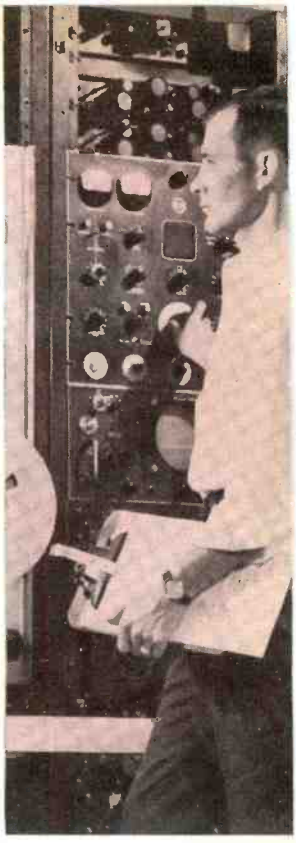

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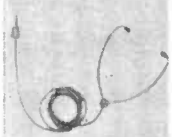

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CIRCLE NO. 44 ON READER SERVICE PAGE

POPULAR ELECTRONICS

WORLD'S LARGEST-SELLING ELECTRONICS MAGAZINE

VOLUME 24 **MAY, 1966** NUMBER 5

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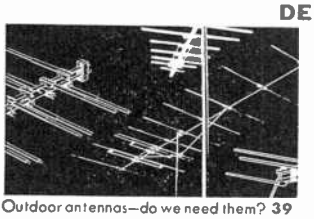
ELECTRONIC CONSTRUCTION PROJECTS

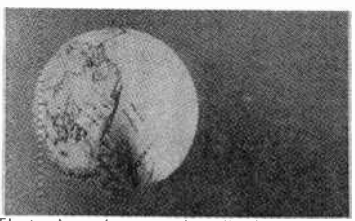
COMMUNICATIONS

ELECTRONIC FEATURES AND NEW DEVELOPMENTS

DEPARTMENTS



Outdoor antennas—do we need them? 39



Electronic gadget cancels pull of gravity 67

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This month's cover photo by Bruce Pendleton

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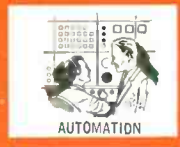
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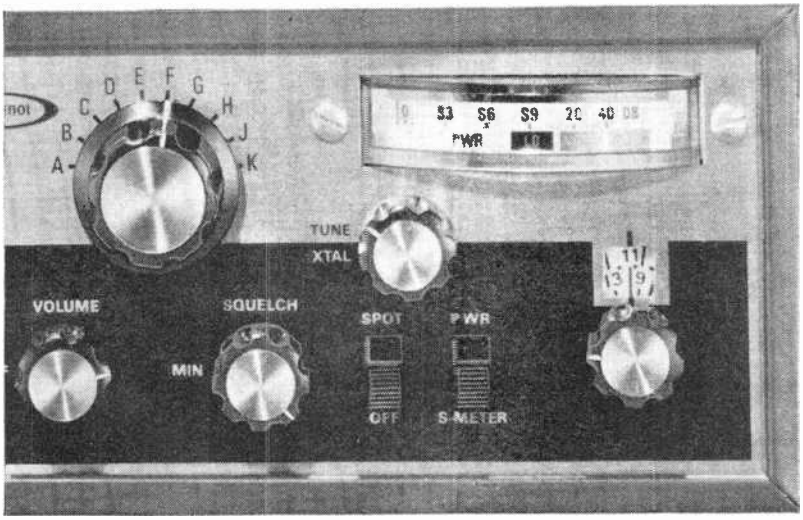

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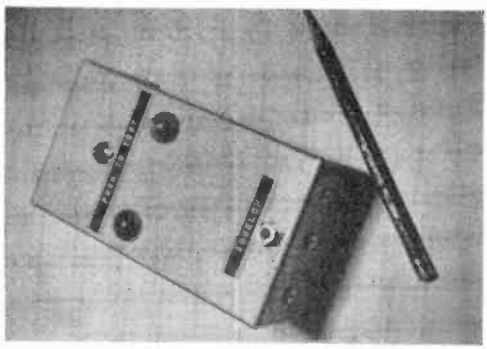
CIRCLE NO. 3 ON READER SERVICE PAGE

LETTERS
FROM OUR READERS

Address correspondence for this department to: Letters Editor, POPULAR ELECTRONICS One Park Avenue, New York, N. Y. 10016

PANIC ALARM BUILDER HATH NO COMPASSION

In designing your panic alarms, I think you have been too lenient on the victims. In the "Build Panic Alarm" unit (May, 1964), it was a simple matter to pull the plug to stop the alarm. In "Don't Panic—Push the Button" (January, 1966), one could simply flick a switch on the back of the unit. By combining these two projects and using a little initiative, I have come up with a panic alarm which doesn't give an inch to its unsuspecting victim. I used the basic relay circuit from the May article and the blinking lights and squelch idea from the January article. Then I added a metal bushing to the squelch button so no one could stop the noise by putting a



book on the alarm. In order to turn my alarm off, you have to push a pin into one of several pinholes around the box, and simultaneously open a magnetic reed switch, hidden somewhere in the box, with a magnet.

GREG TARLE
Fresh Meadows, N. Y.

Greg, how cruel can you be?

ELECTROLOCK-CUTELY YOURS

The "Electrolock" (January, 1966), looked like an "in" way to demonstrate my skill at keeping visiting kids out of my hi-fi set. All I would need would be a microswitch connected to the cover of the turntable so that nothing could be turned on unless the combo had been dialed and the cover lifted. But, the kids today are smarter than I ever was. One kid held down the push button and another ran through the entire sequence of possible combinations in less than an hour.

I figured that I'd forget a combo of six or seven numbers, which is what I would get if

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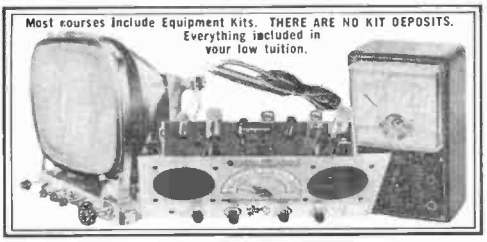

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LETTERS (*Continued from page 6*)

I added more switches, so in desperation, I removed the battery and even stuck a diode in series with one of the terminals so that the battery, which I hid, had to be connected just right. This normally would double the odds, but maybe my little devils have ESP. My wife found them with a filament transformer connected to the posts so that the a.c. got through the diode no matter which way the transformer was connected.

I have been fiddling around with delay circuits, with the idea that, if the button were

pressed on the wrong combination, the circuit would "deactivate" for half a minute or so; but my temporary remedy has worked long enough now that it may be of interest to others. You simply connect all unused terminals through a second set of terminals on the push button to a very loud doorbell. If the wrong combo is dialed, everyone in the house knows about it.

Now all I have to do is to persuade my wife to remember to scramble the combination after she opens the set.

JOHN D. SANKEY
St. Catharines, Ontario, Canada

ANTENNA POTPOURRI

I plan to use a 75-ohm line to run from my outdoor antenna into the house. There I will connect it to a matching "Coloraxial" transformer and to a 4-set Blonder-Tongue color splitter. Four shielded 300-ohm lines will be connected to four outlets on the first floor. Will this setup give me better color pictures and better stations? Also, what type of insulators should I use for the coax? And can I use this setup for CATV in the future?

STEPHEN JACKSON
Kalamazoo, Mich.

Steve, if you match everything up, there's no reason why the setup won't work. Be sure your antenna has a 75-ohm takeoff point to accommodate your 75-ohm transmission line; otherwise use a matching transformer. As for better color pictures, better than what? Unless you're a stockholder of a station, you're not going to be able to make them any better or worse. Insulators for coax (if you mean standoffs) are not critical, just so long as you don't kink the wire. If your system works with

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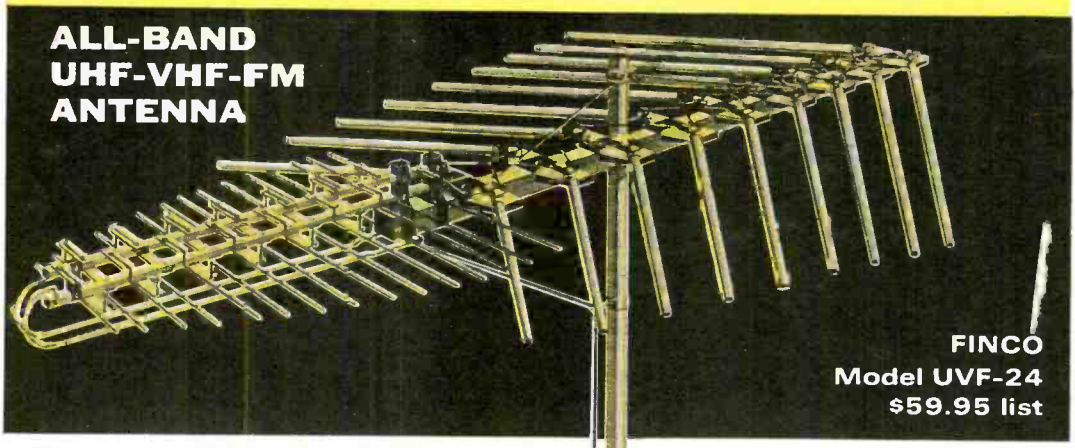

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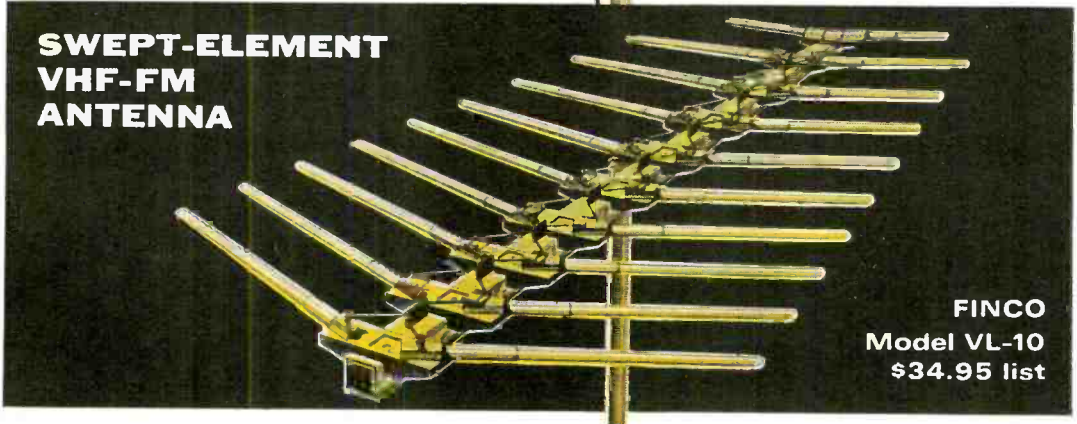

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CIRCLE NO. 12 ON READER SERVICE PAGE

LETTERS (*Continued from page 8*)

an off-the-air signal, it should work equally well with CATV. See "Antenna Boom" starting on page 39 of this issue.

ENGLISH-LANGUAGE NEWSCASTS

My compliments on the accuracy of your "English-Language Newscasts to North America" list. Within the space of one week, I received all 23 countries on the list, at the times and on the frequencies listed.

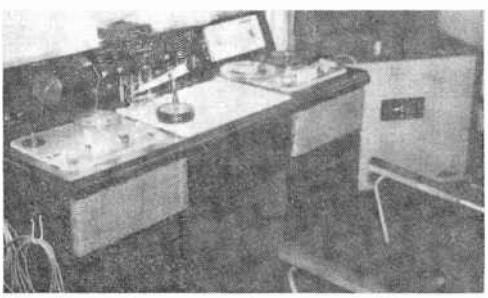
ELLIOT STRAUS
West Orange, N. J.

Elliot, how about taking a crack at the list of more difficult to hear "Broadcasts from Asia and Oceania" which appears on page 78 of this issue?

TAPE CLUBS

As a subscriber to your outstanding magazine, may I—and CANTRA (Canadian Tape Recordists Association)—request that more articles on taping and tape recorders be published? I am enclosing a picture of a console I built at our Ottawa location.

CANTRA was originally formed in 1963. It is a non-profit organization, and its aim is



friendly tapespondence throughout the world. If any of your readers would like more information about CANTRA, they may contact Hal Redfield at 4406 W. Florissant, St. Louis, Mo., in the U.S.A. or myself here in Ottawa at 248 Elgin St., #5.

E. J. POMBERT (CANTRA Director)
Ottawa 4, Ont., Canada

The December 1965 issue of POPULAR ELECTRONICS with its articles on tape recording is well worth the price of the annual subscription. I would like to share "Inside Tips from the Pros" with all members of the American Tape Exchange. The Exchange is a non-profit club which was organized to promote brotherhood and fellowship throughout the world. An application form for membership and information about the club can be had by sending a stamped self-addressed envelope to the American Tape Exchange, 84 Chambers Dr., Marietta, Ga. 30062.

L. S. COBB, Director
Marietta, Ga.

(*Continued on page 12*)

Why does one of these men earn so much more than the other?

More brains? More ambition?

No, just more education in electronics.

You know that two men who are the same age can work side-by-side on the same project, yet one will earn much more than the other.

Why? In most cases, simply because one man has a better knowledge of electronics than the other. In electronics, as in any technical field, you must learn more to earn more. And, because electronics keeps changing, you can never stop learning if you want to be successful.

But your job and family obligations may make it almost impossible for you to go back to school and get the additional education you need. That's why CREI Home Study Programs are developed. These programs make it possible for you to study advanced electronics at home, at your own pace, on your own schedule. You study with the assurance that what you learn can be applied on the job to make you worth more money to your employer.

CREI Programs cover all important areas of electronics including communications, servomechanisms, even spacecraft tracking and control. You're sure to find a program that fits your career objectives.

You're eligible for a CREI Program if you have a high school education and work in electronics. FREE book gives all the facts. Mail coupon or write: CREI, Dept. 1205-D,3224 Sixteenth Street, N.W., Washington, D.C. 20010

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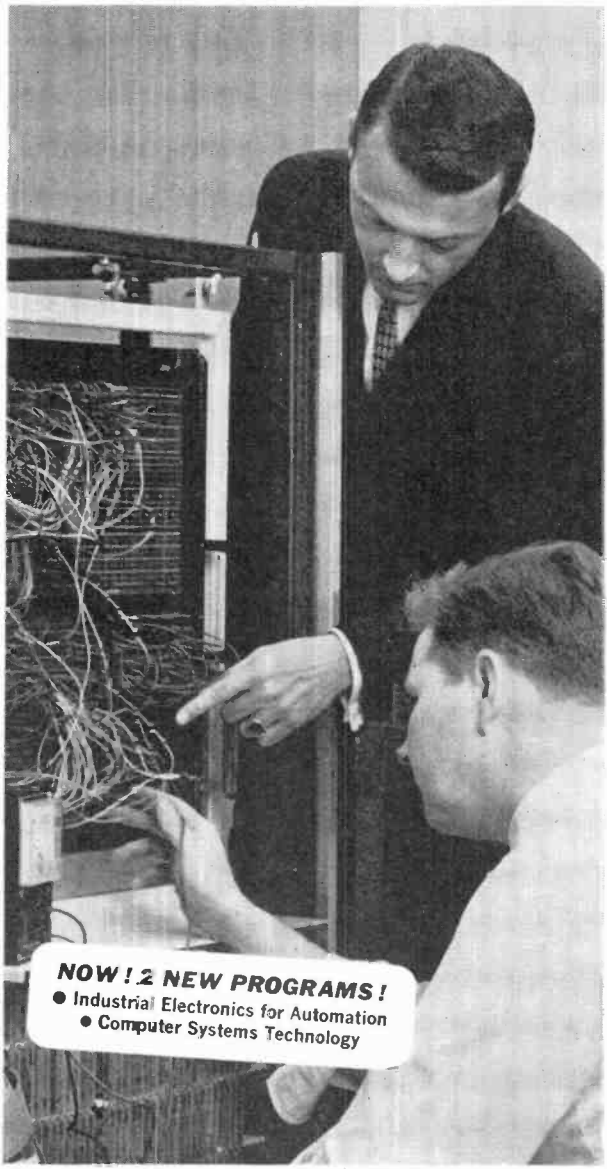

The Capitol Radio Engineering Institute
Dept. 1205-D, 3224 Sixteenth Street, N.W.
Washington, D.C. 20010

Please send me FREE book describing CREI Programs. I am employed in electronics and have a high school education.

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TYPE OF PRESENT WORK_____

I am interested in ☐ Electronic Engineering Technology
☐ Space Electronics ☐ Nuclear Engineering Technology
☐ NEW! Industrial Electronics for Automation
☐ NEW! Computer Systems Technology

LETTERS (*Continued from page 10*)

"TICKLE STICK"

I built "The Tickle Stick" (February, 1966), put the works into an attache case, and hooked the electrodes to the two catches. So far no one has seen the inside of the case.

RICKIE PRINDLE, WN50BY
Abilene, Texas

Was I surprised when I pushed the button on the "Tickle Stick." I expected a small shock, but was almost jolted off my feet. Then I tried it on all my friends.

STEVE GOLDBAND
Haverstraw, N. Y.

I would like to know if it is possible to obtain information on how to increase the shock strength of the "Tickle Stick." I would like to be able to build something which is just as compact but which has about four times the "tickle," so that I could use it to condition some of our animals. Our present stimulator is a.c.-operated and, thus, not portable.

DARRELL E. ROSE, Ph.D.
Director of Audiological Research
Monterey Institute for Speech and Hearing
Monterey, Calif.

Rickie, it looks like you should join the Diplomatic Service. Steve, you better join Rickie, as you probably don't have any friends left. Darrell, we can't publish anything that tells how to get a greater shock, but there are commercial units available for police work and for use in stock yards.

AMAZING ELECTROMAZE

Your "Electromaze Puzzle" in the February, 1966, issue was superb! It was thought-provoking as well as interesting. Let's have another!

MITCH ZIMMER
Brooklyn, N. Y.

Mitch, did you see the one in the April issue? Another one is scheduled for June.

ALL FOR 99 CENTS?

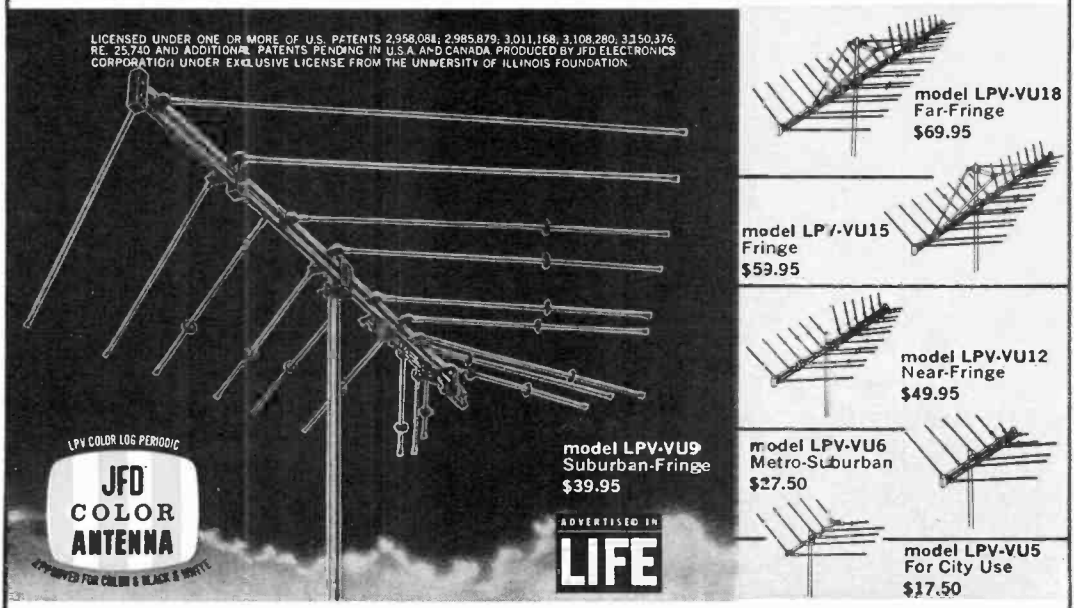
The "Unique 99-Cent Speaker Enclosure" (November, 1965) really works. But, in my unit, sound quality suffered from vibration of the waste basket. Experimenting disclosed that six or eight bands of wire or heavy nonstretch twine, fitted tightly around the basket, would dampen the vibrations considerably. The wires should be fitted as tightly as possible two or three inches above the desired position, then pushed toward the wider end to tighten them even more. Uniform spacing of the bands is not necessary, and might be undesirable. A second waste basket, also with a hole in the bottom, and placed over the first basket, also dampens the vibrations con-

(*Continued on page 94*)

for brilliant 82-channel TV performance—COLOR or black & white, plus FM/Stereo

INSTALL THE NEW...

JFD® LPV COLOR LOG PERIODIC TV ANTENNA



Now you can enjoy the best reception ever on any VHF, UHF or FM/Stereo station—from one antenna, using one down-lead—with the patented new JFD COLOR LPV Log Periodic.

Why cripple your reception with inefficient antenna "hodge-podges?" Choose a powerful space-age JFD LPV . . . see and hear the spectacular difference!

DON'T BE MISLED BY IMITATIONS—NO OTHER ANTENNA WORKS LIKE THE JFD LPV BECAUSE . . .

- Only the LPV is designed according to the **original** log periodic patented design of the University of Illinois Antenna Research Laboratories.
- Only the LPV combines **frequency-independent** design with **capacitor-coupled** electronic dipoles for . . .
- **Higher**, more **uniform** gain and narrower directivity on channels 2 to 83—and FM.

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JFD ELECTRONICS CORPORATION • 1462 62nd Street • Brooklyn, N. Y. 11219

world's largest manufacturer of TV & FM antennas

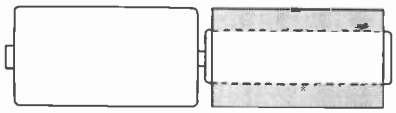
CIRCLE NO. 45 ON READER SERVICE PAGE

PARTS METHODS IDEAS GADGETS DEVICES

TIPS & TECHNIQUES

PADDED CELL KEEPS FLASHLIGHT LIT

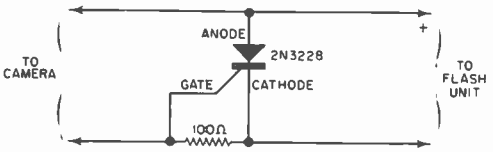
Situation: a "dead" flashlight and the only batteries on hand are physically too small to use. Sound familiar? Next time it happens to you, try putting the flashlight back in use by padding a small battery with a roll of



tape and paper, cardboard, or other bulk insulating material. Build up the diameter of the small battery until it fits in the larger battery holder, and you're in business—at least for a little while. —*Art Trauffer*

SCR TAKES LOAD OFF CAMERA FLASH CONTACTS

Photographers who constantly use an electronic or other type of flashgun will appreciate this simple, inexpensive gadget—it cuts down the high voltage and current normally



"felt" across the camera's contacts and extends their life. You can assemble the 2N3228 silicon control rectifier (SCR) and 100-ohm resistor in any small plastic container; a coin holder will do nicely. If you insert the assem-

(*Continued on page 20*)

POPULAR ELECTRONICS
READER SERVICE PAGE

You can get
additional information promptly
concerning
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in this issue

1

Circle the number on the coupon below which corresponds to the key number at the bottom of the advertisement or is incorporated in the editorial mention that interests you.

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Mail the coupon to the address indicated below.

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VOID AFTER JUNE 30, 1966 5

You can earn more money if you have an FCC License

FCC FORM 758 A

The United States of America

NUMBER P1-20-6490

FEDERAL COMMUNICATIONS COMMISSION

RADIOTELEPHONE OPERATOR LICENSE

FIRST CLASS

(General Radiotelephone Certificate)

This certifies that TOMMY WILLIS DUFFY

IS A LICENSED RADIO OPERATOR, AUTHORIZED, SUBJECT TO ANY SPECIAL ENDORSEMENT PLACED HEREON, TO OPERATE THE CLASSES OF LICENSED RADIO STATIONS FOR WHICH THIS CLASS OF LICENSE IS VALID UNDER THE ORDERS, RULES AND REGULATIONS OF THE FEDERAL COMMUNICATIONS COMMISSION, ANY STATUTE OF THE UNITED STATES AND ANY TREATY TO WHICH THE UNITED STATES IS A PARTY.

THIS LICENSE IS GRANTED UNDER THE AUTHORITY OF THE COMMUNICATIONS ACT OF 1934, AS AMENDED, AND THE TERMS AND CONDITIONS THEREOF AND OF ALL LEGISLATIVE ACTS, EXECUTIVE ORDERS, AND TREATIES TO WHICH THE UNITED STATES IS SIGNATORY, AND ALL ORDERS, RULES AND REGULATIONS OF THE FEDERAL COMMUNICATIONS COMMISSION, WHICH ARE BINDING UPON RADIO OPERATORS, ARE MADE A PART HEREOF AS THOUGH SPECIFICALLY SET OUT IN FULL HEREIN.

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PLACE AND DATE OF ISSUANCE: BUFFALO, NEW YORK SEPTEMBER 11, 1963

DATE AND TIME OF EXPIRATION: SEPTEMBER 11, 1968 AT THREE O'CLOCK A. M., EASTERN STANDARD TIME.

SPECIAL ENDORSEMENTS: SHIP RADAR ENDORSEMENT - SEPTEMBER 11, 1963 - BUFFALO, NEW YORK

SPECIMEN

ISSUING OFFICER

Federal Communications Commission

Tommy Willis Duffy (Licensee) (Issuing Officer) Ben F. Waple (Secretary)

NOT VALID UNTIL SIGNED

Employers are paying good money for men holding FCC tickets. Read how to get yours:

When you hold a Commercial License issued by the FCC (Federal Communications Commission) you have written proof that you know and understand basic electronic theory and fundamentals. It's worth plenty... particularly to companies on the lookout for qualified technicians. Here's how one of the country's leading office machine manufacturers rates men with FCC Licenses:

> "An FCC License is an asset to any man looking to enhance his career in the field of electronics. At our Company, a licensed man is well-rewarded because an FCC License attests to his knowledge of electronics theory..."

Thousands of employers will tell you the same thing. Licensed men get the good jobs. They make more money ...move ahead faster...enjoy exciting, challenging work. What's more, they're needed badly in every field of electronics. Industrial electronics. Radio-TV Broadcasting. Aerospace, Electronics Servicing...including mobile and marine radio *plus* CB.

Yes...your opportunities are unlimited once you're carrying that FCC Commercial Ticket. AND CLEVELAND INSTITUTE OF ELECTRONICS CAN GET ONE FOR *YOU!* On the facing page, read how four ambitious men just like you have cashed in on CIE's surefire FCC Licensing Program. Read about CIE's exclusive money-back offer. And then enroll in the FCC course of your choice. You will soon be on *your* way to a Commercial FCC License and the many rewards that go with it!

NEW in 1966

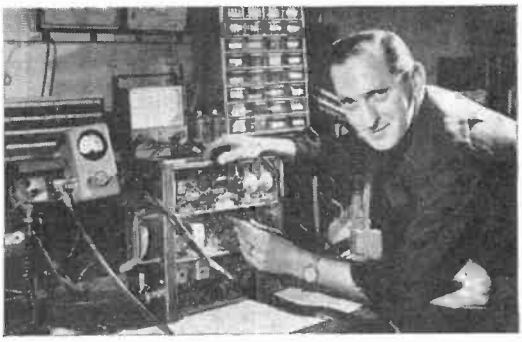
Only CIE offers new, up-to-the-minute lessons in all of these subjects:

- Logical Troubleshooting
- Single Sideband Techniques
- Laser Theory and Application
- Pulse Theory and Application
- Microminiaturization
- Boolean Algebra

These CIE men have good jobs
(they have Commercial FCC Licenses)

Matt Stuczynski, Senior Transmitter Operator, Radio Station WBOE. "I give Cleveland Institute credit for my First Class Commercial FCC License. Even though I had only 6 weeks of high school algebra, CIE's AUTO-PROGRAMMING teaching method makes electronics theory and fundamentals easy. After completing the CIE course, I took and passed the 1st Class Exam. I now have a good job in studio operation, transmitting, proof of performance, equipment servicing. Believe me, CIE lives up to its promises!"

Ted Barger, Electronic Technician, Smith Electronics Co. "I've been interested in electronics ever since I started operating my own Ham rig (K8ANF). But now I've turned a hobby into a real interesting career. Cleveland Institute of Electronics prepared me for my Commercial FCC License exam . . . and I passed it on the first try. I'm now designing, building and testing all kinds of electronic equipment . . . do a lot of traveling, too. It's a great job . . . and thanks to CIE and my FCC License, I'm on my way up."



Chuck Hawkins, Chief Radio Technician, Division 12, Ohio Dept. of Highways. "Cleveland Institute Training enabled me to pass *both* the 2nd and 1st Class License Exams on my *first* attempt . . . even though I'd had no other electronics training. (Many of the others who took the exam with me were trying to pass for the eighth or ninth time!) I'm now in charge of Division Communications and we service 119 mobile units and six base stations. It's an interesting, challenging and extremely rewarding job. And incidentally, I got it through CIE's Job Placement Service . . . a free lifetime service for CIE graduates."

Glenn Horning, Local Equipment Supervisor, Western Reserve Telephone Company (subsidiary of Mid-Continent Telephone Company). "There's no doubt about it. I owe my 2nd Class FCC License to Cleveland Institute. Their FCC License Program really teaches you theory and fundamentals and is particularly strong on transistors, mobile radio, troubleshooting and math. Do I use this knowledge? You bet. We're installing more sophisticated electronic gear all the time and what I learned from CIE sure helps. Our Company has 10 other men enrolled with CIE and take my word for it, it's going to help every one of them just like it helped me."

FCC LICENSE WARRANTY

A CIE FCC License Course will quickly prepare you for a Commercial FCC License. If you don't pass the FCC exam . . . on the first try . . . after completing your course, CIE will refund all your tuition. You get an FCC License . . . or your money back!

Two out of three men who took the 1st Class Commercial FCC License exam in 1965, failed. Nine out of ten CIE-TRAINED men who take this exam, pass . . . the very first try!

And that's why CIE can back their courses with the warranty you see at the left. CIE-trained men know their stuff...because CIE AUTO-PROGRAMMED™ lessons *work!*

Get started now. Send postage-paid reply card for free information about a plan that gets you an FCC License *or costs you nothing!*

CIE **Cleveland Institute of Electronics**

1776 East 17th Street, Dept. PE-40, Cleveland, Ohio 44114

TIPS

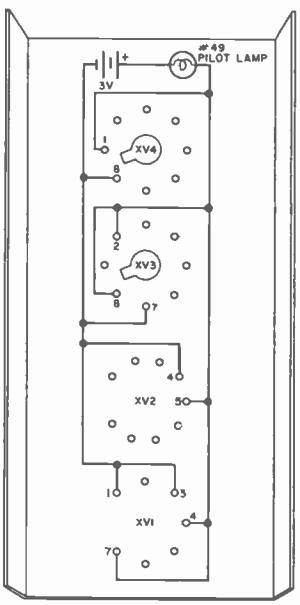
(*Continued from page 14*)

bly in the flash cord, you'll be able to use the hookup with different flash units and with different cameras. No additional batteries are required since the gadget is powered by the flash unit. Cost is less than $2.00.

—*William S. Gohl*

QUICKIE TUBE FILAMENT CHECKER FROM OLD RADIO CHASSIS

Do you have an old radio chassis in your junk box? You can turn it into a "quick-and-dirty" tube filament checker for testing a blacked-out series-string of tubes. Replace all duplicate sockets with an assortment of other sockets including 7- and 9-pin miniatures (*XV1, XV2*), octal (*XV3*), and loctal (*XV4*) types. Wire the filament pins, a #49 pilot lamp, and two 1½-volt flashlight cells as shown. To test a tube, insert it in the appropriate socket; if the lamp lights, chances are that the filament is good. While you can be mislead in some instances by tubes having shorted elements and open filaments, and by filaments that act up only when full voltage is applied, in most cases this checker will work to your advantage. Also, you can connect a pair of test leads to, say, pins 2 and 7 of XV3, and use the gadget as a continuity tester (with a 3-volt pilot lamp).



—*Mike Ianelli*

"TIPS" WANTED

Do you have a favorite "tip" or "technique" that you would like to pass on to other readers? It may be worth money to you. Send it in (about 100 words or so, with a rough drawing and/or a clear photograph), and if it is accepted, you will receive a check in return. The size of the check will depend upon the originality of the idea and how practical it is. Material not accepted will be returned. Address the "package" to: Tips & Techniques Editor, POPULAR ELECTRONICS, 1 Park Avenue, New York, N. Y. 10016.

Hallicrafters' new CB-19 transceiver
is about as sleek and trim and compact
as an infantry boot.

That's why there's room for the "S" meter,
the receiver tuning VFO, the king-size communications
speaker and unsurpassed basic performance
—for only **$149.95**

You'll get a boot out of these features!

■ 8 crystal-controlled channels. 23-channel receiver tuning with frequency spotting switch. ■ Built-in, amateur-type "S" meter. ■ All-electronic push-to-talk circuitry. ■ Dual conversion, superheterodyne receiver. Superior sensitivity—less than 1 microvolt for 10 db S/N. ■ Hallicrafters' exclusive "Racket Buster" built-in noise limiter.

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"Quality through Craftsmanship"

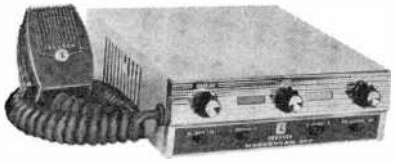
CIRCLE NO. 15 ON READER SERVICE PAGE

NEW PRODUCTS

Additional information on products covered in this section is available from the manufacturers. Each new product is identified by a code number. To obtain further details on any of them, simply fill in and mail the coupon on page 15.

SINGLE-SIDEBAND CB TRANSCEIVER

Single-sideband operation is now available to all Citizens Band operators—with the introduction of the new *E. F. Johnson* "Messenger 350" transceiver. During periods of high noise, severe skip interference, and other atmospheric disturbances, the "350"



has covered up to three times the range of ordinary 5-watt AM CB transmitters. For business users, the solid-state unit can operate on any of 46 different frequencies without adjacent channel interference. The basic "350" is equipped for 12-volt operation, and is furnished with crystals for two channels and a dynamic push-to-talk microphone. An optional a.c. power supply for base station use is available, as is a small power pack battery module for hand-carried field operation.

Circle No. 75 on Reader Service Page 15

"BALL" TYPE MICROPHONE

Called the "Spher-O-Dyne," the new "ball" type microphone announced by *Shure Brothers, Inc.*, is available in both high-impedance and low-impedance models (533SA and 533SB respectively). A dynamic omnidirectional unit, it features a built-in wind, breath, and "pop" filter, uniform frequency response from 40 to 11,000 cycles, and a built-in "on-off" switch. The Spher-O-Dyne is supplied with an adjustable swivel adapter, which permits it to be tilted through 90° from vertical to horizontal when mounted on a stand, and to be quickly disengaged for hand-held use.

Circle No. 76 on Reader Service Page 15

MASTER TOOL SET KIT

Packaged in a durable, attractive leatherette carrying case are six of the most popular precision tool sets marketed by *Moody Machine Products Company, Inc.* Called the Moody Master Kit (MMK-6), the package includes this company's screwdriver and awl set; Phillips driver and Allen-type wrench set; nonmagnetic socket wrench set; tap set; offset open-end wrench set; and fishing reel repair kit.

Circle No. 77 on Reader Service Page 15

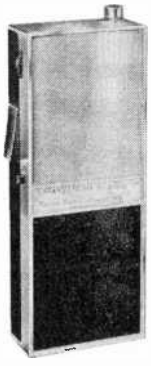
FOUR-SPEED MANUAL RECORD PLAYER

Incorporated in the *Garrard* Model SP20 four-speed manual record player are a semi-counter-balanced arm with adjustable stylus pressure, a trip which allows tracking as light as 2 grams, a full-sized weighted turntable, and an interchangeable plug-in head that will take any cartridge. After play, the tonearm returns to the rest, and the machine shuts off automatically.

Circle No. 78 on Reader Service Page 15

"SUPER-POWER" WALKIE-TALKIE

Lafayette Radio Electronics has introduced a walkie-talkie that features 300 milliwatts input and built-in "Range Boost" circuitry to increase the effective range. Two switchable channels in the HA-99 give multiple-channel versatility. Other features include a 9-transistor, 3-diode, 2-thermistor circuit, and a sensitive superhet receiver with push-pull audio and modulator. The battery supply can be eight penlight cells or any external d.c. source. Housed in a sturdy black and silver metal case, the HA-99 comes complete with a pair of channel 10 transmit and receive crystals, batteries, leather carrying case, and a telescoping antenna. Actual size: 2⅞" x 7½" x 1½".



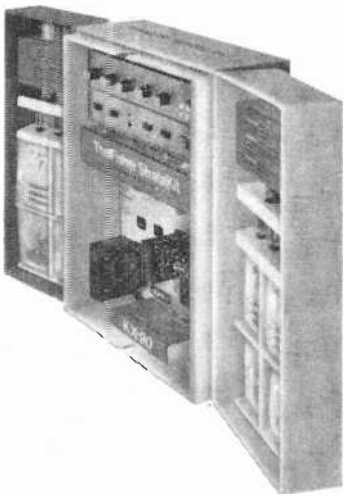
Circle No. 79 on Reader Service Page 15

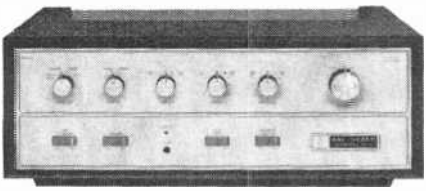
THREE-BAND PORTABLE RECEIVER

Short-wave broadcasts as well as AM and FM stations can be heard on *Hallicrafters'* new WR-3100 pocket-size portable—it covers the broadcast spectrum from 4 to 12 mc. Excellent sound quality, sensitivity, and receiving power normally associated with far larger radios are said to have been en-

Who makes the only great amplifier for $99.50?

You do... with the new Fisher KX-90 StrataKit.





Now, for the first time in high fidelity history, you can own a truly distinguished stereo control-amplifier for less than $100—if you are willing to build it yourself.

Fisher refuses to compromise quality. Therefore, even at $99.50*, the Fisher KX-90 StrataKit incorporates the same basic standard of fidelity as the most expensive Fisher components. Take away its price tag and it would still excite the admiration of the fastidious audiophile.

With 40 watts of clean power, the KX-90 can drive even inefficient speakers to their maximum performance level. Superior output transformers make certain this power will not fall off steeply at the frequency extremes. Advanced preamplifier features, including rocker switches and complete phono/tape facilities, provide unlimited flexibility.

It's all yours if you follow directions. And that's no problem with the exclusive Fisher StrataKit method. No experience is necessary. Assembly takes place by simple, *errorproof* stages (Strata). Each stage corresponds to a *separate* fold-out page in the uniquely detailed instruction manual. Each stage is built from a *separate* packet of parts (StrataPack). Major parts come already mounted on the extra-heavy-gauge steel chassis. Wires are *pre*cut for every stage —which means every page. All work can be checked stage-by-stage and page-by-page, before proceeding to the next stage.

The end result is a Fisher stereo control-amplifier that is fully equal in performance as well as reliability to its factory-wired prototype. Fisher guarantees this. And who should know better than Fisher?

FREE! $1.50 VALUE!

Send for *The New Kit Builder's Manual*, an illustrated guide to high fidelity kit construction, complete with detailed specifications of all Fisher StrataKits.

Fisher Radio Corporation
11-35 45th Road
Long Island City, N.Y. 11101

Name_____

Address_____

City_____

State_____ Zip_____

105

*WALNUT CABINET, $24.95

OVERSEAS AND CANADIAN RESIDENTS PLEASE WRITE TO FISHER RADIO INTERNATIONAL, INC., LONG ISLAND CITY, N.Y. 11101.

The Fisher

PRODUCTS *(Continued from page 22)*

gineered into the 6¾" x 4⅞" x 2½" unit. Its circuitry employs 10 transistors and 4 diodes. Two antennas—including a 24" telescoping whip—are built into the WR-3100. An earphone is provided for private listening.

Circle No. 80 on Reader Service Page 15

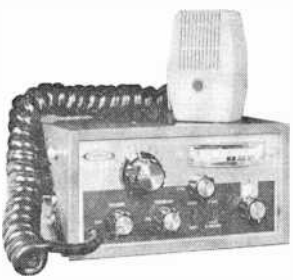
HAM AND CB "TRANSMATCH"

The compact, portable, easy-to-use Model 715 "Transmatch" announced by *EICO Electronic Instrument Co., Inc.*, quickly indicates the status of all the vital r.f. characteristics of ham and CB transceivers. At a flip of a switch, it reads SWR from 1 to 30, true r.f. power up to 50 watts, percentage of modulation to 100%, and relative field strength on a calibrated scale of 1 to 10. A set of headphones can be plugged in for an aural check on modulation distortion, and for monitoring. This solid-state, self-powered, sensitive (100-μa. meter) unit is available wired or in kit form.

Circle No. 81 on Reader Service Page 15

COMMUNICATIONS-TYPE CB TRANSCEIVER

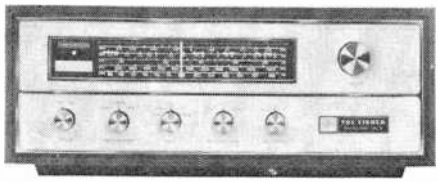
An 18-transistor, 9-diode CB transceiver, the *Amphenol* Model 650 contains a new crystal-correlated tunable dual-conversion receiver, adding the stability of a crystal oscillator to a high-*Q* tuned circuit. Seven panel controls, plus an easily read output/S-meter permit a high degree of regulation and monitoring of transmitted and received signals. A stud-mounted transistor is used for the transmitter's final output stage; power output peaks at 3.5 watts. The Model 650 also serves as a p.a. system when used with an external speaker. With self-contained 12-volt d.c. and 115-volt a.c. power supplies, it measures only 3¾" x 6¾" x 9½" deep. It can be operated at temperatures as low as −25°F.



Circle No. 82 on Reader Service Page 15

MULTI-BAND TUNER

Stereo enthusiasts and SWL's can now have something in common: the R-200-B transistorized FM stereo/AM multi-band short-wave tuner available from *Fisher Radio*. The R-200-B's features include a high-sensitivity (1.8 μv.) front-end and automatic multiplex switching for FM stereo reception. The four-band AM section (150-350 kc., 510-1630 kc., 5.9-6.3 mc., 7.0-16.5 mc.) has a tuned r.f. amplifier stage and a 3-gang tuning capacitor to

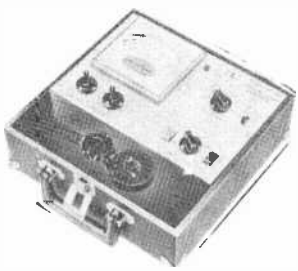


make possible low-noise reception even in weak signal areas. A unique gain control regulates three stages to effectively reduce the fade-out often associated with SWL'ing on conventional tuners. Razor-sharp selectivity is said to be achieved by a front panel AM bandwidth selector switch.

Circle No. 83 on Reader Service Page 15

TV PICTURE TUBE ANALYZER

Quality tests for both color and black and white tubes can be performed with the CRT-100 picture tube analyzer introduced by *Lectrotech, Inc.* Color tubes are checked at the two extremes of operating conditions—maximum and minimum emission—which provides an accurate means of comparing the three color guns. Grid-cathode leakage is measured by a sensitive indicator. Rejuvenation is accomplished by a momentary application of a high energy potential between grid and cathode, and momentary high voltage between elements is used to burn out shorts. The CRT-100 comes with plug-in type sockets and cables.



Circle No. 84 on Reader Service Page 15

AUDIO FAN

You can extend the life of your hi-fi set or communications gear by installing a high-powered, low-noise fan such as the "Hi-Fi Boxer" available from *IMC Magnetics*. The "Hi-Fi Boxer" can blow fresh air into your set or operate as an exhaust fan. Small enough ($4\frac{11}{16}$" square x 1½" deep) to fit into almost any enclosure, it provides enough air to flush the average cabinet 10 to 20 times per minute, thus minimizing thermal drift and improving component life. The unit sports a rugged metal housing, and an aerodynamically efficient 5-blade impeller. It comes as a kit but requires only a minimum of assembly.

Circle No. 85 on Reader Service Page 15

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CIRCLE NO. 18 ON READER SERVICE PAGE

ELECTRONICS LIBRARY

RCA RECEIVING TUBE MANUAL, RC-24

Considered by many to be the most complete and authoritative reference book in its field, the new streamlined edition of the *RCA Receiving Tube Manual, RC-24,* is more compact and easier to use. It gives up-to-date information on the complete RCA line of receiving tubes for home-entertainment applications, picture tubes for black-and-white and color TV receivers, and voltage-regulator and voltage-reference tubes. There is detailed coverage of all active tube types, while the technical data on the older types are presented in tabular chart form. A new index provides ready access to data on specific tube types.

Published by Radio Corporation of America, Electronic Components and Devices, Harrison, N. J. 07029. Soft cover. 576 pages. $1.25.

ABC'S OF LASERS & MASERS, Second Edition

by Allan Lytel

The new edition of this book encompasses all the basic principles of both lasers and masers in a language that anyone can understand. The up-to-date text and illustrations introduce the reader to the various devices used to produce microwave and light radiation. Also of interest are the practical applications outlined for such devices—surgical knives, welding torches, heat ray sources, etc. Future possibilities are discussed as well.

Published by Howard W. Sams & Co., Inc., 4300 W. 62 St., Indianapolis, Ind. 46206. Soft cover. 128 pages. $1.95.

TRANSISTORS: PRINCIPLES AND APPLICATIONS

by R. G. Hibberd

It is a pleasure to review a book on solid-state devices that fills the void between the construction-project texts and the mathematical treatises on how transistors work. The author, an employee of Texas Instruments Ltd. in England, has written a thorough, readily understandable book on

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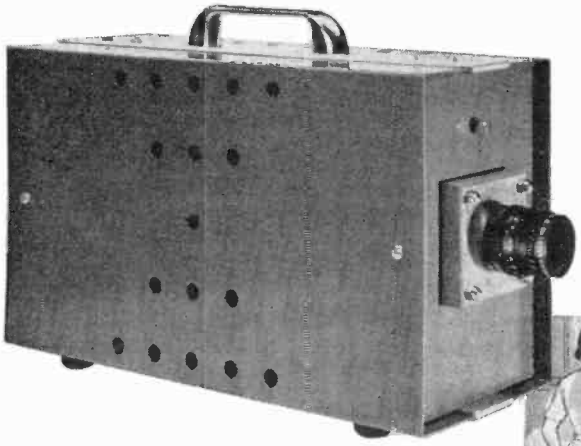

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10 bands tune longwave, standard AM, FM and 2-22.5 mc shortwave. 16 transistors, 6 diodes, and 44 factory-built & aligned RF circuits. Separate FM tuner & IF strip same as used in deluxe Heathkit FM tuners. Two built-in antennas, 4" x 6" speaker, battery-saver switch. Operates anywhere on 7 flashlight batteries, or on 117 v. AC with optional charger/converter GRA-43-1 @ $6.95. Assembles in 10 hours. 17 lbs.

Kit GR-43
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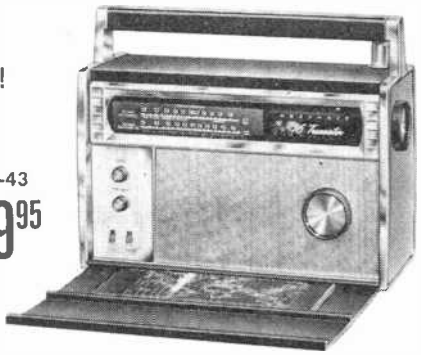

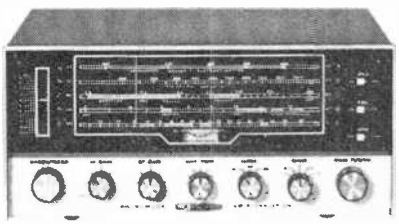

Kit GR-54
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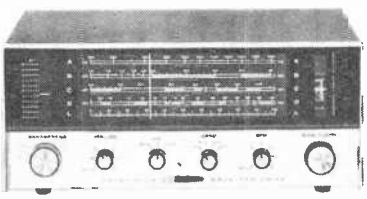
New Deluxe Shortwave Radio!

Compare it to sets costing $150 and more! 5 bands cover 200-400 kc. AM, and 2-30 mc. Tuned RF stage, crystal filter for greater selectivity, 2 detectors for AM and SSB, tuning meter, bandspread tuning, code practice monitor, automatic noise limiter, automatic volume control, antenna trimmer, built-in 4" x 6" speaker, headphone jack, gray metal cab., free SWL antenna. 25 lbs.

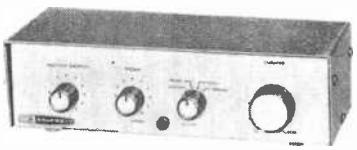
Low Cost Shortwave Radio!



Kit GR-64
$37.50

Covers 550 kc to 30 mc—includes AM plus 3 shortwave bands. 5" speaker; bandspread tuning; signal strength indicator; 7" slide-rule dial; BFO; 4-tube circuit plus 2 rectifiers; noise limiter; external antenna connectors; Q-multiplier input; gray aluminum cabinet; AM antenna. 15 lbs.

New "Q" Multiplier!



Kit GD-125
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Use with matching GR-64 (opposite) or similar SWL receivers with IF circuits from 450-460 kc. Creates extra-sharp selectivity through an efficient "Q" of 4000 and provides a notch for adjacent signal attenuation. Includes built-in power supply. Charcoal cabinet gray front panel. 3 lbs.

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CIRCLE NO. 16 ON READER SERVICE PAGE

LIBRARY (*Continued from page 26*)

transistors. Fortunately, even the transistor types have been "Americanized" as much as possible. Anyone with a working knowledge of tubes should find this book easy to comprehend, and those just getting their feet wet in transistors will find it difficult to put this "bargain" book down.

Published by Hart Publishing Co., Inc., 510 Sixth Ave., New York, N.Y. 10011. Hard or soft cover. 304 pages. $5.95 (hard cover), $2.45 (soft cover).

BUILD USEFUL ELECTRONIC GADGETS FOR YOUR HOME

by Stuart Haberman

One of a series put out by Editors and Engineers, Ltd., for the "do-it-yourselfer" with some interest in electronic gadgets, this book contains five construction projects: an "invisible switch" (capacity-operated relay), humidity indicator, electronic "detective" (photoelectric relay), light-operated switch, and a telephone amplifier. Pictures and text describe step-by-step building of the units, and parts lists and troubleshooting data are included. Techniques and hints for use in construction are also given. For information on the other books in this series, contact the publisher.

Published by Editors and Engineers, Ltd., New Augusta, Ind. Soft cover. 96 pages. $1.00.

THE RADIO AMATEUR'S HANDBOOK, 43rd Edition, 1966

by The Headquarters Staff of the ARRL

Although not changed this year in total number of pages, the 1966 HANDBOOK has been updated with several dozen brand-new construction projects. More concentrated effort is being expended on RTTY and SSB, and the background material on solid-state physics, mobile operation, and antennas has been enlarged. Also, the paper of the 43rd Edition has been changed—at the request of readers; it has a softer sheen and greater legibility.

Published by the American Radio Relay League, Newington, Conn. Soft cover. 704 pages. $4.00 (U.S.A.), $4.50 (U.S. Possessions and Canada), $5.50 (elsewhere). Hard cover edition is $6.50 (U.S.A., Canada, and U.S. Possessions), $7.00 (elsewhere). —30—

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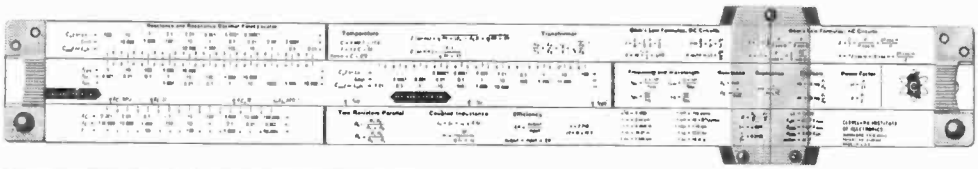

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The Head of the Electrical Technology Dept., New York City Community College, Mr. Joseph J. DeFrance says:
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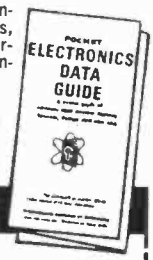

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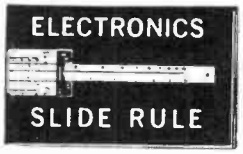

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CIRCLE NO. 7 on READER SERVICE PAGE

NEW LITERATURE

To obtain a copy of any of the catalogs or leaflets described below, simply fill in and mail the coupon on page 15.

There should be something for everybody in the new 300-page catalog (No. FR-67) published by *GC Electronics.* It covers the latest output of GC's five divisions: Walsco Electronics (phono drives, chassis punches, service aids, hardware); GC-Electrocraft (plugs, jacks, adapters, switches, connectors); GC-Telco (television hardware); Audiotex (audio accessories); and GC Electronics (cements, chemicals, tools, service aids, hardware, TV knobs, and resistors).

Circle No. 86 on Reader Service Page 15

For amateur radio operators: *Mark Products Company* now has a new catalog (AM-661) on its complete line of amateur fixed station and mobile antennas, mounts, and accessories. Consisting of four pages plus inserts, it features the various Heliwhip® antenna models.

Circle No. 87 on Reader Service Page 15

Two "compact" (3" x 6") catalogs have been put out by *Amprobe Instrument Corporation.* One, No. AAE-14, is a 16-page brochure on the complete Amprobe line of service instruments; the other, No. REE-16, covers a line of miniature strip chart recorders in 8 pages. Both contain application information on specific product uses.

Circle No. 88 on Reader Service Page 15

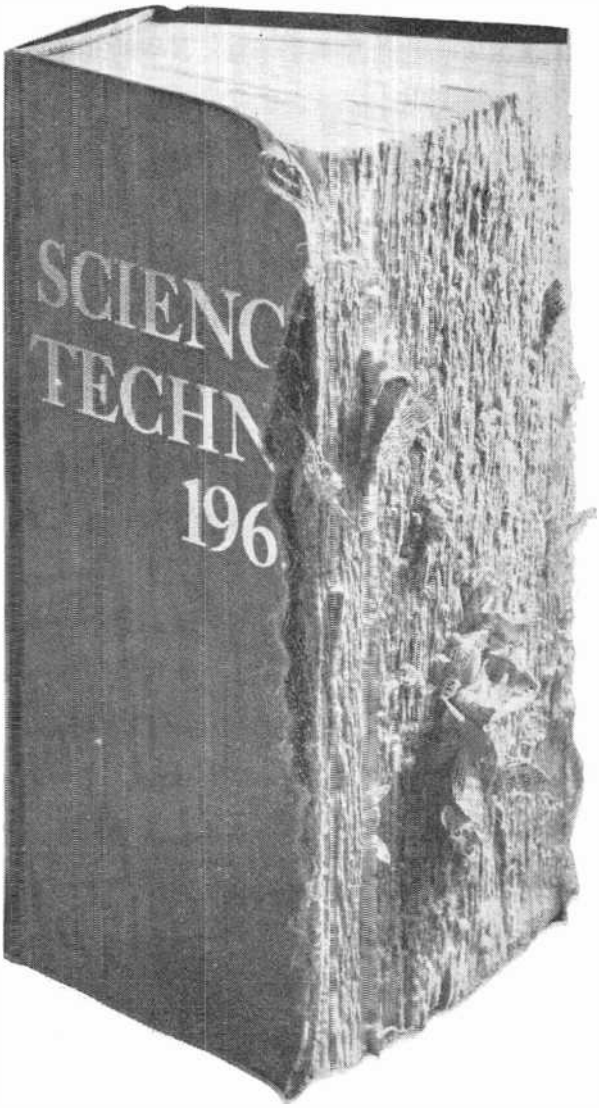
Using the data from a 6-page brochure available from *Jensen Manufacturing Division/* The Muter Company, a home craftsman can design and build his own ducted-port, bass-reflex enclosure. Cabinet dimensioning and construction are explained, and technical nomograms show proper cabinet volume for various sizes of speakers and duct lengths for tuning.

Circle No. 89 on Reader Service Page 15

Photographs, descriptions, and specifications for all current *Acoustech* solid-state amplifiers and kits are included in this company's 1966 catalog. In addition, there are two special sections in its eight 8½" x 11" pages on (1) what to look for in amplifier specifications, and (2) what features to look for in an amplifier.

Circle No. 90 on Reader Service Page 15

Where will you stand 10 years from today, when half of what you now know becomes obsolete?



Right now you're steeped in the latest technologies. But 10 years from now half of this knowledge will be obsolete. And half of what you will need to know isn't even available today.

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ANTENNA BOOM

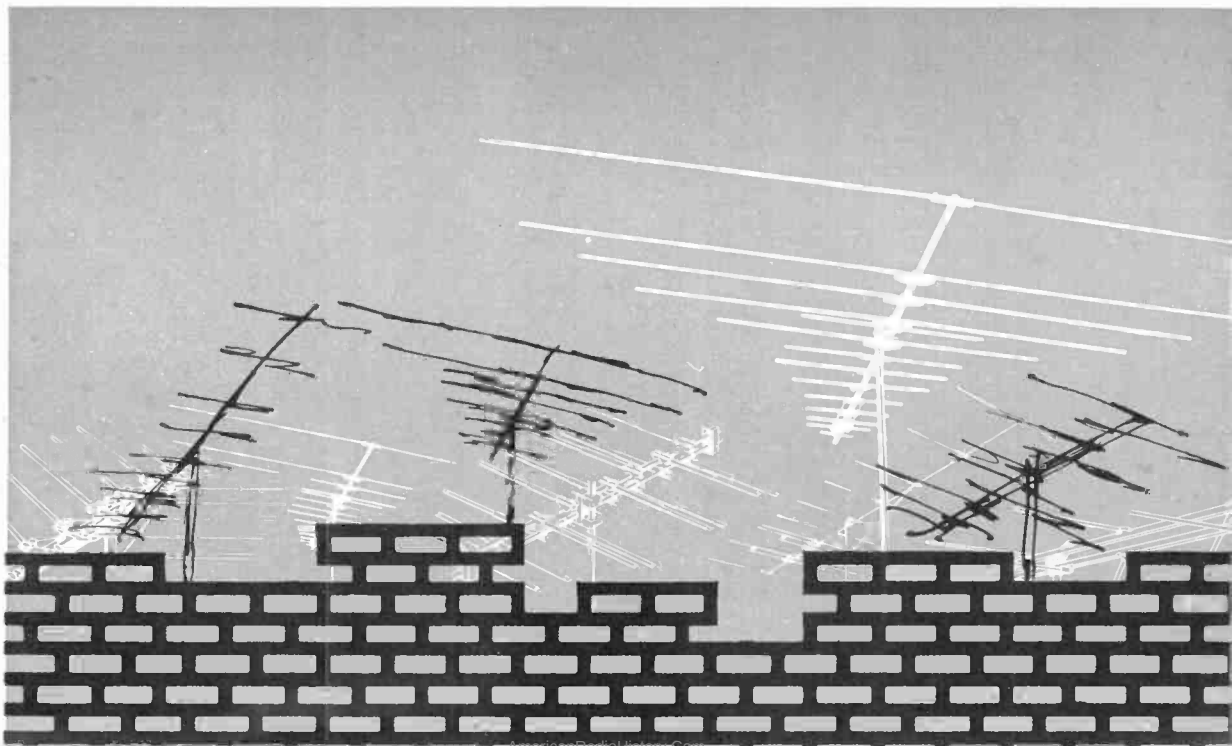
Color TV and FM stereo combine with multiple-set installations to stage comeback of roof-top antennas

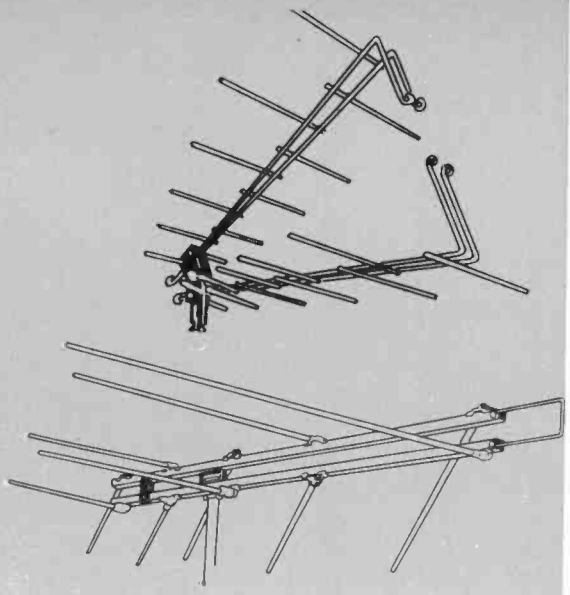
By ROBERT CORNELL
Managing Editor

TODAY'S COMPLEX radio and TV reception requirements have once again moved most men's minds to the great outdoors, or at least to their roof tops. A brief look back into a typical home TV installation only a few short years ago reveals but one black-and-white TV set attached to an outdoor antenna. Many homes had the set attached to two antennas: one for channels 2 to 6, and one for channels 7 to 13. Some of these dual antenna installations had one downlead, and some had two downleads and a knife switch to select one of the antennas. Instead of a switch, the more sophisticated installation had a two-set coupler hooked up backwards to act like a line splitter. Antennas for FM radio as well as FM radio itself were struggling for acceptance. The future of color TV looked rather dismal, and was little more than a gleam in a well-known general's eye.

But things changed more rapidly than even the most optimistic experts predicted, and antenna engineers had to work fast. At first, antenna design improved and it became possible to purchase one antenna to capture both high and low channels and with some gain characteristics. Then a combination of events took place and it began to look like the beginning of the end of outdoor antennas for a great many of the new TV set installations. After all, isn't this what happened to AM radio?

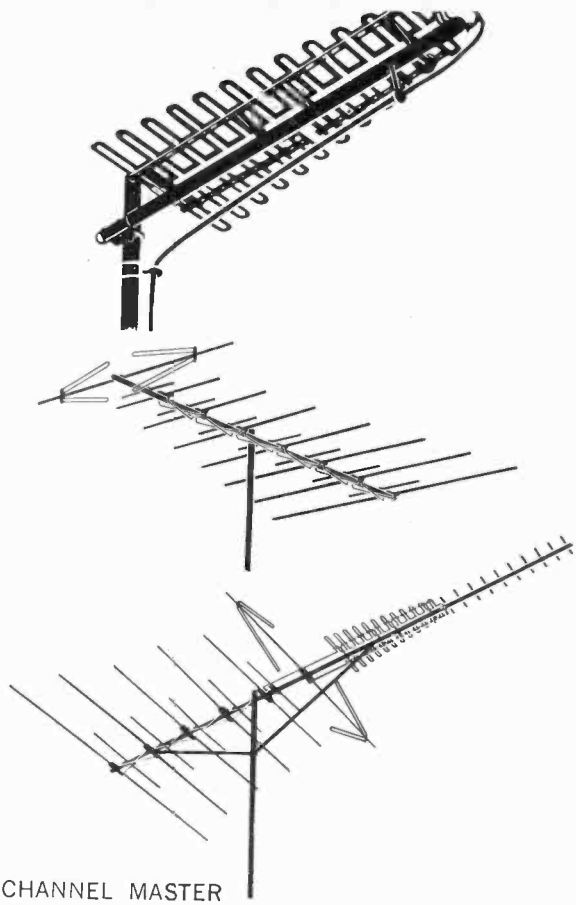
Television stations with stronger signals, and TV sets with more efficient tuners combined forces to get satisfactory pictures into more homes, spread over a larger area. A side effect of this one-two punch was that people could obtain more usable signals with less antenna—and "rabbit ears" came into be-





BLONDER-TONGUE

"U-Ranger-11" (top) is an 11-element log-periodic UHF antenna which can work independently or be added to an existing antenna to pick up channels 14 to 83 as well as 2 to 13. "Color-Ranger-5" (below the "U-Ranger") is a 5-element log-periodic antenna for VHF color TV and FM stereo reception intended for strong-to-medium signal areas. Three-element and 10-element "Color-Rangers" as well as a smaller "U-Ranger" and several FM antennas are made for strong or weak signal areas—they can be put together or added to other antennas to comprise an all-band installation. Blonder-Tongue (9 Alling St., Newark, N.J.) has available a 12-page booklet entitled "How to Plan a Home TV System."



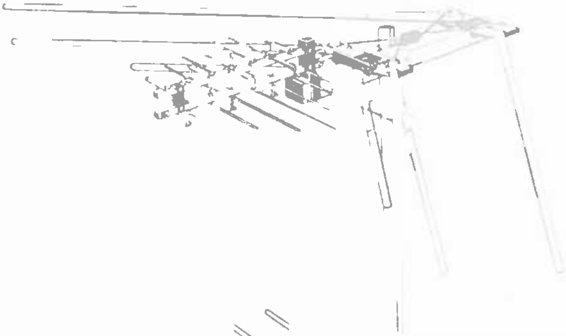
CHANNEL MASTER

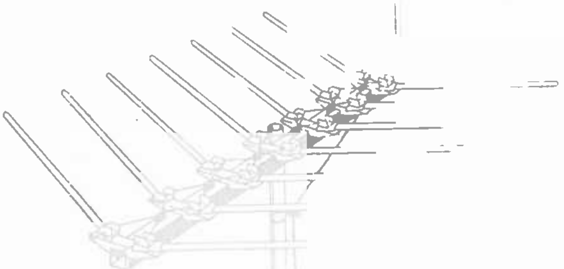
"Ultradyne 4313G" high-gain UHF-only antenna (top) has 12 live elements for metropolitan to suburban reception. Said to act like a 300-ohm transmission line at VHF frequencies, it can be attached to any 300-ohm VHF antenna without loss or interaction, and without a coupler. "Color Crossfire 3613G" (center), a far-suburban antenna for VHF color and FM stereo, has 15 elements and a "Tri-Band" director. It is one of several models having a lesser or greater number of elements for metropolitan to deep fringe areas. The "3634G" (bottom) is a combination of the "Ultradyne 4314G" and the "Crossfire 3614G" which has 11 elements. Channel Master (Ellinville, N.Y.) also markets related accessories.

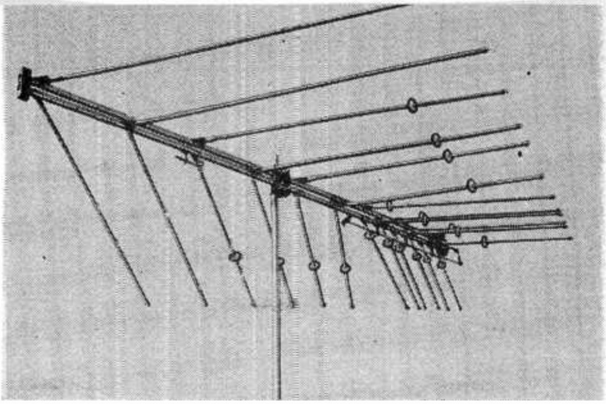
ing. They multiplied practically overnight. The indoor antenna worked well enough to justify its becoming standard equipment on practically all sets.

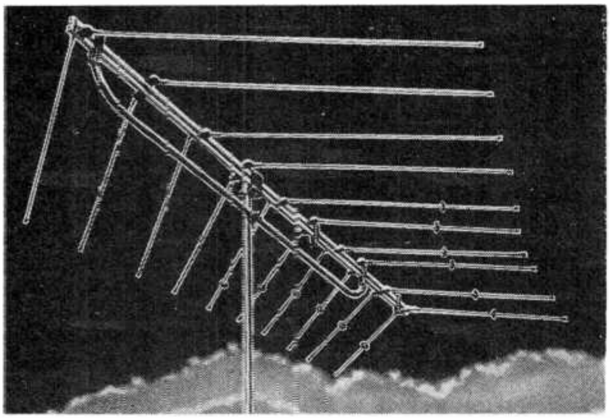
Outdoor antenna installation business in urban communities fell into a state of depression. Apartment houses loaded with abandoned "dead" antennas created new problems. Old antennas with their loose elements and flopping downleads interfered with "live" installations, took up space, and radiated like mad; they caused ghosts, noise, and other unpleasantries on nearby antennas that were still in use, and forced many marginally-minded antenna installers to head indoors. Those viewers in fringe and near-fringe areas, as well as those in urban areas who wanted nothing but the best TV reception, continued to specify outdoor TV antennas. Eventually, the slow, tortoise-like progress of color TV reached acceptance in the marketplace, the outdoor antenna people started to collect their bets, and a new generation of antennas was born.

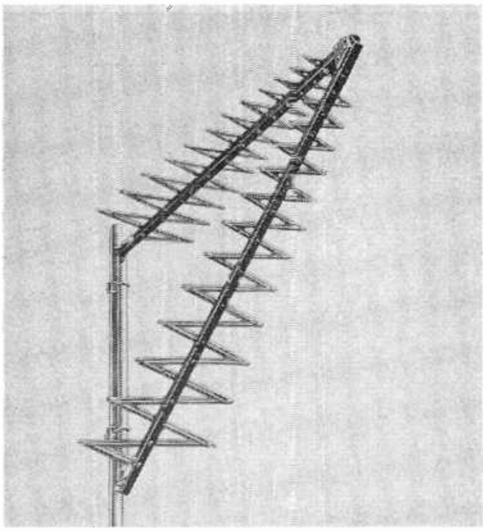
The Big Swing. It's no secret that antenna requirements for color TV are more critical, and that now there's a big swing back to outdoor antenna installations, only this time with a lot more vigor and with many more new antenna











FINNEY

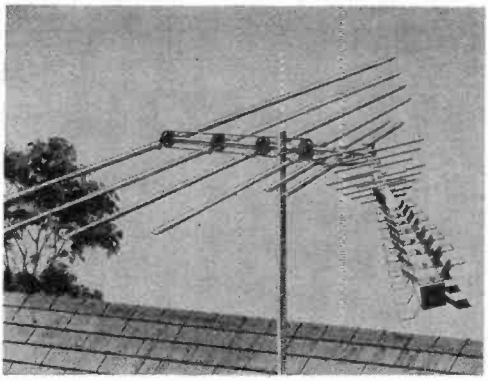
All ba d Col r V o VF 10 ( ) h VHF nd 7 UH elem ... o pick ... r TV ... FM ... UHF s c ion ...

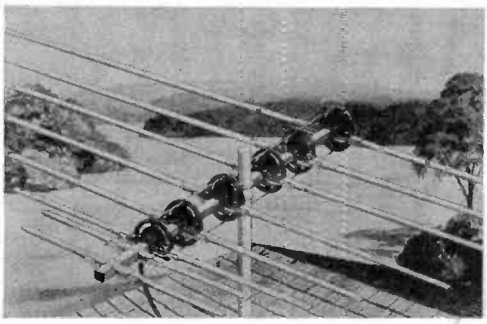
JFD

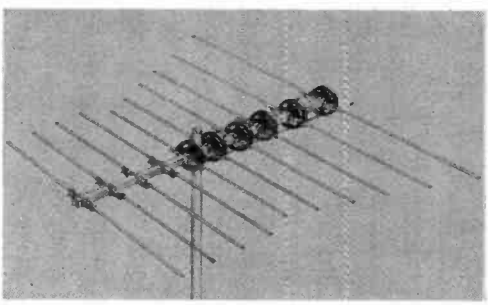
(bo)

designs.* There is also a greater assortment of auxiliary equipment such as signal amplifiers, couplers, splitters, impedance-matching transformers, different types of transmission lines, etc. Color TV demands flat, broadband, ghost-free signals.

*"Rabbit ears" are still doing a great job for portable TV sets, and in many areas where signal conditions are fairly good. If, for one reason or another, you cannot take advantage of a full-blown antenna installation, use of "rabbit ears" may very well be your next best bet.

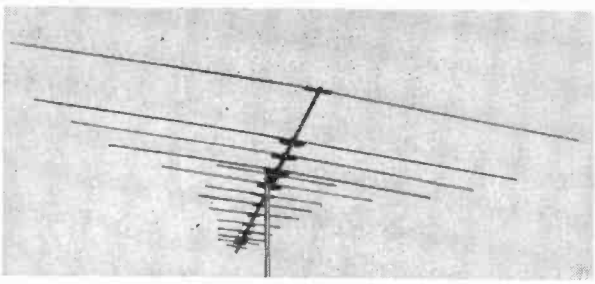


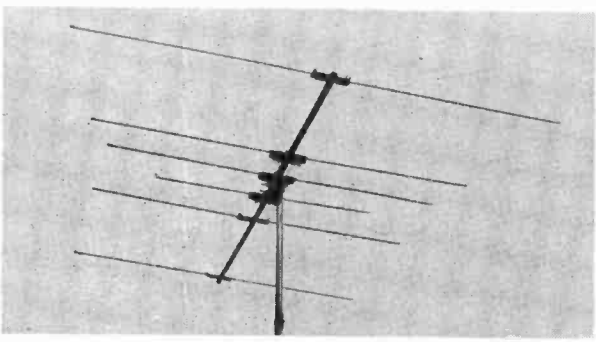


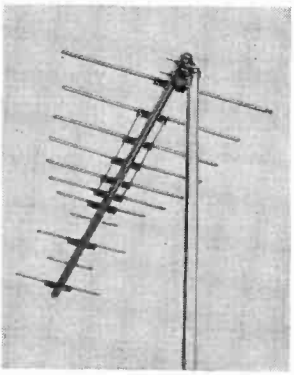


JERROLD

"Coloraxial Pathfinder PXB-50" (top) is a combination of a cascaded-periodic VHF antenna and a UHF section, all in one preassembled unit, with both 75-ohm and 300-ohm outputs for all-channel reception of color TV and FM stereo. There are 5 different-size models to choose from for metropolitan to fringe areas. Dipoles are interconnected without crossing of transmission lines. Connections are concealed inside the tough Cycolac insulators. The UHF hinged section can be individually oriented up to 30 degrees. Design utilizes a single downlead without a splitter. The "PAX-60" (center) is a broadband VHF antenna, about 6' long, and is the second in size of 7 models ranging from about 4 feet to 16 feet in length. The longest element on all models is about 8½ feet. (Note: Jerrold's former "JTP" series of "Paralogs" has been replaced by the "PAX" series.) The "FMP-10" (bottom) is the middle version of 3 models in this series specifically intended for fringe area reception of FM stereo. Jerrold Electronics Corp. (15th & Lehigh Ave., Philadelphia, Pa.) features a line of coaxial antenna accessories and has a "Blue Book of Antenna Systems."







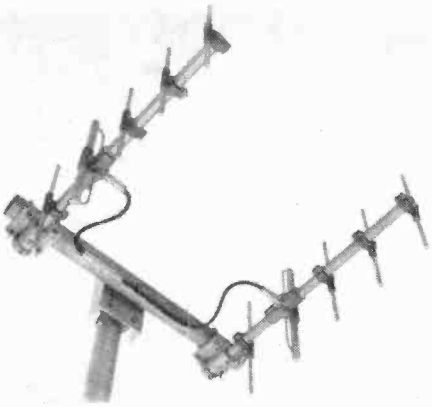
RCA

"Color Scan 10B1120" (top), the middle size of 5 all-band antennas for color TV and FM stereo, has 14 elements for suburban applications. The "10C450" (center), a 6-element FM stereo model, is for suburban installations. A larger 10-element version snares signals in fringe areas. The "Stratostar 7B151" (bottom) is an 11-element UHF antenna and has a built-in VHF-UHF coupler to enable connection to an existing VHF antenna using a single downlead. RCA Parts and Accessories Div. (Deptford, N.J.) also has a line of VHF antennas. There are a total of 20 antennas to choose from to satisfy varying requirements.

A modern TV antenna is called upon to perform in a manner that would have discouraged most engineers a few years ago. You can appreciate the engineers' dilemma when you consider that these demands (broadband and sharp directivity) are essentially diametrically opposed parameters—the more directional the antenna, the narrower the beam width, and vice versa.

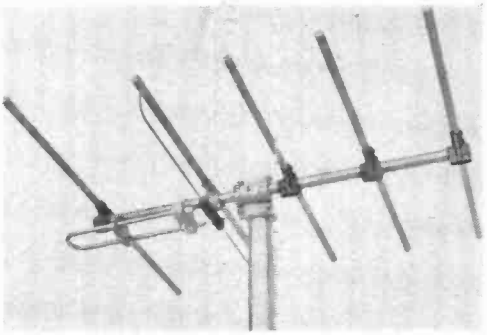
As if color TV reception problems weren't enough, the industry took another giant step, and, with an eye to the future, the Federal Communications

(*Continued on page* 95)

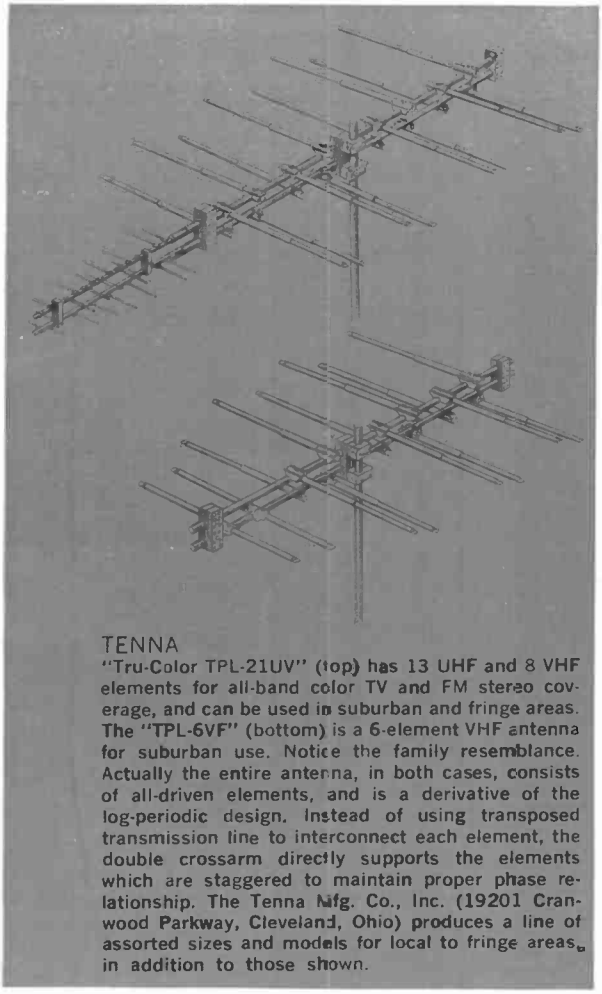


SCALA

Stacked "CA5-450" (above) is a UHF Yagi-type of antenna employing a built-in Teflon insulated balun to provide a balanced feed system while permitting the driven element to be supported by metal

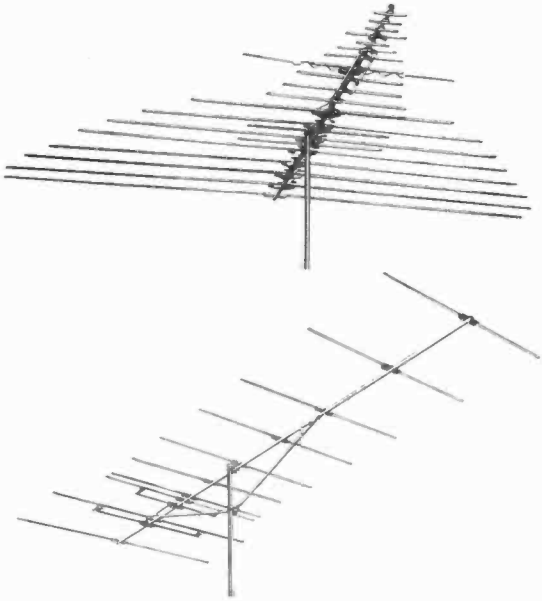


instead of an insulator. A single antenna with a 10-db gain figure is also available. (Stacked version has 13 db gain.) The "CA5-150" (above), a VHF 5-element Yagi, sports a 9-db gain and a 52-ohm output. Other models are also available. Heavy-duty construction for industrial applications is stressed here. Scala Radio Co. (1970 Republic Ave., San Leandro 1, Calif.) can provide a 24-volt built-in heating system for most of its antennas.



TENNA

"Tru-Color TPL-21UV" (top) has 13 UHF and 8 VHF elements for all-band color TV and FM stereo coverage, and can be used in suburban and fringe areas. The "TPL-6VF" (bottom) is a 6-element VHF antenna for suburban use. Notice the family resemblance. Actually the entire antenna, in both cases, consists of all-driven elements, and is a derivative of the log-periodic design. Instead of using transposed transmission line to interconnect each element, the double crossarm directly supports the elements which are staggered to maintain proper phase relationship. The Tenna Mfg. Co., Inc. (19201 Cranwood Parkway, Cleveland, Ohio) produces a line of assorted sizes and models for local to fringe areas, in addition to those shown.



WINEGARD

"Chroma-Tel CT-90" (top) one of four all-band antennas for color TV and FM stereo, uses a "Chroma-Lens Director System" which intermixes both VHF and UHF directors and "Impedance Correlators" to maintain proper phase and impedance of closely spaced elements to make it possible to cut the antenna length by as much as 50%. The 17-element CT-80 (not shown) is only 5-feet long. Each element can be purchased separately if needed. A line splitter, furnished with the antenna, separates VHF and UHF signals coming in on the single downlead. The "SF-100FM" (bottom) is a Yagi type designed to pull in FM stereo signals in fringe areas. Winegard Co. (3000 Kirkwood St., Burlington, Iowa) also features a line of "Hot Shot" all-band antennas for metropolitan areas.

WHAT'S SO DIFFERENT ABOUT CB ANTENNAS?

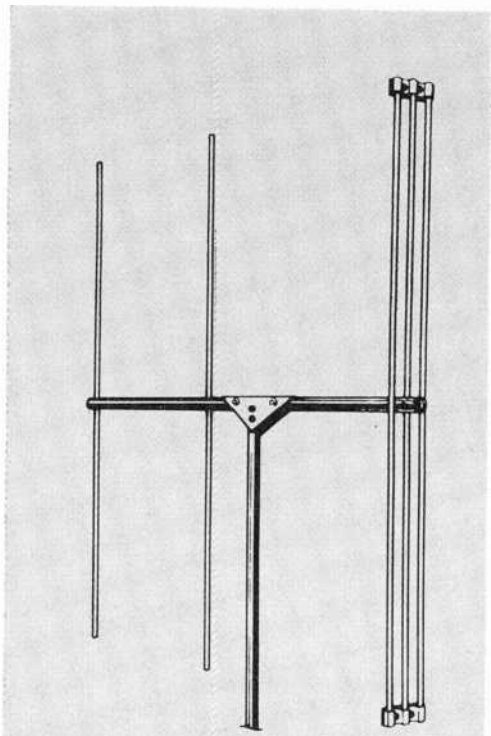
Every product has something different to set it apart, but the CB antenna manufacturers really take these words seriously

By ROBERT O'BRIEN

IT SEEMS as though the only famous restaurants are the ones which specialize in one particular dish in addition to their regular line of good food. Even dog kennels have "their own" breed. Antenna manufacturers, too! If you're one of those skeptics who believes that the expression "CB antenna" means some sort of anonymous-looking 20-foot rod with a few ground radials, or a 102-inch mobile whip, you'll flip your relay when you see what's new and *daringly* different in the world of CB antennas.

Sure, each company still turns out the old standbys such as ground planes, whips, and the like; but each has devised one or two exclusive specialty items which stand out from the roof top.

Want an example? Master Mobile Mounts (4125 West Jefferson Blvd., Los Angeles, Calif.) has whipped up a CB version of something called a "DDRR low profile mobile antenna." The thing looks like a hula hoop that lost an argument with a locomotive. Odd looks aside,

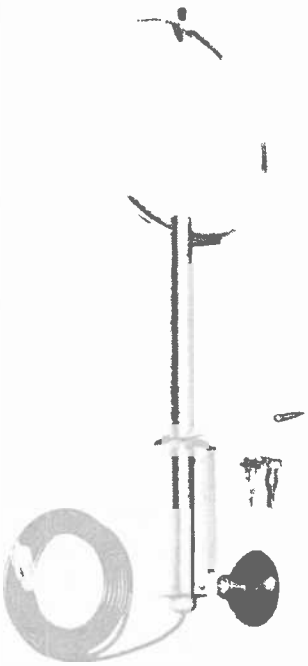


Master Mobile Mounts' contribution in "different" CB antennas is a 5-element (?), 3-element beam. Three reflectors provide a vastly improved front-to-back ratio to screen out unwanted signals.

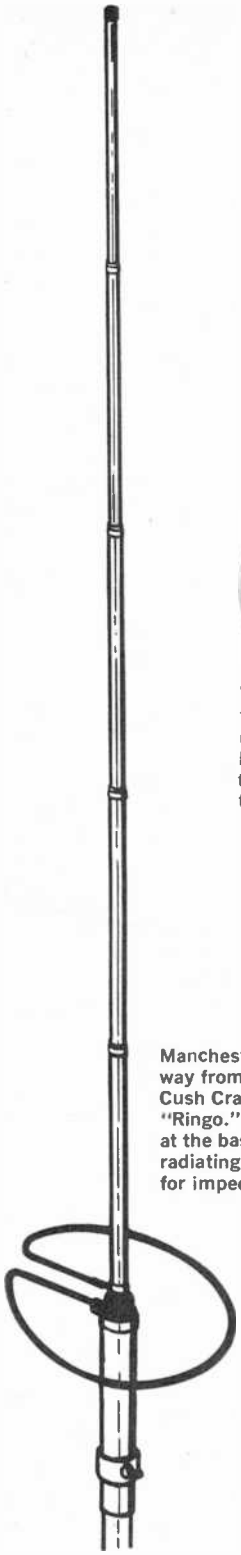
the antenna is based on a startling design concept which permits this horizontally mounted antenna (it goes inconspicuously on your car roof) to transmit a vertically polarized signal efficiently.

Master hasn't forsaken base station operators who want something distinctive either. Someone came up with something called the Model CB-51 3-element beam, which is pretty strange—especially since the thing has five elements. Forgetting math for the moment, the two "phantom" elements are parallel to the third element (the reflector) and are intended to provide more "pazazz" to the outgoing signal. This is accomplished by giving a better front-to-back ratio than a normal, unembellished, plain Jane, 3-element beam.

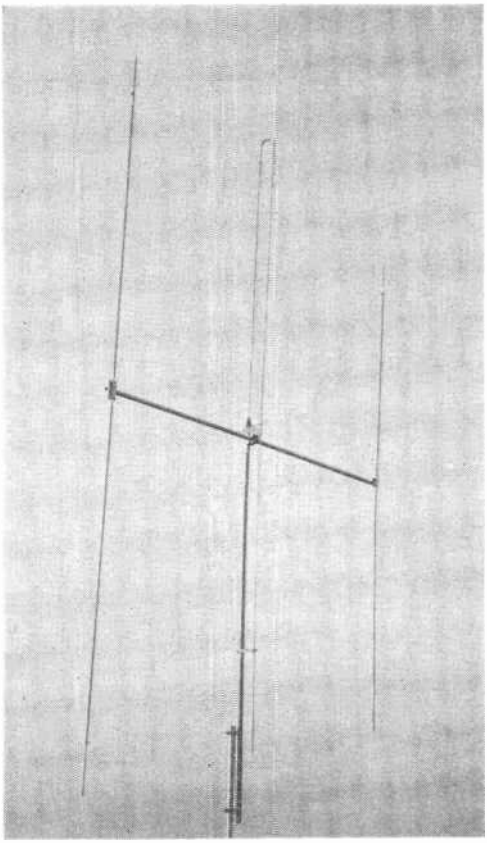
Another specialty is the "Squalo" from Cush Craft (621 Hayward St., Manchester, N.H.), a square-shaped affair. It is similar in electrical design to the "halo" antenna of 6- and 2-meter ham radio fame; but here's one case



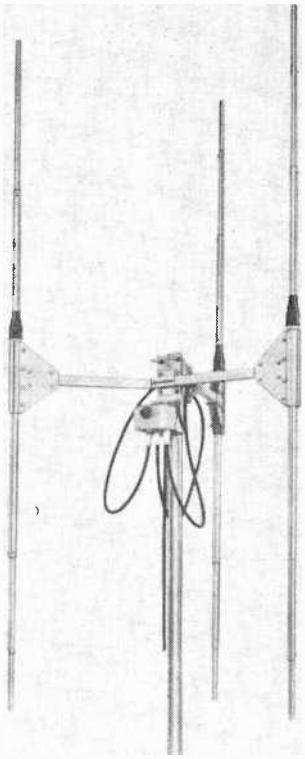
Want to scare the wits out of that CB'er with the outboard linear? Just attach this Gold Line "Signal Hunter" loop to the window of your car and pretend you're an FCC monitor.



Manchester, N.H., is a long way from the West, but Cush Craft calls this antenna "Ringo." The 14" ring at the base of the half-wave radiating element is for impedance matching.



Mark Products' 3-element beam with folded-over radiator has found much favor among CB'ers. The folded element puts almost the entire beam at d.c. ground for protection from lightning.



When you see three elements cut for the CB channels mounted in this configuration, you'll recognize Antenna Specialists' "Scanner." Although rigidly mounted to a support pole, it's a beam antenna.

where being a *square* is an advantage, because the new design soups up the output. You can mount it on your car roof, on your house or apartment roof, anywhere. It's really different!

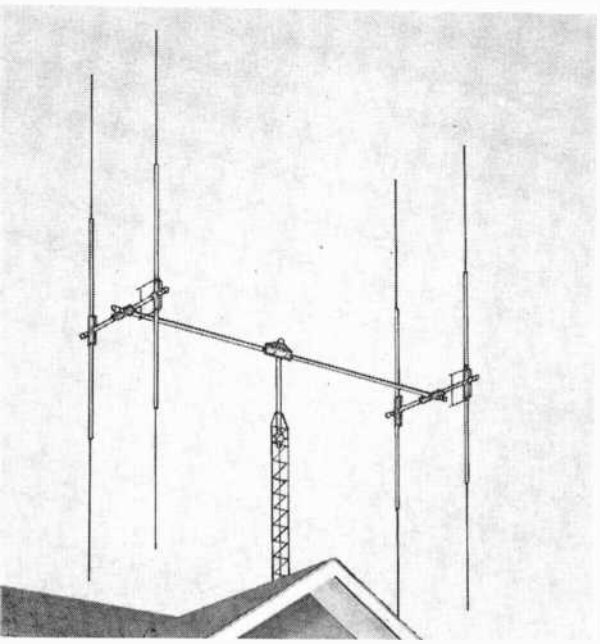
Anybody who has ever seen the new "Colorguard" line of CB antennas will certainly agree that it also lives up to the description "different." Antenna Specialists (12435 Euclid Ave., Cleveland, Ohio) created a series of mobile antennas colored in fluorescent international emergency orange, dazzling enough to be spotted at great distances. The color has long been used by military and government emergency services, and "Colorguard" marks its introduction to CB radio.

Antenna Specialists hasn't neglected base station antennas either—nobody has ever come out with anything quite like the M-119 "Scanner." This is a beam antenna which can change the direction of the maximum signal *without* being rotated. Rotation of the direction is accomplished by switching around the signal from element to element; while one of the three is radiating, the other two are reflecting. Switching is done by the operator from a control box in the radio shack.

Mark Products (5439 West Fargo Ave., Skokie, Ill.) is making its mark with the MJ-27 "Long Ranger" base station antenna, which, despite its official description as a "full ½-wavelength-long vertical dipole," could pass itself off as a giant hairpin. The people at Mark say that their unique 18-foot antenna provides maximum possible omnidirectional signal because it isn't hampered by "pattern-distorting radials." Going even one step further, they added two huge outrigger vertical elements to the MJ-27 and made it into a far-out 3-element beam they call the MJ-3.

On the other hand, New-Tronics Corporation (3455 Vega Ave., Cleveland, Ohio), an organization that shook up many CB'ers with its fold-over "Hustler" mobile whips a year or two ago, has now come up with an interesting

(*Continued on page* 92)



For maximum "effective radiated power," there's nothing to beat one of the 4-, 6-, or 10-element Hy-Gain "Duo-Beams." The manufacturer estimates that this 4-element beam has an ERP of 42 watts.

SWL ANTENNAS for the "Forgotten Man"

For $16 or less, the SWL can give his receiver a chance to do a topnotch DX'ing job

THERE IS no record of the number of disenchanted SWL's who bought good receivers only to attach them to poor antennas. Some years ago it was the custom of many SWL receiver manufacturers to enclose a hunk of wire in the receiver shipping carton. When this wire was coupled to the receiver, some signals could be heard on most of the International Broadcasting Bands; but so could a lot of unnecessary noise and interfering signals.

The needs of the SWL have not really been forgotten, though, and the following paragraphs will serve as a reminder that at least three manufacturers sell antennas ideally suited for SWL DX'ing.

Peak Efficiency. Every communications engineer will agree that there is nothing equal to the signal-grabbing ability of a resonant antenna. Mosley Electronics Inc. (4610 N. Lindbergh Blvd., Bridgeton, Mo.) solved the dilemma of how to make a single antenna resonate on six different short-wave broadcast bands by inserting traps to electronically alter the length of the flat-top section. When the SWL tunes within the resonant band, the traps act as insulators. As soon as the SWL tunes outside the resonant band, the traps simply act like so much more wire and shorten the overall length of the flat-top. Thus, the Mosley SWL-7 will operate at peak efficiency in the 11-, 13-, 19-, 25-, 31-, and 49-meter bands. It is also shorter in length on most of these bands than a simple dipole cut to the center frequency of the band.

For the SWL who wants to concentrate on DX'ing in the ham bands, a similar Mosley antenna—called the RD-5—is available. This trapped antenna will resonate in the 10-, 15-, 20-, and 75-80 meter bands. If you're thinking of going ham radio, the RD-5 sounds like a good investment.

All-Band DX'ing. For the average SWL likely to tune *any* frequency between 550 kc. and 30 mc., there is nothing quite equal to the simple flat-top (sometimes called the "Inverted L").

While by no means as responsive in the six short-wave broadcast bands as the trapped antenna*, the Inverted L is simple to erect and is non-critical in operation. For that budget installation, Hy-Gain Electronics Corp. (Highway 6 at Stevens Creek, Lincoln, Nebr.) offers its SW-6. The flat-top section is 50′ long, and the antenna is sold with 50 feet of rubber-covered lead-in, molded plastic end insulators, and 18 feet of nylon rope attached to each end. Assembly time—indoors or outdoors—is kept to a minimum.

Single-Band DX'ing. The SWL specializing in DX'ing only one band—say 19 or 31 meters—can make good use of a vertical antenna. World Radio Laboratories (3415 W. Broadway, Council Bluffs, Iowa) has an 18′ vertical which is base-loaded and needs only to be attached to a pipe sunk in the back yard. Changing clips on the loading coil resonates this "WVG-mkII" vertical to any frequency or narrow band of frequencies from 10 to 80 meters.

Taking a different approach to all-band listening, but still a vertical antenna, is the Hy-Gain SW-9. This antenna is also base-loaded, but the 9′ telescoping element is attached to a heavy-duty bracket which is bolted to a window frame or side of a house or apartment. For SWL's who suffer from antenna space restrictions, the SW-9 is worth serious investigation. —30—

**The Mosley SWL-7 has a figure 8 receiving pattern with the lobes of maximum signal pickup broadside, or at right angles to the wire. Thus, if strung north-south, the SWL-7 picks up best from east and west. On the other hand, the "Inverted L" picks up better off the ends of the flat-top.*

A LIGHT on one side of this mystery box flashes, and a ring jumps toward it like a trained animal. Within a few seconds a light on the opposite side flashes. and the ring leaps over to it with the same rapidity. This action continues as long as power is applied.

What facet of space-age technology has made it possible for a light to attract what appears to be a black metal ring? Is it an ionic generator of some sort, or some heretofore unknown plasma or form of energy at work? What electronic genius thought this thing up in the first place? Chances are that you will get as many different explanations as there are viewers, if you insist upon answers to your questions.

The flashing light creates the illusion of attracting the ring, and the illusion attracts a crowd. Aside from the commercial aspect of being able to capture the attention of large groups of people, a principle of mutual induction can be demonstrated and the project should make an intriguing entry in science fairs or other similar events.

How It Works. A slow-revolving (6-rpm) timing motor alternately energizes a coil located at each end of a semicircular soft iron rod. See Fig. 1. Coil *L1* is energized when contact 1 or 3 is touched by the rotating arm; coil *L2*, when contact 2 or 4 is made. When a coil is energized, a magnetic field is created.

The soft iron rod in the center of the coil concentrates much of the energy in the magnetic field and increases the coupling of the magnetic field to the aluminum ring. This causes an induced current to flow in the ring, which sets up a

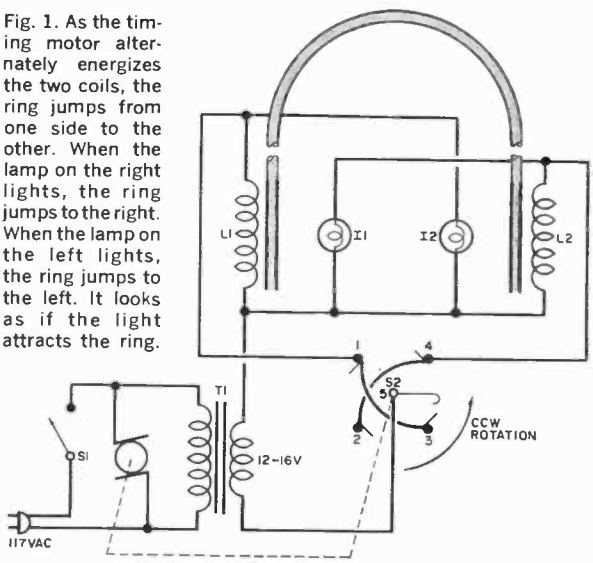


Fig. 1. As the timing motor alternately energizes the two coils, the ring jumps from one side to the other. When the lamp on the right lights, the ring jumps to the right. When the lamp on the left lights, the ring jumps to the left. It looks as if the light attracts the ring.

THIS AMAZING RING HOPS FROM ONE SIDE TO ANOTHER, CHASING THE FLASHING LAMPS

By **WALTER B. FORD**

BUILD THE CROWD STOPPER

magnetic field of its own. These fields magnetically oppose each other, and the ring is vigorously repelled. It shoots upward and away from the coil, travels around the loop, and lands on the other side, near the other coil. When the other coil is energized, the ring is shot back to where it came from. This back-and-forth motion is in step with the rotation of the timing motor.

The timing motor operates directly off the 117-volt line. Coils *L1* and *L2* operate off the 12-volt secondary winding of *T1*. Lamp *I1* is wired across *L2* and lights when this coil is energized. Similarly, lamp *I2* is connected across *L1* and lights when *L1* is energized. Because each lamp is physically located opposite its coil, there is the illusion that the lamp attracts the ring.

Construction. Drill the Masonite panel as shown in Fig. 2. Place the drilled panel over the open space on the aluminum chassis; then mark and drill around the flanged edges of the chassis as shown. Drill a few additional holes in the chassis for ventilation, line cord entrance, switch mounting, and rubber feet.

Remove any nicks from the 24″ soft iron rod being used for the loop, with a fine file or sandpaper. Then polish the rod with emery cloth and steel wool. Make a wood form for shaping the loop (Fig. 3). Attach another piece of wood to the form by means of a back plate so as to provide a slot for holding one end of the rod.

Place the form and back plate in a vise, and insert the iron rod into the slot so that the end of the rod is positioned 5⅞″ from where the semicircle ends. Bend the steel rod around the form, using a rubber mallet or block of wood as necessary. If one side of the rod is

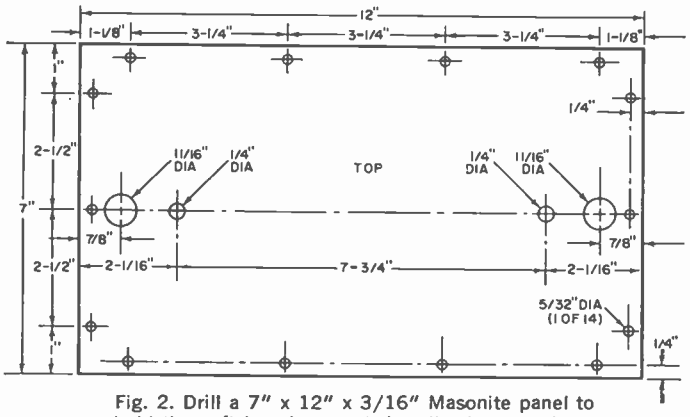


Fig. 2. Drill a 7″ x 12″ x 3/16″ Masonite panel to hold the soft iron loop and the pilot lamp sockets. Position of mounting screw holes is not critical.

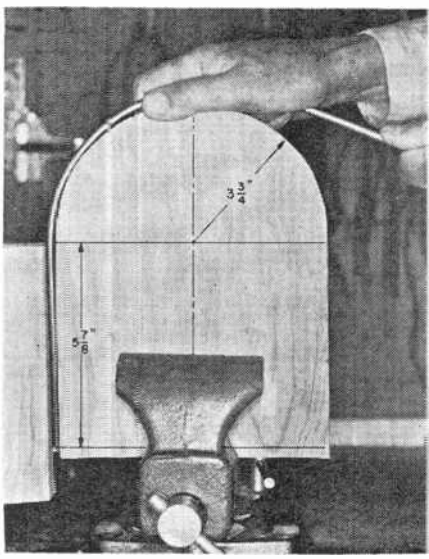


Fig. 3. Carefully bend the rod around the wood form to obtain a smooth shape in the loop. Rod must be clean and free from burrs to permit the ring to travel freely without interference.

PARTS LIST

I1, I2—12-16 volt miniature bayonet lamp
L1, L2—See text
S1—S.p.s.t. toggle switch
S2—See text
T1—Filament transformer; 117-volt primary, 12-16 volt secondary, 2 amp., minimum (Allied Radio 62 G 331 or equivalent)
1—6-rpm timing motor, 117 volts a.c., 60 cycles —see text
1—7" x 12" x 3/16" piece of Masonite
1—2¾" x 2¾" x 3/16" piece of Masonite
1—3" x 7" x 12" aluminum chassis (Bud AC-408 or equivalent)
1—24" soft iron rod, ¼" diameter
2—1¾" fiber or Micarta washers, ⅛" thick
1—8' length of soft iron wire, 16 or 18 gauge
1—22-gauge enameled magnet wire—see text
2—Pilot light assemblies (Allied Radio 7 E 891)
1—½" brass rod, ½" diameter
4—Pieces of 20- or 22-gauge round brass tubing, ¼" o.d., ½" long
1—½" piece of 20- or 22-gauge seamless aluminum tubing, ⅜" o.d. (won't work with a seam)
4—5/16" x 9/16" pieces of 26-gauge spring brass
1—5/16" x 1⅞" piece of 26-gauge spring brass
Misc.—Line cord, ¾" x 6-32 brass round-head machine screws (4), 2" x 6-32 steel round-head machine screws (2); 6-32 hexagon brass nuts (8), 6-32 hexagon steel nuts (2), rubber screw bumpers (4), ⅜" x 6 sheet metal screws (14), ½" x 1½" wood dowels (2), ¼" rubber grommet, ¼"-20 hexagon steel nuts (4), ¾"-diameter steel washers with ¼" center (2), #6 lock washers (4); and #6 brass washers (4)

longer than the other after forming, cut it to make both sides even. Then thread about ½" from the ends using a ¼" die.

Construction of L1 and L2. Make two coil forms with fiber or Micarta washers and strips of thin cardboard as shown in Fig. 4. Wrap a strip of 2"-wide cardboard around a ½" wood dowel and apply glue between the layers of cardboard without getting any glue on the wood dowel. Drill holes in the fiber coil ends to fit the cardboard tube and cement the tube and the ends together. Then drill two 1/16" holes in one end washer of each coil form to pass the wires through.

Wind approximately 80' of No. 22 enamel-covered magnet wire on each form. The exact amount is not important, but it is important to wind the coil turns close together and evenly. Suppliers of magnetic wire generally sell the wire wound on ½-lb. spools. One such spool is usually enough for both coils.

Mount the pilot light assemblies to the Masonite as shown in Fig. 5. Then center the two coils on the underside of the panel and over the ¼" holes, and cement the coils in place. The aluminum ring

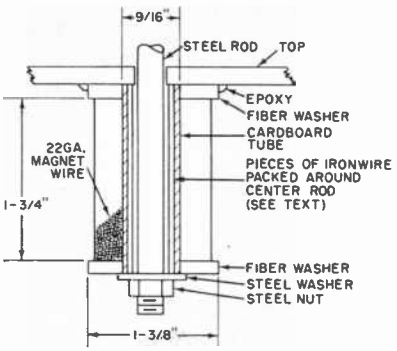


Fig. 4. Construct coil forms as shown. Each coil takes about 80 feet of No. 22 enamel-coated wire. A ½-pound spool should be enough for both coils.

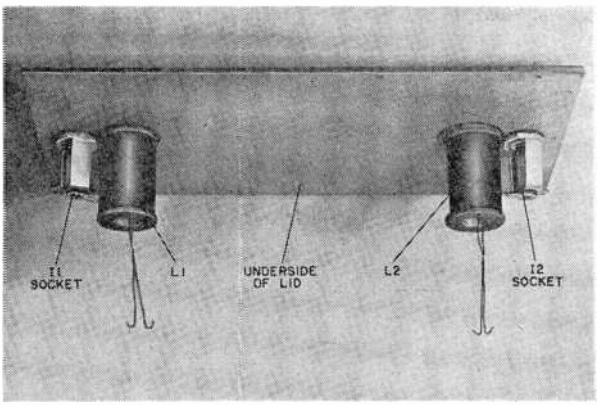


Fig. 5. Cement the finished coils to the bottom of the panel. Use extra long coil leads to avoid undue stress on the connections when assembling the unit.

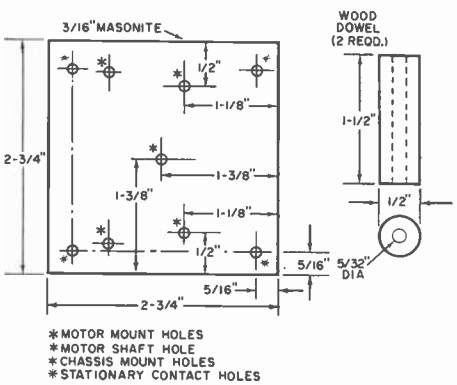


Fig. 6. Fabricate the rotary switch on a 2¾" x 2¾" piece of Masonite and bolt it to the chassis using two ½"-long dowels and 2"-long screws.

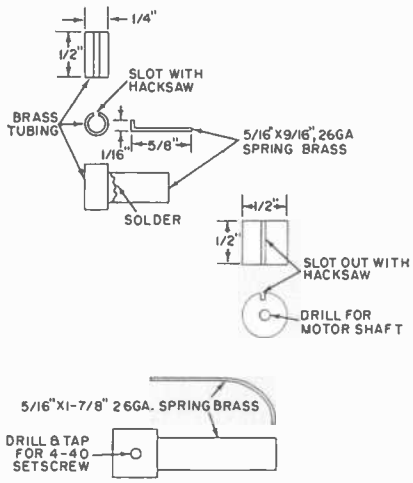


Fig. 7. Contacts are made from strips of spring metal soldered to short lengths of tubing. Drill the rotating contact to fit snugly on the motor shaft.

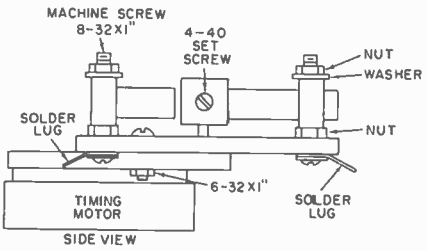


Fig. 8. Stationary contacts (side view) should be positioned to provide gentle contact and timed to extinguish the light just before the ring reaches it.

which flips back and forth on the steel loop is made from ½"-long, ⅜"-o.d., 20- or 22-gauge aluminum tubing; both ends of the ring should be reamed before the ring is placed on the loop.

Insert the ends of the loop from the top of the panel through the centers of the coils until the ends extend ¼" beyond the coils. Then turn the unit upside down and support the ends in the same position. Cut a number of pieces of No. 16 or 18 soft iron wire, each slightly less than 2" long, and straighten the pieces as much as possible. Then insert the wires around the steel loop ends (Fig. 4) in the center of the coils, applying a coating of epoxy cement to each piece as it is inserted in place.

Tightly pack both coils with the wires. You'll find it easier to insert the wires if you sharpen one end of the wire with a file. Then cut notches in the steel washer to clear the coil leads; place the washers and nuts over the ¼" rod projecting from the coil ends. Do not tighten the nuts until the epoxy glue has set.

Drill the 2¾" x 2¾" Masonite board used to mount switch *S2* as shown in Fig. 6. Measure the spacing of the mounting holes on your timing motor and drill corresponding holes in the base.

Herbach and Rademan Inc., 1204 Arch St., Philadelphia, Pa., 19107, offers a line of synchronous timing motors from ½ to 30 rpm. The 6-rpm model is priced at $4.95, f.o.b. Philadelphia. Motor rpm is not critical and almost any timing motor, down to 1 rpm, will work well.

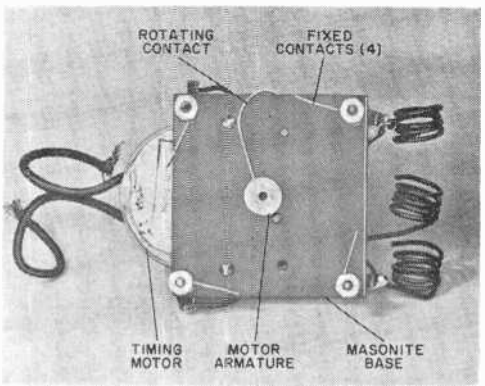


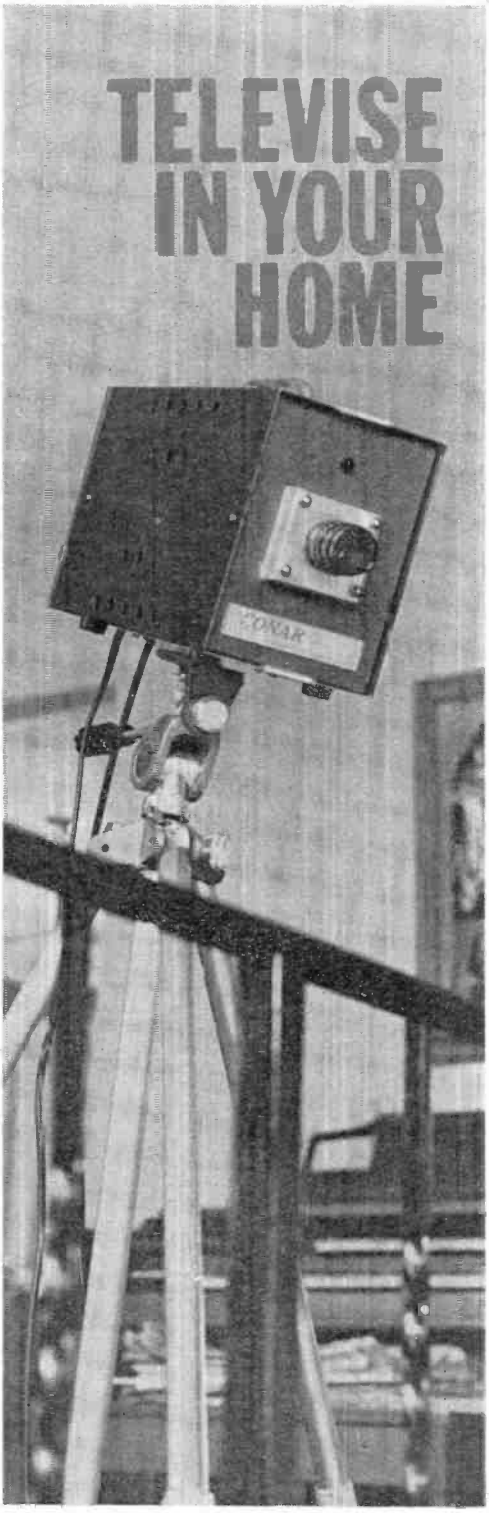
Fig. 9. Curve the rotating contact to get a gentle spring-like action. Contact and motor leads should be long enough to allow assembly without stress.

Next, start making the four stationary contacts from 20- to 22-gauge, ¼"-o.d., brass tubing cut to ½" in length. As shown in Figs. 7, 8, and 9, they are made by soldering a 5/16" x 9/16" 26-gauge piece of brass spring into the slotted tubing. When making the contacts, cut each length in line with the "grain" of the metal to prevent it from snapping when bent. The alignment of the grain can be determined by observing the direction in which the metal tends to curl when laid on a flat surface.

The rotating contact is made by soldering a strip of spring brass into a piece of slotted brass rod as shown in Fig. 7. Dress down the edges of the rotary and stationary contacts to insure quiet operation. Each of the four sta-

(*Continued on page* 96)

TELEVISE IN YOUR HOME



COVER STORY

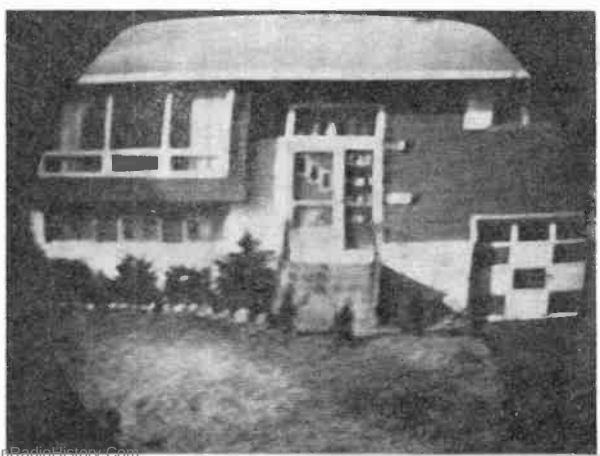
First closed-circuit TV camera kit proves to be a bargain

IN AN unexpected announcement, Conar Instruments* added a utility closed-circuit TV camera, the Model 800, to its line of test equipment. This is the first TV camera offered to the hobbyist/experimenter as a kit. The low price of $209.50 includes the all-important vidicon and other electronic components, plus an *f*/1.9 25-mm. lens. This price is substantially lower than that of any other nationally advertised TV camera. If you would rather have a fully wired model, the assembled camera is only $259.50.

Assembling It. POPULAR ELECTRONICS was fortunate in being able to obtain one of the first Model 800 TV camera kits. Because half of the wiring is on printed circuit boards, the camera goes together in just under six hours. Mechanical assembly and initial warmup adjustments absorb another hour or so. In our estimation, a moderately experienced builder can get this TV camera working satisfactorily in seven or eight hours.

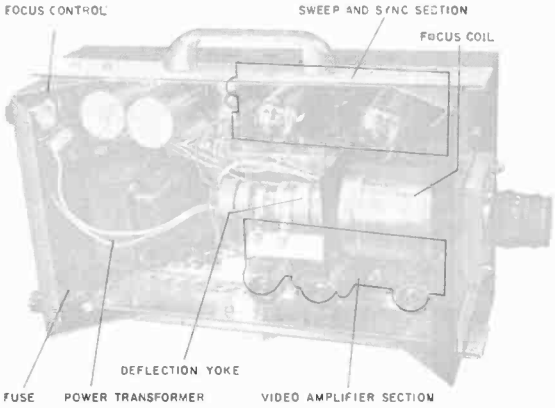
Unlike some CCTV cameras that require an outboard (or extra) r.f. oscillator to serve as a carrier, the Model 800 has this circuit (really a very low

**Conar Instruments, 3939 Wisconsin Ave., Washington, D.C. 20016*



power transmitter) built in. The oscillator can be tuned to any TV channel between 2 and 6. Connection from the camera to the TV receiver is through 72-ohm coax cable—a distance of up to 1000 feet being possible without serious loss of signal strength or deterioration of picture quality. The scanning and sweep rates are American standard (15,750 cycles horizontal and 60 cycles vertical to render 525 lines and 30 frames per second).

Additional lenses for the Model 800 are sold by Conar. A 12.5-mm. wide-angle lens is $36 and a 50-mm. telephoto lens is $28.00. The camera is light (about 10 pounds) and can be wall-mounted; Conar has available a professional photographer's tripod for $21, however.



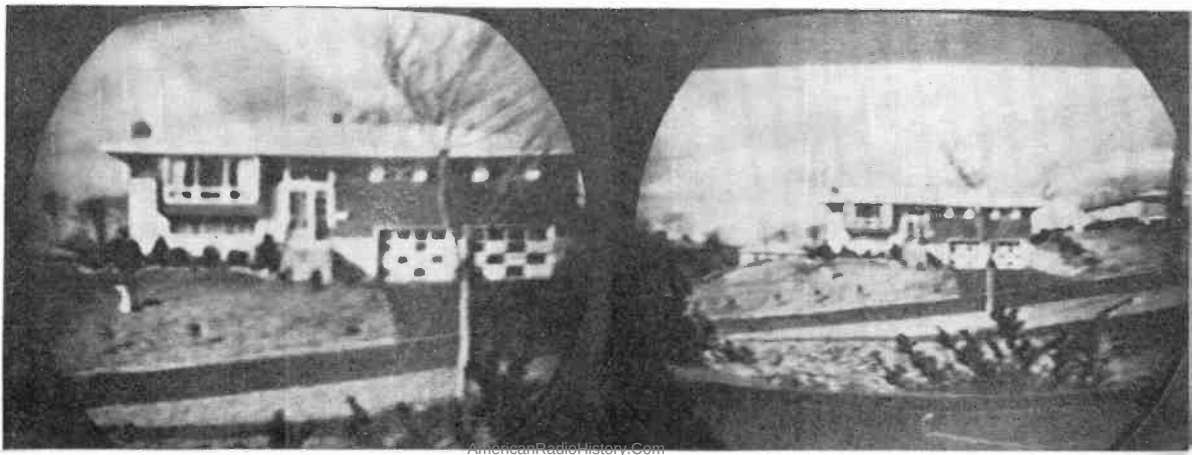
Roomy interior and quick assembly of TV camera is made possible by the use of printed circuit boards.

Use of a 50-mm. telephoto lens (left, above) almost lets you see who's behind the door in the house across the street (left, below). The middle ground is brought into view with a 25-mm. lens (center), and a 12.5-mm. wide-angle lens (right, above) takes in the whole scene (right, below).

Testing It Out. There are a few unusual adjustments to be made in setting up any CCTV camera, but these are easily mastered with the help of Conar's thorough instruction book. We found definition to be more than adequate for surveillance or remote pickups. Light sensitivity is excellent and only 150-200 watts of illumination gave pictures of good contrast.

The uses of a CCTV camera are many and varied. Besides watching for illegal entry, playground surveillance, call-board announcements, etc., CCTV is being used by many portrait photographers to help pose their subjects. With home video tape recording on its way, this camera seems like a natural investment.

In one test, the Editors used the Model 800 on Channel 6, coupling the camera output to the TV receiver through a splitter. This arrangement permitted the receiver to be used on all other channels without mechanically switching antenna leads. Isolation between the camera and the indoor antenna was about 20-24 db, but the Channel 6 signal could be weakly observed on a neighbor's TV receiver some 100 yards distant. So, watch what you're "transmitting." —30—



秋葉原
AKIHABARA

TOKYO'S "RADIO ROW"

There's one in every metropolitan city

By J. WANDRES

THAT miniature TV set your friend brought back from Tokyo—ask him where he bought it and chances are he'll say, "Along the Ginza somewhere." Ask if he went to Akihabara first, and he'll probably say, "Aki . . . what?"

It's not surprising that this part of Tokyo is unfamiliar to most visitors. It isn't a noted tourist attraction. And for shopping, it's the Ginza department stores with their English-speaking store guides that attract most tourists.

But five minutes away from the Ginza (on the Yamate line), within the shadow of the Akihabara elevated subway station, is the largest electronics and high-fidelity market in Tokyo—and probably the whole of Asia. This is where shrewd shoppers for radios and TV sets go hunting for real bargains. Here, discounts start at 15% and have been known to go as high as 50%.

As you get off the train at Akihabara and walk with the crowds to the market place, the din of a hundred television sets, hi-fi's, transistor radios, and tape recorders drowns out the noise of the trains overhead. Into a triangle about an acre in size are jammed half a dozen arcades containing scores of little shops and stalls.

Most of the shops carry items for which there is a heavy popular demand: 7-lb. TV sets; matchbox-sized radios; 2-lb. tape recorders; radio/phono combinations as big as a box of Kleenex; and pocket-sized CB transceivers. Many shops specialize in high-fidelity sound equipment; if some of it looks familiar, it may be because it is marketed all over the world under different names and at *very* different prices. Other stalls sell fluorescent lights, stoves, refrigerators, and household appliances. And still others handle more sophisticated items such as oscilloscopes, test equipment, radar and sonar for pleasure boats,

Geiger counters, and remote-control radios for model builders.

Since the second World War, technologic advances and the low cost of labor has made the manufacture of transistorized electronics one of Japan's leading industries. The low prices and tax-free-for-tourist laws practically dare a visitor not to buy.

Akihabara is essentially a discount market. And while haggling (as many of the G.I.'s knew it) has died out, the shopkeepers will not always turn a deaf ear to a little dickering—*if it is done right*. On $10 or $15 items, the shopkeeper will probably stand firm on his 15% discount. But if you are interested in $100 to $200 worth of amplifiers, tuners, turntables, and speakers, feel free to drive as hard a bargain as you can.

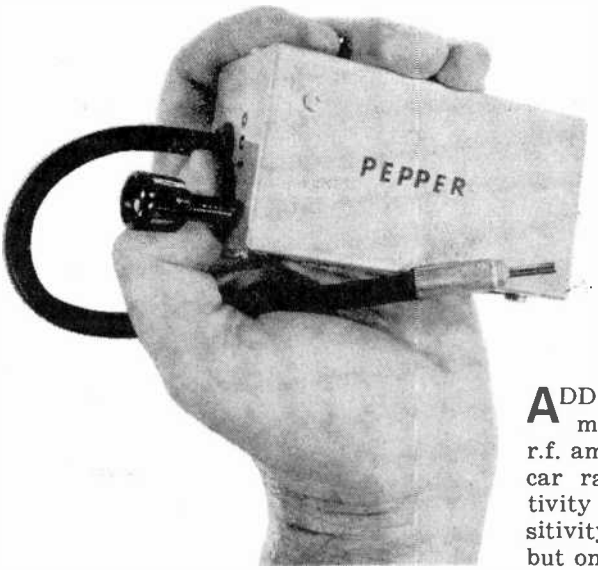
If the shopkeeper has any command of English, he will be eager to bargain in that language. But this "command" can be deceptive. A sale on the verge of closure can easily stall because of a simple misunderstanding of a word or gesture. If you are planning to spend a large sum, it would be wise to secure an interpreter (for about five dollars a day) through the Japan Tourist Bureau or the Tokyo Chamber of Commerce. Your interpreter will be able to express your wants honestly, and do it in a manner familiar and acceptable to Japanese businessmen.

From the time Akihabara opens at 8:30 a.m.—an hour earlier than the downtown stores, to the time it closes (later than the downtown stores) at 7 p.m.—and still later in the summer, there is a continual scene of happy confusion. Trucks constantly unload cases of factory-sealed merchandise into the already crammed aisles. Whole families come and spend the day selecting a new "telebee." Department store buyers from all over Japan conclude enormous deals over little cups of green tea. And scores upon scores of people just stand around taking in the action.

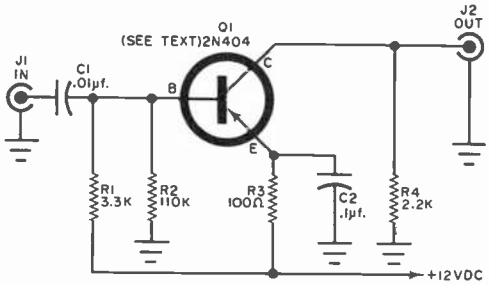
If you've ever seen Cortlandt Street in New York, you will have a good idea of what Akihabara in Tokyo is like. But while the days of "radio row" Cortlandt-Street-style are numbered, Akihabara is still going strong. -30-

PEPPER

Variety may be the spice of life, but "Pepper" can beef up fringe area reception



The physical size of this outboard r.f. amplifier could be sliced in half—the perforated board and the box used by the author happened to be handy.



Practically any pnp transistor can amplify radio frequencies up to 1600 kc. Substitutions for the 2N404 are almost limitless and are dirt cheap.

PARTS LIST

C1—0.01-μf. disc ceramic capacitor
C2—0.1-μf., 100-w.v.d.c. Mylar capacitor
J1—Motorola jack
J2—Motorola plug at end of 10" coaxial cable
Q1—2N404 transistor—see text
R1—3300-ohm, ½-watt resistor
R2—110,000-ohm, ½-watt resistor
R3—100-ohm, ½-watt resistor
R4—2200-ohm, ½-watt resistor
Misc.—Small piece of perforated board, aluminum box, cable, clamp, screws and nuts, etc.

By JOHN J. BORZNER

ADD a little "Pepper" to your automobile AM radio with an outboard r.f. amplifier. The modern transistorized car radios lack the astonishing sensitivity of older tube-type car radios. Sensitivity is excellent for local reception but on vacation, for example, when AM stations are 25 or more miles away, the pepper added by another r.f. stage is well worth the investment.

Construction of this amplifier is as easy or difficult as you care to make it. The author used a perforated board (somewhat oversize) and a commonly available aluminum box. A Motorola antenna jack is mounted at one end of the box for the lead from the cowl antenna. A short length of coax with a Motorola plug connects the amplifier to the auto radio. Power to the amplifier is supplied by an unused back-of-the-dash panel connection that is switched off and on by the ignition key.

Almost any *pnp* transistor can be used in "Pepper." The 2N404 listed costs about 50 cents, but a 2N107—costing even less—will probably work just as well. For a positive ground battery system, use an *npn* transistor.

Performance of the amplifier is evidenced by the following fact. From Daytona Beach, Florida—notorious for rock-and-roll AM stations, "Pepper" saved the day for the author, who can now hear good music from Orlando. —30—

SUPERCHARGED SALT SHAKER

IN YOUR KITCHEN you'll find more than just food. Look around and you'll come across some of the things needed to make a small Van de Graaff generator. Here's a "recipe" for an electrostatic generator which can put out upwards of 100,000 volts of harmless static electricity, and which requires very little culinary skill to prepare. Ingredients called for include a small pie tin, a large aluminum salt shaker, and a few "condiments."

Although it's diminutive in size, there is little difference in principle between this midget powerhouse and the massive 2-million-and-more-volt units used in atomic research. This generator makes a perfect science fair project and is easy to build. You can use it to demonstrate the laws of electrostatics—and don't be surprised if it makes your hair stand up as well!

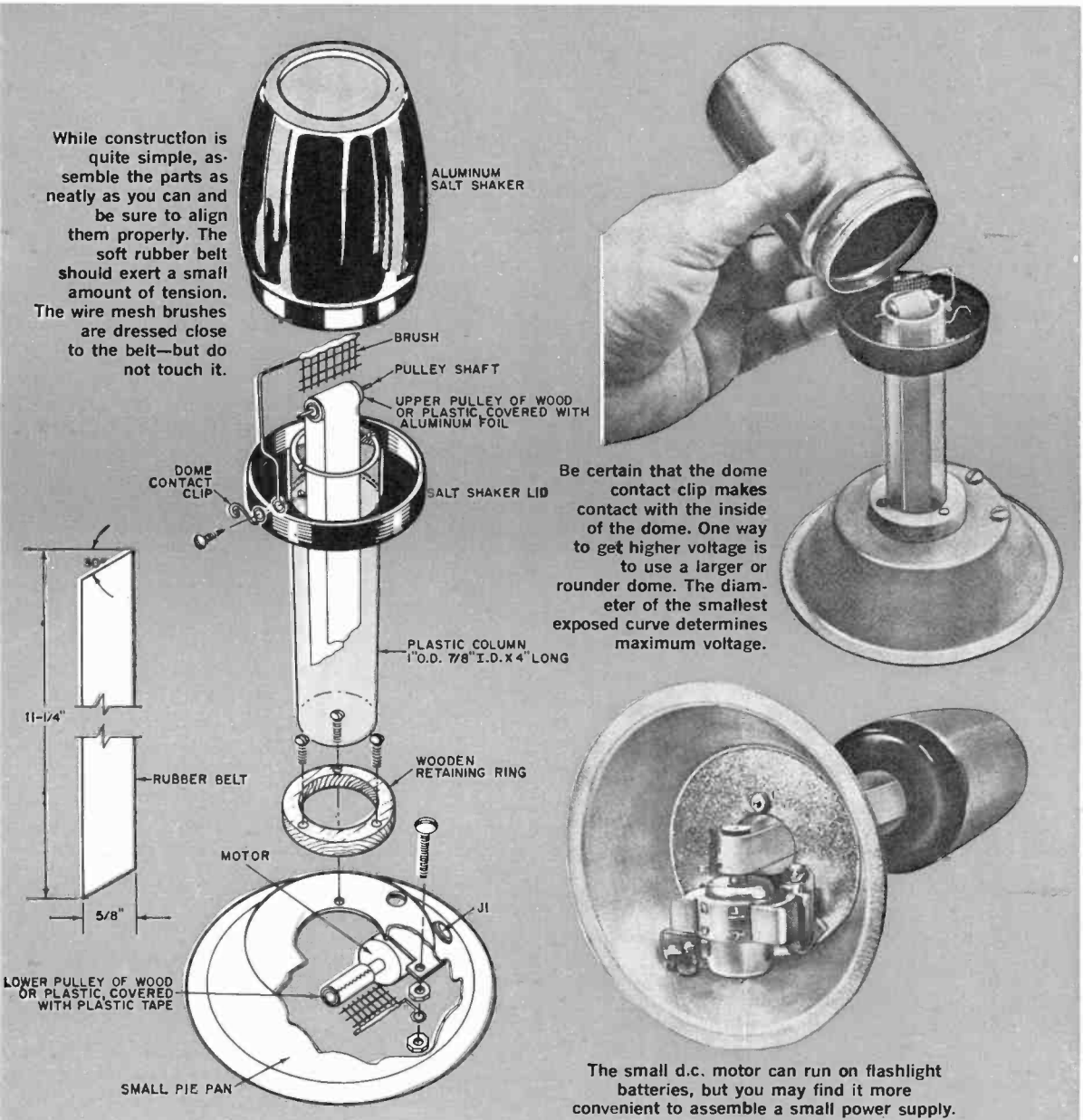
How It Works. As you know, the simplest way to generate static electricity is to rub two pieces of material together. Walk across a carpeted floor on a dry day, and chances are you'll draw sparks when you touch a metal surface; or run a comb through your hair, and you'll hear

"Hopped-up" utensils and about $2.50 worth of ingredients desert the kitchen for the science fair

By ED FRANCIS

things snap, crackle, and pop. While this static electricity is commonplace, it is no different from that produced by the little Van de Graaff generator "cooked up" here. A hollow insulating column held in place by a pie-plate base supports a salt-shaker dome. Within the base, a small toy motor drives a rubber belt around a plastic pulley.

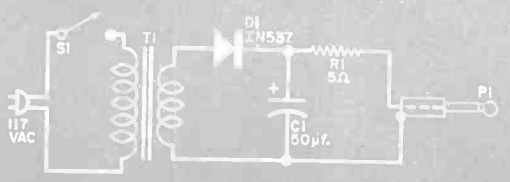
When two dissimilar substances are rubbed together, they become electrostatically charged. The one with the higher dielectric constant usually takes on a positive charge, and the other takes on a negative charge. Plastic materials generally have a higher dielectric constant than rubber, and if this is the case with the materials you select, the plastic will become positively charged by giving off electrons to the rubber. But regardless of which material is positive and which material is negative, the rubber



While construction is quite simple, assemble the parts as neatly as you can and be sure to align them properly. The soft rubber belt should exert a small amount of tension. The wire mesh brushes are dressed close to the belt—but do not touch it.

Be certain that the dome contact clip makes contact with the inside of the dome. One way to get higher voltage is to use a larger or rounder dome. The diameter of the smallest exposed curve determines maximum voltage.

The small d.c. motor can run on flashlight batteries, but you may find it more convenient to assemble a small power supply.



Optional power supply can be installed next to the motor if you use a large enough pie plate as a base, or you can mount it in a box. Construction and parts are not critical.

POWER SUPPLY PARTS LIST

C1—60-μf., 50-volt electrolytic capacitor
D1—1N537 diode or equivalent
P1—Miniature phone plug
R1—5-ohm, 1-watt resistor
S1—S.p.s.t. switch
T1—6.3-volt filament transformer
Misc.—Line cord, small chassis or box, 3' cable

belt transfers the charge deposited on it to the dome, until a certain maximum charge is reached. This charge is dependent upon the roundness of the dome —it's usually on the order of 30,000 volts per inch of diameter of the smallest curve or point. Therefore, if you want to build up high voltage, use a large diameter ball without any ripples, points, or other small projections.

The wire mesh brushes at top and bottom merely aid the flow of electrons to or from the dome and the base, depending upon which is positive and which is negative. You can use flashlight batteries to power the motor, or you can build a small half-wave-rectifier power supply to convert the line voltage to 6 volts d.c., and eliminate the batteries.

BILL OF MATERIALS

1—Miniature hobby motor (Lafayette "Super Micro-Motor" or equivalent)
1—Large aluminum salt shaker
1—⅝" x 11¼" piece of sheet rubber
1—Small pie-plate base
1—4" long x 1"-o.d. x ⅞"-i.d. plastic column
2—¾"-long x ⅜"-diameter plastic rods (to serve as pulleys)
1—1⅞"-o.d. x 1"-i.d. wood retaining ring, made from 5/16" stock
1—1⅛"-long x 1/16"-diameter brazing rod (for pulley shaft)
2—⅜" x ⅝" bronze screen brushes
1—Miniature phone jack (J1)
Misc.—Plastic electrical tape, #18 copper wire, aluminum foil, cement, nuts, bolts, etc.

Construction. Most people associate the Van de Graaff generator with a huge ball-shaped metal dome, but the shape of the metal dome need not be perfectly round as long as it has no sharp edges or small curves. An inexpensive large-size aluminum salt shaker with a plastic lid can be used with excellent results. The plastic lid is a good electrical insulator and prevents corona discharge from the small diameters of the threaded end of the salt shaker.

The column is made from a 4" length of 1"-o.d. Lucite, Plexiglass, or polystyrene tubing. The inside diameter must be wide enough (about ⅞") to pass the rubber belt. You might try obtaining a large pill vial from your druggist to serve as the column. The small pie tin should be large enough to keep the structure from toppling over.

Drill a hole in the center of the shaker lid which is the same size as the outside diameter of the tubing, and cement the cover in place about an inch down from what will now become the top of the column. Drill holes in the pie-plate base to mount the motor, and the jack (*J1*) for the batteries or power supply. Bolt the retaining ring made from about 5/16" wood stock to the pie pan. Do not cement the column to this ring, at least not until after you have aligned the belt, and then only if you have to. The hole in the center of the pan is only as large as the inside diameter of the tube, and

does not allow the tube to pass through the pan.

Make the upper pulley from a ¾" length of ⅜"-diameter plastic or wood dowel. Drill a 1/16" hole lengthwise through the center of the dowel and insert a ¾" length of rod cut from 1/16"-diameter brazing wire or piano wire so that it protrudes about 3/16" from each end. Cement a layer of aluminum foil around the pulley. The lower pulley is made from the same material except that it should be drilled for the motor shaft and covered with an even layer of plastic electrical tape.

Cut two notches about 1/16" deep on top of the column to cradle the upper pulley shaft. Then drill a 3/32" hole approximately one-quarter inch below one of the notches for the upper brush bracket and dome contact. Fasten the lower brush in the base on the side of the belt which travels upward.

A wide variety of motors will work with the generator; in fact, almost any miniature, fairly high rpm toy motor will do.

The 11¼" x ⅝" belt can be fashioned from a piece of thin sheet rubber of the type available from surgical supply houses or cut from an old swimming cap. Angle both ends to obtain a long, smooth butt seam. Apply rubber cement—the kind used to fix a flat tire—to each end, and when dry, carefully press the ends together and apply a thin coat of cement over the joint.

After the joint is bonded, install the belt by dropping it down through the tube and engaging both pulleys. Check the belt for proper alignment and tracking. You can do this by running the motor. If the belt doesn't track, shim up the motor where necessary, or cut one of the upper pulley notches deeper. Belt tracking can also be improved by constructing the pulleys with a slight crown or hump in the center.

Both upper and lower brush brackets are made by soldering a small piece of No. 18 copper wire, bent to shape as shown, to a ⅜" x ¾" bronze or other metal window screen material. The dome contact clip, which is also a piece of copper wire bent to shape, should be mounted so as to make contact with the inside of the salt shaker body when assembled. Use a 6 x ½" sheet metal screw to attach the contact and brush to the column.

Adjust both brushes so that they are close to the rubber belt but not touching, and in line with the pulley. Then screw the dome in place. Miniature phone jack *J1* is then mounted on the base and attached to the motor to facilitate the battery or power supply connections.

A small wooden box houses the power supply components. A miniature phone plug on the end of a 3' lead plugs into the pie pan. If you happened to use a large enough pie pan, you might get away with installing the power supply inside the base.

Operation. Some laws of electrostatics can be demonstrated by placing small bits of aluminum foil, paper or sawdust on the metal dome and watching them fly away from the dome as a charge is built up. These bits take off because they gain a like charge. *Like charges repel; unlike charges attract.*

The Indian rope trick, in miniature form, can be duplicated by attaching a few long strands of string or tissue paper to the dome. When the strands take on a charge, they will stand on end as they try to fly away. Touch the strands with your fingers, and they'll lean toward your hand as your body steals the charge.

A jumping ball demonstration can be performed by placing two or three small pith balls inside a small plastic tube, covering the tube with a metal disc, and placing it on top of the dome. As the balls are repelled upward from the dome, they will cling to the metal disc on top and then fall back to the dome. This action repeats itself until the disc approaches the potential of the dome.

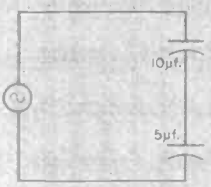
To send corona discharge into the air, bend a piece of stripped hookup wire so that it will sit on top of the dome with one end pointed up. This end should be filed to a sharp point. Douse the lights, turn on the unit, and sit back and watch man-made lightning in miniature being produced. Another indication of the presence of corona is the peculiar smell of ozone which is usually generated.

Moisture and dirt in the column and dust on the dome will rob your unit of its prowess. So keep it clean. —30—

SERIES-CIRCUIT QUIZ

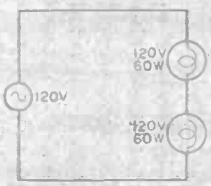
By **ROBERT P. BALIN**

Experimenters often have to connect similar electronic components—resistors, capacitors, coils, etc. —in series to obtain a desired value or effect. This deceptively simple task requires an understanding of the basic operating principles of the components. See how many of these TRUE-FALSE questions you can answer correctly by first working out each problem.



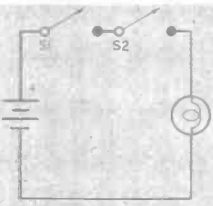
1 If two capacitors are connected in series across a voltage source, the smaller one will charge up to the larger proportion of the applied voltage.

TRUE___ FALSE___



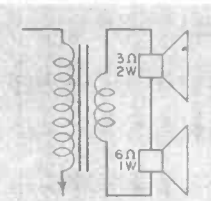
2 If two lamps of equal voltage and wattage rating are connected in series across a power source, each will deliver one-half of its rated power.

TRUE___ FALSE___



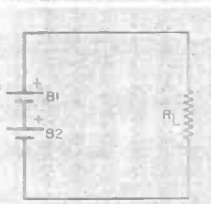
3 If two s.p.s.t. switches are connected in series with a battery and a lamp, the arrangement may be considered the same as an "OR" logic circuit.

TRUE___ FALSE___



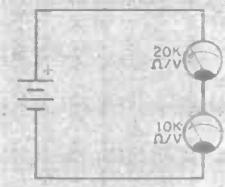
4 If a 3-ohm, 2-watt speaker and a 6-ohm, 1-watt speaker are connected in series, the 1-watt speaker will deliver twice as much power as the 2-watt speaker.

TRUE___ FALSE___



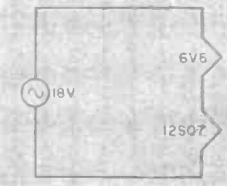
5 If two dry cells of equal current and voltage rating are connected in series across a load, the current-handling capability of the circuit is increased twofold.

TRUE___ FALSE___



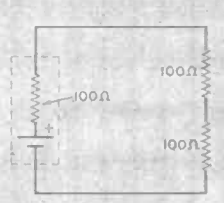
6 If two voltmeters, each set on the same scale, are in series across a voltage source, the one with the higher ohms/volt rating gives the greater deflection.

TRUE___ FALSE___



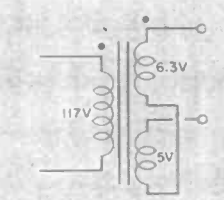
7 If the filaments of a 6V6 and a 12SQ7 electron tube are wired in series, the tubes will operate satisfactorily when connected across an 18-volt source.

TRUE___ FALSE___



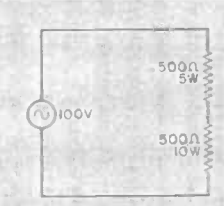
8 Two 100-ohm resistors placed across a battery having an internal resistance of 100 ohms dissipate twice as much power as one of the external resistors.

TRUE___ FALSE___



9 If the two secondary windings of a transformer are in series as shown, the output voltage is the sum of the individual secondary coil voltages.

TRUE___ FALSE___



10 If a 500-ohm, 5-watt resistor and a 500-ohm, 10-watt resistor are in series across a 100-volt source, they are considered equal to a 1000-ohm, 15-watter.

TRUE___ FALSE___

(*Answers appear on page* 101)

HEATH BLAZES TRAIL WITH 25" COLOR TV KIT

New automatic degaussing circuit eliminates need for manual degaussing when set is relocated

By JOHN D. DRUMMOND, Technical Editor

IF WE DIDN'T build it ourselves, we'd think someone was trying to pull the wool over our eyes. But we weren't taking any chances . . . we simply had to know how well a 25-hours-to-build, $469.95 color TV kit would stack up against the more expensive ($600-$650) well-advertised wired sets people were gobbling up. It didn't take us long to find out that the Heath* GR-25 compares favorably with the best of them.

A new automatic degaussing circuit that demagnetizes the set each time it is turned on, a vertical swing-out chassis that takes the sweat out of servicing, and a 25" rectangular "rare earth" color tube that allows your custom cabinet to stand only 22 inches from the wall are features which not even Heath's own GR-53A** (21" tube) color set have.

Easy to Build. We didn't break any time record putting the set together, and we advise you not to try it, either. More important, we were looking for any pitfalls that an adventurous builder might encounter. We honestly didn't find any. Heath's 180-page combined assembly and service manual was so thorough in all respects—and easy to follow, too—that we couldn't help having that uneasy feeling that something was wrong. Nothing was!

All critical circuits, including the UHF and VHF tuners, i.f. amplifiers, sound detector, and horizontal output assembly, are furnished preassembled and prealigned. The builder assembles the sound/sync circuit board, the color circuit board, and the convergence board, and takes care of all the point-to-point circuit wiring, most of which is done through a preassembled color-coded wiring harness. Then there's a small matter of assembling the picture tube shield which mounts the vertical swing-out chassis.

Final Checks. After we made our final connection, we just weren't in any hurry to plug in the set. Experience has taught us to resist the urge. Instead, we carefully went over all the wiring connections and removed a few accidental grounds here and there.

Incidentally, we can't overemphasize the fact that you must scrupulously follow the assembly manual at all times. For example, the manual tells you that during initial degaussing you must move the external coil as far away from

*Heath Company, Benton Harbor, Mich.
**The GR-53A was reviewed in the May, 1964, issue of POPULAR ELECTRONICS.

Close-up view of the main control panel (top) shows all tuning controls. The panel can also be mounted in a wall cutout or other suitable location at the top, bottom, or right side of the picture tube. Tilt-out convergence panel (below) enables you to perform dynamic convergence from front of set.

the set as possible before you turn off power. To ignore this seemingly unimportant detail is to have an improperly degaussed set, as evidenced by irregular splotches on the screen.

Initial Adjustments. If you carefully follow the directions in the service section of the assembly manual, you should have no trouble at all with the initial adjustments: purity, static and dynamic convergence, tracking and linearity. It should take you approximately two hours to complete all the adjustments. And you don't even need a color signal generator. A built-in dot generator that you turn on with the flick of a switch on the back of the set is all you use.

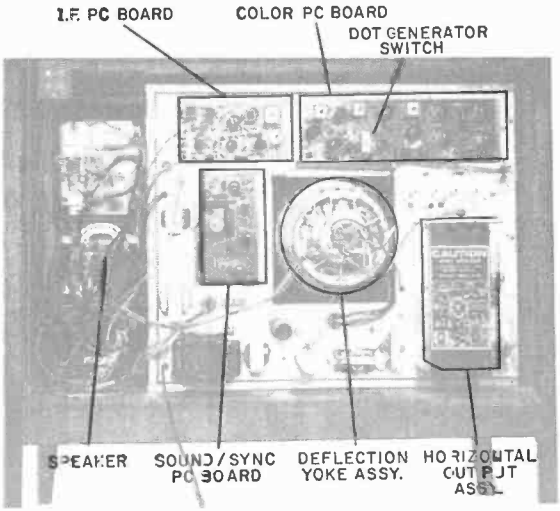
If, for any reason, any difficulties are encountered, you simply refer to a trouble table that tells you where to look and what to do. Incidentally, the adjustment and servicing information provided is so complete, with full-color photos and all, that you should have no need to call in a TV repairman for any service whatsoever. Just think of what you'll save in service contracts alone!

Working the Set. Before preparing this report, we worked the set for a couple of weeks to make sure there were no bugs. During this test period, the GR-25 consistently produced excellent colors with proper hues, and had unusually good resolution even when the brightness control was deliberately advanced beyond its normal setting. Purity and tracking were equally good, and overall interference rejection was outstanding, even in the presence of low-flying aircraft.

Finally, we tried out the automatic degaussing feature by operating the set in various parts of the room, with the screen facing in all directions. The set operated equally well in every direction without further degaussing.

If you think the Heathkit GR-53A color TV is great—and it certainly is—just wait until you see the magnificent GR-25 color set. —30—

Printed circuit boards and the horizontal output assembly are shown mounted on a vertical swing-out chassis that hinges on the left side of a Magna-Shield[R] enclosure designed to isolate the picture tube from external magnetic fields. With the chassis swung open, all test points and terminals are readily accessible for servicing and adjustments.



ZERO-BEATING THE NEWS

PUSH-BUTTON ROOM—A unique conference room equipped to the hilt with electronic gadgets to aid conferees is nearing completion at the Federal Aviation Agency Aeronautical Center in Oklahoma City. A flick of a switch will dim the room lights, draw back curtains to reveal three images on a rear-projection screen, raise and lower a lectern, record conversations, and even permit making conference telephone calls to link various regional FAA headquarters. University speakers and microphones are hidden behind audio grilles in the ceiling.

LASER TV HAS DARK EYES—Whether the lights are on or off makes no difference to a new laser TV camera that can operate in the dark. It was developed by Perkin-Elmer, Norwalk, Conn.

REMOTE BANKING FACILITIES—Dollars can now go a long way. Customer and teller are connected by a two-way television and voice circuit, and a pneumatic tube. Diebold Inc., Canton, Ohio, banking equipment firm uses closed-circuit RCA-manufactured TV cameras in its "Auto-Teller" units.

RADAR HEART DETECTOR—Small gill movements of a goldfish show up clearly on an oscilloscope when it is used in conjunction with the "Ultrasonic Doppler Cardioscope" (UDC) being operated here by its inventor, James R. Richards, a sound engineer at the U.S. Naval Research Laboratory. The device can monitor the heartbeats of a human embryo. A Doppler shift of the narrow ultrasonic beam of sound from the UDC, caused by a moving object, is picked up and detected by a receiver.

Official United States Navy Photograph

MOST POWERFUL BATTERY—A 25-million-watt (5000-volt, 5000-amp.) rechargeable nickel-cadmium battery is under construction by Gulton Industries for the U.S. Army Missile Command. It will be as large as a phone booth, contain thousands of pounds of electrodes.

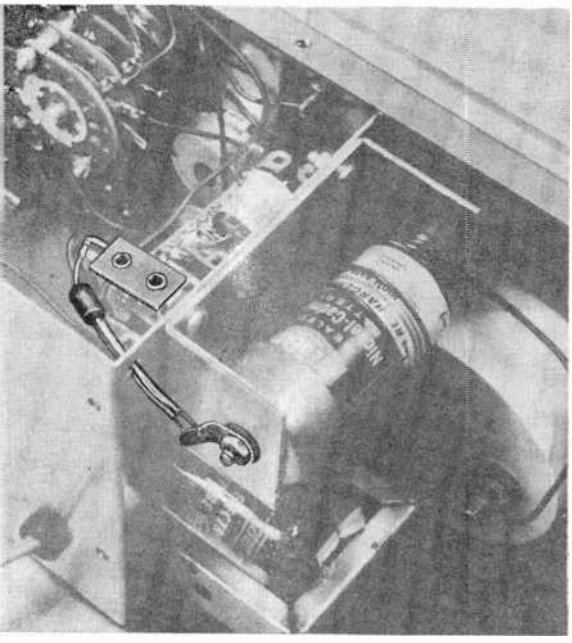
HEARTFELT TELEPHONE CALL—Putting a dime in a pay telephone seems simple enough, but to Pierre Provencher of Toronto, Canada, it's a miracle. The 20-year-old youth lost both hands in an accident and now he's equipped with "Myo-Electric" hands. They look and work like real hands and are activated by impulses from the brain.

UPI photo

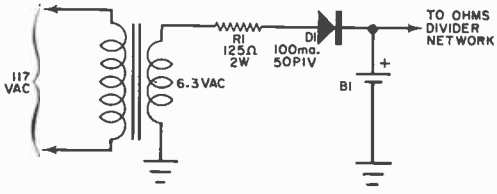
ETERNAL VTVM "C" CELL

Substitute a rechargeable battery —and forget it

By GARRY BOROSS



Looking inside a typical VTVM (Heathkit IM-13), note how Eveready N54 nickel-cadmium cell slips into battery holder. Only two additional parts are needed. Tie point is added to support wiring connections between R1 and diode rectifier D1. Filament connection is made at pin 9, V2, in this case.

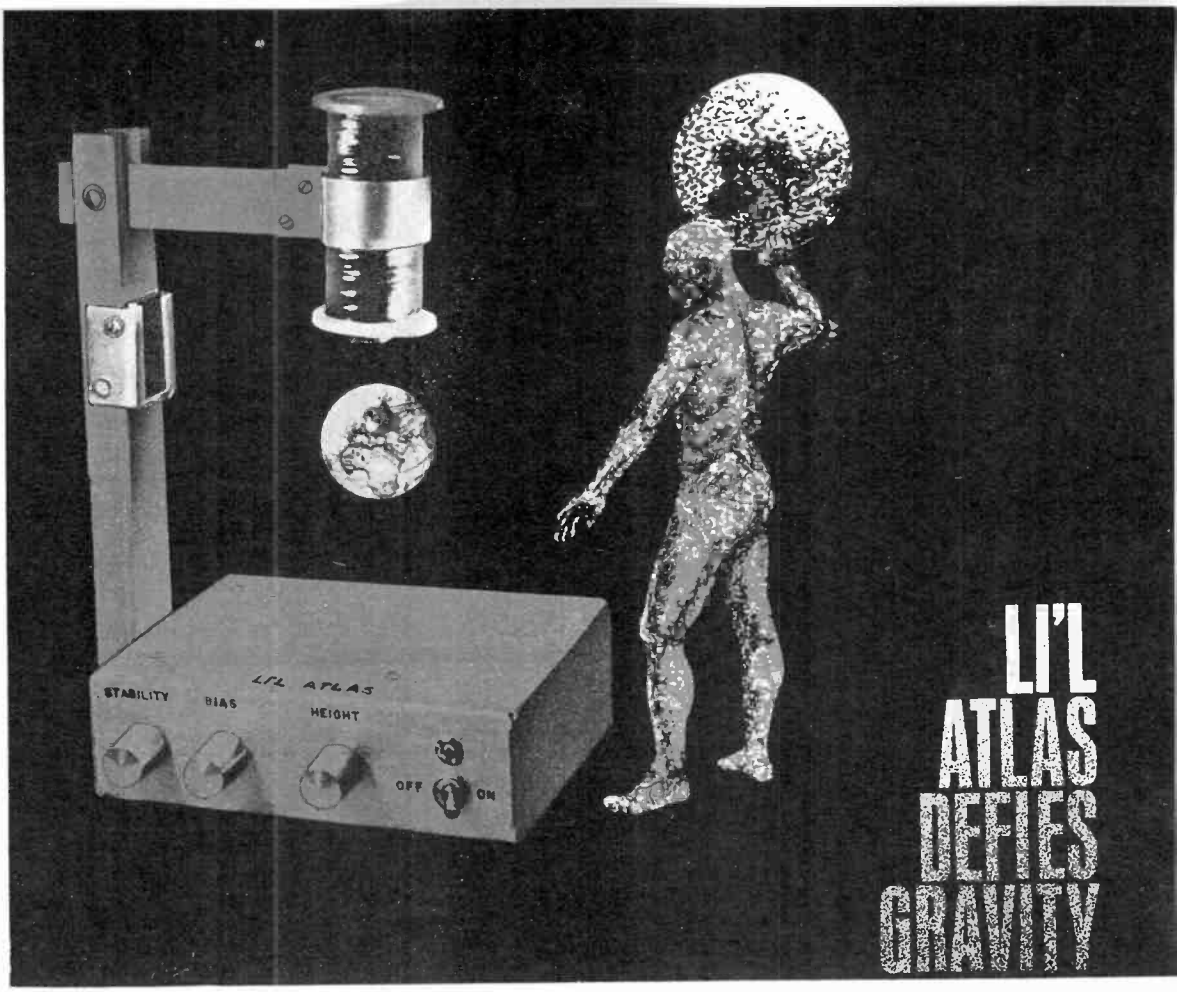


EVERY seasoned experimenter/hobbyist will agree that the VTVM is a basic tool for circuit testing and electronics repair work. But it has one shortcoming—hidden inside that metal case is an ordinary flashlight battery. Too often this battery is forgotten until the experimenter realizes that the ohmmeter readings are way off and a corrosive fluid is seeping out the bottom of the VTVM case.

If you believe that an ounce of prevention is worth a pound of cure, try substituting a nickel-cadmium battery (*B1*) for that old flashlight cell.* Simultaneously, wire into the VTVM a simple half-wave rectifier using a silicon diode. This diode (*D1*) and a series current limiting resistor (*R1*) are fed from the 6.3-volt filament winding.

The nickel-cadmium cell can be inserted into the battery holder in the VTVM. Or, if you would like to solder the battery into the circuit, you can obtain a nickel-cadmium cell equipped with soldering tabs. When power is applied to the VTVM, the battery will receive a small trickle charge—generally 20-30 ma. There is no danger of the battery being overcharged, even if the VTVM is left on continuously. -30-

**Mercury batteries are not used in VTVM's because of their high internal resistance. Alkaline batteries are occasionally recommended for use in VTVM's, but they sometimes release corrosive gases that damage switch contacts.*



LI'L ATLAS DEFIES GRAVITY

Like orbiting satellites, objects just float in space when magnetic attraction overcomes the pull of gravity

By WILLIAM J. PRICE

UNLIKE the Atlas of Greek mythology, condemned to carry the heavens on his shoulder for all time, "Li'l Atlas" is no myth. It's an electromagnetic photoelectric type of servo system that can establish a weightless condition on small metallic objects. And it's sure to steal the show at any Science Fair.

You place an object—an ordinary door key, a child's tin toy, or a small metal globe like the one shown—in the device's "sphere of influence." Then, like the boys at the Cape, you man the controls to suspend the object in space. You can move it up or down, or even wiggle it, if you wish.

How It Works. A photoelectric cell serves as a position sensor, and controls the intensity of a magnetic field that is used to counteract the pull of gravity on the object being suspended. (See photo.) Photocell *PC1* is mounted on a wooden column opposite a light source. When an object is suspended, it breaks part of the light beam reaching *PC1*.

If the object begins to fall, more light reaches the photocell, increasing the photocell's output current (Fig. 1). This current increase is amplified by *Q1* and *Q2*, and direct-coupled to power transistor *Q3*, whose output is in series with an electromagnet (coil *L1*). The resulting current increase through *L1* causes an increase in its magnetic field to overcome the pull of gravity, raising the object back up in place.

Similarly, if an object is raised above its predetermined height, less light falls on *PC1*, reducing the current to *Q3*. The magnetic field intensity is decreased, al-

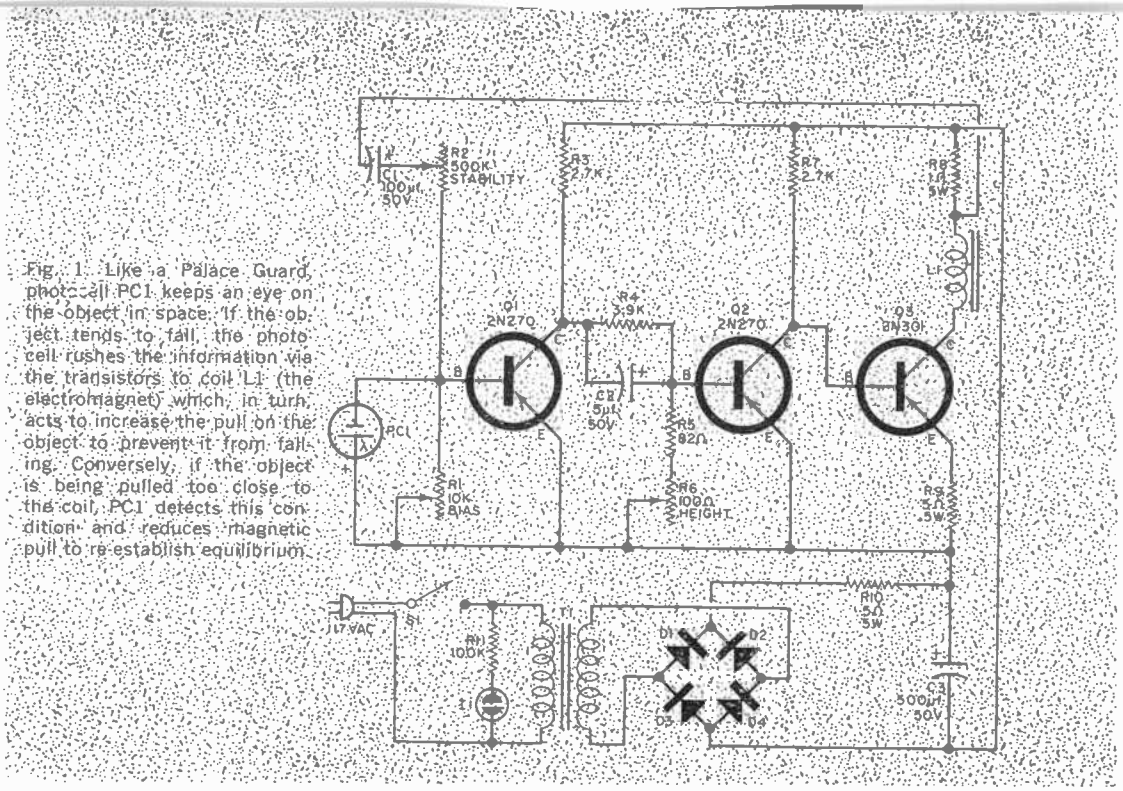


Fig. 1. Like a Palace Guard, photocell PC1 keeps an eye on the object in space. If the object tends to fall, the photocell rushes the information via the transistors to coil L1 (the electromagnet) which, in turn, acts to increase the pull on the object to prevent it from falling. Conversely, if the object is being pulled too close to the coil, PC1 detects this condition and reduces magnetic pull to re-establish equilibrium.

lowing the object to drop down to its proper position.

The *BIAS* potentiometer, *R1*, controls the amount of current through *Q1* for proper operation under existing lighting conditions. Similarly, the *HEIGHT* control, *R6*, adjusts the bias on *Q2*, and establishes the height range through which an object can be suspended. The *C2-R4* coupling network stabilizes *Q2*'s base current for a smooth response. *STABILITY* control *R2* stabilizes the oscillatory tendency of the suspended object by adjusting the amount of feedback voltage developed by *R8* and fed back to *Q1* through *C1*.

The power supply is comprised of filament transformer *T1*, a full-wave bridge rectifier (*D1* through *D4*), limiting resistor *R10*, and filter capacitor *C3*.

Construction. If you use the chassis listed here, your first task is to lay out and drill the holes as shown in Fig 2. If you elect to use a different chassis, the suggested layout can still be followed except for the dimensions—which may change.

Once the chassis has been drilled and deburred, lay it aside temporarily while you proceed to make the wooden bracket,

PARTS LIST

C1—100-μf., 50-volt electrolytic capacitor
C2—5-μf., 50-volt electrolytic capacitor
C3—500-μf., 50-volt electrolytic capacitor
D1, D2, D3, D4—1N2859A silicon diode or equivalent
I1—NE-2 pilot light
L1—Coil—see text
PC1—1½" x ¾" selenium photocell (Lafayette Radio 99 R 6244 or equivalent)
Q1, Q2—2N270 transistor
Q3—2N301 or 2N2869 transistor
R1—10,000-ohm potentiometer, linear taper
R2—500,000-ohm potentiometer, audio taper
R3, R7—2700-ohm, ½-watt resistor
R4—3900-ohm, ½-watt resistor
R5—82-ohm, ½-watt resistor
R6—100-ohm potentiometer, linear taper
R8—1-ohm, 5-watt resistor
R9, R10—5-ohm, 5-watt resistor
R11—100,000-ohm, ½-watt resistor
S1—S.p.s.t. toggle switch
T1—Filament transformer: primary, 117 volts a.c.; secondary, 25.2 volts at 1 amp. (Stancor P-6469 or equivalent)
TS1—Single-lug terminal strip
1—5" x 7" x 2" aluminum chassis (Bud AC-402 or equivalent)
1—3½" x 4" Vectorboard
2—1¾" x 2" x ⅛" pieces of Lucite or Bakelite
1—TO-3 insulated transistor mounting kit
1—10"-long wooden column
1—4½"-long wooden cross arm
Misc.—Photocell mounting brackets, electromagnet mounting bracket, No. 26 Formvar insulated magnet wire (1 lb.)—see text, transistor sockets, ⅜" rubber grommet (2), #6 solder lug; ⅜"-o.d. rubber feet (4), knobs, etc.

photocell mounting bracket, and the coil support strap, as shown in Fig. 3.

Winding the Coil. The coil is wound on a ½" x ¾" x 3½" core made from laminated strips of mild steel (Fig. 4). You can have these strips made up by your local sheet metal shop, or they can be salvaged from an old power transformer core.

Clamp the laminations tightly together, then wrap a layer of black plastic tape around the core to hold the laminations close together while the coil is wound. This will also prevent the wire forming the first layer of the coil from being stripped by the sharp edges of the core. At one end of the core, keep the tape ⅜" away from the edge.

Cut a ½" x ¾" opening in the center of one of the two Lucite or Bakelite end stops. Insert the piece with the cutout over the end of the core with the ⅜" recessed tape. Center the other piece of Lucite over the other end of the core. Then, cement both pieces of Lucite in place using epoxy cement.

Allow sufficient time for the epoxy to dry thoroughly, and close-wind 800 feet of #26 Formvar magnet wire (approximately 2500 turns) on the core. Wrap one or two layers of plastic tape around the finished coil to protect the wires and hold the turns in place. Remove about one inch of varnished insulation from both ends of the coil using a fine file or sandpaper, then tin the bare wire. The d.c. resistance of the finished coil is approximately 30 ohms.

Installing the Parts. You are now ready to begin mounting the components on the 4" x 3½" prepunched Vectorbord. Do not mount *Q1* and *Q2* any closer to the 5-watt resistors than is shown in Fig. 5. Also, make certain the capacitors and diodes are connected with polarities as shown.

Mount the filament transformer and terminal strip using *8-32* x ½" screws

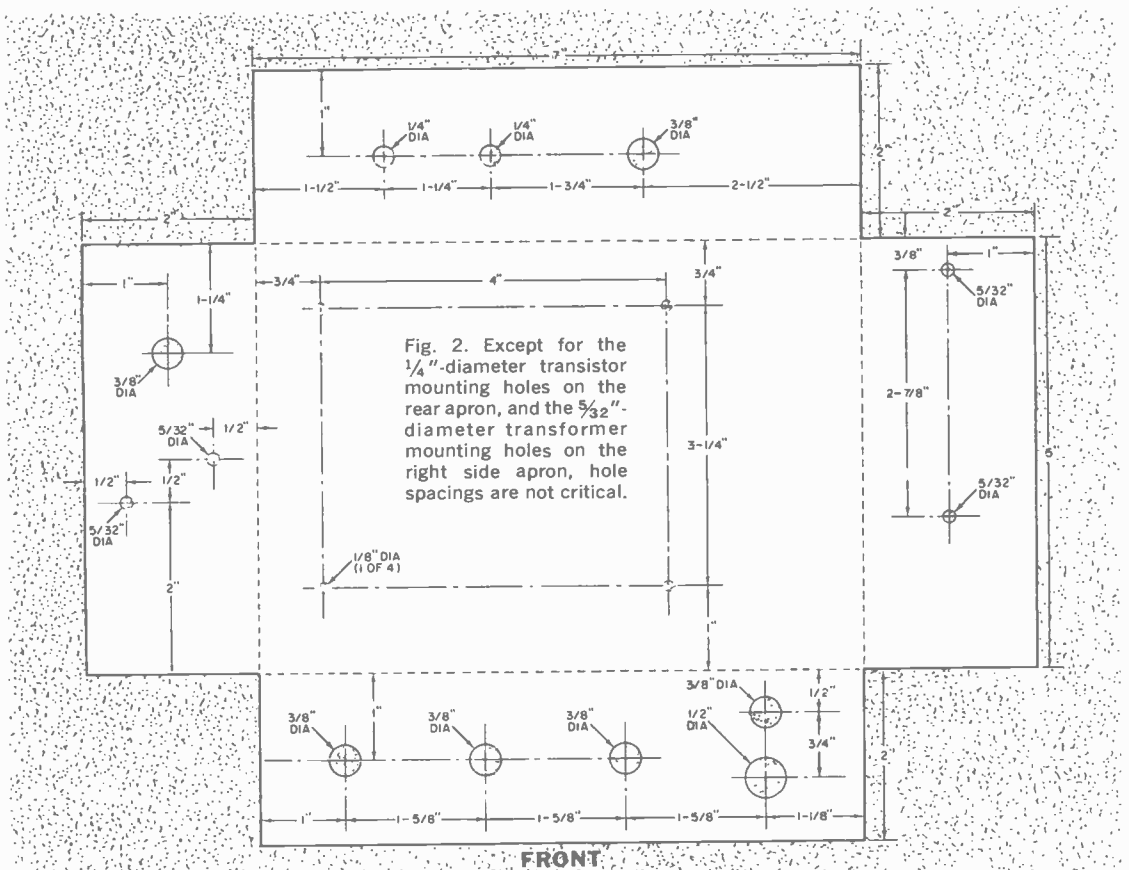


Fig. 2. Except for the ¼"-diameter transistor mounting holes on the rear apron, and the 5/32"-diameter transformer mounting holes on the right side apron, hole spacings are not critical.

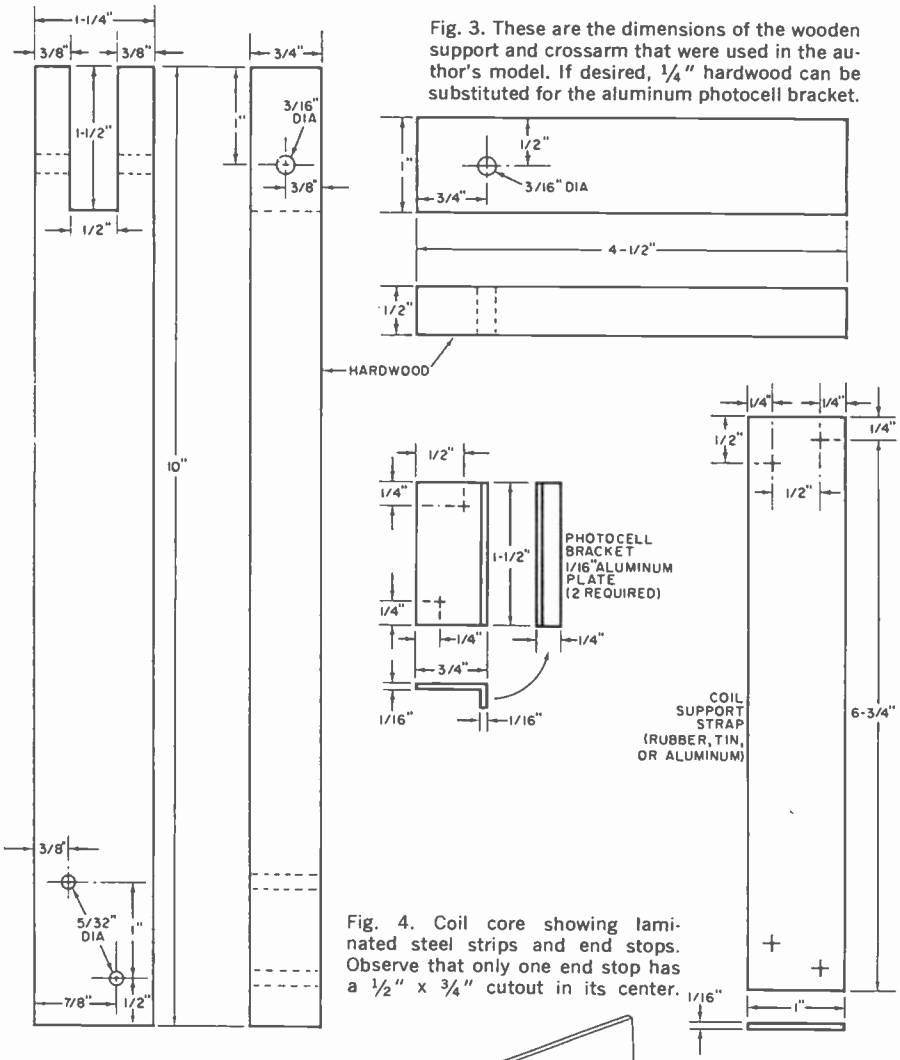


Fig. 3. These are the dimensions of the wooden support and crossarm that were used in the author's model. If desired, 1/4" hardwood can be substituted for the aluminum photocell bracket.

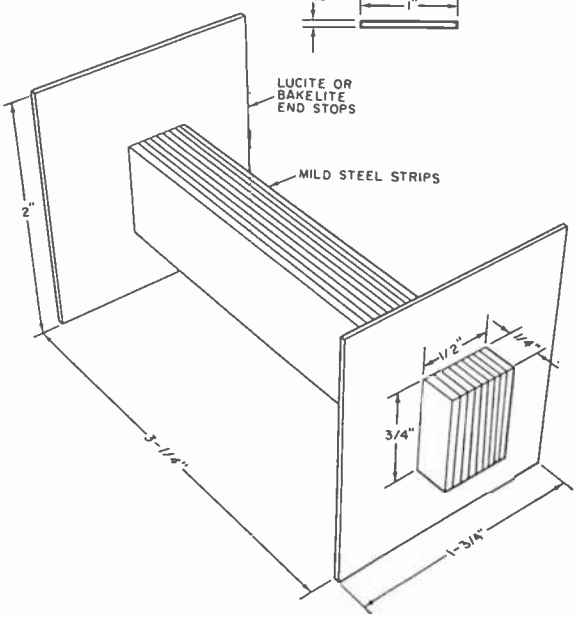
Fig. 4. Coil core showing laminated steel strips and end stops. Observe that only one end stop has a 1/2" x 3/4" cutout in its center.

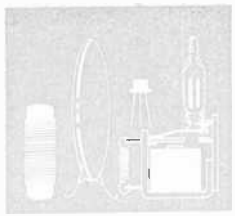
and nuts. Note that the terminal strip is held in place with one of the transformer screws.

To mount *Q3*, drill the *base* and *emitter* holes using the mounting kit's diamond-shaped mica washer as drill guide. Apply silicon heat-sink grease to the transistor mounting surface to insure good heat transfer. The base terminal must be positioned toward the top of the chassis while the emitter faces toward the bottom. The collector is grounded to the case. Be sure the ⫨6 solder lug is mounted on the screw as shown.

Now install the two 3/8" rubber grommets, controls *R1*, *R2*, and *R6*, and the pilot light assembly. Connect a 100,000-ohm resistor (*R11*) from one of the

(*Continued on page* 84)





PARTS PROFILES

By DON LANCASTER

COMPONENTS OF THE MONTH

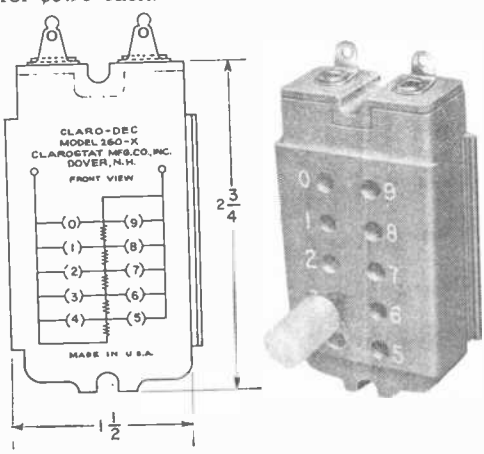
"PARTS PROFILES" IS INTENDED TO PROVIDE YOU WITH EXCITING INFORMATION ABOUT UNUSUAL OR LITTLE KNOWN ELECTRONIC COMPONENTS AND DEVICES THAT ARE INEXPENSIVE, INTERESTING, AND USEFUL. THESE PRODUCTS WILL USUALLY ENABLE YOU TO BUILD MORE INTERESTING PROJECTS AT LESS COST, IN LESS TIME, AND WITH IMPROVED PERFORMANCE. ITEMS COVERED ARE AVAILABLE NATIONALLY OR FROM AT LEAST ONE RELIABLE SOURCE OF SUPPLY.

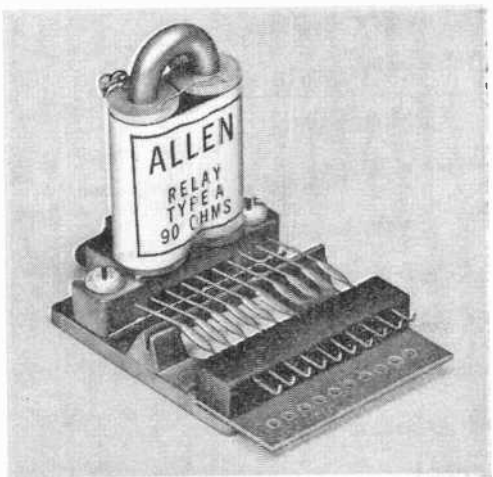
DECADE RESISTANCE BOXES

Here's a series of tiny decade resistance boxes you can buy for under $4 apiece. Dubbed "Claro-Decs" by Clarostat, the decade boxes are available in seven ranges: 0.1-0.9 ohm, 1-9 ohms, 10-90 ohms, 100-900 ohms, 1000-9000 ohms, 10,000-90,000 ohms, and 100,000-900,000 ohms. Current ratings are from 1 ma. to 1 ampere, depending on resistance range. All Claro-Dec resistors are wire-wound types with tolerances from 1% to 5%, and power ratings of up to 2 watts.

Each decade box is encased in a two-piece molded gray plastic housing which bears the circuit schematic diagram, resistance multipliers, and current rating. Solder lugs on each unit provide external connections. Several decade boxes can be ganged together by means of a tongue-and-groove arrangement to provide any desired resistance.

Claro-Dec resistance boxes are made by Clarostat Mfg. Co., Inc., Dover, N.H., and are available from local parts distributors for $3.95 each.





LOW-COST RELAYS FOR THE HOBBYIST

A 15-pole relay at less than 10 cents a pole? Who ever heard of such a thing? Allen Organ Company is now manufacturing some—along with 10-pole relays. They can be used in dozens of experimental circuits or devices ranging from electromechanical computers, tic-tac-toe games, outdoor exhibits that spell out messages, to latching and memory circuits and binary demonstrators.

You can, for example, use a set of these relays to light up a digital display that can be anywhere from one inch to eight feet tall, and at a cost below the price of a single Nixie indicator or other readout tube. The relays are single-throw types, and have 12-volt d.c. coils which dissipate 1.6 watts. Contacts are rated at 0.5 ampere at up to 100 volts. Because the contacts are all in line, the units are ideally suited for printed circuit applications; all connections are

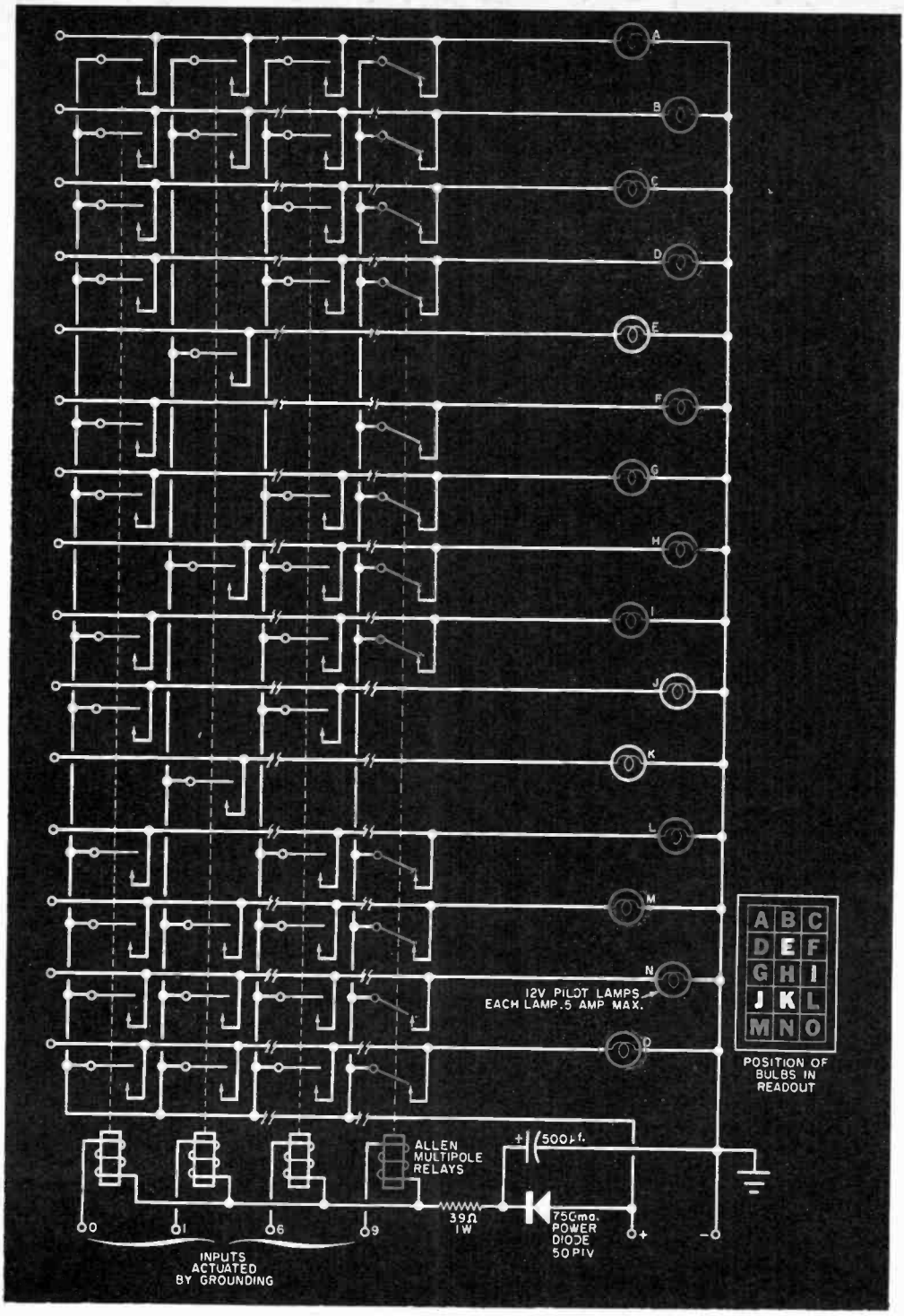


Fig. 1. This digital readout circuit has been programmed to display all numerals from 0 through 9. However, in order to simplify the circuit somewhat, some numerals have been intentionally omitted from the illustration. The relay for numeral 9 is assumed to be activated, and its circuit is shown in color.

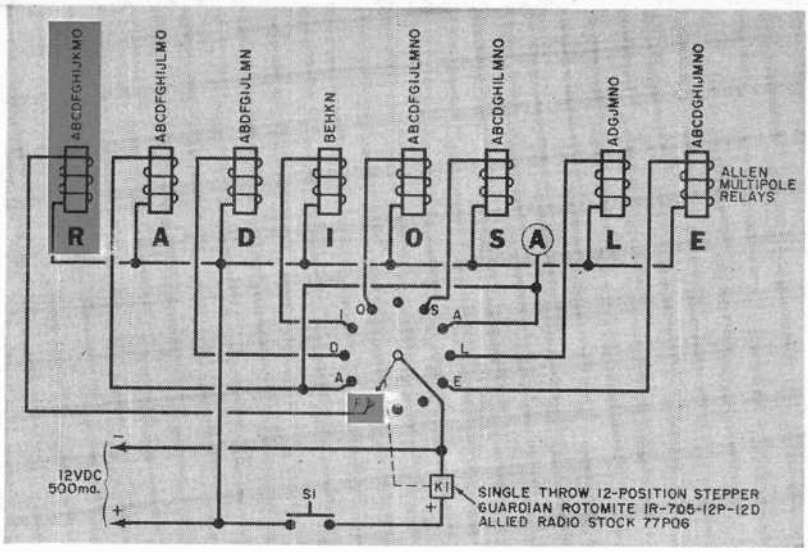


Fig. 2. The simple readout arrangement shown in Fig. 1 can be modified to spell out a sales pitch. The letters which appear above the relay coils indicate the lamps that will go on to spell out the large letters below the relays. When a message contains a letter which is repeated, only one relay is used to display that letter.

bonded in copper, and are made through eyelets in a double-sided printed circuit board.

Making a Digital Readout. Figure 1 shows the circuit of a typical readout device. The readout itself is made up of 15 boxes, each with a translucent front. The boxes are arranged five high by three wide in a matrix, and each box is equipped with a 12-volt lamp. If you want greater brightness than these lamps will give, you may connect as many lamps in parallel as necessary, as long as you do not exceed a total current drain of 0.5 ampere per box. Ordinary pilot lamps or automobile light bulbs can be employed. You can use a 12-volt automobile battery to power the whole display, but you'd be better off with a line-powered supply which you can build from a filament transformer, rectifier, and filter, and mount separately on a chassis.

Relay contacts are wired to light lamps needed for readout of all numerals from 0 to 9. For example, if the lamps are laid out as shown in Fig. 1, you can display the numeral 1 by merely connecting the display common busbar to one side of lamps A, B, E, H, K, M, N, and O. Unused relay contacts are, of course, not wired.

You can see, therefore, that the relay contacts are programmed to light only the lamps that are required for a particular display. For instance, if you want to display a "9", you merely ground the input terminal to relay 9, causing it to pick up, and thus light lamps A, B, C, D, F, G, H, I, L, M, N, and O. So, for any given display size, all you have to do is determine the number of bulbs you need for the necessary brightness, and away you go.

Getting Your Display to Read. You operate the readout by grounding the input to applicable relays. This can be done manually, or automatically by means of a saturating transistor switcher. The input switching circuit must be capable of handling 12 volts at 120 ma., easily accomplished by virtually any small transistor. Although the operating principles are quite basic to professional sign-makers, they are also applicable for use in digital readout circuits of voltmeters and frequency meters. Some score boards in large auditoriums operate on these principles.

If you want your readout to count, or spell out a sales pitch, then you'll have to include a stepping relay and a pulse source. Incidentally, keep in mind that your copy must not contain the letters M, N, Q, V, or W. (If these letters are to appear, the readout box must be rearranged.) Also, the number of contact positions on the stepper or selector switch must at least be equal to the total number of letters and spaces contained in the message. If you happen to have more switch positions than you have letters and spaces, you can add extra spaces at the end of your message to take up the slack.

To determine the number of multipole relays you need for any given message, count all the *different* letters that make up the copy. For instance, if there are three A's, you count just one. As to the number of poles each relay must have, that will depend on the particular letters involved. An "I", for example, would require fewer poles than an "R." If you use 15-pole relays, you'll have no problem, since a 15-pole

(*Continued on page* 109)

ON THE CITIZENS BAND

By **MATT P. SPINELLO,** KHC2060, CB Editor

A FRANTIC telephone call to our OTCB desk recently advised that "those wacky-walkies are taking over the 27-mc. band; they have us surrounded and are about to wipe out our super-powered 5-watt operation!" Cradling the phone with an ear and a shoulder, we quickly glanced through our "slang terms" file lest we be placed on the caller's "out-crowd" list for not knowing to whom the unfamiliar term referred. Drawing a void from our file, we played guessing games for a few rounds until the disguised voice revealed an old friend who wanted to call our attention to what one community had done to combat interference from walkie-talkie users.

Our caller admitted that the threat was probably not as pressing as he first pretended, but that a "wacky-walkie" problem does exist in most parts of the country. The information he gave us could well be the answer to the problem, without any ill feelings occurring between mini-watters and 5-watters, and with many more thousands of public service volunteers added to the coast-to-coast net of assistance-minded CB'ers.

Hand-held transceivers available for use on CB channels range in price from $7.50 per unit in kit form to nearly $200 in 1-, 2-, and 5-watt gear, depending on the features included. The lower priced rigs have made it possible for even the smallest piggy bank to be turned in for at least one walkie-talkie—usually a pair of them. Under present rules there is no reason why *anyone* who can talk should be denied the use of hand-held equipment. That's where the trouble begins!

A youngster on the East Coast was found to be operating his talkie on a daily basis, butting into and interfering with conversations of 5-watt users. An unidentified CB licensee informed him that he had better check Part 15 before he found an FCC citation in his mailbox. He replied that there was no such *part number* on the component list shipped with his walkie-talkie, and he earnestly hoped *someone* would send him a citation; he was looking forward to hanging *award certificates* on his wall! Without another word the licensed CB'er on the other end pulled the switch in disbelief.

Another youngster, in a midwestern call area, informed 5-watters that he didn't have to pull his walkie-talkie off the air when it interferred with their transmissions because his dad had a *badge,* and his dad had told him he could operate as long as he wanted, any time he wanted. We didn't know Dick Tracy was still issuing I.D. material! However, there is one gentleman we know (with a badge) who is aware of the rules, and the *law,* and has proposed a national solution to the "wacky-walkie" problem—Chas. A. Matteson, Village Marshall of Pecatonica, Illinois.

The village of Pecatonica was issued a block license for its volunteer fire group, emergency aid units and the Marshall's office, to cover all base stations and mobile vehicles to be used as needed. Separate channels were selected for police and fire information. But when youngsters in Pecatonica went on the air with more than 20 walkie-talkies they received last Christmas, the village's CB operators noted an alarming increase in interference.

Village Marshall Matteson, a veteran

Officers of the newly organized Pecatonica Radio Club discussed above receive pointers on walkie-talkie operation from Village Marshall C. A. Matteson (center). Gale Orris (at left) is secretary/treasurer of the club; DeeDee McDonald and Richard Falk (at right) are chairman and vice president, respectively.

Rockford (Ill.) Morning Star photo

CB'er, enlisted the aid of the Rev. Howard Brooks, Congregational minister and an amateur radio operator. Together the men reasoned: "Why not organize this nuisance and channel it to useful purposes?" Walkie-talkie owners were invited to a meeting in the basement of the Congregational church, and Rev. Brooks explained FCC regulations on two-way radio operating procedures to them.

Marshall Matteson hit on the idea that the abundant supply of walkie-talkies in the area could be used during emergencies. He theorized that such a team could be coordinated with the police department's CB radio and five other CB radios now in use in Pecatonica.

At the group's second meeting, officers were elected and objectives of the newly organized Pecatonica Radio Club were spelled out. The members have pledged not to interfere with the operation of licensed radio communications, and are in the process of making a detailed study of FCC regulations. They will also be instructed in radio operation in order to qualify for CB and/or amateur radio licenses, and will be taught first aid and search and rescue operations.

To sum it all up, Matteson stated: ". . . we hope to provide a service to the community while offering a service to the youngsters."

Canadian Corner. The General Radio Service (Canada's CB Service) celebrated its fourth anniversary last month. For the past three years, the South Western General Radio Association has been shaping itself into the largest GRS club in Canada. Past president Gerald Inch has kept us abreast of club activities on a monthly basis since the association was formed in January, 1963.

The SWGRA covers a large portion of Ontario and presently boasts a membership of 400. It was the first Canadian group to receive a charter, and has continually published an excellent monthly news bulletin (one of the few to survive the years without advertising), plus a mighty thick directory that contains complete member listings, the club history, and DOT (Department of Transport) rules and regulations.

The SWGRA is familiar to thousands of U.S. CB'ers who recall the club's successful GRS/CB Campouts of 1964-65. The 1965 event drew upwards of 3000 people, with 14 states and 3 provinces represented.

Riding on the success of the last two outings, the SWGRA Camp-Out moves this year to larger quarters in Tillsonburg, Ontario. Dates of the fest are July 2 and 3, and expectations are that attendance will break the 5000 mark. Those interested in attending should contact Gerald Inch for the complete story, at 283 Talbot St., St. Thomas, Ontario, Canada.

U.S. CB Jamborees. A reminder for clubs planning jamborees and get-togethers: be sure all information regarding your event is forwarded to us well in advance. We were unable to include several jamborees in the OTCB Jamboree Calendar last year because we received notification of the events after publishing deadlines.

Grateful Ham. Robert Sampson, WA3CQQ, Pennsburg, Pa., recently discovered that a valuable mare had run away from his farm. When the animal was still missing after dark, Sampson appealed to a neighbor CB'er for help. Within an hour, several members

(*Continued on page* 102)

ENGLISH-LANGUAGE BROADCASTS TO NORTH AMERICA

Prepared by ROBERT LEGGE

Many stations will make frequency changes on May 1 when they switch to their summer schedules. Listed below are the frequencies and times expected to be in use for English-language broadcasts as of that date.

TO EASTERN & CENTRAL NORTH AMERICA

COUNTRY	CITY	TIME—EST	TIME—GMT	FREQUENCIES (MC.)
		MORNING BROADCASTS		
AUSTRALIA	Melbourne	7:15–8:15 a.m.	1215–1315	9.58
CANADA	Montreal	7:15–8:15 a.m.	1215–1315	5.97, 15.32
DENMARK	Copenhagen	7:30–8 a.m.	1230–1300	15.165
FINLAND	Helsinki	7:15–7:45 a.m.	1215–1245	15.185 (Tues., Sat.)
GREAT BRITAIN	London	9:30–11:30 a.m.	1430–1630	15.35, 17.81
SWEDEN	Stockholm	7–7:30 a.m.	1200–1230	15.195
		EVENING BROADCASTS		
ALBANIA	Tirana	7–7:30 p.m.	0000–0030	7.265
BULGARIA	Sofia	7–8 p.m.	0000–0100	9.70
CHINA	Peking	8–10 p.m.	0100–0300	11.945, 15.06
CUBA	Havana	8–11 p.m.	0100–0400	11.865
CZECHOSLOVAKIA	Prague	8–9 p.m.	0100–0200	5.93, 7.115, 9.795
DENMARK	Copenhagen	9–9:30 p.m.	0200–0230	9.52
ECUADOR	Quito (HCJB)	9–11:30 p.m.	0200–0430	9.745, 11.915, 15.115
GERMANY	Berlin	8–9 p.m.	0100–0200	9.56, 11.88
	Cologne	8:30–9:50 p.m.	0130–0250	9.64, 11.795
HUNGARY	Budapest	8:30–9:30 p.m.	0130–0230	9.833, 11.91
ITALY	Rome	8–8:20 p.m.	0100–0120	9.63, 11.905
JAPAN	Tokyo	7–8 p.m.	0000–0100	15.135, 17.755
JORDAN	Amman	8:15–8:45 p.m.	0115–0145	9.557
LEBANON	Beirut	8:30–9 p.m.	0130–0200	9.575
NETHERLANDS	Hilversum	8:30–9:20 p.m.	0130–0220	9.59 (Bonaire relay)
PORTUGAL	Lisbon	9–9:45 p.m.	0200–0245	6.025, 9.74
RUMANIA	Bucharest	8:30–9:30 p.m.	0130–0230	9.57, 11.94
SPAIN	Madrid	8–9:45 p.m.	0100–0245	6.13, 9.76
SWEDEN	Stockholm	8:45–9:15 p.m.	0145–0215	11.805
SWITZERLAND	Berne	8:15–9:15 p.m.	0115–0215	6.12, 9.535, 11.865
U.S.S.R.	Kiev	7:30–8 p.m. (Mon. & Thurs.)	0030–0100 (Tues. & Fri.)	9.665, 11.955
	Moscow	5–5:30 p.m. and hourly to 12–1 a.m.	2200–2230 and hourly to 0500–0600	9.665, 9.685, 11.87
VATICAN	Vatican	7:50–8:10 p.m.	0050–0110	7.25, 9.645, 11.74

TO WESTERN NORTH AMERICA

COUNTRY	CITY	TIME—PST	TIME—GMT	FREQUENCIES (MC.)
ARGENTINA	Buenos Aires	7–8 p.m. (Mon.–Fri.)	0300–0400 (Tues.–Sat.)	9.69
AUSTRALIA	Melbourne	5–7:45 p.m.	0100–0345	15.22, 17.84
BULGARIA	Sofia	8–8:30 p.m.	0400–0430	9.70
CHINA	Peking	7–9 p.m.	0300–0500	9.457, 11.82, 15.095
	Taipei	6:50–7:50 p.m.	0250–0350	11.86, 15.345
CUBA	Havana	9–10 p.m.	0500–0600	11.865
CZECHOSLOVAKIA	Prague	7:30–8:30 p.m.	0330–0430	7.345, 9.795, 11.99
GERMANY	Cologne	9–9:40 p.m.	0500–0540	6.145, 9.735
GHANA	Accra	7:30–8:30 p.m.	0330–0430	9.76
HUNGARY	Budapest	7–8 p.m.	0300–0400	9.833, 11.91
JAPAN	Tokyo	7–8 p.m.	0300–0400	11.78, 15.135
KOREA	Seoul	7–7:30 p.m.	0300–0330	15.125
PORTUGAL	Lisbon	8–8:45 p.m.	0400–0445	6.025, 9.74
SWEDEN	Stockholm	7:15–7:45 p.m.	0315–0345	11.805
SWITZERLAND	Berne	8:15–9:15 p.m.	0415–0515	6.12, 9.535
THAILAND	Bangkok	8:15–9:15 p.m.	0415–0515	11.943
U.S.S.R.	Moscow	7–10:30 p.m.	0300–0730	9.54, 11.755, 15.18

SHORT-WAVE LISTENING

By **HANK BENNETT,** W2PNA/WPE2FT
Short-Wave Editor

STATION XEJNOP: WHERE IS IT?

ONE of the most determined efforts to pinpoint the location of a new station that we've seen in recent years has been made in connection with XEJNOP. A Mexican station, it was first found on 2390 kc. in late 1965. To date, to the best of our knowledge, there have been no published reports on this station from any official source.

Three members of the Newark News Radio Club put in many long hours in an attempt to locate XEJNOP and to obtain a verification from the station. Jack Keene of Houston and Jim Cumbie of Waco, both in Texas, and John Hopkins, Jr., of New Orleans, La., have determined that XEJNOP carries the slogan of *Radio Huayacocotla.* It is an educational station and appears to be tied into the "Sistema Educativo Radiofonico de Mexico" network.

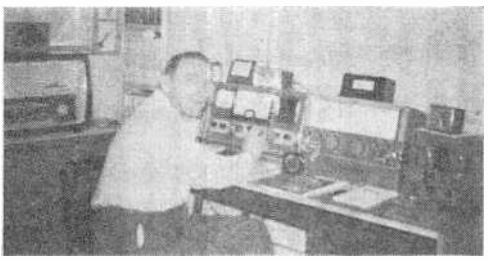
Noted at good level from 0100 to 0230 s/off, XEJNOP's programs range from simple arithmetic to problems at a high school level. Questions are asked, there is a musical interlude, then the answers are given. The power of the station is announced as 1000 watts.

Up to the present time, no verification has been obtained for the simple reason that the Mexican Post Office is apparently unable to locate the station. It is thought that the area where the transmitter is operating may have no postal service. Huayacocotla, if that is where it is, is a very small place with a geographical location of 20.34 north latitude and 98.27 west longitude, or about 40 miles northeast of Pachuca, Hidalgo, near the border of the Mexican states of Hidalgo and Veracruz. As far as can be determined, XEJNOP has no medium-wave outlet.

Items of Interest. The report concerning *Radio Electra,* 9VK7, which was questioned in the March column (page 112) has indeed been found to be a hoax. In addition, the report on WERG in New Jersey (February, page 110) was also falsified. Both of these stations are non-existent except in the minds of those who "invented" them. We would like to point out that it is a serious offense to deliberately submit phony or false reports to any publication having interstate circulation.

We are receiving an increasing number of applications for Monitor Registration Certificates and/or DX Awards from operators of Citizens Band radio stations. The "verifications" they claim to hold are, in fact, no more than the CB station cards used for card-swapping purposes. While we have nothing whatever against CB'ers or the hobby of card swapping, we cannot justify the use of such cards in connection with

(*Continued on page* 105)



Edgar Vassallo, of Toronto, Ontario, Canada, uses three receivers in his listening post: a British Eddystone, an Italian Geloso, and a Lowe Opta domestic receiver. He has all continents logged.

At left is John Kuc, WPE1GFM, of Indian Orchard, Mass. John's receiver is a Hallicrafters SX-110, his antenna a 25'-high Mosley SWL-7. John's record to date: some 33 states and 38 countries verified.

BROADCASTS FROM ASIA AND OCEANIA

Prepared by BILL LEGGE and BOB HILL

Short-wave broadcasting stations in Eastern and Southeast Asia are the most difficult for listeners in Eastern North America to hear, due to the distance and difficult propagation path involved, but they are much easier to hear in the West. Many of the islands of Oceania are also among the hard-to-hear stations, due to their low power and low frequencies. In general, stations in these areas that transmit in the lower bands (3 to 9 mc.) are most likely to be heard around dawn in the receiving area, i.e., at approximately 1000-1200 GMT in Eastern North America and 1300-1500 GMT in Western North America. The following listing gives the times and frequencies to tune for best reception.

COUNTRY	LOCATION	TIME—GMT		FREQUENCIES (mc.)	LANGUAGES
		Eastern N.A.	Western N.A.		
AUSTRALIA	Melbourne	1000-1200	1200-1400	6.15	English
	Perth	1100-1300	1300-1500	9.61	"
BRUNEI	Brunei	1100-1200	1200-1400	4.863	Malay, English (1300)
BURMA	Rangoon	1100-1200	1300-1600	5.041	Burmese, English (1430)
CAMBODIA	Phnompenh	1315-1400	1400-1545	9.695	SEA
CEYLON	Colombo	1230-1330	1400-1700	9.67	English
CHINA (Mainland)	Peking	1200-1400	1300-1400	9.65	English
CHINA (Taiwan)	Taipei	1130-1300	1300-1610	9.685, 11.825	English (1130, 1530), Chinese
COOK ISLANDS	Raratonga	0600-0745	0430-0745	5.045	English, Maori
FIJI ISLANDS	Suva	0900-1030	0600-1030	3.23, 3.284	English (3.23), Vernaculars (3.284)
GILBERT & ELLICE ISLANDS	Tarawa	0930-1030 (Thurs.)	0730-1030 (Thurs.)	4.912	English
HONGKONG	Hongkong	1000-1100	1400-1600	3.94	Chinese
INDIA	Bombay	1230-1330	1400-1600	9.575	Hindi
	New Delhi	1945-2045	1945-2045	9.915, 11.64	English
INDONESIA	Ambon	1000-1200	1200-1430	7.14	Indonesian
	Djakarta	1100-1200	1430-1530	9.585 or 9.864	English
JAPAN	Tokyo	0000-0200	0300-0500	15.105	English
	" (JOZ)	1100-1300	1300-1600	9.595, 6.055	Japanese
KAZAKH S.S.R.	Alma Ata	0000-0400	1300-1600	10.53	Kazakh, Russian
KIRGHIZ S.S.R.	Frunze	1100-1200	1300-1500	4.01	Kirghiz, Russian
NORTH KOREA	Pyongyang	0100-0200	0100-0200	11.75, 14.52	Spanish
SOUTH KOREA	Seoul	0300-0330	0300-0330	15.125	English
LAOS	Vientiane	1000-1200	1200-1400	6.13	Laotian
MALAYSIA	Kuala Lumpur	1115-1215	2245-2315	11.90, 6.175	English
MONGOLIA	Ulan Bator	1000-1100	1100-1300	4.165	Mongolian
NEPAL	Katmandu	1320-1330	1320-1500	7.10	Nepali
NEW CALEDONIA	Noumea	1000-1100	0900-1100	3.355	French
NEW GUINEA	Wewak	1000-1130	1000-1230	3.335	English
NEW ZEALAND	Wellington	1000-1145	0600-1145	9.54, 6.08	English
PAKISTAN	Dacca	1345-1400	1400-1600	9.435	Urdu
	Karachi	1945-2030	1335-1350	11.672	English
PAPUA	Port Moresby	1000-1200	1200-1400	4.89	English
PHILIPPINES	Manila (FEBC)	1145-1245	1530-1630	11.92 (1145)	English
				9.505 (1530)	"
RYUKYU ISLANDS	Okinawa	1000-1200	1200-1630	7.165	English
SABAH	Jesselton	1000-1130	1200-1400	4.97	English
SARAWAK	Kuching	1100-1200	1200-1400	4.95	English, Chinese
SINGAPORE	Singapore	1030-1230	2230-2400	11.94, 9.635	English
SOLOMON ISLANDS	Honiara	1030-1130	0800-1130	3.995	English
TAHITI	Papeete	0300-0400	0500-0800	11.825, 6.135	French
THAILAND	Bangkok	1000-1300	1300-1430	11.943	English (1030), Thai
TADZHIK S.S.R.	Dushanbe	1000-1200	1200-1500	4.635	Tadzhik, Russian
TURKMEN S.S.R.	Ashkhabad	0100-0300	1300-1500	4.825	Turkmen, Russian
U.S.S.R. (Asiatic)	Khabarovsk	1100-1400	1200-1600	6.035	Russian
UZBEK S.S.R.	Tashkent	1200-1230	1400-1430	9.60, 11.925	English
NORTH VIETNAM	Hanoi	1300-1330	1530-1600	11.84, 9.83	English
SOUTH VIETNAM	Saigon	1100-1300	1300-1600	9.62	Vietnamese

AMATEUR RADIO

By **HERB S. BRIER,** W9EGQ
Amateur Radio Editor

ARE YOU READY FOR "SHORT SKIP" ON SIX?

EACH YEAR towards the end of April amateurs start watching the 50-mc. ham band for the opening of the "short-skip" or sporadic-E DX season. They know from experience that sometime around May 1 the 6-meter band will suddenly become filled with strong signals from stations 500 to 1000 miles away. The signals may remain audible for a few minutes, a few hours, or even a day. Then they will disappear as suddenly as they appeared, only to reappear—probably from an entirely different direction—a few hours to a few days later.

Just when a sporadic-E 50-mc. opening will occur is unpredictable, but the chances are that most of them will occur between May 1 and August 1. During an opening, signals from even low-power 6-meter stations are usually strong over long distances. A simple antenna frequently does as well as or better than an elaborate beam antenna under such conditions. This means that a low-power, 6-meter operator whose best previous DX may have been 10 to 20 miles suddenly finds himself working stations over 500 miles away. And it is not unusual for an alert, reasonably well equipped 6-meter station to work over 30 states (or 200 DX stations) during a summer.

Sporadic-E propagation is the result of small, intensely ionized patches appearing in the ionosphere at about the same height as the normal "E" layer—about 65 miles. Ordinarily none of the layers in the ionosphere are sufficiently ionized to reflect 50-mc. signals back to the earth to permit long-distance communications. But the sporadic-E layer is so highly ionized that it will often reflect frequencies well above 50 mc.

Scientists are not too sure about what produces the patches of sporadic-E ionization. They suspect, however, that they are produced by unpredictable, greater-than-normal emission of ultraviolet and soft X rays from the sun. Although sporadic-E propagation is most likely to occur in North America in May, June, and July, it can occur in any month—but it is normally infrequent in January and February. Similarly, sporadic-E propagation can occur at any time of the day, but it occurs most often between 9 a.m. and noon and between 5 and 8 p.m. local time.

Favorable Publicity. If you doubt that newspapers are interested in printing stories about amateur radio, read the following headline which appeared in the Chicago

AMATEUR STATION OF THE MONTH

Here's a ham who QSL's 100% and wishes all amateurs would. Barry G. Siegfried, WB2NWM, New York, N.Y., operates a Johnson "Viking" transmitter and "Courier" amplifier at 200 watts AM phone and 500 watts CW. He receives on a Hammarlund HQ-160. Barry's record is 45 states and 11 countries, mostly on 40 meters. We are sending WB2NWM a one-year subscription for submitting the winning entry for May in the Amateur Station of the Month contest. If you would like to enter the contest, provide us with a clear photo of your station, preferably showing you at the controls, and some details on your radio career and the equipment you use. Entries go to: Amateur Photo Contest, c/o Herb S. Brier, Box 678, Gary, Indiana 46401.

Operating as W9KJ/9 in Tribune Tower, Chicago, Ill., Pauline Course, WA9CNV, has been transmitting hundreds of amateur radiograms to Vietnam.

Tribune on Sunday, January 9: "Hams to Send Messages to Troops in Viet." The headline introduced a two-column story by Frank Hughes, W9KJ, about radio amateurs and the Military Affiliate Radio System (MARS) combining their efforts to send radio messages to U.S. personnel in Vietnam.

The *Tribune* subsequently printed a dozen articles on this project which contained many laudatory remarks about radio amateurs by prominent civic and religious leaders. The newspaper also acted as the collection agency for the over-100 messages a day to be sent to Vietnam. And through the cooperation of the Hallicrafters Company, Hamfesters Radio Club, and others, a complete high-power amateur CW, SSB, RTTY station was set up in the lobby of Tribune Tower so the public could see their messages started on their way.

The idea for this imaginative project came from three YL's (Pauline, WA9CNV; Yolanda, WA9CCP; and Roberta, K9IVG) immediately after the Vietnam government's authorization of K1YPE/XV5 to handle third-party messages in Vietnam was announced. Following the lead of the Chicago area amateurs and the Chicago *Tribune*, many other amateurs and newspapers have cooperated in similar projects throughout the midwest.

FCC and Other News. On petition of the U.S. Civil Defense Council, the FCC on January 12 proposed to make the Radio Amateur Civil Emergency Services (RACES) a permanent part of the amateur service. RACES has been authorized as a "temporary" service since June, 1952, and there is little doubt that the FCC will adopt this proposal.

Sp/4 Clarke Stockwell, WN7BVQ/KL7, is on military duty in Fort Greely, Alaska, where he has worked some 12 states and Canada, all on 15 meters. See News and Views on page 103 for more details.

Gary Confrey, WN1EDJ, Killingworth, Conn., is shown here before the arrival of his General Class license. Gary's Hammarlund HQ-120 receiver, Lafayette "Starflite" transmitter, and 40-meter dipole antenna worked 23 states and Canada in 4½ months.

Section 97.163 of the amateur regulations defines RACES as ". . . a radio communications service carried out by licensed amateur radio stations while operating on specifically designated segments of the regularly allocated amateur frequency bands under the direction of authorized local, regional or federal civil defense officials pursuant to an approved civil defense communications plan." It may be used for

(*Continued on page* 103)

SOLID STATE

By **LOU GARNER,** Semiconductor Editor

THE SERVICE manager of an auto repair shop in the 1970's is interviewing a prospective employee.

"And what is your background, Mr. Smith?"

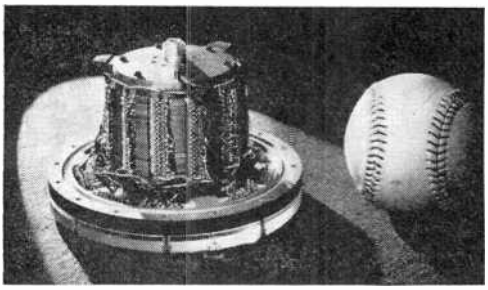
"I've been trained in engine work, carburetor rebuilding and adjustment, automatic transmission systems, brake design and repair, lubrication techniques, and cooling system repair and maintenance."

"Is that all?" asked the service manager, frowning.

"No," replied the applicant, "in addition, I've taken courses in electronic instrumentation, solid-state technology, and oscillographic analysis."

"That's better," said the service manager, his frown changing to a smile, "we'll be able to use you as a general auto mechanic."

Farfetched? Not if current trends are any indication. For electronic equipment is being used in ever-increasing applications in automobiles, and the day may not be far off when the average mechanic will need a thorough grounding in electronics to handle his job.



Space-age baseball-size computer memories such as the IBM experimental design above may be standard equipment in tomorrow's automobiles. A computer-guided car could automatically adjust its speed to the ever-changing traffic conditions, and even take evasive action to avoid accidents. Currently, solid-state technology enables us to enjoy the best in fine music while driving. For example, New-Tronics' new "Titan RV-66" audio reverberation system (below) is said to provide sound waves of unique richness and realism when used with any car radio.

The expanded use of electronic systems in automobiles is due largely to the availability of inexpensive, efficient, and reliable semiconductor devices capable of operating on low battery voltages. Many of the systems were first used in custom installations; then, having proven their worth, they were adopted by the auto manufacturers.

Solid-state ignition systems are prime examples. A relatively short time ago, these systems were considered special "custom" accessories and, often, were home-assembled and installed by the user. Today, they are standard on many luxury automobiles, and are also offered as off-the-shelf accessories for most cars. Automotive experts predict that solid-state ignition will be standard equipment on almost all 1967 model domestic autos.

Alternators and semiconductors are replacing the older and less efficient d.c. generators, and many manufacturers have standardized on transistorized voltage regulators. Electronic headlight dimmers, transistorized light flashers and rear-view mirror controls are offered as standard options, with transistorized electronic tachometers and radar speed trap detectors available as custom accessories.

One major semiconductor manufacturer, Motorola, has developed a transistorized fuel pump. Described in Application Note No. AN-175, the electronic fuel pump uses a transistor oscillator circuit to actuate a solenoid plunger pump, eliminating the need for rotating contacts and brushes that may arc and spark.

The boom in automotive electronics is not confined just to engine and electrical system operation, however. Entertainment and communications devices are becoming more popular than ever before. A variety of AM, AM/FM, and multi-band radio receivers, do-it-yourself and custom audio reverberation systems, and rear-seat TV sets are available. And one of the "hottest" items in 1966 is Ford's tape cartridge hi-fi stereo system.

Mobile two-way CB radio equipment, once a novelty, is now commonplace. Also, many motorists have added the convenience of a 117-volt a.c. outlet to their cars by using transistorized d.c./a.c. inverters.

Nor has the mechanic been neglected. Allied Radio recently introduced a D.C. Power Timing Light kit for both part-time and professional auto mechanics. The device is a solid-state pistol grip gun with a built-in power supply and high intensity (600-volt) flash tube that generates brilliant flashes much brighter than those produced by lights operated directly from the ignition coil. The timing light can be used for checking ignition timing, synchronization of double breaker arms, automatic spark advance, and distributor cam wear.

A British firm, John Craig & Co. (117 Lower Ashley Rd., Bristol 2, England), has developed a fully transistorized engine analyzer. Dubbed "Motoset," the instrument can be used to check coil efficiency and polarity, capacitor efficiency, plug leads, distributor caps and rotors, and to make open-circuit and full-load checks on the car battery. It is also suitable for checking the generator's charging rate, checking and adjusting the voltage regulator, testing the auto's electrical wiring, testing the vacuum control operation, making ignition timing adjustment, testing spark plug condition, and making dwell angle and engine rpm measurements.

Looking to the future, we can foresee the development of solid-state auto refrigerators and air conditioner/heater systems as well as thermoelectric engine oil warmer/coolers. Thermoelectric power supplies may yet replace the currently popular engine alternator. Electroluminescent dials will be powered by transistorized inverters; and transistorized precision radar alarms may be used to reduce the dangers of rear-end and head-on collisions. Wireless remote burglar alarms may help reduce auto thefts. Short-range integrated circuit oscillators, controlled by tire pressure, will warn motorists and truck drivers of impending flats. Subminiature digital computers and electroluminescent readouts may also replace both speedometers and odometers in tomorrow's autos.

If the experience of the past few years is any criteria, one thing is certain—auto manufacturers will be quick to adapt electronic circuitry to every job that electronics can handle more efficiently and more economically than mechanical or electromechanical devices.

Reader's Circuit. An interesting general-purpose audio oscillator circuit was submitted by reader Craig Schmidt (104 E. Newkirk Lane, Oak Ridge, Tenn.). The unit, no bigger than Grandma's thimble, can be used as a code practice oscillator, as a signal source for test purposes, or for any number of experimental applications.

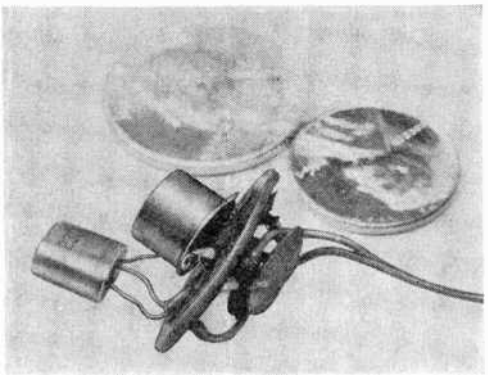
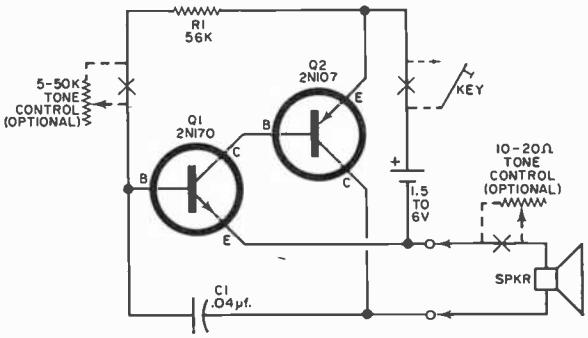


Fig. 1. Submitted by reader Craig Schmidt, this general-purpose audio oscillator fits into an ordinary fluorescent light starter. The oscillator frequency is determined by the values of R1 and C1.

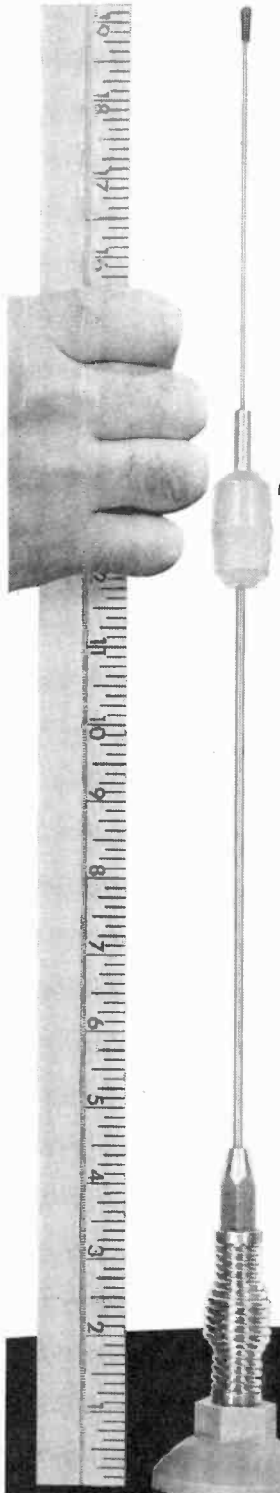


The basic oscillator circuit (Fig. 1) comprises direct-coupled transistors *Q1* and *Q2*, and *R1* and *C1*. Timing capacitor *C1* is part of the feedback loop to sustain oscillation. The oscillator frequency is determined by the values chosen for *R1* and *C1*. Transistor *Q1* is a 2N170 *npn* type, and *Q2* is a 2N107 *pnp* unit. But Craig states that just about any old *pnp* type—including a power transistor—can be substituted for the 2N107. Also, if you happen to have a 2N166 in your parts bin, you can use it in place of the 2N170. Resistor *R1* is a quarter-watter, and *C1* is a disc type capacitor. But you can use a half-watt resistor for *R1* if you wish.

Craig mounted the oscillator—less battery—on the phenolic base of an ordinary fluorescent light starter. To remove the base from the cover, just pry up the tabs. Then, cut away the starter and the feed-through terminals from the base.

Although Craig mounted the transistors on one side of the phenolic base and the

(*Continued on page 98*)



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CIRCLE NO. 17 ON READER SERVICE PAGE

LI'L ATLAS DEFIES GRAVITY

(Continued from page 70)

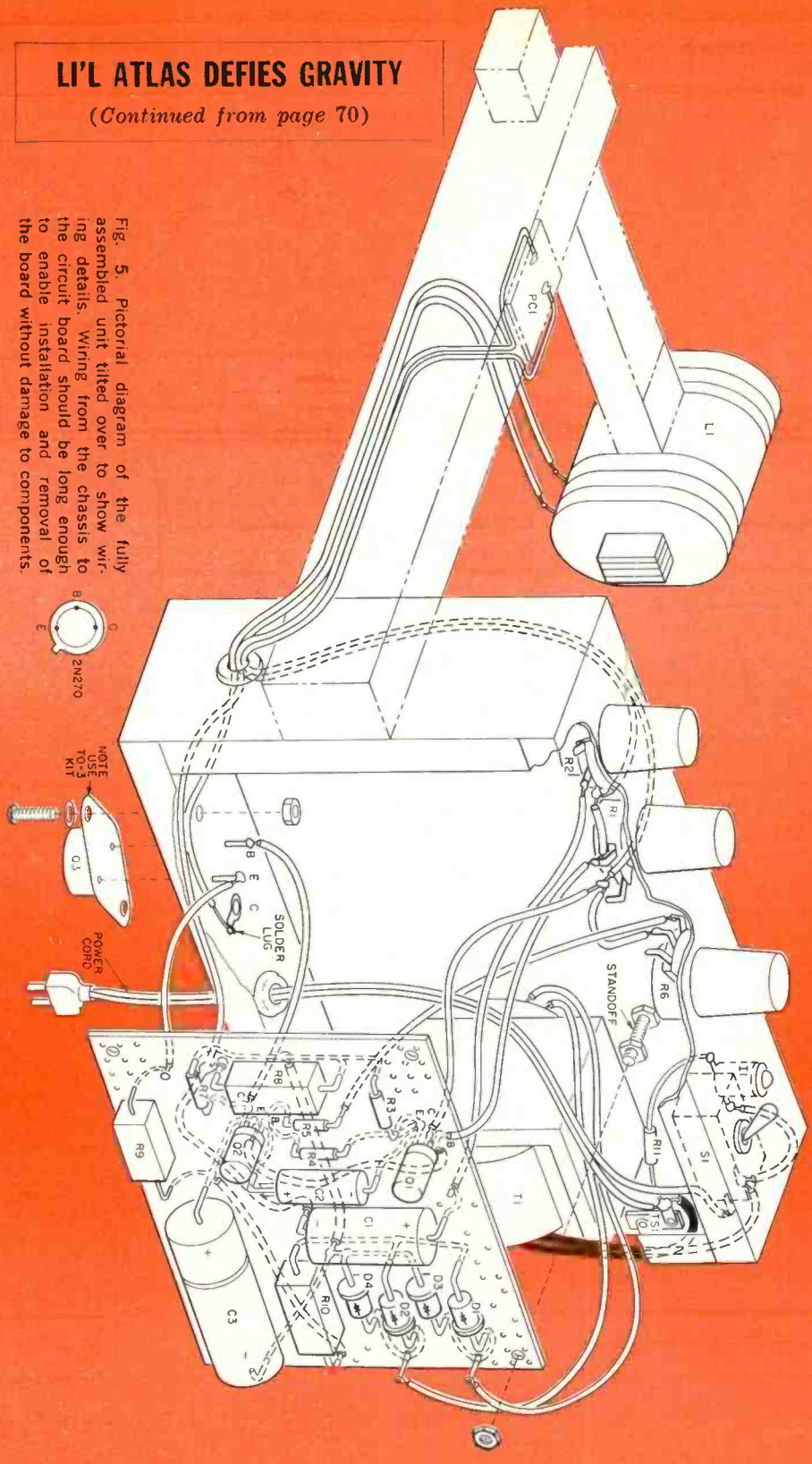


Fig. 5. Pictorial diagram of the fully assembled unit tilted over to show wiring details. Wiring from the chassis to the circuit board should be long enough to enable installation and removal of the board without damage to components.

pilot light terminals to the terminal strip, and connect one end of a 3″ length of insulated hookup wire to the free terminal of the pilot light. Insert the line cord through the grommet provided, and connect one of the leads to the terminal strip. Then connect one of the transformer primary leads (black) to the terminal strip. Solder all leads.

Position the power switch (*S1*) close to its chassis mounting location. (Do not mount the switch at this time.) Connect the remaining transformer black lead to one of the switch terminals. Then connect the free end of the hookup wire from the pilot light to the same switch terminal, and the free lead from the line cord to the other switch terminal. Solder all leads and mount the switch on the chassis.

Mount the coil and photocell on the assembled wooden bracket as shown in Fig. 6, and secure the bracket to the chassis. Feed the leads through the grommet, and connect the wires as shown in Fig. 5.

Finally, insert four *6-32* x 1¼″ screws down through the top of the chassis,

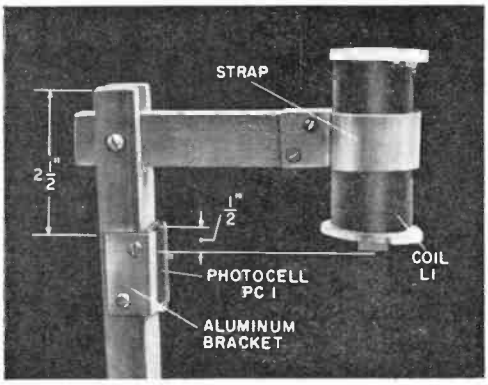


Fig. 6. The distance of the photocell from the coil is not critical. You may prefer to mount the photocell entirely away from the unit, perhaps on a wall. The coil should be aligned as shown, however.

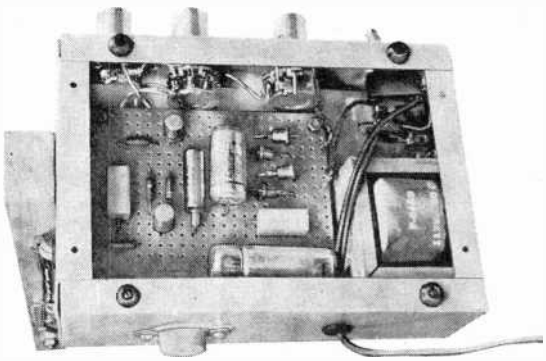
tightening the nuts against the inside of the chassis. Thread a second nut ¼″ down on the screw to act as a standoff for the component circuit board. Then mount the circuit board and complete all wiring.

Operation. Before plugging in the Li'l Atlas, check to make sure that (1) ex-

posed coil terminals are not grounding out against the supporting metal strap, if one is used; (2) the coil and photocell are properly positioned as shown in Fig. 6; (3) all connections have been soldered, and there are no shorts.

Place a light source (a 50- or 60-watt desk lamp will do) opposite the photocell, and about two feet away from it. Position the light so that the exposed end of the coil core casts a shadow on the upper portion of the photocell. If Li'l Atlas is to perform in a strongly lighted room, shield the photocell with a piece of cardboard or paper tubing.

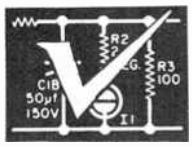
Now all you need is a small object that will remain suspended in space. Almost any small iron or steel object, such as a key, can be used. If you want something that will spin as it floats around, obtain a round object such as a tiny globe which you can get in a dime or stationery store.



Interior view showing components mounted on perforated phenolic board, suspended on standoff screws. Transistor Q3 is mounted on the chassis back panel while transformer T1 is on the inside of the right panel, directly behind the on/off switch.

Turn on Li'l Atlas and set its *STABILITY* control for maximum resistance, the *BIAS* control for minimum resistance, and *HEIGHT* control to midpoint. Loosely hold the object about ¼" below the magnet, and advance the *BIAS* control until the magnet begins to pull. Then adjust the *STABILITY* control to "settle down" the object as it begins to oscillate. Remove your hand and the object will remain suspended.

You can cause the object to vibrate rapidly for special effects by advancing the *STABILITY* control. -30-



OPERATION ASSIST

Through this column we try to make it possible for readers needing information on outdated, obscure, and unusual radio-electronics gear to get help from other *P.E. readers. Here's how it works: Check the list below. If you can help anyone with a schematic or other information,* write him directly—*he'll appreciate it. If* you *need help, send a postcard to Operation Assist,* POPULAR ELECTRONICS, *One Park Avenue, New York, N.Y. 10016. Give maker's name, model number, year of manufacture, bands covered, tubes used, etc. State specifically what you want, i.e., schematic, source for parts, etc. Be sure to print or type everything legibly, including your name and address. Because we get so many inquiries, none of them can be acknowledged.* POPULAR ELECTRONICS *reserves the right to publish only those items not available from normal sources.*

Hickok Model 110-B VTVM, ser. 1188. Schematic, operating manual, and source for a.c. probe needed. (Lloyd E. Root, Tuttles Pt., Guilford, Conn.)

Arkay Model 14T21 TV receiver; has 15 tubes. Schematic of high-voltage sections needed. (Melvin C. Gonzalez, David, Chiriqui, Panama)

Zenith 9-S-365 receiver; tunes 540 kc. to 18 mc. on 3 bands; has 9 tubes. Schematic needed. (Don Erickson, 24360 Myers St., Sunnymead, Calif. 92388)

Motorola Model 52B4U portable receiver; tunes BC. All available data wanted. (Howard Silverstein, 6720 Calvert St., Philadelphia, Pa. 19149)

Stromberg-Carlson Model 240-M receiver; covers 3 bands; has 10 tubes and magic eye. **Zenith** Model 12S265; covers 3 bands; has 12 tubes. Schematics needed. (George Jones, 349 Fourth Ave., Troy, N.Y. 12182)

Regal Electronics TV set made for Gimbels, ser. 179-679, code 111, circa 1954. Schematic needed. (Norbert Sosinski, 1159 Bingay Dr., Pittsburgh, Pa 15237)

Hammond "Solovox" Model J receiver, series A. Schematic and operating manual needed. (Paul Snider, 1507 6 St., Coeurd'Alene, Idaho 83814)

Dumont cathode-ray oscillograph, type 241. Operating manual needed. (Brother Victor, Franciscan Brothers, St. Francis Friary, 179 North 6th St., Brooklyn 11, N.Y.)

BC-455 tuning capacitor with trimmers and gear drive needed. **1D-59/APA-11** radar pulse analyzer oscilloscope; 3BP1 scope tube. Schematic and conversion data needed. (Francis Merat, Frenchville, Pa. 16836)

R.M.E. Model 45 receiver, circa 1945. Schematic needed. (L.W. Bettes, 207 Wabasso, Walled Lake, Mich.)

Federal Telephone & Radio receiver, surplus, ser. 405, type CFT-46183-A; tunes 250 kc. to 30 mc. Schematic needed. (Charles H. Zuck, Route #1, Marietta, Pa. 17547)

Mecablitz strobe flash unit, ser. 65835. Schematic needed. (H. H. Johnson, 905 Quay Ave., Artesia, N. M. 98210)

Olympic record player, turntable PS143, made in Great Britain; has a 12AV6, 50C5 and 50DC4 tubes. Schematic needed. (Michael Turano, 9009 5th Ave., Brooklyn, N.Y. 11209)

BC-344-D receiver, surplus, circa 1952; tunes 150-1500 kc.; has 10 tubes. **BC-342-N** receiver, surplus, circa 1950; tunes 1500-18,000 kc. Operating manuals needed. (Lance C. Muller, 8895 Halsted St., San Diego, Calif. 92123)

(*Continued on page* 88)

ASSIST (Continued from page 87)

Raytheon Model UM30-1 transceiver, ser. 1583. Schematic needed. (L. A. Shearer, 9205 Ventnor Ave., Margate, N.J.)

Capehart receiver / record player / preamplifier, ser. 479880, circa 1948; has 9 tubes; tunes AM and FM. Schematic and instruction manual needed. (John Hoecker, 7302 Wayne Dr., Annandale, Va. 22003)

E. H. Scott Model 7697 receiver, surplus, circa 1943; tunes 80 kc. to 23 mc; has 11 tubes. Schematic and operating manual needed. (Mike Adams, 2623 W. 9 St., Panama City, Fla. 32401)

Philco Model 37-116; covers 5 bands; has 15 tubes. Schematic, pictorial, parts list, and operating manual needed. Pontiac Model 984170 car radio; tunes BC; has 5 tubes. Schematic, service manual, and parts list needed. (Tim Thompson, Hanover Rd., Hanover, Md. 21076)

Ampro sound projector, ser. U-22249; has 4 tubes. Schematic of amplifier needed. (Paul A. Eckhardt, 119 W. 4th St., Bridgeport, Pa. 19405)

CAY 46076 receiver, surplus, made by Westinghouse, part of RBM radio equipment; tunes 200 to 2000 kc. on 4 bands. Schematic and operating manual needed. (John M. Montgomery, Box 47, Virginia, Ill. 62691)

Arvin receiver. Oscillator coil needed. (John Moore, 6042 S. Sawyer Ave., Chicago, Ill. 60629)

Supreme Model 561 signal generator. Schematic and/or instruction manual needed. (J.M. Burke, 933 N. State St., Chicago, Ill. 60610)

AVR-20-A1 receiver, surplus, made by RCA, ser. 1150; tunes 2300-6500 kc.; has 4 tubes. Schematic and tube chart needed. (Bill Mellema, R.F.D. #2, Finksburg, Md. 21048)

Harvey Wells Model R-9 Bandmaster "Hamband" receiver, circa 1950. Schematic needed. (Rick Zeidman, 6938 Costello Ave., Van Nuys, Calif.)

Chevrolet 12-volt car radio, circa 1955. Schematic needed. (Steve Bjork, 78 Claremont St., Deer Park, N.Y.)

Simpson 260 VOM. Schematic and operating manual needed. (Herman Frisch, 14602 S. Avis Ave., Lawndale, Calif.)

AN/PRS-4 mine detector made by Emerson Radio, ser. 2950, circa 1953; has 3 tubes and 3 batteries. Schematic and instruction manual needed. (Douglas Clare Purcell, 520 Birch St., Trussville, Ala. 35173)

McMurdo Silver Model 909 sweep signal generator; tunes 2-226 mc. Schematic and technical data needed. (John Borst, 1034 Dudley Rd., Schenectady, N. Y. 12303)

Wilcox-Gay Model A-27 receiver, ser. 103753; tunes 1.5-4.5 mc. and 500-1600 kc.; has 5 tubes. Schematic needed. (John Wrosch, 2409 Hickman Rd., Ypsilanti, Mich. 48197)

Bogen Model FM 801 tuner. Webcor Regent Coronet Model EP-2007-1 tape recorder, ser. 073201. Schematics needed. (Norman A. Teck, MacVicar Hall 2C37, State University College, Potsdam, N. Y. 13676)

BC-652-A receiver, made by G.E., circa 1945; tunes 2-6 mc.; has 8 tubes. Schematic needed. (Jay Coffeen, 864 Dawson, Aurora, Colo. 80011)

Zenith receiver, chassis 5905, circa 1935; tunes BC and s.w. to 18 mc.; has 9 tubes. Schematic and 6T5 magic-eye tube needed. (Ken Koyan, R. D. 1, Box 170, Oberlin, Ohio)

Marconi receiver, type 106, circa 1917; range, 200-8500 meters. Schematic needed. (Robert Farkaly, 2653 S. St. Louis, Chicago, Ill. 60623)

Musicall Model 676 intercom, circa 1956; has 6 tubes. Schematic and voltage and resistance charts needed. (Lewis Barton, 5224 21 Ave., Sacramento, Calif. 95820)

BC-733 receiver, surplus. Schematic, crystals and conversion data needed. BC-611-F walkie talkie, surplus. Schematic, crystals, and coils L1 and L2 needed. (Don Brinson, 706 E. Howard Ave., Dade City, Fla. 33525)

E. H. Scott receiver, ser. L-630, circa 1933; tunes 550 kc. to 22.5 mc. on 4 bands; has 23 tubes and 2 chassis. Schematic and service notes needed. (Tom Perkins, 235 S. Oak Park, Oak Park, Ill. 60302)

—30—

HAM HOBBY CLEARINGHOUSE

If you have a hobby or interest in addition to amateur radio and would like to talk about it on the air, you can contact other hams with the same hobby through this column. To be listed here, just send a legibly printed postcard to Ham Hobby Clearinghouse, POPULAR ELECTRONICS, *One Park Ave., New York, N.Y. 10016, including on it your call letters, other hobbies, the frequencies you use, mode of operation, when you operate, and your name and address.*

WN1DUV—Biology, guitar, classical music, stage lighting; 2 meters AM and CW; Fridays, weekends, and school vacations. (Richard G. Abrams, Bayne St., Norwalk, Conn.)

WB2UJA—Model rocketry and railroading, science, music, photography; 80 through 20 meters AM, CW, or SSB; daily after 3 p.m. EST. (James Lettera, 45 Dalemere Rd., Staten Island, N.Y. 10304)

WN2TUT—Slot-racing, science, model rocketry; 40 and 15 meters CW; weekdays 3:30 to 6 p.m. EST. (Frank Lauri Jr., 645 Van Nest Ave., Bronx, N.Y. 10460)

WN2UUD—Coins, stamps, radio construction, chess; 80 to 40 meters; daily after 6 p.m. (Larry Schwartz, 98 Havilands Lane, White Plains, N.Y. 10605)

WN4AEG—Hunting, fishing, radio construction; 21.12 and 7.16 mc. CW; weekdays after school. (Harold D. Dale, Box 274, Adairsville, Ga. 30103)

K5UCT—Fire-fighting, archery, RTTY; RTTY on 7140 kc, SSB on 3.9 mc. (Robert "Rags" Ragsdale, 313 Douglas Dr., Odessa, Texas 79760)

WB6MBF—Genealogy, hiking, camping, astronomy, SWL'ing; 7 to 7.075 mc. CW or 3.920 mc. phone; 1500 PST Sundays. (Dennis R. Freeman, 301 West Castle St., Mount Shasta, Calif. 96067)

WA7BIA—Classic and imported cars, classical music, Civil Defense; 2 meters AM, 145.35 mc. mobile. (Arnie A. Lewin, 2911 Toledo Pl., Tucson, Ariz. 85716)

WA8MTS—Astronautics, professional broadcasting, trumpet playing, antennas and T.V.I. problems; 160 to 2 meters AM, some CW; daily from 6 to 9 p.m. EST, all weekend. (Bob Krueger, 2634 Dibblee Ave., Columbus, Ohio 43204)

W9FTQ and K9LMW—Standard broadcasting, guitar playing, collecting beer bottles and cans (empty?); 6 meters phone; daily after 10 p.m. (Patti Rocki, 8208 W. Tesch Ave., Greenfield, Wis.)

WN9QYC—Jazz, SWL'ing, hi-fi, BCB DX'ing; 80, 40, 15 meters; usually weekends. (Jim Jindrick, 801 Florence Ave., Racine, Wis. 53402)

WAØCME/VE6—Writing, religion, philosophy, government, music, art, physical development; all bands, particularly 20 and 80 meters AM; evenings and weekends. (Ronald Zins, Box 651, Cardston, Alberta, Canada)

-30-

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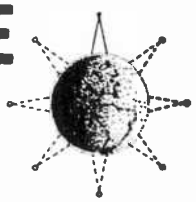
1255 Portland Place, Boulder, Colorado 80302

SATELLITE ACTIVITY REPORT



Space walk activity (Gemini 8 and others) will be conducted using a frequency of 296.80 mc., according to reports from the radiotelephone equipment manufacturer.

TV pictures from Luna 9, the Soviet moon probe, were broadcast on 183.538 mc. Contrary to reports indicating just the opposite, the Luna 9 signals WERE recorded by various receiving stations in North America. The picture information was broadcast in a simple line/scan modulation code.

Soviet satellites in both the Cosmos and Proton series continue to use telemetry in the 20-mc. band. Some samples of recent use include: Proton 2 on 19.545 mc.; Cosmos 95 on 20.005 mc.; Cosmos 98 on 19.996 mc.; Cosmos 102 on 19.735 mc.; and Cosmos 104 on 19.995 mc. Using only moderately sensitive receivers, SWL's on both coasts of the U.S.A. can hear Soviet telemetry.

Radio signal congestion in the NASA 136-137 mc. band continues to mount, even though most U.S. satellites now transmit on "command" only. NASA expects to use the 136-137 mc. band for another three or four years, eventually moving telemetry and tracking signals into the UHF spectrum.

NASA will experiment with satellite-to-aircraft communications in the 112-130 mc. band using the soon-to-be-launched "Application Technology Satellite" (ATS). Long "over water" flights may be able to utilize normal VHF in place of erratic short waves if the ATS experiments prove fruitful. The ATS opens up some very interesting SWL'ing possibilities. More details after launch.

Readers interested in the "electronics" of a launch and tracking operation should try to see "The World Beyond Zero," a movie about STADAN. In color, and about 29 minutes long, this movie is narrated by Robert Preston and Richard Burton. It tells the story of satellite launch problems and procedures, plus details on acquisition and tracking. Prints can be rented from Charles E. Gallagher, 145 East 74 St., New York, N. Y.

Four long-orbiting Soviet satellites were still transmitting as this was being written at the end of February. Elektron 1 was operating on ground command on 20.005 and 30.008 mc. Elektron 2 was being "commanded" on three frequencies: 19.430 mc., 19.540 mc., and 90.225 mc. Cosmos 44 was still available on 90.023 mc. And "peeping" around the clock was Polyot 2 on 19.895 mc. —30—

COMES THE REVOLUTION or "40 Million Frenchmen Can't Be Wrong"

IN ANY CASE, you can thank or blame the French for the metric system. It was during their revolution that they devised this simple system which uses only three basic units: grams, liters, and meters. Yes, it really is simple, if you compare it to the more than 75 different units used in the U.S.A.: inches, feet, yards, rods, miles, pints, quarts, gallons, bushels, tons, etc. Counting money is easy because we use decimals to point out pennies, dimes, and dollars, and so it is in the metric system with its milli's, deci's, kilo's, mega's, etc.

Except for a few major countries, such as Australia, Canada, South Africa, and the U.S.A., most of the world uses the metric system. Our annual dollar losses on foreign trade run into the billions because we are not on the metric system. Costs of engineering time spent in converting English to metric and metric to English run as high as $500 million a year.

It may take a generation before the big change is made, but in the meantime, POPULAR ELECTRONICS is swinging over from cycles to hertz in the June issue (see "Old World Standards Breaking Through," April, 1966, page 28) in keeping with the rest of the electronics industry.

All references to frequency next month will be in accordance with the table below:

NEW		OLD
hertz	Hz	cycles
kilohertz	kHz	kc.
megahertz	MHz	mc.
gigahertz	GHz	gc.

CB ANTENNAS

(*Continued from page* 46)

base station antenna dubbed the "Pro 27." Almost 20 feet tall, it is possessed of three horizontal radials at the base, PLUS six additional "little" radials about a quarter of the way towards the top. While this may look like a Martian totem pole to the uninitiated, engineers have acclaimed its extremely low angle of radiation and low standing-wave ratio.

The engineers at Astro Antenna Corporation of America (2 Rock Spring Rd., West Orange, N.J.) have also decided that the more radials the merrier. Their unusual-looking "Super Star Burst" base station antenna displays 54 feet of aluminum by means of a 20-foot radiator and no less than (count 'em) SIX big radials to produce a CB signal which has an effective radiated power of 9 watts.

Ever see a doughnut sticking out of a car window? It was probably the "Signal Hunter" antenna produced by the Gold Line Company (Muller Ave., Norwalk, Conn.). This is a mobile CB direction-finding antenna which attaches to the window by means of a suction cup. Intended for directional transmitting or receiving, the "Signal Hunter" has many uses for emergency work, locating CB interference, or for Part 15 (100-milliwatt) "hidden transmitter hunts." Whatever use you make of it, you'll find that there has never before been anything like it on, by, or even near, 11 meters.

Junking the radials must have been the goal of the designers at Mosley Electronics (4610 N. Lindbergh Blvd., Bridgeton, Mo.) because they ended up with a 68" CB antenna ideally suited to marine use. As a matter of fact, Mosley calls this antenna the "Silver Dolphin" and, believe it or not, the "Dolphin" will work without a ground system. Also, you'll like an additional idea that Mosley offers with this antenna and that is the provision to mount the "Dolphin" on a window ledge—or even on your four-wheel mobile.

Dig fiberglass antennas? They're great mobile whips, and Columbia Products (Route 3, Columbia, S.C.) has been making them for more years than you can shake an antenna at. Bet you never heard of a fiberglass base station antenna. Consider the "Horizon King," a one-of-a-kind fiberglass ground plane which is free of many of the ills plaguing some metal base station antennas (grit, grime, corrosion, rust, etc.). It's white, it's wild, it's without equal.

A giant tarantula on the loose? No, it's the really different "Range Master" base station from L-Coil Research (Brighton, Mich.). All new in concept and design, it can't be lumped into any previously seen or known category. Four loaded elements point up, four long elements point down, and the signal goes round and round. But if you think that the "Range Master" is of radical design, take a look at L-Coil's "Whirly Bird" mobile antenna sometime.

Webster Manufacturing Co. (317 Roebling Rd., S. San Francisco, Calif.) has combined the advantages of fiberglass whips with the practicality of top loading *and* the advantage of being able to peak the antenna on your most-often-used channel. A unique, novel, and very clever marriage of these three features makes the Webster "49'er" something more than just a little different.

But for sheer out-and-out rock-crushing, window-shattering, transceiver-twitching signal, you can't help but notice CB radio's biggest and most awesome antenna, the "Duo-Beam 10" by Hy-Gain Electronics Corporation (Highway 6 at Stevens Creek, Lincoln, Neb.). This is a good, old-fashioned, gigantic beam antenna; in fact, it's a 10-element beam which takes your little CB signal and turns it into a *withering* 120 watts! It's the biggest thing this side of the Eiffel Tower, and to say that it is distinctive is the understatement of the year. Interested in something else with a fresh approach? Hy-Gain has a new mobile antenna which attaches to your car roof by means of a magnet; and it's center-loaded, too!

As you can see, CB antennas are far from run-of-the-mill units. Members of the new breed have a dash of flamboyancy, an extra helping of engineering development, and plenty of CB appeal. By the way, they lay a pretty healthy signal onto 11 meters, too. -30-

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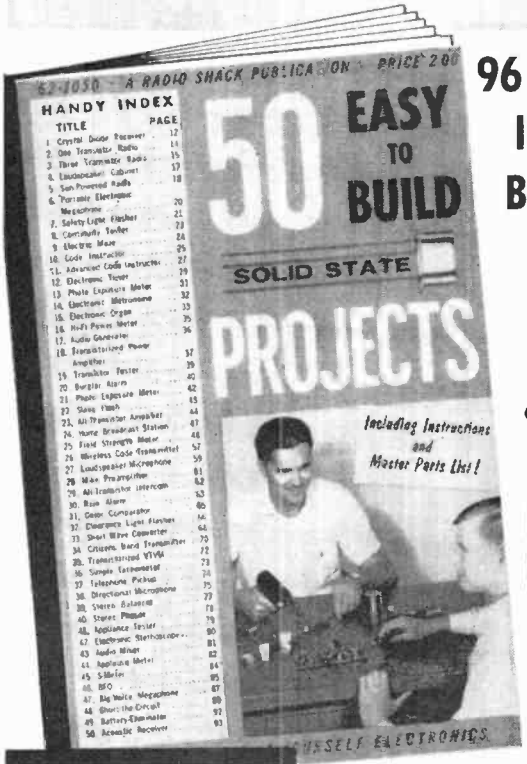

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CIRCLE NO. 27 ON READER SERVICE PAGE

LETTERS (*Continued from page 12*)

siderably. A small air space between the baskets is desirable in this case and can be obtained by using thin shims of folded paper or cardboard to separate them (I used two different-sized baskets to obtain the air space). A sound-absorbent lining for the speaker enclosure should also be helpful.

GRANT O. HERB
Philadelphia, Pa.

You did all this for 99 cents, Grant?

AMERICAN PEN PAL WANTED

I am a German SWL and I would like to have an American pen-friend who is interested in amateur radio. I am 17 years old, pupil of a Gymnasium (high school), and my listener's number from the DARC (German Amateur Radio Club) is DE 15330. The correspondence can be in the English or German language, and it can be either on tape or by letter.

KLAUS BECKERS
Regentenstrasse 2
Koeln-Muelheim
Germany

TRANSISTOR BOLO TIE

Here's an electronic project that's guaranteed to work the first time, even with defective transistors. Try it and see for yourself. Take a piece of printed circuit board, preferably one loaded with transistors, diodes, and resistors, and cut it to whatever shape pleases you. Then run a wire through it to hold it around your neck, western style . . . and smile. I built mine in only 15 minutes. If the gem-stone hobbyists and arrowhead

hunters can display their wares on a shoestring tie, then why can't I, an ardent electronics experimenter? If anybody goes into production, I would appreciate a 10% override on all sales, as would normally be due the inventor.

D.P. WILKINSON, WØQOW
Curtis, Nebr.

Thanks D.P., but before you claim your 10%, see "Give Him (Or Her) Electronic Jewelry" (December, 1964). -30-

ANTENNA BOOM

(*Continued from page 42*)

Commission blessed us with UHF TV, forcing the antenna engineers to take us all the way up to channel 83. Just reflect, for a moment, that we are now trying to scoop out of the atmosphere frequencies ranging from 54 mc. to 896 mc. You can rightfully be awed by this span when you consider that the entire AM broadcast band (535 kc. to 1605 kc.) is only 1.07 mc. wide.

But the antenna engineers' problems didn't end there. They also had to consider the facts that most homes today have more than one TV set and that most people want to get every last channel, even those in different but nearby areas. And to this conglomerate mixture of multiple sets and multiple bands, add the needs of the home also furnished with FM and FM stereo radio.

Get the Facts. While the frequency spectrum allotted for home entertainment purposes is large and the requirements for good reception are stringent, the assortment of antennas and related equipment currently available can satisfy most, if not all, of your needs. But don't expect to get the best results from an indiscriminately selected and haphazardly installed antenna.

We have presented just a sampling of antennas and related equipment now on the market. Most antenna manufacturers or their distributors will provide you with technical assistance and make specific recommendations for your particular situation. Technical data showing typical installations, how to plan a system, how to get the best reception, and catalog sheets are usually available.

If you have an antenna problem, write directly to one or more of the manufacturers to get the benefit of their experience and thinking, and then decide for yourself. Remember, there is no one solution, there is no panacea, and there is no limit to what you can do, but your chances of getting a million dollars' worth of entertainment right in your own home are better than ever, and you don't need a million dollars—not even a half-million dollars. —30—

CROWD STOPPER

(*Continued from page* 51)

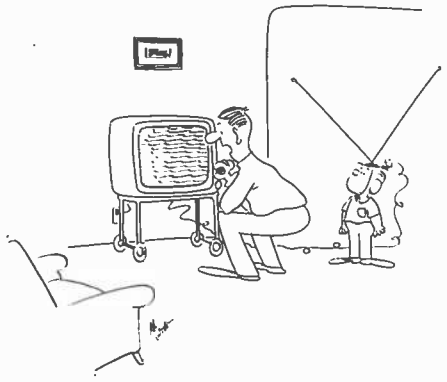
tionary contacts is mounted on a ¾" x *6-32* brass machine screw, and the rotating contact is mounted on the armature of the motor.

Timing Motor and Switch (S2). Assemble the motor and switch as in Figs. 8 and 9. If you're using a counterclockwise motor, position the four switch contacts as shown; otherwise, reverse orientation of the switch contacts.

Connect stationary switch contacts 1 and 3 together and 2 and 4 together; use solder lugs beneath the mounting screws to make it easier to solder the leads. Also, solder a 10" lead to each pair of contacts. Then fasten the switch assembly to the bottom of the chassis with two 2" machine screws and two 1½" wood dowels; the motor faces down.

Final Wiring. Mount *T1* so it will clear the coils when the chassis lid is put on. When wiring the rest of the unit, make sure leads are long enough for the lid to be removed without having to break the connections. Turn the rotary contact by hand and note the pressure between it and the stationary contacts: there should be just enough pressure to make contact without slowing down the motor.

Installation. Plug the unit in, and adjust the contacts so a lamp will go out just before the flip ring reaches it. When all adjustments have been made, arrange the wiring neatly inside the chassis to prevent interference with the operation of the motor. -30-



"Now take one step back, and two to the left."

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SOLID STATE

(*Continued from page 82*)

resistor and capacitor on the other, there is room enough to mount all of these components on one side only. Then you can put the starter cover back on for a more professional-looking job.

The oscillator can be powered by a 1.5- to 6-volt transistor or flashlight battery. The bigger battery gives you more power to work with and increases the oscillator frequency at the same time. For code practice, you can use a transistor-type 8-ohm speaker, and a key in series with the battery as shown. If you use the unit as a signal source, put an 8-ohm, 1-watt resistor across the speaker terminals to act as a load. You can also put a tone control in series with the speaker lead, or in series with *R1* as shown in Fig. 1.

Manufacturer's Circuit. Although originally designed by Sylvania Electric Products, Inc., for use as a laboratory power supply for electroluminescent display and readout devices, the circuit shown in Fig. 2 is also suitable for a variety of experimental and hobbyist applications because of its simplicity, versatility, and relatively high power output. It can be used, for example, as a high-voltage audio frequency driver for high-impedance devices, or as an a.c. source for modulation-type experiments. As described in a Sylvania Engineering Data Service Bulletin, the circuit has a rating of 250 volts (r.m.s.) at 400 cycles, and can deliver up to 25 ma. to a capacitive load with a 20% power factor.

The circuit itself is of straightforward design. Transistor *Q1* functions as a power oscillator. Transformer *T1* serves the dual purpose of stepping up the a.c. signal developed by the oscillator and of providing the feedback necessary to maintain oscillation. Voltage divider *R1-R2* establishes *Q1*'s base bias and feedback signal level, while

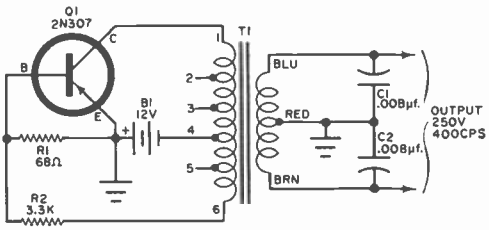

Fig. 2. Multi-purpose Sylvania-designed power supply has a rating of 250 volts, 400 cycles, when used with 25-ma., 20% power factor capacitive load.

the transformer's secondary is tuned by capacitors *C1* and *C2*.

Transistor *Q1* is a 2N307. Resistors *R1* and *R2* are half-watters, while *C1* and *C2* are 400-volt tubular paper or disc ceramic capacitors. A Stancor A-3856 universal output transformer (*T1*) is wired "in reverse," that is, with its low-impedance output winding used as a primary.

Although the circuit can be assembled on a printed circuit board, chassis type construction is recommended, with an insulated heat sink provided for *Q1*. Operating power can be obtained either from a 12-volt lantern battery or a line-operated d.c. supply.

Transitips. As a general rule, circuit layout and lead dress are not too important when dealing with low-to-moderate frequency, low-power d.c., or audio circuits. At higher frequency and power levels, however, both of these factors become increasingly critical. Finally, at VHF, UHF and SHF frequencies, layout may be more important than actual circuit design or component values in determining circuit performance.

Layout, of course, refers to the physical placement of components and the actual circuit arrangement. *Lead dress* refers to the length and routing of connecting leads, including not only the wiring but the actual component leads as well. Poor layout or lead dress can result in unwanted oscillation, hum, or instability in amplifiers, poor response characteristics, signal loss, or other undesirable operational characteristics.

Unfortunately, there are no hard and fast rules that can be followed when choosing a "good" layout. For, at some frequencies and power levels, even the best engineered and most carefully planned layout must be modified to obtain satisfactory circuit performance. By the same token, there is no 100% effective technique for determining lead dress. The lead dress and wiring runs are, of course, dependent on the layout used. There are times when the "best" layout from a parts placement viewpoint will result in poor lead dress, requiring a compromise design. As always, practical experience is the best teacher.

But although there are no firm rules for determining circuit layout and lead dress on the drafting board, there are a few techniques, based on experience, which, if followed, will improve your chances of developing a satisfactory design.

First, when dealing with multi-stage circuits, *keep the input and output sections well separated.*

Second, *keep all signal leads as short and direct as practicable.* This applies to signal

bypass leads as well, and is particularly important when dealing with VHF, UHF and SHF circuits. At some frequencies, a half-inch length of hookup wire behaves like an r.f. choke!

Third, *make all ground connections for each stage to a common point.* This prevents possible ground loops.

Fourth, *position coils and transformers so that their cores are at right angles* to each other. This minimizes stray electromagnetic coupling.

Fifth, *don't place heat-generating devices, such as power resistors, near heat-sensitive components, such as input transistors.* (There are applications, however, in which the heating effects may be desirable.)

Sixth, if an a.c. power supply is used, try to *mount the power transformer as far away from audio transformers as is practicable.*

Observe these rules and, while your layouts may still need some modification, you'll probably reduce your layout and lead dress problems to a minimum.

Until next month—good luck with your projects.

—Lou

PIGTAILS

The possibility that an alien civilization will know about earthlings before we know of "them" is becoming quite likely. A scientist from the California Institute of Technology has pointed out that a distant observer need only note the year by year increase in microwave radiation to conclude that the earth is populated. In fact, the "natural" distribution of radio energy is now so far out of line that earthlings have unwittingly transmitted knowledge of their presence to other worlds. Scientists estimate that a billion watts of radio energy is radiated every second.

Pirates of background music are in for a hard time. The Los Angeles Superior Court has handed down a permanent injunction against Calbest Electronics, Nisei Trading Co., Sweet Music Co., and Audio Design, restraining the manufacturing and sale of SCA equipment. The court decision—in favor of Muzak—may be one of the first that will eventually prohibit the bootleg construction, installation, and use of devices to pick off FM multiplexed "background" music.

The hi-fi kit builder can now buy parts on the installation plan at his local supermarket. Precision Apparatus has packaged its hi-fi amplifier and tuner—usually selling for $89—into 21 separate kit packages. The builder plunks down $3.98 per package whenever the mood moves him to take soldering iron in hand. Reportedly, supermarket managers think this idea is the greatest thing since the "25¢ off" special.

QUIZ ANSWERS

(*Quiz appears on page* 61)

1 TRUE. With unequal capacitors in series, the voltage across each capacitor is inversely proportional to its capacitance. This is shown by the formula E = Q/C, where Q, the number of electrons moving in the circuit, is the same for both capacitors.

2 FALSE. Since the lamps have the same resistance, the applied voltage and the current in the circuit will be reduced by a factor of one-half. And, since P = EI, each lamp will operate at one-fourth its rated power.

3 FALSE. As shown, S1 and S2 must BOTH be closed before the lamp will light, so that the arrangement forms an "AND" circuit.

4 TRUE. Each speaker will receive the same amount of current from the source, and, since $P = I^2Z$, the power developed will be a function of the voice coil impedance, Z. The 6-ohm speaker produces twice the power of the 3-ohm speaker for the same input.

5 FALSE. Although the total voltage across the two cells in series equals the sum of the individual cell voltage, like two similar fuses in series, the current-handling capability of the circuit is not altered.

6 TRUE. Voltmeter sensitivity is a product of its ohms/volt rating and the scale setting. On the 5-volt scale, the resistance of the 20,000 ohms/volt meter is 100,000 ohms, while the resistance of the 10,000 ohms/volt meter is 50,000 ohms. The voltage drop across the 20,000 ohms/volt meter is greater than the drop across the other meter, giving a greater deflection.

7 FALSE. From the tube manual, a 6V6 draws 450 ma., while a 12SQ7 draws only 150 ma. From Ohm's law, the filament resistances are, respectively, 13 ohms and 80 ohms. Therefore, the current in the series circuit would be approximately 200 ma., placing 2.6 volts across the 6V6, and more than 15 volts across the 12SQ7.

8 FALSE. Since $P = I^2R$, the reduced current resulting from two resistors instead of one has a greater effect on the power dissipation than does an increase in resistance.

9 TRUE. The polarity marks indicate that the secondary voltages are in phase and are series-aiding. Thus, the output voltage is the sum of the two secondary voltages.

10 FALSE. Since a current of 100 ma. flows in the circuit, the power dissipated by each resistor is 5 watts (P = EI) for a total dissipation of 10 watts. If a 1000-ohm resistor is substituted for the two 500-ohm units, the power dissipation remains at 10 watts (by the same formula).

ON THE CITIZENS BAND

(*Continued from page 75*)

of the Perkiomen Valley Radio Club from Redhill, Pa., were on the road, aiding in the search. Thirty minutes later, club members located the horse some five miles away from the farm. When Sampson realized that most of the men had left their evening meal to help a total stranger, he was amazed and extremely grateful.

1966 OTCB Club Roster. The following clubs are represented on the OTCB club roster for the first time. Active CB clubs not yet registered with this column are urged to submit complete details about their operation: membership totals, officers, club history, emergency and public service assists, and planned activities. Photographs and a sample club decal would also be appreciated. Send them to: Matt P. Spinello, CB Editor, POPULAR ELECTRONICS, One Park Avenue, New York, N.Y. 10016.

Lawrence, Kansas: Kaw Radio Emergency Group, Inc. Organized in 1962. Activities of this club include manhunts, searches, weather watches, and assistance to civil defense authorities. Officers: Allen Ott, KNH0243, president; Jim Tatham, KGI-5511, vice president; David Daniel, KGI-1782, secretary/treasurer.

Ludlow, Kentucky: Brent Spence CB Club of Kentucky. Club maintains road patrol on all major highways in area, is equipped with gasoline, CB gear, and automobiles supplied by club members without charge. Members Ed Stephens, KNN5000, and Clifford Niemeyer, KNM3189, were recently lauded for spotting and returning an auto stolen from CB'er Gene Snyder, KDC0341. President of the club is Jack A. Warner.

Bellingham, Washington: Northwest Area Citizens Radio Ass'n., Inc. Activated in June, 1961, this group works with civil defense authorities, fire and sheriff's departments, and provides communications for Jacee's annual Blossom Time Parade in May. Officers: Allen Hart, KFJ2182, president; Frank Williams, KLD1101, vice president; James Leverett, KLD0237, secretary; Bob Elsner, KND1984, treasurer. Club publishes compact handbook listing CB'ers in alphabetical and numerical order.

Multiple thanks to Rock River Valley CB Club president Irv Camp and members for your CB Editor's honorary membership for the next year. This club is located in Rockford, Ill., home of CB's most active voice: Pierre LaBounty, 18Q3647!

I'll CB'ing you,

—Matt, KHC2060

AMATEUR RADIO

(*Continued from page* 80)

civil defense communications purposes only during periods of local, regional, or national civil emergencies.

In Tasmania, Australia, VK7PF has copied a number of U.S. amateurs via amateur satellite OSCAR-IV, which was launched on December 21. This is believed to be the greatest distance spanned by radio transmission through any communications satellite, including Syncom and Early Bird. OSCAR-IV automatically retransmits on 431.940 mc. signals it receives on 144.1 mc. It should remain operative for at least a year. Send reports to Project OSCAR, Foothill College, Los Altos Hills, Calif.

The January, 1966, issue of the *Sidewinder,* put out by the Permian Basin Amateur Radio Club, Box 1406, Odessa, Texas, reports that "Soupy" Groves, W5NW, recently worked W2NW for the second time. According to W2NW's original QSL card, which W5NW still has, their first contact was on January 1, 1926!

The *log* of the VHF High Banders, Inc., Ashley, Ohio, recorded the award of trophies to the following club members in recognition of their 1965 VHF DX work: 50 mc., W8CJP, 2500 miles; 145 mc., K8ZES, 700 miles; 432 mc., K8ZES, 200 miles.

NEWS & VIEWS

Sp/4 Clarke Stockwell, WN7BVQ/KL7, 19788630, USA Met. Team (Greely), APO Seattle, Wash., is on military duty in Ft. Greely, Alaska. He earned his Novice and Technician licenses last summer while acting as a weather observer out on the Greenland ice cap. Clarke uses an old Harvey-Wells "Bandmaster-Deluxe" transmitter running 45 watts to feed a Hy-Gain 18V vertical antenna or a 15-meter dipole; he receives on a Heathkit SB-300. He has worked 12 states and Canada, all on 15 meters, which is open between 1000 and 1300 Alaskan Standard Time (2 p.m. to 5 p.m. EST). Clarke has made only one contact on 40 meters and has had no luck on 80 meters; also, he has never heard another Alaskan Novice. But Ron Grandmason, K1YIW, will soon be operating an SB-100 from Greely on weekends. . . . **Elliott Winslow, WNØMPN,** 7238 Pershing, University City, Mo., has concluded that the reason Novices do not work much DX on 80 and 40 meters is because there isn't any there to work. He is partly right. Except for Canadians, there is seldom anything but U.S.A. stations, including an occasional Alaskan, Hawaiian, or Puerto Rican station, to be worked in the 80-meter Novice band, but there is much southern and western DX to be found in the 40-meter Novice band. At any rate, Elliott's Heathkit DX-60A feeding a "long wire" antenna has worked 23 states. He has QSL cards from 21 of them.

With regard to our February article on safety belts, **Wesley Brogan, W3ARM,** an experienced ship's electrician, says that an 8-foot length of ½-inch *Manila* hemp line (*NOT* Sisal or Mexican hemp) can be safely used in place of the safety belt. Consult a *Blue Jacket's Manual,* a seaman's manual,

or a Boy Scout manual for information on how to make square knots and bowlines to tie the line around yourself and the structure being worked on. Be sure the line does not pass over rough surfaces or sharp edges that will cut it, or act like a slip knot or noose in case you slip. . . . **David R. Oester, WN7CPI,** Rt. 1. Box 328, Deer Island, Ore., has worked 40 states—all confirmed—VE3, 6, and 7 in his 11 months as a Novice. He offers to sked anyone needing Oregon, which must mean Dave expects his General ticket soon. Dave uses an EICO 720 transmitter, a dipole antenna, and a National NC-300 receiver.

Geoffrey J. Fox, WN2VCM/WPE2NLJ, 65-43 Parsons Blvd., Flushing, N.Y., could not work even a local with a long-wire antenna dropped out the window of his fifth-floor apartment until he discovered he was trying to feed it through a shorted coaxial connector. After he corrected the difficulty, his EICO 720 transmitter and "Globe-ceiver" 65-320 knocked off seven contacts in three states and Canada in short order . . . The Kansas State Amateur Radio Club and the Kansas State Sports Car Club are trying to set up a nation-wide weather net for college students who are driving home for school vacations. Anyone interested should write to: Kansas State Amateur Radio Club, c/o **Capt. Peter M. Dyer,** Military Science Building, Manhattan, Kan. 66504 . . . As a Novice, **Dennis Schaefer, WA5IIS,** 409 West Cedar, Brinkley, Ark., worked and confirmed 48 states. You guess which two he missed. After a year and a half as a General, he is WAS. WAC and has over 100 countries worked. Seventy-two of the countries are confirmed. Besides DX'ing and contest operating, Dennis likes to handle traffic and is manager of the Arkansas SSB net. He uses a Drake TR-3 transceiver, a Drake 2-B receiver, and an assortment of antennas for the bands between 80 and 10 meters. He operates SSB and CW on all of them.

Frank Chapman, WN6QWJ, 3812 Marber Ave., Long Beach, Calif. kept his EICO 720 transmitter and Drake 2-B receiver hot enough to work 44 states and 11 countries with his General ticket due momentarily. A home-brew transmit-receive switch transfers the antenna from his receiver automatically. Either a 40-meter vertical or a 15-meter beam is available. Frank also built the "Camper's Special" (August, 1965, issue) and got an S5 report from Oregon with it . . . **Tommy "Sarg" York, WN8SCZ,** 3831 Cumberland Dr., Youngstown, Ohio, first wanted to become a ham 36 years ago but was too lazy to learn the code then. Sarg is a railroad engineer, and has been running his transmitter like a locomotive with the throttle down. In about two months, he has made 477 contacts in 40 states, Canada, and Puerto Rico; and he claims his contacts usually last 30 minutes to an hour and a half! Actually, WN8SCZ sports two transmitters, a Knight-Kit T-60 and a Hallicrafters HT-40, and he receives on a Hallicrafters SX-110.

Thomas Riley, WA1BYM, 347 E. Main St., Fall River, Mass., enrolled in a Novice course while studying Electronic Engineering at Southeastern Massachusetts Technical Institute and has had his General Class license for a year. He uses a Lafayette "Starflite" transmitter driven by a Heathkit VFO and a Lafayette KT-320 receiver in conjunction with a 125' end-fed or a vertical antenna. Operating AM phone and CW, Tom has 32 states and eight countries verified . . . For information about the Montana Novice Net on 3710 kc. on Tuesdays and Thursdays, WA7DBA NCS, write **Jim Fuller,** 1129 N. 26 St., Billings, Montana.

Will we see your picture or "News and Views" in the *Amateur Radio* column next month? The first step is up to you. Thanks for keeping us on the mailing list to receive your club papers. Send mail to: Herb S. Brier, W9EGQ, Amateur Radio Editor, POPULAR ELECTRONICS, P.O. Box 678, Gary, Ind. 46401.

73, *Herb, W9EGQ*

SHORT-WAVE LISTENING

(*Continued from page 77*)

either the Monitor Registration or the DX Awards. Please make sure that you have bona-fide verification in your possession before applying for either a certificate or an award.

Those who would like to have their own WPE cards printed may be interested in a new and revised listing of QSL and SWL Card Printers that is now available. To obtain a copy, write to your Short-Wave Editor and ask for Leaflet K. Please include return postage.

CURRENT STATION REPORTS

The following is a resume of current reports. At time of compilation all reports are as accurate as possible, but stations may change frequency and/or schedule with little or no advance notice. All times shown are Greenwich Mean Time (GMT) and the 24-hour system is used. Reports should be sent to SHORT-WAVE LISTENING, P.O. Box 333, Cherry Hill, N.J., 08034, in time to reach your Short-Wave Editor by the fifth of each month; be sure to include your WPE identification, and the make and model number of your receiver. We regret that we are unable to use all of the reports received each month, due to space limitations, but we are grateful to everyone who contributes to this column.

Afghanistan—Kabul can be heard on 4775 kc. at 0200 s/on *IF* conditions are good. It's poor copy at best on a generally "rugged" frequency.

Algeria—*La Voz de la Libertad*, a Portuguese-language quasi-clandestine station, is now heard on Sundays and Thursdays at 0015-0100. It uses *R. Alger*'s xmtrs on 575, 890, 1304, 6080, 6175, 9685, and 11,835 kc. The address given on the air is F.P.L.N., 3 Rue Auber, Alger, Algeria.

Andorra—*R. Andorra* is again being heard on the short waves from 2100 to 0000 on 5995 kc., with 25-kw. power, in Eng., German, Italian and Swedish.

Australia—*R. Australia*'s Eastern N. A. service has returned to 9580 kc. and is being received much better than it had been before. Tune for it at 1214-1315.

Bechuanaland—The BBC Central African Relay in Francistown began operating December 30, 1965. The present schedule is 0400-0730 and 1015-1130 on 7295 kc., 1545 (Saturdays from 1615) to 2015 on 4840 kc., and on 908 kc. with no anmts or local ID given at any time.

Bolivia—An explosion severely damaged CP5, *Emisorias Pio XII*, Siglo Viente. Communist-inspired miners were presumably responsible for tossing a large charge of dynamite over a 10′ wall into the patio of the station, destroying the recording studios, offices, residential rooms, and the station truck. This is a religious station operated by the Oblate Fathers of Mary Immaculate on 1550 and 5962 kc. Plans had been under way to open a second, higher-powered station in Oruro to be known as *R. Bolivia*. Since the dynamiting of the Siglo Viente station, however, plans are to move all operations to Oruro.

Brazil—Station ZYR31, *Bauru Radio Clube*, Bauru, Sao Paulo, was noted with Brazilian pop tunes and a clear ID at 0235 on 3275 kc.

Canada—*R. Canada* now uses 5970 kc. for its 1215-1313 Eng. xmsn to the United States. The same xmsn is beamed to Europe on 17,820 and 15,320 kc.

China—Peking is scheduled to transmit to N.A. at 0000-0055 on 11,820 and 15,060 kc., and at 0100-0155 and 0200-0255 on 9480, 11,945, and 17,680 kc. Loggings include broadcasts on 6430 kc. at 2320 in an Asian tongue and on 9920 kc. at 0100 in Chinese.

Colombia—Station HJCH, *La Voz de la Victor*, Bogota, was noted on 4895 kc. at 0130-0200 with Latin American music and ID's given by a girl.

Ecuador—Station HCJB, Quito, now operating on 9645 kc., was noted at 0430-0600; HCJC5, *Ondas Azuayas*, Cuenca, was noted on 4980 kc. at 0200-0230; HCDY4, *R. Iris*, Esmeraldas, 3373 kc. (moved from 3947 kc.) at 0400; HCVC3, *La Centinela del Sur*, Loja, 5053 kc., at 0200-0300 s/off; and HCPS5, *Ondas Canaris*, Azogues, listed for 5030 kc. but tuned on 5251 kc., around 0200 and earlier. All of these stations featured Latin American and Ecuadorian music, anmts, and some listener's requests; all Spanish.

Egypt—Cairo has been testing on one of its seldom-used frequencies, 9595 kc., around 0210. English was heard on 17,920 kc. at 1400-1420 fade-out; Eng. to Europe is aired daily at 1632-1700 (Sundays, Tuesdays, Wednesdays to 1715) on 9475 and 11,915 kc.; and Eng. was also noted on 9475 kc.

SHORT-WAVE ABBREVIATIONS

anmt—Announcement
BBC—British Broadcasting Corporation
Eng.—English
ID—Identification
IS—Interval signal
kc.—Kilocycles
kw.—Kilowatts
N.A.—North America
ORM—Station interference
R.—Radio
s/off—Sign-off
s/on—Sign-on
xmsn—Transmission
xmtr—Transmitter

SHORT-WAVE CONTRIBUTORS

Jim Howard *(WPE1EFO)*, Wellesley, Mass.
Roger Camire *(WPE1GEK)*, Manchester, N. H.
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Don Jewler *(WPE3GGH)*, Takoma Park, Md.
Grady Ferguson *(WPE4BC)*, Charlotte, N. C.
Bruce Churchill *(WPE4EVD)*, Virginia Beach, Va.
Roger Legge *(WPE4FI)*, Etlan, Va.
Jim Cumbie *(WPE5AC)*, Waco, Texas
Jack Keene *(WPE5BMP)*, Houston, Texas
James Helmke *(WPE5DCV)*, San Antonio, Texas
John Hopkins, Jr. *(WPE5DPN)*, New Orleans, La.
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Shaler Hanisch *(WPE6BPN)*, Pasadena, Calif.
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Charles Bailey, Athens, Ga.
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Jonathan Dandridge, Dorchester, Mass.
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David Gross, Syosset, N. Y.
Bob Hill, Washington, D. C.
Tom Mann, Lewisburg, W. Va.
Radio New York Worldwide, New York, N. Y.
Nippon Hoso Kyokai, Tokyo, Japan
Radio Canada, Montreal, Que., Canada
Sweden Calling DX'ers Bulletin, Stockholm, Sweden

from 2146 to 2200 in American pop tunes, news, and commentary.

England—London operates at 1530-1730 to N.A. on 15,350 kc., a move from 15,300 kc. due to QRM from Havana. Another new outlet to North, Central, and South America is 6180 kc., noted at 2300-0030, dual to 9510 and 6195 kc. An additional xmsn to South America and Caribbean areas is given at 0900-0945 on 9640 kc. and at 0945-1315 on 15,410 kc. World Service to Asia has been expanded with a xmsn at 0130-0245 on 7140 kc.

Honduras—Station HRVC, *La Voz Evangelica*, Tegucigalpa, is now operating on 4820 kc. at 1200-1400 and 2300-0300 daily. The power is 5 kw.

Hungary—*R. Budapest* uses 3995 kc. only during the second German program at 2130-2145 although this does not appear in their schedules.

Japan—Tokyo's current schedule reads: to N.A. at 0000-0100 on 11,780 and 15,135 kc.; to N.A. and Latin America at 0200-0400 on 15,135, 15,235, and 17,875 kc.; to Hawaii at 0600-0700 on 11,705 and 15,235 kc.; to Australia and New Zealand at 0930-1030 on 11,875 and 15,235 kc.; to Europe at 0615-0845 on 15,135 and 17,875 kc.; to the Philippines and Indonesia at 1230-1430 on 9525, 11,780, and 11,940 kc.; to S. E. Asia at 1230-1600 on 9675, 11,705, and 11,875 kc.; to S. Asia at 1500-1630 on 9525, 9765, and 11,780 kc.; to Middle East and N. Africa at 1645-1845 on 9525 and 11,780 kc.; and to Africa at 1900-2000 on 9670 and 11,780 kc. English is given during each listed xmsn.

Laos—*La Voix de Pathet Lao*, controlled by the Laotian Communists, is heard on 6199 kc. at 1430-1530 with French at 1500-1515.

Netherlands—A new frequency for Hilversum is 15,115 kc. at 1855-2005, beamed to the West Indies, with Eng. until 1910. Hilversum has started a radio course covering transistors which is broadcast on Thursdays during the "DX Juke-Box"

show. Printed texts and diagrams will be supplied free, and you can enroll by writing to the station at P. O. Box 222, Hilversum.

Peru—Station OAX9D, *R. Tropical*, Tarapoto, has moved from 9710 to 9773 kc. where it is heard in Spanish around 2330. Listed as inactive, *R. La Hora*, Cuzco, is very much alive on 9730 kc.; try for it around 0510. Station OAX2S, *R. Jaen, La Voz de la Frontera*, Jaen, 5005 kc., is heard from 0435 to 0505 s/off.

Pitcairn Island—The "Back to the Bible" broadcast is rebroadcast by amateur station VR6AC on 14,100, 14,200, 14,278, or 14,324 kc. with 100 watts and a dipole antenna. The operator is Floyd McCoy, governor, pastor, and school teacher on the island.

South Africa—The South African Broadcasting Corp. in Paradys has been noted on 6005 kc. with its bird call IS and s/on at 0430. The new higher powered xmtrs have caused many listeners to "discover" a number of previously unreported channels.

Thailand—*R. Thailand*, Bangkok, is scheduled to broadcast to N. A. at 0415-0515 (Eng. news at 0425), and in the General Overseas Service at 1025-1157 (Eng. news at 1030), on 6160, 7185, and 11,910 kc.; to the Thai Forces in Korea, Vietnam, and Cambodia at 0930-1020 and in a Home Service relay at 1300-1400 on 11,910 kc. (no Eng. listed). Home Service programs in Thai are aired at 2300-0130 and 1100-1530 on 4830, 7185, and 11,910 kc.; in Laotian at 0135-0435 and Malay at 0630-0645 on 4830 kc.; in Chinese (Kuoyu) at 0230-0245 and in Laotian at 1300-1330 on 6097 kc.; and in French (Monday through Friday) at 0530-0600 on 11,910 kc.

Tunisia—Tunis has been noted using 6305 kc. from before 2000 to 2330 s/off with all-Arabic programs; this may be a move from the listed 6195-kc. channel. Check for the ID *Huna Al-Idha-A Att-Tounoussia*.

U. S. A.—*R. New York Worldwide* features the "DX'ing Worldwide" program for SWL's and DX'ers on Saturdays at 1300 on 17,845, 15,440, and 11,960 kc., and at 2130 on 17,845, 17,775, 15,440, and 11,970 kc.

U. S. S. R.—According to a recent verification, *R. Vilnius* (Lithuanian S.S.R.) broadcasts in Eng. on Sundays only at 2230 on 7360, 7250, 7185, 5940, and 5920 kc.

Venezuela—Station YVKD, *R. Cultura*, Caracas, 5057 kc., has an Arabic xmsn ("La Hora Arabes") at 2213-2258.

Vietnam (North)—*The Voice of Vietnam*, 58 Quan Su Street, Hanoi, 9840 and 11,840 kc., operates at

Although Allen Holmes, of Alderwood Manor, Wash., is young in years, he is a veteran at DX'ing. Using two receivers, a National NC-173 and a Majestic 4810E, he has piled up verifications for 40 states out of 47 heard, and 60 countries out of 100 heard. Allen's antenna is a 125' dipole, 50 feet high.

SHORT-WAVE MONITOR CERTIFICATE APPLICATION

ALL radio listeners interested in furthering the hobby of SWL'ing—regardless of whether you DX on the BCB, VHF, TV, SW, or FM bands—are eligible to apply for a POPULAR ELECTRONICS "Certificate of Registration." You must have verified (have QSL cards from) a minimum of five radio stations, of which one was outside the borders of the United States. There is no age limit, or special equipment qualification; the only requirement is that the applicant have a sincere interest in radio communications.

All certificates are filled in and lettered before mailing; they are mailed flat and unfolded. If you want to register and receive your WPE identification sign, fill in the application blank below. Mail with 50 cents in coin (or stamps) to: MONITOR, P.O. Box 333, Cherry Hill, N.J. 08034. (Personal checks will not be acceptable). Canadians should use their own currency, and other applicants not in the U.S.A. should use 10 International Postal Reply Coupons. Allow 4-6 weeks for processing.

(Please Print) (Do not fill out)

Name . . . . . .

Street, City and Zone . . . . . .

State and Zip . . . . . .

Receivers in use Make . . . . . Model . . . . . .

Make . . . . . Model . . . . . .

Age Occupation . . . . . .

Ham/CB call-letter assignment(s) . . . . . .

I listen mostly to SW Broadcast Hams CB BCB VHF VLF . . . . . .

I use the following antennas . . . . . .

I have QSL cards and countries verified. Check if subscriber to P.E. . . . . .

Signature Date . . . . . .

1300-1330 and 2300-2330 with a "Special for American Servicemen in South Vietnam," and at 1000-1030 and 1530-1600 with news bulletins and features for overseas listeners. "Vietnam Mailbag" is aired on Sundays at 1015-1030 and 1545-1600.

Vietnam (South)—*Vo Tuyen Vietnam*, Saigon, 9755 kc., is heard in Vietnamese from 0015.

Zambia—Lusaka, 3346 kc., has been noted with a normal "A" tuning signal at 0330-0340 and to 0342 with an IS which consists of the cry of the fish eagle. The program that follows is in native language and is typically African.

Clandestine—*R. Espana Independiente* has been heard on 7020 kc., dual to 6950 kc., at 2155-2202, and on 14,485, 15,160, and 17,696 kc. at 1300-1400.

R. Euzkadi noticed a particular listing in the Dec., 1965, column, and commented as follows: "It is with pleasure that we have seen in your POPULAR ELECTRONICS issue the mention of our station, *Radio Euzkadi*. In effect, we transmit from our mobile station daily programs in Basque and Spanish at 2030 and 2200 on 13,230 and 11,260 kc. Please note the new schedule and times as well as frequencies. . . . *Radio Euzkadi* is the voice of the Basque underground fighters for freedom and democracy in our homeland, Euzkadi. Reports will be welcomed at P. O. Box 59, Poste Centrale, Paris 16, France." This comment was in the form of a letter signed by "The Editor" for *Euzkadi Irratia—Radio Euzkadi*. -30-

PARTS PROFILES

(*Continued from page 73*)

relay can handle all letters and numerals as well.

Handling a Message. Assume that you want to announce a "RADIO SALE" on your readout. You would program the relay contacts as shown in Fig. 2, based on the lamp positions given in Fig. 1. With a stepping relay and an appropriate pulser, the message could be repeated indefinitely. The message requires an 11-pole stepper, but you would select a 12-pole unit, which is a stock item, and which will give you a longer pause between "RADIO" and "SALE." Also, observe that although there are nine letters in the message, only eight relays are needed since the letter "A" appears twice.

In operation, the stepper is pulsed momentarily every time a new letter is to come up. This may be done manually with a push button, or automatically with an automobile-type flasher, a pulser, or a synchronizing relay. If you use a pulser, you will get good effects with a pulse width of 100 milliseconds spaced one to three seconds apart. Of course, the best results will be obtained by trial.

The Allen multipole relays are available from the manufacturer, Allen Organ Company, Components Division, Macungie, Pa., at $1.40 each for the 15-pole unit (10-pole unit, $1.30). There is a $20 minimum factory billing. A free data sheet on multicontact relays is available. -30-

ELECTRONICS MARKET PLACE

COMMERCIAL RATE: For firms or individuals offering commercial products or services. 90¢ per word (including name and address). Minimum order $9.00. Payment must accompany copy except when ads are placed by accredited advertising agencies. Frequency discount: 5% for 6 months; 10% for 12 months paid in advance.
READER RATE: For individuals with a personal item to buy or sell. 55¢ per word (including name and address). No Minimum! Payment must accompany copy.

GENERAL INFORMATION: First word in all ads set in bold caps at no extra charge. Additional words may be set in bold caps at 10¢ extra per word. All copy subject to publisher's approval. Closing Date: 1st of the 2nd preceding month (for example, March issue closes January 1st). Send order and remittance to: Hal Cymes, POPULAR ELECTRONICS, One Park Avenue, New York, New York 10016.

FOR SALE

FREE! Giant bargain catalog on transistors, diodes, rectifiers, SCR's, zeners, parts. Poly Paks, P.O. Box 942, Lynnfield, Mass.

MESHNA'S TRANSISTORIZED CONVERTER KIT $4.50. Two models converts car radio to receive 30-50 mc or 100-200 mc (one mc tuning). Meshna, Lynn, Mass. 01901.

GOVERNMENT Surplus Receivers, Transmitters, Snooperscopes, Radios, Parts, Picture Catalog 25¢. Meshna, Nahant, Mass. 09108.

"SPECIAL! WPE-SWL-CB-QSL cards, 3 colors, $2.50 per 100—Free Samples. Garth, Jutland, New Jersey."

CANADIANS—GIANT Surplus Bargain Packed Catalogs. Electronics, Hi-Fi, Shortwave, Amateur, Citizens Radio. Rush $1.00 (Refunded). ETCO, Dept Z., Box 741, Montreal, **CANADA.**

WEBBER Labs. Transistorized converter kit $5.00. Two models using car radio 30-50 Mc or 100-200 Mc, one Mc spread. Easily constructed. Webber, 72 Cottage, Lynn, Mass.

JAPAN & Hong Kong Electronics Directory. Products, components, supplies. 50 firms—just $1.00. Ippano Kaisha Ltd., Box 6266, Spokane, Washington 99207.

CANADIANS, TRANSISTORS AND PARTS. Free catalogue contains reference data on 300 transistors. J. & J. Electronics, Dept. PE, Box 1437, Winnipeg, Manitoba.

TRANSISTORIZED CONVERTER 26-200 MC. Receive signal from 26 to 200 MC (1 MC spread), on broadcast band using car radio, crystal control or tuneable (1 MC spread). Kit $11.00 pp. Wired $20.00 pp. Webber Labs, 72 Cottage St., Lynn, Mass.

TRANSISTORS—Miniature Electronic Parts. Send for free Catalog. Electronic Control Design Company, P. O. Box 1432K, Plainfield, N.J.

INVESTIGATORS, FREE BROCHURE, LATEST SUBMINIATURE ELECTRONIC SURVEILLANCE EQUIPMENT, ACE ELECTRONICS, 11500-L NW 7TH AVE., MIAMI, FLA. 33168.

CONVERT any television to sensitive, big-screen oscilloscope. Only minor changes required. No electronic experience necessary. Illustrated plans, $2.00. Relco Industries, Box 10563, Houston 18, Texas.

ACHTUNG! Das machine is nicht fur Gerfingerpoken und mittengraben. Is easy schnappen der Springenwerk, blowenfusen und poppencorken mit spitzensparken. Ist nicht fur gerwerken by das Dummkopfen. Das rubbernecken sightseeren keepen hands in das pockets. Relaxen und watch das Blinkenlights. This attractive, brass metal plaque only $2.00 each, ppd. Southwest Agents, Dept. P, P.O. Box 12283, Fort Worth, Texas 76116.

NEW Supersensitive transistor locators detect buried gold, silver, coins. Kits, assembled models. $19.95 up. Free catalog. Relco-A33, Box 10563, Houston 18, Texas.

TELEPHONE VOICE SWITCH: (LS-500). ACTUATES AUTOMATICALLY AND UNATTENDED ANY TAPE OR WIRE RECORDER. PICTORIAL INSTALLATION INSTRUCTIONS INCLUDED. $23.75. POST PAID USA, WJS ELECTRONICS. 737 NORTH SEWARD, HOLLYWOOD, CALIF. 90038.

INVESTIGATORS: KEEP IN STEP WITH ADVANCEMENTS IN THE ART OF ELECTRONICS FOR THE PROFESSIONAL. SEND $1.00 FOR EQUIPMENT BROCHURE. WJS ELECTRONICS, 737 NORTH SEWARD, HOLLYWOOD, CALIF. 90038.

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SAFEGUARD PRIVACY! New instrument detects electronic 'bugs,' wire-tapping and snooping devices. Free information. Dee Equipment, Box 7263-E7, Houston 8, Texas.

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"GREAT BUYS" Catalog 10¢. Multimeter Special $9.95, VHF Transmitter, Stepping Switch, Torroid Assemblies, UHF Grounded Grid, VHF Transistorized Amplifiers, Variacs 5a-10a, Mercury Relays. Fertik's, Ninth Tioga, Phila., Pa. 19140.

LOWEST Prices Electronic Parts. Confidential Catalog Free. **KNAPP,** 3174 8th Ave. S.W., Largo, Fla.

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TV CAMERA—Build For $40.00. Free Science Project Catalog. Beck., 2950 Sarah Court, Newbury Park, Calif. 91320.

WHOLESALE: Microphones 89¢, transformers 34¢, Speakers 56¢. Hundreds of items. Catalog 25¢. Refundable. Royal, Box 2591, El Cajon, Calif. 92021.

ELECTRONIC "CRACKAJACKS," relays, transistors, photocells, etc. Guaranteed prizes. $1.00 ppd. **DART ELECTRONICS,** Box 214, Jericho, N.Y.

NEW Solid State Schmitt Trigger Module $2.75. Free Computer Module Catalog. Diotran, P. O. Box 112, Somerville. Mass. 02145.

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R.F. CONVERTERS $10 up. World's largest selection. Also CCTV cameras, transmitters, etc. Lowest factory prices. Catalog 10¢. Vanguard 196-23 Jamaica Ave., Hollis, N.Y. 11423.

110VAC 60cy 350 Watts. From car generator. Easy conversion. Plans $2.00. **TEDCO,** P.O. Box 12098, Houston, Texas 77017.

DIAGRAMS—SENT AIRMAIL—TELEVISION $3.00. RADIO 1919-1965 $2.00. GIVE MODEL. DIAGRAMS, BOX 55, WILLIAMSPORT, PA. 17704.

LASER: Hobbyists, experimenters, amateur scientists. Build your own coherent-light optical laser. Complete instructions, drawings, schematic diagrams and parts list. $6.00. Same as above, diode laser, $3.00. Technical Writers Group, Box 5501, State College Station, Raleigh, N.C. 27607.

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RADAR: Build your own ultrasonic doppler radar. Detect motion of people, automobiles, even falling rain drops. Transistorized, uses standard small 9-volt battery. Complete plans, drawings, schematic diagrams and parts list. $4.00. Technical Writers Group, Box 5501, State College Station, Raleigh, N.C. 27607.

TV CAMERA: Build your own. The real thing—no rotating disc. Uses 5 tubes plus videcon tube. Output: 72 ohms, and also any channel 2 to 6. Receive on any TV set without modification. Excellent circuit—good picture. Complete plans, drawings, schematic and parts list. $6.00. Technical Writers Group, Box 5501, State College Station, Raleigh, N.C. 27607.

WE SELL CONSTRUCTION PLANS. Telephone Equipment: $40 Answering Machine, $15 Bell System Type Speaker Phone, Phonevision $10 Legal Telephone Connector, Telephone Extension in your cars, $25 Automatic Dialer, Central Dial System. Television Equipment: $50 Camera, $30 3DTV Converter, $35 All Electronic Color Converter, Video Recorder. Hobbyist: $50 Ultrasonic Dishwasher, Transistorized Teletype, $75 Electron Microscope, Electronic Tranquilizer, Private Eye Tail Transmitter, Police Radar Detector plus Legal Jammer. Plans $4.95 each. Air Mail Service 50¢ each. **SUPER HOBBY CATALOG** 10¢. Don Britton Enterprises, 7906 Santa Monica Blvd., Hollywood, Calif. 90046.

FREE ELECTRONICS (new and surplus) parts catalog. Bigelow Electronics, Bluffton, Ohio 45817.

SECURITY ELECTRONICS introduces its **NEW** 1966 line of **SURVEILLANCE EQUIPMENT.** Improved **NEW** designs for maximum performance and greater value. **FREE DETAILS.** Security Electronics-PE, 11 East 43rd St., N.Y., N.Y. 10017.

COMPONENTS? Kits? Hardware? For catalogue write Trans-Vu-Pacs, Box 267, Chelsea, Mass. 02150.

DETECTIVES GO or no **GO** in **HIGH QUALITY LOW COST** Electronic Surveillance Equipment **SILMAR MAKES** the **DIFFERENCE.** Write Today! **SILMAR ELECTRONICS,** 3476 N.W. 7th Street, Miami, Fla. 33125.

DIAGRAMS for repairing Radios $1.00. Television $2.50. Give make model. Diagram Service, Box 1151 PE, Manchester, Connecticut 06042.

SURVEILLANCE EQUIPMENT—Hottest on market today. Complete Kits. Brochure—$1.00. Tri-Tron, Inc., P.O. Box 3183, Albuquerque, N.M. 87110.

007 ELECTRONIC devices. Straight from James Bond's **GOLDFINGER** and **THUNDERBALL.** Reasonable prices. Free catalog. Baker Electronics, R.R. 3, Greencastle, Indiana 46135.

ORIENTAL Electronics Directory. 200 Japanese—Hong Kong Manufacturing Exporters. All products. $2. Dee, Box 211, Beverly Hills, Calif. 90213.

CIRCUIT Boards, Parts for "Poptronics" projects. Free catalog. **DEMCO,** Box 16297, San Antonio, Texas 78216.

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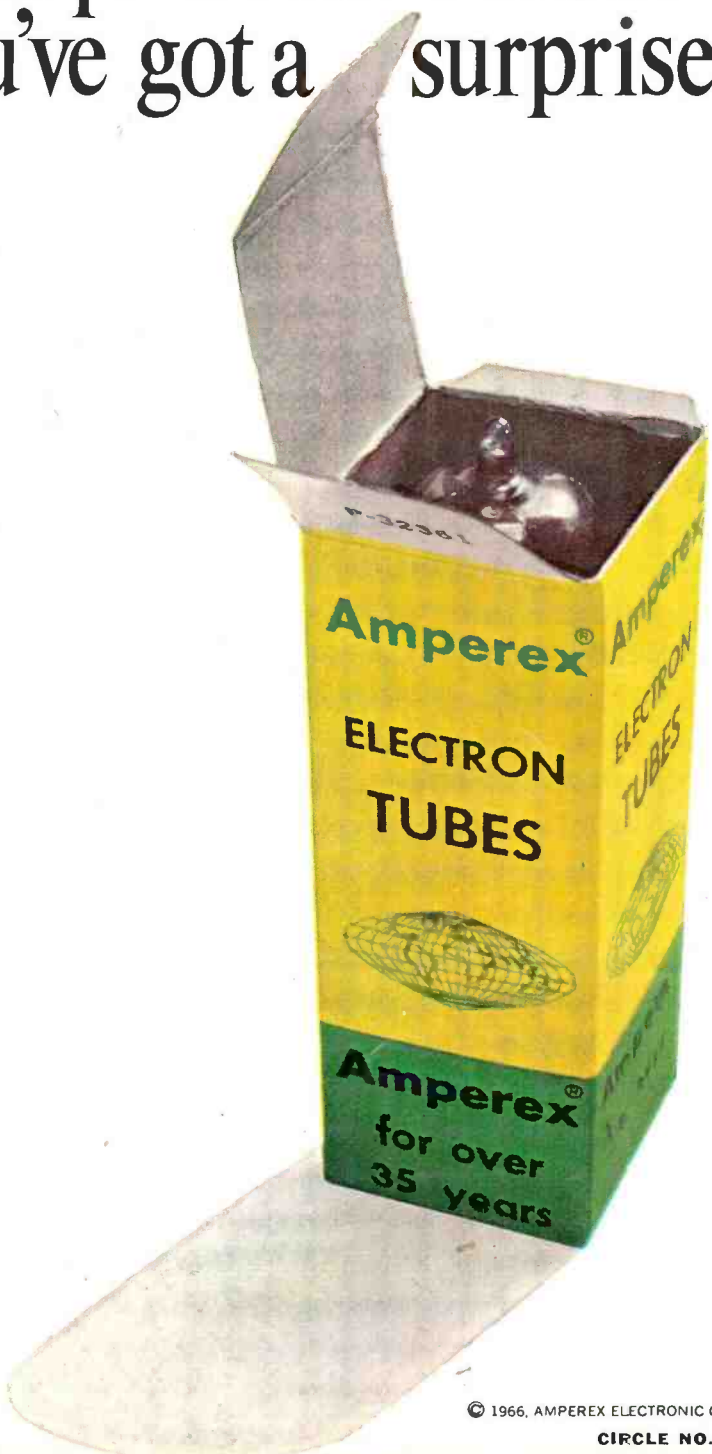

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