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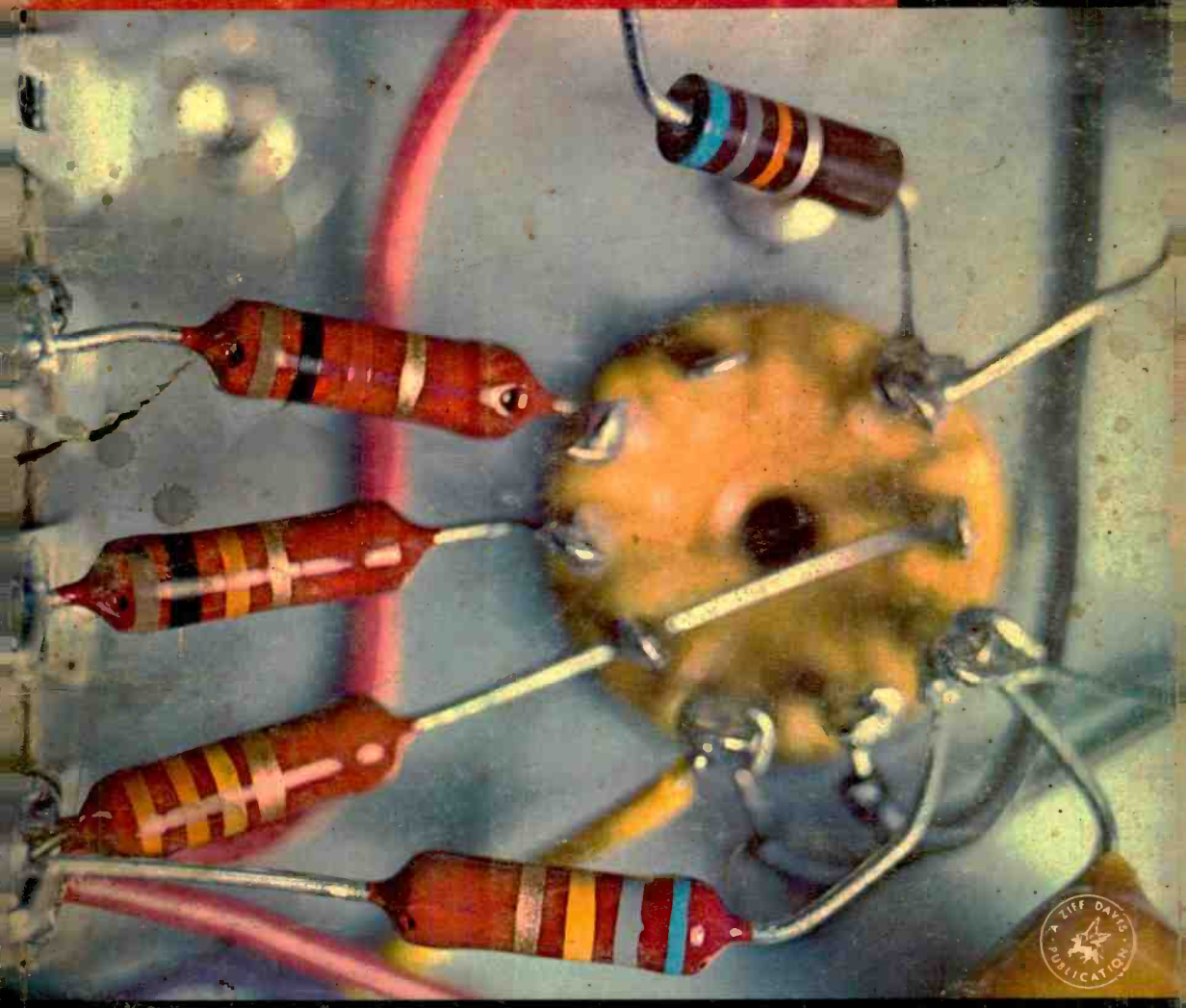

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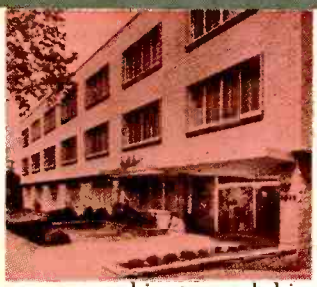

Electronics is a growing and expanding industry. That's why so many ambitious men are deciding to train for careers in this exciting field. They recognize the opportunities to advance and prosper. But, *where* a man trains and *how* the school of his choice teaches Electronics . . . how it encourages him to reach his goals and realize his ambitions . . . is most important to his success.

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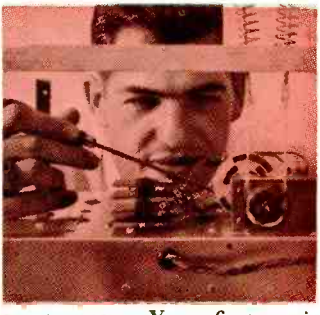

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This month's cover photo by Bruce Pendleton

VOLUME 17 DECEMBER 1962 NUMBER 6

Special Feature

Electronic Construction Projects

Amateur, CB, and SWL

Audio and High Fidelity

Electronic Features and New Developments

Departments

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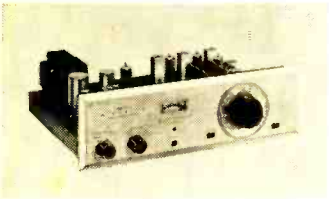
Scott Stereo Tuner Kit Wins Rave Reviews from every Leading Hi-Fi Expert!

Just one year ago Scott introduced the LT-110 FM Stereo Tuner Kit. High Fidelity Dealers built this superb kit themselves, examined its many features, and recommended it without reservation. Enthusiastic kit builders deluged us with mail. Now the verdict is in from all the leading technical experts. Never before in the history of the industry has a single kit received such unanimous praise. We reprint a few excerpts below.



from Popular Electronics

A test model of the LT-110 was wired at POPULAR ELECTRONICS in just under five hours. Another 40 minutes was used for careful alignment and the tuner was "on the air." . . . The LT-110 met or exceeded all the manufacturer's detailed specifications on sensitivity, distortion, output level, a.c. hum, and capture ratio. . . . the audio response is excellent, being within ± 1 db, from approximately 20 to 16,000 cycles. . . . Channel-to-channel crosstalk is particularly excellent both in terms of uniformity and the fact that it holds up well above 10,000 cycles. . . . Frequency drift of the LT-110 from a cold start is extraordinarily low — less than 5 kc. The a.c. hum level (referred to 100% modulation) is low and exceeds the manufacturer's rating by 5 db. . . . It's difficult to imagine a kit much simpler to assemble than the LT-110. The full-color instruction book eliminates just about the last possible chance of wiring errors. . . . From a plain and simple operational standpoint, the LT-110 *works well and sounds good.*"

Popular Electronics, Oct. 1962

from ELECTRONICS WORLD

"Construction time for the unit we tested was 6½ hours, without alignment. . . . in listening tests, the tuner showed its high useable sensitivity to good advantage. Using an indoor antenna which produced marginal signal to noise ratios on most other tuners we were able to get noise-free, undistorted stereo reception."

Electronics World, Nov. 1962

from AUDIO

"The LT-110 (is) so simple to build that we unhesitatingly recommend it for even the novice. . . . We found that the useable sensitivity (IHFM) was 2.1 uv. . . . a fine stereo tuner and an unusually easy kit to build." Audio, April 1962

from RECORD GUIDE

"It seems to me that every time I turn around I am building another of H. H. Scott's kits. And each time I end up praising the unit to the skies.

The Scott instruction books should be a model for the industry. They feature full-color, step-by-step, illustrated directions. Each resistor or other component is shown in the progressive phases in its color code and in its proper position. . . .

This tuner kit has to be ranked on the same plane as H. H. Scott's factory-wired units. It is an excellent product. . . . very likely to give long, trouble-free service."

American Record Guide, Sept. 1962

Now Sonic Monitor* Added . . .

Scott's unique Sonic Monitor has now been added to the LT-110. This foolproof stereo signaling device tells you audibly when you are tuned to a stereo station. Just turn the switch to "Monitor", tune across the dial. When you hear the monitor tone you know you've tuned to a station broadcasting new FM Stereo.

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*Patent Pending

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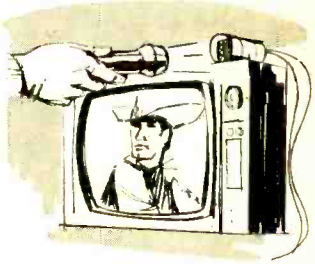

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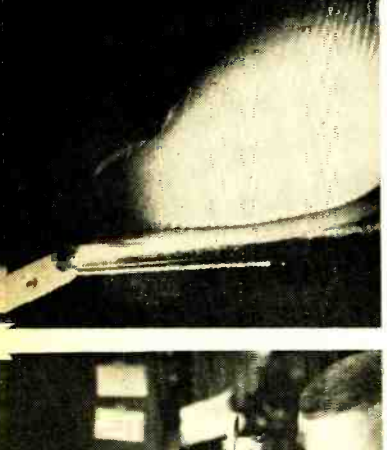

HOT DIODE—At left is a close-up of a new gallium arsenide diode that will transmit 20 television pictures simultaneously on a single beam of intense infrared light. Developed by the M.I.T. Lincoln Laboratory, with the joint support of the U. S. Army, Navy and Air Force, the diode converts an electrical input signal into a concentrated beam in a narrow spectral band, only 100 angstroms wide, centered at a wavelength of about 8600 angstroms. (There are 100 million angstrom units to a centimeter.) As you can see, the diode is considerably smaller than the finger pointing to it or the alligator clip holding it; the tiny device is located behind the hole in the center of the material it's mounted on, and the infrared light beam is emitted through this hole.

THE EYES HAVE IT—The steady gaze of Orpheus, a scrubby little barnyard owl, is an important factor in Massachusetts Institute of Technology studies on the nervous system. The owl's pupillary system is being carefully scrutinized by a General Electric GE-225 computer in an effort to develop a clearer understanding of human nerve and brain disorders such as Parkinson's disease. The computer helps the M.I.T. neurologists investigate pupil contractions in a manner similar to other studies involving servomechanisms. The neurologists are concentrating on the eye because it's representative of other body systems and because it is externally located and easily observed. Orpheus is a good subject due to his unusually large eyes and generally complacent nature.

HOW HIGH IS UP? When an airplane comes in for a landing, the pilot can't rely on his standard barometric altimeter—it doesn't tell him his height above the air strip, only above sea level. But the Sperry Gyroscope Company has developed a radar-operated low-level altimeter so accurate that it can even give the plane's altitude above the runway before it takes off. Designed for the U. S. Air Force, the altimeter is known as the APN-150 and fits flush in the wing of a plane, thereby introducing no air resistance. The instrument, accurate to ± 2 feet at very low altitudes, will allow Air Force planes to maneuver safely at heights previously impractical because of limited altitude measuring capabilities.

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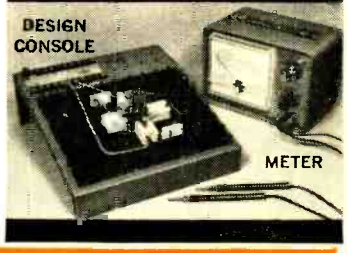

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LETTER TRAY

Address correspondence for this department to: Letters Editor, POPULAR ELECTRONICS, One Park Avenue, New York 16, N. Y.

Two Pleased Readers

■ Thanks for the "BC-Band DX Booster" (February 1961 issue). By substituting some equivalent values and employing junk-box parts, I kept the cost below a dollar. Used between a long-wire antenna and a 5-tube a.c./d.c. receiver, my booster really brings in some spectacular DX.

DOUG KEARNEY
Picton, Ontario

■ I've just completed the "Loud-Speaking CPO" (April 1962 issue), and all I can say is that when you promised it would be *loud* you meant it. The sound quality is fine, and I recommend it to all prospective hams.

ROGER HARRISON
Philadelphia, Pa.

High-Voltage Tesla Coil

■ Ever since I saw my first issue of your magazine about four years ago, I have become more and more interested in electronics. I have had much success with several construction projects, but the one that interested me the most was "Tesla's Trickery" (May, 1960). I constructed six models of the Tesla coil, each using the parts of the previous model plus a few more, and was able to

boost the voltage on the last one to almost one megavolt—as compared to the original 20,000 volts.

GLENN A. WAYCHUNAS
Drexel Hill, Pa.

Great going, Glenn, but are you sure you're not frightening the neighbors?

Older "Mello Monster"

■ At the very first glance, I noticed a startling resemblance between the "Mello Monster" (Oct., 1962) and an article entitled "A Homemade Exponential Horn," by E. E. Combs, Jr., which appeared in *QST* (Dec., 1939). In addition, the *QST* article referred to a paper of a more basic nature—no build-it-yourself tips—appearing three years earlier in the *Proceedings of the IRE*. This original paper was called "Combination Horn and Direct Radiator Loudspeaker," and was authored by H. F. Olson and R. A. Hackley. Although no dimensions

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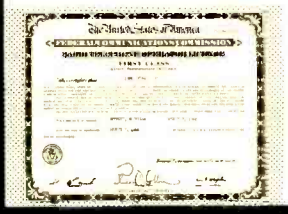

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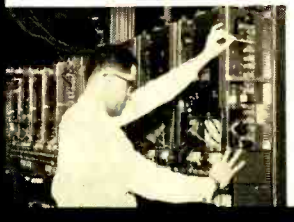

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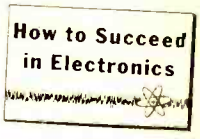

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Letter Tray

(*Continued from page* 8)

or details were given for sawing the plywood, the paper did discuss the horn mathematically and included sketches similar to those in the P.E. article.

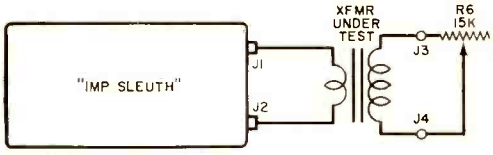
Incidentally, I built one of these speakers and baffles in 1942, and I still have the unit. The speaker is a 6" high-fidelity (for the year 1942) horn and gave excellent performance for a unit of that day.

IRA C. BECHTOLD
La Habra, Calif.

Thank you very much for your enlightening letter, Ira; many of our readers should find this background information on the "Mello Monster" of interest. We knew that the basic design principles of the "Monster" were not original, but we were pretty sure that no enclosure of this particular design had appeared in print during the past five or ten years. Frankly, it never occurred to us to look as far back as the 1930's!

"Imp Sleuth"

■ Here's an innovation which should aid users of "The Imp Sleuth" (May, 1962, issue). The measurement of transformer primary impedance can be simplified by using a calibrated potentiometer of 15,000 ohms or more, as shown in the diagram. Using such a pot makes it unnecessary to bridge



various sized resistors across the primary of the transformer under test for a trial and error method of measurement. (Any pot can be calibrated with the aid of an ohmmeter.)

NESTOR A. RIVERA
Trenque Lauquen, Argentina

Thanks for the tip, Nestor. We're sure many readers will make use of such a calibrated pot with their "Imp Sleuths."

Information, Please!

■ My old Emerson DP-332 receiver is great for SWL'ing on 20 meters, as these DX catches show: EA3JE, TG9US, CT1LA, and XE3AG. I also get some good results on other bands. Can you tell me what year this receiver was built?

PAUL O'MARA, WPE2CCO
Central Beach, R.I.

■ Could you tell me where I can get a schematic for a 1946 Bendix radio (Model 0526E)? I am in the process of rebuilding such a receiver and need a schematic.

PHILIP DARBY
Princeton, Mass.

Well, boys, suppose we do it this way; the information you want is in Supreme Publications'

Letter Tray

(*Continued from page* 10)

"Most-Often-Needed Radio Diagrams." Paul, in Vol. R-3 we find the first mention of the DP-332; and since this is the volume for 1940 radio circuits, we'd say the set was made around 1940. Phil, Supreme's Vol. 7 contains the schematic you're looking for.

BCB DX'ing

■ After reading Mr. Stanbury's article entitled "DX'ing the Broadcast Band" (Feb., 1962), I became extremely interested in this phase of radio. Thus far, I have logged 55 stations in 14 states and one foreign country. Now I have two questions, which I hope you can answer for me. First, do broadcast-band stations send out QSL cards, and second, are there any BCB DX Clubs?

LLOYD GOSA
Americus, Ga.

■ In reading P.E. over the years, I have noticed that there is no regular coverage of BCB DX'ing. Is there some way that interested parties can keep in touch with the latest news?

STEVEN S. MORRISON
WA2WIH, WPE2DDW
Bayside, N. Y.

Lloyd and Steve, we'll answer the question you both have in common first. Many BCB DX'ers, as well as hams and SWL's, keep in touch with each other and the latest news through the Newark News Radio Club, 215 Market St., Newark 1, N. J. This club has a monthly bulletin which covers the broadcast band in addition to the amateur and short-wave bands. As for QSL cards, Lloyd, we're sure that you and other BCB DX'ers will be happy to know that many stations do send them out. —30—

THIS MONTH'S COVER

"Pretty as a picture?" The circuitry in almost any kit *can* be—if it's wired by a kit-builder who cares. The one on the cover was! We were so taken with its colorful "twistings" that we decided it merited a little more attention than it was getting. So, instead of leaving it forever buried under a chassis, we put a portion of it on this month's cover! What you see there is a stage in Fisher's KX-200 integrated stereo amplifier. Tests are now being run on the KX-200, and you'll want to read all about it in *Hi-Fi Lab Check* next month (i.e., next year).

NOW with TRANSISTOR POWER supply

INTERNATIONAL MODEL 100 A EXECUTIVE TRANSCEIVER

International's new Model 100 A is the latest in the outstanding line of Executive transceivers. The advanced design Executive features a *transistor power supply, new perforated metal cabinet,* and a *new rugged microphone* . . . all of which contribute to a more reliable mobile operation.

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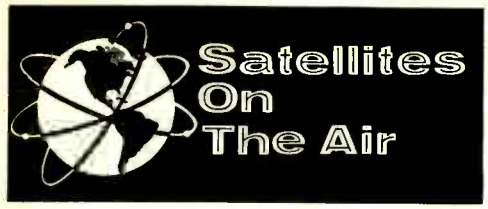

The following satellites, launched by the United States and the Soviet Union, were reported to have beacon and telemetry transmissions as of October 10, 1962. The satellites are listed by their code names, according to frequency; because some transmit on more than one frequency, they appear more than once.

Explorer VII*	19.990 mc.
Discoverer XXXVI	20.005 mc.
Transit IVA	54.000 mc.
Courier IB	107.970 mc.
TIROS I	107.997 mc.
TIROS III	108.000 mc.
Vanguard I*	108.024 mc.
TIROS III	108.030 mc.
Telstar	136.050 mc.
Transit IVA	136.200 mc.
TIROS IV	136.230 mc.
TIROS V and TIROS VI	136.235 mc.
Explorer XIV	136.440 mc.
Injun SR-3	136.500 mc.
Traac*	136.650 mc.
OSO I	136.744 mc.
Transit IVB	136.800 mc.
TIROS IV	136.920 mc.
TIROS V and TIROS VI	136.922 mc.
Alouette	136.979 mc.
Transit IVA	150.000 mc.
Transit IIA	161.990 mc.
Transit IIA	215.990 mc.
Midas IV	228.200 mc.
Midas IV	232.400 mc.

*Signal may be very weak

At least four more satellites are in orbit and may be transmitting. However, these are so-called "secret" satellites launched by the U.S. Air Force.

If you're interested in eavesdropping on satellites, and missed our June 1962 article on the NASA-136 converter, we recommend that you look it up. Easy to construct, this sensitive converter can intercept the satellites operating in the 136-137 mc. band.

how will your success in electronics compare with this man's?

Will you have a rewarding career, like Robert N. Welch? Or will you never get beyond a routine job?

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SUPERVISING A FREQUENCY MEASUREMENT *in the Precision Measurement Equipment Laboratory at Vandenburg Air Force Base is CREI grad Robert N. Welch. He is a Philco Tech Rep Engineer and a Section Leader in the Lab.*

LET'S LOOK AT THE FACTS. Men with ordinary qualifications may always be accepted for routine, low-paying jobs. But for critical technical assignments in well-paying career positions with engineering status—where electronics is applied to the frontiers of the missile and space programs—only men with advanced technical knowledge will do.

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- ☐ Nuclear Engineering Technology
- ☐ Automation and Industrial Electronic Engineering Technology
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Name ..... Age .....
Address .....
City ..... Zone ..... State .....
Employed by .....
Type of present work .....
Education: Years High School ..... Other .....
Electronics Experience .....
Check: ☐ Home Study ☐ Residence School ☐ G.I. Bill

34

Tips and Techniques

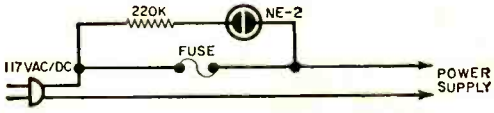
HEAT SINKS FROM ALLIGATOR CLIPS

When leads from a pair of heat-sensitive components (such as transistors, diodes, miniature capacitors, etc.) are being soldered together, two heat sinks are required. Though long-nosed pliers do a fine job of drawing away heat, it's not easy to hold two pairs and solder, too. So before starting on your next project, try making up a heat sink like the one pictured here. It's nothing more than a pair of alligator clips connected together with a short piece of heavy, stranded wire. Clip it across a joint before soldering and your troubles are over.

—Robert E. Kelland

BLOWN FUSE INDICATOR

A neon lamp and a resistor are all that are needed to indicate a blown line fuse in your equipment. Solder a 220,000-ohm, ½-watt resistor in series with an NE-2 neon bulb and connect them across the fuse, as



indicated in the diagram. Now, when the fuse blows, the bulb will glow. With the bulb mounted on the front panel of your receiver or transmitter, you'll never be in doubt as to whether a line fuse has blown or something else is the matter.

—Charles D. Rakes

ADAPTERS CONVERT PROBE TIPS TO ALLIGATOR CLIPS

If your multimeter has test leads terminating in probe tips, you've probably had oc-

(*Continued on page* 19)

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I cannot praise N.T.S. enough. I've just graduated and already I have started repairing radios and servicing TV's . . . At 53, I'm starting a new life and my diploma from National Technical Schools is my proudest possession.

William E. Eckenrod

Thanks to N.T.S. I have a business of my own right in my home. I have paid for all my equipment with money earned servicing TV sets. Yes, N.T.S. gave me my start in television.

Louis A. Tabat

As field director of Berean Mission Inc., I have complete charge of our radio work. With the expert advice and training I am receiving from you I can do my own repairs on our recorders and P.A. systems, besides keeping our radios going. My training from N.T.S. helps keep us on the air. I feel privileged to be a member of such a fine institution.

Rev. Enoch P. Sanford

I have a TV-Radio shop in Yorkville, Illinois, about 4 miles from my home, and it has been going real good. I started part-time but I got so much work that I am doing it full-time. Thanks to National Technical Schools.

Alvin Spera

SEE OTHER SIDE

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PHASE 1 TELEVISION INCLUDING COLOR TV
90% of homes have at least one set. Color TV is becoming more popular daily. TV Stations grow in number, need technicians. Maintenance and repair offer big opportunities.

PHASE 2 RADIO—AM & FM
Radios in homes, cars, schools, all need expert upkeep. Stations expand as FM becomes popular. Now transistors boom entire field.

PHASE 3 INDUSTRIAL ELECTRONICS
Computers, Data-Processing machines, Electronic Controls, Guided Missile Systems are new fields where Electronics play a vital role.

PHASE 4 SOUND SYSTEMS
New popularity of Hi-Fi-Stereo, as well as industrial sound systems and business intercoms make this a highly specialized and important field.

PHASE 5 FCC LICENSE PREPARATION
FCC License holders have a wide range of top jobs open to them. FCC License now a requirement for most Communication jobs.

PHASE 6 RADAR AND MICROWAVES
These are the communications systems of the future, already used in tracking and contacting satellites.

PHASE 7 AUTOMATION & COMPUTERS
Automation and Computer electronics are the new tools of industry and commerce. Skilled Technicians in these fields are in great demand at top pay.

PHASE 8 BROADCASTING & COMMUNICATIONS
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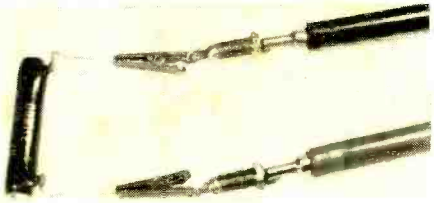
Tips

(*Continued from page* 16)

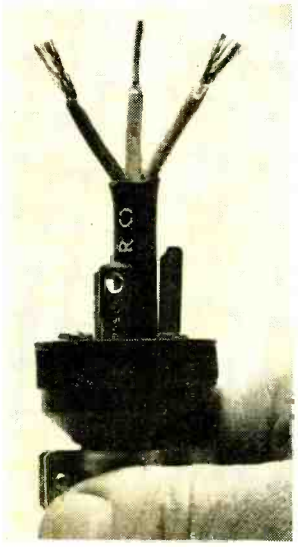
casion to wish that they were equipped with alligator clips instead. You could make up an extra set of leads having clip terminations, of course, but the adapters pictured



here are a neater solution. Just solder alligator clips to a set of pin jacks as shown. The probe tips will slip into the jacks—and you're all set. —*Stanley E. Bammel*

TINNED LEADS FOR LINE-CORD SAFETY

If you're like most of us, you probably have trouble occasionally in connecting stranded-wire line cord to an a.c. plug. The wire tends to "squash out" from under the attachment screws, where it might cause a short circuit and even a fire. If enough strands escape from under the screws, you have another kind of fire hazard as well. The power-handling capacity of the remaining wire might not be enough for the load you're drawing. This would cause overheating at the plug (and also reduce the voltage available at the other end of the line). So don't take chances. Assure a sound mechanical and electrical connection by wrapping the strands of each lead tightly together and tinning them before connecting them to the plug. Form the tinned leads into loops with long-nosed pliers, and they'll slide right under the screws.



—*Robert Hertzberg*

(*Continued on page* 20)

Tips

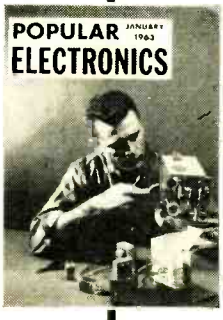
(*Continued from page* 19)

DETERGENT "BOTTLES" BECOME CONTAINERS FOR TOOLS OR PARTS

Don't let the lady of the house throw away those empty detergent "squeeze bottles." With their tops cut off (a hacksaw does the job nicely), they make handy containers for your work bench. The larger sizes (like the one illustrated) will hold aligning tools, screwdrivers, etc. The smaller ones are fine for miscellaneous hardware. If you want to, you can cover the advertising labels with a couple of coats of dark paint.

—*H. Leeper*

COMING NEXT MONTH



Can a simple receiver have everything? Yep—pretty much, anyway. Plug-in coils, bandspread tuning, separate gain and regeneration controls, and your choice of speaker or phones are only a few features of the snappy little one-tuber in the works for next month!

ON SALE

DECEMBER 27

- **ELECTRONICS TO THE RESCUE**
  Crossing the busy North Atlantic is safer than ever. Learn how 53 nations and 1 electronic computer have cooperated in this major achievement.
- **KIDDIES' CHRISTMAS PHONO**
  Take an old portable phono, or pick up a few parts. Wire this simple circuit, tack on a finishing touch here and there, and the kiddies will be offering tons and tons of "tune-y tanx" to Santa—and in stereo yet!
- **NERVE FINDER**
  This "electronic shocker" should be a sure winner at science fairs. Transistorized and battery-powered, it demonstrates the effect of electric current on various muscles and nerves.

The new RCA MARK VIII 27-Mc 2-WAY RADIO

More Features · Improved Performance · AT A LOWER PRICE

Here is THE outstanding bargain today in a 2-way Citizens' Band radio: THE NEW RCA MARK VIII. Compact, dependable, simple to operate, it outperforms and offers more features than even the famous RCA Mark VII.

Look what this remarkable new unit offers you:

- 9 crystal-controlled transmit and receive channels
- Tunable receiver for reception of 23 C-B channels; dial marked in both channel numbers and frequency
- Exceptionally good voice reproduction—high intelligibility
- Maximum allowable transmitter input of 5 watts*—nominal output of 3 watts or more
- Highly selective superheterodyne receiver with one rf and two if amplifier stages
- Operates from standard 117-volt AC; separate DC power supply (optional) for mobile installations (you don't pay for unnecessary power supplies)
- Electronic switching—no relay noise or chatter
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*Maximum plate input power to final radio-frequency amplifier stages as defined by FCC regulations

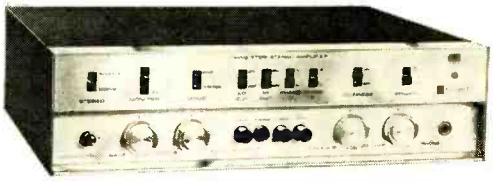
**Optional list price

The Most Trusted Name in Electronics

Hi-Fi Showcase

*A quick look at new products in the stereo/hi-fi field**

SANTA has come up with two fine equipment cabinets (by *Audio Originals*) which are mighty attractive answers to the old problem of "where to put" a component stereo system. One cabinet, the Model 202, is modeled along contemporary lines; the other (Model 303) takes its stylish cues from Danish Modern. Both contain compartments or shelves for stereo speakers and other components, and the 303 also features a sliding pull-out changer/turntable shelf. Each is made of genuine hardwoods, and you have your choice of oiled walnut, fruitwood, cherry, or mahogany finishes. Prices: $69.50 for the 202; $99.50 for the 303. . . . An all-transistor integrated stereo amplifier from *Allied Radio* carries a 100-watt music power rating—50 watts per channel and more than enough punch for almost any type of speakers in almost any listening room. Both frequency response and

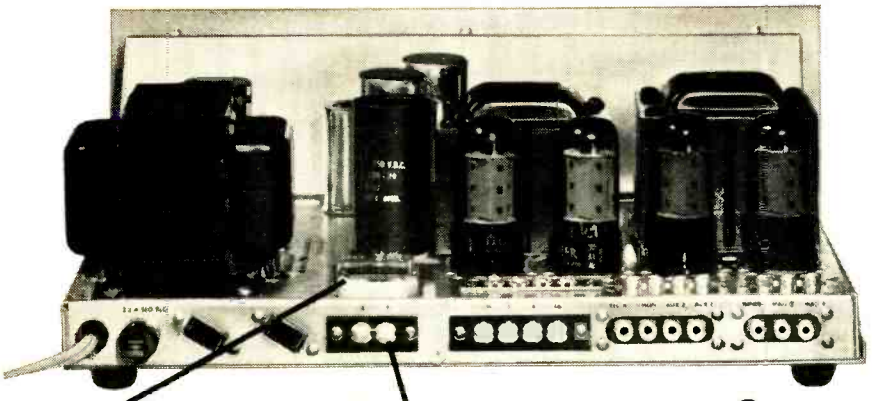


Knight KN-450A stereo amplifier

distortion ratings are especially impressive: the Knight KN-450A delivers its rated output within half a db from 20 to 30,000 cycles, and total harmonic distortion at full power is less than 0.5%. There are five pairs of stereo inputs for practically every stereo source, and there are high-impedance outputs for tape recording, a headphone jack, and a high-impedance center-channel speaker jack in addition to the two speaker outputs. Housed in a dark brown textured metal case with a polished brass control panel, the KN-450A is priced at $189.95; an optional oiled walnut cabinet is available for an additional $14.95.

Slim, trim, and an excellent performer, *Electro-Voice*'s new Regina 200 speaker sys-

**Write to the manufacturers listed at the end of this column for more data on products mentioned*



1. Others don't have this.

2. Others don't have this.

3. Others can't have this.

Three points of superiority of the Fisher KX-200 StrataKit over all other single-chassis stereo control-amplifier kits:

1. Built-In d'Arsonval Meter. For easy, positive adjustment of bias and balance—with laboratory accuracy. Assures peak performance from the start; permits 'touching up' for continued peak performance throughout the years, regardless of tube aging. No other single-chassis control-amplifier kit has this vital feature.

2. Third-Speaker Output with Volume Control. Blends the two stereo channel outputs to feed a third loudspeaker system—at **any** desired volume level. Ideal for center-channel stereo fill-in or for a mono extension speaker in another room. Another Fisher exclusive among control-amplifier kits.

3. The Fisher Name. The inimitable Fisher exclusive. Your guarantee of a head start in kit building—before you even pick up your screwdriver.

And there is something **under** the chassis, too, that others don't have: StrataKit construction—assembly by totally error-proof stages (strata). Each stage corresponds to a **separate** fold-out page in the instruction manual. Each stage is built from a **separate** transparent packet of parts (StrataPack). Major components come already mounted on the extra-heavy-gauge steel chassis. Wires are **pre-cut** for every stage—which means every page. Result: Absolutely equal success by the experienced kit builder or the completely unskilled novice!

The KX-200 has a power output of 80 watts (IHFM Standard)—40 watts per channel. Harmonic distortion at rated output is 0.4%. The architectural brass-finish control panel is styled to match all other Fisher-built components. Price **$169.50*.**

The KX-100 StrataKit, an advanced 50-watt stereo control-amplifier kit with center-channel output, **$129.50*.**

The KM-60 StrataKit, world's most sensitive FM Stereo Multiplex wide-band tuner available in kit form, **$169.50*.**

The KS-1 three-way speaker kit, only Slim-Line loudspeaker system available in kit form, **$59.50**.**

FREE! $1.00 VALUE! The Kit Builder's Manual: a new, illustrated guide to high-fidelity kit construction.

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Please send me without charge The Kit Builder's Manual, complete with detailed information on all Fisher StrataKits.

The Kit Builder's Manual

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*WALNUT OR MAHOGANY CABINET, $24.95. METAL CABINET, $15.95. **IN UNFINISHED BIRCH ($64.50 IN UNFINISHED WALNUT.) PRICES SLIGHTLY HIGHER IN THE FAR WEST. EXPORT: FISHER RADIO INTERNATIONAL, INC., LONG ISLAND CITY 1, N.Y. CANADA: TRI-TEL ASSOCIATES, LTD., WILLOWDALE, ONT.

THE FISHER

Showcase

(*Continued from page 22*)

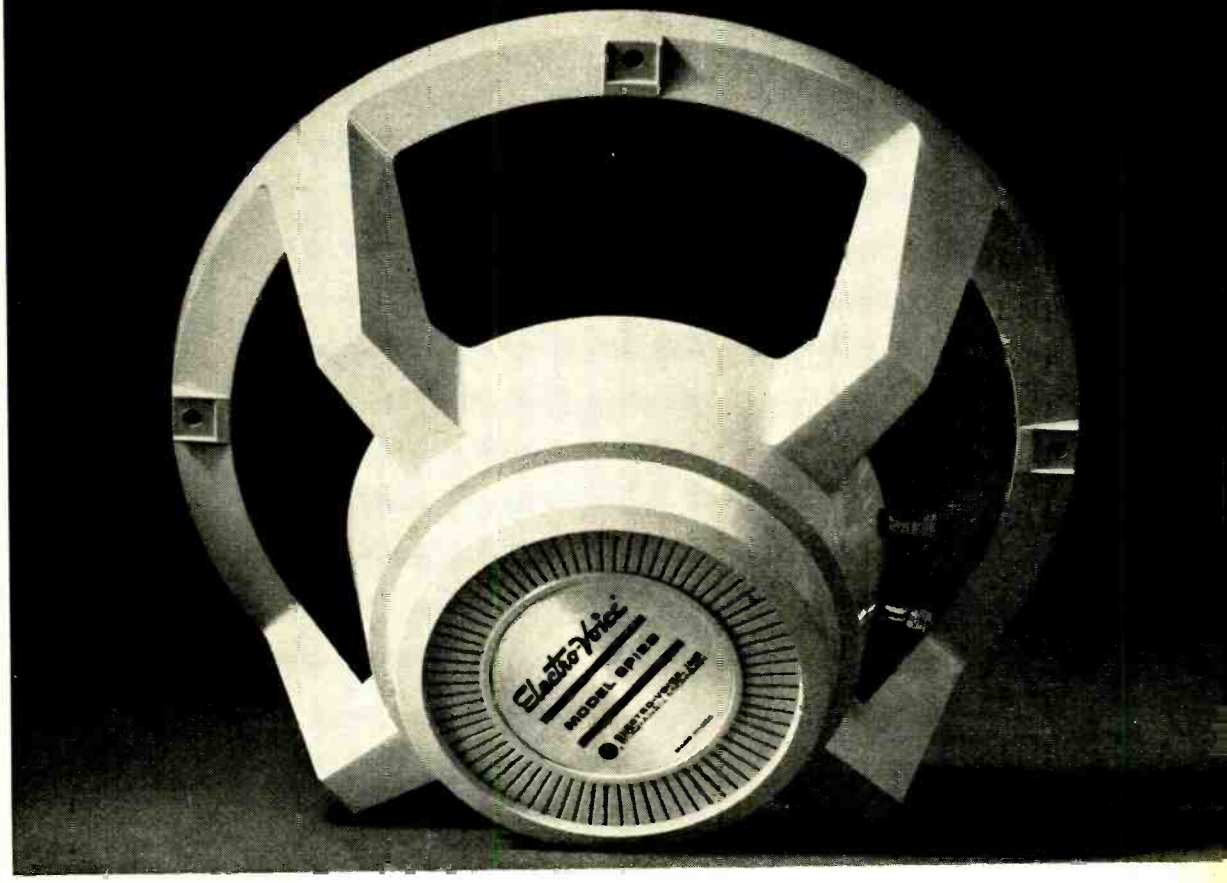
tem is less than 6" deep and will blend with virtually any furniture style or room decor. A true two-way system, the Regina 200 employs a 5" tweeter mounted in a totally isolated chamber to prevent interaction with rear-wave pressure from its high-compliance 10" woofer; the crossover point is 800 cycles. Price, $89.50. . . . An all-transistor integrated stereo amplifier in kit form, ***Lafayette***'s KT-900WX boasts a music power output of 120 watts for fullest dynamic realism. Its 22-transistor circuit also incorporates 14 diodes, and the kit is supplied complete with an attractive gold-anodized aluminum panel, a walnut vinyl-covered metal case, and a step-by-step instruction manual. Frequency response is

Lafayette KT-900WX stereo amplifier

held within 1 db from 10 to 25,000 cycles at full power output; the front panel has separate concentric bass, treble, and volume controls; a four-position input selector; switches for rumble filter, loudness control, scratch filter, and power on/off. Price of the KT-900WX, $134.50.

First in ***H. H. Scott***'s new line of speaker kits is the SK-4. Patterned after the company's famed S-3 speaker, the SK-4 features a factory-assembled cabinet in walnut, mahogany, or unfinished pine or hardwood. There are three speakers in the system, with separate controls for the mid-range and tweeter drivers. Price, $79.95 and up. . . . An AM/FM/FM-stereo tuner by H. H. Scott provides reception of just about any sound on the airwaves. You have your choice of monophonic AM or FM, and AM/FM or FM-stereo with the 333, and there are facilities for taping off-the-air. The FM section offers 2.5 μv. sensitivity, and Scott's "Sonic Monitor" gives positive indication of when a station is broadcasting FM-stereo. The Model 333 carries a price tag of $259.95. . . . Speaking of FM-stereo, Scott is also offering a 7" stereo record which explains exactly what this new system is all about. The disc enables you to hear an actual FM-stereo broadcast "off the air," and it demonstrates what various specifica-

Now, One Look Tells You...



The Best Buys Are Better Than Ever!

Take a close look at the all-new Electro-Voice SP12B and 12TRXB custom loudspeakers. Speakers with the honest beauty of precision... created by the sure, deft hand of a master designer.

Here is beauty with a reason... beauty that actively mirrors the superb performance of these famous speakers. Chosen for over a decade as "best buys" by listeners and laboratories alike, now the SP12B and 12TRXB look better and sound better than ever before.

No mystery about why they sound so good. Every detail of design has been refined, every manufacturing tolerance tightened to assure the highest level of musical performance and engineering integrity in your high fidelity system.

We urge you to carefully judge the SP12B and 12TRXB on every basis ... on facts and figures, on appearance, and finally with your own critical ear. In every way these speakers give a full measure of satisfaction. And the real beauty is that they are very modestly priced.

ELECTRO-VOICE, INC.
Consumer Prod. Div., Dept. 1224P, Buchanan, Mich.
SETTING NEW STANDARDS IN SOUND

Electro-Voice

Showcase

(*Continued from page* 24)

tions mean and how they affect FM-stereo listening. The record is free—just drop Scott a line, and ask for it.

Are you looking for an easy way to take care of distortion and interference when taping FM-stereo broadcasts? A little gadget produced by ***Viking*** is a perfect solution to your problem. Basically an LC-type low-pass filter, the MX-10 is designed for "patch-cord" connection between the output of any FM-stereo tuner and the hi-level inputs of any stereo tape recorder. There are no adjustments or controls to fiddle with, yet the MX-10 prevents interaction between the 38-kc. multiplex carrier and the tape-recorder bias oscillator by providing a sharp cutoff at precisely 20,000 cycles. Price, $14.50.

Audio Originals, 474 S. Meridian St., Indianapolis 25, Ind.
Allied Radio Corp., 100 N. Western Ave., Chicago 80, Ill.
Electro-Voice, Inc., Buchanan, Mich.
Lafayette Radio Electronics Corp., 111 Jericho Turnpike, Syosset, L.I., N.Y.
H.H. Scott, Inc., Dept. P, 111 Powdermill Rd., Maynard, Mass.
Viking of Minneapolis, Inc., 9600 Aldrich Ave. S., Minneapolis 20, Minn.

HI-FI FUNDAMENTALS

Judging from the inquiries we receive, plenty of people are looking for a good grounding in the basics of hi-fi/stereo. Now, with two volumes of the new Acoustic Research library off the presses, another fine source of hi-fi fundamentals is theirs for the reading.

Volume 1, "High Fidelity Systems," (by Acoustic Research's chief engineer, Roy F. Allison) presents some extremely useful information about selecting, installing, and operating a component hi-fi system. In the author's words, this 70-page paperback is intended "to provide the interested layman with reliable, helpful guidance to the installation and operation of high-fidelity stereo music systems." Actually, this little book does far more, touching on subjects ranging all the way from recommended recordings for evaluating pickups and speakers to how to mount a tone arm.

Volume 2, "Reproduction of Sound," is the work of Edgar Villchur, Acoustic Research's president. This 93-page "sister" volume explains how hi-fi components work rather than how to use them. And, like Volume 1, it's written in such a way that you don't have to be a technician to understand it.

Copies of both volumes are available from Acoustic Research, Inc., 24 Thorndike St., Cambridge 41, Mass. Volume 1 sells for $1.00, and Volume 2 for $2.00, postpaid.

NEW LOOK FROM PACO

IN LOUDSPEAKERS:
REVOLUTIONARY NEW PACO SPEAKER SYSTEM DARES TO USE 6" CONES!

PACO is proud to present the Model L4 System, a revolutionary new development in loudspeaker design that offers a degree of brilliance, clarity and quality unequaled by speakers selling for as much as $300. Yet this remarkable speaker system costs only $99.95 net.

Here's the secret. Developed by a brilliant and famous audio designer, the new system consists of three 6-inch woofer mid-range speakers in close configuration and a tweeter. Normally, 6-inch speakers have very high cone resonance, no bass response and low power capacity. In this system, however, a special ball diffuser, bonded to the voice coil form, disperses sound in the middle frequency and widens the normally narrow axis beam of the speaker. The result is an extremely smooth response in the middle range.

Each speaker cone also has three struts bonded to it, and to each diffuser. This produces a rigid diaphragm which eliminates edge distortion and provides the much-desired "pistan effect" up to 7,000-8,000 cycles. The arrangement also produces a cone resonance in the mid-range woofers of approximately 40 cycles—comparable to the most expensive woofer.

Model L4 by PACO: $99.95 net.

Because of their close proximity, the three speakers act as a single mass in moving air, but without the sluggishness often associated with large speakers. And, each individual speaker remains light enough to produce an accurate mid-range. This elimination of the cross-over between bass and mid-range affords an even greater degree of clarity and fidelity. With a response of 45-18,000 cycles, the system is capable of reproducing every nuance of even the most intricate musical passage. Designed to operate with all amplifiers, its impedance is 8 ohms. See and hear it at your dealer or write today to PACO Electronics Co., Inc., Glendale 27, New York.

IN HIGH-FIDELITY KITS: The ST-55MX FM Stereo Multiplex Tuner Kit and the SA-50 Stereo Preamp-Amplifier Kit (50 watts: 25 per channel) are two completely new, decorator-designed units that enhance the decor of any home. Handsome new styling and color scheme make this combination look as distinctive as it sounds. And, like other famous PACO kits, the ST-55MX and SA-50 assemble 1/3 faster and easier than similar kits sold by other kit makers.

ST-55MX FM Stereo Multiplex Tuner Kit (Prealigned; less enclosure): $99.95 net. Factory wired (includes enclosure): $159.95 net. Enclosure: $7.95 net.

SA-50 Stereo Preamp-Amplifier Kit (less enclosure): $79.95 net. Factory wired (includes enclosure): $149.95 net. Enclosure: $7.95 net.

ST-25MX FM Stereo Multiplex Tuner Kit (Pre-aligned, less enclosure): $69.95 net. Factory wired: $99.95 net. Enclosure: $14.95 ner. (walnut); $4.95 net. (metal).

IN TEST-EQUIPMENT: A complete line of PACO test equipment is now available in kit form far the audiophile, ham operator and electronic technician who wants maximum quality at lowest possible cost.

New Model T-62 Grid Circuit Analyzer Tube Tester and Megohmmeter. Tests Novars, Compactrons and Nuvistors. Kit: $49.95 net. Factory wired: $67.95 net.

New Model T-63 CRT Tester and Rejuvenator. Utilizes a true beam current test circuit. Kit: $44.95 net. Factory wired: $59.95 net.

New Model G-32 Sweep Generator and Marker-Adder. Simplifies sweep alignment procedures. Kit: $85.95 net. Factory wired: $129.95 net.

New Model G-34 Sine and Square Wave Generator. Versatile coverage of 7 cps to 750 kc sine and square wave in 6 bands. Kit: $64.95 net. F'cty wired: $99.95 net.

New Model G-36 Color Bar and White Dot Generator. Features ease of operation and utmost stability. Kit: $119.95 net. Factory wired: $179.95 net.

Model C-25 In-Circuit Capacitor Tester. Tests for faulty capacitors without removing them from circuit. Kit: $19.95 net. Factory wired: $29.95 net.

Model V-70 Vacuum Tube Voltmeter. Versatile, AC operated, peak to peak. Kit: $31.95 net. F'cty wired: $49.95 net.

Model S-55 Wide-Band Oscilloscope. Covers range between DC and 5 mc. Kit: $95.95 net. Factory wired: $155.95 net.

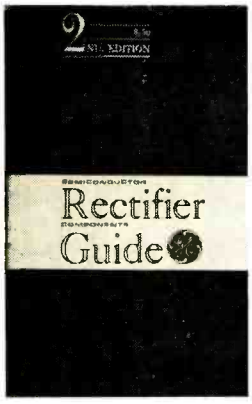
Model G-30 RF Sig. Generator. Fine and coarse attenuators handle any signal level. Kit: $32.95 net. Wired: $44.95 net.

PACO ELECTRONICS COMPANY, INCORPORATED, 70-31 84th STREET, GLENDALE 27, NEW YORK
DIVISION OF PRECISION APPARATUS CO., INC. EXPORT: MORHAN EXPORTING CORP., 458 BROADWAY, N. Y. 13, N. Y.

POP'tronics Bookshelf

SEMICONDUCTOR RECTIFIER COMPONENTS GUIDE, Second Edition

The newly published second edition of the GE *Semiconductor Rectifier Components Guide* contains 27 additional pages of specification data. It offers the power supply designer a convenient reference book for the planning of rectifier circuits and for the selection of silicon, germanium, selenium, and copper-oxide rectifier components. Many charts are included, and one of the 19 chapters contains a current listing of Joint Electron Device Engineering Council rectifier types with cross-reference information to specification data. The guide was prepared in the Application Engineering Center of GE's Rectifier Components Department.



Published by the General Electric Co., Auburn, N. Y. 142 pages. Soft cover. 50 cents.

FUN WITH RADIO-CONTROLLED MODELS

by Edward L. Safford, Jr.

Written by a pioneer in the R/C model field and author of other volumes on the same subject, this book takes the reader step by step through all phases of radio control. It is a "learn-by-building" text. The reader begins by assembling basic units, such as relay and steering devices, to become familiar with their operation. Then he learns how to use R/C equipment, both constructed and manufactured, in model boats, cars, and airplanes. Diagrams and photos accompany much of the text, and there is a 14-page glossary of R/C terms.

Published by Gernsback Library, Inc., 154 W. 14th St., New York 11, N. Y. 160 pages. Soft cover. $3.20.

(*Continued on page* 30)

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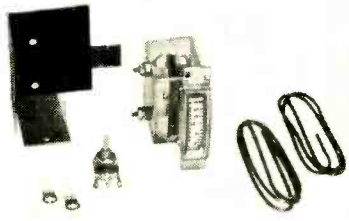
CB-3A

dual conversion
citizens band
TRANSMITTER/RECEIVER

only $159.95
(S-meter optional extra)

New, improved version of Hallicrafters' high-performance CB-3 27-mc. transmitter/receiver—incomparable result of a 30,000-mile, continuous-operation field test under the most punishing conditions imaginable.



S-meter kit—easy to install as shown in photo above. $8.95

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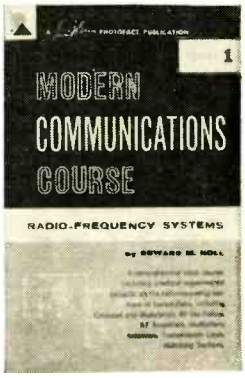
Bookshelf

(*Continued from page 28*)

MODERN COMMUNICATIONS COURSE, Volume 1, Radio-Frequency Systems

by Edward M. Noll

The increase in two-way radio communications in recent years has placed the transmitter in almost as prominent a position as the receiver. Thus, there is a growing demand for technicians who understand the function and operation of transmitting equipment, and who can maintain this type of gear. The first volume of this complete course on radio communications systems describes typical circuits and antenna systems used for r.f. transmission. Experiments and review questions are given at the end of each chapter, and numerous diagrams, photos and schematics clearly illustrate the subject matter.



Published by Howard W. Sams & Co., Inc., 1720 E. 38th St., Indianapolis 6, Ind. 256 pages. Soft cover. $4.95.

SINGLE SIDEBAND FOR THE RADIO AMATEUR, Third Edition

edited by the American Radio Relay League staff

The revised and expanded third edition of *Single Sideband for the Radio Amateur* contains over 75 selected articles. This book is a comprehensive digest of the most noteworthy material on the theory and practice of SSB (single sideband) operation which has appeared in QST (the ARRL monthly publication) over the years. A general history of SSB is presented, and construction projects are included for linear amplifiers, receivers, filter systems, and many accessories. The book is well illustrated with photos, diagrams, schematics and tables.

Published by the American Radio Relay League, Inc., West Hartford 7, Conn. 224 pages. Soft cover. $2.00.

(*Continued on page 32*)

What does it take to feel like a man?

It takes *action* to feel like a man. Takes *pride*, too, and good, skillful *training*. Join the modern Army's Combat Arms program and you'll have all three.

Pride? In Combat Arms it makes no difference whether you select Infantry, Armor, or Artillery. You'll be proud of any one of them. And you'll end up proud of yourself, too.

Action? In today's modern Army it's *go* all the way. Every unit is smooth, fast, and flexible. And every day brings fresh, new challenges. It takes real men to cope with them.

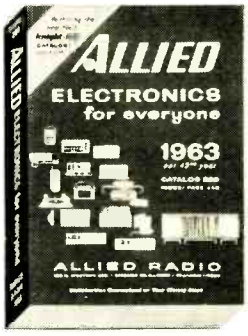
Training? In today's world nothing but skilled hands and minds will do. The whole Army is like a huge, well-oiled engine—with men and machines closely interlocked. It takes *men* to fit into this kind of picture. And of course you have other choices, too. Want Combat Support or Technical Training? Then ask for Electronics, Heavy Equipment, Transportation or Maintenance. It's as simple as that. If you're *qualified*, your choice is *guaranteed before you enlist*. Find out how to feel like a man in today's fast-changing world. See your local Army recruiter today!

Bookshelf

(*Continued from page* 30)

New Literature

"Electronics for Everyone" is the theme of the 1963 Allied Radio catalog. Increased to 464 pages, this edition represents over 600 leading manufacturers and 70,000 product categories (114 pages are on the Knight-Kit and pre-wired Knight lines of audio equipment). New developments in all phases of audio, hi-fi, and communications are highlighted, ranging from the latest fully transistorized stereo units to the newest in kits, parts, and components. To receive your free copy of Catalog No. 220, write to the Allied Radio Corporation, 100 N. Western Ave., Chicago 80, Ill.



The 1963 284-page Radio Shack catalog features over 10,000 individual items made by major manufacturers. A large portion of the catalog is devoted to stereo/hi-fi systems designed by Radio Shack engineers. For the ham, kit builder, and electronic repairman, there are over 60 pages of receivers, transmitters, test equipment, parts, and tools. In addition, the CB transceiver section has been greatly enlarged. Copies may be obtained from Radio Shack, 730 Commonwealth Ave., Boston 17, Mass.

A detailed booklet is now available on the Amperex Type 6GB5, all-glass, beam-power pentode. Designed for use in TV-receiver horizontal deflection stages, the tube is equipped with a unique "cavitrap" plate which gives it an unusually high plate-to-screen-grid current ratio. For a copy of the free, 10-page brochure, write (on company stationery) to Amperex Electronic Corp., Semiconductor and Special Purpose Tube Division, 230 Duffy Ave., Hicksville, L.I., N.Y. —30—

BUILD 10-20 RADIO CIRCUITS AT HOME with the Deluxe PROGRESSIVE RADIO "EDU-KIT"®

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Training Electronics Technicians Since 1946

A Practical Home Radio Course

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- ★ SQ. WAVE GENERATOR
- ★ SIGNAL TRACER
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- ★ CODE OSCILLATOR

- ★ No Knowledge of Radio Necessary
- ★ No Additional Parts or Tools Needed
- ★ EXCELLENT BACKGROUND FOR TV
- ★ **SCHOOL INQUIRIES INVITED**
- ★ Sold In 79 Countries

YOU DON'T HAVE TO SPEND HUNDREDS OF DOLLARS FOR A RADIO COURSE

The "Edu-Kit" offers you an outstanding PRACTICAL HOME RADIO COURSE at a rock-bottom price. Our Kit is designed to train Radio & Electronics Technicians, making use of the most modern methods of home training. You will learn radio theory, construction practice and servicing. THIS IS A COMPLETE RADIO COURSE IN EVERY DETAIL.

You will learn how to build radios, using regular schematics; how to wire and solder in a professional manner; how to service radios. You will work with the standard type of punched metal chassis as well as the latest development of Printed Circuit chassis.

You will learn the basic principles of radio. You will construct, study and work with RF and AF amplifiers and oscillators, detectors, rectifiers, test equipment. You will learn and practice code, using the Progressive Code Oscillator. You will learn and practice trouble-shooting, using the Progressive Signal Tracer, Progressive Signal Injector, Progressive Dynamic Radio & Electronics Tester, Square Wave Generator and the accompanying instructional material.

You will receive training for the Novice, Technician and General Classes of F.C.C. Radio Amateur Licenses. You will build 20 Receiver, Transmitter, Square Wave Generator, Code Oscillator, Signal Tracer and Signal Injector circuits, and learn how to operate them. You will receive an excellent background for television, Hi-Fi and Electronics.

Absolutely no previous knowledge of radio or science is required. The "Edu-Kit" is the product of many years of teaching and engineering experience. The "Edu-Kit" will provide you with a basic education in Electronics and Radio, worth many times the price of the entire kit.

THE KIT FOR EVERYONE

You do not need the slightest background in radio or science. Whether you are interested in Radio & Electronics because you want an interesting hobby, a well paying business or a job with a future, you will find the "Edu-Kit" a worth-while investment.

Many thousands of individuals of all ages and backgrounds have successfully used the "Edu-Kit" in more than 79 countries of the world. The "Edu-Kit" has been carefully designed, step by step, so that you cannot make a mistake. The "Edu-Kit" allows you to teach yourself at your own rate. No instructor is necessary.

PROGRESSIVE TEACHING METHOD

The Progressive Radio "Edu-Kit" is the foremost educational radio kit in the world, and is universally accepted as the standard in the field of electronics training. The "Edu-Kit" uses the modern educational principle of "Learn by Doing." Therefore you construct, learn schematics, study theory, practice trouble shooting—all in a closely integrated program designed to provide an easily-learned, thorough and interesting background in radio.

You begin by examining the various radio parts of the "Edu-Kit." You then learn the function, theory and wiring of these parts. Then you build a simple radio. With this first set you will enjoy listening to regular broadcast stations, learn theory, practice testing and trouble-shooting. Then you build a more advanced radio, learn more advanced theory and techniques. Gradually, in a progressive manner, and at your own rate, you will find yourself constructing more advanced multi-tube radio circuits, and doing work like a professional Radio Technician.

Included in the "Edu-Kit" course are 20 Receiver, Transmitter, Code Oscillator, Signal Tracer, Square Wave Generator and Signal Injector Circuits. These are not unprofessional "breadboard" experiments, but genuine radio circuits, constructed by means of professional wiring and soldering on metal chassis, plus the new method of radio construction known as "Printed Circuitry." These circuits operate on your regular AC or DC house current.

THE "EDU-KIT" IS COMPLETE

You will receive all parts and instructions necessary to build 20 different radio and electronics circuits, each guaranteed to operate. Our Kits contain tubes, tube sockets, variable, electrolytic, mica, ceramic and paper dielectric condensers, resistors, tie strips, hardware, tubing, punched metal chassis, instruction Manuals, hook-up wire, solder, selenium rectifiers, volume controls and switches, etc.

In addition, you receive Printed Circuit materials, including Printed Circuit chassis, special tube sockets, hardware and instructions. You also receive a useful set of tools, a professional electric soldering iron, and a self-powered Dynamic Radio and Electronics Tester. The "Edu-Kit" also includes Code Instructions and the Progressive Code Oscillator, in addition to F.C.C.-type Questions and Answers for Radio Amateur License training. You will also receive lessons for servicing with the Progressive Signal Tracer and the Progressive Signal Injector. a High Fidelity Guide and a Quiz Book. You receive Membership in Radio-TV Club, Free Consultation Service, Certificate of Merit and Discount Privileges. You receive all parts, tools, instructions, etc. Everything is yours to keep.

FREE EXTRAS

- **SET OF TOOLS**
- SOLDERING IRON
- ELECTRONICS TESTER
- PLIERS-CUTTERS
- ALIGNMENT TOOL
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- VALUABLE DISCOUNT CARD
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- TESTER INSTRUCTION MANUAL
- HIGH FIDELITY GUIDE • QUIZZES
- TELEVISION BOOK • RADIO TROUBLE-SHOOTING BOOK
- MEMBERSHIP IN RADIO-TV CLUB: CONSULTATION SERVICE • FCC AMATEUR LICENSE TRAINING
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SERVICING LESSONS

You will learn trouble-shooting and servicing in a progressive manner. You will practice repairs on the sets that you construct. You will learn symptoms and causes of trouble in home, portable and car radios. You will learn how to use the professional Signal Tracer, the unique Signal Injector and the dynamic Radio & Electronics Tester. While you are learning in this practical way, you will be able to do many a repair job for your friends and neighbors, and charge fees which will far exceed the price of the "Edu-Kit." Our Consultation Service will help you with any technical problems you may have.

FROM OUR MAIL BAG

J. Stataitis, of 25 Poplar Pl., Waterbury, Conn., writes: "I have repaired several sets for my friends, and made money. The "Edu-Kit" paid for itself. I was ready to spend $240 for a Course, but I found your ad and sent for your Kit."

Ben Valerio, P. O. Box 21, Magna, Utah: "The Edu-Kits are wonderful. Here I am sending you the questions and also the answers for them. I have been in Radio for the last seven years, but like to work with Radio Kits, and like to build Radio Testing Equipment. I enjoyed every minute I worked with the different kits; the Signal Tracer works fine. Also like to let you know that I feel proud of becoming a member of your Radio-TV Club."

Robert L. Shuff, 1534 Monroe Ave., Huntington, W. Va.: "Thought I would drop you a few lines to say that I received my Edu-Kit, and was really amazed that such a bargain can be had at such a low price. I have already started repairing radios and phonographs. My friends were really surprised to see me get into the swing of it so quickly. The Trouble-shooting Tester that comes with the Kit is really swell, and finds the trouble, if there is any to be found."

Choose From These Popular "Edu-Kit" Models

#10A: 10 Circuits $14.95

#15A: 15 Circuits $19.95

#16A: 16 Circuits (includes Printed Circuitry) $22.95

#20A: 20 Circuits (includes Printed Circuitry and 4 Advanced Circuits) $26.95

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ORDER DIRECT FROM AD—RECEIVE FREE BONUS RESISTOR AND CONDENSER KITS WORTH $7

MODEL desired..... Price .....

- ☐ Send "Edu-Kit" postpaid. I enclose remittance in full.
- ☐ Send "Edu-Kit" C.O.D. I will pay postage.
- ☐ Send me FREE additional information describing "Edu-Kits."

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Investigate the superb facilities for technical instruction at the RCA Institutes today. It can be the smartest move you ever made.

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Communications Electronics · Automation Electronics
Computer Programming · Transistors · Electronic Drafting

Voluntary Tuition Plan. All RCA Institutes Home Study courses are available under the Voluntary Tuition Plan. This plan affords you the most economical possible method of home study training. You pay for lessons only as you order them. If, for any reason, you should wish to interrupt your training, you can do so and you will not owe a cent until you resume the course. No other obligations! No installment payments required.

RCA Personal Instruction. With RCA Home Study training you set your own pace in keeping with your own ability, finances, and time. RCA Institutes allows you ample time to complete the course. Your lesson assignments are individually graded by technically trained personnel, and helpful comments are added where required. You get theory, experiment, and service practice beginning with the very first lesson. All lessons are profusely illustrated. You get a complete training package throughout the entire course.

You Get Prime Quality Equipment. All kits furnished with the course are complete in every respect, and the equipment is top grade. You keep all the equipment furnished to you for actual use on the job . . . and you never have to take apart one piece to build another.

RESIDENT SCHOOLS

in Los Angeles and New York City— You can study electronics in the city of your choice.

No Previous Technical Training Required For Admission. You Are Eligible Even If You Haven't Completed High School. RCA Institutes Resident Schools in Los Angeles and New York City offer training that will prepare you to work in rewarding positions on research and production projects in fields such as automation, transistors, communications, technical writing, television, computers, and other industrial and advanced electronics applications. If you did not complete high school, RCA will prepare you for such training with courses specially designed to provide the basic math and physics required for a career in electronics.

Free Placement Service. RCA Institutes graduates are now employed in important jobs at military installations with important companies such as IBM, Bell Telephone Labs, General Electric, RCA, and in radio and TV stations all over the country. Many other graduates have opened their own businesses. A recent New York Resident School class had 93% of the graduates who used the FREE Placement Service accepted by important electronics companies . . . and had their jobs waiting for them on the day they graduated!

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3 NEW LOCATIONS

In addition to RCA Institutes Inc. courses, Radio Corporation of America offers a limited selection of basic Resident School Courses in Electronics at three new locations . . . Chicago, Philadelphia, and Cherry Hill, N. J., (near Camden). For complete information, write the city of your preference next to your name on the attached postcard.

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PACIFIC ELECTRIC BLDG., 610 S. MAIN ST., LOS ANGELES 14, CALIF.

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ELECTRONICS DATEBOOK

NOV. 28-DEC. 2
International Communications Fair
New York Coliseum, New York, N.Y.

DEC. 4-6
Computer Conference
Sheraton Hotel
Philadelphia, Pa.

JAN. 21-24
National Symposium on Reliability & Quality Control
Sheraton Palace Hotel,
San Francisco, Calif.

JAN. 28-31
Electrical Engineering Exposition
New York Coliseum, New York, N.Y.

JAN. 30-FEB. 1
Military Electronics Convention
Ambassador Hotel,
Los Angeles, Calif.

FEB. 11-15
International Symposium on Quantum Electronics
UNESCO Building & Parc de Exposition, Paris, France

FEB. 20-22
International Solid State Circuits Conference
Sheraton Hotel & University of Pennsylvania, Philadelphia, Pa.

MARCH 25-28
IRE International Convention
Coliseum & Waldorf-Astoria Hotel, New York, N.Y.

APRIL 17-19
Southwestern IRE Conference & Electronics Show (SWIRECO)
Dallas Memorial Auditorium,
Dallas, Texas

MAY 7-9
Electronic Components Conference
Marriott Twin Bridges Hotel,
Washington, D. C.

MAY 20-22
Electronic Parts Distributors Show
Conrad Hilton Hotel, Chicago, Ill.

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	1G3	.79		6AX5	.74		6SJ7	.88		12DE8	.83
	1J3	.79		6BA6	.50		6SK7GT	.95		12DL8	.88
	1K3	.79		6BC5	.61		6SL7GT	.84		12DQ6	1.04
	1R5	.77		6BC8	1.04		6SN7	.65		12DS7	.84
	1S5	.75		6BE6	.55		6SQ7GT	.94		12DT5	.76
	1T4	.72		6BF5	.90		6T4	.99		12DT7	.79
	1U5	.65		6BF6	.44		6T8	.85		12DT8	.78
	1X2B	.82		6BG6	1.70		6U8	.83		12DW8	.89
	2AF4	.96		6BH8	.98		6V6GT	.54		12DZ6	.62
	3AL5	.46		6BJ6	.65		6W4	.61		12ED5	.62
	3AU6	.54		6BJ7	.79		6W6	.71		12EG6	.62
	3AV6	.42		6BK7	.85		6X4	.41		12EK6	.62
	3BC5	.63		6BL7	1.09		6X8	.80		12EL6	.50
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	3BU8	.78		6BQ6	1.12		7AU7	.65		12F8	.66
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	3CB6	.56		6BX7	1.11		8AU8	.90		12FR8	.97
	3CS6	.58		6BZ6	.55		8AW8	.93		12FX8	.90
	3DG4	.85		6BZ7	1.03		8BQ5	.60		12GC6	1.06
	3DK6	.60		6C4	.45		8CG7	.63		12J8	.84
	3DT6	.54		6CB6	.55		8CM7	.70		12K5	.75
	3GK5	.99		6CD6	1.51		8CN7	.97		12L6	.73
	3Q4	.63		6CG7	.61		8CS7	.74		12SF7	.69
	3S4	.75		6CG8	.80		8EB8	.94		12SK7GT	.95
	3V4	.63		6CL8	.79		8FQ7	.56		12SL7	.80
	4BQ7	1.01		6CM7	.69		9CL8	.79		12SN7	.67
	4CS6	.61		6CN7	.70		11CY7	.75		12SQ7GT	.91
	4DT6	.55		6CQ8	.92		12A4	.60		12U7	.62
	4GM6	.60		6CR6	.60		12AB5	.60		12V6	.63
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	5BQ7	1.01		6CY7	.71		12AF6	.67		18FX6	.53
	5BR8	.83		6DA4	.68		12AJ6	.62		18FY6	.50
	5CG8	.81		6DE6	.61		12AL5	.47		19AU4	.87
	5CL8	.76		6DG6	.62		12AL8	.95		19BG6	1.39
	5CQ8	.84		6DJ8	1.21		12AQ5	.60		19EA8	.79
	5EA8	.80		6DK6	.59		12AT6	.50		19T8	.85
	5EU8	.80		6DN6	1.55		12AT7	.76		21EX6	1.49
	5J6	.72		6DQ6	1.10		12AU6	.51		25AX4	.70
	5T8	.86		6DT5	.81		12AU7	.61		25C5	.53
	5U4	.60		6DT6	.53		12AV6	.41		25CA5	.59
	5U8	.84		6DT8	.94		12AV7	.82		25CD6	1.52
	5V6	.56		6EA8	.79		12AX4	.67		25CU6	1.11
	5X8	.82		6EB5	.73		12AX7	.63		25DN6	1.42
	5Y3	.46		6EB8	.94		12AY7	1.44		25EH5	.55
	6AB4	.46		6EM5	.77		12AZ7	.86		25L6	.57
	6AC7	.96		6EM7	.82		12B4	.68		25W4	.68
	6AF4	1.01		6EU8	.79		12BD6	.50		32ET5	.55
	6AG5	.70		6EV5	.75		12BE6	.53		35C5	.51
	6AH4	.81		6EW6	.57		12BF6	.60		35L6	.60
	6AH6	1.10		6EY6	.75		12BH7	.77		35W4	.42
	6AK5	.95		6FG7	.69		12BK5	1.00		35Z5	.60
	6AL5	.47		6FV8	.79		12BL6	.56		36AM3	.36
	6AM8	.78		6GH8	.80		12BQ6	1.16		50B5	.69
	6AQ5	.53		6GK5	.61		12BR7	.74		50C5	.53
	6AS5	.60		6GK6	.79		12BV7	.76		50EH5	.55
	6AT6	.49		6GN8	.94		12BY7	.77		50L6	.61
	6AT8	.86		6H6	.58		12BZ7	.86		70L7	.97
	6AU4	.85		6J5GT	.51		12CN5	.56		117Z3	.85
	6AU6	.52		6J6	.71		12CR6	.67		807	.75

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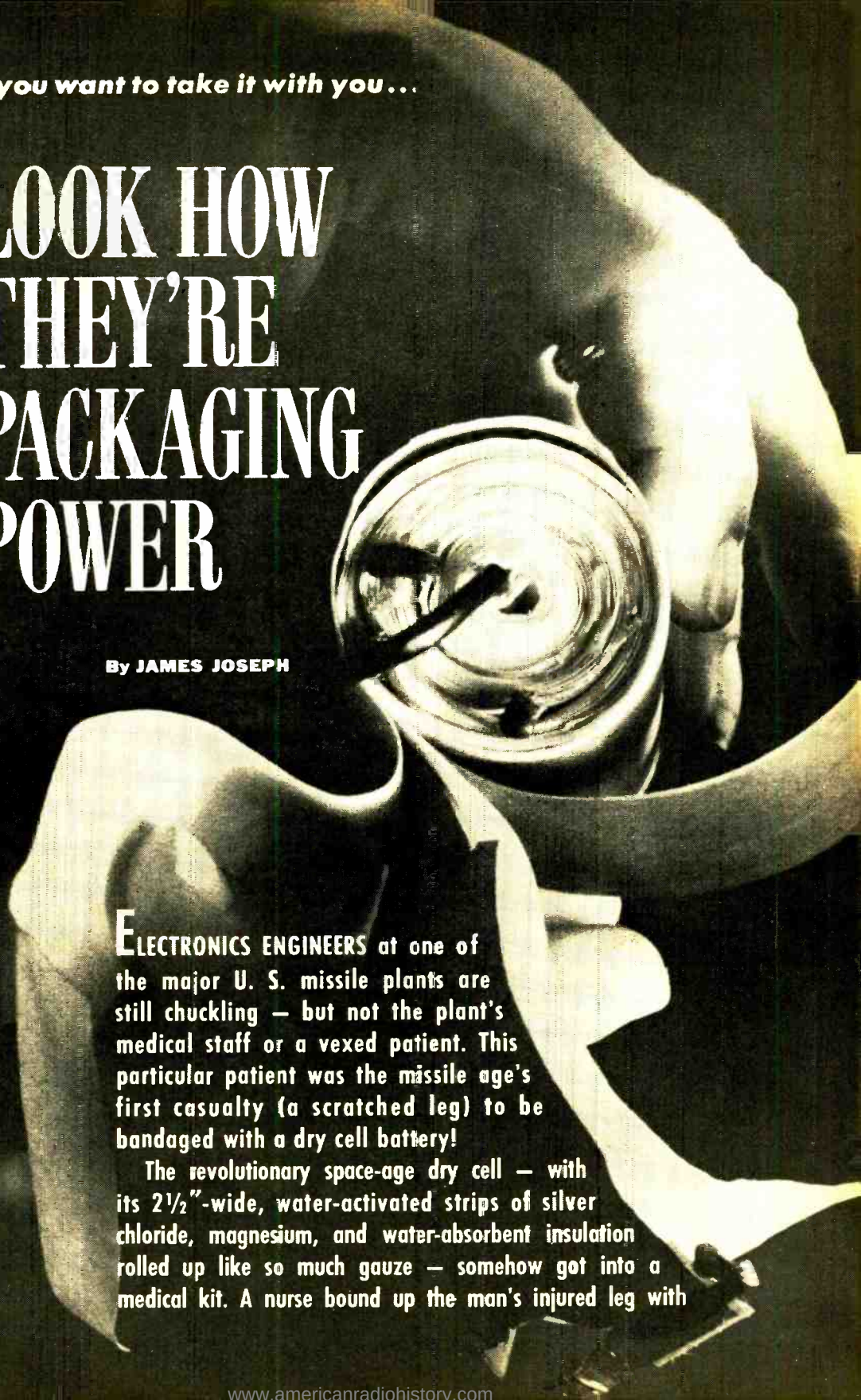
If you want to take it with you...

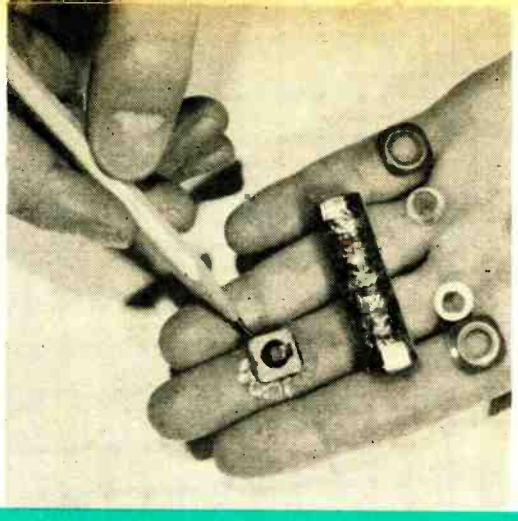
LOOK HOW THEY'RE PACKAGING POWER

By JAMES JOSEPH



ELECTRONICS ENGINEERS at one of the major U. S. missile plants are still chuckling — but not the plant's medical staff or a vexed patient. This particular patient was the missile age's first casualty (a scratched leg) to be bandaged with a dry cell battery!

The revolutionary space-age dry cell — with its 2½"-wide, water-activated strips of silver chloride, magnesium, and water-absorbent insulation rolled up like so much gauze — somehow got into a medical kit. A nurse bound up the man's injured leg with



Snap-together cells by Burgess (above, left), rated at 3 volts, let the experimenter make up non-standard power packs with taps for transistor projects. Carbon-zinc "wafers" (above) rated at 1.5 volts, are stacked by the same manufacturer in leakproof tubes for use in radios, hearing aids, and other portable devices.

LOOK HOW THEY'RE PACKAGING POWER

what amounted to 6 volts and $25.00 worth of "electrical gauze"—before discovering her error.

But her "discovery" is shared by "electronists" everywhere—probably you among them. For nowadays portable power comes in some strange and unusual packages. Gauze-like batteries (for use in space) and some smaller-than-aspirin tablets (yet packing oomph enough to power watches, hearing aids, and miniature circuitry) are opening new vistas for the electronics experimenter. For example:

- A new magnesium cell (1.5 volts) licks sub-zero temperatures, which once doomed dry cells to quick death. Magnesium generates both heat and electricity, keeps the battery's innards warm (and operating) as low as −65°F. Result: now you can operate portable equipment in winter's chill, or at frigid, high altitudes.
- Stackable "wafer" cells—the nickel-cadmium rechargeable type—let you build your own power package to fit almost any transistorized project. Four silver-wax-terminaled 1.25-volt d.c. wafers can be stacked one atop another (connected in series) merely by pressing their waxy terminals together. Result: a 5-volt battery scarcely larger than a pencil's eraser.
- New solid-state batteries of the silver-vanadium pentoxide type (high-voltage, low-current cells) pack 95 volts in a 1″-long, ½″-diameter true "dry" cell—its solid electrolyte is bone dry, can't freeze. One application: a miniature "polarization" source for electrostatic speakers.
- Snap-together cells for transistor circuits are among the newest power "building blocks": snap two 3-volters together in series, and you've got 6 volts for your low-current project.

"All of which," grimaces one home experimenter, "merely *adds to the confusion* . . . what with more than 2000 dry cells, big and small, now available."

Actually, it shouldn't. Despite new packaging (most of it miniaturized) and exotic innards, the electrochemistry of dry batteries—which is what makes them work—hasn't changed much since George Leclanche's carbon-zinc cell (the 1868 "grandaddy" of the common flashlight "D" cell). In fact, no radical changes have been made since about 250 B.C., when the Baghdad goldsmiths electroplated jewelry—including some of

High-rate rechargeable nickel-cadmium cell battery by Eveready (above, left) provides power punch for cordless drills and hedge trimmers. The Sonotone D-size nickel-cadmium cell (center), rated at 1.25 volts, is designed for constant output at temperatures from −40° F to +160° F. Button-cell construction with nickel-cadmium "innards" by Burgess (right) permits stacking cells for home-brew projects.

Cleopatra's—with copper-iron batteries.

So, let's talk about "dry" cells, most of whose conductive electrolyte isn't really dry but rather a wetted paste.

Then and Now. The basis for all batteries is galvanic action—electricity generated by chemical interaction between two dissimilar elements (typically, a carbon and a zinc plate) separated by a chemical conductor (an electrolyte). Connect the carbon and zinc plates externally, and an electrical current flows.

Inside the battery, current flows to the positive plate (carbon) from the negative plate (zinc). As it does, the zinc plate is gradually consumed.

Such simple chemistry produces, at best, about 1.5 volts. But simple as it is, the basic cell is a chemical maverick. Hydrogen bubbles formed in the chemical process film the positive plate, blocking current flow. So engineers have to devise complex (and often secret-formula) electrolytes which also act as "depolarizers"—chemical "sponges" which soak up or absorb the hydrogen bubbles, unblocking current flow. One such depolarizer is manganese dioxide (artificial manganese is generally used, but its absorbent purpose is the same).

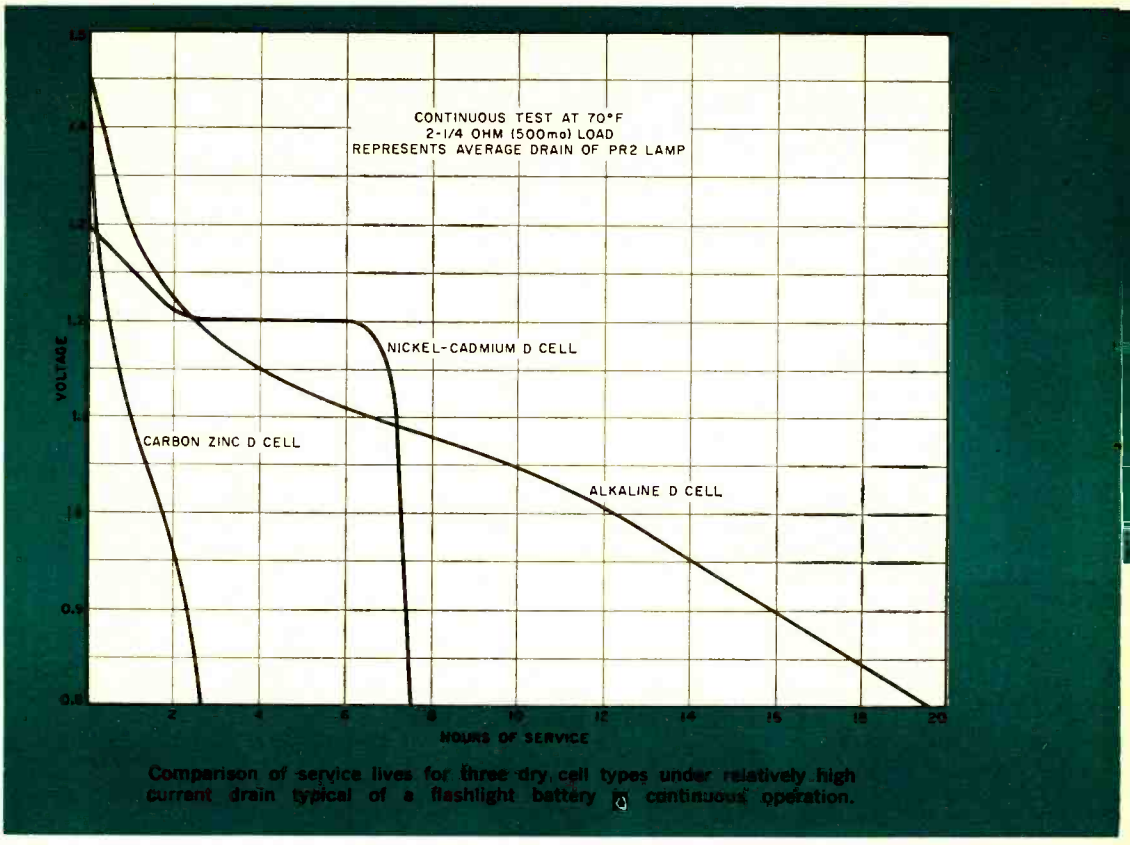
Now that the space and transistor age is here, the changes in packaging *are* radical, and we find:

- Pill-sized nickel-cadmium cells that you can recharge upwards of 500 times.
- Alkaline midgets with nearly 10 times the life of carbon-zinc batteries—and which, unlike the latter, let you all but drain them of their stored energy before their voltage falls below circuit-operating minimum (the so-called "cutoff point").
- "Reserve" cells which lie dormant (you can store them for five years or more), don't perk up or put out voltage until dunked in water; they're ideal for emergency transmitters, alarms, or signal devices.

For every circuit and application, there's a just-right battery size, shape, weight, and volt-ampere life rating. The trick's in knowing which battery when—and why.

Carbon-Zinc Cells. The low-cost, nominal 1.5-volt "traditionals" now come packaged not only in conventional shapes (1½ to about 22½ volts, cylindrical; up to 510 volts, rectangular, in multi-cell packs), but also as flat, midget-sized, and bantam-weight "buttons" and "wafers."

The smallest "buttons" (less than ¼" in diameter) weigh only a quarter of an ounce, yet pack 1½ volts. Some factory-stacked (and packaged) wafer-celled batteries range to 22½ volts. One husky 13.5-volter (Burgess's PM9 transistor "activator") weighs a mere 2½ ounces and is a veritable midget power plant for transistor circuits.



Comparison of service lives for three dry cell types under relatively high current drain typical of a flashlight battery in continuous operation.

Burgess's new rectangular wafers (their corners are slightly rounded) sandwich an artificial manganese dioxide mix between flat discs of carbon and zinc. The sealed sandwich is wrapped in pliofilm. A spot of silver wax on the cell's negative and positive sides provides perfect "wireless" contact, for stacking. Stacked cells (as many as nine to a stack) are wrapped in Mylar insulating film and packaged as round or rectangular dry cells of from 3 to 13.5 volts.

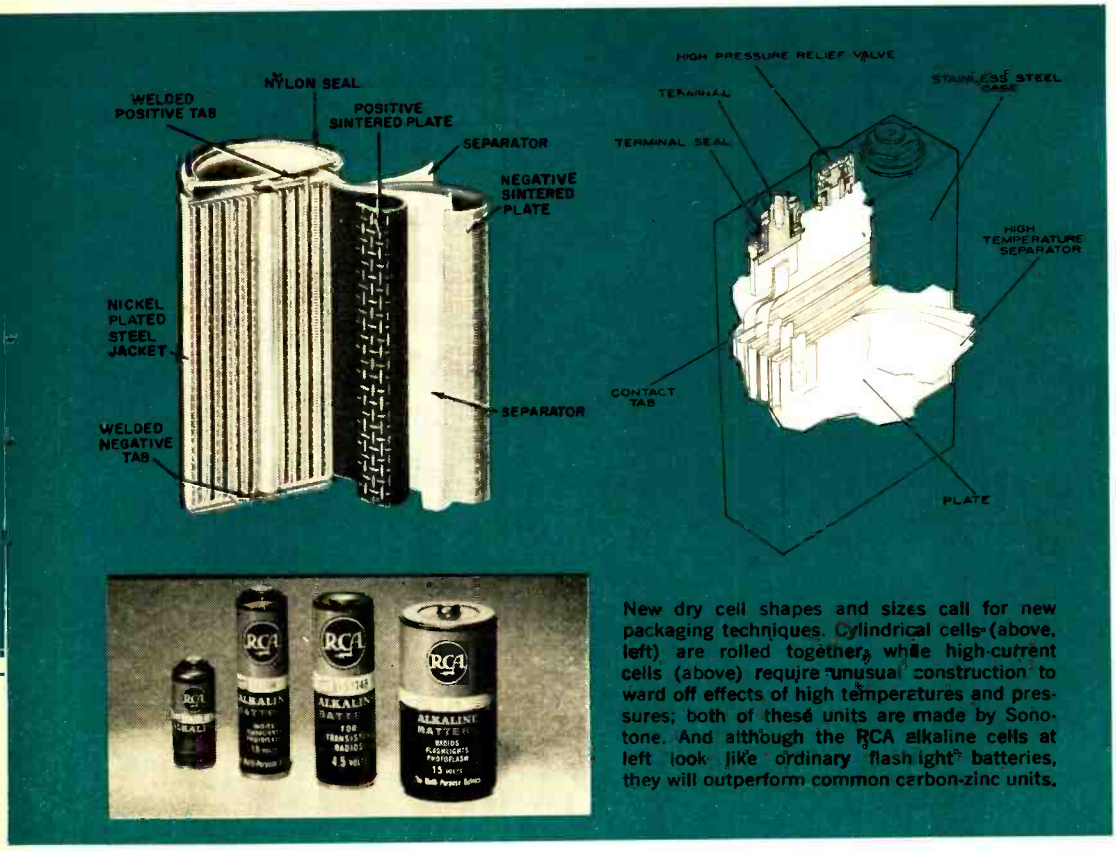
A typical wafer (such as the Burgess 1½-ounce "K" cell, which is 1¼" long, less than 1" wide) can deliver 15 milliamperes for about 14 hours before the cell's nominal 1.5 volts falls to about 0.9 volt, beyond which most circuits won't operate.

Eveready's new carbon-zinc "cathodic envelope" cell for transistorized portable circuits sandwiches the negative zinc plate between *two* flat cakes of depolarizer mix. Encasing this "anode sandwich," and bonded to a plastic envelope sealing the cell, is the cathode collector —a special carbon-impregnated, current-conducting film of plastic and metal foil. Result: greater power, since the electrochemical reaction takes place from *both* sides of the sandwiched zinc anode.

A typical 6-volt "cathodic envelope" (such as Eveready's 2713) weighs only four ounces, and is rated at 140 service hours with a 15-ma. drain.

Carbon-zinc cells, however, have a common failing: their voltage output constantly decreases with current drain. By contrast, some newer dry cells (the alkaline and rechargeable nickel-cadmium types, for example) hold their rated voltage until almost the end of the cell's life span.

According to a well-known dry cell engineer, "you've got to fit your circuit to a just-right battery—and that goes double if it's a carbon-zinc cell you're figuring on as your power source." A typical "life" curve for a carbon-zinc



New dry cell shapes and sizes call for new packaging techniques. Cylindrical cells (above, left) are rolled together, while high-current cells (above) require unusual construction to ward off effects of high temperatures and pressures; both of these units are made by Sonotone. And although the RCA alkaline cells at left look like ordinary flash light batteries, they will outperform common carbon-zinc units.

"D" cell (see graph at left) shows why. Carbon-zinc voltage falls with every milliamp you draw from it . . . and also with temperature.

Suppose the circuit you're building draws 500 ma. Suppose, too, that the components won't operate if battery output falls below 0.8-volt (that is, when the cell's normal 1.5-volt charge is half depleted). This 0.8-volt point is your circuit's "cutoff" or "end point" voltage. (Remember those two terms; they rule your selection when it comes to any battery, especially the carbon-zinc type.)

As the graph indicates, if your circuit is drawing 500 ma., this particular cell's output falls below your circuit's "cutoff" voltage just short of 3 hours of continuous battery use. If, on the other hand, your circuit draws only 2.5 ma., the cell will operate nearly 70 hours before exhaustion.

Obviously, you'll need a battery with longer than a 3-hour life for a 500-ma. circuit. But, for a 2.5-ma. drain, this battery might prove the ideal (and economical) portable power package for you. See the difference? Just "any" dry cell won't do.

Mercury Cells. So named because their positive electrode is mercuric oxide mixed with a conductive material, mercury cells are both more expensive (but not much) and heavier (considerably) than carbon-zinc cells.

Offsetting the slightly lower initial voltage of the mercury cells (1.35 volts compared to 1.5 for the carbon-zinc type) is their relatively *constant voltage output* over much of their service life. You start with less initial voltage, but actually get out more sustained power. In fact, about 80% of a mercury cell's electrical capacity is drained before the "cutoff" is reached, at about 0.9 volt.

One of the smallest mercury "activators" is Burgess's "button" Hg-312—a tiny, ⅓"-dia., steel-encased cell (steel casing is ideal where voltage regulation

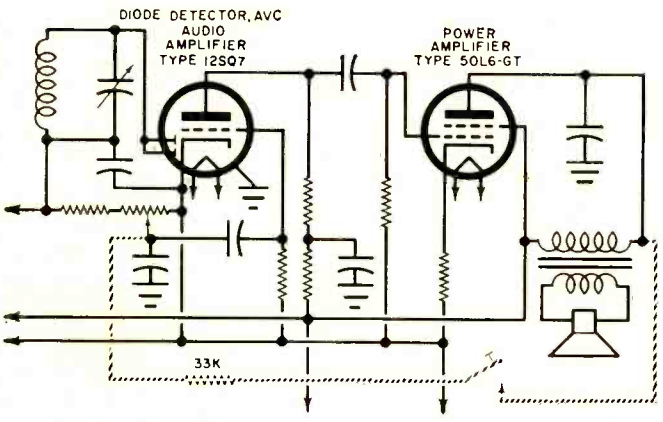
(*Continued on page* 93)

All-American Five Goes CPO

Simple circuit addition lets your receiver double as a code practice oscillator

IT DOESN'T take much effort to get an amplifier to oscillate at audio frequencies. In fact, the audio section of an "All-American 5" home receiver can be converted to a code practice oscillator (CPO) very easily. And the oscillator will have one unique advantage over other types of CPO's—background noise and static on the broadcast band will be heard and will sound much like the "hash" usually received along with transmitted code messages.

The additions to the receiver are simple, as the schematic diagram shows. All that you really need is a 33,000-ohm, ½-watt resistor and some wire; however, adding an open-circuit phone jack will let you remove the telegraph key whenever you wish. With the key open or unplugged, the receiver will operate normally. To use the CPO, just turn on the set, and tune the dial to some point where no stations can be heard. Then depress the key, adjust the volume control for the tone you want, and you're all set to start pounding!



Schematic diagram shows audio stages of an "All-American 5" (solid lines) and added circuit for the CPO (dashed lines).

A word of caution: an "All-American 5" circuit contains no power transformer to isolate it from the a.c. line. So be careful not to come in contact with the leads to the key or the brass parts of the key itself. Also, since the exposed metal parts on the phone jack will be "hot," the jack should be mounted on a bracket inside the cabinet and positioned so that it will be behind one of the existing openings in the rear cover. If an opening must be cut, be careful not to damage the loop antenna.

When the CPO isn't needed, it may be necessary to remove the key to reduce audio hum. —*Howard C. Hall, 5W0564*

"You're ringing the doorbell."

COMING or GOING

By ARTHUR J. DAVISON

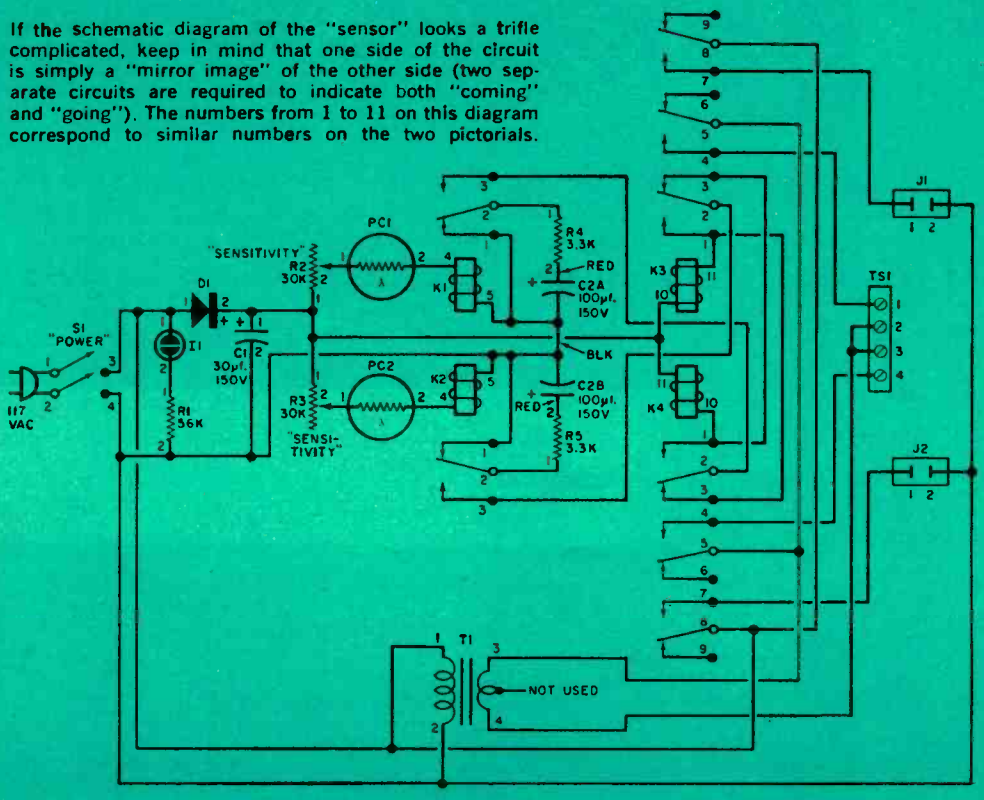
This photoelectric sensing device not only tells you when something is passing in front of it—the gadget will also indicate whether that something is . . . coming or going!

MOST "CUSTOMER-ANNOUNCING" SYSTEMS do a fine job of letting a storekeeper know when someone has passed through his shop door. But suppose the storekeeper's working in back when the signal sounds. Does the clerk in front need help with another customer—or has the original customer gone *out* the door?

This interesting photoelectric device will solve the problem very nicely. Employing twin photocell-and-relay systems, it unfailingly announces the direction of movement of any person or object breaking an associated light beam. You can use it to actuate separate "in" and "out" lamps, a buzzer and bell combination, or whatever else your imagination suggests.

Construction. The components are mounted in a 6″ x 6″ x 6″ utility box having a built-in chassis. Parts placement is illustrated in the photos and diagrams but (except for photocells *PC1* and *PC2*) isn't critical and

If the schematic diagram of the "sensor" looks a trifle complicated, keep in mind that one side of the circuit is simply a "mirror image" of the other side (two separate circuits are required to indicate both "coming" and "going"). The numbers from 1 to 11 on this diagram correspond to similar numbers on the two pictorials.



can be varied to suit your own taste.

For the sake of clarity, most of the wiring has been eliminated from the pictorials. The leads or terminals of all important components, however, are keyed to the schematic diagram by means of matching numbers.

When carrying out the wiring, no special care need be taken with the lead dress; all leads may be routed in the most convenient manner. Install rubber grommets as shown in the pictorials to pass wires through the chassis.

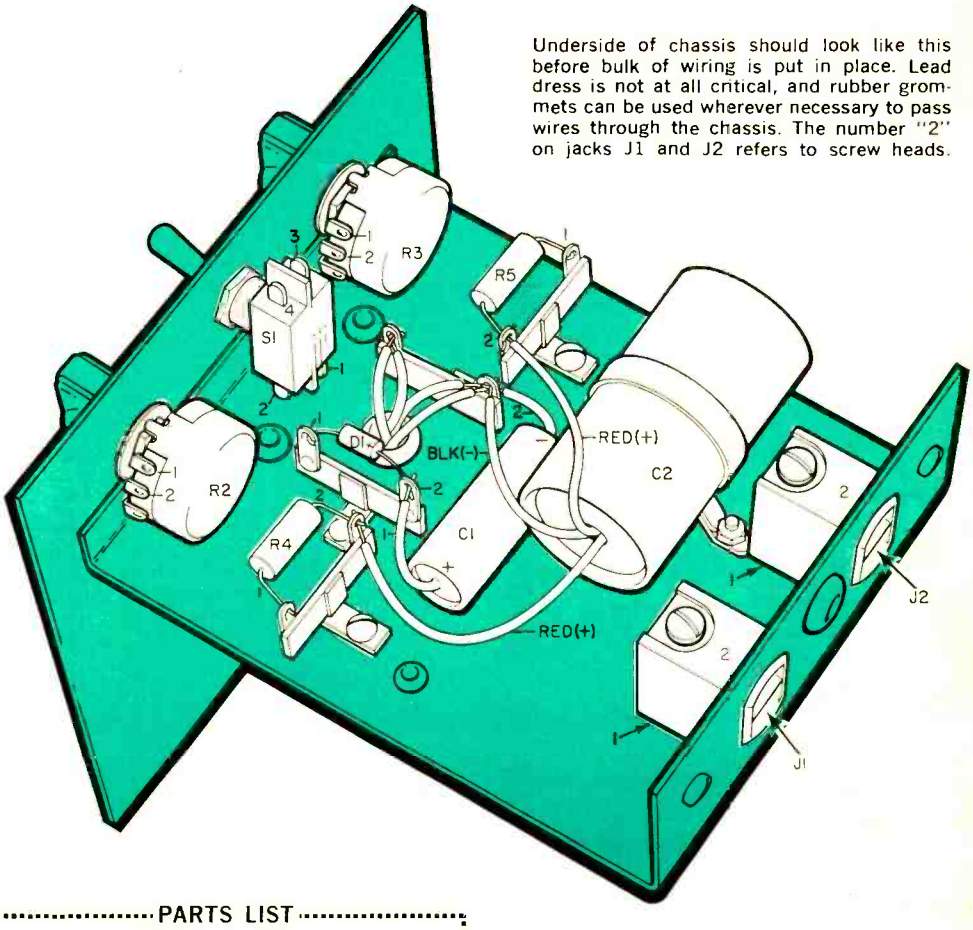
Photocells *PC1* and *PC2* are installed on the box's front panel as shown on page 50. In order to prevent stray light from affecting the photocells, they are set back in 2¼" "wells" made from 9-pin tube shields. These wells are set far enough apart (1¼") so that *PC1* and *PC2* will operate independently.

Note that the shields are press-fitted over shield bases (see Parts List) which have been pushed through holes in the panel. The circular lip at the top of each shield is first sawed off, and slots are cut to clear the shield-retaining bosses on the base. The opening at the other end is slightly enlarged with pliers so that it will fit the casing of the photocell snugly.

The spacing of the pin terminals on the photocells specified for *PC1* and *PC2* is such that any pair of opposite contacts on a 9-pin tube socket will slip over them. This type of socket, then, is used to make the connections to the photocells.

Setup and Adjustment. First provide yourself with a suitable light source. A 6-volt, lantern-type flashlight—among other things—will do the job. If you use such a flashlight, a 6-volt filament transformer can be installed in place of the battery. But be sure that the flashlight's reflector is made of metal rather than plastic. It's possible that transformer heat might warp some plastics.

Aim the light beam so that it crosses the doorway and strikes *PC1* and *PC2*—making sure that the two photocells are



Underside of chassis should look like this before bulk of wiring is put in place. Lead dress is not at all critical, and rubber grommets can be used wherever necessary to pass wires through the chassis. The number "2" on jacks J1 and J2 refers to screw heads.

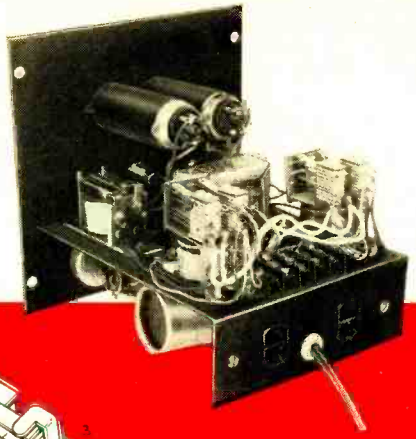
PARTS LIST

C1—30-μf., 150-volt electrolytic capacitor
C2—Dual 100-μf., 150-volt electrolytic capacitor
D1—400-PIV, 750-ma. silicon diode (Lafayette SP-196 or equivalent)
I1—NE-51 neon lamp
J1, J2—Chassis-mounting a.c. outlet
K1, K2—5000-ohm plate relay, s.p.d.t. contacts (Potter & Brumfield Series LB-5 or equivalent)
K3, K4—5000-ohm plate relay, 3-p.d.t. contacts (Guardian "Universal 200" Series; 200-5000 D coil, 200-M5 contact assembly with one pole unused—or equivalent)
PC1, PC2—Cadmium photocell (Lafayette MS-886 or equivalent)
R1—56,000-ohm, ½-watt resistor
R2, R3—30,000-ohm potentiometer
R4, R5—3300-ohm, 2-watt resistor
S1—D.p.s.t. toggle switch
T1—Filament transformer; primary, 117 volts; secondary, 6.3 volts @ 1.0 amp. (Knight 62 G 030 or equivalent)
TS1—4-terminal, barrier-type terminal strip (Cinch-Jones 4-140 or equivalent)
1—6" x 6" x 6" utility case with 4⅞" x 5⅞" x 1¾" chassis (Premier CA-1405 or equivalent)
2—Shield bases for 9-pin miniature tube socket (Cinch-Jones 9SB1 or equivalent)
2—2⅜" shields for 9-pin miniature tube (Cinch-Jones 9SJ3-1 or equivalent)
2—9-pin miniature tube sockets
Misc.—Line cord and plug, rubber grommets, terminal strips, hardware, wire, etc.

illuminated with equal intensity. Then turn on "power" switch *S1*. Neon power indicator *I1* should now glow.

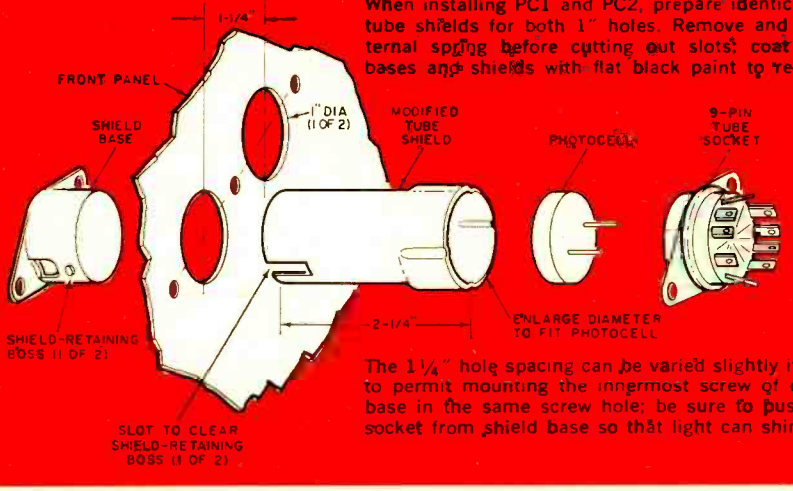
Move both "sensitivity" controls (*R2* and *R3*) to their maximum-resistance positions. Then turn them in the opposite direction until the relays they control (*K1* and *K2*, respectively) pull in—and continue for another quarter-turn. These settings should be about right, but in the first few hours of operation there may be resistance changes in the photocells calling for further reduction in the resistances of *R2* and *R3*.

Now all you have to do is connect the signaling devices. If the photocell unit is placed so that people on the way in will darken *PC1* first, connect the "in" signals to *J1* and/or terminals 1 and 2 of *TS1*. The "out" signals are connected to *J2* and/or terminals 3 and 4 of *TS1*. If people coming in will darken *PC2* first,



Top of chassis is shown above, with much of the wiring still to be done; as in bottom view, numbers here match the numbers on the schematic. At right is rear view of the relay used for K3 and K4.

When installing PC1 and PC2, prepare identical modified tube shields for both 1" holes. Remove and discard internal spring before cutting out slots; coat insides of bases and shields with flat black paint to reduce glare.



The 1¼" hole spacing can be varied slightly if necessary to permit mounting the innermost screw of each shield base in the same screw hole; be sure to push out tube socket from shield base so that light can shine through.

HOW IT WORKS

The a.c. line voltage is rectified by diode *D1* to furnish d.c. for relays *K1-K4*, and capacitor *C1* filters this d.c. voltage well enough to prevent chattering. The coils of relays *K1* and *K2* are each connected, across the d.c. supply, in series with a "sensitivity control" and photocell (*R2* and *PC1*, *R3* and *PC2*).

As long as a light beam strikes the photocells, their resistances remain low, and *R2* and *R3* can be adjusted to pass enough current to pull in *K1* and *K2*, respectively. But if either *PC1* or *PC2* is darkened, its resistance will immediately increase, and the current flow will decrease enough to drop out the appropriate relay.

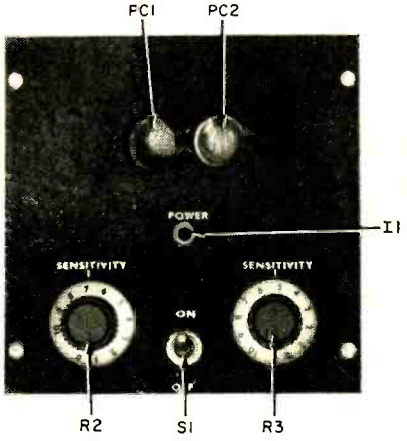
The photocells are so placed that a person walking by them, depending on whether he's coming or going, will darken *PC1* or *PC2* first. If *PC1* is darkened first, *K1* drops out and contacts 2 and 3 of that relay close. This connects capacitor *C2a* and resistor *R4* (through contacts 2 and 3 of *K4*) in series with the coil of *K3* and the d.c. supply.

Current from the supply flows through *K3*'s coil and *R4* to charge *C2a*, and the charging current pulls in *K3*. Since contacts 4 and 5 of *K3* have now closed, the 6.3-volt secondary of transformer *T1* is connected across terminals 1 and 2 of terminal strip *TS1*. In addition, contacts 7 and 8 of *K3* make the a.c. line voltage available across outlet *J1*.

Though contacts 1 and 2 of *K3* also close, this accomplishes nothing until photocell *PC2* is darkened. Then *K2* drops out, closing its contacts 2 and 3. Accordingly, charging current for capacitor *C2b* flows (via contacts 1 and 2 of *K3*) through resistor *R5* and the coil of *K3*—helping to keep the latter relay pulled in.

If the photocells remain darkened, the charging currents for *C2a* and *C2b* will keep *K3* pulled in for about 3 seconds. Therefore, any electrical signaling devices connected to *J1* or to terminals 1 and 2 of *TS1* will operate for that length of time. Should light hit the photocells before the three seconds are up (as is usual), *K1* and *K2* will pull in—dropping out *K3* and cutting off the prior signals. Note that capacitors *C2a* and *C2b* discharge through resistors *R4* and *R5*, respectively—readying themselves for the next cycle—when *K1* and *K2* pull in.

Should *PC2* be darkened first, the reverse situation occurs. Relay *K2* drops out and *K4* is pulled in by charging current for *C2b*. Then as *PC1* is darkened, *K1* drops out—adding the charging current for *C2a* to that already flowing through *K4*'s coil. The result is that 6 volts appears across terminals 3 and 4 of *TS1* and 117 volts appears across *J2*. As before, these signal voltages remain available for about 3 seconds—but will be cut off earlier if light strikes the photocells.



Front panel of the "sensor" is extremely symmetrical, with photocells, pilot lamp, and sensitivity controls arranged in a neatly balanced fashion.

then simply reverse these connections.

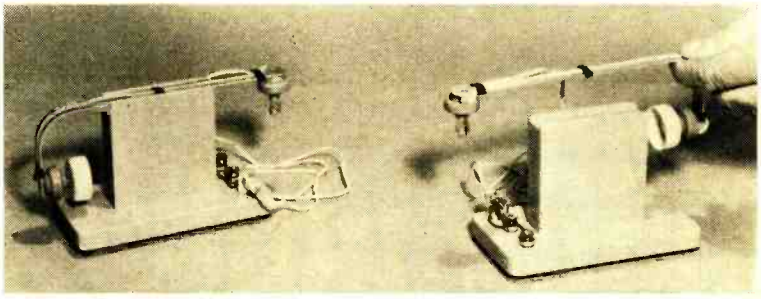
Remember that outlets *J1* and *J2* are for signaling devices (such as illuminated "In" and "Out" signs) which operate on 117 volts. Six-volt devices (such as bells, buzzers, etc.) should be connected to *TS1*.

And there you have it! Chances are you'll stumble across all kinds of interesting applications for this novel alarm. For example, let's say you want to count the number of objects—people, cars, or what have you—passing in one direction only; you just plug a suitable counter into either *J1* or *J2* (depending on whether you want to count them "coming" or "going"), and your problem is solved. Or you can use the gadget to trigger a tape recorder, set up so that it will give one greeting to people coming in and a different message to those going out. Regardless of your specific requirements, one thing is certain: thanks to this little photoelectric "sensor," you'll never again have to wonder whether someone is *coming or going!* —30—

HANDY HANDSET

Sound-powered telephones make superlative yuletide toys

By HAROLD P. STRAND

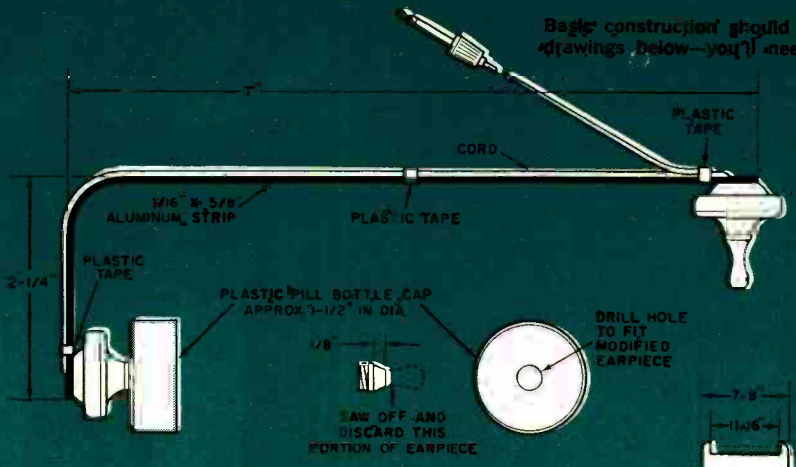


These telephones may not look much like the standard variety, but they have oodles and oodles of practical applications. Room-to-room, basement-to-garage, or wherever you use them, they provide instant communications.

SURE THEY WORK—and you don't even need batteries! What are they? Just a pair of sound-powered telephones that are certain to turn a couple of kids into a pair of happy hooligans for many a fun-time session. And what's the secret? There really isn't any—other than the fact that a crystal earphone will work as either an earphone or a microphone, depending on whether you talk or listen. Connect two such units in series, attach them to a suitable support so that you can hold one to your ear and the other to your mouth, and you have the main elements of this setup.

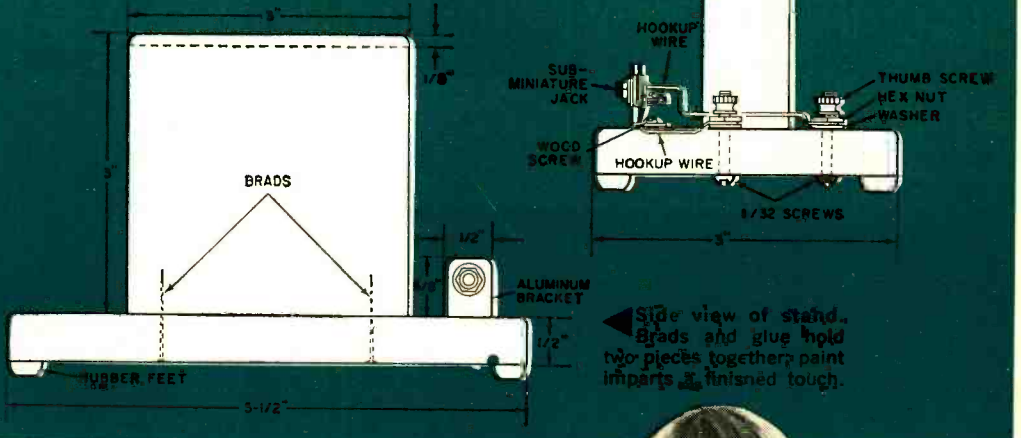
As you can see from the photos and drawings, the handles for the handsets are strips of aluminum which have been bent into the required shape. The bases are made of wood, and almost anything will do for the jacks and connectors. To put the telephones in operation, just connect them together with up to 100 feet of twin or twisted wires, and start talking. Happy holidays! -30-

Basic construction should be evident from the drawings below—you'll need two of everything.



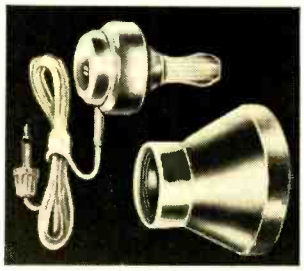
The phones are attached to the aluminum strip with machine screws, then connected in series. Mouthpiece can be made from plastic bottle cap, or you can purchase one that screws on.

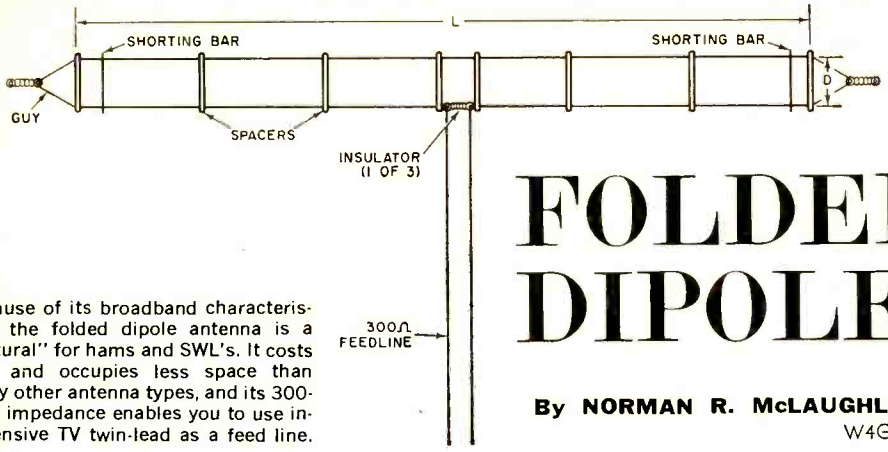
End view of the wooden telephone stand shows how screw terminals and subminiature phone jack for plug on handset are mounted and wired. A set of four crystal earphones along with 100' of interconnecting wire is available from John Meshna, Jr., 21 Allerton St., Lynn, Mass., for $4.00, postpaid.



Side view of stand. Brads and glue hold two pieces together; paint imparts a finished touch.

A crystal earphone with interchangeable earpiece and mouthpiece can save you the trouble of making your own mouthpiece as outlined above. This inexpensive unit is Lafayette's MS-439.





Because of its broadband characteristics, the folded dipole antenna is a "natural" for hams and SWL's. It costs less and occupies less space than many other antenna types, and its 300-ohm impedance enables you to use inexpensive TV twin-lead as a feed line.

FOLDED DIPOLES

By **NORMAN R. McLAUGHLIN**
W4GJR

ONE of the most satisfactory antennas for hams *or* SWL's, the folded dipole has been around for a good many years. And with good reason —it's easy to build, easy to match to a feed line, and fairly inexpensive. Most important, it responds to a relatively broad range of frequencies—once adjusted for the center of an SWL or ham band, it will give equally good performance over the entire band.

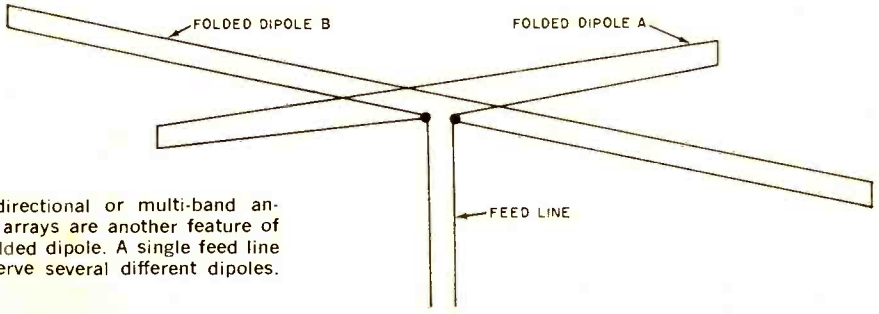
As its name implies, a folded dipole is simply a dipole with another dipole "folded" right back over it (see drawing above). Interestingly enough, adding this top wire increases the impedance of the antenna by a factor of slightly less than four. And since the impedance at the center of a simple dipole is about 70 ohms, the multiplication factor of four raises the impedance of a folded dipole to approximately 300 ohms—perfect for inexpensive 300-ohm TV twin-lead.

The necessary dimensions for putting together your own dipoles appear in the table on page 95, with measurements computed for the approximate center frequency of each band. Dimension D on the drawing isn't especially critical and can range from 1″ to 8″.

Number 12 or 14 enameled wire should be used for the antenna proper, and it's important to stick to the same size wire throughout. A lightweight material such as Lucite will be satisfactory for the spacers if you are unable to obtain ready-made spacers of the proper size.

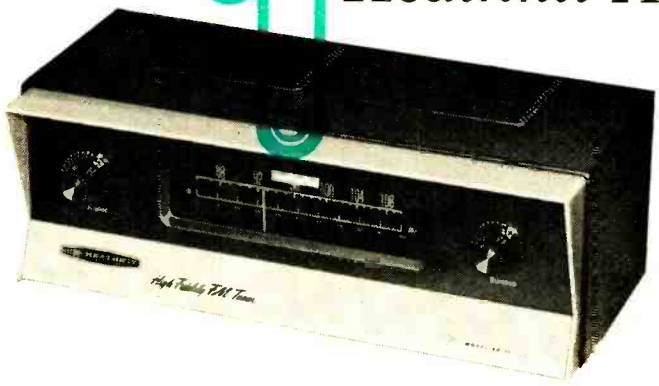
It's easiest if three men work together to install the antenna—one man at a VSWR bridge, and the other two at either end of the antenna.

(*Continued on page* 95)



Multi-directional or multi-band antenna arrays are another feature of the folded dipole. A single feed line can serve several different dipoles.

Add an ELECTRONIC TUNING INDICATOR to your Heathkit AJ-31



IT'S well known that FM sets are a bit more difficult to adjust for optimum reception than their AM counterparts. And for this reason, many FM units come equipped with some variety of visual tuning indicator. If they don't, it's often a simple matter to add one.

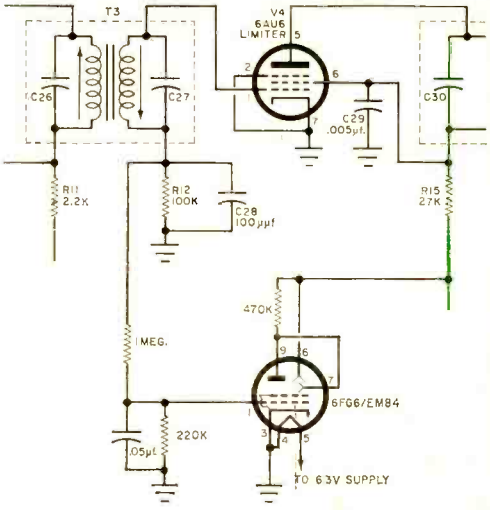
The conversion described here uses the sensitive and easy-to-install 6FG6/EM84 indicator tube, and was carried out on a Heathkit AJ-31 FM tuner. The principles involved, however, apply to many other FM tuners and receivers.

Mounting Indicator Tube. The 6FG6/EM84 is mounted on the rear of the set's dial backing plate and a 1" x 1/8" window is cut in the plate so that the tube's "indicator line" can be viewed from the front. It will be necessary to remove the backing plate to make these

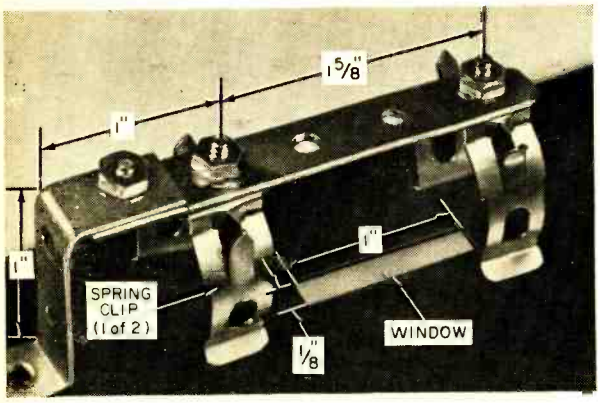
By CHARLES S. VALLONE

PARTS LIST

1—220,000-ohm, ½-watt resistor
1—470,000-ohm, ½-watt resistor
1—1-megohm, ½-watt resistor
1—0.05-μf., 200-volt paper capacitor
1—6FG6/EM84 tube
Misc.—Bracket and socket for tube, terminal strip, wire, etc.



Schematic diagram shows how tuning indicator circuit is connected to AJ-31. All added components and wiring are found in the colored section.



Viewing window and homemade bracket for indicator tube are seen in this photo of rear of dial plate. Bracket is soldered, rather than screwed, in place because screw heads would be visible behind dial.

modifications, of course, and in the case of the AJ-31 this means first disconnecting the a.f.c. switch, removing the volume control, and unstringing the dial cord.

As can be seen in the photograph of the rear of the plate, the author made a bracket for the tube from some metal strapping (about 3/8" wide) and a couple of spring clips. You can duplicate the bracket illustrated or improvise one of your own.

Locate the bracket and window so that the indicator line will be visible behind the upper center of the dial glass after the tube is installed and the dial is put back together. You won't be able to screw the bracket to the backing plate because the screw heads would show; the bracket can be soldered in place instead. Once the above modifications are complete, the dial plate and other components can be reassembled.

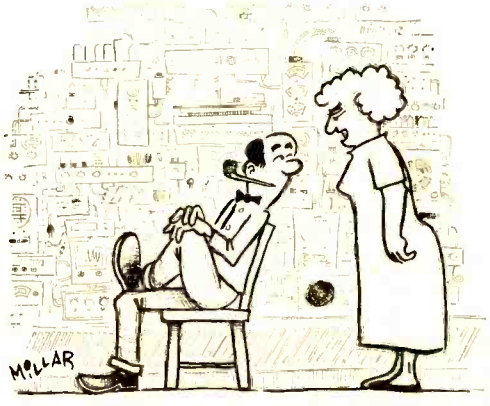
Electrical Connections. The schematic diagram shows how the 6FG6/EM84 tube and its associated components (colored portion of diagram) are connected to the circuitry of the AJ-31. Notice that the "signal voltage" for the control grid of the tube is picked up from the junction of *R12*, *C28*, and the bottom secondary lead of *T3* (the last i.f. transformer preceding the limiter stage).

If your set is not an AJ-31, but has an analogous junction, make this connection in the same way; in the event that there is no similar junction, don't try to use this indicating circuit. The only other connections (besides the various grounds) to the set are those from pin 6 of the 6FG6/EM84 to the bottom of *R15* (or to any other approximately 250-volt point on the B+ line) and from pin 5 to the 6.3-volt heater line.

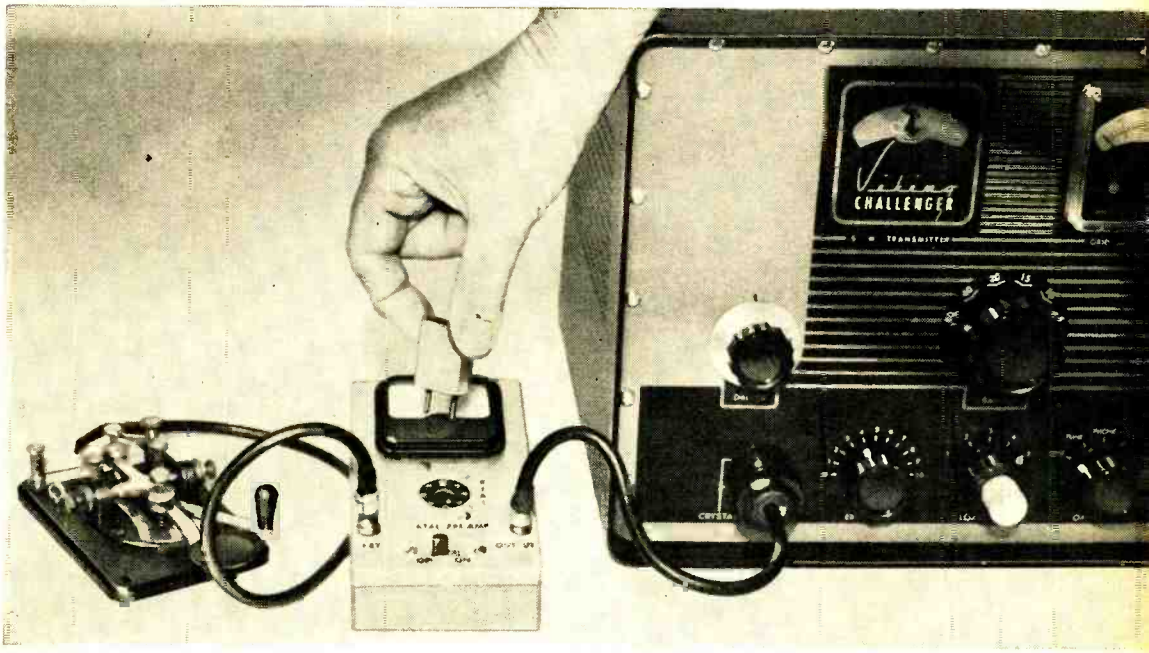
When wiring up the circuit, place the 470,000-ohm resistor on the indicator tube socket and locate the other two resistors and the capacitor under the chassis. A two-lug (one grounded) terminal strip will support the 220,000-ohm resistor, the capacitor, and one side of the 1-megohm resistor. The latter should be as close to the i.f. transformer to which it is connected as possible, so locate the terminal strip accordingly.

With all the connections made, plug the 6FG6/EM84 into its socket and slide the tube-and-socket assembly into the bracket. Adjust the tube so that the indicator line shows through the window, and the installation is complete.

If you find that the tube responds only to the strongest signals, try reducing the value of the 1-megohm resistor. Conversely, if the tube gives too much of an indication even on weak signals, increase the value of the resistor. —30—



"Why can't you go out nights like other men?"



Preamplifier for "Lazy" Crystals

By I. C. CHAPEL

SOMETIMES construction projects are "born of necessity." In this case, the author had some 40- and 80-meter quartz crystals which were known to be good but which just would not excite the oscillator tube of his transmitter. And so this little "preamp" was designed to make use of them.

The unit is actually an oscillator circuit in its own right. But it imposes a lighter-than-usual load on the crystal—a circumstance that will allow even the "laziest" of crystals to oscillate.

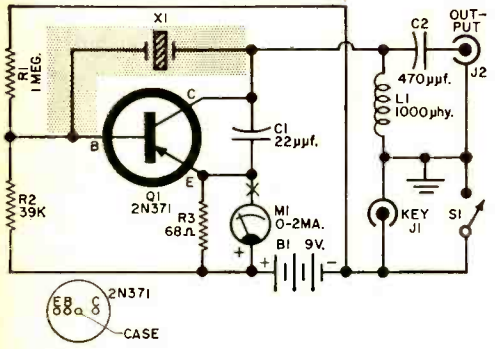
When you're not using the preamp with your transmitter, you can press it into service as an end-of-band marker for your receiver or even as a code-practice oscillator (see "Operation" section).

Construction. The oscillator circuit is housed in a 5½" x 3" x 1¼" aluminum utility box. Mount the parts as shown in the pictorial diagram and photos. Wiring is not critical, but it's a good idea to keep all leads as short as possible.

Note that an octal socket serves both as a socket for an FT 243-type crystal (pins 1 and 3) and as a 4-lug terminal strip (pins 2, 4, 5, and 6). You might want to seal up the openings for all but pins 1 and 3 with glue to prevent accidental insertion of the crystal in the wrong place. Crystals with other than FT 243-style pin spacing can be accommodated by using adapters.

Meter *M1* is a 0-2 ma. unit the author had in his spare parts box. A 0-1 ma. meter can be used instead if you insert a 470-ohm resistor (½ watt is fine) in series with it at the point marked "X" on the schematic diagram. The meter serves only to indicate whether the crystal is oscillating and to measure its relative activity—so the calibration isn't important.

No transistor socket is used, and it will pay you to employ a heat sink while soldering *Q1*'s leads in place. Though a



Meter M1 will read approximately mid-scale when crystal X1 (gray area) causes circuit to oscillate.

PARTS LIST

B1—9-volt battery (Burgess 2U6 or equivalent)
C1—22 μμf. } ceramic or mica capacitors,
C2—470 μμf. } voltage not critical
J1, J2—RCA-type phono jack
L1—1000-μh. r.f. choke (Millen 1300-1000 or equivalent)
M1—0-2 ma. meter (or 0-1 ma. meter with 470-ohm resistor—see text)
Q1—2N371 transistor (RCA or Sylvania)
R1—1 megohm } ½-watt, 10%
R2—39,000 ohms } resistors
R3—68 ohms }
S1—S.p.s.t. switch
X1—80- or 40-meter crystal to be "preamplified"
1—5½" x 3" x 1¼" aluminum utility box (LMB 139 or equivalent)
Misc.—Octal socket, battery connector, cables for output and key, etc.

2N371 transistor is specified for *Q1*, the circuit was tested satisfactorily with both a 2N372 and a 2N374. Either of the latter two types will do the job.

Operation. Just run a cable from jack *J2* to the VFO input of your transmitter, plug the "lazy" 40- or 80-meter crystal into pins 1 and 3 of the octal socket, and turn on *S1*. An indication on *M1* means that the crystal is oscillating properly.

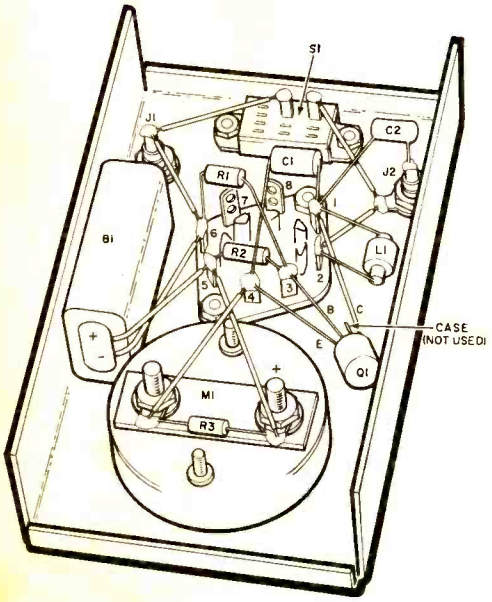
Now, tune up your rig as usual, and you're ready to transmit. For CW operation, open *S1* and plug your key into *J1*.

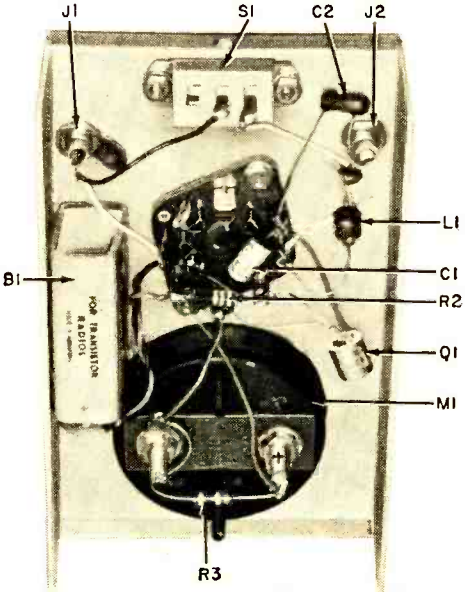
The preamp should supply plenty of drive with the 9-volt battery specified. If it does not, the voltage can be increased to 12 or 13 volts without harming the transistor.

Though no "on-off" switch, as such, is provided, the drain on *B1* is only a few microamps with *S1* open. Therefore, the battery can be left permanently connected, and you won't have to worry about running it down. The drain with *S1* closed is on the order of 10 ma.

To use the preamp as an end-of-band marker, just insert a crystal of appropriate fundamental (or harmonic) frequency and turn on *S1*. You can then tune in the signal on your receiver. To practice code, plug a key into *J1* and turn on the receiver's BFO. —30—

Placement of parts is not critical but it is advisable to follow layout shown in pictorial and photograph. Unused terminals on tube socket serve as tie points.





FLIP FLAP

or THE BIRD, SAM, HENRI, AND I

By SINCLAIR

Drawings by the Author

IT WAS three o'clock Sunday morning. Cautiously I turned the knob and let myself into my brother's room. Muffling my footsteps with huge slabs of foam rubber, I padded silently past Sam's sleeping silhouette and reached the workbench. My prize lay in the clear plastic box marked: *Silicon-Controlled Rectifier*. As my hand approached the treasure, I inadvertently caused the detuning of a resonant circuit secreted away in the bowels of the workbench. Sam's burglar alarm!

With the click of a relay, the room lights went on full, bells clanged, and from somewhere under the bed a tape recorder began to repeat endlessly: "Hands up, gotcha covered, hands up, gotcha covered . . ."

Sam slowly sat up, rubbing his eyes, and I knew that a rapid retreat was of the utmost urgency. Bounding across the room in great leaps, thanks to the foam rubber footpads, my clawing hands discovered that the door had been electrically bolted by the fiendish alarm.

"Ahah! Ouch, ouch, ouch," Sam cried, leaping out of bed and onto the handful of carpet tacks I had scattered to facilitate my escape. "Thief!" he screamed, leaping back on the bed and pulling tacks from his feet. "You pirate," he fumed, searching for his shoes, "I'll teach you to try swiping parts from my stock."

Sensing my opportunity, I swiftly bounded to the foot of his bed, swept away his brogans, and lunged back before he could parry with the whip antenna of his hand-held R/C transmitter. "Simmer down, Sam," I said, tossing him a box of Band-Aid's. "I only wanted one lousy rectifier to finish up a switching circuit I built last night."

"You expect *me* . . . ," he laughed, gesticulating with an adhesive bound foot, ". . . to give *you*, a hi-fi nut, my only silicon-controlled rectifier? You must be soft in the head, kid. That was the last one at the parts store. It'll take them weeks to get another! Anyway, you wouldn't know how to use such a sophisticated component in that idiotic electronic grab-bag you call a hi-fi system."

"Fie!" I spat. "At least I don't waste my time making toy airplanes that

either crash or fly away, never to be seen again. High-fidelity sound reproduction is a mature and exciting hobby, not for clods like you."

"Hi, fi, fo, fum," he retorted, stepping gingerly from his bed to the top of the workbench. "You couldn't build a radio-controlled kiddy car; R/C is a hobby that requires patience and craftsmanship." Sam inched his way along the bench-top.

"Izzat so, izzat so?" I replied brilliantly. "Listen, Sam, I could build a ship that would fly rings around any of those crates you call airplanes."

Sam stepped carefully onto an electronics magazine he had thrown to the floor. Using magazines as stepping stones across the river of tacks, he made his way toward me.

I had to think fast. "How about a little wager, Sam? Two dozen assorted capacitors says I can outfly you."

"Done!" Sam stopped in mid-step. "You pick the place and don't forget to bring along the capacitors. I can use them in a new pulser I'm building." Sam resumed his stalking. "But now to teach you to keep out of my equipment."

As Sam closed in, the hand of fate interceded. Preparing to eat his lunch, the night custodian at the power station took off his coat and hung it on the main breaker handle. In the ensuing moment of darkness, I heard the relays in Sam's alarm drop out, and the door yielded to my frantic tugging. Bounding down the hall, I heard Sam scream as he floundered in the dark and came down hard on the few remaining tacks between him and the door.

THE NEXT FEW DAYS were spent re-acquainting myself with balsa wood and airplane dope. Since I had dabbled in model building in my younger days, I soon had my craft ready to fly. Late one evening, as I was putting the final touches on the actuator installation, Sam bumbled into my room to view the progress.

"Holy moly!" he exclaimed, grasping the door jamb for support. "What in the name of Walter A. Goode is that contraption?"

"That, my ill-informed brother, happens to be an ornithopter, or flapping-wing craft," I held my creation aloft, ". . . modeled after one of nature's finest flying creatures, the pigeon . . . in this case, Henri." I pointed to a corner of my bench where Henri, perched on a defunct tone arm, was preening his feathers and cooing softly.

Sam sat on the floor rubbing his still-bandaged toes. "You think that mechanical bird can outfly one of my R/C ships?" Sam guffawed loudly, causing Henri to flutter nervously to the bed post. "I don't see any glow plug engine. How is it going to fly? With rubber bands?"

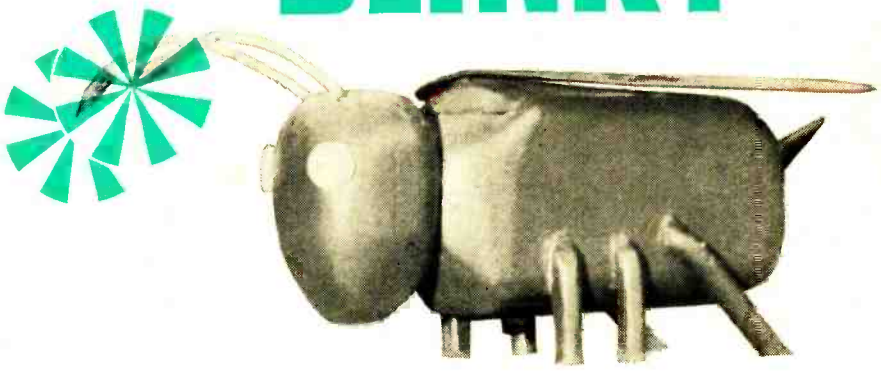
"My dear demented brother," I began, "you are so set in your ways that any innovations in your field are bound to be greeted with ridicule. The motor is electric, powered with nickel-cadmium cells, and located inside the fuselage at the optimum position for power transmission. You might also be interested in the circuitry with which I intend to control this bird." I unrolled the schematic diagram of my control circuits.

Sam was obviously awed as I proceeded to explain the schematic. "As you can see, the receiver front-end is conventional, that is, a crystal-controlled, double-conversion superhet with r.f. preselection. This, then, feeds my control signal—a series of variable audio tones—to a discriminator and hence to the integrated, negative-feedback servo system which I have patterned after the muscle structure of my feathered friend."

"Good grief!" Sam sputtered. "That circuit looks like a cross between a CB

(*Continued on page 89*)

BLINKY



Introducing "Blinky," the nite-light blinking bee

By WILLIAM H. MINOR

HERE'S a little project that's sure to keep the youngsters amused for hours and hours. About 9″ from head to tail, this busy balsa "bee" will blink continuously for over a year on one set of batteries. Blinky's operation is based on two neon-bulb relaxation oscillators, housed in the bee's hollow body.

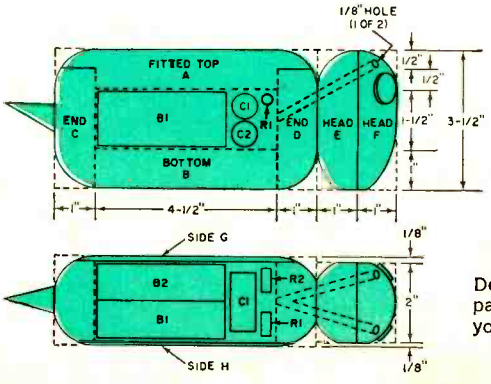
Construction. Cut all the balsa wood pieces to the dimensions given in the Bill of Materials. Then cement the body (B, C, D, and H) together as shown in the drawings. You can also cement E and F together for the head at this time, but don't attach it to the body yet. When the body cement has dried, fit the top (A) snugly to the body.

The next step is shaping. Cut and sand the hollow balsa body as indicated in the detail drawings. Follow the same procedure with the head and cement it to the body. This done, locate the spots where the two antennae will be and drill a 1/8″ hole for each one. Now, using the two 3″ x 8″ x 1/8″ pieces of wood, form and sand the wings; shape them according to your own design, and then cement them onto the top.

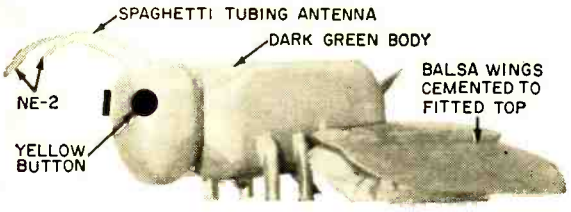
Cement the square legs in place next, carving and sanding them round after they dry. To make Blinky stand evenly on all six legs, place a sheet of sandpaper on a flat surface and sand all the legs at the same time. Dope, paint, and sand the body, and the "handicraft" part of the job is finished.

Wiring. Solder about four inches of No. 20 insulated wire to each lead of the neon bulbs and draw the two leads of each bulb through a strip of spaghetti tubing. Now feed the spaghetti from each bulb through its respective hole in Blinky's head, leaving a few inches protruding for the antennae.

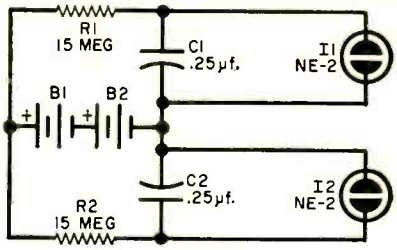
Wire the capacitors, resistors, and



Detail drawings show how the major parts are put together. You can use your imagination for the tail and eyes.



"Blinky" is shown here with his winged, fitted top removed for insertion of the batteries, capacitors, and resistors.



Two neon-bulb relaxation oscillators comprise the circuitry of the blinking bee.

BILL OF MATERIALS

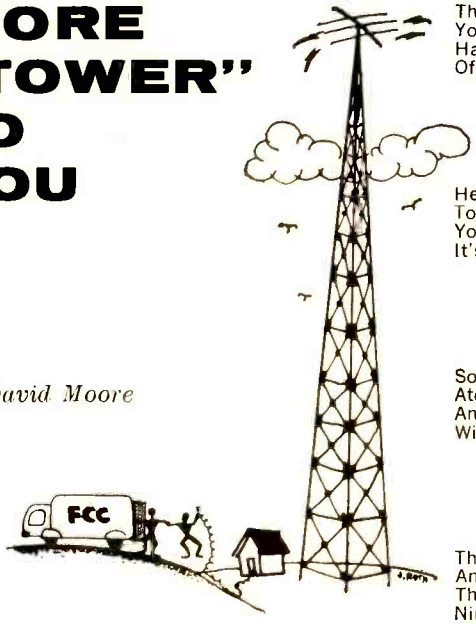
1—24" piece of 1" x 2" balsa wood, cut into:
1—6½" piece for the top (A)
1—4½" piece for the bottom (B)
2—3" pieces for the ends (C and D)
2—3½" pieces for the head (E and F)
1—29" piece of ⅛" x 3½" balsa wood, cut into:
2—3½" x 6½" pieces for the sides (G and H)
2—3" x 8" pieces for the wings
1—18" piece of ½" x ½" balsa wood, cut into:
6—3" pieces for the legs
B1, B2—67½-volt batteries (Eveready 416 or equivalent)
C1, C2—0.25-μf., 200-volt capacitor (Cornell-Dubilier DPMS2P25 or equivalent—see text)
I1, I2—NE-2 neon bulb
R1, R2—15-megohm, ½-watt resistor—see text
2—Strips of ⅛"-diameter, 3½"-long spaghetti tubing
Misc.—Wire, cement, model airplane paint, sandpaper, etc.

batteries, and connect the leads of the neon bulbs as shown in the schematic diagram. The bulbs should start to blink immediately at the rate of one per second. (Due to the limited amount of space in Blinky's hollow body, *C1* and *C2* should not exceed ¾" in diameter and 1½" in length, while *R1* and *R2* should be no larger than ¼" in diameter and ¾" in length.)

Finally, place the batteries and other electrical parts carefully into the body cavity, and install the top. Don't worry about an "on-off" switch—the balsa bee will continue to blink for the shelf life of the batteries. —30—

MORE "TOWER" TO YOU

By David Moore



The CB man this day and age,
You usually will find,
Has equipment in his shack
Of every size and kind.

He has scopes for checking output
And a bridge for standing wave.
He's got to keep his power up—
Those five watts he must save.

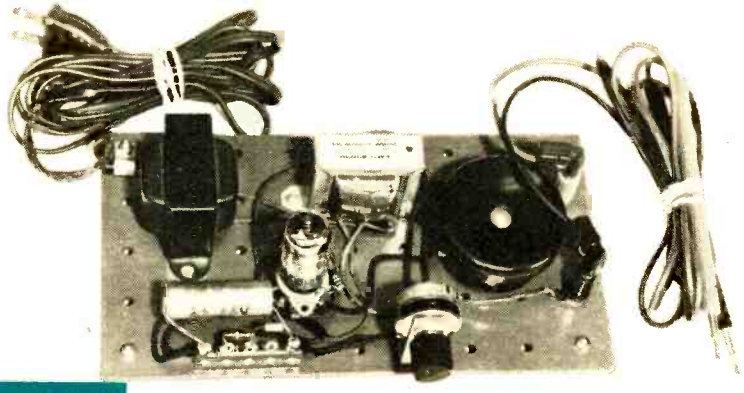
He's got to punch through QRM
To contact Warehouse Two.
You'll find the building down the street—
It's hardly out of view.

Yes, this chap's a perfectionist.
He keeps on with his quest
To improve his CB setup
And to make his signal best.

So naturally he stacks his beams
Atop his home-brew tower.
And, of course, the fourteen elements
Will multiply his power.

However, you're not going to hear
His signal any more.
From his tall tower he must chop
Off sections three and four.

The FCC has grounded him,
And here's the reason why:
Though our friend's tower was mighty fine—
Ninety feet is just too high!

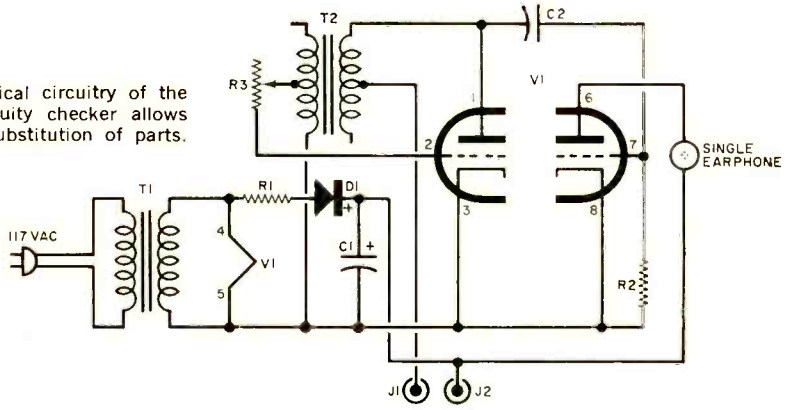


AURAL CONTINUITY CHECKER

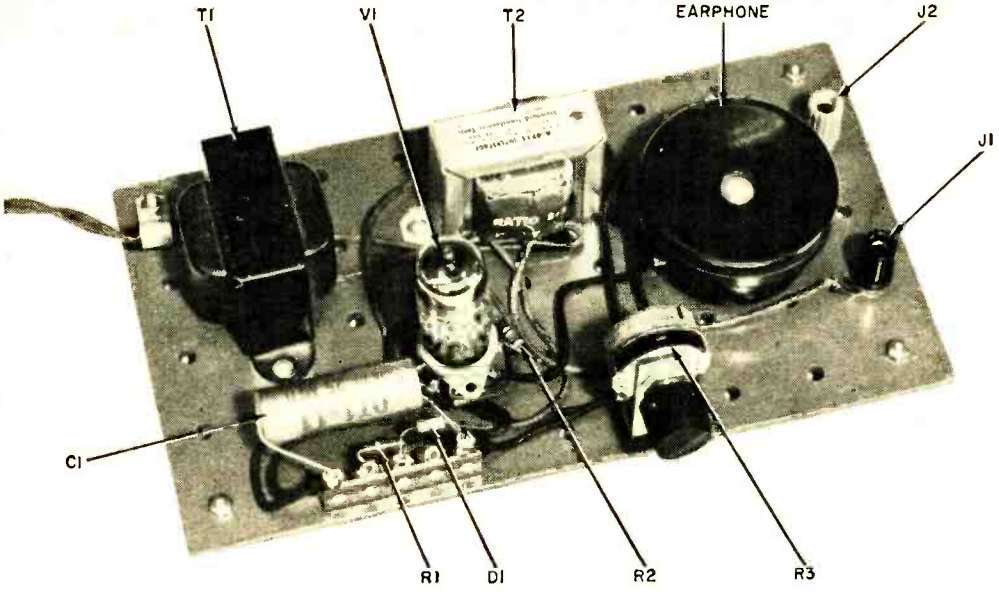
By PHILIP E. HATFIELD, W9GFS
Receiving Tube Dept., General Electric Co.

THOSE OF YOU who have used an ohmmeter for continuity checks know that it is sometimes desirable to have "two heads." After all, how else can you keep your eyes on the meter scale and the test probes at the same time? The answer is that you don't have to—if you use your eyes *and* your ears. With an aural continuity checker, you can keep your eyes on the test probes and *listen* for the "sound" of your circuit.

A number of aural continuity checkers can be constructed but they have certain faults. If you build a checker that employs a dry cell in series with a headphone, you'll find it difficult to distinguish between an open circuit and a capacitor. If you use a buzzer and a dry cell, you can remedy this defect, but the



The non-critical circuitry of the aural continuity checker allows for broad substitution of parts.



With four rubber feet on the bottom of a 5" x 9" pegboard and all the parts on top, the checker can either be hung on a wall or left on a workbench top.

PARTS LIST

C1—25-μf., 25-w.v.d.c. electrolytic capacitor
C2—0.005-μf. paper, ceramic or mica capacitor
D1—1N34A diode (or equivalent)
J1, J2—Five-way binding post (Superior DF30BC or equivalent)
R1—150-ohm, ½-watt carbon resistor
R2—470,000-ohm, ½-watt carbon resistor
R3—250,000-ohm potentiometer
T1—Filament transformer; primary, 117 volts; secondary, 12.6 volts @ 0.15 amp (Triad 3F77S or equivalent)
T2—Audio transformer—see text
V1—Dual triode—see text
1—5" x 9" pegboard
Misc.—Phone jack, pair of test leads, line cord and plug, 5-lug terminal strip, bracket for pitch control, 9-pin miniature tube socket, hardware, etc.

high current required by the buzzer will probably damage some of your parts. With the unit described here, however, you won't encounter these problems. Better yet, you'll probably have the necessary components right on your bench.

This device will enable you to distinguish between a large electrolytic capacitor and a continuous circuit, and will also give you an idea of the magnitude of the resistance in the circuit being tested. The checker operates with a very low current, preventing possible damage to circuit parts.

Construction. Neither parts nor layout are critical. The unit is built on a 5" x 9" pegboard (any suitable board will do), with rubber feet attached at the four corners. A single earphone is mounted directly on the board, but for noisy locations you might want to install a phone jack to accommodate a pair of headphones.

The author used a push-pull interstage audio transformer for *T2;* however, any single-ended audio transformer will do the job provided that the winding impedances are greater than 5000 ohms (such as the Stancor A-53). And you have a choice of a 12AT7, 12AU7, or 12AX7 for *V1.*

Checking Out the Checker. Plug in the unit and, after a suitable warm-up period, touch the leads together. A tone will be heard in the earphone, the pitch of which you can adjust by varying *R3.* If no tone is heard, reverse the leads or either winding of *T2.*

Make continuity checks just as you would with an ohmmeter, but now listen for an audible tone to denote a continuous circuit. To estimate the magnitude of the circuit's resistance, compare this tone to the tone obtained by shorting the test leads. In the author's model, a resistance of about 1.1 megohm gave a low—but still audible—tone. If there is a capacitor in the circuit, the tone should sound and then die away. The time length of the tone is dependent upon the capacity. —30—

BEAM ON WILDLIFE

Brer Rabbit's nocturnal habits come to light with the aid of RDF and midget transmitters

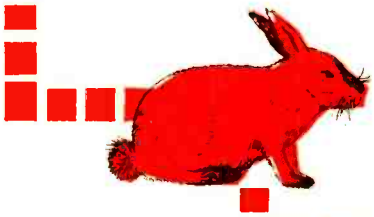
By DUANE VALENTRY

DOWN IN THE EARTH a rabbit stirs, wakened by the timepiece with which nature equips all of its wild creatures, and ventures out to forage for food. A short distance away, two men note that the rabbit is emerging at 5 p.m. for a night of feeding that will end about 7 a.m.

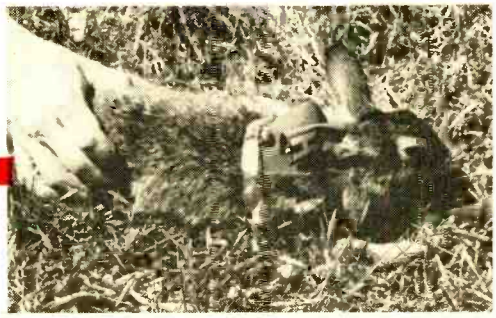
Brer Rabbit doesn't know it, but his every move is being closely monitored by means of a radio transmitter attached to the collar around his neck. No bigger than a thimble, the transmitter weighs less than an ounce—including its built-in battery which supplies power for as long as four months. The transmitter's flexible antenna, encased in plastic, fits around the animal's body and is an integral part of the harness holding the tiny transmitter. A radio direction finder up to two miles away keeps tabs on the bunny's hops and hips.

Cottontail snooping is not a hobby to pass the time with but a serious research project undertaken by William Cochran, electronics engineer in the University of Illinois engineering department, and Rexford D. Lord, Jr., research associate in the Illinois State Natural History Survey located on the campus. Since the two began their experiments, new information on

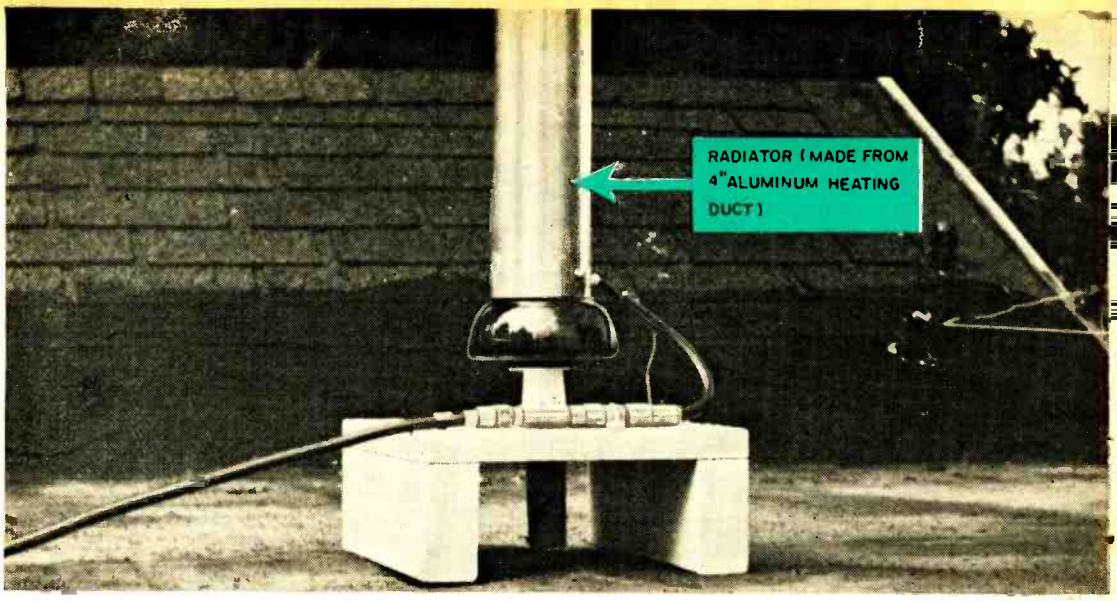
(*Continued on page* 92)



University of Illinois photos



Rexford D. Lord, Jr. (above, left), and William Cochran (above, right) use RDF with 2-foot loop antenna to track wired rabbit (at right).



Base-Insulating Your

By **HOWARD S. PYLE,** W7OE

THOUSANDS OF HAMS find the insulated-base vertical radiator an ideal solution to their antenna problems. But, while the radiating element can be made of water pipe, electrical conduit, aluminum tubing, "rain-gutter" pipe, or even aluminum irrigation piping, the choice of material for the base and base-insulator is often not quite so obvious.

Before we illustrate how easy it is to design an effective base-insulating system, a few things about the construction of vertical antennas need to be reviewed. First of all, the most popular height for a vertical is in the neighborhood of 33 feet. This makes a half-wave antenna for the 20-meter band, a quarter-wave for 40 meters, and an eighth-wave (or, with suitable loading, a quarter-wave) antenna for 75 - 80 meters.

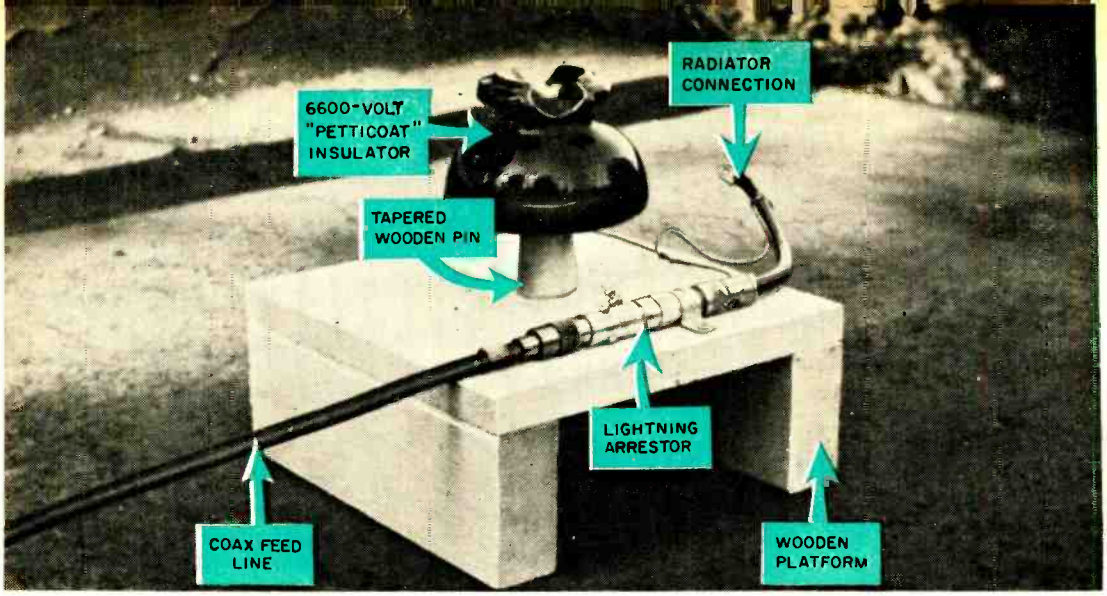
Any vertical piece of tubing 33 feet long, of course, must be guyed. And, while it's not within the realm of this article to discuss guying methods, it should be mentioned that guy wires must be broken up into short electrical lengths by means of insulators (the small "goose-egg" or "airplane" type is most commonly used). Generally, each guy has one insulator near the radiator, one in the center, and one at bottom.

The point we'd like to make here, though, is that the necessity for guy wires is actually an asset when it comes to picking out a base-insulating system. Most of the horizontal stresses caused by the weight of the radiator and the winds are taken up by the wires, the insulator merely acting as a vertical support. This being the case, the insulator need not have great mechanical strength and need not be firmly anchored to the foundation on which it stands.

Constructing the Base. The first thing you need for your base-insulating system, naturally, is a base. As illustrated in Figs. 1 and 2, this can be a very simple structure—but it should be made of cedar, or some similar weather-resistant wood. And for further protection from the weather, the base should have two coats of outside paint or varnish.

If you can toe-nail your base into the roof or into some other rigid surface, the design of Fig. 1 is a good one. It's nothing more than a 10″ square of 1″ x 10″ stock supported on two 2 x 4's. Use 8-penny nails both to put the base together and to fasten it to the roof. A hole for the insulator, if necessary, is made in the center of the square.

Should you have reservations about



Photos point out details of W7OE's unusual vertical antenna.

Vertical

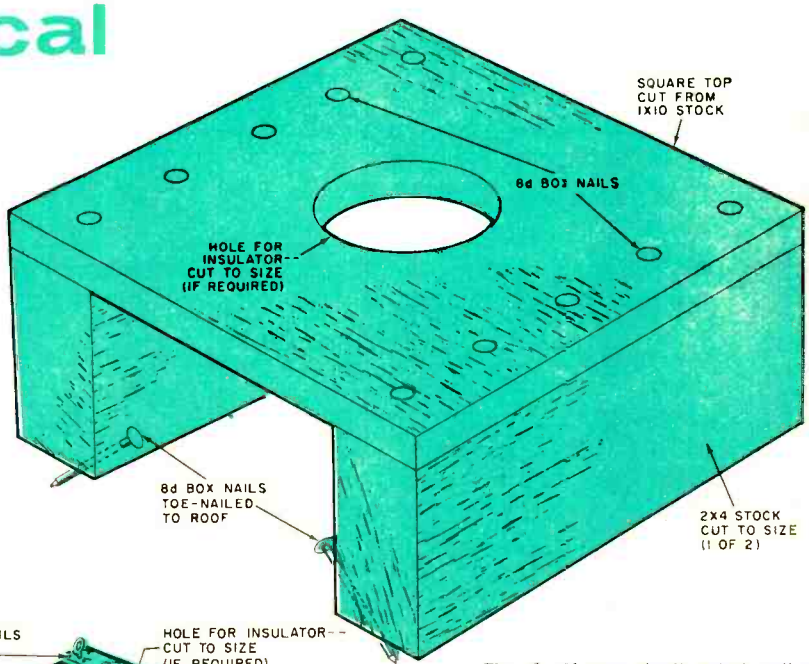


Fig. 1. If you don't mind nails in your roof, this simple base will do for almost any vertical antenna. It requires few materials and can be built quickly.

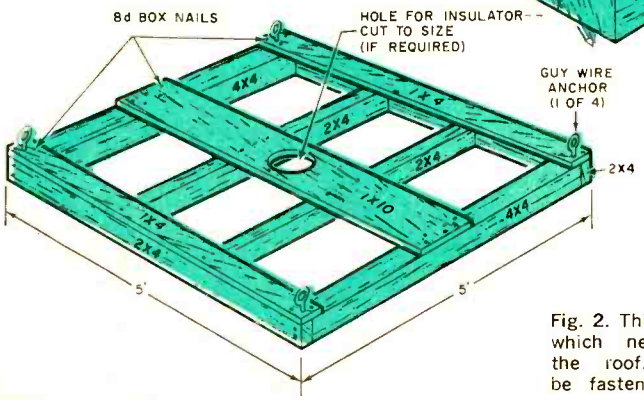


Fig. 2. This is a more elaborate base which need not be nailed into the roof. Guy-wire anchors can be fastened to corners as shown.

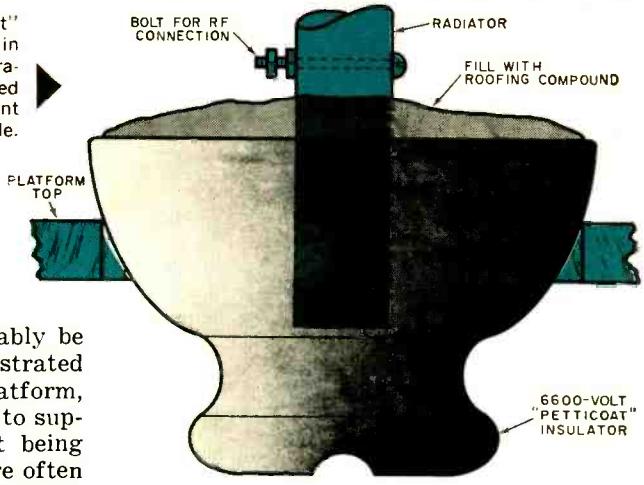


Fig. 3. High-voltage "petticoat" insulator rests, upside down, in platform top to form cup for radiator. Unused space is filled with roofing compound to prevent rain water from collecting inside.

nailing into the roof, you'll probably be more interested in the base illustrated in Fig. 2. Basically a 5'-square platform, it's of heavy enough construction to support a light 33' vertical without being nailed down. Where high winds are often found, however, it's wise to weight the corners with concrete building blocks or some other suitable material. Finally, you can install your guy-wire anchors as shown instead of screwing them into the roof.

Either of these two bases should handle almost any type of mounting situation the average ham is likely to encounter. To keep the antenna perpendicular on a sloping roof, though, wooden "shims" may have to be installed under the appropriate corners.

Pole-Line Insulators. Once you've constructed a base, the next problem is to devise an insulated mounting for the antenna. The author has found that the "pole-line" insulators in common use by telephone and power companies serve very well for this purpose. They are quite inexpensive, and available in many different varieties and voltage ratings at the larger electrical supply houses. Moreover, just about any size will handle even a kilowatt of r.f. with no trouble at all.

Illustrated in the photographs is an antenna installation designed around a glazed-porcelain unit known to the electrical trade as a "primary line high-voltage petticoat cross-arm insulator." The size used here happens to be rated at 6600 volts, but was chosen primarily for its physical dimensions.

This insulator is mounted on a tapered wooden pin which is fastened to a platform similar to that shown in Fig. 1. The radiating element (which is made of 4" aluminum heating duct) simply rests on top of the insulator, not being fastened in any way. The guy wires keep the element firmly in place.

Another way of using the same insulator is diagrammed in Fig. 3. Here the unit rests, upside down, in a circular hole made in the platform top. The base of the antenna fits in the cup-like depression formed by what was originally the bottom of the insulator. Packing the depression with roofing compound keeps it from filling with rain water.

Figures 4 and 5 show two methods of employing the heavy "bottle-glass" insulators favored by telephone companies. In both cases, the insulator mounts upside down in the platform top, as before —and an application of roofing compound prevents rain water from collecting.

The arrangement of Fig. 4 is similar to that of Fig. 3, with the antenna base resting inside the "bottom" of the insulator. The Fig. 5 arrangement is useful in cases where the radiator is too large to fit inside the insulator. Here, a standard crossarm pin (or a wooden dowel) is fitted into the insulator and the radiator mounted on that. If there's too much space between the radiator and the insulator, the play can be taken up with a wooden plug, or with four wood blocks, as shown.

Screw-Base Insulators. A "screw-base service-entrance" insulator, ordinarily used to terminate a power line where it enters a house, can also be employed to good advantage (Fig. 6). It comes equipped with a heavy-duty screw, so

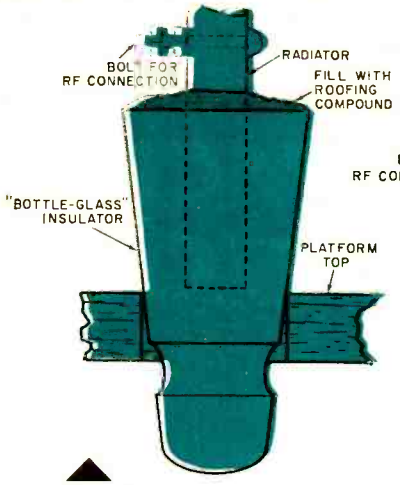


Fig. 4. Here, the arrangement is identical to that of Fig. 3 except that a telephone-type insulator is used.

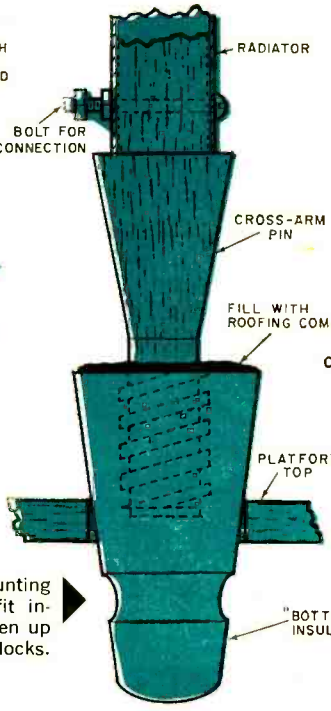
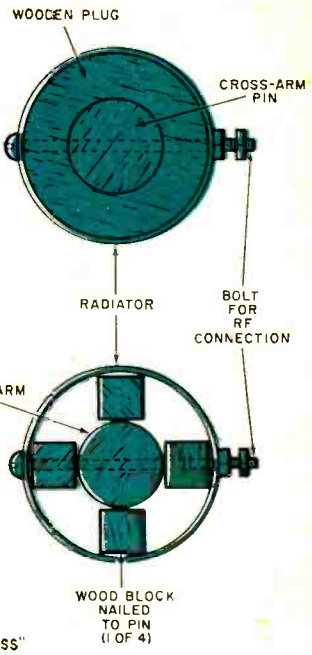


Fig. 5. Ideal for mounting radiator too large to fit insulator. Any play is taken up with wooden plug or blocks.



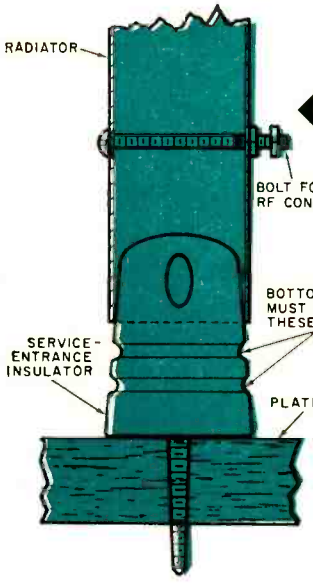


Fig. 6. Service-entrance insulator needs no mounting hole, screws directly into top of platform.

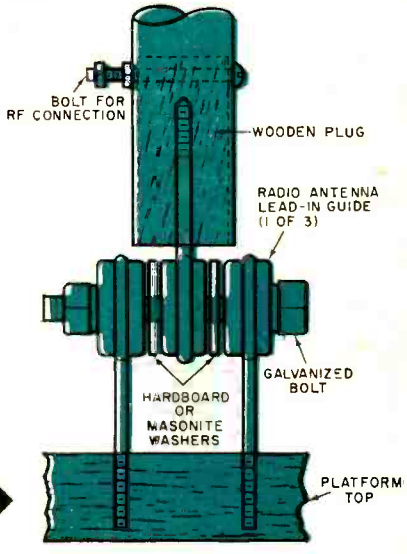


Fig. 7. Three radio antenna lead-in guides make a unique hinged mounting.

there's no problem in mounting it on your platform. The bottom of the radiator is then slipped over the top of the insulator—but be sure to select an insulator large enough so that the radiator is held well above the grooves, as shown. These grooves are weak points, and any play in a radiator resting on them will cause a fracture.

Another type of screw-base insulator —this time from the electronic, rather than the electrical, field—makes an interesting hinged mount for the base of your antenna (Fig. 7). As can be seen in the diagram, the system uses three radio-antenna lead-in guides. Consisting of a round porcelain "eyelet" set in a screw-type wire mount, this kind of insulator is somewhat out-of-date—but is

(*Continued on page* 116)

On the Citizens Band

with MATT P. SPINELLO, 18W4689, CB Editor

Hi there, CB'ers. I'm 18W4689, your new CB Editor. I'd like you to know that I will do my best to fill the CB shoes of Dick Strippel, my predecessor. But I'll need your help! Remember, this is your column, and we want it to reflect all CB activities. So keep those club bulletins and news items pouring in.

Matt P. Spinello

WITH THE END of the year just around the corner, this seems like a good time to ask where CB has gone in 1962, and where it is going in '63. One glance at the POPULAR ELECTRONICS CB Directory (August, 1962, issue) should answer the first question pretty well. The stack of letters and many excellent club newspapers sent to this column during the past year stand as witness, and the more than 300,000 current CB licensees testify still further.

It's a little different than in dad's day when that monstrosity of a broadcast receiver took up a large corner of the living room. Then, technical and visible changes were made at what would seem a snail's pace today. But in this space age of communications, our country's electronic genius has taken the Citizens Band and turned it into a two-way wireless telephone utility. From the hissing, howling depths of those first "handmade" superregens to the heights of present-day multi-channeled, super-selective squelchers, there's a unit and a price range to fit every pocketbook, fulfill every requirement.

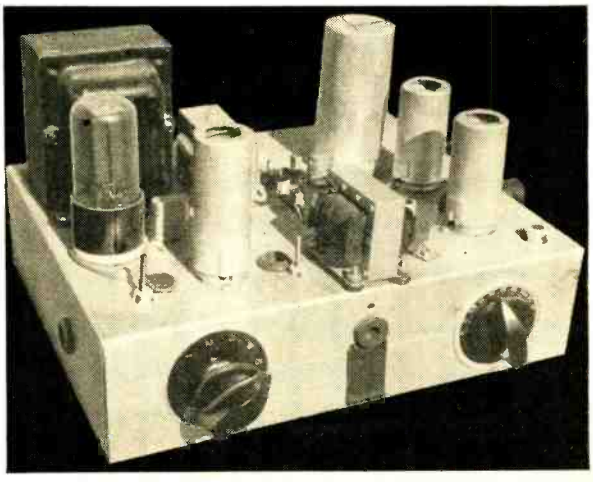
A multitude of transmitters and transceivers are now being offered, ranging from near 100 mw. to 5 watts input. And there are station accessories from crystal checkers, speech boosters, and field strength meters to suppression kits, scramblers, and antenna systems. So it's pretty tough *not* to come up with the right complement of gear.

The manufacturers have certainly done their part to help squelch the ever-mounting problems in the CB traffic jam. And despite continual violation-prone operations by some CB'ers, the CB clubs across the nation have done much to stimulate not only interest but proper usage and operational procedure on the band.

Here's a giant "hats off" for a job well done in '62, to those thousands who are trying to come up with the right combination of FCC "do's" and "don'ts"! Let's heed the plea in '63!

Growing Pains. Antique, collector's item, or even "Old Dog in the Basement" might aptly be the title of the CB unit pictured below. Handmade to the extent of pounding out the chassis, using spare parts, and adding pioneering CB touches,

Remember the "Days When"? This vintage CB unit was built from scratch, even to the extent of a hand-pounded chassis.



This group of CB operators meets twice a week in Rochester, N.H., to study radio theory and code. It's a free course for anyone in the general vicinity who wants to become a ham. See text below.

the unit was originally housed in two sections, with the power supply reposing in a chassis half the size—and weighing twice as much.

One of the first CB units on the air in a section of the 18W Midwest call area, this instrument was constructed by a licensed television engineer, and boasted a ten-mile range for over a year. After several receiver modifications, brought about by an increase in 11-meter use in the area, a modified BC-603 was tied in as a receiver; in addition, a push-to-talk mike was added, actuated by an a.c. solenoid.

In less than four years, CB growth has all but wiped out this type of "proud starter"! Although this particular unit is no longer on the air, the owner won't part with it—partly because of its value as a conversation piece, partly because of the many hours spent trying to keep it on the air during "those early years"!

"Walkie" Talk. Let's face it: there's a definite increase in the popularity of "handie-" and "walkie-talkie's" today. In the beginning, they were pretty much line-of-sight propositions, used mainly when camping and boating in the "open" country; they did make it pretty easy to call the kids in off the lake for lunch —provided that the boat was in sight! But, as in the case of the "walkie-talkie's" 5-watt big brothers, improvements and changes have brought these little jewels much further into the picture, and they are being used to a much greater extent than before.

Employed with a base unit, the 100-mw. gems have been proving themselves invaluable in search operations, traffic control at disasters or special events, at parades, and in other emergencies. With several manufacturers currently providing 1-watt "talkies," unit-to-unit operation should become even more effective. But there seems to be an increasing use of the lesser powered jobs, too. Dad, working on the lawn, in the garage or workshop, carries a "talkie" in his pocket, much as one would a pack of cigarettes; Mom, back in the kitchen, is in direct contact with him at all times.

We heard recently that a concern with a dozen offices under its wing uses a 5-watt base station at the receptionist's desk, and each individual office is equipped with a "handie-talkie." This arrangement also serves to round up strays that seem to have forgotten to return from the coffee bar around the corner. And we have heard of a couple in the Midwest who plan to equip their two sons with "talkies" when the big snows hit, thus keeping in touch until they've arrived safely at school.

With prices ranging all over the lot, 1963 will no doubt see many more "talkies" on the CB scene, used in more diverse applications.

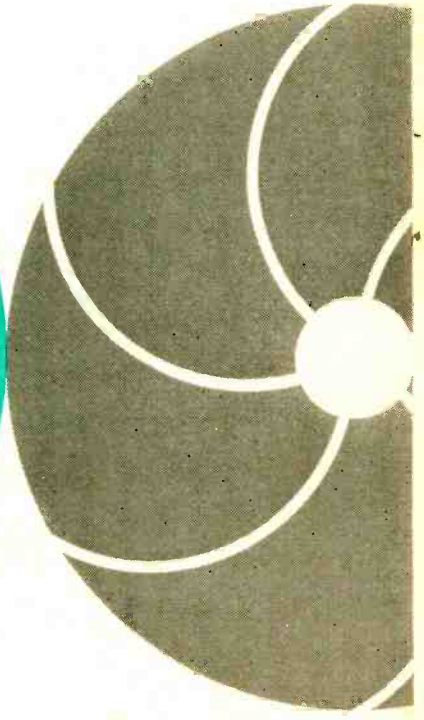
Dih-Dahs in Rochester. A group of Rochester (N.H.) CB operators have banded together to learn code and theory in preparation for the "ham" test. The course is free to local CB'ers, and is taught by Lou Pettit of Rochester. Those taking the course come not only from nearby areas of New Hampshire, but from across the state line in Maine. If you live in the area and are interested, write to Robert F. Durnin, S. Berwick, Maine, for more information.

Tech Tip. Before it gets too wintry out there, why not check on those roof-mounted antennas? Checking solder connections and securing coax lead-in *now* will save many a headache at a time when none of us feel too much like putting up a ladder and stomping across a snow-packed roof. And make certain that antenna solder connections on your

(*Continued on page* 96)

HOW TO PHOTOGRAPH ELECTRONIC EQUIPMENT

Professional photographer of electronic equipment, Joseph Jasgur, demonstrates his technique for avoiding shadows. He shoots photographs of electronic gear for many leading manufacturers.



By **JOSEPH JASGUR**

as told to James Joseph

Shadowless photography is a snap, once you see how a professional uses a very long time exposure

ALMOST any camera will take good equipment photos if you use it properly. Set your camera on a tripod about 10 feet from the chassis to leave you room to move around. Use a lens (telephoto if possible) with a long focal length. I generally *double* the camera's normal focal length—4" telephoto for 35-mm., 6" for 2¼ x 2¼, and 12" for 4 x 5 plate. This gives a sharper image on the negative.

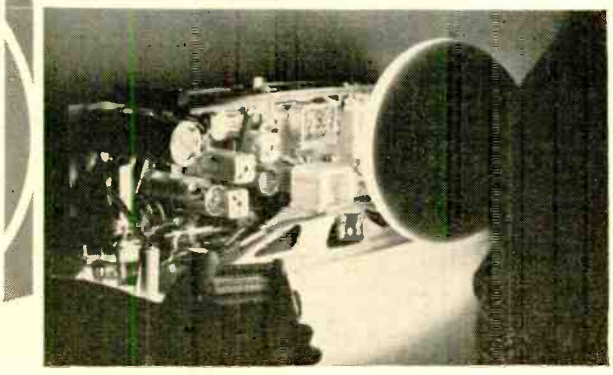
Any medium-speed standard film will do the job—a 150-200 rating is common. Avoid the really slow films as they tend to give a contrasty black-and-white negative, and circuitry details can be lost in the dense black areas. Of course, close the lens down as far as it will go—at least f/22, and preferably f/32 or f/45 if you can.

Try a 30-second exposure, for it is best to overexpose (and underdevelop) a negative. If the meter says 1 minute, try 2; if 2 minutes, try 3 or 3½. Your "light brush" is going to be a #1 photoflood (about 700 watts).

Once set up and focused, you're ready to shoot. Stand behind the camera, open the shutter, and begin moving the light—first up and down (from one side of the chassis to the other), then back and forth across the chassis (also from top to bottom). To erase every shadow, you must learn to work fast and smoothly. Beware of components that reflect light (use a "dulling spray"), and plan on spending half of the exposure time filling in around the worst shadow-makers.

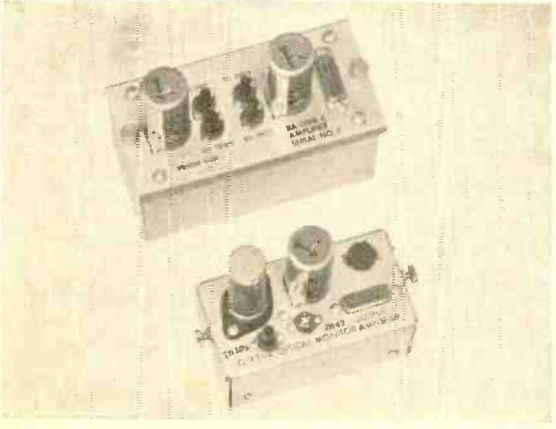
Develop your negatives in a weak, cold (60°) solution or, if you have them done, tell your processor to use a slow, soft developer. Try for thinner, grayer image—the best for shadowless photographs. —30—

Set your camera level at the center of the chassis you want to shoot. Check focus and depth of field; then, while standing behind the camera, prepare to maneuver your shadow-erasing floodlight.



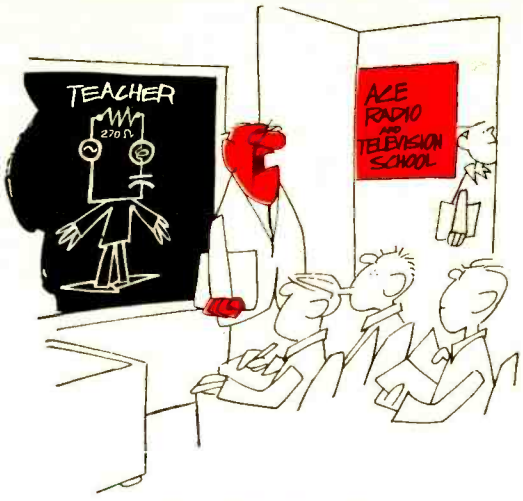
Even though shadows loom large, they will disappear in final print. Maneuver floodlight from many different angles and directions to get light between and around components mounted on chassis.

Take a light meter reading using the reflected light from the chassis. Probably the best way to judge exposure times is by experience, since the exposure needed may frequently be twice as long as the meter reads.



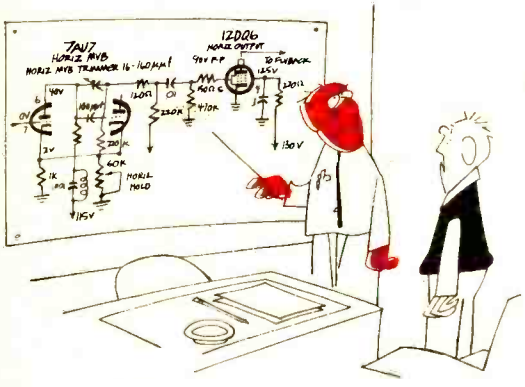
This is the type of photo you can expect when you make a time exposure and "paint" out all possible shadows. How the editors of this magazine wish that all photos submitted with construction projects were this good!

Hobnobbing with Harbaugh

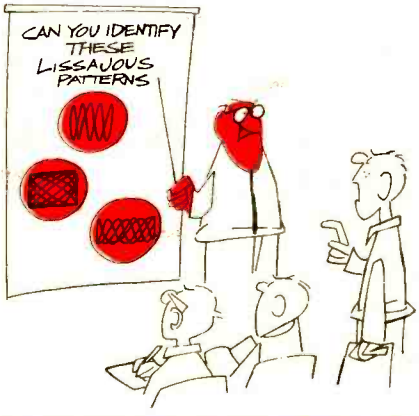


"Very funny, very funny."

The Student



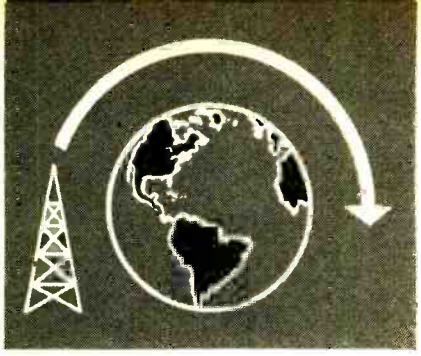
"Did you want me to find the mistake . . . today?"



"Well, the first one's wiggly-like, the second one's a fish net, and the third one looks like a wire fence."

"Barnes, let me explain the use of the scope cart."

"Farnsworth ! !"



Monthly Short-Wave Report

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

POP'TRONICS MAILBAG

INSTEAD OF making a New Year's resolution to answer another batch of questions about SWL'ing, we decided to do it before the end of 1962—and thus avoid having to make that resolution! Here, then, are some of the typical queries which have come in from readers since the last edition of the "POP'tronics Mailbag" went to press (in our July, 1962, column).

Q: Some friends of mine have been sending reception reports to you with the hope of receiving station verifications. Do you maintain this type of service?

A: No; for verification purposes, reports must be sent directly to the stations for which they are intended. Nor are we equipped with facilities to forward reports. We can, however, supply addresses (when known) and outline certain items which you should include in your reports.

Q: What was the first short-wave station, not of the "experimental" type, to start operating on a reasonably regular schedule?

A: *One* of the first stations to operate regularly on a non-experimental basis was HCJB, Quito, Ecuador, which is still in use today. If any of our readers have definite information about the very first regular-schedule station, we will be happy to receive it and pass it along.

Q: How many short-wave clubs are there that I might join, and are there any restrictions in any of them as to race, color, or creed?

A: There are clubs galore at present. A few are old-time, well-organized clubs; the majority are new. The latter are rarely publicized, however, until such time as they are fully organized and able to handle large numbers of members. Leaflet H (available from your Short-Wave Editor for return postage) lists the larger clubs. As for the second part of your question, to my knowledge no s.w. club in North America has re-

Dick Devlin, WPE1CAH, Boston, Mass., DX'es with a Lafayette HE-30 receiver (left), a separate speaker, and a Heath HD-11 Q-Multiplier (right). His antenna is a long-wire, running northwest to southeast. To date, Dick has 65 countries logged, 31 verified.

Frank Koempel, WPE2ERY, Fords, N.J., uses a Lafayette KT-135 receiver, and has an RCA 5-tube superhet standing by. Frank's score is 41 countries logged, with 98 verifications from 25 of them.

strictions as to race, creed, or color, but some clubs are regional and accept applications only from people residing in their areas.

Q: As Short-Wave Editor for P.E., do you confine your listening to short-wave stations exclusively, or do you ever look for other stations?

A: Most of my spare time is devoted to checking reports that come in, through the medium of verification-by-listening. Like most DX'ers, though, I am occasionally overwhelmed by a spirit of recklessness and run down to the medium waves at times! Incidentally, there's an m.w. station report section at the end of this month's column.

Q: I'm a newcomer to SWL'ing, and have no QSL's. What must I do to become eligible for a WPE call?

A: You don't need QSL's to obtain WPE call letters—some of the most avid DX'ers are not always QSL collectors. The basic requirement for a WPE call-sign is that you have a sincere interest in short-wave listening. You'll find an application form on page 113 of this issue.

(*Continued on page* 108)

ENGLISH-LANGUAGE NEWSCASTS TO NORTH AMERICA

All of the stations that are listed here specifically beam English-language newscasts to the U.S.A. at the times indicated. The times may vary a few minutes from day to day.

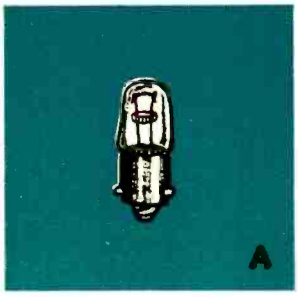
COUNTRY	STATION	FREQUENCY *(kc.)*	TIMES *(EST)*
Australia	Melbourne	17,840, 15,370	2000-2300[1]
Bulgaria	Sofia	9700	1900, 2000, 2300
Canada	Montreal	15,190,11,720,9655	1800[2]
Czechoslovakia	Prague	15,285, 11,990, 9795, 9550, 7345	2000, 2330[3]
Denmark	Copenhagen	9520	2100, 2230
East Congo	Leopoldville	11,755	1630, 2100, 2230
Hungary	Budapest	11,890,9833,9770	1900
		9833, 9770, 7220	2230
Italy	Rome	11,905, 9575	1930, 2205
Lebanon	Beirut	15,295	1600
Netherlands	Hilversum	11,730, 9715, 6020	1630 (ex. Sun.)
		6035, 5985	2030 (ex. Sun.)
Portugal	Lisbon	9740, 6025	2105, 2305
Spain	Madrid	9360, 6130	2215, 2315, 0015
Sweden	Stockholm	17,840	0900
		11,805	2045, 2215
Switzerland	Berne	11,865, 9535, 6165	2030, 2315
USSR	Moscow	9650, 9630, 9620, 7320, 7290, 7240, 7220, 7200, 7180, 7170, 7150[4]	1700, 1900, 2000, 2100, 2300, 0000, 0040
West Congo	Brazzaville	11,725	2015
West Germany	Cologne	11,795, 9735	1530
		9605, 6145	1920
		9735, 6110	0000

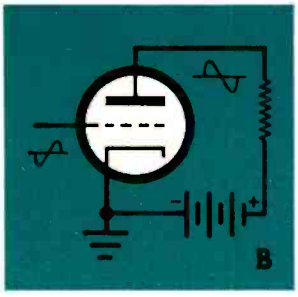
1. During 2000-2300 N.A. transmission.
2. Caribbean transmission.
3. At 2330, 11,745 kc. replaces 15,285 kc.
4. Not all channels are in use at any one time.

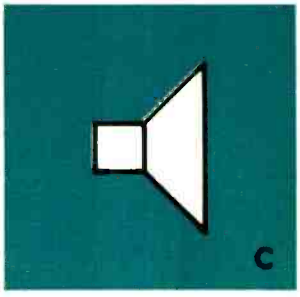
ELECTRONIC NUMBERS QUIZ

By ROBERT P. BALIN

Anyone in electronics gets to know many numbers, each of which relates primarily to some specific circuit or component. Why not try your luck at matching the eight numbers below with the drawings (A — J) to which they most logically refer?







1.414 _____

3.2 _____

47 _____

90 _____

140 _____

180 _____

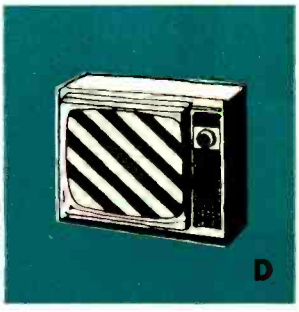
300 _____

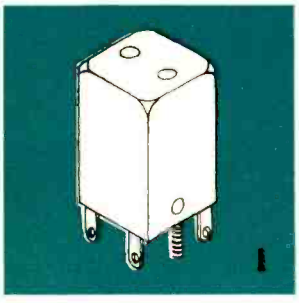
440 _____

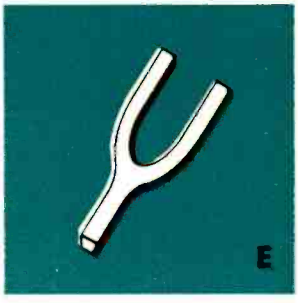
455 _____

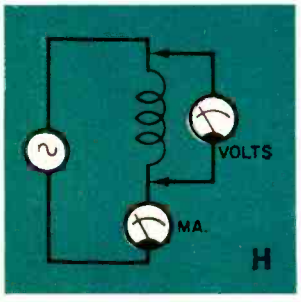
15,750 _____

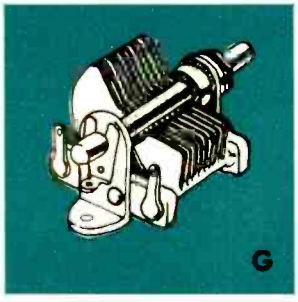
(*Answers on page* 112)

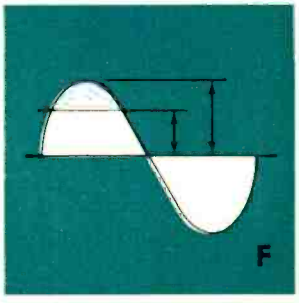












Transistor Topics

By **LOU GARNER,** Semiconductor Editor

WHETHER you live in the sunny south or the frigid north, the holiday season generally brings with it the pleasant—but often difficult—problem of selecting gifts for friends, relatives, and neighbors. There is a good solution to this problem: simply decide, in advance, to give "transistorized" gifts chosen from the catalogs of electronics supply houses. Then, instead of fighting holiday crowds at local department stores and retail outlets, you can shop in relative ease from the comfort of your own home.

Electronics catalogs are available without charge from such firms as Allied Radio (100 N. Western Ave., Chicago 80, Ill.); the Heath Company (Benton Harbor, Mich.); Lafayette Radio Electronics (111 Jericho Turnpike, Syosset, L. I., N. Y.); and Radio Shack (P. O. Box 309, Boston, Mass.). A quick glance at any of them will reveal a variety of transistorized gifts in virtually every price range and suitable for all but the very youngest.

If the prospective recipient of your gift is interested in electronics as a hobby—in other words, if he (or she) is an experimenter, ham, audiophile, etc.—the task of selecting something becomes a "cotton-picking cinch." You can give components, kits, or test instruments. Simply choose an item in keeping with your budget and the recipient's interests—even a transistor or two will make an excellent low-cost present.

Transistor radio receivers are suitable for both sexes in almost every age bracket—from simple 3- or 4-transistor pocket radios for the sub-teens to elaborate 9- or 10-transistor multi-band or AM/FM portables for teen-agers and adults. If you'd like to add a "personal touch" to your gift, you can purchase a receiver in kit form and assemble it yourself.

Often, you can choose an instrument appropriate to the recipient's hobby or business interests. A depth sounder, direction finder, and a power converter are all ideal for a yachtsman or fisherman; a transistorized tachometer, ignition analyzer, FM car radio, and a d.c.-to-a.c. inverter make excellent gifts for the hot-rodder or sports car enthusiast.

Similarly, you can select R/C equipment for the model builder; a telephone amplifier or intercom for the doctor, lawyer, or professional man; a pair of CB "walkie-talkies" for the construction worker, explorer, or surveyor; a power megaphone for the part-time coach, vol-

Transistors in the Headlines

Remember "Electronic Banjo—Revisited" (P.E., March, 1962, p. 71)? Clarence L. Griffith of Rocky Mount, Mo., added a number of capacitors to extend the electronic banjo's range, and has appeared with his transistorized "Stradivarius" at various church gatherings and talent shows. In fact, Clarence did such an outstanding job—both in the redesign of the circuit and the assembly of the final instrument—that a local newspaper, the Jefferson City (Mo.) Sunday News-Tribune, carried a feature story about him and his banjo, complete with photo! Among Clarence's other construction achievements: a one-stringed, semi-electronic guitar, and a "ukatron"—an electronic "shoebox on a stick."

unteer fireman, or anyone else who might like to have one; and, finally, for the housewife, an intercom for use between the kitchen and front door, a rain alarm, or an automatic light switch.

Educational "electronic workshops" or simple single project kits are great favorites with both sub-teens and teenagers. Typically, prices range from less than $5.00 for a crystal radio kit to about $30.00 for an elaborate, multi-purpose experimenter's laboratory.

There are numerous transistorized items suitable for "family" gifts—a portable TV receiver, a stereo amplifier, an FM tuner, or a portable tape recorder, for example. And even these larger instruments needn't overstrain a limited budget. As a case in point, transistorized tape recorders are offered at prices ranging from about twenty to several hundred dollars, depending on performance specifications and operational features.

Readers' Circuits. A device needn't be complicated to be interesting and versatile. As examples of what can be done with a single transistor, three simple

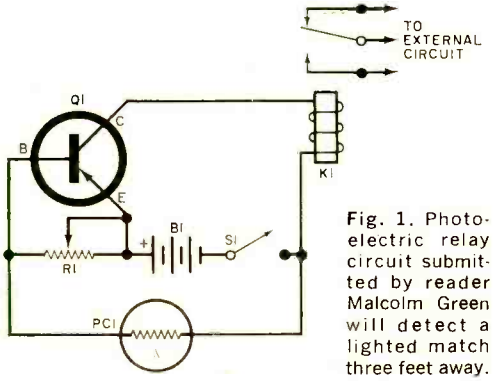


Fig. 1. Photoelectric relay circuit submitted by reader Malcolm Green will detect a lighted match three feet away.

circuits are illustrated in Figs. 1, 2, and 3. Each is non-critical as far as layout and lead dress are concerned, and can be assembled using conventional point-to-point wiring, etched circuit boards, or other standard asembly techniques, depending on individual preferences.

A *photoelectric relay* circuit is shown in Fig. 1. Submitted by Malcolm Green (516 Young St., Piqua, Ohio), this circuit can form the basis of a doorway counter, burglar alarm, light switch, or similar light-controlled installation, depending on the external circuit connected to the instrument's relay contacts.

A *pnp* transistor, *Q1*, is used in the common-emitter configuration as a d.c. amplifier between a photoconductive cell (*PC1*) and a sensitive electromagnetic relay (*K1*). In operation, the base bias current supplied through *PC1* is amplified by *Q1* and used to actuate the relay. A variable resistor, *R1*, is employed as a shunt across *Q1*'s base/emitter circuit, thus serving as a sensitivity control and reducing the effects of the photocell's

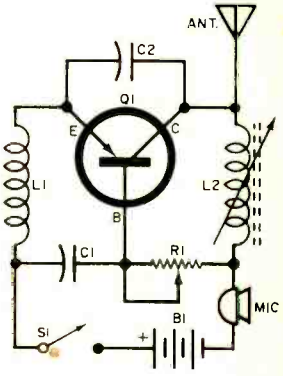


Fig. 2. Wireless microphone circuit developed by Bill Halleron operates from any 6- to 9-volt battery and can thus be easily added to a small transistor portable.

"dark" current. Operating power is supplied by a single 9-volt battery, *B1*, controlled by an s.p.s.t. switch, *S1*.

According to Malcolm, almost any sensitive relay can be used in his device, including popular Kurman and Sigma types; naturally, the unit's overall sensitivity will depend on the type of relay employed. Resistor *R1* is a standard 10,000-ohm potentiometer; *S1* a toggle, slide, or rotary switch; and *B1* a 2U6 or 216 9-volt battery (if preferred, a battery can be assembled by connecting six penlight or flashlight cells in series). Transistor *Q1* is a 2N1265 or 2N107, although other low-cost *pnp* units should work as well. The photoconductive cell, *PC1*, is a Polaris MAJ-1.

Reader William C. Halleron (2707 Cleveland Blvd., Louisville 6, Ky.) submitted the simple *wireless microphone* or "home broadcaster" circuit shown in Fig. 2. Designed for limited-range operation within the AM broadcast band, Bill's circuit can be assembled in an extremely compact package. As a matter of fact, this circuit can be added quite easily to a small portable receiver

to form an inexpensive "walkie-talkie."

As you can see, Bill has used a *pnp* transistor, *Q1*, in the common-base configuration as a simple r.f. oscillator, with its base/collector bias currents modulated by a carbon microphone cartridge (*MIC*) connected in series with *B1*'s negative supply lead. The unit's operating frequency is determined by its collector load, *L2*, while *C2* provides the feedback necessary to start and sustain oscillation. A variable base bias current, provided by *R1*, permits the circuit to be adjusted for optimum performance with different transistor characteristics.

Standard components are used throughout. A small 2.5-mh. coil serves as an r.f. choke (*L1*), and *L2* is a ferrite loopstick (such as a Superex "Vari-Loopstick"). Capacitor *C1*, rated at 0.005 μf., can be either a paper or ceramic unit, while *C2* is a 30-$\mu\mu$f. ceramic or mica capacitor. Transistor *Q1* is a 2N107, *R1* a familiar 500,000-ohm potentiometer, and *S1* a toggle, slide, or rotary s.p.s.t. switch. Almost any standard carbon microphone cartridge should give acceptable results. The circuit's operating voltage is non-critical; Bill says that he obtained good performance with from six to nine volts. A 5′ to 6′ length of hookup wire will serve as an adequate antenna for most applications.

Once the wiring is completed and double-checked for errors, the instrument can be tested by placing it near an AM broadcast-band receiver. The receiver is slowly tuned through its range, while *R1* is adjusted for optimum performance and *L2* is adjusted until the wireless microphone's signal is picked up at a "dead" spot on the dial (where no local station can be tuned) between 1000 and 1600 kc.

The *booster amplifier* circuit shown in Fig. 3 was submitted by Jean Goyer (2244 Prud'homme, Montreal 28, Quebec). Designed to provide additional audio power for a small transistor radio, Jean's circuit employs a single *pnp* power transistor (*Q1*) in the common-emitter configuration as a power amplifier to drive a standard PM speaker. In operation, *C1* serves as a d.c. blocking and input coupling capacitor, while *C2* provides inverse feedback to minimize high-frequency distortion. Transistor *Q1*'s base bias is provided through *R1*; operating power is supplied by a 6-volt battery, *B1*, controlled by an s.p.s.t. switch, *S1*.

According to Jean, parts values for the booster amplifier are reasonably non-critical. He used a Lafayette SP-147 power transistor for *Q1*, but other popular units should work as well . . . typically, a 2N255, 2N256, 2N301, or a 2N554. Capacitor *C1* is a 30 to 50 μf., 20-w.v.d.c. electrolytic, and *C2* a 0.2-μf. paper or low-voltage ceramic unit. Resistor *R1* is a 2200-ohm, 1-watt carbon or wirewound unit, while any standard switch

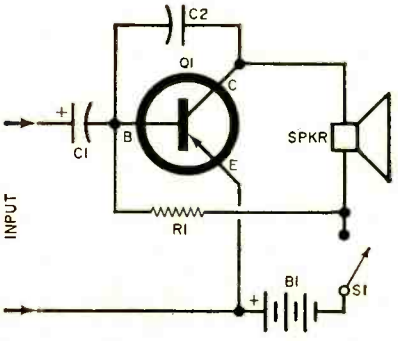


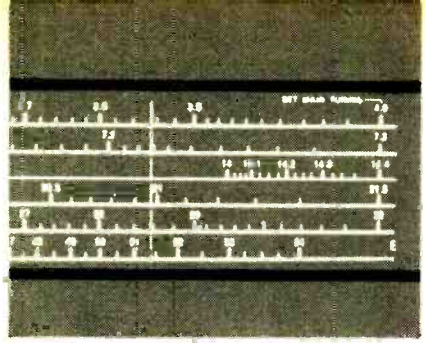
Fig. 3. Jean Goyer is the gentleman responsible for this circuit—a simple one-transistor booster amplifier. If desired, a plug can be added to the input leads to match the receiver's phone jack.

will serve as *S1*. The power supply can be any 6-volt battery or be made up by connecting four flashlight cells in series. Either a 4- or an 8-ohm PM speaker can be used, but the latter will give better results.

Jean suggests assembling the circuit and speaker in a small wooden cabinet, providing a metal heat sink (a small chassis will do) for the power transistor and mounting as large a speaker as possible within the cabinet (a 6″, 8″, or 10″ speaker is perferred to the smaller sizes for maximum efficiency and best quality sound reproduction). The booster amplifier's input leads are connected to a small plug to match the "earphone" jack of the receiver with which it is to be used, and its output volume is controlled with the receiver's regular volume control.

VHF Amplifiers. We've received a number of letters asking about the use of transistors in VHF applications. Actual-

(*Continued on page* 106)



Across the Ham Bands

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

THE WRL "METEOR" SB-175 TRANSMITTER

RIGHT FROM THE START we were pleased with the "Meteor" SB-175 transmitter, manufactured by World Radio Laboratories, Inc. (3415 W. Broadway, Council Bluffs, Iowa). Enclosed in a 5⅛" x 11½" x 8½" dark brown cabinet with a gold anodized front panel, and weighing 10 pounds, the unit is both attractive and compact. A savings in weight and space is accomplished through the use of an external power supply.

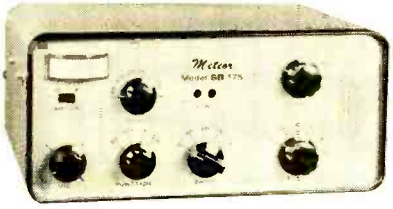
Circuit Features. The transmitter covers the five ham bands between 3.5 and 29.7 mc., and offers complete tuning from 3.5 to 9 mc. for CAP, MARS, and other out-of-ham-band stations. A rating of 175 watts input on c.w. can easily be reduced for Novice operation. Input on AM phone is 100 watts, and on DSB (double-sideband) phone the input is 140 watts peak.

The six-tube complement includes two 6DQ6-B's, which function in parallel as a neutralized power amplifier on AM and c.w. On DSB operation, the control grids are excited in push-pull and the plates are connected in parallel; this arrangement balances out the r.f. carrier and delivers only the audio-generated r.f. sidebands to the antenna.

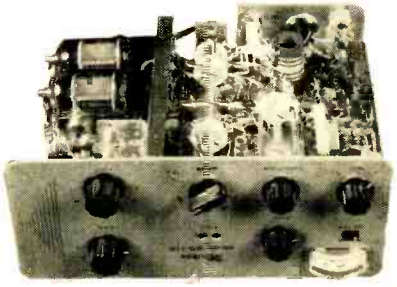
Power for the transmitter is supplied by the WRL PSA-63 power supply—a companion unit. However, any supply can be used if it will provide 300 volts, 125 ma. d.c.; 600 volts, 300 ma. d.c.; and either 6.3 volts, 4.8 amp, or 12.6 volts, 2.4 amp a.c.

Test Results. We put the SB-175 through some operational tests and were quite satisfied with the results. Loaded to the rated 175 watts c.w. input, the unit delivered 120 watts to a dummy load on 3.7 mc., and when loaded on 29 mc. the output was only down a watt or two. At the Novice input limit of 75 watts, the output was better than 50 watts.

Peak power output on phone was also about 120 watts, with the unmodulated carrier power at 30 watts. On DSB,



Completely wired and ready-to-go, the WRL SB-175 transmitter needs only a crystal or VFO and a power supply for operation. Crystal socket is in center of front panel (left); VFO plugs into 11-pin power socket at rear (see underchassis view below).



The WRL PSA-63, companion power supply to the SB-175, boasts solid-state circuitry. It comes either factory-wired or as a kit.

Novice Station of the Month

The winning photo in the "Novice Station of the Month" contest for December was sent in by Eugene S. Wahoff, WN8CHK, Cincinnati, Ohio. Operating on the 80-, 40- and 15-meter bands with a Hallicrafters HT-40 transmitter, a Hallicrafters SX-111 receiver, and an inverted-V antenna, Gene has established radio contact with 44 states and 12 countries so far. He uses a Hallicrafters SX-110 for general listening. Gene's 13- and 14-year-old sons are also Novices (WN8CHJ and WN8CHM), and the three of them are studying together for their General Class licenses.

Gene will receive a one-year subscription to P.E. for his photograph. If you would like to try for a similar award, send us a picture of your station—preferably showing you at the controls, and include with your entry some information about yourself, your equipment, and your activities. You may be one of the lucky winners next year. Non-prize-winning photos will also be published as space permits. Entries should be sent to Herb S. Brier, Amateur Radio Editor, POPULAR ELECTRONICS, P. O. Box 678, Gary, Indiana.

carrier suppression was more than 40 db below the peak power output, exceeding the manufacturer's specifications. Our first calls on c.w. and phone resulted in reports of "T9" on c.w. and "quality good, no hum" on AM phone.

Our conclusions were that the Meteor SB-175 transmitter meets all the manufacturer's claims when operated from a suitable power source, and is well worth its price of $99.95. We recommend this unit for the Novice with an eye on the future, as well as for the low-power General who wants to step up his c.w. power or give "sideband" a whirl without going into "hock" for a commercial transmitter.

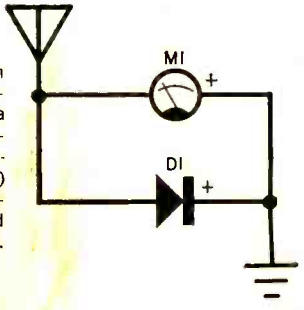
Power Supply. As for the PSA-63 companion unit, it is a heavy-duty power supply which comes in either kit or factory-wired form. The do-it-yourself version sells for $24.95, while the ready-to-plug-in model is $39.95.

Silicon rectifiers are used in a voltage-doubling circuit to supply the 300 and 600 volts of filtered d.c. at a maximum of 300 ma. Any current in the 300-ma. range can be drawn at either voltage, as long as the total power drain does not exceed 210 watts. The three a.c. voltages furnished by the unit are 6.3 volts at 10 amp, 12.6 volts at 5 amp, and 95 volts at 10 ma.

SIMPLE FIELD STRENGTH METER

With a low-range d.c. milliammeter, a general-purpose miniature diode, and a short length of stiff copper wire, you can build a field strength meter and r.f. "sniffer" combination. A device such as the one shown in the diagram below (it was originally built by Neil Barry, W9SNF) comes in mighty handy around the ham shack. In operation, the wire acts as a pickup antenna for the r.f. signal, which is rectified by the diode, and the resulting d.c. causes the meter pointer to deflect.

Connect diode *D1* (a 1N34 or equivalent) directly across the meter terminals, with the polarity matching (positive-to-positive). Now mount the 1-ma. d.c. milliammeter (*M1*) in a cabinet and connect a 20″ length of No. 12 copper antenna wire to either terminal of the meter. Be sure to bend a small closed loop, about an inch long, at the top end of the wire to prevent injury from the sharp end; the equivalent length of the antenna is now 19 inches.



Simple field strength meter can be constructed by paralleling a diode across a low-range d.c. milliammeter (observing polarity) and connecting an antenna to one side and a ground to the other.

If your transmitter, like our 2-meter job, cannot readily be seen from the operating position, you can place the field

(*Continued on page* 100)

Aiding an Instinct

a Carl and Jerry Adventure

By **JOHN T. FRYE** W9EGV

CARL AND JERRY met at the entrance to the H-3 Residence Hall of Parvoo University.

"Where've you been?" Jerry asked his chum as they climbed the stairs to their third-floor room.

"Oh, just goofing off over at the Sweet Shop," Carl replied. "One of the guys had a letter from a pal at an Eastern school, and there was a cute story in it. Seems a professor at this college was conducting a small graduate class of nine students. The prof did a considerable consultation business, and having to lecture at a particular time each day often cut into this lucrative sideline. So he conceived the idea of tape-recording his lectures and having his secretary take the recorder to the classroom each day and start it.

"About a week after this system was put in effect, the prof happened to be in the classroom building during the hour he was supposed to be lecturing, and he decided to check on how things were going. As he stood outside the closed door of the classroom, he was pleased to hear his own voice droning away inside; but when he opened the door, not a living soul was present. Instead, his recorder was talking away on his desk, and grouped around it were nine other recorders taking down every word!"

"That's a good one," Jerry chuckled, "even if it's not true—which it probably isn't. What other earth-shaking topics were discussed at the Sweet Shop?"

"A psychology student, who is also a homing pigeon nut, was boasting about the marvelous sense of direction of his birds. He claimed that he carried a pigeon in a light-tight box mounted on a turntable revolving about 2 rpm fifty miles from home, and then when he released it, the bird made one little circle and started in a beeline for its loft. Which brought up the fact that bees have this built-in radar, or whatever it is. I had to open my big mouth and suggest that some men may have the same instinct. I pointed out that I had never been confused about directions in my whole life and I wasn't ready to concede supremacy in anything to a bird brain.

"At that, this guy, Otis, and three other psych students started pooh-pooh'ing me, and I got a little hot under the collar. Before I knew it I was involved in a wacky wager. Tomorrow night we're all going out to the football stadium. They will blindfold me, and I'm to walk out into the middle of the stadium, turn around, and go straight back to where I started. If I fail, I have to wear a Daniel Boone coonskin cap, complete with tail, for a whole week; but if I succeed, all four of the psycho-

ceramics—crackpots to you—have to flutter their elbows and make pigeon-like cooing noises every time I snap my fingers in their presence, also for a whole week."

"How did D. Boone get into the act?"

"One time someone asked him if he had ever been lost. He said no, he had never been lost, but he was bewildered once for three days. The guys claim I'll be singing the same tune after tomorrow night."

AS CARL finished speaking, he rolled up a pants leg and tenderly felt a barked shin. Replying to Jerry's questioning look, he shamefacedly admitted:

"I decided to make a little test run after I left the Sweet Shop; so I went out to the stadium, blindfolded myself, and tried to walk out into the center and back. I ended up in the bleachers clear down at one end. Do you think I'll look better with the tail of that cap hanging straight down the back or kind of over one shoulder?"

"Don't give up so easily! You were stupid to get into an argument with those psych boys on their own ground; but now you're in it, you have to do all you can to uphold the honor of the engineers. Maybe we can rig up some sort of electronic aid for your feeble homing instinct."

"If we do, we're going to have to be pretty sly about it. Those boys know about us, and they warned me that they won't stand for any electronic hanky-panky. They'll probably frisk me before I take the test."

"Hm-m-m, that complicates matters," Jerry mused; "but I wonder—here, take a look at this," he broke off, and began sketching a simple circuit on a scratch pad. "This is a gadget I found an electrician using to locate conduit in a motel where he was installing air-conditioning units. I talked him into letting me peek inside the little box and sketch the circuit.

"As you can see, the circuit consists of a Delco 2N278 transistor connected as an r.f. oscillator self-modulated by an audio blocking network. It's powered by a 67½-volt B battery. To use it, you tune the oscillator to a dead spot in the broadcast band and clip this antenna lead to an outlet box. Then you employ any portable radio receiver to pick up the tone-modulated signal radiated from the conduit a few feet into surrounding space or earth.

"The electrician said it was a dandy gadget for locating buried or cement-encased conduit. I've had all the parts here in my desk for three months, and I think now's the time to build it. Let's get busy."

"If you say so," Carl agreed, "but I don't really see how that thing is going to help."

The little instrument was simple to construct, and the boys soon completed it. They checked it out by connecting it to an outlet box in their room and tracing the wiring around the building with a transistorized receiver. The tone could be picked up anywhere in H-3 whenever the receiver was brought near a concealed conduit.

"Now let's put on our coats and give it the acid test," Jerry suggested.

A few minutes later they were standing inside empty Moss Ade Stadium. Parvoo campus was always the coldest place in the state, and the empty, U-shaped stadium was the coldest place on the campus, with a damp, bone-chilling wind blowing into the mouth of the U from the south-southeast.

Jerry clipped the antenna lead of the gadget to an outlet receptacle in the press box and began to walk along the edge of the football field, stooping over and holding the little transistor radio only a foot or so from the ground.

Suddenly he stopped and exclaimed, "Ah, there it is! I was hoping a conduit might run across the field. Take the receiver and trace it across. You're the one who's going to need the practice."

Carl obediently took the receiver and

started tracing the buried conduit out across the field. As long as the receiver was held within a few inches of the frozen ground, the signal came in clearly; but if the receiver was raised or moved a couple of feet to either side of the buried pipe, the sound diminished rapidly. It was soon evident that the conduit ran straight across the field.

"That's that; let's head for home," Jerry said, through chattering teeth. "We still have some camouflaging work to do."

Back in their room, the boys worked out the rest of the details for their plan, and then they studied until after midnight to make up for lost time. They liked fun as much as any boys, but they never forgot they were at Parvoo to get an education. Studies came first with them.

CARL AND JERRY were sitting quietly in their room the next evening when the four psychology students knocked. The latter did not stand on ceremony but quickly and efficiently began to frisk Carl for any possible hidden electronic equipment. Otis, their short, bespectacled leader, even turned the pockets of Carl's overcoat wrong-side-out and went carefully over the lining feeling for suspicious lumps. The tail of a coonskin cap hung casually out of Otis's own coat pocket.

"Well, if you suspicious jokers are satisfied, let's get going," Carl said as he picked up his four-buckle arctics standing by the door and began putting them on. As he carefully tucked his pants legs inside the big and clumsy overshoes, he deftly plugged a little wire peeping from a pants cuff into the earphone jack of a very small transistorized receiver concealed in a black cloth pocket sewed to the inside of the top of the right arctic. The thin, flexible, two-conductor cable ran up his pants leg, through his shirt, up the right sleeve, and terminated in a tiny earphone taped to the inside of his biceps.

The group of boys went out the back into a night in which a few scattered snowflakes were just beginning to fall. The windows of H-2 and H-1 were glowing brightly as they passed, and off to the right they could see the tower of the Men's Quadrangle. Carl was careful to

be in the lead as they entered the stadium, and he stopped directly at the point where he knew the buried conduit started across the field.

Three different blindfolds were tied across Carl's eyes; and then, at a prearranged signal, three of the boys grabbed Jerry, threw him to the ground, and sat on his outstretched arms and feet.

"Just making sure there's no collusion between you two," Otis explained with a grin. Jerry was thanking his lucky stars that he had had the foresight to attach the gadget to the conduit and turn it on just before supper. Since it only drew about five mils, it should still be going strong.

At a command from Otis, Carl crossed his arms over the top of his head and started out through the drifting snowflakes. He moved with a most peculiar gait; the right foot slid over the ground as though shod with a snowshoe while the stepping was done with the left foot. At first he moved slowly and hesitantly, but then he seemed to gain confidence and moved more briskly.

Seeing that Carl deviated very little from a perfectly straight line across the field, Otis held a finger to his lips for silence, then moved stealthily around the rim of the semi-bowl until he was some fifty yards from the point at which Carl had started. By this time the blindfolded youth was two-thirds of the way across the stadium.

"Okay, Carl; let's see you turn around and come back," Otis called loudly.

Tricked by the direction of the voice, Carl turned toward Otis and took a couple of steps in that direction. Suddenly he stopped short, realizing that something was wrong. As his crossed arms held the concealed earphone more tightly against his ear, he slid his extended right foot experimentally from side to side. When the signal which was being radiated from the length of buried conduit revealed the whereabouts of the pipe, he turned away from Otis and began retracing the path he had followed coming out into the field.

In a few minutes, he stumbled into Otis, who had come back and was standing right at the point from which Carl had started.

"OKAY," Otis said as he helped Carl off with the blindfolds, "you win, but I still think there's something fishy about how you did it. What's with this business of holding your arms over your head?"

"I was making a loop out of my arms to pick up the earth's magnetic currents," Carl told him with a mocking grin.

Jerry had been released and was trying to beat some circulation back into his numbed arms. "You couch-boys just don't appreciate how smart we double-E's are," he chided.

Out of the corner of his eye, Carl noticed Otis surreptitiously trying to tuck the dangling coon tail back into his coat pocket. A beatific smile spread over Carl's features, and his long arm shot above his head while his fingers snapped sharply.

The four psychology students exchanged sheepish glances. Then each of them began to wave his elbows in a ludicrous imitation of fluttering wings while a discordant chorus of "coo-coo-coo-coo" came from their throats! —30—

FLIP FLAP

(*Continued from page* 60)

receiver, a hi-fi power amp, and something out of a biology textbook."

"Exactly," I purred, stroking Henri's sleek head. "And I've decided that the time for our contest will be next Saturday morning at six o'clock so we'll have the whole field to ourselves."

SATURDAY dawned calm and clear as Sam and I arrived at the local R/C field. While I watched Henri swoop and glide and made some last-minute adjustments to my control systems, Sam fueled his old faithful "Robot" and performed a distance check. Since it would be anti-climactic for me to fly first, I graciously stepped back to watch Sam do his stuff.

It was a rather mediocre flight. He started off by doing the AMA precision pattern and then broke into some free-style acrobatics. You know the stuff: outside loops, flat spins, touch-and-go landings, inverted flight. And for his *coup de grace*, he snapped a servo linkage and buried his engine eight inches in the dirt. A typical flight.

Not in the least impressed with his performance, I stepped to the flight line. Holding the control box, I flipped on the main switch. Soundlessly, my mechanical bird sprang to life.

"None of those raucous glow plug engines here," I called to Sam. With a final check of the pinfeather trim, I launched my bird into the morning sky. Slowly at first, and then gathering speed, it grabbed altitude with gracefully beating wings. Then I put it into a long spiraling glide which ended in a breathtaking recovery across the landing strip and within inches of Sam's nose.

"This is *flying*, Sam!" I shouted to my open-mouthed brother. "Now watch this next maneuver . . . I call it the 'roost'." As my bird flew across the field at low altitude and high speed, I suddenly lowered the tail surface and began backwashing the wings. It came to a near stop and settled on the upended tailsection of Sam's wreck.

"How's that for precision, Sammy?" I said, and I let it take off again. "Look at this baby climb." Laying back on the controls, I sent my bird winging skyward in a tight spiral climb. Up and up, higher and higher, it flew.

I was lost in the ecstacy of true winged flight when Sam nudged my arm, nearly causing me to drop the control box.

"Hey, kid, you'd better bring that machine back over the field. You're getting pretty far downwind."

"Pshaw! Wind and distance don't bother this beauty. But I think I'll bring it in and check the ni-cads." I pushed forward on the flap control and started to wheel my bird back toward the field. Nothing happened!

My fingers flew nervously over the controls. They were all dead. Sam sidled up to me as I was banging the control box against the transmitter and sobbing softly.

"Something wrong, kid?" he snickered. "That monster of yours is just about out of range now."

"I—don't—know," I wept, jumping up and down on the control box. Looking up I could see my bird, now a distant speck, still flapping strongly into the morning sun. "You traitor!" I called after the unhearing model. "After all my work, you desert me!"

"Easy, kid," Sam said, cramming the larger pieces of his "Robot" into the field box. "When you've had more experience in R/C, you'll learn to build a model that's dependable."

ON THE WAY HOME, Sam couldn't help needling me about the flyaway. "Now, if you had used a dual-proportional system," he said, as we arrived at the house, "and trimmed out for a steep glide pattern . . ."

"Sam!" I screamed, grabbing him by the throat. "Look! Up there."

Sam's gaze followed my outstretched arm and his eyes goggled. There, on the windowsill of my bedroom, sat Henri cooing noisily. And next to him, with feeble movements of its wings as the batteries ebbed their last, was my mechanical bird.

"Sam!" I exulted. "Now I know my mistake. I patterned my bird after Henri, but I forgot that Henri was a *homing* pigeon." —30—

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GRA-22-2, no money dn., $5 mo.....**$25.95**

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4-tone selective call circuitry; 5 crystal controlled transmit & receive channels; variable receiver tuning; built-in 3-way power supply for 117 v. ac, 6 or 12 v dc; and more! Most complete CB unit ever designed!22lbs.

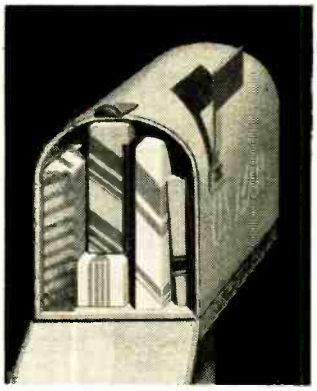
Kit GW-42, no money dn. **$119.95**

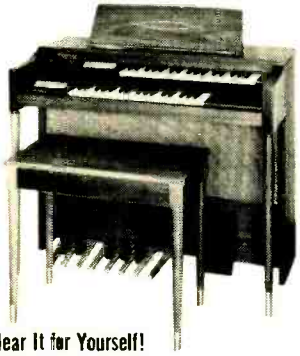
NEW Advanced Transistor Stereo Amplifier

Smooth power—superb dynamic range! 100 watts IHFM Music Power rated, 70 watts Heath rating. 13 to 25,000 cps response @ rated output. 28-transistor, 10 diode circuit. 28 lbs.

Kit AA-21, no money down, $13 mo. **$134.95**

Home and Save
HEATHKIT®





Hear It for Yourself!

Send for this Heathkit organ demonstration record . . . listen to the beautiful voices, rich mellow tone and astounding range of expression offered in this sensational instrument. Send just 50c to cover cost of handling and postage on this 7"—33⅓ rpm record. **Ask for record GDA-232-3.**

ANOTHER HEATHKIT FIRST!
A Real 2-Manual Organ for Only $329.95

The exclusive Heathkit version of the all-new Thomas Transistor Organ now, for the first time, offers you a real two-manual organ at the market-shattering low price of only $329.95 in easy-to-build kit form! Compares in features and performance with assembled units costing well over $700. Features two 37-note keyboards; 10 true organ voices; 13-note pedal bass; variable vibrato; expression pedal; variable bass pedal volume; manual balance control; correctly positioned overhanging keyboards; built-in 20-watt peak amplifier and speaker system; beautifully factory assembled and finished walnut cabinet.

Kit GD-232 (less bench) . . . no money dn., as low as $22 mo. . . . **$329.95**

NEW 10-Transistor FM Car Radio

88 to 108 mc coverage; better than 1.25 microvolt sensitivity; AFC for drift-free FM reception; tone control. Factory-assembled tuning unit; easy circuit board assembly. 7 lbs.

Kit GR-41 . . . no money dn., $7 mo. **$64.95**

NEW FM Portable Radio

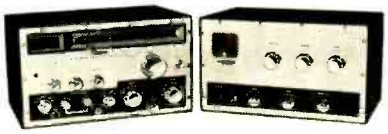
10-transistor, 2-diode circuit; vernier tuning; AFC for drift-free reception; tone control; 4" x 6" speaker; built-in antenna; prebuilt tuning unit. Battery lasts to 500 hrs. 6 lbs.

Kit GR-61 . . . no money dn., $6 mo. . . . **$54.95**

NEW FM/FM Stereo Tuner

Stereo Indicator light; phase control for max. separation and lowest distortion; adjustable AFC for drift-free reception; bar-type tuning indicator; filtered outputs for stereo tape recording. Factory assembled tuning unit. 16 lbs.

Kit AJ-12 . . . no money dn., $7 mo. **$69.95**



NEW Heathkit SSB "Six Pack"

A brand new SSB exciter and linear amplifier for six meter operation; 125 watts P.E.P.! Only $289.90 for the pair . . . less than the cost of most transverters. Loaded with extras for maximum efficiency and operating convenience!

Kit HX-30 Exciter **$189.95**
HA-20 Linear **$99.95**

World's Biggest VTVM Value!

Measures AC volts (RMS), AC volts (peak-to-peak), DC volts, Resistance and DB. Has 4½" 200 ua meter, precision 1% resistors and 11 megohm input. Slim, all-purpose test probe incl. 5 lbs.

Kit IM-11 Special Value Price, ... **$24.95**

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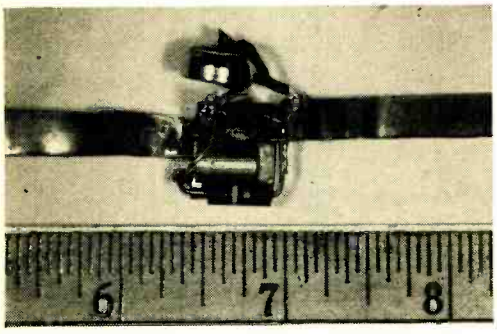
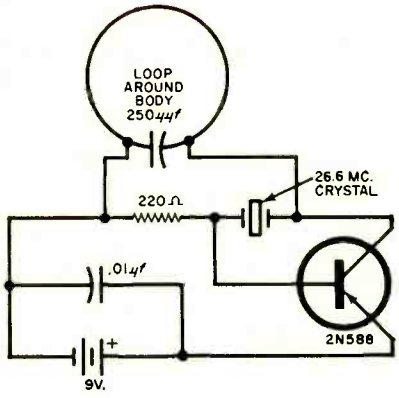
ITEM	MODEL NO.	PRICE

Beam on Wildlife (*Continued from page* 65)



Thimble-size transmitter (above) is powered with single mercury cell and locked on frequency by crystal cut for 26.6 mc. Ultra-simple circuit of the transmitter (right) is fixed-tuned crystal oscillator.

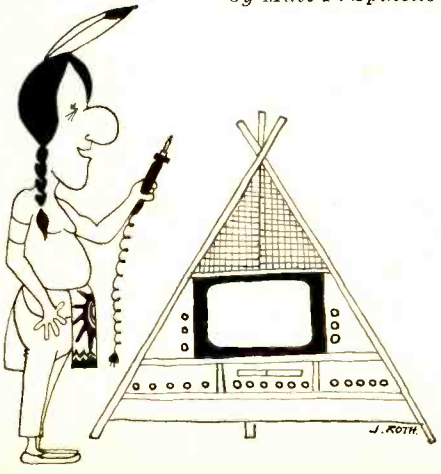


feeding habits of rabbits has come to light. It is now known, for example, that Brer Rabbit keeps to a two-acre area for feeding during any one night, and sleeps through the day hidden at a single spot.

Keeping track of wildlife, not only rabbits but ducks, grizzly bears, deer, etc., is quite simple. The portable radio direction finder (RDF) tuned to the frequency transmitted by the unit strapped to the animal lets the wildlife sleuths snoop without coming too close. An RDF receiver is currently being designed so that up to 40 channels, one per subject, will permit tracking of several animals of different species night or day. Electronics, keeping a beam on wildlife, helps us learn more about nature. —30—

I KITS YOU NOT!

by Matt P. Spinello



A NATIONAL electronics manufacturing firm sponsored a giant contest in which they offered a $10,000 first prize to the person doing the best job of building one of their electronic kits. Upon judging all entries, it was found that a young Indian had built a fantastic radio/TV/stereo console combination with the utmost perfection. There was no doubt about it—he was their first-place winner.

The company immediately sent a filming crew to interview this evident Indian-genius, and they were amazed to find the teepee of the lad's father filled with electronic gear, as well as trophies and plaques for similar feats the father had accomplished. During the film interview, the announcer turned to the young brave and said:

"I can see from your father's electronic accomplishments that you have acquired the kit-building fever also. Evidently the entire family greatly enjoys this type of project. Can you tell me in your own words why you seem to enjoy kit-building as much as your father, young man?"

To which the Indian replied, "Ugh, like solder, like fun!" —30—

Packaging Power

(*Continued from page 45*)

is important). This power-mite's service life is calculated at 36 ma. hours at a drain of 2 ma.

A mercury cell has two major disadvantages. It's non-rechargeable and a poor performer at even moderately chill temperatures; below 40°F the cell goes dormant (it operates best between 70° and 113°F). And at higher temperatures, the cell's electrolyte gives off gas; exposed to direct heat, it may explode.

Alkaline Cells. Packing high current output in a mite-sized package, an alkaline cell provides amps when your portable circuit needs them. The cell's alkaline-manganese positive plate, dioxide-zinc anode, and potassium hydroxide electrolyte combine to give a low internal impedance, resulting in a high current output. Some designers claim the alkaline cell has 8 to 10 times the life of conventional carbon-zinc cells under heavy loads.

The high-current surge output of the alkaline cell (up to 8 amps for 8 seconds in some electronic photoflash applications) makes it suitable for heavy "hobby-craft" chores (powering model boats, igniting model plane "glo-plugs," cranking motion picture cameras).

Common electronic usage sees some alkaline cells with starting drains upwards of 6500 ma. Draw 200 ma. at 70°F, and the alkaline cell is still putting out power enough to operate your circuit after five or six hours. By contrast, a carbon-zinc cell under the same walloping load gives less than one hour's service. But the alkaline cells, which cost about three times as much as the carbon-zincs, are less economical where current drains are low or intermittent, or both.

The spanking new 1½-volt VS1336 standard "D" alkaline cell made by RCA can handle currents up to 1 ampere. It's a "comer" for powering radios, photoflash circuitry, toys, and high-current instruments.

Eveready's No. 560 7.5-volt alkaline battery can be recharged and reused many times. Although the recharging

conditions are exacting, this battery is finding popular usage in Citizens Band transceivers.

Alkaline cells also perform far better at low temperatures than carbon-zinc types. At −20°F, a typical carbon-zinc draining 10 ma. has an operative life span of only about 40 minutes. An alkaline cell, under the same conditions, would be good for almost another hour.

Nickel-Cadmium Cells. You can sum up this type of cell in four words: rechargeable . . . expensive . . . worth it.

The nickel-cadmium cell (its positive electrode is nickel; its negative electrode, cadmium) is a "secondary" cell—meaning "rechargeable." It's akin to your car's storage battery (also a rechargeable "secondary" cell) except that you don't have to add water to the sealed ni-cad. Plug the cell into a recharger, and it's back to full charge—1.25 volts d.c.—in from 14 to 16 hours. Some ni-cads can be recharged 500 to 1000 times.

Once limited to low-current drains, ni-cads now come packaged to fit most home projects and most current drains. Burgess's ni-cad line ranges from its "button" CD1 cell, rated at 1.25 volts and 20 ma. hours, to its standard rectangular CD111 cell, rated at 1.25 volts for 23 amp hours.

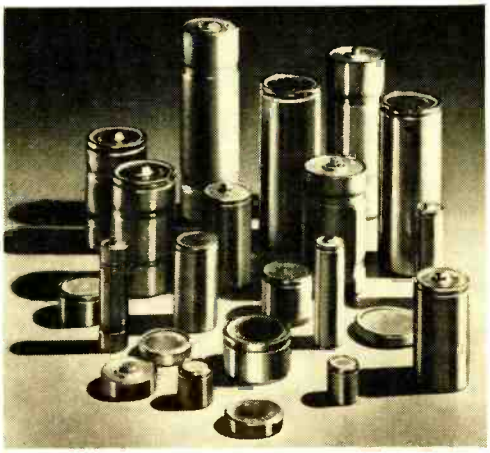
Nickel-cadmiums start with lower full-up voltage (1.25 to 1.3 volts) than the carbon-zincs, but their discharge curve is essentially flat. This means that you can pull more power out of them for a longer time before they have to be recharged, usually when the cell charge falls to about 1.1 volt.

Sonotone's new midget S126 (about ½" diameter) powers pocket paging systems, electric timers, miniaturized alarm circuits and, drawing 25 ma., falls to 1.1 volt "cutoff" after about 6½ hours of use. Draw four times the current—100 ma.—and the cell's good, before recharge, for about 75 minutes.

The main disadvantage of nickel-cadmium cells is that excessively low or high temperatures sap their vigor, and may cause leakage. Their best operational range is between 0°F and 115°F. At 0°F, a typical ni-cad has only 60% of its capacity at an operational-normal of 70°F.

And the ni-cads are expensive, their "first costs" being enough to scare most workbenchers. Whereas the common carbon-zinc flashlight "D" cell might cost 15 cents, the ni-cad "D" is liable to be tagged $2.75 . . . a kindred mercury cell, 75 cents . . . and an alkaline cell, 50 cents. But if you keep recharging and reusing the ni-cad, in the long power-pull you'll get more volts for less money than with any other dry cell, past or present.

"Reserve" Cells. "Whamo" is the word here—for cells which, though "dry," don't produce power until they're activated by water. But the power that they give is the uppercut kind—a jolting, short-lived jab that fires up emergency transmitters, jolts a missile on course—or can trigger your special "one-shot" projects.



These nickel-cadmium dry cells by Sonotone provide portable power in many sizes, shapes, and voltages.

The "reserve" dry cell is just that—power held in reserve until needed. Most of these cells are built around either the cuprous chloride-magnesium system (and are called "cuprous chloride" cells), or silver chloride and magnesium ("silver chloride" cells). To activate them, you dunk them in water—any kind that's available. Ten-seconds wetting is often enough to fire them up.

Some "reserve" cells, many custom-designed for military electronics, deliver up to 30 watts per cubic inch! One new cell no larger than a flashlight battery whacks out 100 amperes. Voltages (figured as "peak voltage") range from 1.52 to 1.60 volts per cell. But output—when

it comes—is short-lived, expended in a matter of minutes.

One big advantage of the water-activated cells is that, once wetted, they operate almost as efficiently (considering their short-duration power punch) at −80°F as at a fiery 185°F.

Dry cells? Ironically, the electronic age's only bone-dry cell must be wetted to work. Still, you can pick and power from at least 2000 not really "dry" cells. Designed to deliver dependable volts, they provide portable power when and wherever you need it. —30—

Folded Dipoles

(*Continued from page* 54)

(You *can* use a receiver with an S-meter instead of the VSWR bridge if you have to, with the receiver tuned to a signal at the approximate center of the desired band.) Try raising and lowering the antenna while observing the VSWR bridge (or S-meter), in order to place the antenna where it will function best.

If you have followed the dimensions given in the table carefully, the antenna should work well. However, critical adjustment can be accomplished by installing shorting bars (as shown in the drawing at the top of page 54). To tune the antenna to the exact center of the desired band, slide both shorting bars in or out (about an inch at a time) until you achieve the best standing wave ratio on the VSWR bridge (or the best reading on the S-meter). —30—

FREQUENCY (mc.)	DIMENSION L (feet)	BAND
3.75	125	amateur
6.075	77½	SWL
7.15	65½	amateur
9.637	49	SWL
11.825	39½	
14.200	33	amateur
15.275	31	SWL
17.800	26½	
21.225	22	amateur
21.625	21	SWL
29.000	16	amateur

On the Citizens Band

(*Continued from page* 71)

mobile unit are okay. Stray r.f. floating around, due to poor soldering, can play a distinct part in weakening your signal.

If your base unit is located in the kitchen, as many are, be particularly sure of proper grounding, especially near running water or other electrical equipment that may have a different ground potential. Let's not lose any CB'er via shock.

Club Chatter. There seem to be an increasing number of reports on stolen CB gear. A good suggestion from the "3W Scribbler," publication of the Buxmont (Pa.) Radio League, is to have your equipment insured. Then, if it is stolen, report the incident—along with the serial number—to the FCC. One of the more active CB organizations, the Buxmont group has over 100 members, with 80 stations working for Civil Defense. Are they CB enthusiasts? Well, one member not only has base and mobile CB rigs, but he installed units on his motorcycle and airplane as well. . . . Another well-organized CB club is the 5-11 Radio Club of Pittsburgh. Their interesting and well-planned newspaper, "The Modulator," complete with illustrations, shows a buzz of activity in all directions. This is one of a number of clubs that have formally asked the FCC's help in clearing up the misuse of the Class D radio service. The members proudly display a multicolored window

decal, and make it known by means of a "scotch-lite" decal that they are using mobile radio, on 11 meters, monitoring channel 9. (If you're interested in purchasing an effective transmitter warning

plate to thwart off would-be "unit snatchers," contact Clifford Klein, 5-11 Radio Club, 868 Glass Run Rd., Pittsburgh 36, Pa.)

Besides the regular duties engaged in by the Racine (Wis.) Citizens Band Club, their social program includes a summer picnic, a roast pig "hog-o-witch" Halloween party, a Christmas party with "Santa" and gifts, and tours to the phone company and radio stations. One of the club members recently found himself in a situation where the appearance of his equipment played an important part in his well-being. While parked at a stop light early one a.m., he found his auto surrounded by hoodlums, one carrying a wrench. In direct contact with the police on channel 22, the Racine CB'er called in for help. When the hoodlums saw the CB'er's mike and antenna, they immediately fled in their own car. The CB'er followed them, and was soon joined by a police squad which apprehended the group.

Among several clubs out to stimulate the interest of the feminine side in CB are the Ottawa (Ill.) 5 Watters. Their monthly paper, the "Break-Break," features a column called the "XYL Corner." It lists everything from baking tips to painting pointers. . . . A very interesting issue of "The Feedback," sponsored by the 11/27 Radio Club of Millis, Mass., describes two different 10-33's which were handled quite well by CB'ers. On an August evening, from 6:30 p.m. to 2:30 a.m., approximately 20 mobile units assisted in tracking an escaped convict around the Norfolk prison area. On another evening, several units assisted in apprehending two young ladies who had escaped from a reformatory located nearby.

That about winds it up for 1962. To help kick off the new year, let's institute an annual roll call by having all active clubs across the country verify their mailing addresses, current officers, and number of members. Please continue to send us your monthly newspapers and information regarding club activities and plans, and—when available—pictures that you think will be of interest to P. E. readers. All mail should be addressed to: Matt P. Spinello, CB Editor, POPULAR ELECTRONICS, One Park Avenue, New York 16, N. Y. —30—

New Products

FILAMENT CHECKER

Speedy testing of filaments and heaters in all types of tubes is the function of the Sencore FC123. Nuvistors, novars, compactrons, and 10-pin tubes, as well as all of the more familiar types, can be quickly and easily checked with this device. A pair of test leads is supplied for checking CRT's, making other continuity tests, and testing neon indicator lamps. The FC123 sells for $3.95. (*Sencore, Inc.*, 426 S. Westgate Dr., Addison, Ill.)

UHF CONVERTER

Said to offer 50% more picture power than other single-tube UHF converters, the Gavin Model G-2 features a long-life, low-noise Nuvistor circuit. A built-in UHF-VHF coupler allows the use of existing VHF antennas and transmission line. Measuring 8½" x 3" x 4" and weighing 2¾ lb., the converter incorporates an isolation transformer for "cold" chassis operation. All UHF channels from 14 to 83 can be

tuned with the Model G-2. Price, $24.95. (*Gavin Instruments, Inc.*, Depot Square, Somerville, N. J.)

AUTOMATIC PHONE PATCH

Any mobile unit in a two-way radio system can now be automatically patched into a telephone with the Model 301 "Patch-a-Call." The 301 is a transistorized, voice-operated device, which is physically connected only to the transmitter or transceiver at the base station. The telephone handset is placed in a receptacle on the 301, automatically turning it on; and when the party on

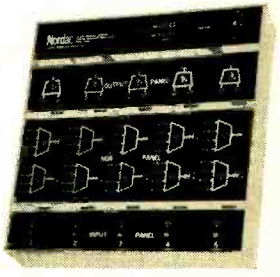
the land line speaks, the transmitter is actuated. When no speech is present, the receiver is switched into the circuit. The base station operator can monitor the conversation over an auxiliary speaker. The "Patch-a-Call" is priced at $64.95. (*Business Radio, Inc.*, P. O. Box 5652, Minneapolis, Minn.)

COMPACT WORKBENCH

Occupying just eight square feet of floor space, the Hirsh all-steel "Work and Hobby Bench" has a 24" x 48" high-impact fiberboard work area. A perforated back panel with double-tier tool rack provides storage space for dozens of small hand tools, and there is a 12" x 20" storage drawer and a storage shelf as well. The bench is finished in gray enamel. Suggested retail price, $25.00. (*S. A. Hirsh Mfg. Co.*, Skokie, Ill.)

DIGITAL COMPUTER KIT

Using transistorized "NOR" circuitry, the "NORDAC" is said to be the first fully transistorized digital computer kit. It is the newest addition to the "MINIVAC" line of computer teaching devices. No special electronics skill is needed to assemble the kit, which demonstrates all basic computer operations. An accompanying manual contains over 100 experiments and programs covering the fundamentals of computer technology. Information is fed to the computer through five input switches and results read out by five indicator lamps. Colored patch cords are used for programming the device. Price, $64.95. (*Scientific Development Corp.*, 372 Main St., Watertown, Mass.)



SHORT-WAVE RECEIVER KIT

The Heathkit HR-20 eight-tube superhet tunes AM and CW as well as SSB signals on any ham band from 80 through 10 meters. A crystal bandpass filter provides sharp selectivity, and a tuned r.f. stage insures better than 1-μv. sensitivity on all bands. Tuning is simplified by a 5½" slide-rule dial with a 30-to-1 gear ratio, and an easy-to-read S-meter indicates relative signal strength. The 17-lb. receiver operates from a 12-volt car battery using the Heathkit HP-10 mobile power supply, or from 117 volts using the Heathkit HP-20 a.c. power supply. The HR-20 (without power supply) is priced at $134.50. (*Heath Co.*, Benton Harbor, Mich.)

"EDUCATIONAL" HEADSET

The Clevite Model ED-300 "educational" headset is designed specifically for language labs and other teaching applications. It can be worn comfortably over glasses and, having only a single cord, is easy to put on and take off. Two types of ear cushions are available: a "donut" type (recommended for long listening periods and for maximum elimination of external noise), and a "blanket" type (which prevents direct contact between ear and phone). The cushions are attached by means of a special nylon zipper and can be removed easily. Frequency response of the headset is 50-10,000 cycles; impedance is 50,000 ohms at 1000 cycles. Price, $28.00. (*Clevite Electronic Components*, 232 Forbes Rd., Bedford, Ohio)

FOUR-BAND RECEIVER

An amateur communications receiver, the HE-60 features a sensitive superhet circuit and tunes all frequencies from 550 kc. to 30 mc. in four bands. The 4" speaker is automatically disconnected when a low impedance headset is plugged into the front panel jack. Housed in a 10$^{11}/_{16}$" x 5$^{5}/_{8}$" x 8$^{1}/_{8}$" cabinet and weighing 9 lb., the receiver operates from 105-125 volts, 50/60 cycles. The HE-60 is priced at $39.95 and the headset (ME-42) is $2.35. (*Lafayette Radio Electronics Corp.*, 111 Jericho Turnpike, Syosset, L. I., N. Y.) -30-

Across the Ham Bands

(*Continued from page* 82)

strength meter where *it* is visible and will indicate whether or not the transmitter comes on the air when the transmit button is pushed. The 2-meter rig is the reason for the 19″ wire (one-quarter wavelength). Longer lengths of wire give greater signal pickup on the lower frequencies, but there is usually enough r.f. floating around the shack of even a low-power, 80-meter transmitter to obtain a good meter deflection with a 19″ length, especially near the transmitting antenna's feedline.

Used as an r.f. "sniffer" and tuning or neutralizing indicator, the unit will show the presence or absence of r.f. in various sections of a transmitter, to help determine whether the corresponding circuits are functioning properly. Since the copper antenna can be bent into different shapes and straightened again, almost any point in the transmitter can be reached.

News and Views

Terry Schieler, WNØCNO, 8754 Westcott, Jennings 36, Mo.. works the four Novice bands. A Heathkit DX-60 transmitter and a Knight-Kit R-100 receiver share a 40-meter dipole on the three low-frequency bands, and a Heathkit "Twoer" sports a "halo" on 146 mc. Terry has 16 states and Mexico confirmed, but he's not too busy with his hamming to help prospective Novices obtain their tickets. . . . Our June Novice Photo Contest winner, **Carl D. Fuglein,** 42 Midland Ave., Berwyn, Pa.. has knocked that first "N" out of his call and is now **K3QNC.** But he says he can't work Delaware—and Delaware is only 20 miles away! At least Carl needn't feel lonesome; he has lots of company. . . . **Terry Cantrell, WN4GPA,** 456 Pinehurst Drive, Smyrna, Ga., has kept his Heathkit DX-40 transmitter, Hammarlund HQ-110 receiver, and dipole antenna on 40 meters to work 28 states—27 confirmed—in his four-month Novice career. By the way, all Terry wants for Christmas is his General Class license.

"Happy" Walt Alyea, KN9HND, Greenfield, Ind., operates on all four Novice bands—on 80, 40, and 15 with a home-brew 1625 rig, and on 2 meters with a Heathkit "Twoer."

Jethro "Jep" W. Meek, WN9BYS, 222 East Washington St., Greensburg, Ind., pushes 50 watts into a Heathkit DX-20 transmitter to excite a 40-meter dipole antenna. He receives on a converted ARC-5 "Command-Set." With this equipment, Jep has collected QSL cards from 21 states. He also has a 15-wpm code proficiency certificate and his General Class license is on the way. . . . From far-off East Africa, **Sylvester de Mello,** c/o Police Signals, P.O. Box 9141, Dar-es-Salaam, Tanganyika, would like to correspond with a U. S. ham about 19 years old. Sylvester would like to become a ham, too, but there are some obstacles in his path. In the meantime, he's a radio technician in Dar-es-Salaam. If you write to Sylvester, we suggest you use airmail; otherwise, it may take many weeks for your letter to arrive.

. . . **David L. Sporre, WV2YVM/WA2YVM,** 609 Ravine Rd., Plainfield. N. J.. works 40 and 2 meters. On 40 he receives with a Lafayette HE-10 and transmits with a home-brew 40-watter feeding a dipole. On 2 meters, a home-brew converter goes ahead of the HE-10 and a home-built 15-watter feeds a variety of antennas—all products of the WA2YVM antenna laboratories. Among the antennas are a 2-meter dipole, a 2-meter "cloverleaf," and a 10-element beam. Two hundred contacts in three states just goes to show that David isn't talking to himself. . . . **Bill Griffith, K1QAQ,** 385 Green Farms Rd., Westport. Conn., who recently received his General license, has separate dipoles for each ham band from 80 to 10 meters; but 40-meter c.w. is still his favorite. Bill transmits on an EICO 720 transmitter, and he receives on a Hammarlund HQ-100.

Bill Payne, KN7TDO, 7822 S.E. 16th, Portland, Ore.. gets on the air around 11:00 p.m.

"Cool" Roger Wiechman, WV6ZVP, Sherman Oaks, Calif., made 92 contacts in 11 states (including Alaska) over a 2-month period using a Hallicrafters HT-40 transmitter and a Knight-Kit R-55 receiver.

his time (2:00 a.m. on the east coast) and would like to make some skeds with eastern stations. Bill pokes at the ionosphere with a Heathkit DX-60 transmitter running the Novice limit to a 40-meter dipole, and he receives with a Heathkit HR-10. He doesn't think that his record of five states worked in 2½ months is anything to brag about, but he has enjoyed every contact. . . . **Camilo A. Castillo, HP1AC,** P.O. Box 354, Panama, Republic of Panama, reports that Novices put strong signals into Panama City on both 7 and 21 mc. Cam looks for Novices and calls "CQ N" on 21 mc. as often as possible on weekends and will also make weekend 7-mc. skeds. HP1AC's equipment includes a Globe Scout-66 transmitter running 60 watts and a Hallicrafters S-85 receiver, helped along by an RME DB-22A preselector and a BC-453 "Q-5'er." The antennas are a home-brew 15-meter, 2-element beam and a 40-meter dipole. If you work HP1AC, the fastest way to get a QSL card is to send *your* QSL and a stamped return envelope to Jack, W2CTN. Oddly enough, Cam himself is the QSL Manager for the "Liga Panameña de Radio Aficionados"—the Panamanian Radio Club!

. . . **Danny Domondon, WV6URY,** 9226 Rosser St., Bellflower, Calif., runs 23 watts to the "High-Performance Transmitter" described in our January, 1962, column to shake up the electrons on his 40-meter dipole. He uses a Philmore CR5AC receiver and, in 5½ months, has tacked up on the shack walls 158 QSL cards from 18 states.

When he's not hamming, **Salvatore Morgera, KN1WFV/WPE2FOP,** 46 Freeman St., Warwick, R. I., is experimenting in the field of thermodynamics; he has won two "firsts" in science at the Rhode Island State Fair and a 1962 New England Regional Forst Award. As a ham, Sal uses a Heathkit DX-20 transmitter tied to a 70', end-fed antenna, and a Heathkit GR-91 receiver plus a Q-multiplier. In three months he has put 25 states and Canada in his logbook. . . . **Ed Smith, KN7SPT,** Unit #1, Fairview Heights, Burns, Ore., operates on 80 and 40 meters with a Heathkit DX-35 transmitter and "Comanche" receiver. His antennas are only 10' high, but he has worked eight states—including Hawaii.

An interesting little book which recently crossed your Amateur Radio Editor's desk is *The Technician Magazine*, published by **Armond M. Noble, K7MFA,** Box 465, Billings, Montana. A request, plus a quarter, mailed to Armond will get you a sample copy. . . . **Bob Nordstrom, WV6WCG,** 283 Hasse Drive, Los Angeles 25, Calif., feeds his Johnson Ranger transmitter into a 40-meter dipole antenna; he receives on an RME-45. Twenty-three states and Bermuda (VP9) are on Bob's "brag" list.

Your news, views and picture would fit very nicely in a future column; so let's hear from you. Address mail to Herb S. Brier, W9EGQ, Amateur Radio Editor, POPULAR ELECTRONICS, P.O. Box 678, Gary, Indiana.

May the Christmas season be happy and peaceful for the entire world! 73,

Herb, W9EGQ

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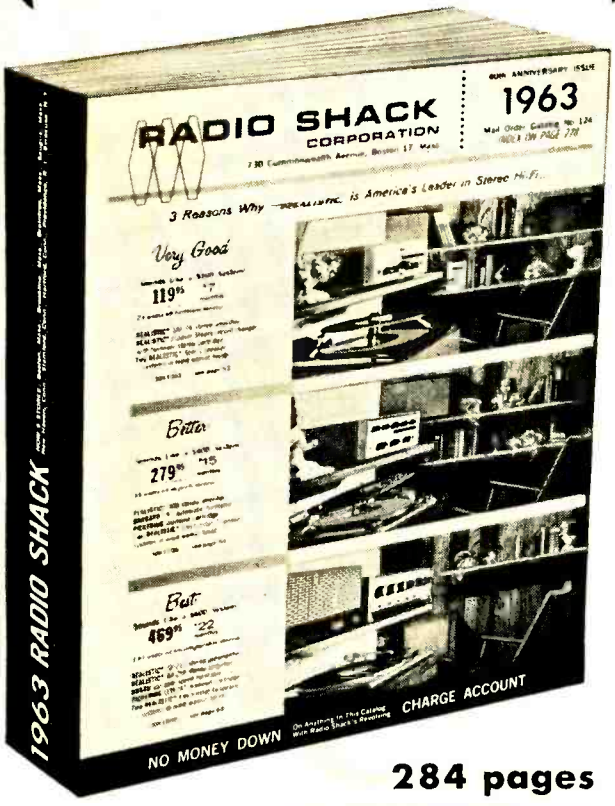

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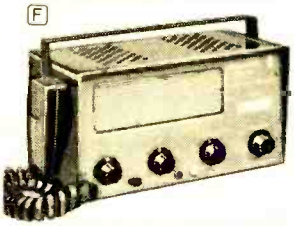

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Transistor Topics

(*Continued from page* 80)

ly, there are no special "tricks" involved. Except for the selection of transistors and component values, VHF circuits are quite similar to those employed at lower frequencies. All three basic configurations—common-base, common-emitter, and common-collector—are used. Circuit assembly is more critical, of course, but no more so than with vacuum-tube circuits operating in the same frequency ranges. Leads must be kept short and direct, and special attention must be paid to layout and wiring.

A typical wide-band 200-mc. amplifier circuit is shown in Fig. 4. Developed by Motorola, this amplifier has a bandwidth of 10 mc., a power gain of 15 db, and a noise figure of only 5 db. It is designed for operation from a 6-volt power source and draws 4 ma. The circuit features a 2N1142 epitaxial mesa transistor.

Referring to the diagram, we see that the common-emitter configuration is used. Neutralization is provided by *L3*, coupled to collector load *L2* and feedback capacitor *C4*. Capacitors *C1*, *C2*, *C4*, *C6*, and *C7* are ceramic trimmer capacitors with the ranges shown, while *C3* and *C5* are ceramic bypass units. Resistor *R1* is rated at ½ watt; coils *L1*, *L2*, and *L3* are all wound with #28 wire on a 3/16" air core, with *L1* consisting of two turns, *L2* of three turns, and *L3* of one turn.

Amplifier circuits such as this one can be employed in the "front-end" of communications receivers and TV sets, and as drivers or buffer amplifiers for low- to medium-power transmitters.

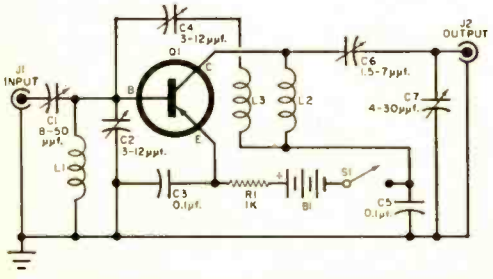


Fig. 4. Low-noise, broadband, 200-mc. amplifier circuit designed around Motorola's new 2N1142 pnp germanium transistor. See text above for complete coil-winding and significant performance data.

Hot or Cold? Most of us know that high temperatures have an adverse effect on semiconductors, and can even cause permanent damage to transistors and diodes. The fact that extremely low temperatures can also affect semiconductor characteristics is not as well known. While low temperatures won't—as a rule—cause damage, they can shift operating parameters to the point where a receiver or amplifier may fail to operate.

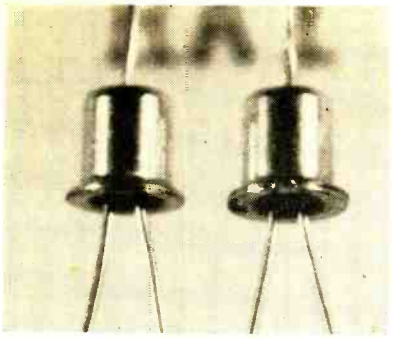
Reader George L. Rotherham (Onion Lake, Sask., Canada) has written us of his experiences along these lines:

"I heard so many complaints this winter that transistor radios wouldn't operate on cold mornings that I tried an experiment to find out why. I tuned in a powerful station on my transistor radio and then put the set outside when the temperature was 15° below zero. In ten minutes the signal faded right out. When I took the set inside, the batteries tested okay, but the set wouldn't work. I placed it in a warm place and it slowly came back to life."

The moral to the story? If you have trouble with a piece of transistorized equipment that has been exposed to very low temperatures, don't try to troubleshoot it until *after* it has warmed to normal room temperatures.

Product News. Relatively few hobbyists are familiar with Raytheon's line of "double-ended" transistors, even though they were introduced quite some time ago. There are 20 germanium types in the line, including computer and general-purpose r.f. and a.f. types. All are subminiature units approximately 21 times smaller than the familiar TO-5 package, and the majority have electrical characteristics which approximate those of some more familiar type. They are suitable for ultra-compact assemblies and are quite adaptable to multiple-board configurations.

General Electric (W. Genesee St., Auburn, N. Y.) has introduced a semiconductor gate turn-off (GTO) switch. Carrying experimental type number ZJ224, the new unit is a logical development of the silicon-controlled rectifier (SCR) and can be turned "off" as well as "on" by means of its gate control electrode. (See *Transistor Topics*, November, 1962,



"Double-ended" transistors developed by Raytheon have been on the market for some time. The 20 different types in the line are ideal for use in compact assemblies.

for a discussion of the SCR). The GTO is intended primarily for use in d.c. circuitry and has a typical switching time of 1 μsec. Suitable for such applications as low-power inverter circuits, power flip-flops, high-speed solenoid and relay drivers, saw-tooth generators, oscillators, and ring counters, it will also serve as a triggering device for conventional SCR's or transistors when used in high-frequency, high-power inverter applications.

From the Heath Co. (Benton Harbor, Mich.) comes news of a solid-state regulated power supply kit. Designated as Model IP-20, it has four current ranges (50 ma., 150 ma., 500 ma., and 1.5 amp), and an adjustable (0-50 volt) output; ripple is less than 150 μv. at full output. The instrument uses a transistorized series-type voltage regulator and a zener diode to provide the voltage reference. Operation is stabilized by an OB2 VR tube for good line regulation. The kit nets for $72.95, plus postage, direct from the manufacturer.

If you're experimenting with tunnel diodes, and have had trouble selecting suitable mountings, you should investigate the tunnel diode clip-in sockets now being produced by Med-Tronics, Inc. (2019 Westchester Ave., Bronx 62, N.Y.). Designed to eliminate soldering and possible heat damage, these sockets are available in a number of models.

Season's Greetings, and I'll see you next year.

—*Lou*

Short-Wave Report

(*Continued from page 76*)

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 Eastern Standard and the 24-hour system is used. Reports should be sent to P. O. Box 254, Haddonfield, N.J., in time to reach your Short-Wave Editor by the eighth of each month; be sure to include your WPE call letters 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 is noted in Turkey on 4710 kc. in Eng. daily at 0900-0930 and on 15,225 kc. at 0530-0600. Heavy QRM makes reception difficult even in the Middle East.

Australia—The N.A. xmsn, formerly heard mornings, is now being broadcast at 2000-2300 on 17,840 and 15,370 kc. Other Eng. xmsns are as follows: to S., S.E., & S.W. Asia at 2000-0300 on 21,540 kc., at 1915-0400 on 17,870 kc., at 1714-2000 and 0300-0400 on 15,220 kc., at 0330-0800 on 11,880 kc., at 1714-1915 on 11,840 kc., at 0730-0930 on 11,760 and 9540 kc., at 0400-1230 on 9570 kc., and at 0900-1230 on 7220 kc.; to East Asia at 1559-1915 on 15,240 kc., at 0330-0530 on 11,810 kc., and at 0600-0712 on 11,810 and 9580 kc.; to Africa at 2330-0045 on 17,820 kc.; to the British Isles and Europe at 0100-0230 on 11,710 and 9570 kc.; to Mid-Pacific Islands at 1500-1700 on 15,315 kc., at 2129-0230 on 15,220 kc., and at 0244-0712 on 7190 kc.; to New Zealand and South Pacific Islands at 1500-1700 on 11,840 kc., and at 0100-0415 on 11,710 and 9570 kc.

The Christian Broadcasting Association, 420 Lyons Road, Fivedock, Sydney, New South Wales, has applied to the Australian Broadcasting Control Board for a permit to operate a 10-kw. station which will broadcast gospel messages to South Asia using 11,740 kc. and either 17,700 or 17,900 kc.

Bolivia—*R. Indeamerica,* Potosi, is noted on 4785 kc. in Brazil (a change from 6202 kc.) at 2123 to 2206 s/off. The call may be CP54. A news bulletin in Spanish is given at 2123. Severe QRM is encountered from a local Morse network.

Brazil—*R. Nacional,* Rio de Janeiro, now operates on a new frequency of 11,795 kc., dual to 6145, 9720, and 15,295 kc., and is noted at 1900-2200.

ZYF24, *Radiodifusora do Maranhao,* Sao Luis, is noted on 4750 kc. at 0350-0420 with pop vocals. This is listed for 4755 kc. and was last reported on 4735 kc.

Canada—Montreal has made extensive changes in frequencies. Their newest schedule reads as follows: to Europe daily in Czech at 0645-1200 on 17,820 and 15,320 kc. (also at 0630-0645 on 11,720 kc.), to Canadian Forces at 0700-0730 on 17,820 and 15.320 kc. (to 0815 on Tuesdays and Sundays), various programs in Polish, Ukrainian, Russian, Slovak, Czech, and German at 0800-1030, 1100-1200, and 1215-1330 on 17,820. 15,320, and 11,720 kc., Eng. and French at 1030-1045, Hungarian at 1045-1100, Eng. at 1200-1215 on 17,820 and 15,320 kc.; to Africa in Eng. at 1333-1415 and in French at 1415-1445 on 17,820. 15,320, and 11,720 kc. (French continues to 1458 on 15,320 and 11,720 kc.); to Europe (Second Xmsn) in French and Eng. at 1501-1630 on 15,320, 11,720, and 9630 kc.; to Caribbean and Latin America in Eng. at 1800-1830 and in Portuguese and Spanish at 1830-1945 on 15,190, 11,720, and 9655 kc.; to Australasia in Eng. at 0330-0900 on 9630 and 5970 kc.; to Northern Canada daily at 0700-0730 (Tuesdays and Sundays to 0815), at 1030-1045 and 1200-1215 on 11,720 kc., at 1700-1745 and 2000-2200 on 11,720, 9585, and 5970 kc., and at 2200-0200 on 9585 and 5970 kc.

Chile—Soc. Nacional de Agricultura, Santiago, inactive on 12,000 kc. since the 1960 earthquake, is back on the air on 15,315 kc., where it is heard at 1800-2300.

Colombia—A new station is *La Voz de Llano,* Villavicencio, 5950 kc. It has been noted with s/off at 2300.

Dominican Republic—HI2U, *R. Caribe,* Santo Domingo, has returned to its 1960 frequency of 6090 kc. where it is noted at times late in the evening. Station HI2JP, *R. Comercial,* Santo Domingo, 4880 kc.. listed as inactive, is on the air (s/on at 0550, s/off at 0102) but it is rarely heard because a Latin American teletype station operates on the same channel. Both of these stations were heard in Brazil.

East Congo (Katanga Province)—*R. Elisabethville,* which was destroyed, is now back on the air as *R. Katanga.* Elisabethville, and operates to Europe at 1240-1600 on 11,871 kc. French news bulletins are given at 1300 and 1500; Eng. at 1520 and 0130. All reports *must* be addressed to *R. Katanga,* B.P. 1152, Elisabethville, Katanga, via Brussels and Usumbura.

Ecuador—A station on 9755 kc., in Quito, has been tentatively ID'd as *R. Victoria* at 0730. This may be a new short-wave outlet for medium-wave station HCPX1.

Two rarely heard stations are: HCFA4, *La Voz de Manabi.* Portoviejo, 4815 kc., noted at 2258-0035; and HCOB5, *R. Ondas Azules,* Cuenca, 5106 kc., noted from 2135 to 2230 s/off. Both stations had Spanish only.

A late report indicates that a new outlet may soon be operating on 4545 kc.

Egypt—Cairo has made several changes. The European Service now reads: 1330-1830 on 11,915 and 9495 kc. with Italian at 1330, French at 1430, German at 1530, Eng. at 1630, and Arabic at 1730. Kurdish and Turkish programs are broadcast on the same channels at 1200-1325. The *Voice of Africa* has replaced 17,760 kc. with 17,905 kc. at 1045-1330, and Eng. to Africa is now beamed at 1430-1515 (replacing 1415-1500). An Eng. newscast was noted at 1650 on 11,775 kc., and another Eng. segment was found on 17,820 kc. at 1250-1305 starting with a newscast.

England—Here's the latest schedule from London for the Western Hemisphere. The General Overseas Service broadcasts to N.A. at 1615-1715 on 15,375 kc., at 1615-1845 on 11,

780 kc., at 1715-2200 on 9510 kc., and at 1800-2200 on 6195 kc.; to West Indies, Central and South America (North of the Amazon) at 1500-1715 on 17,870 kc., at 1615-1715 and 1745-1930 on 15,070 kc., at 1700-1715 on 12,095 kc., at 1700-1715 and 1745-2200 on 11,750 kc., at 1745-2200 on 12,040 kc., and at 1800-2200 on 9580 kc.; to South America (South of the Amazon) at 1500-1715 on 17,740 kc., at 1500-1815 on 15,260 kc., at 1615-2200 on 12,040 kc., and at 1715-2200 on 9510 kc.; to South Georgia at 1715-1930 on 11,820 kc. The Caribbean Service broadcasts at 1715-1745 on 15,070, 12,095, and 11,750 kc. Transmissions to the Falkland Islands are at 1700-1730 on 11,945 and 9750 kc. The N.A. Service is listed at 1615-1715 on 15,375 and 11,780 kc. (to 1845 on 11,780 kc.), at 1715-2200 on 9510 kc., and at 1800-2200 on 6195 kc.; however, a late report indicates that the Canada & U.S.A. xmsn at 0930-1200 on 15,300 kc. and

Maurice Leveille, VE2PE1BT, Pierrefonds, Quebec, uses a Hallicrafters SX-110 with a built-in S-meter, a tape recorder, and a 100′ dipole antenna.

at 1100-1200 on 17,860 kc. may have changed—the latest schedule for monitoring indicates that the latter xmsn has been switched from 17,860 kc. to 17,890 kc. The BBC may be planning to use a low frequency this winter due to drop in solar activity; you might watch around 2880 kc. for London.

Fiji Islands—Suva has been noted on 4756 kc. at 0350 with talk; at 0400 with chimes and time pips, then news; at 0410 with a weather report and program summary; and at 0415 with request music. This is all English.

Formosa—*Voice of Free China,* Taipei, has been tuned at 0505-0550 with Eng. news and Chinese music on 9685, 7130, 6095 kc., and at 0730-0755 on 11,825 kc. with Eng. and Chinese.

Germany (East)—*R. Berlin International* has been tuned at 2000 with Eng. news on 9560 kc. and at 0730-0815 with an Eng. play on 15,210 kc. There is a short news bulletin at 0800.

Indonesia—Djakarta is noted in Eng. at 0600-0630 beamed to Singapore and in native language to 0700 beamed to Asia on 9770 kc., at 0930-1030 in Eng. with good signals on 9585 kc., and in Eng. to Europe at 1400-1500 on 9585 and 11,715 kc.

Iran—*R. Iran* has newscasts in Persian at 0130, 0325, 0430, 0530, 0630, 0730, 0830, 1030, 1130, 1230, 1430, 2130, 2230, 2330, and 0030 on 7031 and 3780 kc. *R. Teheran* has newscasts in Arabic at 1330, in Russian at 1500, in Turkish at 1515, in French at 1530. and in Eng. at 1545 on the same channels. The 9660-kc. outlet may

also be in operation though the schedule did not indicate its use. Call-signs: EQO on 3780 kc.; EPB7 on 7031 kc.; and EQC on 9660 kc.

Iraq—*R. Baghdad,* 9635 kc., has German at 1600-1620 but the 1630-1700 Eng. xmsn is usually QRM'ed. A report from Florida indicates that the Eng. period is frequently heard well, with the signal rising towards the end of the xmsn. Features include news, commentary, an editorial, and some U.S. records.

Japan—This is the latest schedule from *Nippon Hoso Kyokai,* Tokyo: to N.A. at 1830-1930 on 15,135, 15,390, and 17,895 kc. in Eng. and Japanese; to N.A. and Latin America at 2100-2300 on 11,780, 15,235, 17,725, and 17,895 kc., in Spanish, Japanese, and English; to Hawaii at 0030-0200 on 15,235 and 17,725 kc. in Eng. and Japanese; to Europe at 0115-0345 on 11,780, 15,135, and 17,895 kc. in Russian, German, French, Italian, English, Swedish, and Japanese; to Australia and New Zealand at 0430-0530 on 11,875 and 15,235 kc. in Eng.; to the Philippines and Indonesia at 0730-0930 on 11,780 and 15,135 kc. in Eng. and Indonesian; to S.E. Asia at 0800-1100 on 9675 and 11,705 kc. in standard Chinese, Fukienese, Cantonese, French, Vietnamese, Eng., and Thai; to S. Asia at 1000-1130 on 9525 and 11,780 kc. in Hindi, Eng., Urdu, and Benghali; to the Middle East and North Africa at 1145-1345 on 7195, 9525, and 11,780 kc. in Arabic, French, Eng., and Japanese; to Africa at 1400-1500 on 9525 and 11,875 kc. in Eng., French and Japanese. The General Service in Eng. and Japanese transmits half-hour programs at 1900, 2000, 2100, 2200, 2300, 0000, and 0100 on 15,325, 15,105, and 15,195 kc.; at 0200, 0300, and 0400 on 9505, 15,195, and 15,325 kc.; at 0500 on 9505, 9605, and 15,325 kc.; at 0600, 0700, 0800, and 0900 on 9505, 9605, and 9740 kc.; and at 1000, 1100, 1200, 1300, and 1400 on 9605, 11,725, and 9740 kc.

SHORT-WAVE CONTRIBUTORS

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(Hallicrafters S-120)
Grove Calkins, *WPE1EFG,* Newton, Mass.
(National NC-173)
Marc Perlin, *WPE1EFP,* Mattapan, Mass.
(National NC-60)
Thomas Sundstrom, *WPE2AJ,* Philadelphia, Pa.
(Hammarlund HQ-150)
David Markus, *WPE2FMR,* Depew, N. Y.
(Hammarlund HQ-100C)
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Richard Grab, *WPE2HYM,* Forest Hills, N. Y.
Daniel Ciskal, *WPE2HYX,* Lackawanna, N. Y.
Fred Meyer, *WPE3AKF,* Gaithersburg, Md.
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William Dickerman, *WPE3BEB,* Williamsport, Pa.
Jim Pieklo, *WPE3CHJ,* Conshohocken, Pa.
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John Wilson, *WPE3NB,* Wilmington, Del.
George Cox, *WPE3NF,* New Castle, Del.
Grady Ferguson, *WPE4BC,* Charlotte, N. C.
(Hallicrafters SX-28, SX-100)
Gary Atkins, *WPE4EHL,* Louisville, Ky.
Kenny Forsyth, *WPE4EKW,* Mobile, Ala.
(Zenith B600)
Mark Stone, *WPE4FAJ,* Louisville, Ky.
(Hallicrafters S-38D)
Roger Legge, *WPE4FI,* McLean, Va.
B. Convease, *WPE4FMU,* Raleigh, N. C.
(Hallicrafters S-76)
B. Edward Lorenzen, *WPE4FNA,* Hopewell, Va.
(Zenith 15U269)
William Bing, *WPE5AG,* New Orleans, La.
(Hallicrafters SX-100)
Paul Moratto, *WPE5AVL,* League City, Texas
(Heath AR-3)
Jack Keene, *WPE5BMP,* Houston, Texas
(Lafayette KT-135)
Delbert Hirst, *WPE5CFU,* Snyder, Texas
(Heath GR-91)
Marvin Easley, *WPE5CHG,* Jackson, Miss.
(Lafayette KT-200)
Robert Fiegel, Jr., *WPE5CKB,* New Orleans, La.
(Hallicrafters S-107)
John Hall, *WPE6BWZ,* San Francisco, Calif.
Bill Lund, *WPE6CJ,* Manhattan Beach, Calif.
Richard Rush, *WPE6DEJ,* Maywood, Calif.
(8-transistor portable)
Gary Payne, *WPE6DHU,* Fresno, Calif.
(Heath AR-3)
Ed Ericson, *WPE7BDL,* Lakeview, Wash.
Jim Klotz, *WPE7BHI,* Seattle, Wash.
Robert Kipp, *WPE8IBL,* Detroit, Mich.
Tim Shaw, *WPE8BUV,* Bay Village, Ohio
(Hammarlund HQ-145-X)
Chester Sheets, *WPE8CUJ,* Columbus, Ohio
Nils Young, *WPE8DKN,* Dayton, Ohio
Frank Ruzicka, Jr., *WPE8EHV,* Aurora, Ohio
E. J. Stuart, Jr., *WPE8EMM,* Tampa, Fla.
(Zenith 1000)
Rusty West, *WPE8ERJ,* Painesville, Ohio
Dick England, *WPE8FV,* Columbus, Ohio
Mike Kander, *WPE8MS,* Dayton, Ohio
Robin Fisher, *WPE8OG,* Beach City, Ohio
(Knight R-100)
Billy Wambach, *WPE9AT,* Evansville, Ind.
(Knight R-100)
J. P. Arendt, *WPE9DN,* Aurora, Ill.
Jonathan Reise, *WPE9DVE,* Milwaukee, Wis.
(Gonset 212)
Todd Curless, *WPE9DVP,* Indianapolis, Ind.
Michael Peters, *WPE9EEC,* Burnett, Wis.
(Philco 39-31)
Harvey Rogoff, *WPE9EFJ,* Calumet City, Ind.
(Knight Span-Master)
Edward Bassett, *WPE9EHF,* Toledo, Ill.
(Gonset 212)
Allen Titlebaum, *WPE9EKD,* Skokie, Ill.
(Knight Span-Master)
Jack Palladay, Jr., *WPE9EOE,* Indianapolis, Ind.
(Knight Span-Master)
John Beaver, Sr., *WPEØAE,* Pueblo, Colo.
(National NC-109, Hallicrafters SX-42, 5R100A)
David Velten, *WPEØANV,* St. Louis, Mo.
Larry Hastings, *WPEØCRA,* Augusta, Kansas
Giacomo Perolo, *PY2PE1C,* Sao Paulo, Brazil
John Yokoff, *TA3PE1J,* Diyarbakir, Turkey
Gregg Calkins, *VE1PE3L,* Saint John, N. B.
(Hallicrafters S-108)
Robert Viau, *VE2PE6O,* Sept Iles, Quebec
Bruce Lawton, *VE3PE6Y,* Scarborough, Ont.
(Heath AR-3)
Harold Balitski, *VE5PE3R,* Eastend, Sask.
(MACO AB-210)
D. Dawson, *VE6PE4K,* Grande Prairie, Alta.
Kenneth Alyta, Jr., Charlotte, N. C.
(Knight Span-Master)
Bernard Brown, Derby, England
(Eddystone S880)
Robert French, Bellaire, Ohio
(Knight Ocean Hopper)
Del Green, Salt Lake City, Utah
Stephen Thurlow, Cabramatta, N.S.W., Australia
(Philips TX458A)

SHORT-WAVE ABBREVIATIONS

BBC—British Broadcasting Corporation	N.A.—North America
Eng.—English	QRM—Station interference
ID—Identification	R.—Radio
kc.—Kilocycles	s/off—Sign-off
kw.—Kilowatts	s/on—Sign-on
	xmsn—Transmission

Lebanon—Beirut has a mailbag period during the N.A. Eng. xmsn on Wednesdays at 1600-1618.

Madagascar—Tananariva on 3288 kc. is noted in England from 1330 with French; a clear ID of *Ici Tananarive* is given at 1345.

Nigeria—A station has been noted on 9505 kc. with a missionary broadcast in Eng. at 2230. While as yet unconfirmed, this might be the listed but never reported outlet on 9500 kc. Can anyone confirm it?

Norway—Oslo still beams 100 kw. towards the USA at 2000-2130 and 2300-0030. The only Eng. programs on this 9610-kc. channel are broadcast on Sundays. Request music is played on Wednesdays, and Eng. listeners' requests may be answered during this period. Other frequencies (in dual) are 11,850, 15,175, and 6130 kc.

Peru—Two new stations are: OAX8U, *R. Echo,* Iquitos, 9665 kc., heard fairly well at 0600-0700 and 1900-2300; and OAX8I, *R. La Hora,* Iquitos, 9540 kc., noted during the same time periods. Station OAX2G, *R. Cajamarca,* Cajamarca, 4770 kc., is noted in Brazil from 2341 to 0000 s/off, and again at 0700 s/on with Peruvian music and frequent time checks in Spanish.

Other Peruvian stations noted are: Chiclayo on 6700 kc., heard well almost any time during the evening with all-Spanish language and a few U.S. records; OAX7F, *R. Nacional Puno,* 9570 kc., which usually has an excellent signal around 2300; and OAX4X, 15,105 kc., with music and Spanish news at 2130-2200.

Philippines—DZH8, Manila, 11,855 kc., is tuned in Eng. and Far East languages at 0900-1230, usually with good signals.

USSR—*R. Tashkent* continues to air its Eng. xmsn daily on 9600 kc. from 0700 s/on to 0730 in English. News is given at 0700-0710, after which music is presented.

Venezuela—YVOM, San Cristobal, is now on 9640 kc., replacing 9570 kc., and was noted with fair strength at 0600-0800.

Windward Islands—Windward Islands Broadcasting System, St. Georges, Grenada, is heard regularly on 9500 kc. at 1900-2115.

Medium-Wave Stations

The following stations have been heard on the standard broadcast band in Trinidad and Tobago. Several of these stations have been reported as being heard from time to time in the USA, especially in Atlantic Coastal states.

Aruba—*R. Victoria, The Cultural Voice of the Caribbean,* broadcasts daily at 0830 with religious programs, at 1000 in Spanish, at 1230 and 1830-2000 in English. The frequencies are 920 and 940 kc.

British Guiana—*R. Demerara,* 760 kc., broadcasts all day in English. The short-wave out-

lets are on 3265 kc. (s/on, 1515) and 5981 kc. (s/off, 1545). Reports go to: Broadcasting House, St. Phillips Green, Georgetown, British Guiana.

St. Kitts—*Radiodiffusion Francaise*, Basseterre, broadcasts French all day on 625 kc. (approx.). The ID is *Ici Basseterre*.

St. Lucia—*R. Caribbean International*, P. O. Box 121, Castries, St. Lucia, has French on 830 kc.; Eng. at 1500-1700.

Trinidad and Tobago—WVDI, the U.S. Navy station at Chaguaramus, is noted daily on 570 kc. (s/on time is 0645; s/off varies from 2300 to 0200); broadcasting in Eng. all day, it often presents ball games and Armed Forces Radio Service relays. *R. Guardian* operates daily at 0500-2300 on 610 kc., all English; reports go to P. O. Box 610, Port of Spain, Trinidad. *R. Trinidad, The Voice of Independent Trinidad & Tobago*, operates with 20 kw. on 730 kc. in Eng. at 0500-2300; reports should be sent to 11b Maraval Road, Port of Spain, Trinidad.

Virgin Islands—WIVI, Christianstead, St. Croix, operates on 970 kc., and has been noted off and on from 0945 to 1745. —30—

Numbers Quiz Answers

(*Quiz on page 77*)

1.414 — F The maximum or peak value of a SINE WAVE is 1.414 times its effective or r.m.s value.

3.2 — C A common impedance for SPEAKER voice coils is 3.2 ohms.

47 — A A type 47 PILOT LAMP is the one almost always found in the "All-American 5" receiver.

90 — H Current through a pure INDUCTANCE lags the applied voltage by a quarter of a cycle, or 90 degrees.

140 — G A common maximum capacitance value for a VARIABLE CAPACITOR is 140 $\mu\mu$f.

180 — B A signal fed into a VACUUM TUBE between grid and ground is inverted, or shifted 180° in phase, when observed between plate and ground.

300 — J The impedance of TV and FM TWIN-LEAD is 300 ohms.

440 — E A TUNING FORK used to tune musical instruments vibrates at 440 cycles, or A above middle C.

455 — I A common frequency for an I.F. TRANSFORMER is 455 kc.

15,750 — D The frequency of the horizontal sweep oscillator in a TV SET is 15,750 cycles.

SHORT-WAVE MONITOR CERTIFICATE APPLICATION

To become a Short-Wave Monitor registered with POPULAR ELECTRONICS, just follow these simple directions:

1 Fill out the form below. (You must be a short-wave listener presently active in the hobby to be eligible for a Short-Wave Certificate.)

2 Send us 10 cents in coin to cover the cost of the certificate as well as the handling and registration costs. If you live outside the United States and cannot obtain U. S. coins, send either 15 cents in Canadian currency or two International Reply Coupons (IRC's).

3 Insert the application form, coins (or IRC's) and a stamped, self-addressed envelope in another envelope and mail it to:
Monitor Registration, POPULAR ELECTRONICS
One Park Avenue, New York 16, N. Y.

(Please Print)

Name . . . . . Ham Call-Area Prefix . . . .

Address . . . . . City . . . . . Zone . . . . State . . . .

Receivers | Make . . . . . | Model . . . . .

Make . . . . . | Model . . . . .

Principal SW Bands Monitored | Number of QSL Cards Received

. . . . . .

Type of Antenna Used . . . . . .

Signature . . . . . | Date . . . . .

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TO VOLUME 17

July-Dec., 1962

AMATEUR RADIO AND SWL

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TEST EQUIPMENT

TRANSISTORS

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Base-Insulating Your Vertical

(*Continued from page 69*)

still available at many of the larger electronics supply houses.

Two of these insulators (Fig. 7) are screwed to the platform, the third to a wooden plug over which the bottom of the radiator is fitted. The two platform-mounted insulators should be spaced so that hardboard or Masonite washers can be inserted between the eyelets; these washers prevent the porcelain faces from grinding against each other.

A galvanized bolt, nut, and washer holds the entire assembly together. Be sure that the bolt fits loosely in the porcelain eyelets and that the nut is not drawn up too tightly.

Bottles as Insulators. While not as good a choice as the types of insulators already described, milk, beer, or soft-drink bottles have often been pressed into service by ingenious hams. Such a bottle may be buried—halfway up to its neck—in the ground, or even set in a small block of concrete. The base of the radiator is then slipped over the "neck" of the bottle and held in place by the "shoulder."

Most milk bottles, for example, are just the right size to hold a radiator made of 2"-diameter rain-gutter pipe. But, whatever you do, don't try to mount a radiator *inside* the neck of a milk bottle. Even the small "wobble" of a well-guyed mast will cause it to crack. —30—

"He finally said it . . . first the usual 'da, da' but then, a perfect 'dit.' "

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RATE 60¢ per word. Minimum 10 words prepaid. February issue closes December 5th. Send order and remittance to Martin Lincoln, POPULAR ELECTRONICS, 1 Park Ave., New York 16, N. Y.

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GOVERNMENT Surplus Receivers, Transmitters, Snooperscopes, Parabolic Reflectors, Picture Catalog 10¢. Meshna, Malden 48, Mass.

DIAGRAMS for repairing Radios $1.00, Television $2.00. Give make, model. Diagram Service, Box 672-PE, Hartford 1, Conn.

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WPE-CB-QSL cards—Brownie-W3CJI—3110A Lehigh, Allentown, Pa. Catalogue with samples 25¢.

CB WPE QSL Cards, Samples Free. Radio Press, Box 24, Pittstown, New Jersey.

INVESTIGATORS, write for free brochure on latest subminiature electronic listening devices. Dept. 12A, Ace Electronics 11500 NW 7th Ave., Miami 50, Fla.

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