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OCTOBER 1961

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SPECIAL: You Wouldn't Want To Be An Electronics Hobbyist in the U.S.S.R.

(see p. 41)

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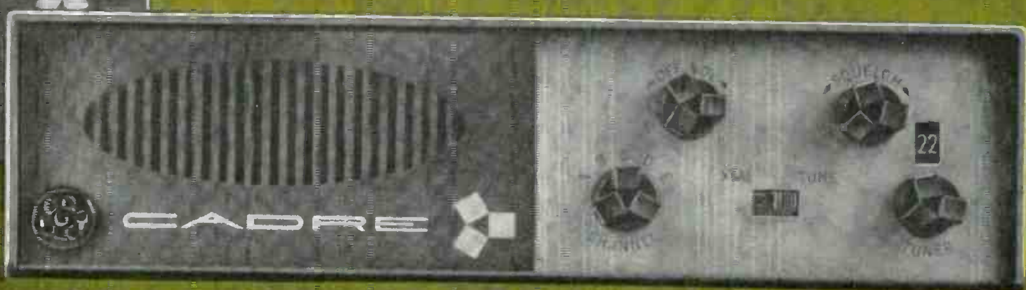

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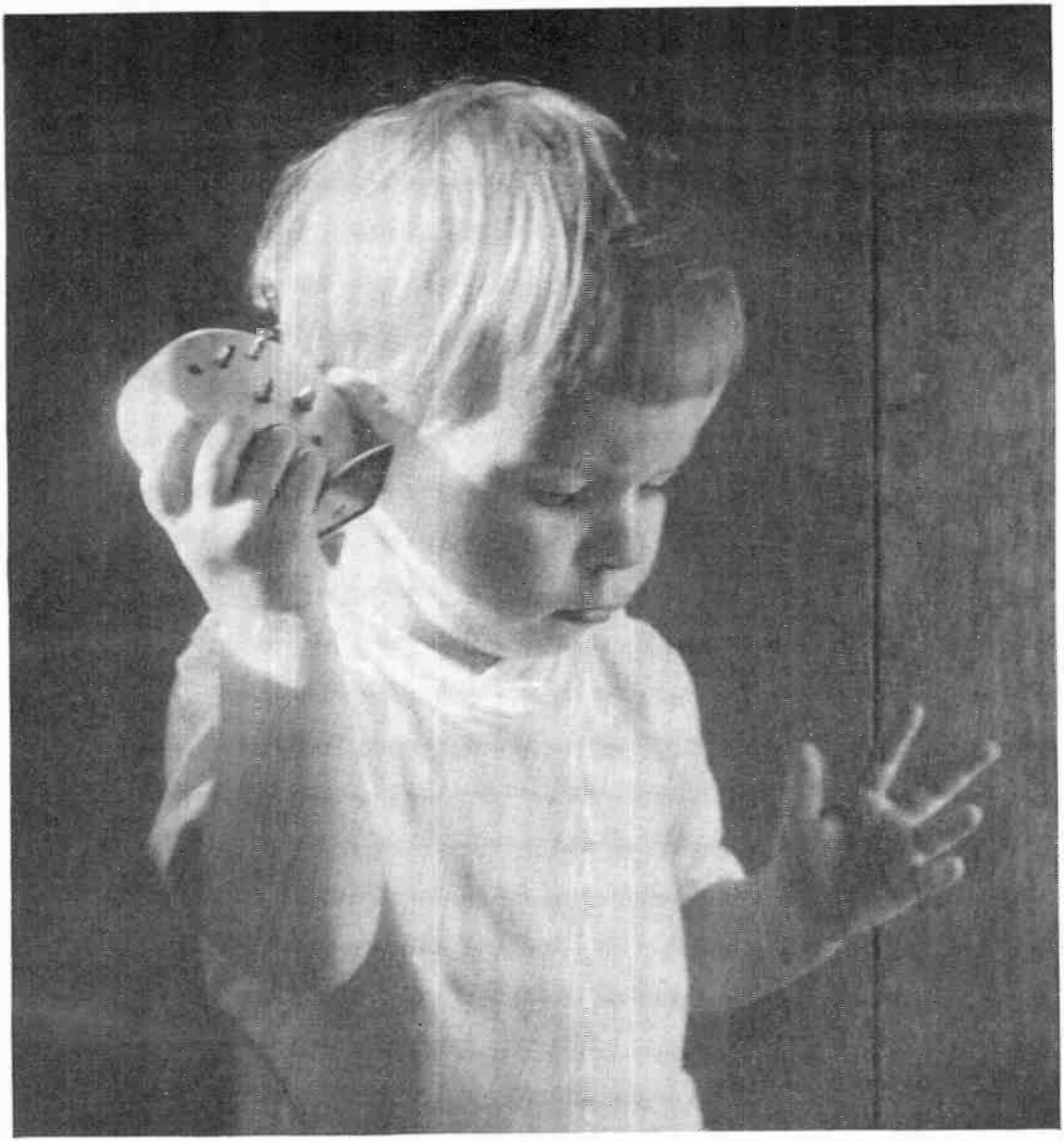

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POPULAR ELECTRONICS

OCTOBER 1961

VOLUME 15 NUMBER 4

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This month's cover photo by Joe Petrovec

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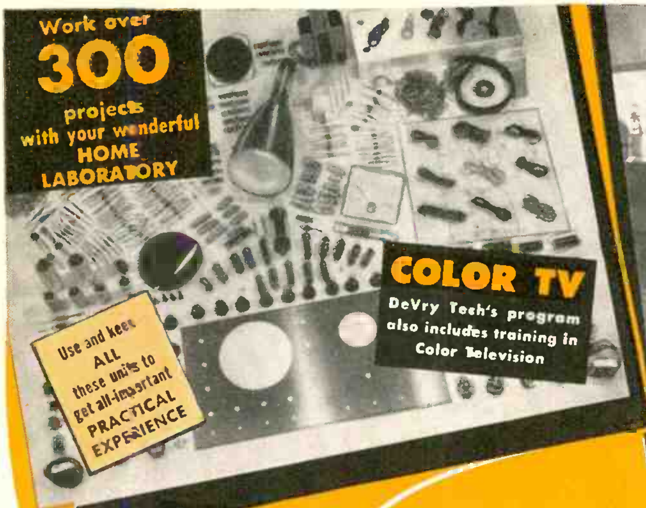

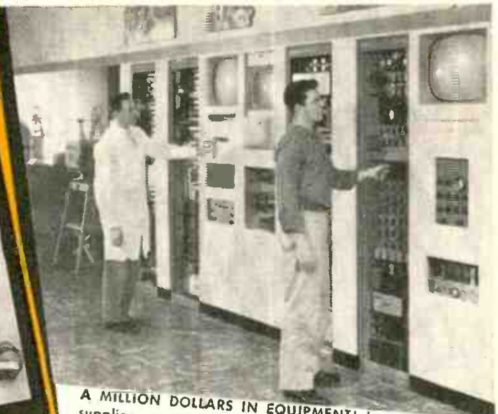

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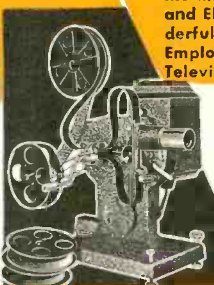

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Hi-Fi Showcase

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

UNUSUALLY smooth response throughout its entire frequency range (500 to 22,000 cycles) is one of the outstanding features of ***Altec Lansing's*** new 804A high-frequency driver unit. An improved version of the popular 802D, the 804A incorporates an aluminum voice coil and an aluminum alloy diaphragm. It has a nominal impedance of 16 ohms and is intended for use with a sectoral horn in systems built around Altec's 803B or 414A woofers. Price: $63.00. . . . Another new product from Altec Lansing is actually a complete, full-sized speaker system. Equipped with its own built-in 800-cycle crossover network, the system is available in two models: the 837A "Avalon," with a frequency range from 35 to 22,000 cycles; and the 838A "Carmel," which employs a second 414A speaker for a frequency response from 30 to 22,000 cycles. Price of the 837A is $246.00; the 838A sells for $297.00.

From ***Fisher Radio*** comes a new speaker system—the XP-4—in which the woofer and the enclosure are a single, inseparable unit. The result, according to the company, is elimination of fatiguing "enclosure tone" and greatly increased listening pleasure. Four speakers—a 12" woofer of special design, two 5" mid-range units, and a 2" tweeter—cover the full frequency range with a three-way crossover network. The compact XP-4 sells for $199.50 in mahogany, cherry, or oiled walnut; an unfinished birch version is priced at $189.50. . . . Still another speaker system—this one created by ***Mercury Electronics***—makes use of an airtight compartment to relieve sound pressure within the enclosure for almost perfect baffling. A three-speaker system, the CR-1 "Crescendo" combines a 10" bi-axial transducer and a 4" tweeter, yet reproduces fre-

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

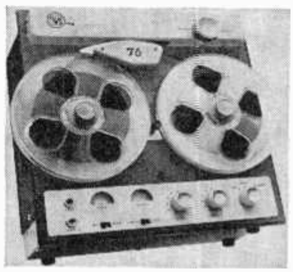
Showcase

(Continued from page 8)

quencies from 25 to 18,500 cycles. Finished in genuine walnut veneers with an aluminum trim, the CR-1 lists at $79.95.

Two new kits available from ***H. H. Scott*** are the LC-21 preamplifier and the LK-150 power amplifier. Dimensions of the LC-21 are exactly the same as those of Scott's LT-10 FM tuner, and there are 14 front-panel controls. Equipped with five pairs of stereo inputs as well as stereo tape recorder outputs, it delivers 2.5 volts at less than 0.1% distortion. As for the LK-150 stereo power amplifier kit, harmonic and intermodulation distortion are both less than 0.5% at full power (65 watts per channel). Companion units for a complete stereo amplifier/preamplifier setup, the LC-21 preamp is priced at $99.95 and the LK-150 amplifier at $169.95.

You can get hi-fi quality at moderate price with two new ***University*** dynamic microphones. Low-frequency response of both models extends to 50 cycles, with a smooth roll-off below, and response on the high end soars to the 18,000-cycle region. Both are free from harshness or stridency, and impedances of 30, 50, and 20,000 ohms are available via color-coded leads at the end of a 15'-long cable. Model 71 incorporates an on/off switch and sells for $34.95; Model 70 is supplied less switch for $29.95 . . . . A quarter-track stereo record/playback tape unit at a budget price, ***Viking's*** 76 "Compact" delivers 25 to 16,000 cycles within 3 db; bias frequency is 80 kc. for distortion-free recording. Utilizing a single motor for both 3¾ and 7½ ips speeds, the 76 "Compact" is equipped with jacks for high-level output, monitor output, and playback head output on the rear of the case; a single knob selects play, fast-forward, rewind, or stop functions. Price: $199.50.



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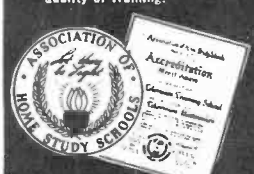

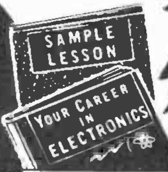

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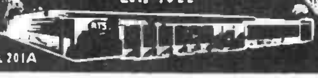

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Letters from our readers

Satisfied Reader

■ I have, in my library, every issue of POP'tronics ever published (since October, 1954). Quite a collection! And during these past seven years I've observed the changes in the magazine's personality. You've had your bad times, but for the most part you've set a standard.

Thanks for those 9 big projects in the July issue, especially the 6-meter mobile and the starved amplifier. I've just finished building a hi-fi amplifier from one of your older issues (January, 1958) for use in my recording studio, and it works fine. Keep up the good work.

Jim Coker
Athens, Ga.

We're glad you're pleased with Popular Electronics, *by and large, and we hope most of our other readers feel the same way that you do. We'll be looking forward to hearing from you again, Jim, in another seven years!*

Fish Caller

■ I read James J. Bucher's "Electronic Fish Caller" article in the June 1961 issue and found it very interesting. It seemed to me, though, that the 50-μf. capacitor in the schematic (*C1*) was shown with its polarity reversed. Correcting this, I built the unit and it performed well.

Being one who is never satisfied, however, I had to make some changes. Obtaining a Trimm "Acme" headset, I removed one phone. I then uncoiled approximately half of this 1000-ohm unit's winding and brought out a center tap. The adapted headphone was substituted for the transformer-earphone combination shown in the schematic.

Then, to increase the volume of the finished unit, I used a 2N255 transistor instead of a 2N1265 and increased the battery voltage to 3 volts. In order

to maintain the same frequency-repetition rate relationship, it was necessary to change the 27K resistor (*R1*) to 33K, and the 5K potentiometer

Letters

(*Continued from page 12*)

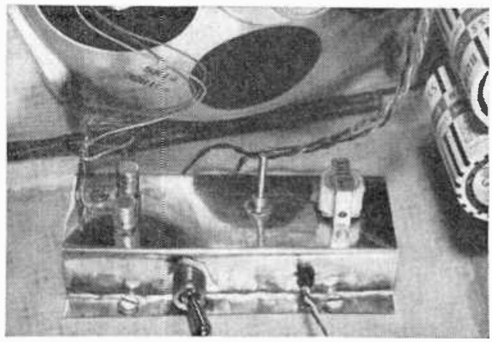
(*R2*) to 1K. I feel that this modification provides more efficiency and more volume.

Roy R. Niehaus, Jr.
Jupiter, Florida

Your modification sounds both ingenious and effective, reader Niehaus, and we bet that no fish within 10 miles of your boat is safe. Capacitor C1*'s polarity should indeed be reversed.*

Modified "Transi-Booster"

■ Thanks for the article on the Transi-Booster ("Big Sound from Personal Portables," April, 1961). I thought you might like to see the one I put together. I made no wiring changes, but I built the amplifier on a scrap-metal chassis rather than the suggested piece of fiberboard. Also, I



used an 8" speaker baffle and left its back open. The unit is quite easy on batteries, thanks to the variable bias, and with it my portable easily meets the outdoor picnic-table challenge.

Phil B. Jones, 1st Lt., USAF
San Antonio, Texas

Earth Communicators

■ Two of my friends and I have set up an earth communication system like the one described in your July 1960 issue ("Communicating Through the Earth"). We located the ground rod of each station about 25 feet from the water pipe and got excellent results—both on c.w. and phone. Our calls are GTSE (Ground Travel Station, Edmundston) 1, 2, and 3.

Robert L'Italien
Edmundston, N.B., Canada

6 Meters and Mobile

■ I believe I've found an error in the article "6 Meters and Mobile" (July, 1961). Shouldn't capacitor *C7* (.001 μf.) be connected from the junction of coils *L2* and *L4* to ground? In the schematic it appears on the other side of the r.f. choke.

Tristan Leviste
Riverdale, N.Y.

You're right, reader Leviste, and thanks for calling this to our attention. Capacitor C7 *should be installed between* L2 *and* L4. —30—

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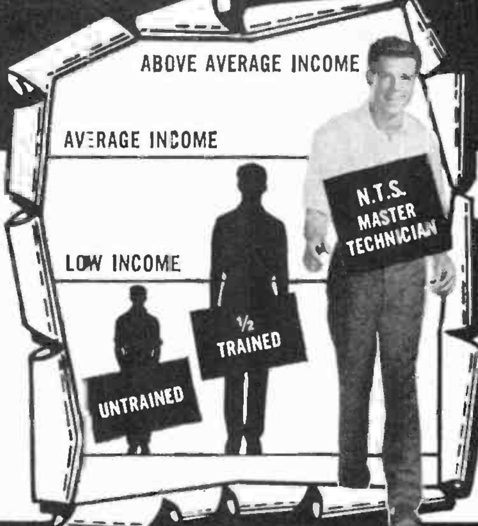

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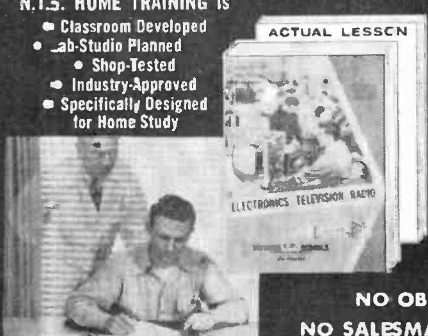

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POP'tronics Bookshelf

TELEVISION AND RADIO REPAIRING
by John M. Markus

Assuming no previous knowledge of television or radio repairing, this thick volume is designed to train the beginner to handle over 75% of the repair jobs that come to the average TV and radio service shop. The first section explains what tools are needed, how to make service calls, and how to test parts with a multimeter. Later chapters cover tube checking, soldering techniques, and the testing of soldered-in parts. The book concludes with some good advice on cabinet repair and antenna servicing and installation.

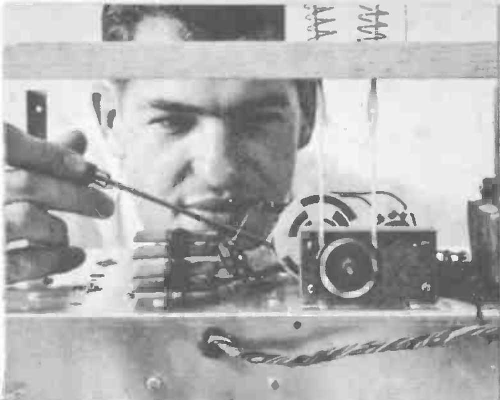
Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. 568 pages. Hard cover. $8.95.

INDUSTRIAL ELECTRONICS in Questions and Answers
by Edward J. Bukstein

This new paper-bound edition of the hard-cover book published some years ago should be a handy reference volume for technicians and others working in the diversified industrial electronics field. The question-and-answer format allows the reader to locate specific pieces of information without the necessity for formal study, and diagrams and illustrations are generously used. The nine chapters discuss many different types of equipment, including x-ray, welding, counting, and time-delay devices. Special circuitry and test instruments are also covered.

Published by Frederick Ungar Publishing Co., 131 E. 23rd St., New York 10, N. Y. 197 pages. Soft cover. $1.75.

(*Continued on page* 20)



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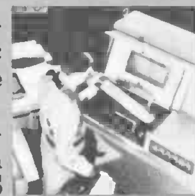

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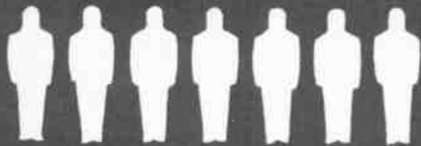

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Service and maintain AM-FM Radios, TV sets, Stereo Hi-Fi, PA systems, etc. A profitable, interesting spare or full-time business of your own.

SEE OTHER SIDE

"THE FINEST JOB I EVER HAD" is what Thomas Bilak, Jr., Cayuga, N. Y., says of his position with the G. E. Advanced Electronic Center at Cornell University. He writes, "Thanks to NRI, I have a job which I enjoy and which also pays well."

BUILDING ELECTRONIC CIRCUITS on specially-designed plug-in type chassis, is the work of Robert H. Laurens, Hammonton, N. J. He is an Electronic Technician working on the "Univac" computer. Laurens says, "My NRI training helped me to pass the test to obtain this position."

"I OWE MY SUCCESS TO NRI" says Cecil E. Wallace, Dallas, Texas. He holds a First Class FCC Radiotelephone License and works as a Recording Engineer with KRLD-TV.

MARINE RADIO OPERATOR is the job of E. P. Searcy, Jr., of New Orleans, La. He works for Alcoa Steamship Company, has also worked as a TV transmitter engineer. He says, "I can recommend NRI training very highly."

FROM FACTORY LABORER TO HIS OWN BUSINESS that rang up sales of $158,000 in one year. That's the success William F. Kline of Cincinnati, Ohio, has had since taking NRI training. "The course got me started on the road," he says.

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International's exciting New Compact transceiver for the Citizens licensee who desires quality workmanship and engineering plus the best possible circuit for the money invested. Field tested full 5 watt transmitter contained in the higher price Executives. Certified tolerance .005%. Tunable superheterodyne receiver covering all 23 channels. Three position crystal control transmit channel selector. Manual transmit-receive control. Noise limiter. Available accessories include four separate power supplies — 6 vdc, 12 vdc, 24 vdc or 115 vac, push-to-talk relay kit, squelch kit, and 12 position transmit channel selector. **Complete with 1 transmit crystal, matching microphone and external speaker, but less power supply.**

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MODEL 50

A precision engineered transceiver featuring push-to-talk operation. Three position crystal control transmit channel selector. Dual conversion superheterodyne receiver tuning all 23 channels. Full five watts plate input. Crisp and clear modulation. Certified tolerance .005%. Series Gated automatic noise limiter. New International NR squelch. Three way power supply for 6/12 vdc, and 115 vac. The Model 50 Executive is a rugged yet handsome piece of communication gear equally at home in the office, service truck or field. Inside the Model 50 and every International Executive you'll find the latest circuitry, careful craftsmanship and quality components. Additional features of the Model 100 Executive may be added at any time. **Complete with 1 transmit crystal and matching microphone.**

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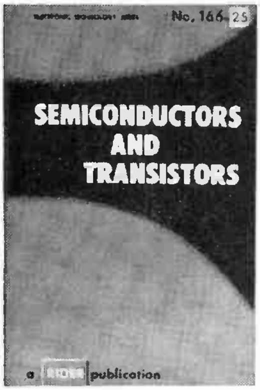
Bookshelf

(*Continued from page* 16)

SEMICONDUCTORS AND TRANSISTORS
by Alexander Schure, Ed.D., Ph.D.

The newest volume in the Rider Electronic Technology Series, this book discusses the theory and characteristics of semiconductors and transistors. Careful treatment is given to atomic structure, the quantum theory, conductors, insulators, and semiconductors. The *pn* junction under equilibrium conditions and in reverse and forward bias is analyzed, and *pn* junction theory is extended to cover transistors. Considerable attention is paid to basic transistor amplifiers, and a foundation is provided upon which more advanced concepts can be built.



Review questions are included at the end of each chapter.

Published by John F. Rider Publisher, Inc., 116 W. 14th St., New York 11, N. Y. 144 pages. Soft cover. $2.90.

New Literature

A completely revised version of EICO's "Guide to High Fidelity Stereo and Monophonic Sound" covers the latest developments in the fast-moving hi-fi field. Included are such subjects as the "factors comprising high fidelity," the component parts of a hi-fi system, the meaning of stereo, how to convert a mono system to stereo, and how to save money when buying hi-fi equipment. The 36-page booklet may be obtained for 25 cents from EICO Electronic Instrument Company, Inc., 33-00 Northern Boulevard, L. I. City 1, N. Y.

The Universal Relay Corp., 42 White St., New York 13, N. Y., has released a 20-page illustrated bulletin listing and describing many of their 1,200,000 relays, steppers, sensitrols, solenoids, contactors, rectifiers and related items. A copy is available for the asking. —30—

Don and Larry Taylor, with twin backgrounds and skills, have competitively built kit after kit, Paco vs. other makes. In one test Don built the Paco, in the next Larry did. Net results: Paco kits proved faster, easier, and better in performance. **For a typical Twin-Test report turn the page.**

HERE ARE JUST A FEW OF PACO'S NEWEST KITS:

V-70 VACUUM TUBE VOLTMETER KIT: Employs balanced vacuum tube bridge circuit for all voltage and resistance measurements plus 3-way probe for accurate, rapid test. Includes: 7 DC voltmeter ranges, 7 AC voltmeter ranges (RMS) from 0 to 1500 volts, and 7 AC voltmeter ranges (peak to peak) from 0 to 4000 volts. Also 7 decibel ranges, −6 to +66 db and 7 electronic ohmmeter ranges from 0.2 ohms to 1000 megohms.

V-70 Kit with "Twin-Tested" operating assembly manual .... $31.95 net

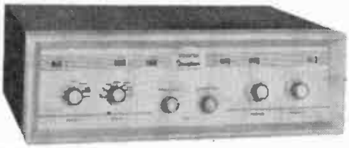
V-70W: Factory-wired ...... $49.95 net

C-25 IN-CIRCUIT CAPACITOR TESTER KIT: Reveals dried out, shorted, or open electrolytics—in the circuit—with Paco's exclusive Electrolytic Dial.

Simple Sequential Test: reveals open or shorted capacitors, even electrolytics. Electrolytic Dial: indicates in-circuit capacity from 2 to 400 mfd: condenser is proved non-shorted and not open if capacity reading can be obtained.

Model C-25 Kit: with Paco-detailed operating assembly manual .... $19.95 net

Model C-25W: Factory-wired .. $29.95 net

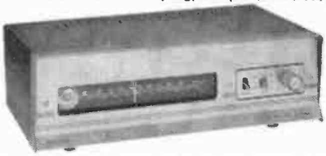


SA-40 STEREO PREAMP-AMPLIFIER: Power: 20W (RMS) per channel, 40W total. Peak, 40W with 80W total. Response: 30 cps to 90 Kc, within 1.0 DB. Distortion: within 0.5% at 20W per channel. Includes: 14 inputs and 14 Panel Controls, black and gold case.

SA-40 Kit with enclosure, "Twin-Tested" operating assembly manual ...... $79.95 net

SA-40W: Factory-wired, ready to operate .... $129.95 net

SA-50: Stereo Kit as above with different styling, 25w per channel .... TBA*



ST-25 FM TUNER: Sensitivity: 1.5 microvolts for 20 DB quieting. Harmonic Distortion: less than 1%. Includes: Dual Limiters, AFC and AFC Defeat, "Eye" type tuning indicator, Multiplex jack. Black and gold case or walnut enclosure at slight extra cost.

ST-25 Kit with fully-wired prealigned front end. "Twin-Tested" manual . . $42.95 net

ST-25W: Factory-wired, ready to operate .... $59.95 net

ST-26 Tuner-Amplifier Kit: Same as ST-25, with built-in amplifier .... $54.95 net

ST-26W Tuner-Amplifier: Factory-wired, ready to operate .... $69.95 net

DF-90 TRANSISTORIZED DEPTH FINDER KIT: Protect your boat against shoals and underwater hazards with this compact, easy-to-read depth finder. Locates hard-to-find schools of fish, too.

Fully Transistorized: 5 transistors, low battery drain for very long battery life.

Fast, Easy Readings: over-sized scale with 1-ft. calibrations from 0-120 ft.

DF-90 Kit: Complete with "Twin-Tested" assembly operating manual .. $84.50 net

DF-90W: Factory-wired .... $135.50 net

G-15 GRID DIP METER: Major Functions: 1-Variable Frequency Oscillator covering 400 Kc up to 250 Mc in 8 bands; 2-Absorption Wavemeter, 400 Kc to 250 Mc; 3-Modulation Indicator. Applications: antenna tuning, standing wave checks, neutralizing. TVI suppression, carrier monitoring, etc: RF signal source for visual alignment marking between 400 Kc and 250 Mc. Weighs only 3 lbs.

G-15 Kit: Complete with 8 plug-in coils, "Twin-Tested" manual ...... $31.95 net

G-15W: Factory-wired ...... $39.95 net

 ALL PRICES INCL. F.E.T. *Price to be announced

"I built the Paco SA-40 Stereo Preamp Amplifier."

Larry Taylor, 8 Stevens Place, Huntington Station, N. Y. "It took me one-third less time to build the Paco kit than it took Don to make the almost identical preamp-amplifier by another kit maker. But it wasn't just the time; it was knowing you're using the right part, and that you understand the instructions completely. Paco parts are all pictured and labelled, the resistors are neatly mounted on cards for easy identification. And Paco's instruction book doesn't leave you guessing. The fold-out diagrams and drawings are always right beside the instructions, so you're not reading one part of the book and following a diagram in another part. Photographs in Paco's book show how each assembly should actually look. I enjoyed building Paco kits, because I wasn't wasting time or worrying."

"I built a competing Stereo Preamp Amplifier."

Don Taylor, 39 Cross Street, Smithtown, N. Y. "Neither Larry nor I are speed demons because we're very meticulous about wiring and soldering. So I was even more surprised when it took me 50% more time to finish my kit. My problem began when I tried to separate the parts. The resistors were in boxes, but not in any logical way: identical resistors often wound up in different boxes. The instruction book was clumsy to work from. It caused wasteful mistakes. Once I lost 20 to 25 minutes because I misread a tiny key letter that meant not to solder a certain connection. A lot of the fun of kit-building was lost when I had to spend time making up for shortcomings of the packaging and the instruction manual."

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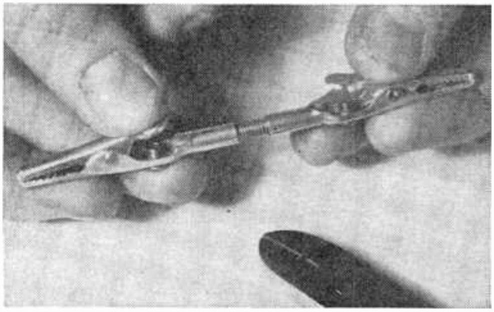
(Continued on next page)

BUILD A HI-FI MUSIC WALL! Don Brann's new book How to Build a Hi-Fi Music Wall gives you step-by-step instructions for building a decorator styled cabinet or an entire music wall. Send 50c and your name and address to: PACOTRONICS, INC., Dept. PE-10 70-31 84th Street, Glendale 27, New York.

Tips and Techniques

DUAL CLIPS FROM SINGLES

If a dual alligator clip is needed for a quick test hookup and you don't have one, two single clips can be quickly coupled together. Pick out a machine screw which will just fit the soldering sleeves of the two clips and

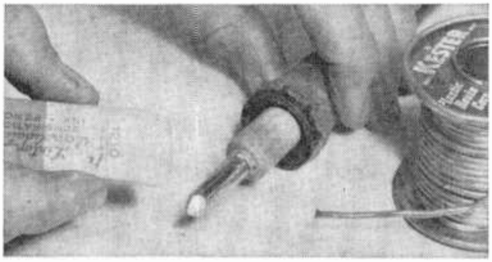


cut off its head. Then simply insert an end of the headless screw into each sleeve, and force-thread the clips together.

—*Joseph Carroll*

ERASER CLEANS SOLDERING IRON

An ink eraser does a fine job of removing surface oxide from a cool soldering iron tip. Unlike a file, the eraser doesn't remove



a noticeable amount of metal. This prolongs the life of the tip and means that you needn't tin it so often.

—*Jerome Cunningham*

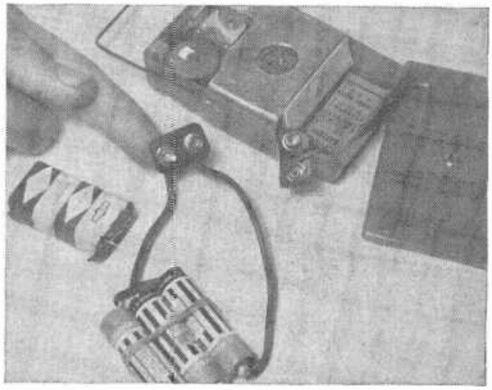
EMERGENCY POWER FOR PORTABLES

Penlight cells can be used to supply emergency power to a small transistor portable if an exact replacement battery isn't available. Just solder leads to the cell terminals and wire them in series. Then remove the connectors from the old battery and solder them to the output wires of the series-connected cells—but make sure you observe the proper polarity. Any number of cells

Tips

(*Continued from page* 24)

from three to six will operate most 9-volt portables; for best results, however, the use of six cells is recommended. The cells may



be temporarily secured to the outside of the portable's case with rubber bands.

—John A. Comstock

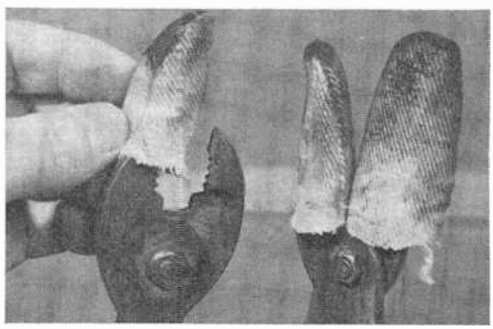
MINIATURE TUBE GROUNDING

If you have many ground connections to make to the center shield of a miniature tube socket, here's a good way to increase its capacity. Take a solder lug of the "insulation grip" variety (the No. 6 or No. 8 size is just about right), and bend its prongs so that it will fit inside the shield. Slip in the lug, solder it in place, and you'll be able to connect as many wires as you need.

—M. L. Snedeker

MITTENS FOR PLIERS

To prevent plier jaws from damaging delicate surfaces, use the fingers or thumbs from old gloves as "mittens." Clip off a



supply and keep them handy—sometimes two or three pairs of these mittens are required for full protection. *—Ken Murray*

(*Continued on page* 28)

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Central grad GLEN LEIRER, shown here, earned an attractive income from part-time Radio-TV Servicing. Now he's employed as a Computer Technician for RCA Service Co., Camden, N. J.

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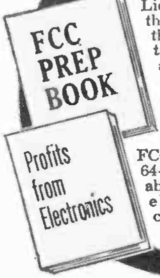
Central grads HOWARD EDMONDS & FLOYD CONKRIGHT are joint owners of EDCO FACTORY TV SERVICE CO., K. C., Mo., and RANCH MART TV & STEREO, Leawood, Kansas, have three service trucks, seven full-time employees.

Grad FRANK LEENKNECHT works in missile field for Convair Astronautics, San Diego, Calif., and as Transmitter Engineer for Station KDEO as a sideline.

FREE



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Tips

(*Continued from page* 26)

CLEANING CAUTION

Keeping equipment clean is a good idea, but be careful when you use wax-dissolving solvents such as carbon tetrachloride or alcohol. If applied to isolantite, steatite, or other ceramic substances, they may remove a waxy coating designed to keep moisture from collecting in the small pores. This would spoil the insulating quality of the ceramic material, lowering the voltage-breakdown point. —*James E. Arconati*

TREATED THREAD "DAMS" SOLDER

A coarse cotton thread which has been soaked in a whiting-and-water solution, then allowed to dry, keeps molten solder from spreading where it's not wanted. A few turns of this thread tied tightly around a solder lug or wire makes an effective "dam." Whiting, which is calcium carbonate in finely powdered form, is available at paint, plumbing-supply, or drugstores.

—*W. C. Wilhite*

COMING NEXT MONTH

TV stars Roger Smith and Efrem Zimbalist, Jr. are featured on next month's cover. In case you don't recognize the equipment —it's the new CB setup that has been given a prominent part in their "77 Sunset Strip" show.

(ON SALE OCTOBER 26)

- **ELECTROLUMINESCENCE**
  Did you know that those 89¢ plug-in nite lights can be doubled or tripled in brilliance? That they can be made to change color from green to blue, and even be operated from a battery? See our November issue for details.

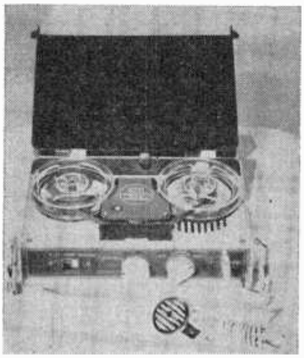
- **SQUELCHING YOUR SUPERREGEN**
  After testing countless squelch adapters for CB superregen equipment, we have found a simple 1-tube unit to be the best one we've ever seen.

- **HI-FI HEAT WAVE**
  Some conclusive evidence of the damage excessive heat does to hi-fi gear.

NEW products

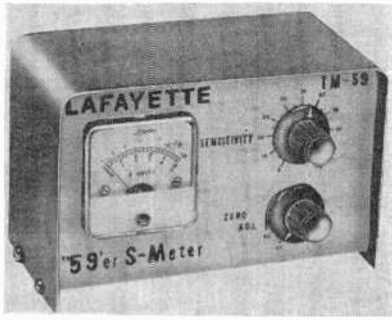
PORTABLE TAPE RECORDER

Completely portable and transistorized, the Model RA-11 tape recorder uses standard tapes and batteries and plays for up to 15 minutes on a side. Weighing 2½ pounds, the miniature unit measures only 9" x 7" x 3½". It sells for $26.95 plus $1.95 for handling, and comes complete with carrying case, battery, tape, speaker, earphone and microphone. (*Tape-Recorders,* P. O. Box 852, Sherman Oaks, Calif.)



"59'ER S-METER"

A low-priced signal-strength meter for hams, SWL's and CB'ers is available from *Lafayette Radio* (165-08 Liberty Ave., Jamaica 33, N.Y.). Called the "59'er S-Meter," the Model TM-59 can be connected to any superheterodyne receiver having an



a.v.c. system. The sensitive, easy-to-install unit is calibrated both in "S-units" and in db. Magnetic feet on the case simplify dashboard mounting. Price, $7.95.

"TUCK-AWAY" SOLDERING IRON

Thanks to a dual-purpose handle, you can store the new Sampson Model SP-1 soldering iron without waiting for it to cool. The

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FM Stereo Multiplex Tuner Kit. Highest standards of excellence with deluxe built-in integral multiplex section. It features wide band circuitry for exceptional sensitivity: 2.2 µV, drift-free selectivity. Frequency response 10-20,000 cps ±1 db. 3 I-F stages, 3 limiters. 11 tubes plus rectifier. Muting, tuning, function selector. Tape recorder output. 90LX092—$149.95

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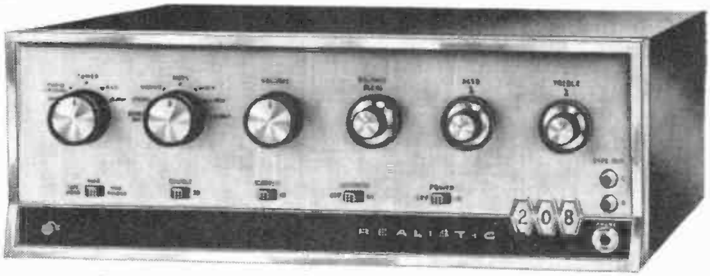
50-Watt Stereo Amplifier Kit — the powerful, all-transistor HK-208. Unique 18-transistor circuit eliminates hum, noise, output transformers and heat. Absolutely flat —1 db 10-15,000 cps at full power. Truly a breakthrough in semi-conductor stereo design, the only amplifier of its kind in the world! 90LX093—$139.95



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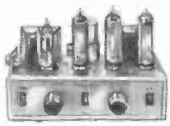
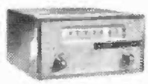
- Stereo Balance Meter Kit
- Wireless Intercom Kits
- Deluxe Signal Generator Kit
- Deluxe VTVM Kit
- Standard VTVM Kit
- Ultra-Modern Tube Tester Kit
- 500W Variable AC Supply Kit
- VOM Kit with 4½" Meter
- Signal Generator Kit
- AC VTVM Preamplifier Kit
- Electronic Photo Relay Kit
- "Novatherm" Thermometer Kit
- 5-Tube Teakwood Radio Kit
- 2-Transistor Home Radio Kit
- 6-Transistor Portable Radio Kit
- Transistor Experimental Lab Kit

See complete specifications of these fine kits in Free Catalog



Stereo Amplifier Kit. Terrific value! Converts mono phono to stereo. Easy to build. 90LX079—$10.95



The HK204—Quality FM Tuner Kit. Incredible value! Simple assembly. 90LX070—$19.95

Dual Trace Oscilloscope Kit. Flat response from 10 cycles to 3 megacycles. 94LX072—$79.95

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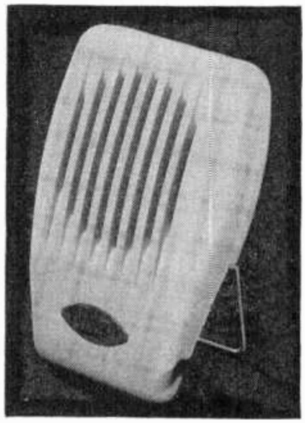
products

(Continued from page 30)

handle, which is a hollow Bakelite sleeve, can be unscrewed and transferred to the other end of the iron—where it prevents the hot tip from touching any surrounding objects. This "tuck-away" soldering iron is priced at only $2.95. (*Sampson Company,* 2244 S. Western Ave., Chicago 8, Ill.)

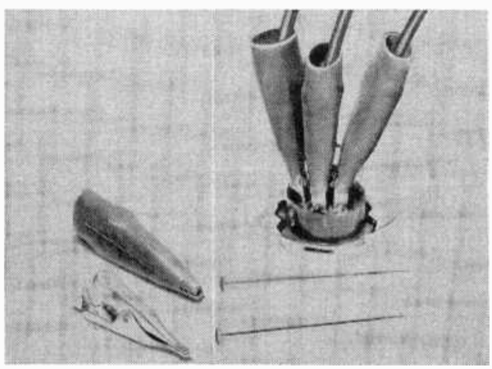
TAPE RECORDER MICROPHONE

Two models of a sensitive microphone for use with tape recorders are being manufactured by the *Turner Microphone Co.,* 909 17th St., N.E., Cedar Rapids, Iowa. Housed in a thin, lightweight polystyrene case with a handy fold-out stand, the Model 608 is a crystal (—45 db output level) microphone and the Model 607 is a ceramic (—55 db output level) unit. Each has a frequency response of 60 - 8500 cps, and is priced at $8.00.



MINIATURE TEST CLIP

The tip of Mueller Electric's "Micro-gator" clip, insulator and all, is no larger than a pin-head. Intended for use on small termi-



nals and tight-packed circuits, the clip measures only 1$\frac{3}{32}$" long and has a jaw spread of $\frac{7}{32}$". "Micro-gators" come in a

(Continued on page 38)

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For men and women with a sincere desire to succeed

"In the years that have passed since my days on the faculty of RCA Institutes, I have become even more firmly convinced that the individual who continues his education . . . particularly his technical education . . . is the individual who profits both as a thinking man and as a working man. Science and industry will reward you for your talents and energy. Out of your efforts may come inventions, new products, processes and services. There is everything good yet to be accomplished in our lives and in our work. What man has done, man can do better."

David Sarnoff

Chairman of the Board,
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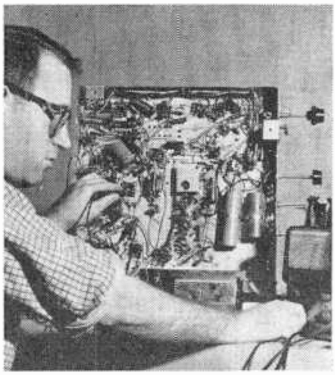

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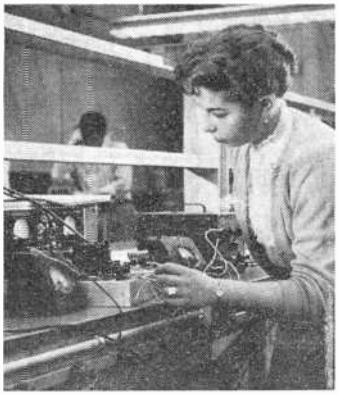

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products

(*Continued from page* 32)

cadmium-plated steel version (7 cents each), and in solid copper (8 cents each); the insulators are available separately in a variety of colors for 6 cents each. These prices cover lots of ten or less. (*Mueller Electric Co.,* 1600V East 31st St., Cleveland 14, Ohio)

IN-CIRCUIT CAPACITOR TESTER

Television and radio technicians can quickly isolate faulty capacitors without disconnecting them by using the Precision IC-60 tester. It detects shorted units with circuit shunting resistances as low as 10 ohms, and makes open-circuit tests on capacitors rated as low as 5 μf. Capacitors of all types can be checked in their circuits, and the actual capacities of electrolytics rated at from 2-400 μf. can be measured. Price, $32.95. (*Precision Apparatus Co., Inc.,* Glendale 27, L. I., N. Y.)

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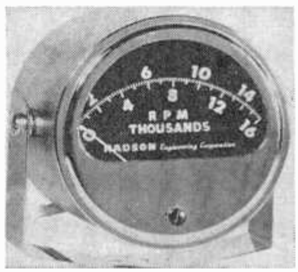
The "Super-Tach," a transistorized tachometer sold by *Radson Engineering Corp.* (Automotive and Marine Division, Macon, Ill.) needs no batteries, relays, or sender units. Each of the four available meter assemblies (0—5000, 8000, 10,000, and 16,000 rpm) can be tailored, by means of a special printed-circuit board, to fit almost any gasoline engine. You have a choice of various mounting assemblies. Ideal for installation on automotive, marine, motorcycle, and other engines, the basic unit (meter assembly plus printed circuit board) costs $39.95. Installation cable and mounting hardware are extra. —30—



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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.

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Included in the "Edu-Kit" course are twenty 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 instruction 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.

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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."

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At no increase in price, the "Edu-Kit" now includes Printed Circuitry. You build a Printed Circuit Signal Injector, a unique servicing instrument that can detect many Radio and TV troubles. This revolutionary new technique of radio construction is now becoming popular in commercial radio and TV sets.

A Printed Circuit is a special insulated chassis on which has been deposited a conducting material which takes the place of wiring. The various parts are merely plugged in and soldered to terminals.

Printed Circuitry is the basis of modern Automation Electronics. A knowledge of this subject is a necessity today for anyone interested in Electronics.

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(Literal Translation)

ЭНТУЗИАСТЫ ЭЛЕКТРОНИКИ В СССР

WHEN it comes to electronics, the United States and the Soviet Union are very much alike—both countries are placing ever-growing emphasis on this all-important field. But as the demand for electronics technology increases, so, too, does the demand for electronics engineers and technicians. (*Continued*)

By **THEODORE M. HANNAH,** K3CUI

How do the Russians satisfy this need? What does the Soviet government do to make sure there are enough electronics specialists to go around? And what part does the electronics hobbyist play in all of this?

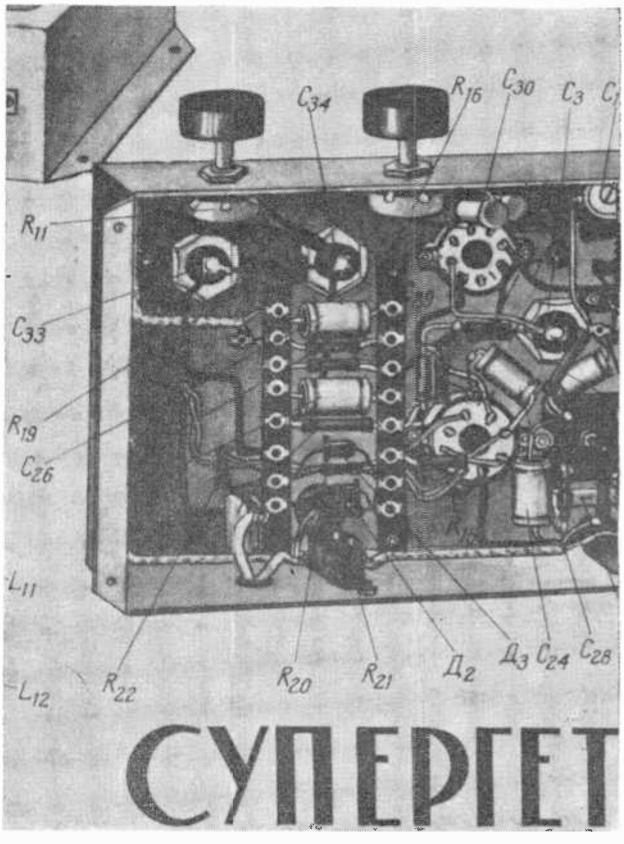
Accent on Youth. To a greater extent than probably in any other country, the Soviet Union officially encourages young people to become interested in electronics. It organizes electronics courses (called "radio circles") in elementary schools and in the club houses of the "Young Pioneers" (these are the youngest "members" of the Communist Party, ranging in age from 9 to 14 years). It hires instructors and furnishes all the equipment to teach youngsters—girls as well as boys—the Morse code and electronics fundamentals. It requires such students to build and test simple receivers and other equipment. And it encourages youngsters who show an aptitude for electronics to go into regular electronics courses, which eventually lead to degrees in electronics engineering.

Training electronics technicians and radio operators in the Soviet Union is the responsibility of a government agency known as DOSAAF (Voluntary Society for Assistance to the Army, Air Force, and Navy). Headed by a Lieutenant-General in the Red Army, DOSAAF claims to have a membership in the millions. And as a semi-military organization, it sponsors not only electronics training courses, but rifle, parachute-jumping, and motorcycle clubs as well.

In the electronics field alone, DOSAAF claims that more than a million persons have completed its courses. And in addition to training electronics specialists, DOSAAF also publishes electronics books and magazines, sponsors code-speed contests, sets up exhibits, awards prizes for the best electronics construction projects, and organizes ham radio contests of all kinds.

A new contest called "Radio Network Operating" is a good example of how the Russians combine physical and technical training. The contest involves hiking cross-country while carrying a 25-lb. load (the weight of a pack radio). At three different points along the route the contestants stop, set up portable stations, and transmit messages to each other. The whole contest is a race against time, with demerits given for not completing the hike, setting up the stations, or handling messages in the time allowed.

As part of this training, the Soviet government makes it as easy as possible for hobbyists to get answers to questions on electronics. Any DOSAAF office anywhere in the country will answer such questions, either in person or by phone. The same is true of all Ministry



Pictorial and schematic diagrams appearing in Russian electronics magazines are surprisingly similar to our own. Pictorial at right (only part of which is shown) is for one of "three simple superhets" described in a recent issue of "Radio;" lettering at bottom is portion of Russian word for "superhetereodyne." Schematic at far right is of a receiver for hidden-transmitter hunts, as Russian words at top explain. Note that resistors are ordinarily represented by rectangles instead of zig-zag lines.

of Communications radio centers. SWL's and beginning hams can obtain technical help by mail from the Ministry of Communications in Moscow. And there are even government offices set up to help hobbyists who are interested in radio-controlled boats and planes.

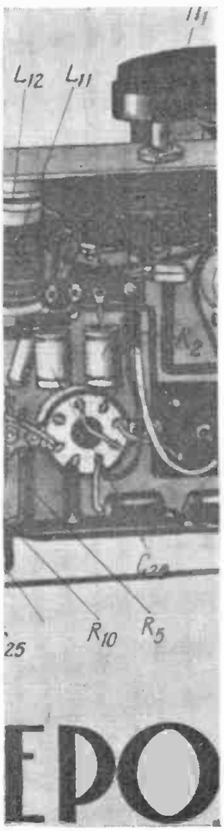
As a matter of fact, if *you* should ever be in Moscow and find yourself stumped by an electronics problem you might try calling the Central Radio Club—the phone number is K-5-92-71!

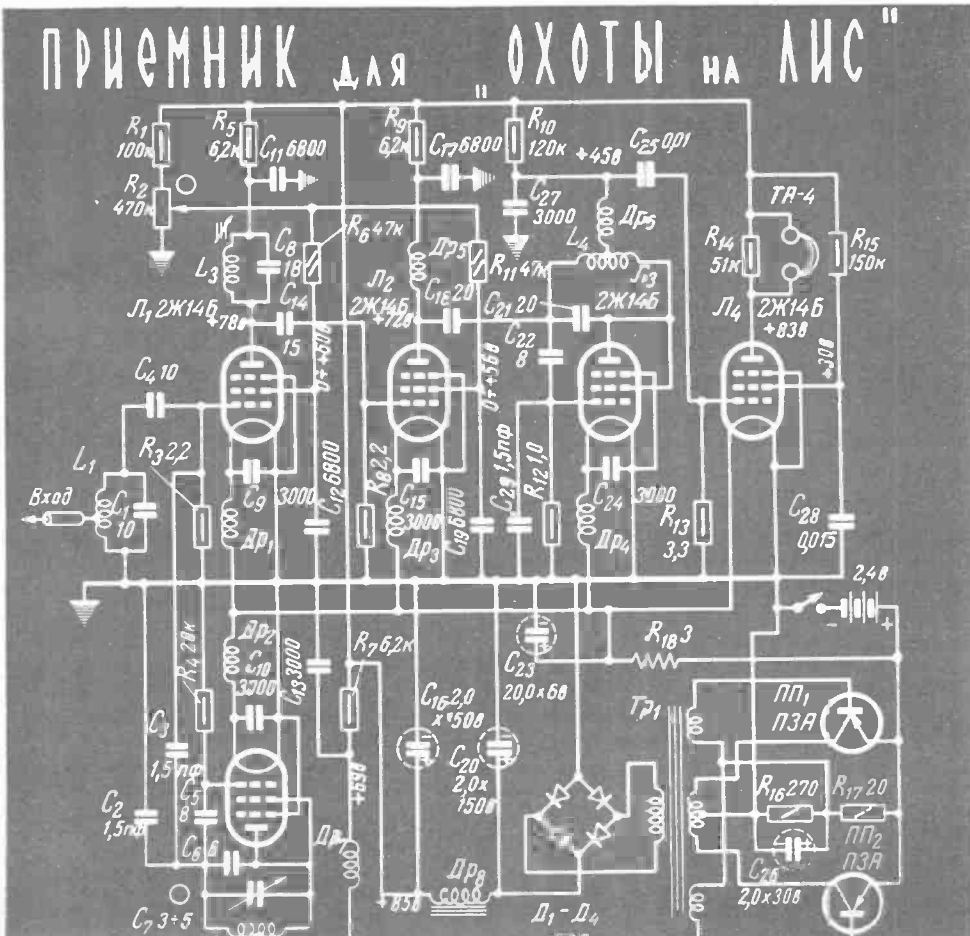
Electronics Magazines. Among the most widely read of all Soviet publications are magazines dealing with electronics. But with millions of Russians interested in electronics, no such magazine remains on the newsstands for very long. On the other hand, small booklets on all phases of electronics are mass-produced and sell for 10 to 15 cents apiece; written for the beginner, they are widely read, particularly in rural areas where there may be no regular electronics courses available.

The most popular of the Soviet electronics magazines (and the one most like POPULAR ELECTRONICS) is called, not surprisingly, *Radio* (pronounced "Rahdio"). A monthly publication, *Radio* sells for 30 kopecks (about 30 cents). It's published by the Soviet Ministry of Communications and the DOSAAF organization which was discussed on the previous page.

Every issue runs exactly 64 pages, no more, no less. And in those 64 pages will be found a half-dozen construction projects dealing with anything from simple battery radios to complex tape recorders and ham transmitters. Usually, there will be an article or two on space exploration, too, with special emphasis on the electronics equipment used in the space vehicles.

As a matter of fact, it was in the pages of *Radio* that the Russians revealed the first advanced details of Sputnik I. So that their radio amateurs would be prepared to listen for Sputnik's





signals, the Soviet government published the exact frequencies, transmitting power, and type of signal to be used by the satellite. All of this information appeared in the June, July, and August 1957 issues—as much as four months before Sputnik caught the world by "surprise."

The average issue of *Radio* will also contain one or two articles on some new Soviet receiver, TV set, or tape recorder. There will be at least one article on the use of electronics in such fields as automation, cybernetics, or radio astronomy. And for the ham and SWL, there is a column called "Chronicle," which reports on DX activities around the world.

Single-sideband is becoming quite popular among Russian hams, and a column called "CQ SSB" reports on the latest in sideband techniques. Another regular feature is a column called "From the Pages of Foreign Magazines"; here the Russian reader learns something about the latest developments in foreign electronics, much of it translated from American magazines.

Obtaining Parts. Like most Soviet magazines, *Radio* contains no advertising. This raises an interesting question: how does the Russian experimenter know what to buy and where to buy it? As for *what* to buy, *Radio* and other magazines tell him what is available. As for *where* to buy it, there is only one place —a government-owned electronics store. Theoretically, there should be one such store in every town and more than one in the large cities. However, even when this is the case—and it doesn't always work out that way, there is still a problem in getting parts.

Radio quite often prints letters from readers who complain that their local parts stores never have any parts! In this case, the electronics hobbyist can order parts by mail from government-operated parts houses. And if that fails, about all he can do is wait, hope, and write letters to *Radio*.

Actually, there *is* one other solution to this problem: the hobbyist can make his own parts. This is particularly true of transformers, and construction articles in Russian electronics magazines usually include transformer-winding data for the Soviet do-it-yourself'er. Switches, tuning capacitors, coils, and even the mechanical parts of tape recorders are also much more commonly homemade in Russia than here.

A few electronics kits are available, but only to hobbyists living in rural areas. The kit selection includes a two-

ТЕЛЕГРАФНАЯ АЗВУКА

Буквы				Знаки препинания	Цифры
А	A . —	П	P . — — .	Точка (.)	1 . — — — —
Б	B — . . .	Р	R . — .	Запятая (,) .—.—.—	2 . . — — —
В	W . — —	С	S . . .	Точка с запятой (;) —.—.—.	3 . . . — —
Г	G — — .	Т	T —	Двоеточие (:) — — —...	4 . . . . —
Д	D — . .	У	U . . —	Вопросит. знак (?)..— —...	5 . . . . .
Е	E .	Ф	F . . — .	Восклицат. знак (!)— —..— —	6 — . . . .
Ж	V . . . —	Х	H	Тире (—) —....—	7 — — . . .
З	Z — — . .	Ц	C — . — .	Апостроф (') — — — — —	8 — — — . .
И	I . .	Ч	Ö — — — .	Скобки (()) —.— —.—	9 — — — — .
Й	J . — — —	Ш	Ch — — — —	Кавычки («») .—..—.	0 — — — — —
К	K — . —	Щ	Q — — . —	Дробная черта (/)— — — — — —	
Л	L . — . .	ЪЬ	X — . . —	Знак большого раздела—...—	
М	M — —	Ы	Y — . — —	Знак ошибки	
Н	N — .	Э	É . . — . .		
О	O — — —	Ю	Ü . . — —		
		Я	Ä . — . —		

"Telegraphic alphabet" lists letters, punctuation marks, and numerals. This chart is from a Soviet handbook and is the kind Russians use to learn both the Russian and the International Morse codes.

band receiver, a power supply, and a low-powered transceiver, all of which can be ordered by mail from a government department in Moscow.

Circuits and parts used by Russian hobbyists are not very different from those used here—printed circuits, transistors, silicon diodes, and other relatively new components are all familiar to the Russian experimenter. About the only difference stems from the fact that Russian electronics parts are not as miniaturized as ours; as a result, their equipment tends to be a little larger and heavier than its American counterpart.

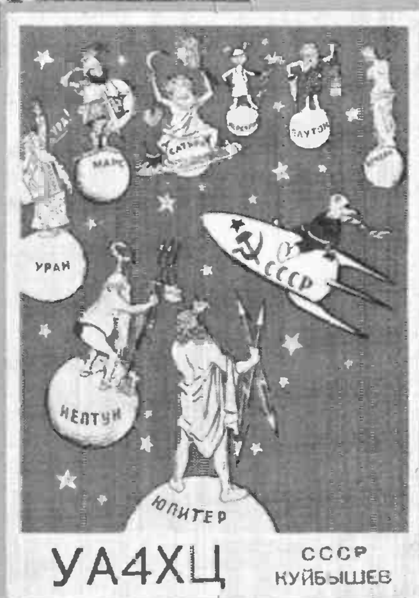
Hams and SWL's. The Soviet government's involvement in amateur radio is much greater than is the case in the United States. Like our Federal government, the Soviet government issues licenses and regulates communications. But it also does much more. It aids, encourages, and even subsidizes the ham and SWL by awarding prizes and medals to winners in code-copying competitions, in hidden-transmitter hunts, and in national and international DX contests.

Even QSL cards are available free from the government, although many hams and SWL's design their own. Ever since Sputnik I, a favorite theme on Russian QSL's has been the various Soviet space achievements. Some very handsome cards (and stamps, too) have been issued on the Sputniks, Luniks, and cosmic rockets. The latest subjects are, of course, Yuri Gagarin, Gherman Titov, and their manned space flights.

How does a prospective ham get a license? First, he must have completed a basic DOSAAF electronics course. Then he takes an SWL test (in Russia the only officially recognized SWL's are those who are licensed to listen on the ham bands). To pass the test, he will have to understand basic electronics theory, wave propagation, "Q"-signals, amateur operating procedure and lingo, log-keeping, the amateur frequencies, international radio prefixes, safety rules, and first aid.

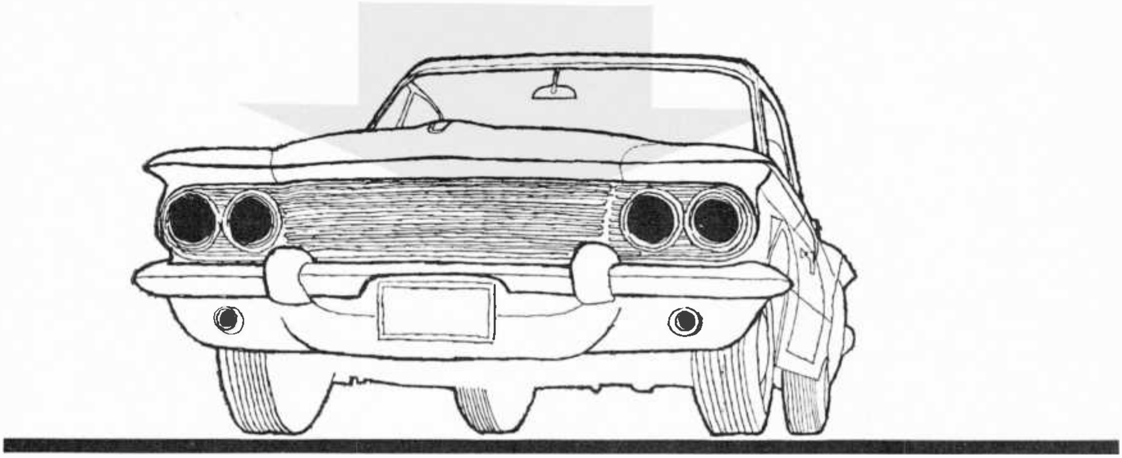
He must also send and receive Morse code—both Russian and International—at a minimum speed of 10 words per minute, and be able to build and repair simple receivers. (As you can see, the Soviet SWL test is considerably more difficult than even our Novice or Technician

(*Continued on page* 115)



QSL cards from Russian hams frequently portray the country's achievements in space. Card at bottom is from station UA4HC in Kuibyshev and shows a Russian space ship off to visit the planets. The ham at left is Al, UA1FE, of Leningrad.

ELECTROSTATICS UNDER THE HOOD



Experimental oil filter works on corona principle

By JAMES G. BUSSE

AN ENGINEER from Chicago recently drove his car into a service station in southern Minnesota and asked for an oil change. The attendant put the car up on a ramp and promptly drained the oil. But when he lifted the hood to replace the oil filter, he got the surprise of his life.

"There's something wrong with your car," he told the driver, excitedly. "The oil filter's missing!"

"Oh, it's there, all right," said the engineer, reassuringly. He leaned over and disconnected a heavily insulated wire from a small plastic cylinder attached to the fire wall. Picking up a wrench, he opened the bottom of the cylinder and tapped it gently. Out slid three months' accumulation of oil sludge.

He closed the cylinder, and the fresh oil was added. He then reconnected the insulated wire and packed up samples of the new oil, the old oil, and the sludge. In a few minutes, he was on his way again, leaving the service station attendant more bewildered than ever.

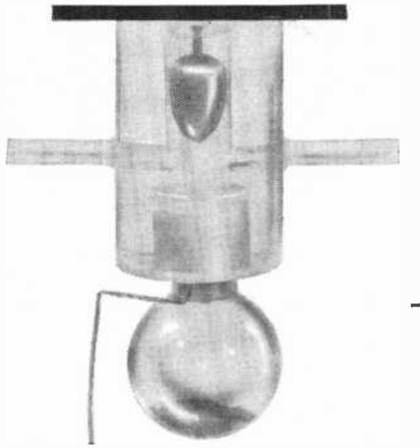
The engineer from Chicago is one of several now driving around the country, testing a new electronic device which promises to make your present oil filter as out-of-date as a hand crank or a running board. Besides eliminating the inconvenience and expense of conventional oil filters, it will mean less frequent oil changes. In short, this new device could easily add years to the life of your car.

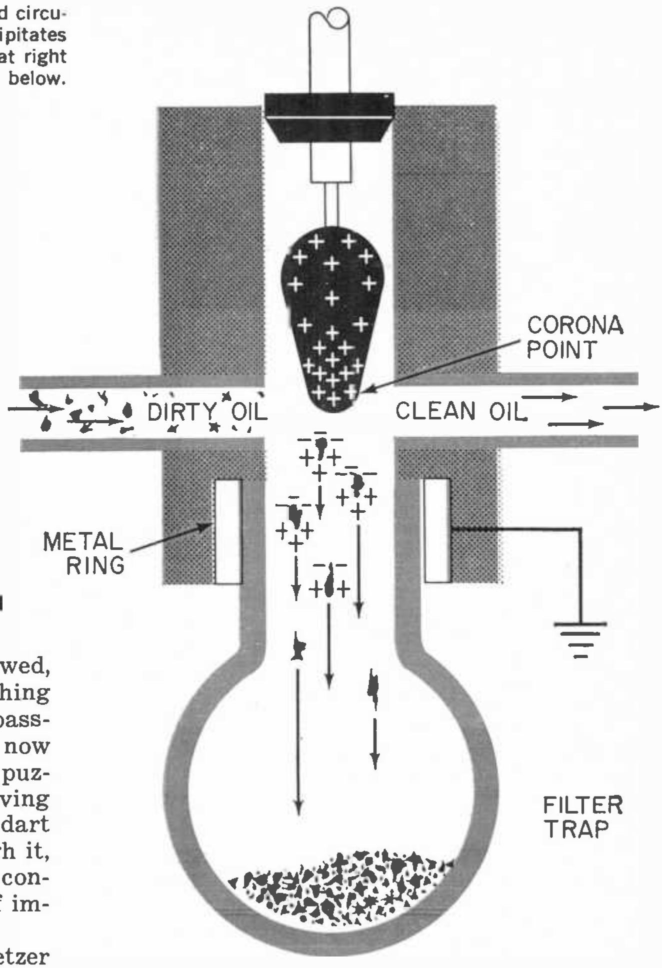
Electronic Pump. The story of this ingenious gadget begins several years ago in Minneapolis. Hidden away in the basement of a building occupied by the Mechanical Division of General Mills was a tiny laboratory. In it, Dr. Otmar Stuetzer, an ex-German scientist, was busy studying the operation of a dielectric pump, a device which pumps dielectric liquids directly without moving parts (see POPULAR ELECTRONICS, April, 1959, p. 99).

In front of Dr. Stuetzer lay a plastic container filled with ordinary motor oil. Inside were two small metal rings separated by a short piece of glass tubing. Wires ran from the rings to a high-voltage d.c. power supply.

Dr. Stuetzer switched on the supply and adjusted its output to 10,000 volts. Slowly, the oil moved toward one electrode. The "pump" worked!

High voltage applied between corona point and circular metal ring in electrostatic oil filter precipitates dirt into trap, as shown in pictorial diagram at right and in photo of experimental laboratory model below.





In the days and weeks that followed, Dr. Stuetzer spent many hours watching the oil move around the container, passing through the rings. And every now and then he saw something which puzzled him. A tiny particle of dirt moving along with the oil would suddenly dart toward one of the rings, pass through it, and then settle to the bottom of the container. Soon, a significant deposit of impurities could be seen there.

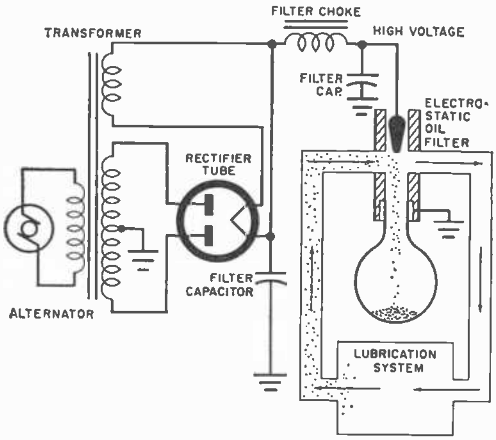
40,000 Volts. Eventually, Dr. Stuetzer had a glass blower make a special tube in which the electrodes were sealed in walls directly across from one another and at right angles to the oil flow through the tube. The lower ring surrounded the opening of a small glass bulb or "trap" attached to the main tube.

Connecting the electrodes to the power supply, he used a conventional pump to direct the motor oil past the electrodes. The oil wasn't dirty enough to suit him, so he gathered up all the dust and dirt he could find around the lab and dumped it in, tossing in some ground-up ashes from his cigar for good measure. Then he switched on the high-voltage supply and sat back to see what would happen.

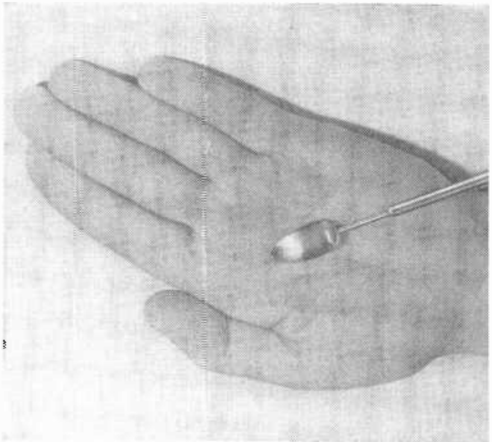
Although a steady stream of dirt particles was passing between the electrodes, the color of the dirty oil flowing through the tube did not change. Dr. Stuetzer hopefully raised the voltage on the electrodes; several particles of dirt shot down into the trap. Cautiously, he increased the voltage to 40,000 volts. In a short time, a cloud of dirt appeared in the trap, and it continued to increase in size and density. Soon, the oil flowing through the tube became translucent again. The oil was being filtered electronically!

Two Electrodes. Conventional oil filters clean the oil in your car by forcing it through layers of tightly packed fibers and screens. As more and more dirt accumulates in the filter, its efficiency decreases. Finally, it becomes so clogged that it allows dirt to remain in the oil returning to the engine.

But in the electrostatic filter, two electrodes accomplish this filtering electronically. The high voltage applied to



Simple power supply for the electrostatic oil filter.



Relative size of filter's corona point is shown here.

the electrodes produces an intense electrostatic field between them, and any dirt particle entering this field is of course affected by it.

If the particle is conductive—a piece of carbonized motor oil, say—its electrons are actually drawn towards the positive electrode. If the particle is non-conductive—a tiny piece of sand, for instance—its charge is similar to that of the dielectric in a charged capacitor: its orbiting electrons are repelled by the negative electrode and attracted by the positive one.

Once the particle is within the electrostatic field, it begins to move toward the negative electrode—the higher the voltage on this electrode, the faster the particle moves. But because this electrode is circular in form, the dirt particle has passed out of the electrostatic field by the time it reaches the electrode. And since it's out of the moving stream of oil, too, it settles to the bottom of the "trap."

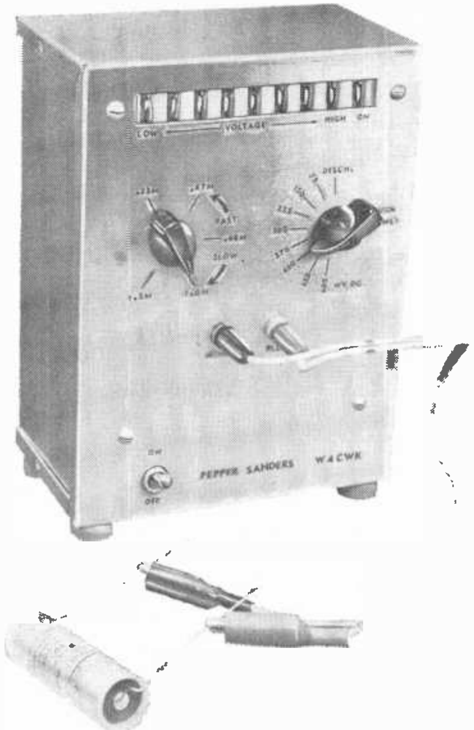
"Corona" Point. In the original electrostatic filter, a large portion of the dirt particles were attracted to the upper electrode and thus would fall back into the oil stream, untrapped. But by substituting a pointed conductor for the upper ring electrode, Dr. Stuetzer killed two birds with one stone. For one thing, the pointed conductor concentrated the electrostatic field. And at the same time, it forced all of the dirt particles to move toward the lower electrode and the trap.

Why? Simply because the amount of static electricity on any conductor is proportional to the curvature of the conductor's surface. (This explains why all types of high-voltage electrical apparatus have smooth, rounded surfaces.) And when a high voltage is applied to a conductor with a pointed surface, the electrical charge concentrated at the tip is so intense that everything near it becomes strongly charged.

In air, this "corona" point charges and repels the atoms, generating a wind strong enough to blow out a candle. Similarly, in the electrostatic filter, the "electrical wind" charges even the smallest particle of dirt and literally "blows" it at the lower ring electrode. And this concentrated electrical field around the corona point also makes it possible to clean oil which is flowing through the filter at a relatively fast rate.

Power Source. Powering an electrostatic oil filter in a car is no problem. The current drain of one prototype filter is only a few microamperes at 25,000 volts, and this can be easily supplied through a filter choke and a couple of capacitors connected to the car's generator.

Although you can't buy an electrostatic oil filter for your car just yet, the time may not be too distant when they'll be installed in every new car rolling down the production lines. In fact, the day may come when a service station attendant will lift the hood and remark, "But, sir! This car has a non-electronic oil filter!" —30—



IF YOU'RE one of the many experimenters who have large stocks of used electrolytic capacitors in storage, you know that such units often break down as soon as they are again placed in service. These capacitors aren't cheap, and you can avoid wasting them by using this efficient automatic restorer. Costing less than $16.00 to build, the device will give the most senile electrolytic in your spare parts box a new lease on life.

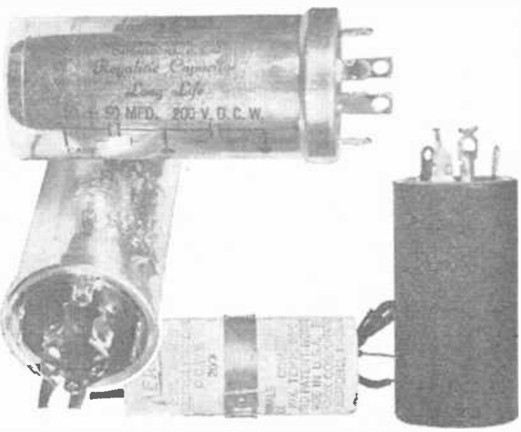
Inside the Electrolytic. Most electrolytic capacitors contain two sheets of thin aluminum foil which are held apart by a layer of electrolyte-impregnated paper or gauze separators and rolled into a cylinder. Each of these sheets is connected to one of the capacitor's pigtail leads, and the positive foil is coated with an insulating (dielectric) film of aluminum oxide. The thickness of this film, which is deposited on the side facing the electrolyte, determines the maximum safe working voltage of the capacitor.

When the capacitor is in service, the thickness of the dielectric film is adequately maintained by the circuit voltage. In storage, however, time and heat

THE RESTORER

...gives your electrolytics a new lease on life

By H. E. SANDERS, W4CWK



cause the film to deteriorate. Full voltage placed on an electrolytic that has been idle for some time will almost invariably puncture the weakened dielectric, ruining the unit.

It is possible, however, to electrically retore or "form" a deteriorated dieelectric film. One standard forming procedure has been to apply a very low voltage to the capacitor, slowly increasing it over a period of an hour or so, until the normal working voltage is reached.

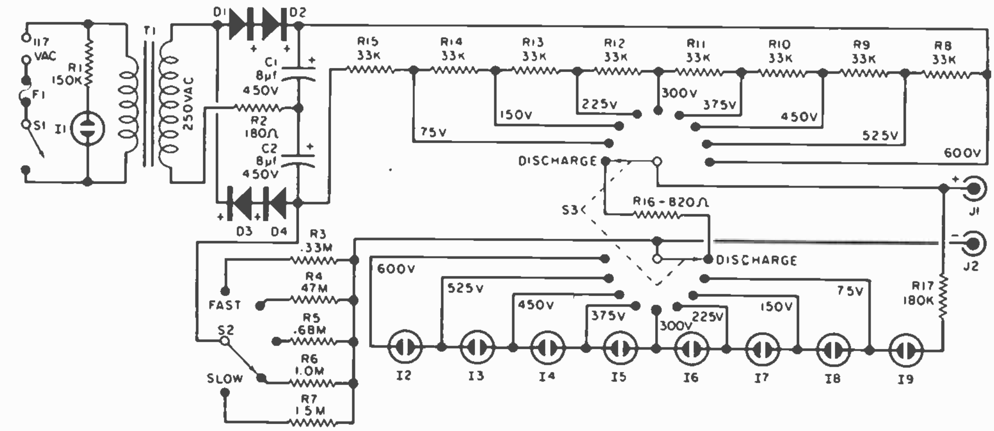
How the Restorer Works. The unit described in this article has been designed to carry out the forming process described above automatically. The capacitor itself is made to adjust the speed of forming in accordance with its age and the condition of its oxide film. The progress of the forming is observed on a series of neon lamps.

Power for the automatic restorer is provided by transformer *T1* and a voltage-doubling full-wave rectifier circuit consisting of diodes *D1 - D4* and capacitors *C1* and *C2*. Resistor *R2* protects the diodes from damage by excess current. The transformer's primary is connected to the line through a ¼-ampere fuse (*F1*) and a toggle switch (*S1*). Neon lamp *I1*, with its associated dropping resistor (*R1*), serves as an "on-off" indicator.

The approximately 700-volt d.c. output lamp is connected in series with the original one. Resistor *R17* protects the neon lamps from a current overload.

Voltage applied to the capacitor to be formed, through the series current-limiting resistor (see "Operation" section for appropriate voltage and resistance settings), divides between the two units as if they were both resistors. Since the unformed capacitor has a very low forward—or insulation—resistance, almost all the voltage is initially dropped across the resistor. The small drop across the capacitor begins the forming process, however, and as the deteriorated electrolytic film is restored, the capacitor's resistance gradually increases.

As the capacitor's resistance becomes



Schematic diagram of the "Restorer." Switch S3 taps the power supply's voltage divider, selecting the "forming" voltage, and also controls the indicating lamp circuit. Switch S2 inserts the proper current-limiting resistor.

of the power supply is dropped across a voltage divider made up of resistors *R8* through *R15*. The voltage drop across each of these resistors is on the order of 90 volts. One section of switch *S3* taps the voltage divider, determining the multiple of 90 volts which will be applied (through a series current-limiting resistor) to the capacitor being formed. The current-limiting resistor to be used (*R3, R4, R5, R6* or *R7*) is selected by switch *S2*.

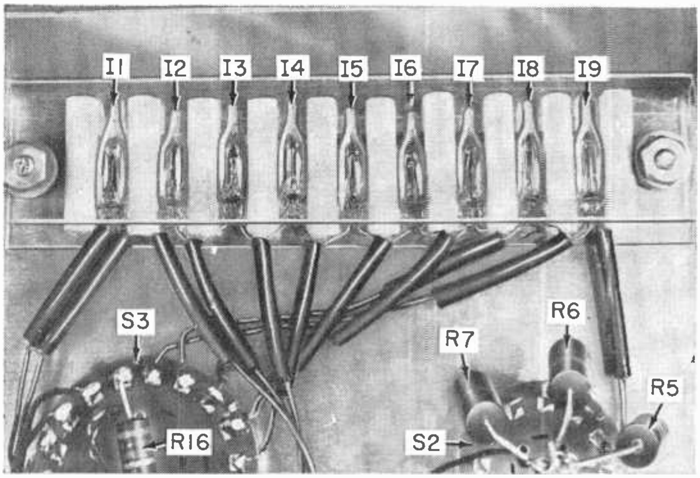
The other section of *S3* controls the automatic indicator circuit. In the lowest-voltage position of this switch, neon lamp *I9* is connected across the capacitor being formed. For each successively higher position of *S3*, an additional neon greater, a larger proportion of the voltage is dropped across it. When the voltage across the capacitor has risen to the value at which *S3* is set, the lamp (or lamps) associated with that position of *S3* will fire—indicating that the forming is complete. Switch *S3* is calibrated in 75-volt intervals because the NE-2 neon lamps used at *I2 - I9* fire at 75 volts each.

Before disconnecting the restored electrolytic, *S3* is turned to the "discharge" position. In this way the capacitor, its charge drained through *R16*, is made safe to handle.

Construction Details. The restorer is built into an 8" x 6" x 3½" aluminum utility box equipped with an "L"-shaped mounting shelf. The shelf is formed from a 5½" x 4¼" piece of heavy aluminum; make a 90° bend along the long dimension, 1" in from one end. The resulting lip is used to bolt the shelf into the utility box.

Mount transformer *T1* on one side of the shelf and the remainder of the power switches *S1, S2* and *S3,* and the indicating lamps are mounted directly on the box. Before making the front-panel opening for the lamps, construct the lamp holder as described below.

The author made the lamp holder by bending a 2½" x 5½" piece of plexiglass (along its long dimension) into a "U"



Details of the Restorer's lamp holder can be seen clearly in this photo; the author made his holder from a single strip of plexiglass. Use of quick-drying cement keeps lamps and rolled-paper separators in place.

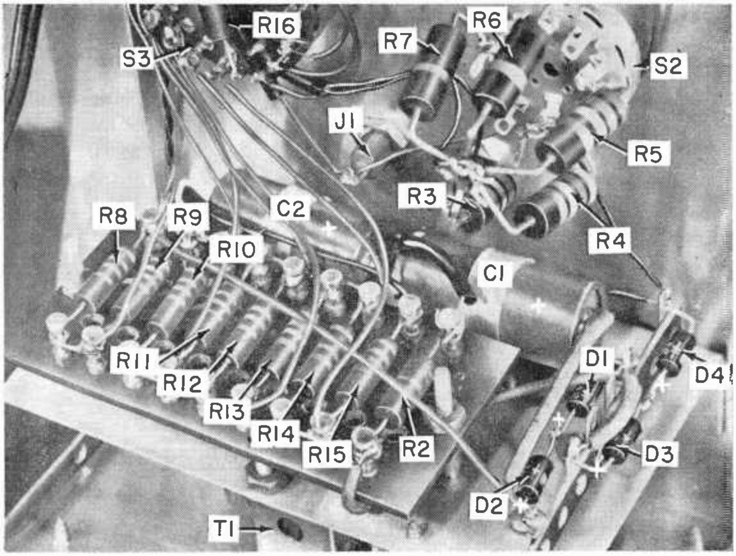
PARTS LIST

C1, C2—8-µf., 450-volt electrolytic capacitor
D1, D2, D3, D4—400-PIV, 200-ma. silicon rectifier (Sarkes-Tarzian 2F-4 or equivalent)
F1—¼-ampere, 3AG fuse
I1 - I9—Neon lamp (General Electric NE-2 or equivalent)
J1, J2—Banana jack (one red, one black)
R1—150,000-ohm, ½-watt resistor
R2—180-ohm, 1-watt resistor
R3—0.33 megohm
R4—0.47 megohm
R5—0.68 megohm } *all 2-watt resistors*
R6—1.0 megohms
R7—1.5 megohms
R8 - R15—33,000-ohm, 1-watt resistor
R16—820-ohm, 1-watt resistor
R17—180,000-ohm, ½-watt resistor
S1—S.p.s.t. toggle switch
S2—1-pole, 5-position, non-shorting rotary switch
S3—2-pole, 9-position, non-shorting rotary switch
T1—Power transformer; primary, 117 volts; secondary, 250 volts @ 25 ma. (Knight 62 G 008 with filament winding and plate winding CT unused, or equivalent)
1—8" x 6" x 3½" aluminum utility box (Bud CU-3009A or equivalent)
Misc.—Sheet aluminum for shelf, line cord and plug, test leads, terminal board and strips, plexiglass strips, cement, hardware, fuse clip, wire, etc.

supply components (*R2, R8 - R15, D1 - D4, C1* and *C2*) on the other. To facilitate construction, the resistors are wired onto a terminal board; drill two 3/16" ventilation holes in the board below each resistor. The diodes can be mounted on a long terminal strip.

When installing the shelf, position it so that transformer *T1* is inverted, with its weight resting on the bottom of the utility box. Banana plugs *J1* and *J2,* shape. You can get the same effect, however, by bolting together two 1" x 5½" plexiglass strips, spacing them about ¼" apart. One of the strips, of course, need not be transparent—so you can substitute wood, metal, or any other material you happen to have handy.

The "on-off" indicator lamp (*I1*), as well as voltage indicator lamps *I2 - I9,* are inserted between the strips. Use only new NE-2 lamps; old ones may



The Restorer's "L"-shaped mounting shelf is fastened to the rear of the front panel. Transformer T1, though fastened to the shelf, is really supported by the bottom of the box.

have drawn heavy currents in prior usage, causing them to fire at a voltage which is too low. The NE-2's are separated with ¼"-diameter x 1"-long cylinders made of rolled paper, and both the lamps and cylinders are held in place with quick-drying cement.

When the cement has dried, measure the assembly to determine the proper dimensions for the front-panel opening. The same screws that hold the unit together may be used to fasten it to the front panel.

Operation. Plug a set of test prods into *J1* and *J2*, and clip them to the capacitor to be formed—being sure to observe the polarity. If the polarity is accidentally reversed, no harm will come to the capacitor but forming will not occur.

Switch *S2* selects one of the five possible series current-limiting resistors. Faster forming takes place with the lower resistances, but you'll get a higher quality capacitor with the higher ones. Some high-capacitance units, however, will never complete forming at the higher resistance settings. A little experience will soon show you how to use *S2*, but in general you should stick to the 1.0-megohm setting unless you're in a hurry or the capacitance is too high.

Switch *S3* simply selects the d.c. working voltage marked on the capacitor's shell. All possible voltages, of course, are not available, and it may occasionally be necessary to select a slightly higher one. A 20% or 30% excess voltage is not harmful.

After setting switches *S2* and *S3* to their proper positions, flick on power switch *S1* and await results. Relatively new capacitors will form in a few minutes; very old ones may take several hours. When the forming is complete, the appropriate indicator lamps will light.

It's not necessary to disconnect the capacitor from the "former" as soon as the lamps light. The voltage across the restored unit will soon drop to a lower level and remain there, even if you wait all day. When you do disconnect it, though, remember to drain its charge first by turning *S3* to the "discharge" position.

Two electrolytics of the same working voltage may be formed at the same time by connecting them in parallel across *J1* and *J2*. A 330,000-ohm, 1-watt resistor should be placed in series with each one, and the .33-ohm position of *S2* should be used. Under these conditions, one of the capacitors should complete forming before the other. When the indicating lamps light, therefore, disconnect the capacitors and reconnect them individually in the normal way. The unit which requires more forming will not relight the indicators. –30–

A NEWCOMER TO HI-FI ASKS POPULAR ELECTRONICS:

"WHAT CAN YOU TELL ME ABOUT RECORD PLAYERS?"

By **RICHARD A. FLANAGAN**
Associate Editor

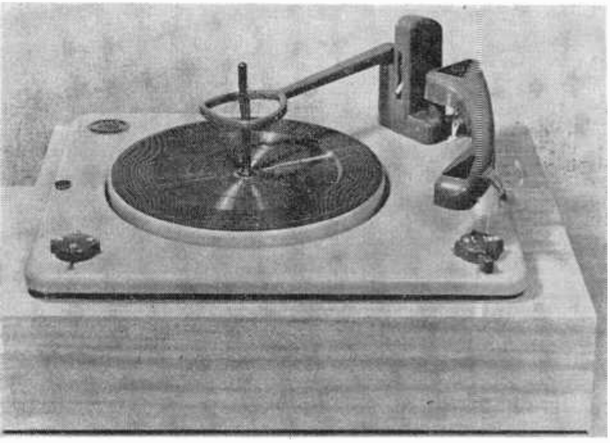
The most important thing to keep in mind about "record players" is that they are made in a wide variety of types and styles, including automatic changers, manual players, and some interesting hybrids. Choosing the "right" player for a stereo system involves much more than simply satisfying your eye and your pocketbook. The "right" player for your system is the one that will give you exactly what you want out of it. And the best way to go about selecting it is to know precisely what you are looking for before starting your search.

Just what is the function of a record player in a hi-fi system?

A record player is simply one link in the proverbial "chain" that comprises a sound-reproducing setup. In simplest terms, it consists of four parts—a motor to revolve a turntable, a turntable to hold and revolve the record, a stylus and cartridge assembly to convert the modulations on the record into electrical energy, and a tone arm to hold the cartridge and allow it to move freely across the record.

Isn't a manual player better than an automatic changer for most purposes?

No, since the whole matter hinges on your criteria for judging. Generally



Typical of the fully automatic record changers is the Lesa CD2/21. A four-speed, jam-proof player wired for both mono and stereo, the CD2/21 features a heavy-duty 4-pole motor and automatic intermixing of records of varying sizes. Supplied with a universal-type plug-in head, it sells for $44.50.

speaking, the audiophile who is primarily interested in listening to popular and light classical selections will find an automatic changer more to his liking. The reason is self-evident: loaded with a stack of 33 1/3-rpm long-playing records, a record changer will play for hours, completely unattended.

On the other hand, the person whose tastes run toward symphonies, operas, Broadway shows, and similar "long" types of program material will no doubt prefer a manual-type player. This way, he can play both sides of his records in their proper sequence, and he has the assurance that he's giving his records the best of treatment, too.

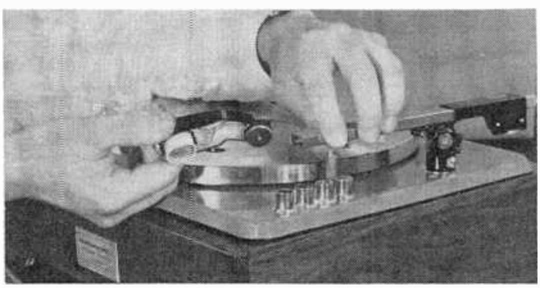
That sounds as though a manual player is the best choice from the point of view of record wear. Is this true?

To some extent, yes. It's really not fair to underestimate record changers, though. They've been around for a long time, and the manufacturers have come up with some pretty ingenious mechanisms which make for both foolproof operation and longer record life. Even so, a changer will usually require a heavier stylus force than a manual player, since it is actually the stylus that is responsible for tripping the reject mechanism at the end of a record.

Another matter to keep in mind is what audio engineers call the "angle of incidence." This is the angle at which the stylus strikes the record, and only one such angle is "ideal." In the case of a changer, this angle will vary with the number of records on the turntable—the stylus will necessarily be at a different angle to the record it is playing when there are five records on the turntable instead of one.

Furthermore, turntable speed variations are more common with a changer than with a manual player, since the motor is being called on to do more than simply revolve the record. In fact, flutter, wow, and rumble are all potentially

Among the more versatile hybrids is the Miracord "Studio" series with plug-in cartridges (see photo below). Equipped with a 7-lb, non-ferrous, machined turntable, the Studio player functions either as an automatic turntable or as a record changer. It is priced at $79.95 with heavy-duty 4-pole motor, $99.50 with hysteresis synchronous motor.



more troublesome with a changer than with a good manual player.

Exactly what is the difference between flutter, wow, and rumble?

There is actually quite a big difference between these characteristics, although all of them are undesirable and contribute to poor fidelity and listening fatigue.

Before we consider them separately, however, keep in mind that it takes a top-quality motor to do a good job in any type of record player, and that most quality machines use either a 4-pole induction motor or one of the hysteresis-synchronous types. Remember, too, that producing a good turntable platter isn't an easy task. In fact, the more expensive turntables are carefully cast, then painstakingly machined to remove any possible cause of eccentricity.

"Flutter" is nothing more than a rapid wavering in the speed of the turntable as it revolves, and it usually results from inadequacies in the motor itself or in the drive mechanism between the motor and the turntable. "Wow" is the term given to any turntable speed variations which are slow enough to change the pitch of a tone perceptibly; it ordinarily stems from poor construction of the turntable platter itself or the turntable suspension system. "Rumble" is a series of low-frequency vibrations transmitted from the motor to the cartridge; it can result from any number of causes, chief of which is poor mechanical construction of the player and improper suspension of the motor.

One good way to keep the three terms straight is to look at them this way: *wow* is a "slow" form of *flutter,* and both are audible only as effects on program material; *rumble* is a distinct sound in itself and is the only one of the three that can be heard even in the absence of programing.

Isn't there some way to check on flutter, wow, and rumble before purchasing a record player?

Definitely. A good "ear" can detect wow and flutter on almost any form of program material, but your best bet is to play a record of piano music. The average listener is apt to miss speed fluctuations on orchestral or other forms of ensemble playing, but a sustained tone on a piano really shows up this defect. Rumble can be heard by turning up the volume or loudness and bass controls on the amplifier, but the tone is very low pitched and is therefore most disturbing only on speaker systems fully capable of reproducing it.

The Thorens TD-184, a semi-automatic record player, features "dialomatic" operation: one dialing motion selects 7", 10", or 12" record size, starts the motor, and brings the pickup into the first record groove. Priced at $75.00, this unit is shown on our front cover. The turntable platter was removed to show the combination belt and idler drive.

Another way of tackling the wow and flutter problem is to view the operation of the changer or manual player with a "strobe disc" on the turntable. Changes in rotational speed will be evident as variations in the location of the "stationary lines."

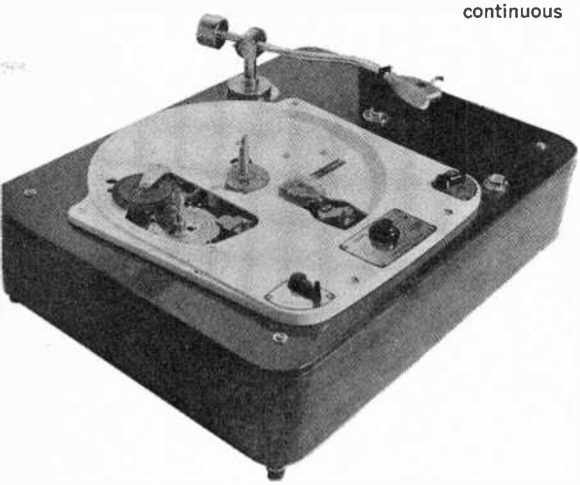
But if wow and flutter are both negligible, can you be sure that the turntable is really revolving at the desired speed—33⅓ rpm, say?

Not necessarily. Lack of flutter and wow has nothing to do with the overall rotational speed of the turntable. In most cases, however, the actual rotational speed will be close enough to the proper speed for practical purposes; and

these adjustments are rather "tricky" and could make the player sound worse instead of better by introducing excessive wow and flutter.

Players with hysteresis-synchronous motors usually do not require a speed variation control since the motor's speed is determined by the 60-cycle a.c. power line frequency. Hysteresis motors are more expensive to manufacture, and this additional cost is reflected in the difference in the purchase price between players with 4-pole motors and hysteresis motors.

Professional "transcription type" turntables such as the Garrard 301 are supplied without tone arm (an ESL S-2000 is pictured here) and are intended for custom installations. A three-speed unit with variable eddy-current control for each speed, the 301 employs a 6-lb aluminum turntable and a heavy-duty four-pole motor; a built-in pressure lubricating system insures continuous lubrication at all times. Price, $89.00.



few people possess a feeling for "absolute pitch" anyway.

Some record players with 4-pole motors feature a special knob for adjusting turntable speed within small limits. This means that a recording can actually be brought precisely on pitch in order to satisfy the demands of a professional musician or other extra-critical listener as well as to accompany live musical instruments.

Since the more inexpensive players seldom incorporate such a feature, it's best to give some thought to this point before selecting a record player. It is possible to mechanically alter the size of the drive pulley or the intermediate drive wheel on most players, of course, but

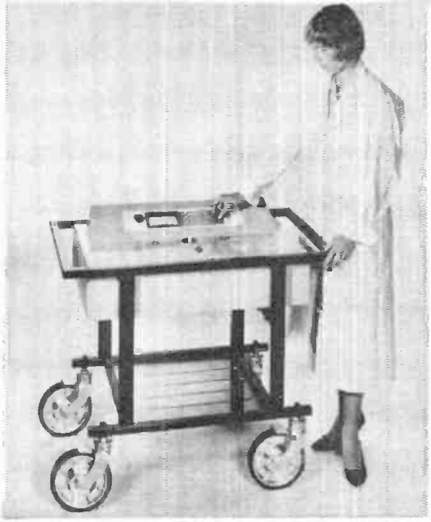
Is there any possibility of a record player introducing hum into a stereo system?

Yes, although this shouldn't be a serious problem in any player of proper design. Inadequate shielding of the cartridge or of the leads from the cartridge may result in excessive hum pickup.

Just how important is the use of a good record player in a stereo system?

Since it is the first link in the sound-reproducing "chain," its importance cannot be minimized—obviously, the preamplifiers, amplifiers, and speakers in the system can be expected to do no more than faithfully reproduce the signal the record player supplies.

While some of the more inexpensive players are easy on the pocketbook, they may prove "false economy" in the long run. A poorly designed record player (even when used with a fine cartridge) can introduce distortion. Equally important, it could damage valuable records. Therefore, if you value your records and are looking for the best in sound, it's wise to purchase the finest player you can afford. –30–

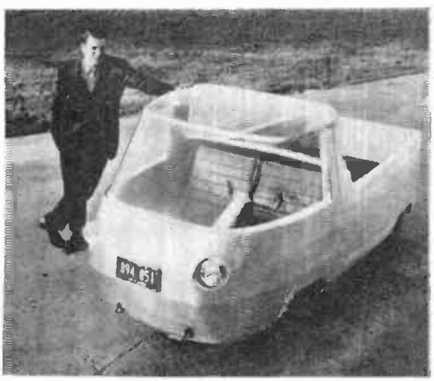


POP'tronics NEWS SCOPE

BLOOD VOLUME in a patient's body can now be determined rapidly, repeatedly, and with greater precision than previously possible, with an automatic device Atomium Corporation physicists helped develop. The "Volemetron" works on the following principle: a doctor injects into the blood stream a measured amount of human blood protein "tagged" with a small amount of radioactive iodine. Ten minutes later, when the protein is mixed thoroughly in the patient's circulation, a blood sample is taken, and its radioactivity measured. The amount of dilution of the tagged protein indicates the blood volume diluting it. During an operation, the "Volemetron" may prove invaluable in determining blood loss. Particularly important for patients with heart ailments, it will help prevent the possible disastrous consequences of under- or over-transfusion.

BOUNCING EGG—An egg embedded in a flexible silicone compound developed by General Electric makes an unbreakable bouncing toy for the youngster at left. The silicone compound was developed to protect delicate electronic parts in missiles and space vehicles from severe shock and vibration. Easy to use, it is poured around whole pieces of electronic circuitry and allowed to set to a flexible solid, forming a thick protective wall around the parts. It also serves to shield components from moisture and contaminants. Good news for our astronauts and egg wholesalers!

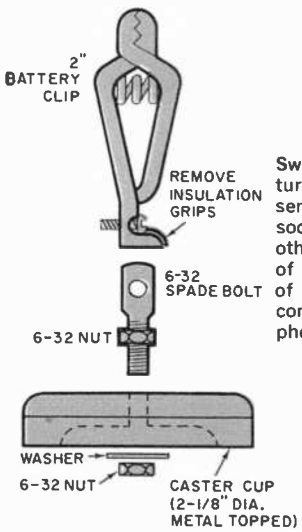
TRANSPARENT STEEL—Thanks to the cooperation of two industries, this fall's color TV picture tubes will use an improved steel "see-through" shadow mask. Rolled to 6/1000 of an inch thick by U. S. Steel's American Steel and Wire Division, the 21"-diameter steel disc is put through a special etching process by the Buckbee Mears Company, a photoengraving firm in St. Paul, Minn. Transparency is achieved by automatically etching exactly 441,222 perfect holes correctly spaced in the paper thin steel. Result: when the hero of a TV Western rides off into a colorful sunset, you can easily distinguish him from the view.



BEEP BEEP!—Is the Mrs. all set for a shopping spree? Well, SPARKY, the all-electric urban runabout, might be just the car for her to hit the highways with. Designed by Marnie C. Averitt, one of the six winners of the Aluminum Company of America Student Design Merit Awards for 1961, SPARKY can speed along at 30 mph powered by an electric motor. Batteries provide a 60-mile range between charges; a built-in battery charger plugs into any power outlet, permitting full charge in eight hours and half charge in two hours. SPARKY employs three driver controls: aircraft-type steering bar (providing necessary torque for unpowered steering, quick response for maneuverability), accelerator, and brake. When the accelerator is pressed, SPARKY starts up, and the hydraulic brake stops it—there's no waste of power. Mileage (miles/kilowatt) is high if you don't blow the horn.

MIKES FROM LAMP SOCKETS

By ART TRAUFFER

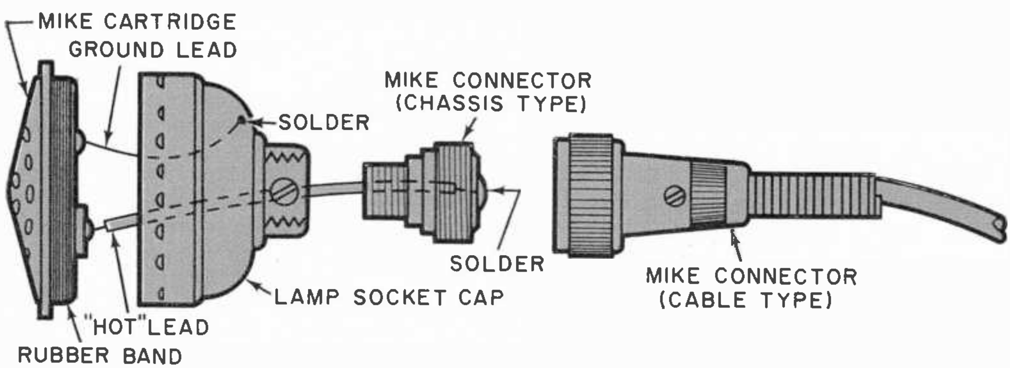


Swivel desk mike pictured above is assembled from a lamp socket cap plus a few other common pieces of hardware. Diagram of stand is at left; construction of microphone is shown below.

THE VARIETY OF inexpensive microphone cartridges now on the market is a challenge to the experimenter's ingenuity. Many of them are sensitive units with good frequency response. Mount one in an appropriate housing and you'll have a useful microphone at little cost.

The author has found that the metal enclosure from an old lamp socket makes an almost ideal housing. Its dimensions are just about right and the threaded mounting collar will accept a chassis-type mike connector. Illustrated here are three designs for lamp-socket microphones.

Swivel Desk Mike. Just the cap of a lamp socket enclosure was used as the basis for the handy desk mike shown on this page. A Lafayette MS-108 crystal cartridge (with a rubber band slipped around it to provide a cushioned press-fit) mounts neatly in the 1½"-diameter mouth. The cartridge's ground lead is soldered to the interior of the cap and



the "hot" lead brought out to a mike connector (Amphenol 75-PC1M) screwed into the cap's mounting collar.

The base is made from a 2⅛"-diameter metal-and-rubber caster cup. A *6-32* spade bolt fastened to the cup serves as a swivel mount for a 2" battery clip. The clip, in turn, is clamped to the mike's cable connector.

Desk or Floor Mike. A complete enclosure (with socket and switch removed) houses the mike at right, top. The cartridge used here is a Western Electric magnetic unit (Model MC-253-A), cemented into the front opening of the enclosure. Any cartridge that will fit can be used, of course, and there's even room for a subminiature impedance-matching transformer if necessary.

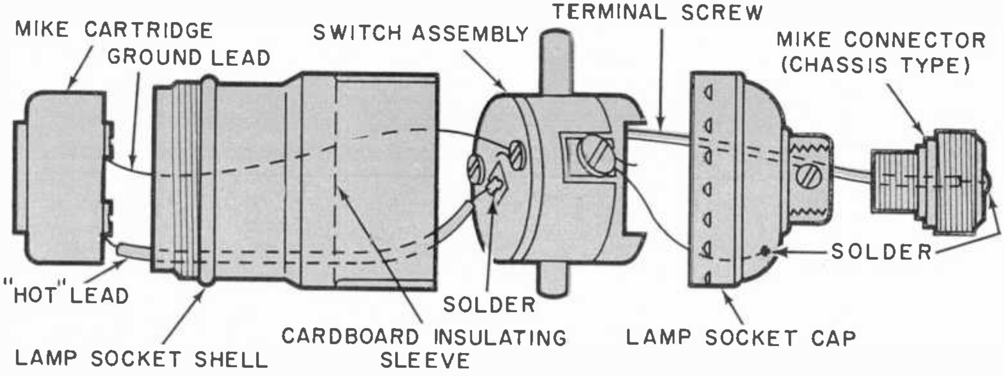
A threaded retaining ring (removed from a cable connector) is soldered to the side of the enclosure to act as a socket for a standard desk or floor stand. Refer to the swivel desk mike diagram for wiring and connector installation.

Hand Mike with Switch. In the hand mike shown directly at right, the socket switch was left in place for use as a microphone control. The threaded lamp holder is removed from the switch assembly and the cartridge ground lead soldered to one of its mounting screws (an ohmmeter check should be made to see which one connects to a terminal screw). The "hot" lead is soldered to the old center lamp contact.

Other wiring and construction details for the hand mike are given in the diagram below. Be sure to use the original cardboard insulating sleeve (cut down so that it just fits the switch) to prevent the screw terminals from shorting to the enclosure. —30—

Desk or floor stand model utilizes a complete lamp socket enclosure. Retaining ring from cable connector is soldered on to serve as socket for microphone stand.

Hand mike below, a variation of the unit above, is turned on and off by original lamp-socket switch. See construction details at bottom of page.



On the Citizens Band

By DICK STRIPPEL, 2W1452

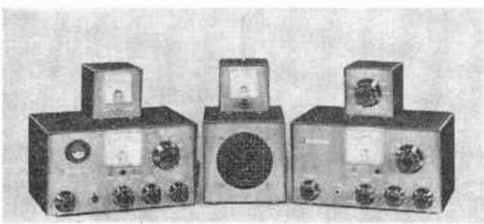
THE Citizens Radio League of Northlake, Ill., was recently honored by the Boy Scouts of America for its service during the Scouts' annual Canoe Marathon. Mobile CRL units covered the 18-mile route of the race on the Des Plaines River in which more than 200 canoes participated.

One CB unit was in a canoe, covering the entire route, while automobile units parked near the river or on bridges which crossed it. A mobile unit equipped to give first aid for participants and spectators was called upon several times.

In recognition of their outstanding work, the Boy Scouts presented the CRL with a plaque acknowledging the services rendered.

The inscribed plaque at right was presented to Joe Perry, 18W5527, CRL chairman, by Ralph Freese (left, above), and Harry Weissinger (right, above), of the Boy Scouts.

New CB "Station." A newcomer to the CB field, the Sampson Company Electronics Division, Chicago 8, Ill., is producing a Citizens Band "radio station" consisting of three to six components. The receiver is 11" x 6" x 7¼" and boasts extremely high sensitivity and selectivity. The transmitter, housed in a similar-sized cabinet, has a *pi-net* output, a full five-watt input, and a metering and modulation percentage indicator. It also uses a separate oscillator and final amplifier—no dual tube here.



An external loudspeaker is used with the receiver. Accessories include an external transmitter crystal selector which adds another 12 "rocks" to the 10 already there, an r.f. output meter, and a field strength meter. Since the "station" costs more than $300 with all six components, it's designed for the commercial user.

Transceiver Workout. We recently had a chance to give the General Radiotelephone MC-4 transceiver a workout. From our rather poor location, down in a valley, we were able to hear ground-wave signals from a good 25 miles away. In transmitting, we found that the unit put *out* better than 2½ watts, as measured by lab-quality gear, into our Marconi antenna (grounded ¼-wave vertical).

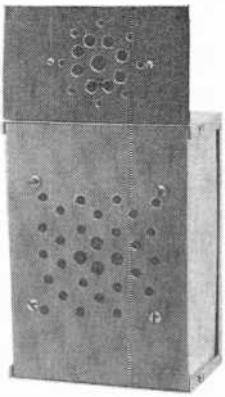
The selectivity of the receiver is such that you actually have to retune slightly

(*Continued on page* 108)

ELECTRONIC Do-Re-Mi

Liven up your parties and startle your friends with this portable, remote-controlled tonemaker

By MARTIN H. PATRICK



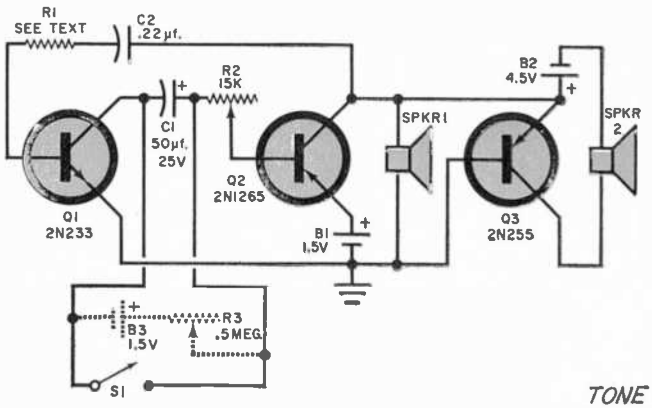
YOU CAN USE this simple gadget to provide novel effects for parties or games, to replace your conventional doorbell, or . . . you name it! Three inexpensive transistors and a minimum of other parts produce and amplify a series of rising tones closely resembling a musical scale. The "Do-Re-Mi" unit, which is remotely controlled by a simple push-button switch, operates from its own self-contained batteries and can be carried anywhere.

About the Circuit. An *npn* and a *pnp* transistor (*Q1* and *Q2*) are used in a multivibrator circuit so arranged that transistor *Q2* normally remains cut off due to a biasing charge developed on capacitor *C1*. When the bias is removed by shorting *C1* with bell-button switch *S1*, the circuit oscillates—producing from one to six tones (depending on the setting of *Tone Adjust* potentiometer *R2*) of successively higher frequency.

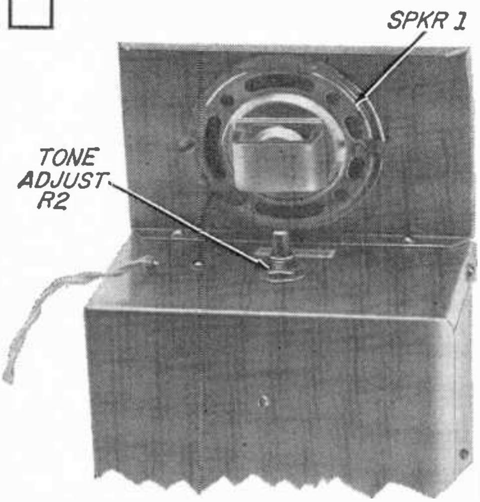
A 16-ohm, 2¾" PM speaker (*SPKR 1*) makes the tones audible and also serves as a collector load for transistor *Q2*. The tone sequence ends when *C1* again acquires a full charge, cutting off transistor *Q2* and stopping the oscillations.

Power for the transistorized multivibrator circuit is supplied by battery *B1*, a 1½-volt "D" cell. Although current is always being drawn from *B1*, even when the circuit is not oscillating, battery life is quite long. During "quiet" periods, current drain is caused primarily by transistor leakage and is on the order of 0.2 milliampere.

If desired, an optional duration control circuit (shown dotted in the



The "Do-Re-Mi" circuit, though unusual, is quite simple. Potentiometer R2 determines number of tones produced; R3 varies length of intervals (see optional, dotted section of diagram).



Mount the 16-ohm speaker (SPKR 1) on top of the box to prevent excess cone damping. Potentiometer R2 is just behind it, and twisted cable at left runs to the push-button switch.

PARTS LIST

B1—1½-volt flashlight cell (Burgess Type 2 or equivalent)
B2—Three 1½-volt penlight cells in series (three Burgess Type Z or equivalent)
**B3—1½-volt flashlight cell (Burgess Type 2 or equivalent)*
C1—50-µf., 25-volt electrolytic capacitor
C2—0.22-µf., 100-volt Mylar or paper capacitor
Q1—2N233 transistor
Q2—2N1265 transistor
Q3—2N255 transistor
R1—½-watt resistor—see text
R2—15,000-ohm potentiometer
**R3—0.5-megohm potentiometer*
S1—S.p.s.t. push-button switch (doorbell type)
SPKR 1—16-ohm, 2¾" PM speaker (Calrad PM2.75Z or equivalent)
SPKR 2—3- to 4-ohm, 4" PM speaker (Lafayette SK-25 or equivalent)
1—7" x 5" x 3" aluminum utility box (Bud CU-3008A or equivalent)
1—1" x 3⅛" x 4" open-end aluminum chassis (Bud CB-1617 or equivalent)
Misc.—Transistor sockets, perforated board, battery holders, hardware, etc.

**For optional duration control circuit*

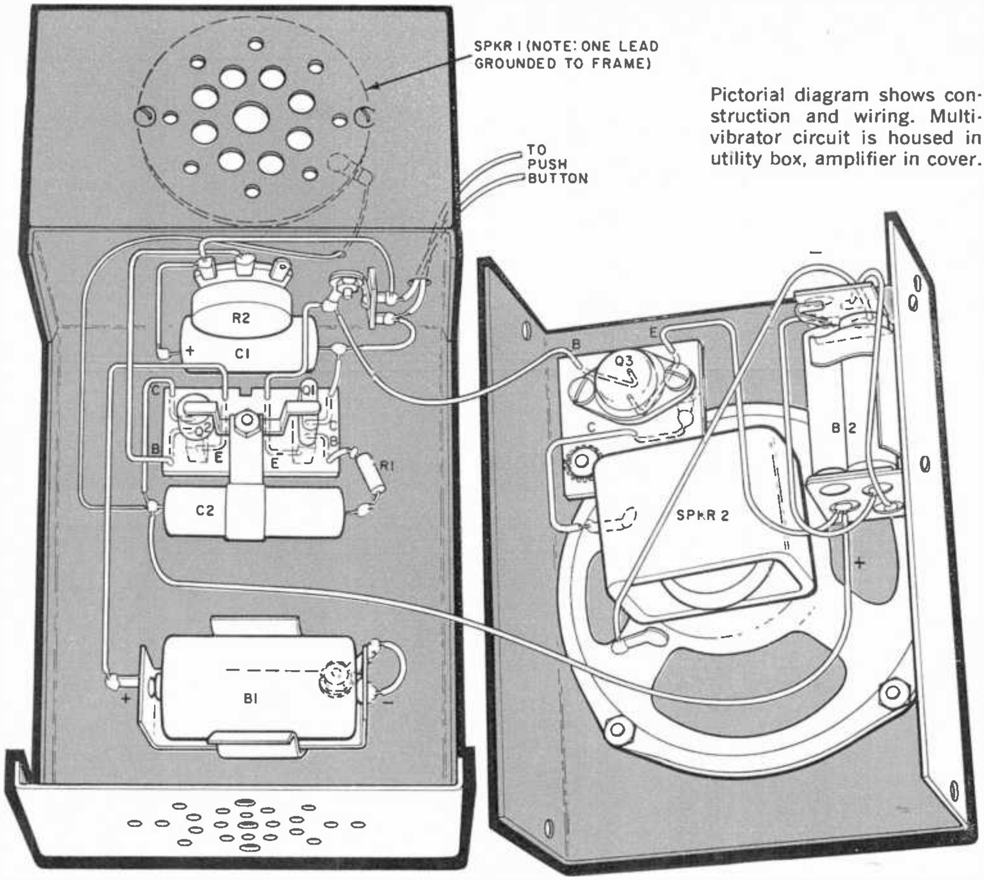
schematic diagram) may be added. Adjusting potentiometer *R3* changes the time constant in the circuit between the collector of *Q1* and the base of *Q2*, varying the length of the tone intervals.

The sound from *SPKR 1* is not very loud, and to augment it, the author added an amplifying stage consisting of transistor *Q3* and a 3-4 ohm, 4" PM speaker (*SPKR 2*). This stage raises the volume to a comfortable level, but note that *SPKR 1* must remain in the circuit since it is necessary for the proper operation of the multivibrator.

Power for the amplifying stage comes from a separate 4½-volt battery (*B2*) consisting of three standard 1½-volt penlight cells in series. The drain on this battery during resting periods is also only about 0.2 ma.

Construction. All of the parts, except for *SPKR 1*, are housed in a 7" x 5" x 3" utility box. Excess damping of the cone of this speaker would interfere with the operation of the multivibrator circuit and spoil the tone effect. The author, therefore, mounted *SPKR 1* on top of the box, using a specially made 3" x 5" plate (you may want to use a standard 1" x 3⅛" x 4" open-end aluminum chassis). In this way, the back of the speaker is left exposed, and a series of holes drilled in the plate give the front of the cone access to the air.

Mount *SPKR 2*, along with transistor *Q3* and battery *B2*, on the box cover. The penlight cells making up *B2* are held in a commercial battery holder; transistor *Q3* is screwed to a 1½" x 1¾"



Pictorial diagram shows construction and wiring. Multivibrator circuit is housed in utility box, amplifier in cover.

piece of perforated board which, in turn, is secured under one of *SPKR 2*'s mounting nuts. Drill a series of holes in the cover in front of *SPKR 2*.

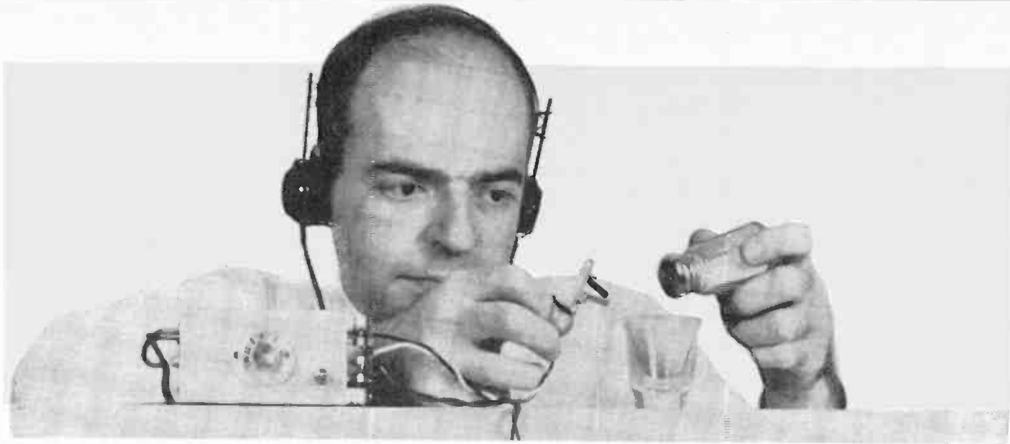
The rest of the components, which make up the multivibrator circuit itself, are located in the box proper. Battery *B1*, like *B2*, is held in a commercial holder. The sockets for transistors *Q1* and *Q2* are mounted on a 1⅝" x ⅞" piece of perforated board screwed down through a hole drilled in its center (use a $\frac{5}{16}$" spacer to keep the bottoms of the sockets from being forced up against the box). The author used the same screw to secure homemade clamps for the transistors and capacitor *C2*.

Bring the push-button leads and the wire to *SPKR 1* out through two holes drilled in the top of the box.

Final Steps. Since the response of the circuit will vary according to the transistors used for *Q1* and *Q2* and the type of speaker used for *SPKR 1*, the value of resistor *R1* must be selected by experiment.

Complete the wiring temporarily, substituting a 5000 - 20,000-ohm potentiometer for *R1*, and install the batteries. Then experiment with different settings of the temporary potentiometer and potentiometer *R2* until you hear one or more notes from the speaker when you press push-button switch *S1*. At the final adjustment of the temporary potentiometer, from one to six well-spaced tones (depending on the setting of *R2*) should be heard each time the switch button is pressed.

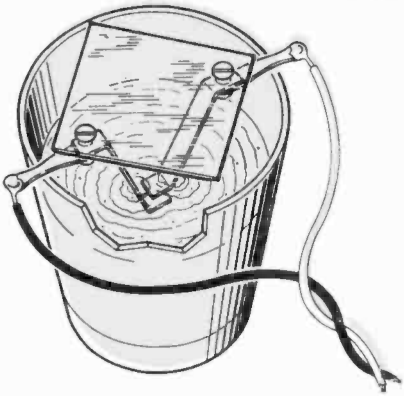
The temporary potentiometer is then disconnected and its resistance measured with an ohmmeter. Wire in a ½-watt resistor of the measured value (in the author's unit it turned out to be 1000 ohms) for *R1*, and your electronic "Do-Re-Mi" will be ready to use. —30—

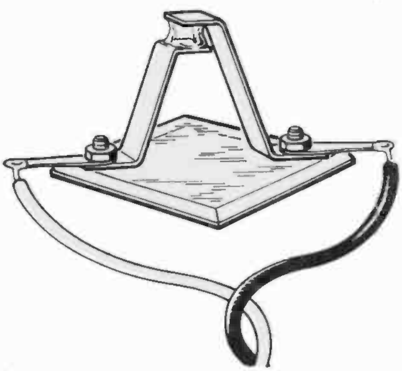


SALT WATER POWERS ONE-TRANSISTOR RADIO

Easy-to-build AM radio costs nothing to operate

By LEE MARTIN





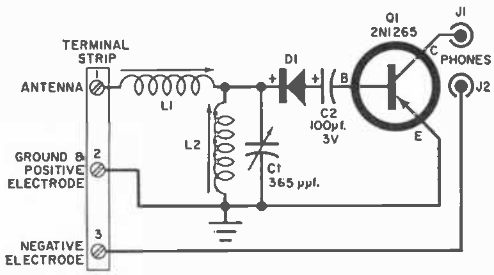
A copper-aluminum cell, using salt water as an electrolyte, supplies current for Q1. Electrodes are dipped in a glass of salt water (top drawing) or a drop of the liquid is placed between them (bottom).

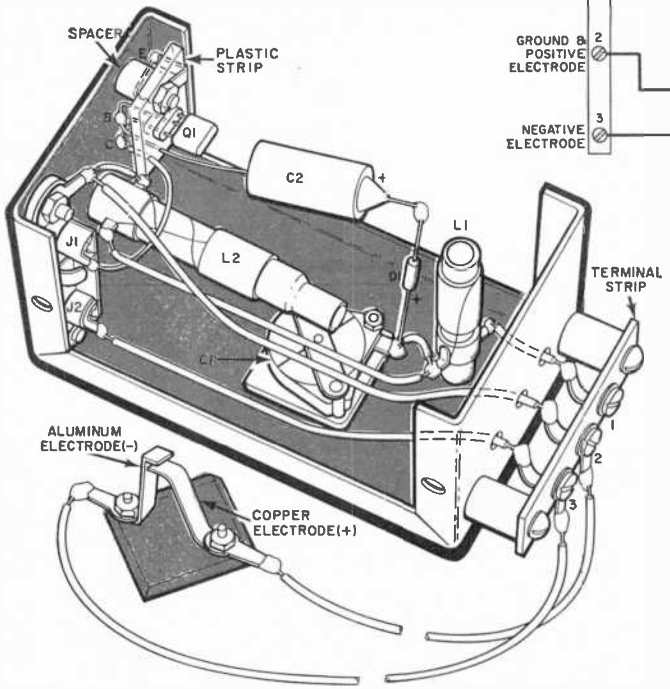
IF YOU LIKE to build small crystal radios, here's one with a new twist. Though this crystal set has a stage of transistor amplification, you'll never have to buy a battery for it. A drop of salt water placed between two metal electrodes supplies the power and, with occasional replenishment, will operate the radio as long as you want to listen to it.

The circuit, which uses two r.f. coils (*L1* and *L2*) for better selectivity, employs a simple crystal diode detector (*D1*). Coil *L2* is tuned by a miniature 365-$\mu\mu$f. variable capacitor (*C1*). Output of the detector is coupled to the base of transistor *Q1* through capacitor *C2*. This transistor serves as an audio amplifier and its output is coupled directly to a set of headphones through jacks *J1* and *J2*. Antenna, ground, and power connections are made through a three-lug terminal strip.

The operating current for transistor *Q1* comes from a copper-aluminum cell which uses salt water as an electrolyte. The copper electrode is positive, the aluminum electrode negative. Enough

Note simplicity of circuit in schematic at right. Coils L1 and L2 are mounted at right angles to each other to prevent coupling (see pictorial below).





PARTS LIST

C1—365-µµf. miniature variable capacitor (Lafayette MS-445 or equivalent)
C2—100-µf., 3-volt electrolytic capacitor (Cornell-Dubilier NLW 100-3 or equivalent)
D1—1N34A diode (or any other general-purpose unit)
J1, J2—Tip jack
L1, L2—Antenna loopstick (Superex VL or equivalent)
Q1—2N1265 transistor
1—4" x 2¼" x 2¼" aluminum utility box (Bud CU-3003A or equivalent)
Misc.—Scrap plastic, transistor socket, copper and aluminum strips, headset, terminal strip

current is supplied by the cell to drive *Q1* at almost its peak power.

Construction of the salt-water radio is quite simple. The parts are housed in a standard 4" x 2¼" x 2¼" aluminum utility box and mounted approximately as shown in the pictorial. Coils *L1* and *L2* are positioned at right angles to each other, preventing coupling between the two units. The author mounted both the terminal strip and the plastic strip supporting *Q1*'s socket on spacers to leave clearance for the lugs.

To put the cell together, you'll need a plastic base about 1" square and two 1⅜" x ⅜" electrodes (one copper, one aluminum). Just screw each electrode to a corner of the base and bend it as shown in the pictorial. When you're through, the gap between the electrodes should be about ⅛". Connections to the cell are made via solder lugs placed under the electrode nuts.

To operate the set, first connect the headphones, ground, cell electrodes, and a good antenna. A drop of salt water should now be placed in the gap between the two cell electrodes, making sure that both electrodes are in contact with the water. If the set is to be used for long periods of time, you might prefer to support the cell, upside down, on the lip of a glass of salt water, immersing the electrodes in the liquid.

Next, move coil *L2*'s slug almost all the way in and turn variable capacitor *C1* to the point where you hear a station. When this has been done, adjust the slug of coil *L1* for maximum volume. Returning to *L2*, adjust its slug so that a maximum number of stations are included in the tuning range of *C1*. The adjustment of both of these coils is relatively permanent; coil *L1*, however, should be retuned if you switch to a different antenna.

Other electrolytes besides salt water will operate the cell—the juice of a citrus fruit, for example, or even saliva. The radio, of course, may also be powered in the conventional way; just connect a single flashlight battery in place of the salt-water cell, being sure to observe the proper polarity. —30—

Transistor Topics

By LOU GARNER

OUR COLLEAGUE, Richard Flanagan, stirred up an enormous amount of interest with his article on "Transistors in Hi-Fi" (POPULAR ELECTRONICS, July, 1961, p. 65). A number of readers have asked for further information on transistorized hi-fi circuit designs, and several have written of their personal experiences with "home-brew" circuits. Inquiries have been divided about equally between dyed-in-the-wool audiophiles and transistor experimenters who consider audio circuits (whether hi-fi or not) as just another facet of their work.

Such interest is not too surprising when one compares the Model S-15 stereo amplifier (Fig. 1) that Dick mentioned in his article with vacuum-tube units having similar performance specifications. Manufactured by Transis-Tronics, Inc., 1601 Olympic Blvd., Santa Monica, Calif., the S-15 measures only 2″ x 10⅛″ x 8½″ overall and weighs less than 8 pounds. This is considerably smaller than even many tube-operated *preamps*, yet the instrument includes two complete amplifier channels—from preamps to power output stages—plus a power supply.

The S-15's small size and light weight are made possible in part by the use of transistors and in part by a circuit design which eliminates the need for bulky output transformers, a large power transformer, and heavy-duty filter chokes.

To review the circuit briefly, nine transistors are used in each channel, and both *npn* and *pnp* types are employed. Two transistors appear in the phonograph preamplifier, and a multi-position selector switch permits a choice of the preamp's output or any of several auxiliary inputs. From here, the selected signal is coupled through the volume- and tone-control networks to the first amplifier stage, a *pnp* transistor in the common-emitter arrangement. The output from this stage is capacitively-coupled to the "pre-driver" stage, which in turn is direct-coupled to the transformerless output section.

Five transistors are used in this section, including a driver stage, *Q5*, and four units, *Q6, Q7, Q8,* and *Q9,* wired as a modified complementary-symmetry, direct-coupled power amplifier. This type

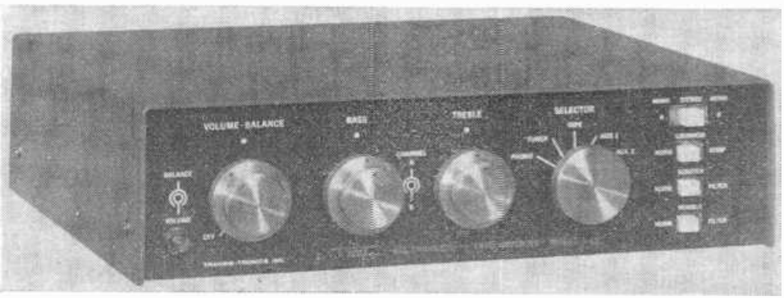


Fig. 1. All-transistor S-15 stereo amplifier manufactured by Transis-Tronics, Inc.

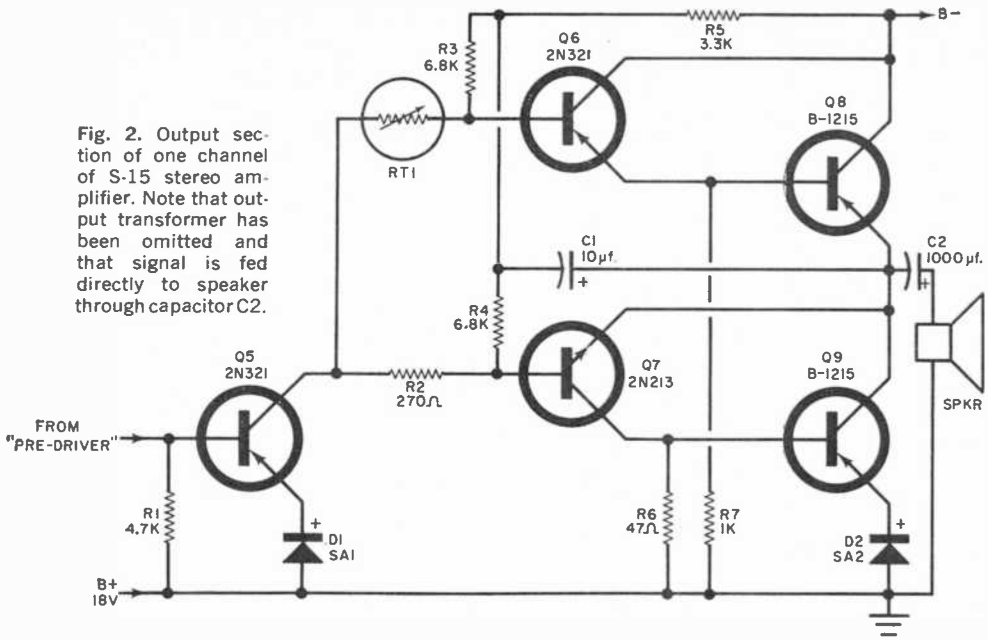


Fig. 2. Output section of one channel of S-15 stereo amplifier. Note that output transformer has been omitted and that signal is fed directly to speaker through capacitor C2.

of circuit differs from more familiar arrangements in that it has a single-ended input and single-ended push-pull output.

A simplified schematic diagram of the output section is given in Fig. 2. Although this circuit appears rather complex at first glance, its operation is relatively easy to follow. Let's assume that the fixed biases and transistor characteristics are such that *Q8*'s and *Q9*'s collector currents are normally equal. Suppose, now, that *Q5*'s instantaneous base bias is shifted in a *positive-going* direction by the amplified signal delivered by the pre-driver stage. Since *Q5* is a *pnp* type, a shift of base bias in a positive direction increases its effective emitter-to-collector impedance. This, in turn, shifts the base biases applied to *Q6* and *Q7* in a *negative-going* direction.

Transistors *Q6* and *Q7* are complementary types and hence react oppositely to a negative shift in base bias. Since *Q6* is a *pnp* unit, its emitter-to-collector impedance decreases, applying a greater negative bias to *Q8*, and causing a corresponding increase in *Q8*'s collector current. At the same time, *Q7*'s emitter-to-collector impedance increases, since it is an *npn* type. This reduces *Q9*'s negative bias and causes a corresponding drop in *Q9*'s collector current. A similar, but opposite, action takes place when a *negative-going* signal is applied to *Q5*'s base, with the result that *Q8*'s collector current decreases and *Q9*'s increases.

By this time, it should be evident that *Q8*'s collector current increases and then decreases on alternate half-cycles of the amplified audio signal. Transistor *Q9*'s collector current changes at the same time, but in the opposite direction. The instantaneous *difference* between the transistors' collector currents, appearing at their common connection point (*Q8*'s emitter and *Q9*'s collector), becomes the amplified output signal, and is coupled through d.c. blocking capacitor *C2* to the load, a speaker voice coil.

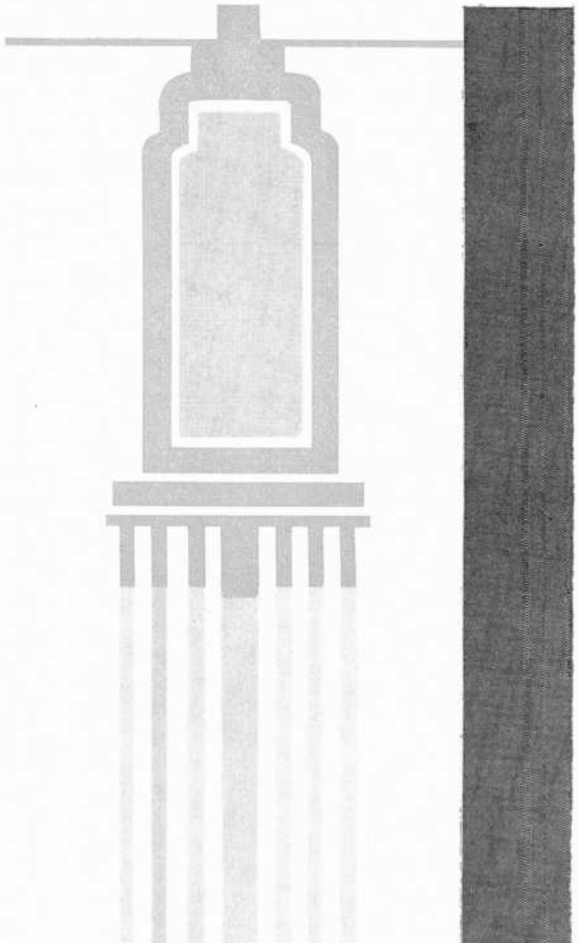
Since *Q8* and *Q9* are power transistors, and hence low-impedance devices, load impedance is not critical. Thus, there is no danger of breakdown if the amplifier is operated without a load, and reasonably good results can be obtained with 4-, 8-, or 16-ohm speakers, without a tapped output transformer.

Reader's Circuit. Experimental circuits needn't be complicated to be interesting. Reader David Schmidt (2231 Brushmore Circle N. W., North Canton 20, Ohio), a student at the Middlebranch Junior High School, proved this point by winning a "Superior Rating" award at a district science fair with an extremely simple transistorized instru-

(*Continued on page* 112)

ELECTRONIC

You don't need a gold-leaf electroscope to carry this simple vacuum-tube unit works just as well,



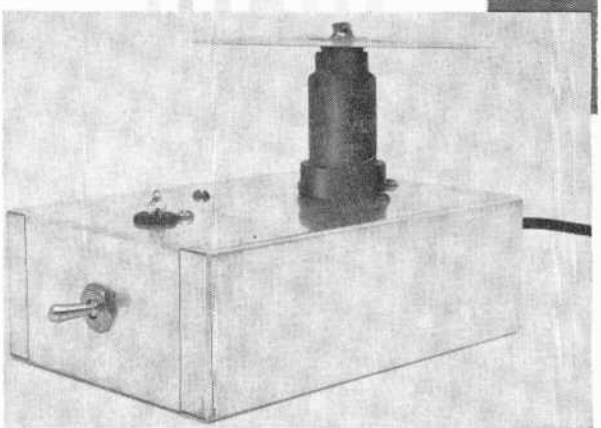
MOST DEMONSTRATIONS or experiments dealing with static electricity require an electroscope to indicate the presence of small amounts of positive or negative charge. In laboratories, gold-leaf electroscopes are commonly used, but these may be too delicate and costly for the average home experimenter. The electronic electroscope described here, however, is not only rugged and inexpensive (under $7.00), but is as sensitive as a gold-leaf electroscope. Needing only a few parts, it can be built in about an hour.

The electroscope fits easily on a standard 2" x 6" x 4" chassis. The detector disc, a 5"-diameter copper or steel plate with a $\frac{3}{8}$" hole drilled through its center, fits over the grid cap of a 6J7 tube (*V1*) and is soldered in place. Neon lamp *I1* is held in a $\frac{3}{8}$" rubber grommet mounted on the chassis.

The 6J7 is effectively connected as a triode and the neon lamp is placed in series with its plate lead. The tube's plate supply is unrectified a.c. taken from the high-voltage secondary of transformer *T1*, and the control grid is connected directly to the detector disc.

When the unit is turned on, a certain amount of plate current will flow and *I1* will light. If a positively charged object is brought near the disc, the grid of the tube becomes positive and the plate current increases—increasing the brightness of *I1*. Conversely, a negatively charged object will cause *I1* to dim or go out because it charges the grid negatively, reducing or cutting off the plate current.

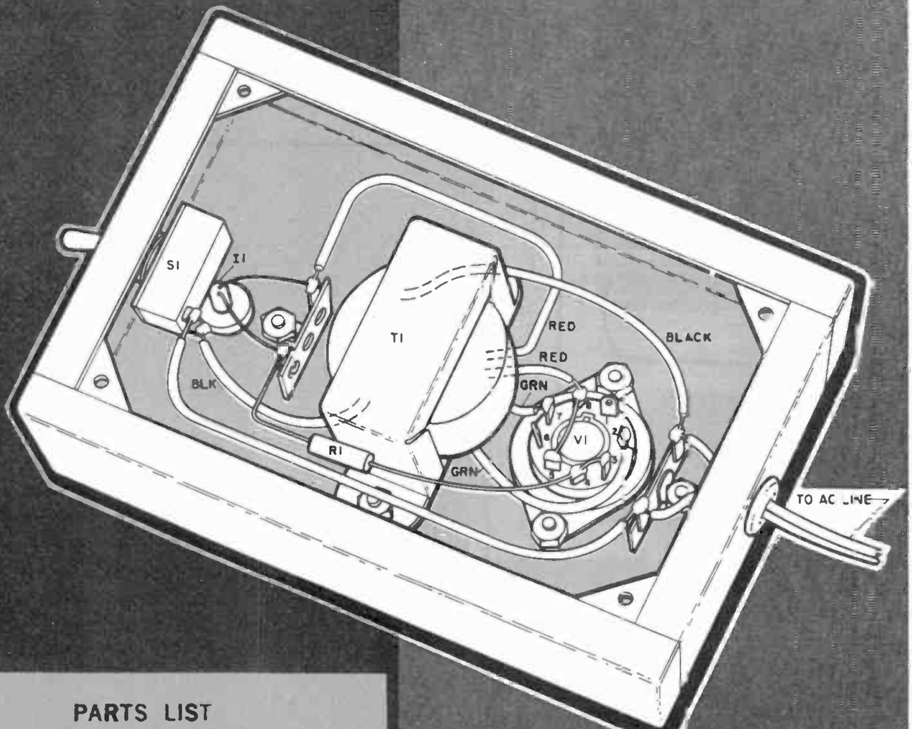
To try out the electroscope, use a glass rod which has been rubbed with silk to supply the positive charge. A piece of rubber which has been rubbed with wool or fur makes a good negatively charged object. You'll find that the electroscope will respond to the presence of a charge placed several feet from the pickup disc. -30-



ELECTROSCOPE

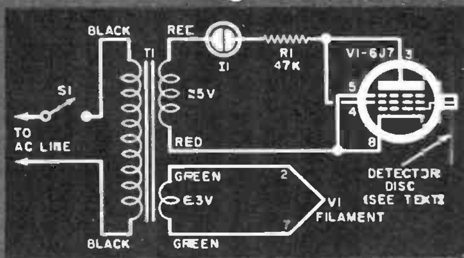
out those static electricity experiments or demonstrations; costs less than $7.00 to build.

By RONALD WILENSKY

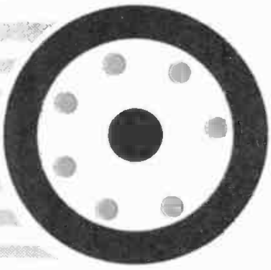


PARTS LIST

I1—NE-2 neon lamp
R1—47,000-ohm, 1-watt resistor
S1—S.p.s.t. toggle switch
T1—Power transformer; primary, 117 volts; secondaries, 125 volts @ 15 ma., 6.3 volts @ 0.6 amp. (Stancor PS-8415, Knight 61 G 410. or equivalent)
V1—6J7 tube
1—2" x 6" x 4" chassis (Bud AC-431 or equivalent)
Misc.—Copper or steel plate for detector disc, octal socket, grommets, terminal strips



Completed unit (left) uses few parts, yet detects the presence of a charge several feet away.



Hi-Fi Construction

STEREO TESTING MADE EASY

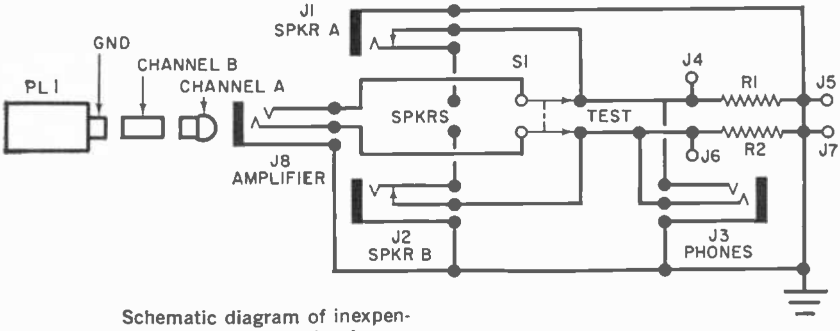
Switch from speakers to test equipment at will with this easy-to-build gadget

By MILTON OGUR

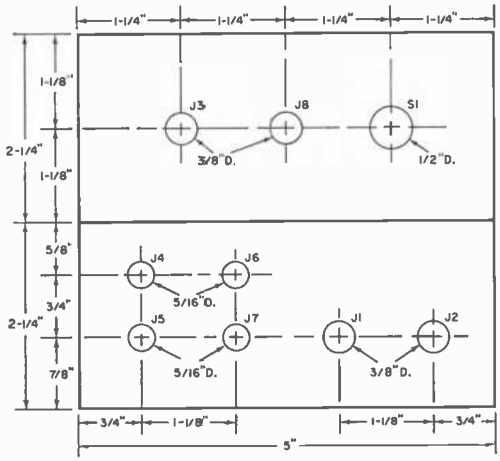
IF YOU'VE HESITATED to test that highly touted stereo system of yours because it meant too much wear and tear on cables, cabinetry, and nerves, this gadget is for you. It's easy to build (only a handful of components are needed), inexpensive (parts will cost you about $5.00), and can be used with monaural amplifiers, too. Furthermore, it's small enough to form a permanent and inconspicuous part of your hi-fi setup.

Comprised of a switch, various jacks, and two resistors, this device should make life easier whenever you want to run frequency response checks, measure distortion, or whatever. Its circuit is built around a single d.p.d.t. toggle switch (*S1*). In normal use, this switch feeds the audio voltage from the input jack, *J8*, to the speaker system, via a pair of 2-conductor, closed-circuit phone jacks (*J1* and *J2*). And for test purposes, it feeds these signals to a parallel combination of the following: banana test jacks *J4*/*J5* and *J6*/*J7* for oscilloscope or VTVM leads; and a 3-conductor open-circuit phone jack, *J3*, for monitoring with low-impedance headphones.

In case the plugs to the speakers are removed from *J1* and *J2*, the amplifiers are automatically terminated in load resistors *R1* and *R2*. For this reason, *R1* and *R2* should possess a power rating in excess of that for each amplifier channel and should roughly match the



Schematic diagram of inexpensive stereo test unit. As explained in text, output from stereo amplifier can be fed to speakers A and B, stereo headphones, or test jacks J4 to J7.

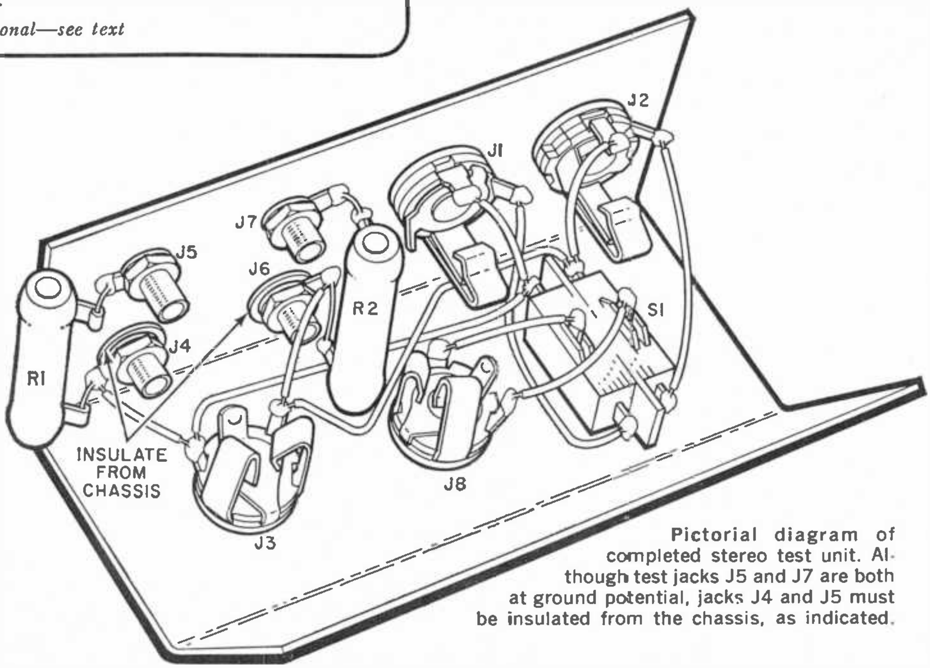


Template at right shows location of holes for jacks J1 to J7 and switch S1. Only two sides of utility box are used.

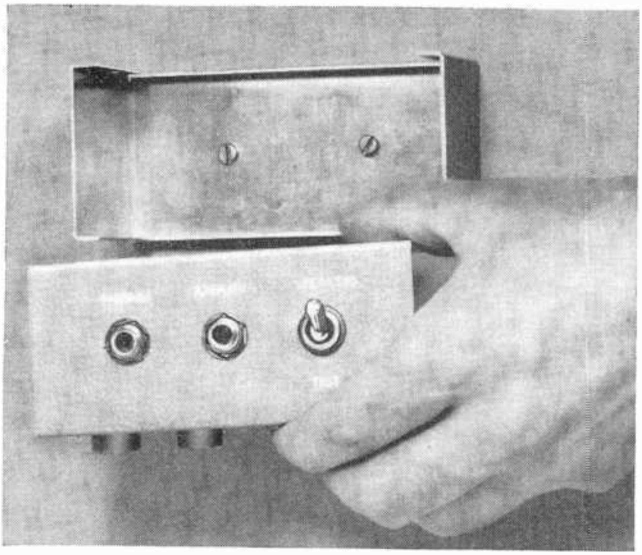
PARTS LIST

J1, J2—2-conductor, closed-circuit phone jack
*J3, *J8—3-conductor, open-circuit phone jack*
J4, J5, J6, J7—Banana jack (2 black, 2 red)
**PL1—3-conductor phone plug (to match J8)*
R1, R2—Wire-wound power resistors—see text
S1—D.p.d.t. toggle switch
1—5" x 2¼" x 2¼" aluminum utility box (Bud CU-2104A or equivalent)
Misc.—Hookup wire (2 colors, one for each channel), 3-wire cable, hardware, decals, solder, etc.

**Optional—see text*



Pictorial diagram of completed stereo test unit. Although test jacks J5 and J7 are both at ground potential, jacks J4 and J5 must be insulated from the chassis, as indicated.



Aluminum utility box with snap-on cover simplifies mounting of stereo test unit. With cover attached to equipment cabinet, the test unit can easily be removed. If "easy remove" feature is not needed, however, the unit can be mounted in an aluminum box and permanently attached to the hi-fi cabinet.

"nominal" impedance of the taps in use —e.g., 4, 8, or 16 ohms.

Construction is relatively simple, but be sure to use an aluminum utility box with a "snap-on" cover. Begin by laying out the components on the "open chassis" —only two adjacent rectangular sides were used for mounting in the author's model. If the suggested layout shown here is used, the following order of mounting is recommended: (1) *S1*, with leads attached; (2) *J4* and *J6* (both red), with lugs bent slightly in, away from the chassis; (3) *J5* and *J7* (both black), again with lugs bent slightly in; (4) *J3* and *J8*; (5) *J1* and *J2* (rotate until terminals are most accessible); and (6) *R1* and *R2*.

As indicated above, the leads to switch *S1* should be soldered in advance of mounting and made long enough—about 3"—to reach the banana jacks (*J4* - *J7*). For channel identification, use two colors of hookup wire. All jacks except *J4* and *J6* are grounded to the chassis; these two should be insulated with fiber shoulder washers.

No terminal strips will be needed, and *R1* can be soldered directly to the terminals of *J4* and *J5*, and *R2* to *J6* and *J7*. It may be necessary to loosen the jacks in order to rotate their lugs into positions where wiring will be easiest; in any case, *R1* and *R2* should be dressed to clear all adjacent parts and the chassis for coolest operation.

Jack *J8* is optional. Should you wish to use the unit to check someone else's stereo system, you'll find it helpful; but if the unit is to be anchored to one cabinet, *J8* can be omitted and a rubber grommet inserted in its place to protect the 3-wire cable connecting the unit to the output terminal strip (or strips) of the stereo amplifier. This cable should be long enough to enable the unit to be used outside the equipment cabinet if necessary.

If space is available within the equipment cabinet, drill two holes in the cover to accommodate wood screws, and mount it in the chosen space. With this done, the chassis can be snapped in place as needed.

For regular listening, leave switch *S1* in the *Speaker* position, or, if headphones are preferred, switch to the *Test* position. When distortion rears its ugly head, bring out the audio oscillator, oscilloscope, VTVM, or what have you; snap the test unit out of its cover; and place it in a convenient spot for testing. (This "open chassis" arrangement insures proper ventilation of *R1* and *R2* when full power is being pumped into them.)

With the switch in the *Test* position, plug the meter leads into test jacks *J4*/*J5* or *J6*/*J7*, as needed, and measure distortion or output level. If an oscilloscope is used, simply plug the cable from its "vertical" terminals into the test jacks. —30—

Short-Wave Report

By HANK BENNETT
W2PNA/WPE2FT

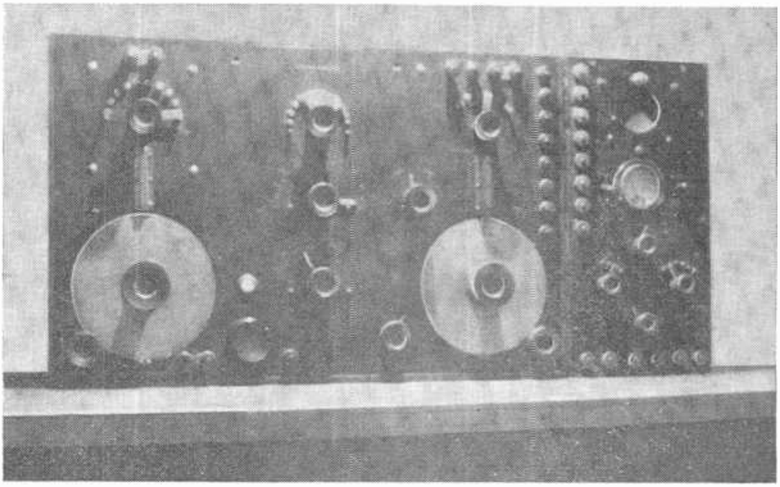
"THE GOOD OLD DAYS"

WHENEVER a group of DX'ers gets together for a rag-chew, banquet, convention, or just to compare notes, the subject of radio reception in years past will almost certainly arise. At such gatherings, the older DX'ers will make no small light of their accomplishments, and—in most instances—they will be justified in their claims of tuning skill and dexterity. The newcomer to DX'ing will look with awe at the records set by their older counterparts, and wonder if they will ever be able to match some of them.

The newcomers to the hobby may fail to realize that at the time those records were being set there were fewer stations on the air, lower powered transmitters, and virtually no jamming. In addition, perhaps propagation conditions were better at certain times than they are at present. On the other hand, receiving equipment in years past was not as highly refined as it is today. The oldsters may have tuned in stations with crystal sets, battery-operated receivers with the old standby tubes of yesteryear—the '01A series, or with homemade receivers of nondescript design. But they worked! And those boys pulled stations in with them, too!

We've been looking through a copy of the "World Wide Station List," edited by Elmer R. Fuller, which appeared in *Radio-Craft* in October, 1947. That was only 14 years ago, but we defy anyone to hear some of the stations which were listed then. For instance, how many of our readers can remember KGEX, San Francisco, 11,730 kc.; WOOW, New York, 11,810 kc.; XGOY, Chungking, China, 11,900 kc.; HEK4, Berne, 11,960 kc.; CSX, Lisbon, 11,990 kc.; WXFD, Adak, Alaska, 12,250 kc. (their schedule read 1800-0100 EST); JZK, Tokyo, 15,160 kc., or JTL3, Tokyo, 15,220 kc.?

In 1947, the Venezuelans around five



Old-time DX'ers used such receivers as this famous Navy Type SE-143 with audion detector box which was developed to replace crystal receivers during World War I days.

Emilio Fernandez, CO2PE1C, formerly of Cuba, now monitors with a National NC-60 receiver in Tampa, Florida. His record includes 25 countries heard.

megacycles had amateur-type calls such as YV5RP instead of the current four-letter calls. And among the stations that were being reported in those days were TAP, VLA7, HCJB, WLWO, CE1174, CXA1O, WWV, TGWA, and KCBR. Do these call-signs sound familiar?

Here's something else that may interest you. Mr. Fuller mentioned in his article that International Reply Coupons (". . . available for *nine* cents . . .") should be sent with reports to all foreign stations in lieu of postage stamps. But he strongly cautioned the readers that the coupon should be merely enclosed with the report, "*not pasted or cemented to it.*"

What ever happened to some of the radio clubs of the 30's and 40's—clubs bearing the names of "Grand National SWL Club," "The International DX'ers Alliance," and the "International Radio Monitors"? They were large clubs in their day.

We "young squirts" can well learn a lesson of sorts from the oldsters. Our equipment is among the finest that can be built, antenna systems are much more complex and directive now, stations are higher powered and much more easily heard. Yes, we admit the interference is there, too, in what would seem to be ever-increasing proportions. But oldsters often did it the hard way—we have it relatively easy. Ask any old-time DX'er about that, and we can almost guarantee that you will be in for another friendly session of . . . The Good Old Days!

(*Continued on page* 96)

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.)

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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 ....

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

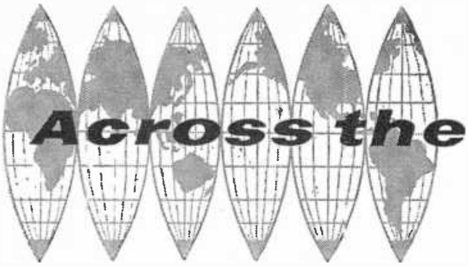
Receivers | Make .... | Model ....

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

Principal SW Bands Monitored .... | Number of QSL Cards Received ....

Type of Antenna Used ....

Signature | Date



Across the Ham Bands

By
HERB S. BRIER
W9EGQ

THE EICO 723 TRANSMITTER KIT

"WHAT a neat little transmitter," seems to be the first comment of most hams upon seeing the assembled EICO 723 transmitter kit. The comment is justified, because the 723 kit *is* a neat little package. Its brown panel—trimmed in beige—measures only 6" high and 8½" wide, and its one-piece cabinet is only 11¼" deep. But don't be fooled by the small size; the 723 is no lightweight either in avoirdupois or performance. It scales a solid 15 pounds and emits an equally solid signal.

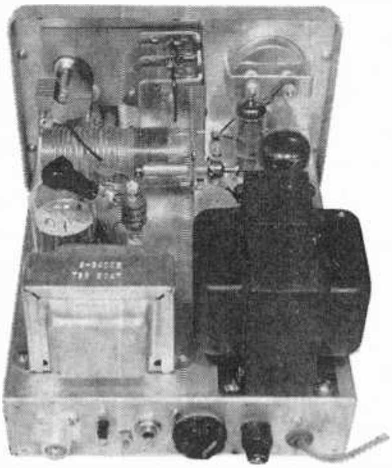
Circuit Features. Technically, the EICO 723 is a five-band (80 through 10 meters), crystal-controlled c.w. transmitter. A 6CL6 functions as the crystal oscillator and frequency multiplier to drive a 6DQ6B as a neutralized r.f. power amplifier. The transmitter output is coupled to the antenna system via a wide-range pi-network tank circuit. A husky power supply employing a GZ34 rectifier and a choke input power supply delivers 500 volts, d.c., to the plates of the r.f. tubes and powers their screens through a voltage-dividing network.

Dominating the front panel is the dual-range milliammeter for measuring amplifier plate and control grid currents. Panel controls include: antenna loading; plate tuning; function switch (off, standby, tune, transmit); meter switch, and band selector. Also on the front panel are a recessed crystal socket and a neon "on-off" indicator.

On the rear chassis lip, next to the coaxial antenna connector, is a slide switch for connecting an additional fixed capacitor across the loading capacitor to match very low-impedance antenna loads. Also at the rear are the key jack, line fuse, ground connection, and accessory socket. The latter permits plugging in an external modulator (such as the EICO 730), and delivers 117 volts, a.c., keyed by the function switch, to actuate an antenna-changeover relay.

Assembly. Completing the EICO 723 requires about 15 hours. As is true of practically all electronic kits I have ever seen, there are one or two connections that I would not care to solder blindfolded—those from the output coil to the

Operating controls are conveniently grouped on the EICO 723's neat front panel. Husky power supply dominates interior view (below), can be used to power extra equipment through the accessory socket at rear of the chassis.



bandswitch, for example. However, a small soldering iron (or gun) with a clean, well-tinned tip simplifies making such connections.

By following the clear, step-by-step instructions in the construction manual faithfully, you will have a minimum of trouble producing a finished unit which will work as well as any comparable, factory-assembled transmitter.

Testing and Operation. The 723 tunes normally on all bands. At its rated 60 watts input, its output compares very favorably with the output of the average "economy type" 75-watter. The one-piece cabinet provides excellent shielding for the transmitter, and both the key jack and the a.c. power line are adequately bypassed. This shielding and bypassing helps a great deal in areas where TVI might be a problem.

Eighty-meter crystals can be used for operation up to 20 meters, and 40-meter crystals are usable on all bands except 80 meters. The oscillator and amplifier tube cathodes are keyed simultaneously. Although a slight keying chirp is apparent on the higher frequency bands, only a purist would complain about it. For General Class work, the 723 can be driven by an external VFO.

Conclusions. On 80 meters, the amplifier plate-tuning capacitor could stand a bit more capacitance—and the coil a correspondingly lower inductance; a more favorable L/C ratio would suppress low-frequency harmonics falling outside of the ham bands. However, the 723 is no more deficient in this respect than many other low-powered transmitters.

I recommend the EICO 723 kit transmitter as an excellent buy in its power and price class ($49.95). Also available is a factory-constructed model (for $79.95). Prices mentioned include all components and tubes, but are less crystals, key, and antenna accessories.

IMPROVED SIGNAL BOOSTER

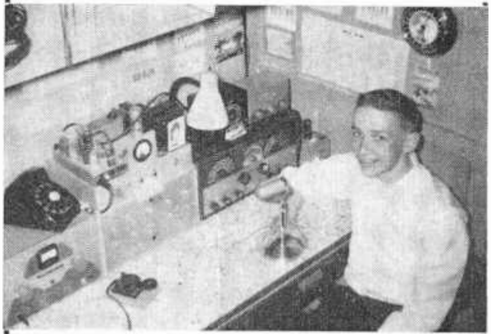
The tunable r.f. amplifier or "signal booster" shown on the next page makes a useful addition to an inexpensive short-wave receiver. Connected between the receiver and the antenna, it will increase signal strength several "S" units and greatly cut down response to "images." The signal-to-noise ratio of all but the most sensitive ham receivers will also be better.

This improved version of the popular 14- to 29-mc. signal booster described in the March, 1960, column, covers all frequencies between 3.5 and 30 mc. Built in a 2-piece, 6" x 5" x 4" aluminum box, it has its own self-contained power supply (which can also be used to power other auxiliary equipment, such as a Q-multiplier or crystal calibrator).

Construction. All components, except the input and output connectors, are mounted in the main section of the box (see photo). Be sure to position capacitor *C1* and switch *S1* so that the connection between them may be made without a lead. Make all necessary leads as short and direct as possible.

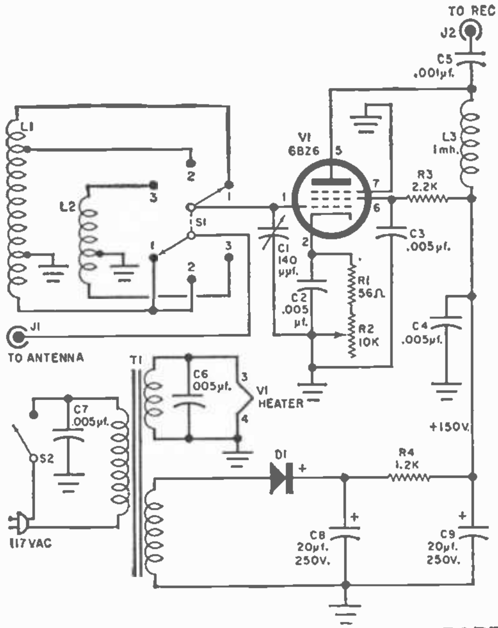
Coils *L1* and *L2* are cut from sections

Novice Station of the Month

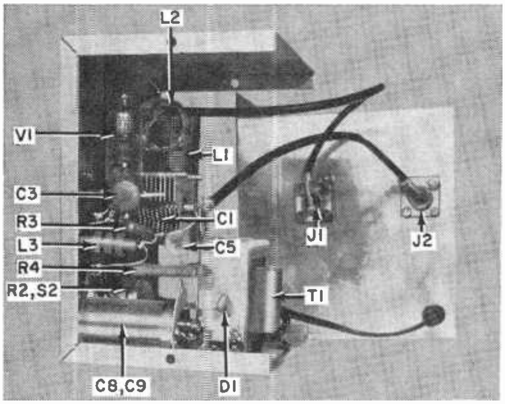


Congratulations to Ron Weerstru, KN8VUE, 2800 Pillon Rd., Twin Lake, Mich., who submitted the winning entry in the Novice photo contest this month. On 80, 40, and 15 meters, Ron transmits with a Heathkit DX-35 and receives on a Hallicrafters SX-99 sharpened up with a Heathkit Q-Multiplier. On 2 meters, he uses an LW-50 transmitter, and a converter ahead of the SX-99 takes care of the receiving. Note the station control panel located between the DX-35 and the SX-99. Ron's antennas are an 80-meter dipole and a 2-meter beam, his microphone an Electro-Voice DN-HZ. In only a short time on the air, he has made over 100 contacts.

Ron will receive a one-year free subscription to P.E. for his photo. If you'd like to try for a similar award, just 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. Maybe you'll be one of the lucky winners. All entries should be sent to Herb S. Brier, c/o POPULAR ELECTRONICS, P. O. Box 678, Gary, Indiana.



The signal booster shown here covers all frequencies between 3.5 and 30 mc. with the aid of two coils (L1 and L2) and bandswitch S1. Note the relative positions of most of the major components in the photo below.



PARTS LIST

C1—140-µµf., midget variable capacitor (Bud MC Midget Type 1876 or equivalent)
C2, C3, C4, C6, C7—0.005-µf., 600-volt ceramic capacitor
C5—0.001-µf., 600-volt, ceramic capacitor
C8, C9—Dual 20-µf., 250-volt electrolytic capacitor
D1—Silicon rectifier (International Rectifier 5E4 or equivalent)
J1, J2—Chassis-type coaxial receptacle
L1—47 turns of #20 wire, 1"-diameter, 3"-long, tapped 5⅞ and 22⅞ turns from one end (cut from B&W 3015 Miniductor coil stock or equivalent)
L2—9 turns of #20 wire, 1"-diameter, ⅝"-long, tapped 2⅞ turns from one end
L3—1-mh. r.f. choke (National R-50 or equiv.)
R1—56-ohm, ½-watt resistor
R2—10,000-ohm potentiometer
R3—2200-ohm, ½-watt resistor
R4—1200-ohm, 5-watt resistor
S1—2-pole, 3-position rotary switch
S2—S.p.s.t. switch (on R2)
T1—Power transformer; primary, 117 volts; secondaries, 125 volts @ 50 ma., 6.3 volts @ 2.0 amperes (Stancor PA-8421 or equivalent)
V1—6BZ6 tube
1—6" x 5" x 4" aluminum utility box (Bud CU-3007A or equivalent)
Misc.—Insulated tie points, tube socket, wire, RG-58/U or RG-59/U coaxial cable, power cord and plug, etc.

of B&W Miniductor coil stock (1"-diameter, 16 turns per inch). Use a complete 48-turn #3015 coil for *L1*, unwinding half a turn at each end for leads, and tap the coil at 5⅞ and 22⅞ turns from one end (the 5⅞-turn tap is the one to be grounded). For *L2*, cut off a 10-turn segment of the #3015 coil stock and again unwind half a turn at each end for leads; this coil should be tapped 2⅞ turns from one end.

Use RG-58/U or RG-59/U coaxial cable to make the connections to jacks *J1* and *J2*. The same cable should be used to hook up the output of the signal booster to the receiver.

Operation. Plug in and turn on the booster, switching *S1* to the desired band (position 1 for the 3.5 to 7.3 mc. band; position 2 for 7 to 14.35 mc.; position 3 for 14 to 30 mc.; see schematic). Adjust *C1* and the receiver antenna trimmer, if it has one, for maximum noise from the receiver loudspeaker. Then tune in a signal on the receiver and peak *C1* for maximum signal strength.

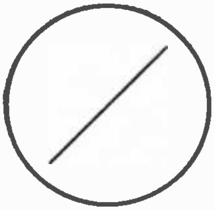
On the 14 to 30 mc. band, *R2* is usually turned full on. On the other bands, an intermediate setting will probably be called for, especially when signals are loud, to prevent receiver overloading. If the receiver or the signal booster breaks into oscillation, decrease the setting of *R2* until the oscillation ceases. Then repeak *C1* and advance *R2* to the desired point. Such oscillation is usually the result of having the receiver and the signal booster tuned to different frequencies.

(*Continued on page* 95)

OSCILLOSCOPE QUIZ

The oscilloscope lets you see what's going on inside a circuit by enabling you to check voltage, phase, frequency, distortion, and other characteristics visually. As you probably know, each of the common applications for this popular device results in a distinctive screen pattern. See if you can match the descriptions listed on the right below with the proper letters (A through J) representing the patterns on the oscilloscope screen.

By ROBERT P. BALIN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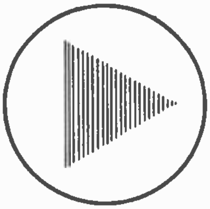
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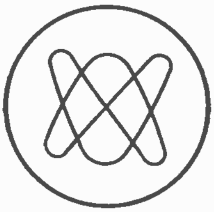
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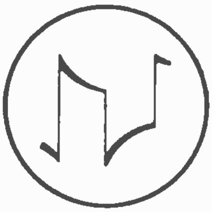
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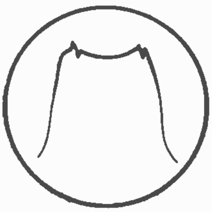
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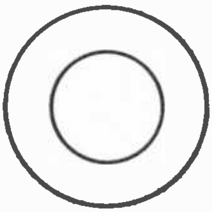

F

1 Intermodulation distortion ____

2 A 3:2 frequency ratio ____

3 Z-axis modulation ____

4 FM discriminator alignment ____

5 Loss of high frequencies ____

6 In-phase signals ____

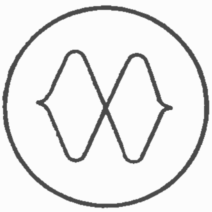
7 Television i.f. alignment ____

8 Transmitter modulation ____

9 Signals 90° out of phase ____

10 Loss of low frequencies ____

(*Answers appear on page* 114)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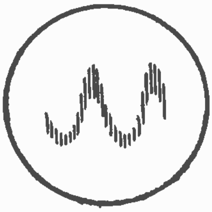
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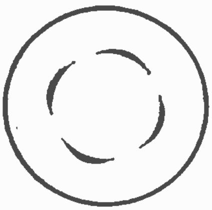
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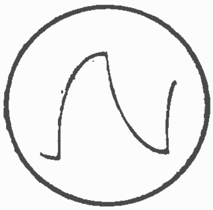
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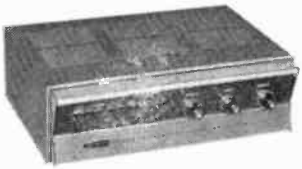

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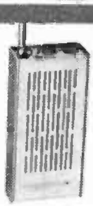

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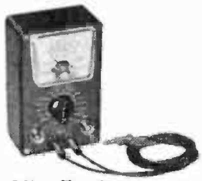

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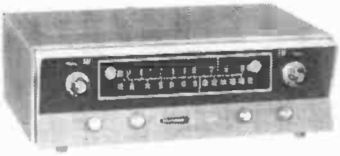

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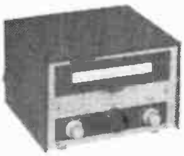

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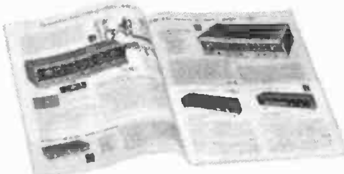

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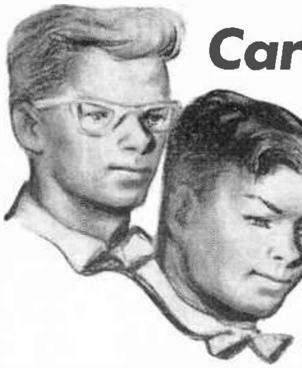

Carl and Jerry

By
JOHN T. FRYE
W9EGV

Blackmailing a Blonde

IT WAS a warm Friday evening in Indian summer, and the balmy air outside Residence Hall H-3 at Parvoo University carried the exciting scent of burning leaves; but Carl and Jerry were seated at their respective desks in their room, doggedly grinding away at conic sections.

"On your feet, frosh, and follow me!" a voice suddenly ordered. The boys turned around to see Pete Lacey, a junior from across the hall, standing in the open doorway. The boys had already learned one lesson well: it was best to humor upper classmen. So they got to their feet and followed Pete to his darkened room. Inside, Carl and Jerry could dimly make out at least half a dozen other fellows sitting around on the floor all staring glumly at a brightly lighted window across the street.

"A sophomore from your home town tells us you two are pretty clever at solving problems," Pete announced. "Well, we have one. See that dizzy blonde holding court in her room in the sorority house across the way? She's a thorn in the flesh of H-3. That's one of our trophies resting on her table, and this is the fourth time she has stolen it.

"The other three times H-3 has gone along with tradition and recovered the trophy by serenading the sorority, but this is becoming ridiculous. She doesn't know when to quit.

"All you two have to do is dream up a way for us to get our trophy back without having to sing for it and, at the same time, discourage that bird-brain from making any more raids."

"Is that all?" Carl muttered sarcastically. "You know an ed who is found skulking around co-ed grounds, no matter what his reason, is almost certain to be expelled . . ."

"What do you suppose those girls are talking about?" Jerry interrupted musingly, as he stared across at the third-floor window some fifty yards away. "Some of that conversation, if recorded, might make good blackmail material," he suggested.

"Yeah, it might at that! You have a fine criminal mind," Pete said respectfully. "But how can we do it? We can't put a mike into that room, and we certainly can't hear a word from here."

"I have an idea," Jerry said; "but it requires some special equipment. Carl and I are going home tomorrow, and we can pick up the stuff and bring it back with us Sunday afternoon. With luck, we may be able to do something Sunday night. Think you can wait?"

"We haven't much choice unless we want to knuckle under and do some more singing," Pete said. "I really don't expect much out of green freshmen, but we'll give it a try."

THE TWO BOYS didn't see much of each other Saturday night and Sunday morning, for each of them tried to spend as much time with his family as he could; but when Mr. Bishop drove them down to the bus station Sunday afternoon, Carl was carrying his tape recorder and Jerry was carrying a long, mysterious-looking object wrapped in canvas.

"What on earth is that thing, a folding movie screen?" Carl asked.

"Nope, it's E-V's very directional gun-type microphone I fast-talked the radio station manager into letting me borrow for a couple of days," Jerry explained. "I remembered our using it when I was helping him cover basketball games last winter. It was fine for picking up cheerleaders, announcements from the floor, and that sort of thing.

"This mike is very similar to the one you see used at President Kennedy's news conferences . . . it sits on a tripod to the left of the President, and the guy operating it aims it like a machine gun at the newsman who is asking a question.

(*Continued on page* 88)

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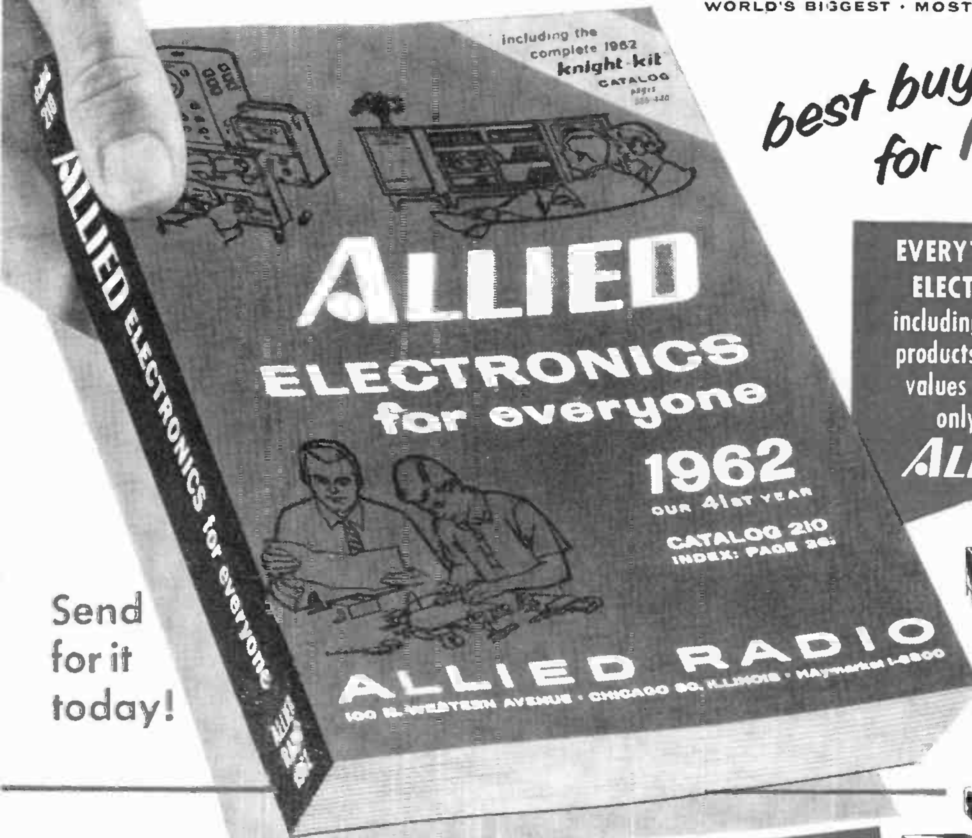

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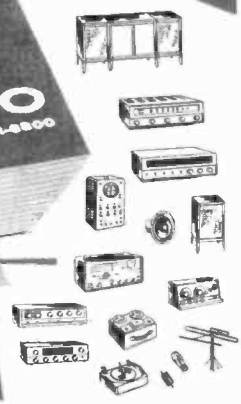

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Carl and Jerry

(*Continued from page* 83)

It picks up that man's voice almost as well as if he were using a hand mike, and it accepts very little else."

"I've always been interested in directional mikes," Carl said as the boys settled down for their hour-long bus ride, "but I'm pretty hazy on how they operate."

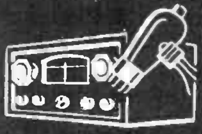
"You know how a parabolic reflector works with a mike—we've used the combination to record bird calls," Jerry pointed out. "Waves arriving from a sound source along the axis of the reflector are uniformly reflected from the curved surface so as to pass through the focal point of the parabolic dish. That means the dish will intercept a large amount of sound energy and concentrate it on a mike mounted at this point.

"On the other hand," he continued, "sound waves arriving from a point *not* on the axis are *not* uniformly reflected to the focal point. Only a small amount of the sound energy from such a point actuates the microphone. The result is a pickup device with a large amount of amplification for a sound source at which it is aimed, and sharp discrimination against sounds coming from a different direction. Generally speaking, the gain of a parabolic reflector is a function of its size, and that constitutes the main objection to it. For it to be efficient, especially at medium and low frequencies, it must be made big and unwieldy."

"How about the cardioid microphone? Why do they call it that? I thought 'cardioid' meant something to do with the heart."

"It gets its name from the shape of its directivity response curve plotted on a polar graph," Jerry replied. "The curve looks like a fat valentine heart with a very blunt point. The point represents sensitivity at the front of the mike; the notch, sensitivity to sound from the back. A good cardioid will display better than 15 db difference between front and back pickup; yet the sensitivity at the front is nearly uniform over a 120° angle. [See graph on p. 90.]

"There are several ways to construct a cardioid microphone," Jerry went on, "but a typical method uses a pressure-



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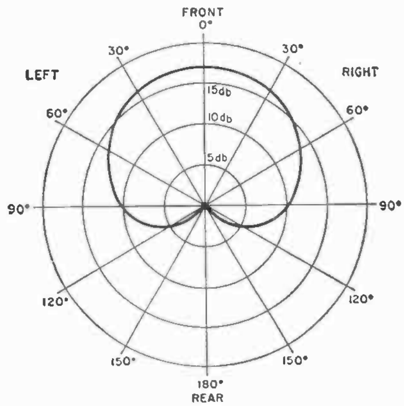
sensitive dynamic microphone and a velocity-type ribbon mike in the same housing. This housing is contoured so the compression half of a sound wave



coming from front, back, or sides exerts equal pressure on the exposed face of the dynamic mike diaphragm and pushes it *back*. In other words, the phase and amplitude of the dynamic mike is the same for sounds from any direction. Let's represent that output by unity, or 1.

"The velocity mike ribbon is mounted with its plane perpendicular to the front-back line. A sound wave from the front pushes this ribbon *back* and produces output of one phase; a wave from the rear pushes the ribbon *forward* and produces output of an opposite phase. Waves from either side slide right across the face of the ribbon without producing any output. The output amplitude and phase are thus determined by the angle at which the sound approaches the mike. This is represented mathematically by saying that the output of the ribbon mike is equal to cos ϕ, ϕ being the angle the sound direction makes with a line drawn straight ahead from the mike. The outputs of the two microphones are combined and represented by the expression $1 + \cos \phi$. Now let's see what happens.

"Sound from the front has an output of $1 + \cos 0°$ or $1 + 1$ or 2. The two mike outputs are maximum and in phase; so they add together. From either side the output is $1 + \cos 90°$ or $1 + 0$ or 1. Only the dynamic mike has output. Sound from the back produces $1 + \cos$

$180°$ or $1 + -1$ or 0. The two outputs are opposite in phase, buck each other, and produce a minimum output.

"As you can see," Jerry summed up, "the cardioid pattern is simply the expression $1 + \cos \phi$ drawn on polar graph paper. Incidentally, the same figure can be traced by a point on the circumference of a circle rolled around the outside of an equal circle."

"I seem to remember seeing a directional mike that looked like a bundle of small tubes," Carl offered.

"Yes, there is one like that. A mike can be made directional simply by placing it at the rear of a long cardboard tube. Sound coming straight down the tube encounters no resistance and produces maximum output. Sound arriving at an angle strikes the inside wall of the tube and bounces back and forth and produces much less effect. Such an arrangement, though, has selective resonant frequencies that produce a talking-into-a-barrel quality.

"But suppose you have several small-diameter tubes of different lengths arranged side by side like stair-steps and bound together with tapes. You start with the longest and roll the tubes into a bundle. The flush ends are fitted into a small chamber containing a microphone. When the open ends are pointed at a sound source, one of the tubes will be very close to the right length to resonate with any frequency picked up.

"Resonance, of course, increases the amplitude of the picked-up frequency tremendously. But since you have some tube of proper length to resonate with any frequency, all frequencies benefit from resonance amplification. Sound arriving at an angle is still diminished as it was in the single tube; so the multitube arrangement retains the directive quality of the single tube while avoiding the objectionable selective-resonance feature."

"How does *this* mike work?" Carl wanted to know.

"I'm not sure," Jerry admitted regretfully. "The station manager didn't know either, and he went so far as to put Duco cement on all the microphone screwheads before he let me have it. Somehow I feel he doesn't trust us! I suspect it's a sophisticated version of the multi-tube mike.

"It could, though, use some sort of labyrinth arrangement so that sound from the sides or rear reaches the mike by two paths. One of these paths could be a half wavelength longer than the other, so that phase reversal and consequent cancellation would take place. But sound from the desired direction would travel a single path and thus avoid cancellation."

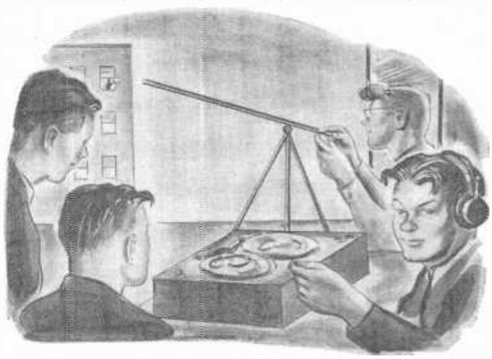
AT THIS POINT the bus arrived at their station. It was dark by the time the boys reached H-3, which was probably just as well, for the gun-mike made a curiosity-arousing bundle. Pete and the other boys were waiting for them, and they went straight to Pete's darkened room.

Carl removed Pete's window screen and cranked open a window so that the muzzle of the mike could be thrust outside. Jerry connected the mike pre-amplifier to the input of the tape recorder and slipped on earphones with which to monitor the recorder output.

These preparations were just completed when, as if on cue, a light came on in the room of Natalie, the blonde with the taking ways, and she trooped in with three of her friends. Fortunately it was still unseasonably warm, and Natalie immediately opened her windows wide.

As the girls chatted gaily, Jerry swung the mike back and forth in small arcs on its tripod. Then he stopped; and, as a wide grin spread over his round face, he reached over and started the tape recorder. The boys in the room scarcely breathed for the next four or five minutes while the recorder was running.

Suddenly Jerry stopped the tape and



started it in a whirring rewind. Next, the tape recorder was placed on the window sill with the speaker facing outside, the volume was cranked wide open, and the tape began to move past the playback head.

From the speaker came a loud peal of girlish laughter, and then a feminine voice asked, "Natalie, what did Mrs. Sorenson want with you in her office this morning?"

"Oh, the old biddy wanted to warn me that I had already exceeded my ten minutes of total tardiness time in meeting our women's weekday 11 p.m. curfew, and that I would be called to account at the next chapter meeting. She wanted me to beg a little, but I didn't give her any satisfaction. Instead, I just kept staring at the dark roots of her blonde hair. She thinks she's fooling everybody, but she's not. And she had the nerve to tell me that perhaps I was going too far in this trophy-stealing thing. The nerve of her!—"

By this time pandemonium was breaking out in the room across the street. Natalie first held her hands over her ears to shut out the booming parroted words; then she ran to her clothes closet, snatched out a white can-can slip, and waved it frantically in front of the open window in a sign of abject surrender.

When Jerry mercifully cut off the tape recorder, Natalie grabbed up the trophy and headed for the door with her friends behind her, and Pete and his buddies started for the stairs. As Carl and Jerry watched out the window, the two groups met under a street lamp down below, and the trophy changed hands. There was a little talk, and then Natalie made a sign of crossing her heart.

"Well," Jerry said as he started dismantling the gun-mike, "I guess that's that. I'll bet she lays off the trophies from now on, especially since we still have this tape. And maybe we've convinced Pete and his buddies that freshmen are not necessarily complete imbeciles. What are you grinning about?"

"Oh," Carl replied, "I was just thinking what I'm going to say the next time my Uncle Roy asks me his stock question: 'Carl, what are you learning in college?' I'll bet I really rock him back on his heels when I answer, 'How to blackmail a blonde!'" —30—

Across the Ham Bands

(*Continued from page* 77)

News and Views

David J. Leonard, KN9FZJ, 5304 E. Raymond St., Indianapolis, Ind., started out with a bang. In two weeks on the air, he worked over 100 stations in 25 states (12 confirmed) on 40 and 15 meters. His electron agitator is a Globe Chief De luxe, running 75 watts. His antenna is a 40-meter dipole, 20′ high, and he receives on a venerable Hallicrafters SX-16 receiver . . . **Howard Grams, K7JNX,** P. O. Box 463, Gillette, Wyoming, worked 44 states in three months operating portable while at school in South Dakota last spring. Starting over from home, he did even better during the summer on 40, 20, and 15 meters. Now, once again, he is back in South Dakota, studying and hamming. . . . **Robert Pollack, WV2QJZ,** 4608 15th Ave., Brooklyn 19, N. Y., has spread 85 contacts over 15 states in a month on 40 meters. A Lettine 240 transmitter and a Hallicrafters S-38E receiver share his 40-meter dipole antenna. Bob has a microphone and a VFO standing by for the arrival of his General ticket one of these days.

Bill Crowell, WA6LSF, 1835 Altura Drive, Concord, Calif., suggests that hams who want to take pictures of their equipment to send to our column try "bounce flash." With a "snapshot" camera, simply aim the flash gun at a pastel ceiling, instead of at the equipment, then shoot the picture in the normal manner. With more elaborate cameras, try F8 or F12 at 1/100 second. Remove any diffuser from the flash gun and use clear flash bulbs. . . . **Dennis Spranger, KN9AEG, K9AEG,** RFD 1, Eland, Wis., worked 25 states and Canada in 2½ months using an AMECO AC-1 15-watt transmitter and a Knight Span Master regenerative receiver. He now has a Heathkit DX-40 transmitter, a National NC-54 receiver, and a states-worked total of 32. His antenna is a 40-meter dipole, 45′ high. Dennis is waiting for his Conditional Class license. . . . **Dennis Kohler, K5QPG,** 5317 Stanley Ave., Fort Worth 15, Texas, has been on the air for three years. His Heathkit DX-40 and VFO, Hornet triband beam, and National NC-188 receiver have earned him WAS and WAC certificates. In the process, he worked 57 countries, acquired a 25-wpm code certificate and a Rag-Chewers Club membership. K5QPG works lots of Novices and is always ready to nominate new members to the RCC. . . . **Chris Nelson, KN9CCW,** 925 Ridgewood, Rockford, Ill., influences the ionosphere with an EICO 723 transmitter feeding a 40-meter dipole on 40 and 15 meters. His "hearing aid" is a National NC-99. Thirty-three states, including Alaska, plus Puerto Rico, form his "brag" list.

Gary Cazier, KN4VGK, 11 Oak St., Eglin AFB #9, Fla., worked 30 states and Canada, all confirmed, as a Novice using a Globe Chief 90, a 40-meter dipole, and a National 120 receiver. By the time you read this, Gary and his new Conditional license will be on their way to Greece with his Dad, who is in the Air

Force. When he gets on the air from there, he will be glad to arrange skeds. . . . Not being too proficient in reading Persian script, we got the name of **S. Javad Mesbahi,** P. O. Box 153, Shiraz, Iran, a little mixed up in the April column. So if your letter to Javad came back undelivered, try the address above. . . . **Isaac "Ike" Kisilevich, PJ2CR,** P. O. Box 533, Curacao, Netherlands Antilles, has been on the air for three months, working 40-, 20-, 15-, and 10-meter phone. He uses a Globe Chief transmitter screen-modulated with a Globe SM-90A and receives on a Hallicrafters S-76. His antennas are a 40-meter dipole and a 1-element "rotary beam" which works on 15 and 10 meters. Ike has already worked 25 countries—all confirmed—and 15 states. His aim is WAS; so keep listening for him. He QSL's 100%. Incidentally, Ike uses the r.f. voltmeter described in our April, 1961, column to help get maximum power into his antenna. He also uses the crystal selector switch described in the July, 1960, column.

Paul Obert, K8URZ/KN8URZ, 38185 Aurora Rd., Solon 39, Ohio, has worked 46 states in 10 months on the air. His Knight T-50 transmitter feeds a Windom antenna, and he receives on a Hammarlund HQ-129X helped along by a home-built preselector. A 20-wpm code proficiency certificate hangs on Paul's shack wall. . . . School work prevents **Ted O'Neil, KN7PMA,** Rte. 2, Box 406, Eugene, Oregon, from putting his DX-40 transmitter on the air as often as he would like. However, Ted has a very unusual receiving setup. He has two Philmore CR-5AC 5-tube receivers hooked up as a single, high-gain 10-tuber! And right in the middle is a Q-multiplier.

That uses up our space for this month. Remember, if the picture of your Novice station is selected as the Novice station of the month, you will receive a one-year new or renewal subscription to POPULAR ELECTRONICS. We will also publish as many additional ham pictures as space permits, and your "News and Views" are always welcome. Address mail to: Herbert S. Brier, W9EGQ, POPULAR ELECTRONICS, P. O. Box 678, Gary, Indiana. 73,

Herb, W9EGQ

Short-Wave Report

(Continued from page 74)

The following is a resume of current reports. At time of compilation all reports are as accurate as possible, but stations may change schedule and/or frequency with little or no advance notice. All times shown are Eastern Standard; the 24-hour system is used. Please send all reports to P. O. Box 254, Haddonfield, N. J., in time to reach your Short-Wave Editor by the eighth of each month.

Afghanistan—*R. Kabul,* 15,222 kc., was heard broadcasting to Europe in Arabic to 1330 and in French to 1400 s/off with Mid-East music. A French newscast was given at 1337. No English has been noted. *(WPE1BM, WPE8MS)*

Andorra—*R. Andorra* has moved from 6195 kc. to just a few kilocycles higher and reportedly has increased power. Noted in French at 1610, it closes at 1700 after a final ID in Spanish. *(WPE3NF, WPE5AVL)*

Austria—Vienna, 15,255 kc., was noted at 2100-0000 with continuous music and a multi-language ID every 45 minutes. A late report indicates a possible change to 15,240 kc. Other broadcasts are scheduled on 9610 kc. at 0100-0400; 11,825 kc. at 1700-2000; and 7200 kc. at 0200-0400, 0700-0830, and 0930-1030. *(WPE1BM, WPE5AG, WPE6CJ, WPE8AD, WPE8FV, ZS-PE1E)*

Australia—VLE9, Melbourne, has replaced 9580 kc. with 9565 kc., and is heard from 0500 s/on in Eng. to S. and S.E. Asia *(WPE2ACO)*

Belgium—Brussels is scheduled (until October 3) in Eng. at 1900-2000 (Mondays and Fridays at 1945-2000) on 9705 and 11,850 kc. (to Africa) and on 11,805 kc. (to N.A.), and at 1515-1550 daily on 15,435, 15,335, and 17,840 kc. (all to Africa). *(WPE2ACO, WPE5AZL, WPE6CJD, WPE8CBM, WPE8CNH, WPE8CSI, WPE8MS, WPE9CEX, WPE9CXW)*

Bulgaria—*R. Sofia* broadcasts on 9700 kc. at 2000-2030 and 2300-2330 in Eng. to N.A. In addition, there is a daily concert at 1835-1900 and a DX program on the first Friday of each month. *(WPE1CRZ, WPE2FBB, WPE2FFR,*

QSL CARDS FOR YOU?

Your Short-Wave Editor is holding QSL cards addressed to the following WPE call-signs. Check the list to see if your call is on it. If it is, write and ask for your card(s). If your call does NOT appear below, please do *not* write us for cards. Another list will appear in the near future.

WPE2APU	WPE6AEP
WPE2BJV	WPE6AXT
WPE2BPQ	WPE6BJD
WPE2CFP	WPE6BKU
WPE2CQP	WPE7WT
WPE2DKU	WPE8APB
WPE2DOO	WPE8CGC
WPE2ELH	WPE9AA
WPE2LP	WPE9AOC
WPE3AGE	WPE9ASN
WPE3BRF	WPE9BPT
WPE3HB	WPE9BRB
WPE4AFA	WPE9JN
WPE4ATZ	WPE9NY
WPE4BV	WPE9OL
WPE4BYG	WPE9PU
WPE4CBN	WPE9QN
WPE4KV	WPE9TU
WPE4RX	WPE9TV
WPE5AQW	WPEØARS
WPE5AWK	WPEØAXZ
WPE5AWX	WPEØBCT
WPE5DO	WPEØGT
WPE5FW	VE2PE3T

Send your request, together with return postage, to Box 254, Haddonfield, N. J., and be sure to give your call-sign as well as your name and address.

WPE3BIK, WPE3CHJ, WPE4CVJ, WPE4CYB, WPE5AYD, WPE5AZL, WPE8DAV)

Canada—A rarely heard station is CFVP, *Voice of the Prairies,* Calgary, Alberta, 6030 kc. It was noted at 0105 with news and to 0135 with pop music and commercials. The power is 100 watts. *(WPEØVB)*

Central African Republic—Bangui was tuned on 5034 kc. from 1645 with pop and native tunes and announcements in French. S/off is at 1700 (Saturdays only). The 7220-kc. channel was noted at 0048-0107 with news, ID, time checks, and music, all-French. *(WPE3NF, PY2PE1C)*

Colombia—A new station is *R. Santa Fe,* Bogota, 4965 kc. It appears to be an "all-nighter," with programs consisting mostly of Mexican and Argentine music. Their medium-wave outlet on 1070 kc. is also noted in California when KNX is off the air. Reports go to Apartado Aereo 9339, Bogota. *(WPE4DIV, WPE6BPN)*

R. Televisora Nacional, Bogota, is strong on 3288 kc., and is dual to 5012 kc. An interesting period is from 2240 with WRUL world news, from 2250 with a Moscow relay, from 2255 with a Paris relay, and from 2258 with a relay from the British Broadcasting Corporation, all in Spanish. *(PY2PE1C)*

Congo—*Studio Leopoldville,* 4879 kc., was noted at 1640 with native music, a gong, and French ID, and was heard until s/off at 1800. Is this a Saturday-only broadcast or do they have a new schedule? *(WPE3NF)*

Costa Rica—TIFC, *Faro del Caribe,* San Jose, is now on 6031 kc., having replaced 6037 kc. Their schedule reads 2200-0000 s/off for Eng., dual to 9645 kc. The medium-wave outlet on 995 kc. can also be noted at times. Reports go to Apartado 2710, San Jose. *(WPE6BMI, WPE8CUS)*

Ecuador—*La Voz del Volante* has moved from 6140 to 6100 kc. and is heard well from 2130 to 2300 s/off. The *R. Sweden* DX program listed the power as 15 kw., although station announcements give it as 5 kw. *(WPE1BM, WPE6BPN)*

Finland—Helsinki's latest schedule reads as follows: to N.A. in Eng. at 1100-1130 on Mondays and Fridays on OIX4, 15,190 kc., OIX2, 9555 kc., and at 1600-1630 on Fridays on OIX7, 6120 kc. (transmissions on 11,805 kc. have been deleted until further notice); to N.A. in Swedish and Finnish at 1100-1330 on Sundays, Wednesdays, and Thursdays, at 1530-1800 on Saturdays, at 1600-1800 on Mondays, at 1530-1730 on Tuesdays, and at 1600-1745 on Fridays on 15,190 and 9555 kc. If you report correctly on the 1100-1130 xmsn in Eng., you will receive a QSL from the Finland DX Club as well as from the station. Reports go to: *Oy Yleisradio Ab,* Helsinki. *(WPE4CON, WPE8CUS)*

Ghana—Accra is now using 15,287 kc. from 1450 to past 1600 with Eng. and French news at 1500 and home news at 1600. In addition, they have been testing on 17,865 kc. from before 0942 to past 1315, with Eng. news at 1300. *(WPE1BM, WPE2CRX, WPE2DLT, WPE3CEF, WPE4BC)*

Greece—*R. Athens, The Voice of Greece,* Athens, is heard on 15,345 kc. to N.W. Europe

in French and Eng. at 1220-1240 and in Greek at 1400-1500, and to the Mediterranean Sea areas in Greek at 1700-1730 and 1800-1830. The latest address for reports is: Hellenic National Broadcasting Institute, Technical Services Directorate, 16 Mourouzi St., Athens, Greece. *(WPE8MS)*

Guatemala—*R. Nuevo Mundo,* TGJA, Guatemala City, 5990 kc., is heard fairly well at 2000 although it can be tuned earlier. Programs consist of music and talks, mostly in Spanish. Reports go to *R. Nuevo Mundo,* 6a Avenida 10-45, Zona 1, Guatemala City. *(VE3PE1DZ)*

SHORT-WAVE ABBREVIATIONS

anmt—Announcement	L.A.—Latin America
BBC—British B/C Corp.	N.A.—North America
B/C—Broadcasting	R.—Radio
Eng.—English	s/off—Sign-off
ID—Identification	s/on—Sign-on
kc.—Kilocycles	xmsn—Transmission
kw.—Kilowatts	xmtr—Transmitter

India—*All India Radio,* Delhi, is noted on 15,150 kc. at 1530-1545 with native music and Eng. anmts. in a beam to West Africa. The 9530-kc. outlet can be tuned in Hindi at 1815-1915 and in Tamil to 2015 broadcast to S.E. Asia. An Eng. ID is given at 15 minutes past each hour. *(WPE2ACO, WPE5BFU)*

Indonesia—YDU6, Denpassar, has been noted down on 7113 kc. (from 7118 kc.) at 0630 with Indonesian news. A Djakarta outlet has been found on 11,712 kc. at 1200-1300 broadcasting in French to the Mid-East, Africa, and Europe. News is given at 1220. Jamming is severe. *(WPE3NF, WPEØAE)*

Israel—According to TelAviv's schedule, there are no xmsns on 11,920 kc., only on 9009 kc. The schedule reads: 1445-1515 in French; 1515-1545 in Eng.; 1600-1630 in French (not Arabic as previously reported); and 1630-1700 in Eng. (to W. Africa). However, your Short-Wave Editor is presently in receipt of a report which definitely shows 11,920 kc. as being in use. *(WPE2DTO, WPE2FHU)*

Katanga—Elisabethville has been noted on a new outlet of 7153 kc. in native language and French at 2315-2330. The 5978-kc. channel has moved to 5953 kc. and was tuned at 2335-0030 with native vocals. The 25-meter xmtr has moved again, this time to 11,885 kc. where it is heard from 2324 with native music. *(WPE1BM, WPE2ACO, WPE3NF, WPE6BPN)*

Kenya—Nairobi is heard on 4885 kc. at 2242 with music and English. The Asian National Service outlet on 4860 kc. (a move from 4855 kc.) has Eastern music at 2250 and an ID with four chimes at 2254. *(WPE3NF, WPEØVB)*

Malaya—The BBC Far Eastern Station relays the General Overseas Service as follows: to Australia at 0800-0815 on 9690 kc.; to N. & E. China, Hong Kong, Korea, and Japan at 0410-0430 on 15,435 kc. (to 0600 on 11,955 kc. and to 0630 on 17,755 kc.) and 0630-0845 on 15,435 kc.; to Burma and Thailand at 0800-0815 and 0900-0915 on 9725 kc., at 0800-0815 and 0900-1150 on 11,955 kc., at 0800-0845 and

0900-1150 on 9690 kc.; to Indonesia at 0600-0615 on 7110 and 9725 kc. (to 0630 on 11,820 kc.), and at 0410-0530 on 7110 and 11,820 kc. (from 0445 on 9725 kc.), the latter three channels running until 0515 on Saturdays, Sundays, and Tuesdays; to Southern China, Vietnam, Laos, and Cambodia at 0410-0430 and 0630-0845 on 15,435 kc., at 0410-0600, 0800-0815, and 0900-1150 on 11,955 kc., at 0410-0630, 0800-0845, and 0900-1150 on 9690 kc., at 0410-0630 on 17,755 kc., and at 0800-0815 and 0900-0915 on 9725 kc.; to India, Pakistan, and Ceylon at 0800-0845 and 1100-1150 on 11,820 kc. and at 0900-1150 on 9690 kc. Note the following addresses: Head Office—Caldecott Hill Studios, P. O. Box 434, Singapore 11, Singapore; Transmitter Site—P. O. Box 716, Johore Bahru, Malaya. It therefore may be concluded that when listeners hear the BBCFES they hear broadcasts from the country of Malaya and *not* from Singapore. *(WPE8MS)*

Monaco—*Trans World Radio,* Monte Carlo, operates in Eng. at 0130 and 1400 on 7185 kc.; in French at 0645, in Italian at 0715, in German at 1035 and 1140, and in Dutch at 1545, all on 7115 kc.; in Portuguese at 0735 on 11,955 kc.; in Spanish at 0800 on 9705 kc. and at 1615 on 7195 kc.; in Russian at 1105 on 11,710 kc.; in Norwegian at 1230 and in Swedish at 1300 on 7120 kc.; in Hebrew at 1330 on 11,815 kc.; and in German at 1515 on 7185 kc. Other languages to be added: Arabic, Armenian, Hungarian, Latvian, Polish, and Rumanian. *(WPE2DTO, WPE3BIK, WPE8MS)*

Pakistan—Karachi, 11,672 kc., has been noted with a new Arabic session at 1230-1330. English to Turkey is now heard at 1345-1430, Eng. to Europe at 1445-1530. *(WPE1BCA, WPE2ACO, WPEØVB)*

Poland—Warsaw broadcasts in Eng. to Europe at 1330-1400 on 9540 kc., at 1430-1500 on 11,865 and 7125 kc., at 1530-1600 on 11,970 and 9675 kc., and at 1630-1700 on 11,865 and 9540 kc.; to Africa at 0700-0730 and 0800-0830 on 7125, 11,800 and 17,800 kc., and at 1700-1730 on 9540, 11,815, and 15,120 kc.; to Australia and New Zealand at 0230-0300 and 0330-0400 on 11,800, 15,275, and 17,800 kc. *(WPE2CUF, WPE3BCM)*

Rhodesia—Lusaka (African Program), 3975 kc., was noted from 2315 with native vocals. Not heard lately on 4828 kc., this channel may have been dropped. The new xmtr at Gwelo (South Regional Program) was logged from 2300 on 3306 kc. with native and pop music; some Eng. was mixed in with the vernaculars. *(WPE3NF)*

Sweden—*Sveriges Radio,* Stockholm, operates in Eng. as follows: at 2215-2245 to Western N.A. and 2045-2115 to Eastern N.A. on 11,805 kc.; at 0900-0930 to Eastern N.A. on 17,840 kc.; at 1245-1315 and 1445-1515 to Africa on 11,705 kc.; at 1800-1830 to Europe on 7210 kc.; at 1115-1145 to the Middle East on 11,705 and 15,240 kc.; at 0945-1515 to S. Asia and at 0730-0800 to the Far East on 17,845 kc. The National Program can be noted at 0000-0400 and 1200-1700 on 6065 kc. and at 0400-0715 on

(*Continued on page* 106)

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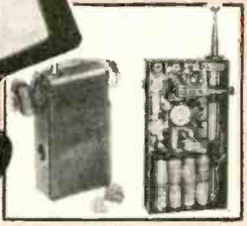

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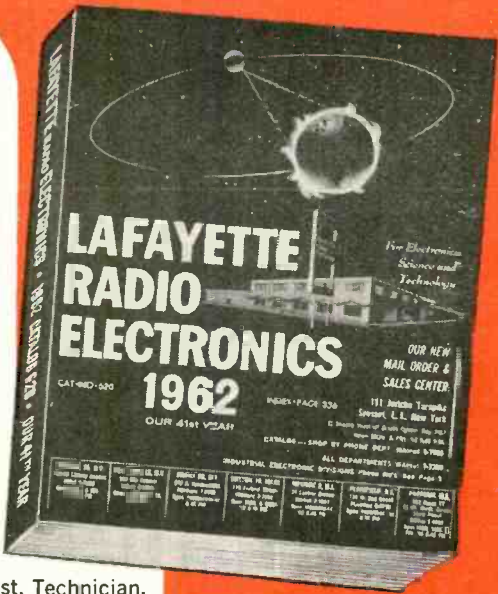

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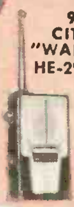

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United States—*KQ2XAU,* Crosly B/C Corp., 6080 kc., has been noted with open carrier at 0140; ID was given in Morse by cutting the carrier. *(WPEØJJ)*

Venezuela—*R. Barquisimeto,* Apartado 576, Barquisimeto, 4990 kc., is heard with L.A. music and frequent announcements around 2145. They operate daily at 0700-2230 on 4990 kc. and at 0530-2230 on 9510 kc., with 15-kw. units. *(WPE5BMT)*

SHORT-WAVE CONTRIBUTORS

John Rushton *(WPE1ARV),* U.S. Air Force, England
Bill Bonadies *(WPE1BCA),* Wethersfield, Conn.
Jerry Berg *(WPE1BM),* W. Hartford, Conn.
Edgar Scott *(WPE1CPS),* Brewer, Maine
James Stacey *(WPE1CRZ),* Fitchburg, Mass.
Paul Buer *(WPE2ACO),* Harrison, N. Y.
Joseph Russo *(WPE2CRX),* Toms River, N. J.
Paul Plache *(WPE2CUF),* N. Tonawanda, N. Y.
Bart Lee *(WPE2DLT),* Bergenfield, N. J.
Ronnie Breiger *(WPE2DTO),* Englewood, N. J.
Richard Daub *(WPE2FBB),* Bayside, N. Y.
Alfred W. Gilmore *(WPE2FFR),* Lyndhurst, N. J.
David Listort *(WPE2FGX),* Elmont, N. Y.
Henry Marbach *(WPE2FHU),* White Plains, N. Y.
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Jim McDonald *(WPE4CYB),* Cocoa, Fla.
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William Bing *(WPE5AG),* New Orleans, La.
Paul Moratto *(WPE5AVL),* League City, Texas
Dwayne Cessac *(WPE5AYD),* Nederland, Texas
Robert Gray *(WPE5AZL),* Texas City, Texas
Ray Bacon *(WPE5BFU),* U. S. Air Force, England
Lee Prall *(WPE5BGP),* Tulsa, Okla.
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Mike Kander *(WPE8MS),* Columbus, Ohio
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John Beaver, Sr. *(WPEØAE),* Pueblo, Colo.
Gerry Dexter *(WPEØJJ),* Waverly, Iowa
George Buchanan *(WPEØVB),* Webster Groves, Mo.
Bill Barclay *(VE3PE1DZ),* Scarborough, Ont.
Garf Challoner *(VE5PE2E),* Norquay, Sask.
Giacomo Perolo *(PY2PE1C),* Bauru, Brazil
H. R. Gutjahr *(ZS-PE1E),* Pretoria-West, South Africa

Yugoslavia—The latest schedule from Belgrade reads: in Eng. at 1030-1100 on 15,240, 11.735, and 9505 kc. and at 1145-1200 on the same channels, and at 1330-1400 on 6100 and 7200 kc.; in Spanish at 1630-1700 on 6100, 7200, and 9505 kc., and at 1900-1930 and 2000-2030 on 7200, 9505, and 11,735 kc. *(WPE2CUF, WPE2FGX)*

Unidentified—*La Voz de la Libertad,* location unknown, has been noted on 13,990 to 14,000 kc. from 1758 to 1822 s/off and around 2200 with talks, political speeches, some marches, and L.A. dance music. *(WPE5AFU, WPE8AGY)* —30—

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On the Citizens Band

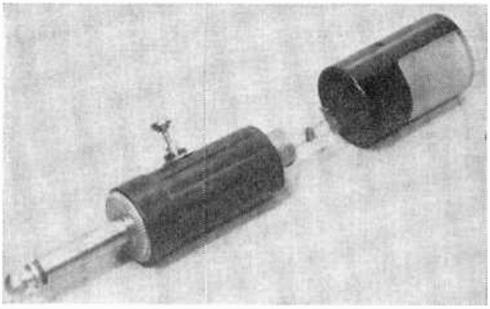
(*Continued from page* 60)

across a channel to pick up stations with transmitting tolerances which are either "high" or "low." Many of the rigs which tuned "low," incidentally, were those whose owners openly bragged that they had added a multiple crystal switch.

The transceiver provided excellent communications with a Heath CB-1, two miles away, which used only a nine-foot wire antenna run up the side of a house. We're convinced it was the superior receiver and transmitter in the MC-4 which made the difference.

Tech Notes. After installing a CB unit in a car, Robert Micals of Freehold, N. J., found that a dash light would be handy for night operation. He built one into a radio phone plug.

Bob used a plug with the largest diameter Bakelite handle he could find. In it,



he mounted a switch removed from a toy electric auto. A hole was drilled in the end of the plug and threaded to accommodate a bulb. Over this was cemented a light shield made from a plastic pill bottle, painted black except for a small window. The "hot" lead to the bulb went to the tip of the plug. On the dash, Bob mounted a mating jack, wiring the tip contact to the ignition switch.

The phone-plug light can be rotated to any position, or removed if desired.

How Do You Operate? We've had several letters recently asking whether the "stationary" unit in a CB net should be called "base," "control," or "fixed" when the call-sign is given. Technically speaking, the FCC considers all CB units to be "mobile," so we get no help there.

Personally, we use the designation,

"control," maybe because the XYL is usually our chief op at that end! All things considered, however, the best way would probably be to have the base station use "unit one" as its call, numbering other units in order.

What's Your Frequency? Here's a tip that was passed on to us by a friend who prefers to be anonymous. Although CB channels are "odd," since the frequency of each one ends in 5 kc., you can check your actual transmitting frequency with a 100-kc. frequency standard that also has a built-in 10-kc. multivibrator. (You can obtain "semi-kits" for these units from International Crystal Mfg. Co., Oklahoma City, Okla.)

After "zero-beating" the 100-kc. crystal against WWV or WWVH, turn on the 10-kc. multivibrator. This will provide "marker" signals throughout the Citizens Band (27.010, 27.020, 27.030, etc.). Operate your transmitter into a dummy load and listen to the resulting combination signal on your receiver. If the transmitter is smack on frequency, you'll hear a 5000-cycle tone.

Here's how it works: The transmitter's signal will beat in the receiver with marker signals above and below it. If your transmitter is right on channel, actually *two* "beat notes" will be heard, but both will be at 5 kc. If the transmitter's frequency is closer to one marker signal than the other, two *different* beat notes will be produced, representing the differences between the transmitter's frequency and the frequencies of the marker signals.

Note that with this setup you cannot determine whether you are "high" or "low," but by using a 'scope or audio frequency meter you can tell how far off you are. Because of this limitation, the setup, as described, does not provide a sufficient check to meet FCC rules, and may not save you from an off-channel violation notice from the FCC. Remember that all frequency measurements for certification, or for reply to an off-channel notice, MUST be made by the holder of an appropriate operator's license, with gear that meets FCC specifications.

Club Notes. Three CB Jamborees that we know of took place this past summer. . . . The Qui-Co Citizens Radio League (Ga.) and the Tri-State Radio Club Inc. held theirs on July 2 and 3, atop Fort Mountain, three miles east of Chatsworth, Ga. Activities included swimming and dancing, plus a booth section set up for manufacturers and dealers to show their equipment. . . . Stickney Lodge of the York Co. (Me.) Fish and Game Assn., Goodwins Mills, was the scene of a Jamboree sponsored jointly by the Standby Club of Biddeford and the Channel Masters of Greater Portland on August 6. A complete chicken dinner was available for $2.25, and cold drinks were on sale. The door prize was a Johnson Viking. . . . On August 13, the Greater Staten Island Chapter of the National 11 Meter League, Inc., held its annual picnic at Connors Hotel, Highlands, N. J. Events there included all sports, CB equipment exhibits, franks, burgers and corn on the cob.

The Oregon Grapevine, Inc., provided a communications system at Portland's Rose Cup Sports Car Races recently, and the club has announced its willingness to participate in other ventures. Contact Kenneth Hahm, 5003 S.E. Malden Drive, Portland 6, Ore. . . . Although CB (or whatever it will be called) is not yet a reality in Canada, the Saskatchewan Citizens Radio Club of Saskatoon has started taking membership applications. The Department of Transport is supposedly still considering rules and regulations for a Canadian CB setup. Although the Saskatoon Club is not accepting membership fees yet, they expect to be in business by next Spring. —30—

Transistor Topics

(*Continued from page 67*)

ment. Dave is shown with his award-winning display in Fig. 3; the schematic diagram of his relay/meter circuit is given in Fig. 4.

A *pnp* transistor, *Q1*, is used in the common-emitter arrangement as a single-stage audio amplifier. Operating power is obtained from a 9-volt battery, *B1*, while the input signal is supplied by a PM speaker used as a microphone and matched to the transistor through a small iron-core transformer, *T1*. The circuit may be employed either as a sound-actuated relay or as a sound level meter, depending on the choice of output load—a sensitive relay (*K1*) or an 0-10 ma. milliammeter (*M1*), respectively.

With no input signal, the only collector current is that due to the transistor's inherent leakage, since *Q1* is operated without base bias and is, in essence, a Class B stage. For practical purposes, then, the collector current is virtually zero. If the relay is used as an output device, it remains open, while the meter, if used, indicates minimum or zero current.

In operation, sound waves striking the speaker are converted into a.c. signals and these are applied through *T1* to *Q1*'s base-emitter circuit. The transistor rectifies and amplifies these signals, actuating the output device. The relay closes or the meter indicates a current level which is directly proportional to the

Fig. 3. Reader David Schmidt and the display that won him a superior rating at a district science fair.

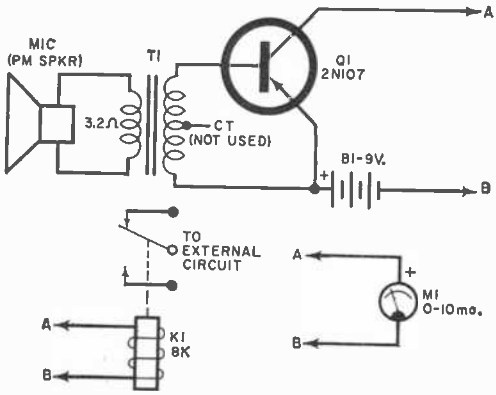


Fig. 4. Schematic diagram of Dave's sound-actuated relay/meter circuit. Speaker serves as microphone.

amplitude of the applied a.c. signal, and hence to the original sound level. Although *Q1*'s collector current is pulsating rather than pure d.c., the relay's inductance and mechanical inertia prevent erratic operation. Similarly, the meter, internally damped, responds to average signal levels. Both devices can follow low-frequency peaks, however, and can "keep time" with music.

Dave's circuit can be assembled either breadboard fashion, as in his orgiinal model, or in a small metal or plastic case as a self-contained instrument. The components are readily available. Any PM speaker with a 3- to 6-ohm voice coil will serve as a microphone, although larger speakers, as a general rule, are more efficient. Transformer *T1* is a small output transformer used "in reverse" as an input matching device; a Thordarson TR-29 or Argonne AR-160 should give good results. Other *pnp* transistors may be employed, or even *npn* types, if the battery and meter polarity are reversed. The relay (*K1*) is a Sigma 4F with an 8000-ohm coil; a single 9-volt battery, such as a Burgess 2N6, will do for *B1* or, if preferred, six flashlight cells can be connected in series as a power supply.

The instrument's effective range depends on the original sound level, on the efficiency of the speaker, and on the transistor's individual gain. Dave says that he has obtained normal operation at distances up to eight feet under average conditions. In some applications, it may be desirable to minimize the instrument's tendency to follow signal peaks; this can be accomplished by connecting a small electrolytic capacitor across the output load device, observing d.c. polarities—a 50-μf., 12-volt unit should be satisfactory. If the relay version is assembled, the unit's contacts are used as a simple switch to operate an external circuit.

Product News. Lafayette Radio (165-08 Liberty Ave., Jamaica 33, N. Y.) is now offering a small automobile radio designed specifically for "compact" and foreign cars (Catalog No. FS-232). Covering the AM broadcast band, it features a superhet circuit employing eight transistors, one diode, and one Varistor. Current consumption is only 200 ma. at 12 volts. The receiver measures 7" x 2½" x 4¾" overall, and sells for $39.95, plus postage.

A new kit of eight American-made transistors and diodes, designed to replace more than 95% of the semiconductors used in Japanese and other foreign radios, is now being marketed by Semitronics Corp., 370 Broadway, New York 13, N. Y. Designated as No. 8JP, the kit is supplied with a complete replacement and interchangeability chart.

The "Transi-Phone," a miniature transistorized transceiver designed for the Citizens Band, is being produced by Iwata Electric Co., Ltd., in Japan. Measuring 4⅞" x 2¾" x 1¾" overall, and weighing 12 ounces, it's powered by eight 1.5-volt batteries. The "Transi-Phone" is intended for short-range communication, having an effective range of ½ to 1 mile. Its U. S. distributor is Electronic Importers and Exporters Co., Inc., Long Beach, Calif.

That sums up the semiconductor story for now—be on hand for more news next month.

—*Lou*

Oscilloscope Quiz Answers

(*Questions on page* 78)

1.........H	6.........A
2.........C	7.........E
3.........I	8.........B
4.........G	9.........F
5.........J	10.........D

Electronics Enthusiasts

(*Continued from page* 45)

exams.) If he passes the test, he will be issued SWL call letters (example: UA3-2791) and will begin listening on the ham bands at his local club station.

After gaining some experience, he can take a test for a transmitting license. For this he must be 14 years old, be able to handle code at 12 wpm, pass a tougher examination, and build a transmitter.

There are two higher classes of licenses which are issued only after the applicant has passed some very difficult tests, but these licenses offer some worthwhile privileges (operation on all bands, 200 watts of power, and phone as well as c.w. operation). The test for the first-class license, for example, includes a written exam similar to that for our Extra Class license. The applicant must also send and receive code at 18 wpm, design transmitter and receiver circuits, and be able to build and trouble-shoot advanced transmitters and receivers.

The closest thing to the Citizens Band in the Soviet Union is a group of hams who can operate only on the very high frequency bands (144 and 420 mc.). The minimum age for these hams is 12 years and they needn't pass a code test; as in the U.S., maximum input power is limited to 5 watts.

There are no exact figures on the number of ham stations in the U.S.S.R., but a reasonable guess might be 10,000 to 15,000. The number of individual hams and SWL's is, of course, much greater—many of the ham stations are club stations, each of which has many operators and listeners. *Radio* magazine has announced that the government hopes to have 25,000 ham stations on the air by the end of next year.

The precise number of electronics hobbyists is also unknown. But as long as Russia needs electronics specialists and is willing to train hobbyists to become specialists, we can assume that Russia's electronics needs will be met. From all accounts, we can also assume that Russia's electronics technicians will be well-trained and competent, the equal of any in the world. —30—

POPULAR ELECTRONICS
Advertisers' Index
October 1961

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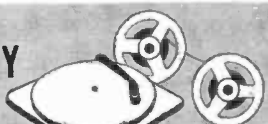

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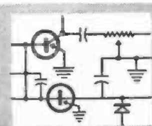

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6AV6	.41	6K6	.63	12DE8	.75
6AW8	.90	6L6	1.06	12DL8	.85
6AX4	.66	6N7	.98	12DM7	.67
6AX5	.74	6S4	.51	12DQ6	1.04
6AX7	.64	6S8	.76	12DS7	.79
6AX8	.92	6SA7GT	.76	12DT5	.76
6BA6	.50	6SG7GT	.41	12DT7	.79
6BA7	.84	6SH7GT	.49	12DT8	.79
6BA8	.88	6SJ7	.88	12DW8	.89
6BC5	.61	6SK7GT	.74	12DZ6	.56
6BC7	.94	6SL7GT	.80	12EG6	.54
6BC8	.97	6SN7GT	.65	12EK6	.56
6BD5	1.25	6SQ7	.73	12EL6	.50
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6BF5	.90	6U8	.83	12EZ6	.53
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6BG6	1.66	6V8	.86	12FA6	.79
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6BZ8	1.09	8CS7	.74	12X4	.38
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6C8	.90	8EB8	.94	17BQ6	1.09
6CB6	.55	8SN7	.66	17D4	.69
6CD6	1.42	9CL8	.79	17DQ6	1.06
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6CL8	.79	12AE6	.43	19AU4	.83
6CM6	.64	12AE7	.94	19BG6	1.39
6CM7	.66	12AF3	.73	19T8	.80
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6CN7	.65	12AJ6	.46	21EX6	1.49
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6CS7	.69	12AT6	.43	25BQ6	1.11
6CU5	.58	12AT7	.76	25C5	.53
6CU6	1.08	12AU6	.51	25CA5	.59
6CY5	.70	12AU7	.60	25CD6	1.44
6CY7	.71	12AV6	.41	25CU6	1.11
6DA4	.68	12AV7	.75	25DN6	1.42
6DB5	.69	12AX4	.67	25EH5	.55
6DB6	.51	12AX7	.63	25L6	.57
6DE6	.58	12AY7	1.44	25W4	.68
6DG6	.59	12AZ7	.86	25Z6	.66
6DK6	.59	12B4	.63	32ET5	.55
6DN6	1.55	12BA6	.50	32L7	.90
6DQ6	1.10	12BA7	.84	35B5	.60
6DT6	.53	12BD6	.50	35C5	.51
6DT8	.79	12BE6	.53	35L6	.57
6EA8	.79	12BF6	.44	35W4	.42
6EB5	.72	12BH7	.77	35Z5	.60
6EB8	.94	12BK5	1.00	36AM3	.36
6EM5	.76	12BL6	.56	50B5	.60
6EM7	.82	12BQ6	1.06	50C5	.53
6EU8	.79	12BY7	.77	50EH5	.55
6EW6	.57	12BZ7	.75	50L6	.61
6EY6	.75	12C5	.56	5763	1.00
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6F6	.69	12CR6	.54	7025	.69
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6GN8	.94	12CU6	1.06	807	.70
6H6	.58	12CX6	.54	117Z3	.61
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Qty. Type	Price	Qty. Type	Price	Qty. Type	Price	Qty. Type	Price	Qty. Type	Price
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0Z4	.79	2D21	1.20	3S4	.61	5BC8	.79	6A8G	1.20
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1B3	.79	3A3	.76	4AU6	.54	5BK7	.82	6AC5	1.05
1DN5	.55	3A4	.60	4BA6	.51	5BQ7	.97	6AC7	.96
1G3	.79	3AF4	1.02	4BC5	.58	5BR8	.79	6AF3	.73
1H5	.54	3AL5	.42	4BC8	.96	5BT8	.83	6AF4	.97
1J3	.79	3AU6	.51	4BN6	.75	5CG8	.76	6AG5	.68
1K3	.79	3AV6	.41	4BQ7	1.01	5CL8	.76	6AH4	.81
1L4	.68	3BA6	.51	4BS8	.98	5CM8	.90	6AH6	.99
1LC5	.59	3BC5	.54	4BU8	.71	5CQ8	.84	6AK5	.95
1LD5	.69	3BE6	.52	4BZ6	.58	5CZ5	.72	6AL5	.47
1LG5	.69	3BN6	.76	4BZ7	.96	5EA8	.80	6AL7	1.43
1LN5	.59	3BU8	.78	4CS6	.61	5EU8	.80	6AM4	1.50
1R5	.62	3BY6	.55	4DE6	.62	5J6	.68	6AM8	.78
1S2A	.76	3BZ6	.55	4DK6	.60	5T4	.79	6AQ5	.53
1S4	.59	3CB6	.54	4DT6	.55	5T8	.81	6AR5	.55
1S5	.51	3CF6	.60	4EW6	.58	5U4	.60	6AS5	.60
1T4	.58	3CS6	.52	5AM8	.79	5U8	.81	6AS6	.80
1U4	.57	3DG4	.85	5AN8	.86	5V3	.90	6AT6	.43
1U5	.50	3DK6	.60	5AQ5	.52	5V6	.56	6AT8	.79
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Please send me the units checked on approval. If completely satisfied I will pay on the terms specified with no interest or finance charges added. Otherwise, I will return after a 10 day trial positively cancelling all further obligation.

☐ Model 79 . Total Price $38.50
$8.50 within 10 days. Balance $6.00 monthly for 5 months.

☐ Model TV-50A...Total Price $47.50
$11.50 within 10 days. Balance $6.00 monthly for 6 months.

☐ Model 85 ......Total Price $52.50
$12.50 within 10 days. Balance $8.00 monthly for 5 months.

☐ Model 83 . Total Price $38.50
$8.50 within 10 days. Balance $6.00 monthly for 5 months.

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All prices net, F.O.B., N. Y. C.

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NO MONEY WITH ORDER—NO C.O.D.

SUPERIOR'S NEW MODEL 83

C.R.T. TESTER

Tests and Rejuvenates ALL PICTURE TUBES

Model 83—C.R.T. Tube Tester
Total Price $38.50
Terms: $8.50 after 10 day trial, then $6.00 monthly for 5 months if satisfactory. Otherwise return, no explanation necessary.

ALL BLACK AND WHITE TUBES

From 50 degree to 110 degree types—from 8", to 30" types.

● Model 83 is not simply a rehashed black and white C.R.T. Tester with a color adapter added. Model 83 employs a new improved circuit designed specifically to test the older type black and white tubes, the newer type black and white tubes and all color picture tubes. ● Model 83 provides separate filament operating voltages for the older 6.3 types and the newer 8.4 types. ● Model 83 employs a 4" air-damped meter with quality and calibrated scales. ● Model 83 properly tests the red, green and blue sections of color tubes individually—for each section of a color tube contains its own filament, plate, grid and cathode. ● Model 83 will detect tubes which are apparently good but require rejuvenation. Such tubes will provide a picture seemingly good but lacking in proper definition, contrast and focus. To test for such malfunction, you simply press the rej. switch of Model 83. If the tube is weakening, the meter reading will indicate the condition. ● Rejuvenation of picture tubes is not simply a matter of applying a high voltage to the filament. Such voltages improperly applied can strip the cathode of the oxide coating essential for proper emission. The Model 83 applies a selective low voltage uniformly to assure increased life with no danger of cathode damage.

ALL COLOR TUBES

Test ALL picture tubes—in the carton—out of the carton—in the set!

Housed in handsome portable Saddle Stitched Texon case—complete with sockets for all black and white tubes and all color tubes. Only **$38.50**

Superior's New Model TV-50A **GENOMETER**

7 Signal Generators in One!

Model TV50-A—Genometer
Total Price $47.50
Terms: $11.50 after 10 day trial, then $6.00 monthly for 6 months if satisfactory. Otherwise return, no explanation necessary.

- ✓ R.F. Signal Generator for A.M.
- ✓ R.F. Signal Generator for F.M.
- ✓ Audio Frequency Generator
- ✓ Marker Generator
- ✓ Bar Generator
- ✓ Color Dot Pattern Generator
- ✓ Cross Hatch Generator

This Versatile All-Inclusive GENERATOR Provides ALL the Outputs for Servicing:

● A.M. RADIO ● F.M. RADIO ● AMPLIFIERS ● BLACK AND WHITE TV ● COLOR TV

R. F. SIGNAL GENERATOR: 100 Kilocycles to 60 Megacycles on fundamentals and from 60 Megacycles to 180 Megacycles on powerful harmonics.

VARIABLE AUDIO FREQUENCY GENERATOR: Provides a variable 300 cycle to 20,000 cycle peaked wave audio signal.

MARKER GENERATOR: The following markers are provided: 189 Kc., 262.5 Kc., 456 Kc., 600 Kc., 1000 Kc., 1400 Kc., 1600 Kc., 2000 Kc., 2500 Kc., 3579 Kc., 4.5 Mc., 5 Mc., 10.7 Mc., (3579 Kc. is the color burst frequency)

BAR GENERATOR: Pattern consists of 4 to 16 horizontal bars or 7 to 20 vertical bars.

DOT PATTERN GENERATOR (FOR COLOR TV): The Dot Pattern projected on any color TV Receiver tube by the Model TV-50A will enable you to adjust for proper color convergence.

CROSS HATCH GENERATOR: The pattern consists of non-shifting horizontal and vertical lines interlaced to provide a stable cross-hatch effect.

Complete with shielded leads **$47.50 Net**

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BEFORE you buy! **THEN** if satisfactory pay in easy, interest free, monthly payments. See coupon inside.

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3849 TENTH AVENUE

NEW YORK 34, N.Y.

We invite you to try before you buy any of the models described on this and the preceding page. If after a 10 day trial you are completely satisified and decide to keep the Tester, you need send us only the down payment and agree to pay the balance due at the monthly indicated rate. (See other side for time payment schedule details.)

NO INTEREST OR FINANCE CHARGES ADDED!

If not completely satisfied, you are privileged to return the Tester to us, cancelling any further obligation.

SEE OTHER SIDE

CUT OUT AND MAIL TODAY!