RADIO & TELEVISION NEWS

DECEMBER
1948
35¢

PRINTED CIRCUITS PASS RIGID LABORATORY TESTS . . . Page 39

alliance
TENNA · ROTOR

Operates in any weather.
Fits all types of antenna.

GETS **STRONGER SIGNALS!**

GIVES **MULTI-STATION DIRECTIVITY**

ROTATES TV OR FM ANTENNA

GREATEST DIRECTIONAL AID
For Maximum Signal Intensity!

THE ALLIANCE TENNA-ROTOR gives instantaneous "arm chair control" to rotate all types of TV and FM antenna. Operating a simple two-way selector switch at the set swings the antenna clockwise, or counter-clockwise, over a complete circle of 360 degrees! You can stop it at any point. This positive control of rotation selects the *exact position for "peaked" reception!*

An automatic signal light tells when the limit of travel is reached.

Tenna-Rotor is easy and inexpensive to install— any antenna mast is quickly clamped into a rotating hollow shaft powered by a fully enclosed, weather-proof, electric unit.

TENNA-ROTOR comes complete—ready to use! The Rotor is sturdy, water-tight, metal housed —a plastic control box five inches square plugs into any 60 cycle 110 volt circuit.

FACTORY LUBRICATED FOR LIFE . . . DESIGNED FOR RUGGED SERVICE

TV and FM dealers, service men and users find that the **Alliance Tenna-Rotor** simplifies and improves both new and existing installations—most important, it assures correct antenna "beaming" for strong, brilliant signals! Approx. shipping weight 10 lbs. Retails at **$39.95.**

Overall dimensions of Rotor Unit 7¾″ x 5¼″ x 8″
Control Box 5″ x 5″

***AMATEURS** can use TENNA-ROTOR for both transmitting and receiving!*

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Export Department: 401 Broadway, New York 13, N. Y., U. S. A.

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I Send You Many Kits of Radio Parts

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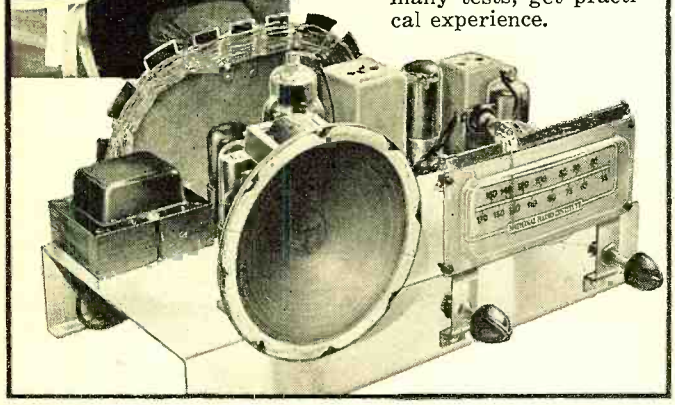
You build this modern Radio as part of my Servicing Course. I send you the speaker, tubes, chassis, transformer, loop antenna, EVERYTHING you need to build this modern Radio Receiver. Use it to make many tests, get practical experience.



YOU PRACTICE RADIO COMMUNICATIONS

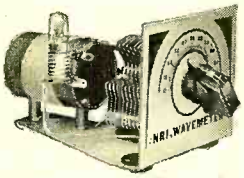
I send you parts to build this Transmitter as part of my new Communications Course. Conduct actual procedure demanded of Broadcast Station Operators, practice interesting experiments, learn how to put a transmitter on the air.

YOU BUILD THIS TESTER

as part of my Servicing Course, with parts N. R. I. sends. It soon helps you EARN EXTRA MONEY fixing neighbors' Radios in spare time.

YOU BUILD THIS WAVEMETER

as part of my NEW Communications Course. Use it with Oscillator you also build that furnishes basic power to transmitter and determines transmitter frequency.



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I Will Train You at Home · SAMPLE LESSON FREE

Want a good-pay job in the fast-growing Radio and Television Industries, or your own money-making Radio-Television shop? I've trained hundreds of men WITH NO PREVIOUS TRAINING to be Radio technicians. Or now you can enroll in my NEW practical course in Radio-Television COMMUNICATIONS—learn to be a Broadcasting and Communications technician. You get practical Radio experience with MANY KITS OF PARTS I send you in my train-at-home method. All equipment yours to keep.

MAKE EXTRA MONEY IN SPARE TIME

As part of my Radio Servicing Course, I send SPECIAL BOOKLETS starting the day you enroll. Make EXTRA MONEY fixing Radios in spare time while training. Then start your own Radio sales and service shop or get a good-pay job in Police, Aviation or Marine Radio, Broadcasting, Public Address work, etc. Or think of amazing Television opportunities. Already manufacturers are producing over 100,000 sets a month. New stations going on the air everywhere! Television is America's fastest-growing industry and men who know it will be in demand.

GET ACTUAL LESSON AND BOOK FREE

My DOUBLE FREE OFFER entitles you to actual SAMPLE LESSON and my 64-page book, "HOW TO BE A SUCCESS IN RADIO — TELEVISION — ELECTRONICS," both FREE. Mail coupon now. See how quickly, easily you can start. J. E. SMITH, President, Dept. 8NR, National Radio Institute, *Pioneer Home Study Radio School*, Washington 9, D. C.

VETERANS

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I TRAINED THESE MEN

Good Job In Radio Station

"Am Chief Engineer of Radio Station WORD in charge of four men. Owe all I know about Radio to NRI."—CLYDE J. BURDETTE, Spartanburg, South Carolina.

Has Own Radio Business

"Now have two Radio shops servicing about 200 sets a month. Have largest service establishment in Southeastern Missouri."—ARLEY STUDYVIN, De-Soto, Missouri.

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National Radio Institute, Washington 9, D. C.

Mail me FREE Lesson and 64-page book. (No salesman will call. Please write plainly.)

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

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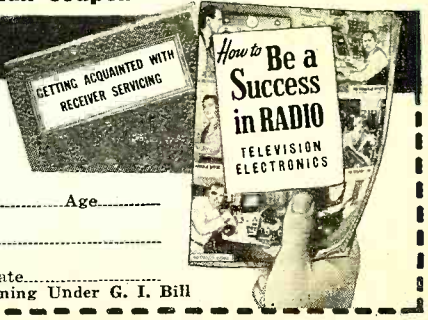

COVER PHOTO: Don Zunker, Centralab engineer, checks a new amplifier unit which incorporates the company's Printed Electronic Circuits in the development and test laboratories of Centralab, Division of Globe-Union in Milwaukee. (Photo by Moni Hans Zielke)

RADIO & TELEVISION NEWS

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CONTENTS — DECEMBER, 1948

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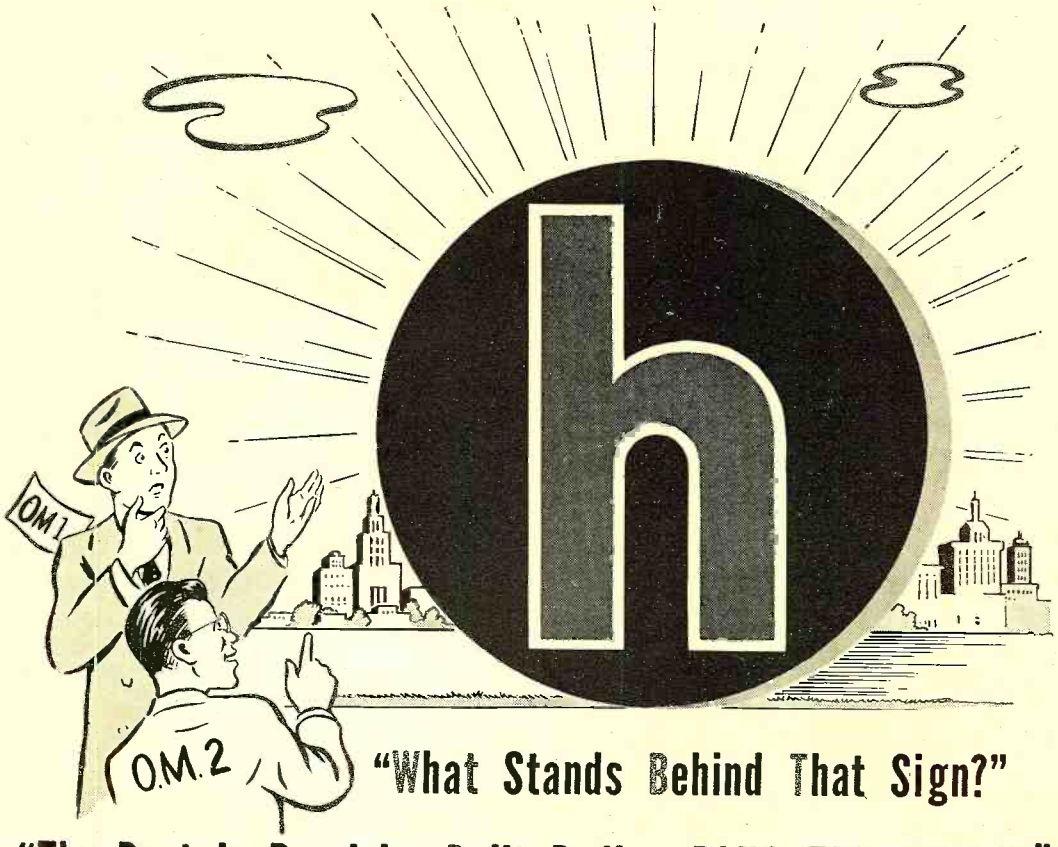

"What Stands Behind That Sign?"

"The Best in Precision-Built Radio...PLUS TELEVISION!"

OM #2 knows his trademarks. And the countless thousands of Hallicrafters users in 89 different countries will back him up.

More Hallicrafters instruments are available to you today than ever before. Here for your information is a complete list of major models:

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SX-42 Communications Receiver	$295.00
SX-43 Communications Receiver	189.50
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S-53 Communications Receiver	89.50
S-38 Communications Receiver	49.95
S-37 VHF Communications Receiver	591.75
S-36A VHF Communications Receiver	307.00
S-51 Marine Receiver	149.50
HT-19 Medium Power Transmitter	359.50
HT-17 Low Power Transmitter	49.50
HT-18 VFO-Crystal Exciter	110.00

Broadcast Receivers

SX-62 Communications-type Bcst. Rcvr.	$289.50
S-47 Broadcast Receiver.	229.50
S-55 Broadcast Receiver.	129.50
S-58 Broadcast Receiver.	59.50
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S-56 Broadcast Chassis..	110.00
S-59 Broadcast Chassis..	49.50

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T-67 10-inch Mahogany finish	299.95
T-61 10-inch Ebony Plastic	289.95
505 7-inch Mahogany finish	199.50
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"You can get a testimonial from me on Ken-Rad tubes any time!

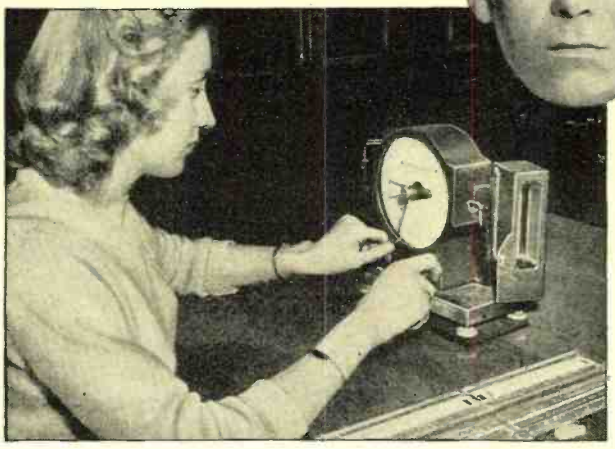
"I use them. I've been using them for years. Believe me, no other tube can touch them.

"They're quality tubes. When I pass them on to a customer I know he won't come back mad.

"My customers come back, all right. But satisfied. They want me to do another job for them!"

R. W. RIEDY, Modern Radio Service, 518 West Broad Street, Bethlehem, Pa. Typical of thousands of radio servicemen, coast to coast, Mr. Riedy uses Ken-Rad tubes because he knows he can depend on them to satisfy customers.

EMMETT MERCER, Foreman, is responsible for the weighing of cathode sleeves to check coating weight (shown below). Another example of the great care that is taken in making Ken-Rad tubes.



"KEN-RAD TUBES ARE MADE TO DO A JOB!"

"We *make* Ken-Rad tubes to perform better, last longer, satisfy customers and increase business for you.

"I've been helping to make them for years. And I can tell you we check and recheck, test and retest, over and over again, the smallest parts that go into our tubes

"We test the tubes themselves for noise, microphonics, static, life, shorts, appearance, gas, air and hum.

"You can count on them to bring customers back satisfied."

178-GA13-8850

KEN-RAD *Radio Tubes*

PRODUCT OF GENERAL ELECTRIC COMPANY

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The Serviceman's Tube

I'll Send You 8 Big Kits of Training Equipment *including*

TWO-BAND 6 TUBE SUPER RECEIVER AND 16 RANGE METER SET-UP *for Testing*

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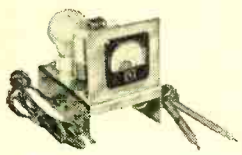
OVER 175 PRACTICAL EXPERIMENTS You'll find out how to build countless Radio Circuits. You'll learn a new, fast way to test Radio Sets without mfg. Equipment.

Learn Fast . . . Earn Fast

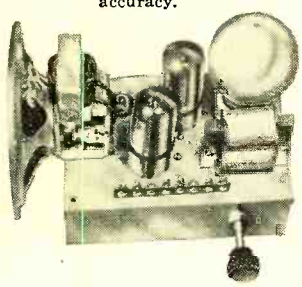
HOME TRAINING Planned For Your Needs

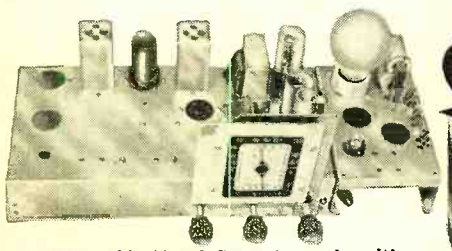
You Build All These TESTERS . . . and MORE!



I give you a fine, moving-coil type Meter Instrument on Jewel Bearings—with parts for a complete Analyzer Circuit Continuity Tester. You learn how to check and correct Receiver defects with professional speed and accuracy.

Practice *Does It!* Soldering, wiring, connecting Radio Parts . . . building circuits with your own hands—you can't beat this method of learning. When you construct this Rectifier and Filter Resistor and Condenser Tester, etc., you get a really practical slant on Radio that leads to a money-making future.





Building this Signal Generator and multi-purpose Tester will give you the kind of valuable experience and practice that is so important as a foundation for making good money in Radio. It makes a breeze out of fixing Radios, and you don't have to spend money on ready-made Equipment.

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For the RECORD

BY THE EDITOR

EVERY once in a while we descend from our Editorial Chair to go on a safari around the country to visit our readers, advertisers, to attend as many Hamfests and conventions as time will allow—and to see, first hand, what is going on in our vast radio, television, and electronic industry.

We were especially interested in gathering ideas for attracting new and young blood into the ranks of ham radio to offset the potential danger to the future security of our hobby (as was first discussed in our Sept. '48 editorial.) We wanted to find out what other amateurs were doing to bolster our ranks and to check our thinking with theirs.

It was heartening, therefore, when George Bailey, in his official address to the National ARRL Convention over Labor Day, called upon the "old timers" and local ham clubs to take cognizance of the need for new amateur radio blood and to do whatever was possible to interest newcomers in their hobby.

Many letters have been received, that concur with our belief that concerted action must come soon from *all* hams, not just a minority.

Following the Milwaukee shindig, we drove to Biloxi to attend and address the hams of the Delta Division. We had the opportunity to further "rag chew" with these W4's and W5's and almost without exception, they were in sympathy with the problem. We would indeed be remiss if we did not mention the warm hospitality of these boys from the Deep South at one of the best managed ham conventions we have ever attended.

We then went to Los Angeles to attend conventions of the IRE, the West Coast Electronic Manufacturers Association, and Southwest Division of the ARRL and to talk to the W6's at the Pasadena Ham Club.

It became apparent that the most logical approach to the problem of selling ham radio to the teenager (or even younger) is for local clubs to appoint committees for the express purpose of calling on Scoutmasters, schools, and other organizations and to provide informed speakers to such groups to tell the story of Amateur radio as a hobby and what it has meant to our country in times of emergency.

Our thinking has been further encouraged by others who are in a position to feel the pulse of ham radio and to know when a remedy is needed. We refer to "Zero Bias" in the October *"CQ"* which we read while enroute to San Francisco, to copies of talks given by L. R. Mitchell, W1HIL to hams at the Concord, N. H., Hamfest and the Eastern Massachusetts Amateur Radio Club and to many others who have recently joined us in spotlighting the fact that "Amateur Radio needs new blood."

These are most serious times in amateur radio. It is now, more than ever before, of greatest importance that a careful selection of our League directors be made. They must be fully aware of the ever increasing pressure brought to bear by others seeking our frequencies. They must be "youth-minded" and unselfish in their attitude about overcrowded bands. And they must, above all, defend the interests of all radio amateurs, regardless of their status as members of any particular organization.

The achievements and growth of the National Rifle Association may well serve to illustrate how successful and strong an organization can become when its affiliated clubs and officers recognize the teenagers as being of equal importance to the old-timers. Organized safe and sane shooting gains respect for these hobbyists in the eyes of Uncle Sam and the public.

We can do the same with Amateur Radio.

As a stimulus to keep the ball rolling RADIO & TELEVISION NEWS will make an important announcement in our next issue to all amateur radio clubs throughout the country whereby they may participate in a program designed to encourage a new influx of youngsters into ham radio during the months of 1949—and—we need thousands of them, not just hundreds.

We'd like to hear from many more hams with suggestions for accomplishing the objective, to receive more "case histories" on progress made by these lads in getting their licenses and we'd like every club secretary to bring us up-to-date on present membership and activities of their group.

We will launch a new series of articles written by Bob Hertzberg who knows from long experience what is needed most by the newcomer in ham radio to qualify for his ticket.

Yes, the time has come to stop quibbling about phone vs. c.w. and to start thinking about the status of our hobby five or ten years from now. O.R.

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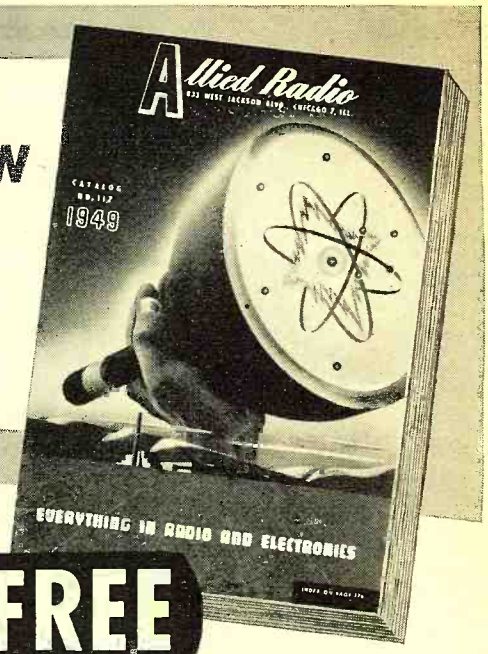
180 Value-Packed Pages Featuring Everything New in Radio!



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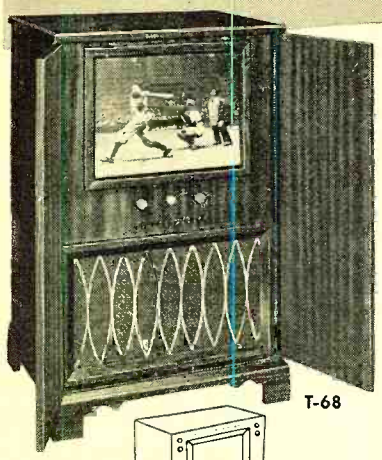


T-68

T-60

IMMEDIATE SHIPMENT FROM STOCK

NEW! Projection Television by Hallicrafters—16″x12″ Screen Amazing 192 Sq. Inch Picture!

Develops a brilliant, steady, optically correct picture; glare-free for comfortable viewing both at close range or distance, day or night. Optical system stays in perfect, stable adjustment. Includes following features: 2½″ magnetic projection triode, sealed optical unit, 25 kv high voltage unit, 12 channel push-button selector, RF amplifier, 3 IF amplifiers, 2 video amplifiers, special synchronizing circuits, AGC and black level control, single picture control, inter-carrier FM system. Complete with 20 tubes, plus projection triode and 5 rectifiers. In handsome classic Chippendale mahogany cabinet. For 105-125 volts, 50-60 cycles AC.

97-805. Hallicrafters T-68 Projection TV in console. NET, f.o.b. Chicago **$695**

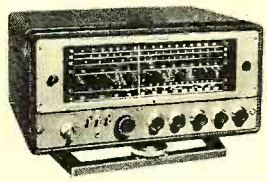
97-801. Hallicrafters T-60 Projection TV in rack (less cabinet) for custom installation. NET, f.o.b. Chicago **$595**

Hallicrafters 10″ Direct View!

Here's an unbelievably sharp picture, with excellent stability and truly photographic contrast. Priced amazingly low for the quality. Features include: 12 channel push-button tuning, RF amplifier, 3 IF amplifiers, 2 video amplifiers, improved sync circuits, AGC, static-free FM. Complete with 19 tubes, plus 10″ picture tube and 3 rectifiers. In rich mahogany table cabinet. For 105-125 volts, 50-60 cycles AC.

97-804. Hallicrafters T-67, 10″ TV wood table model. NET, f.o.b. Chicago **$295**

97-802. Hallicrafters T-61. As above, in black plastic cabinet. NET, f.o.b. Chicago **$279.50**



Short Wave Listeners! DX Fans! SX-62

HALLICRAFTERS' special SWL Receiver! Tuning range: 540 kc to 110 mc, continuous —world-wide Short Wave and special services; broadcast and all FM channels between 27 mc and 110 mc. Features: professional slide-rule dial; 500 kc crystal calibrator; single knob tuning, 60 to 1 ratio; bands illuminated separately; series type ANL; 4-position tone control; high-fidelity audio; 6-step filter; dual IF channels; crystal filter; 8 watts output, etc. In handsome steel cabinet. With tubes.

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97-780. R-42 Speaker to match. NET .. **$34.50**

97-568. B-42 Tilt-Base. NET **$7.50**

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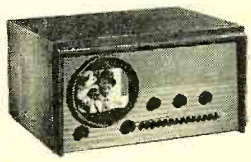
An immensely popular TV receiver at low cost! Provides a brilliant 23 square-inch picture. Easy to operate; excellent sound; install it yourself.

97-803. Hallicrafters 505 in mahogany cabinet. NET, f.o.b. Chicago..... **$199.50**

97-800. Hallicrafters T-54, as above, but in gray furniture-steel cabinet. NET, f.o.b. Chicago... ....**$189.50**



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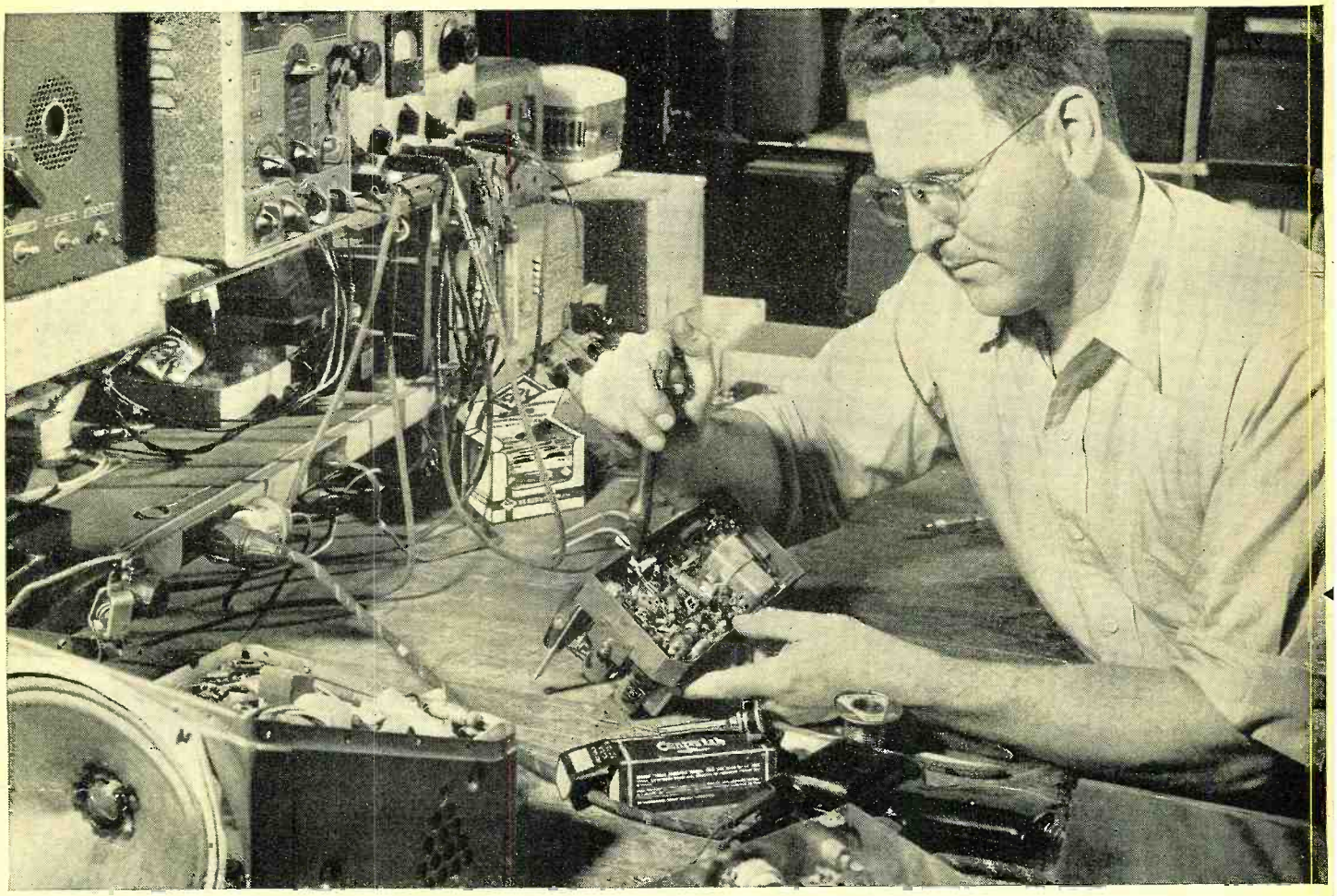
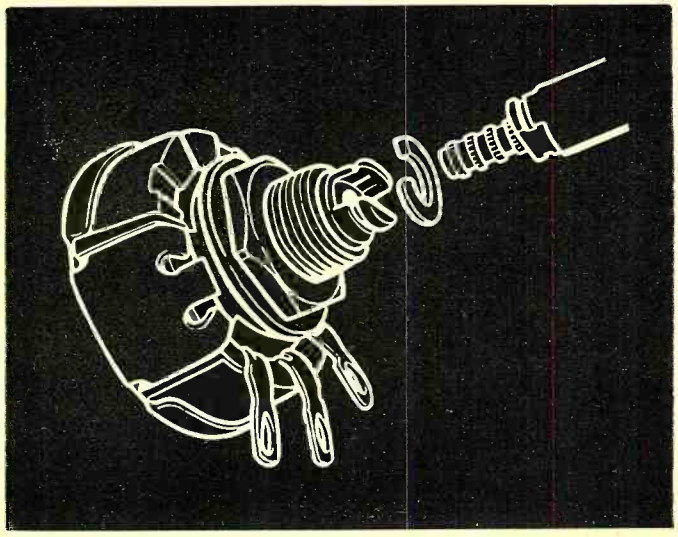
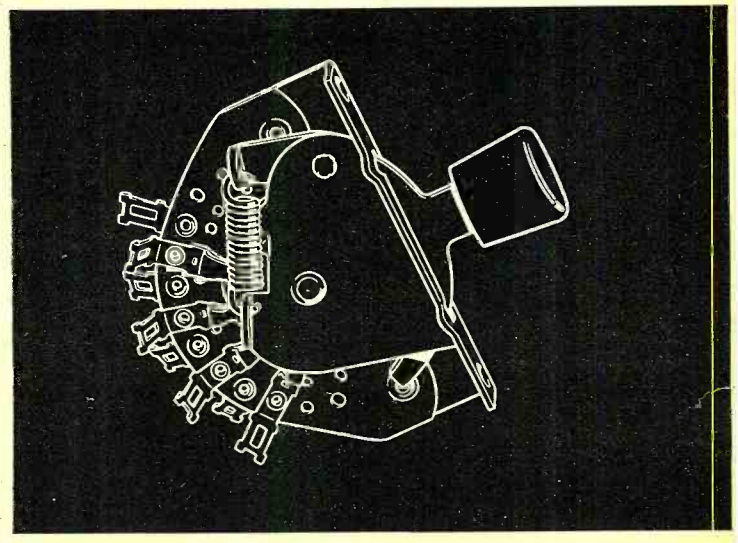






Controls: With CRL's improved *Adashaft* Radiohms you can carry a small stock of controls, yet be ready to handle almost any kind of control replacement problem. No wiggle, no wobble, no slip. Just insert shaft pilot in control stub shaft, and slip "C" washer into place. Available in all sizes for all model "M" volume control applications. Six types of shafts.

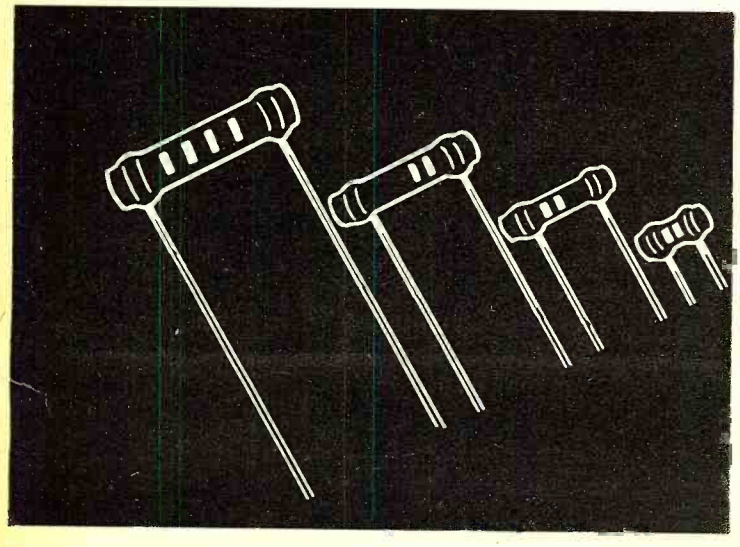
Switches: Centralab offers you a complete line of Tone, Rotary Selector, Lever Action and Medium Duty Power Switches, which features a wide variety in both laminated phenolic and steatite insulation. Available with shorting or non-shorting contacts. See your Centralab Distributor for further information, or write direct for new Catalog 26.

with Centralab parts

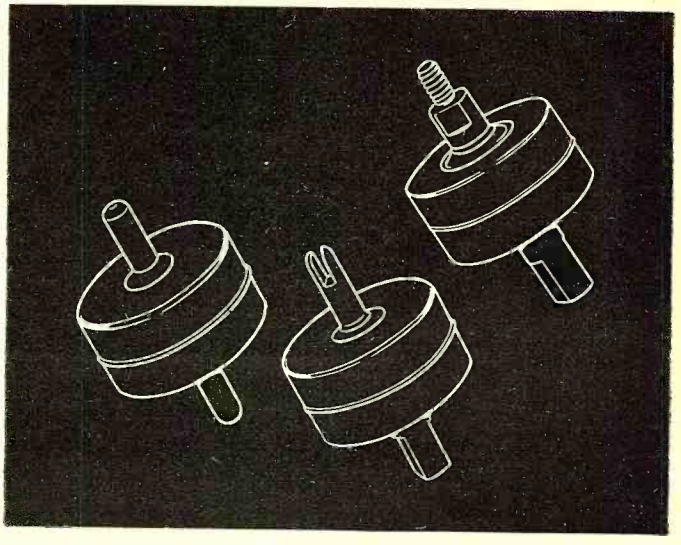
The type of work you turn out determines how fast your business will grow . . . how rapidly your profits will jump. That's why it's vital to use service components that build repeat business and invite new customers. You can be sure with dependable Centralab parts. Compare quality. Compare performance. Compare price. When you do, you'll see why successful radio servicemen everywhere use CRL components to give their customers fast, dependable service. What's more, you'll find that easy-to-stock, easy-to-use Centralab parts increase shop efficiency. For the complete story on the Centralab line, get in touch with your CRL Distributor.

— Rudolf Schiller, serviceman at Lakeside Radio, Inc., Milwaukee, Wisconsin, likes the way customers appreciate his work. Says Schiller, "There's satisfaction — and profit — in doing a good job . . . and Centralab parts help give you both."

Centralab
CRL
Division of GLOBE-UNION INC., Milwaukee



"Hi-Kaps": CRL line of ceramic By-pass and Coupling Capacitors gives you ceramic dependability and permanence at a new low price! Packaged in a convenient envelope of five, *Hi-Kaps* are clean, easy to stock and handle. Wide range from .000050 to .010000 mfd. Rating — 600 WVDC, 1000 VDC. flash tested. Ask your Centralab Distributor for all the facts.



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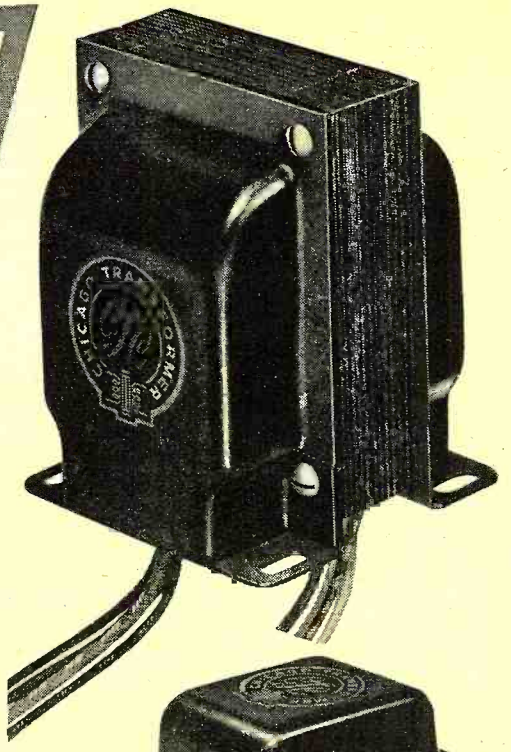

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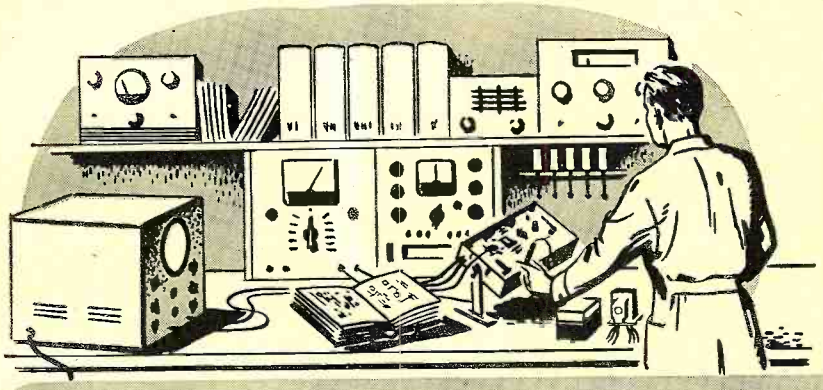

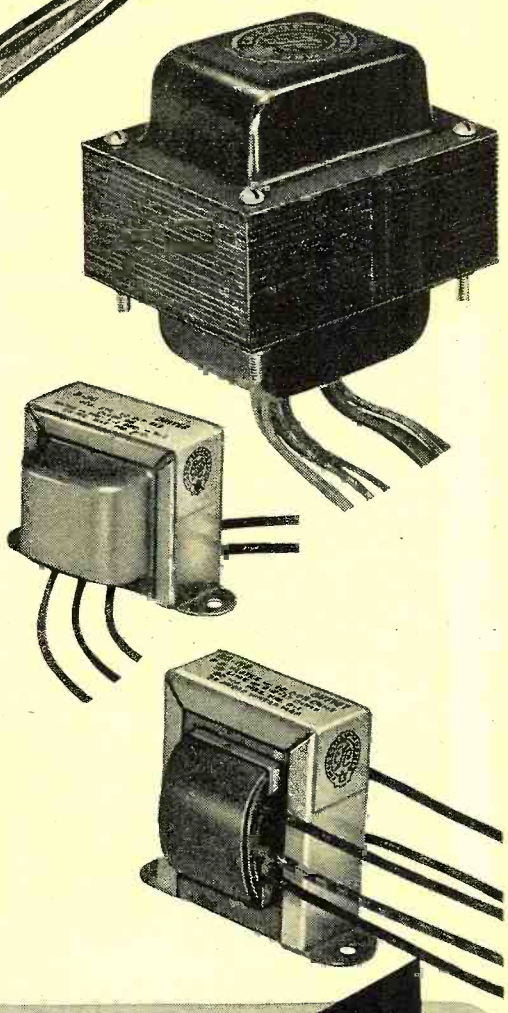

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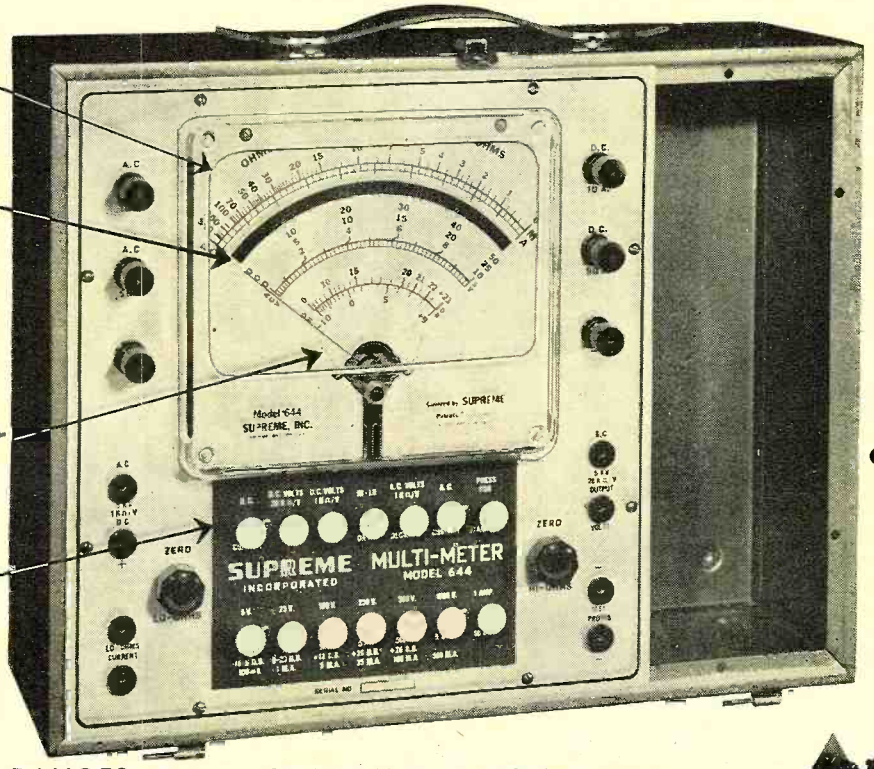

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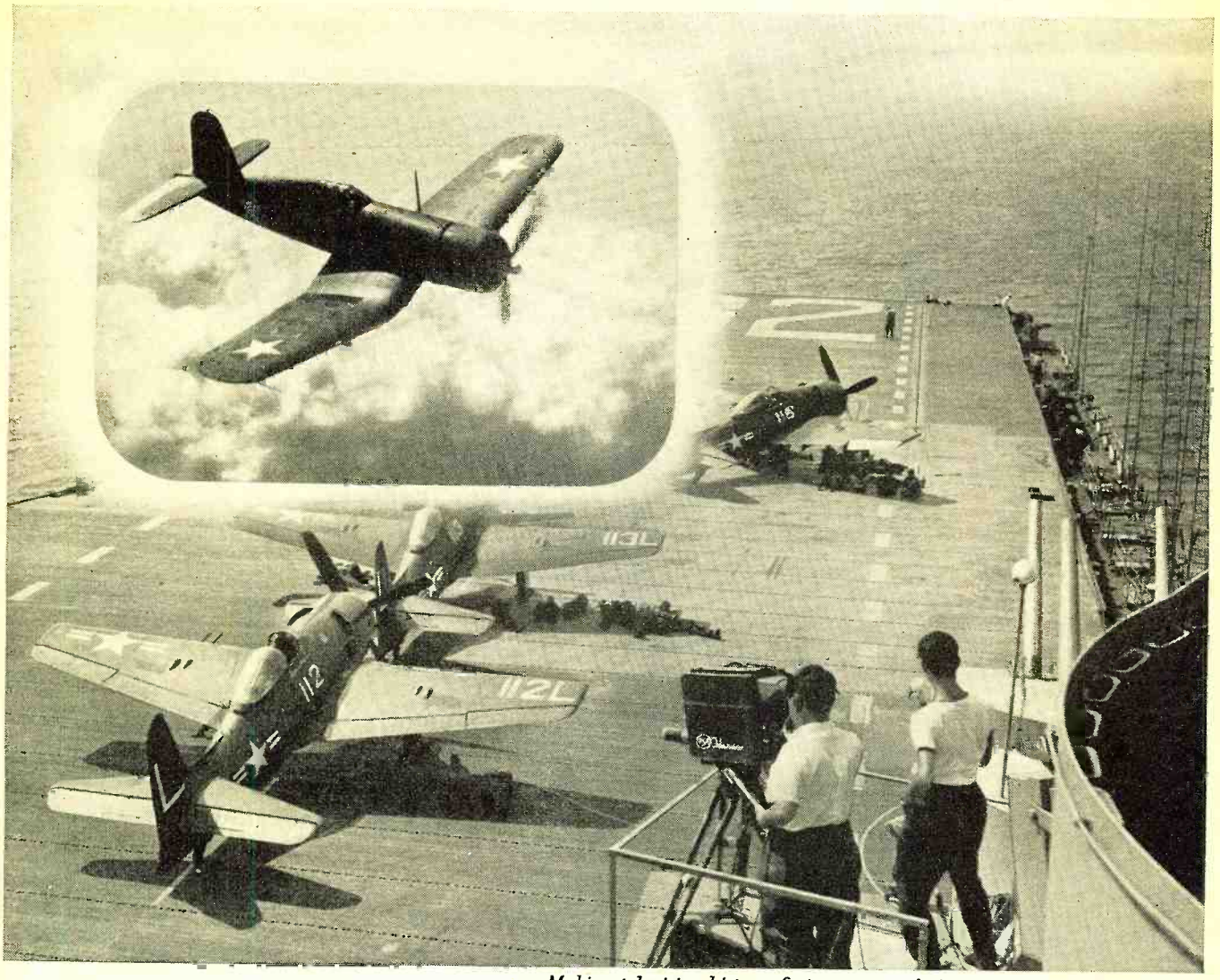

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Action was beamed by radio to shore, then relayed over NBC's Eastern television network. Watchers at maneuvers found reception sharp and clear on home television receivers . . .

Said high officials: "The strategic importance of television in naval, military, or air operations was dramatically revealed" . . . "There is no doubt that television will serve in the fields of intelligence and combat."

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By RADIO & TELEVISION NEWS' WASHINGTON EDITOR

TV AND MOBILE RADIO have become stellar attractions at the U. S. Department of Commerce auditoriums in Washington, and appear to be heading for a record-breaking stay, with quite a celebrated audience assured at all performances. Originally scheduled for the usual three or four day hearing, the TV sessions revolving about the use of the ultra-high and present band channels, suddenly became embroiled in a web of technical problems, and it became obvious that weeks and perhaps months would pass before official FCC verdicts could be readied.

The ultra-high testimony revealed several opinions on the practicability of the 475-890 mc. channels at present. In the report of JTAC (the recently formed Joint Technical Advisory Committee, serving the IRE and RMA) the consensus was that tremendous powers, probably up to 2000 kw., would be required in the higher bands to achieve the 500/5000-microvolt coverage used as a standard in low-band TV. No tubes were available to produce such power at present, JTAC indicated, and quite a stretch of time will be required to design, develop, and manufacture this complex type of tube. Commenting on the high-power tubes developed during the war, the committee stated that these tubes were designed not only for intermittent operation, but with little consideration for fidelity, an extremely important factor in telecasting. It was the committee's opinion that the present 12 channels should be continued as the backbone of black and white TV and that extensive experiments be carried on in the ultra-high bands to permit eventual use of the lower portion of the high bands, now reserved for color, for black and white, and then perhaps the upper portion of high bands for color work.

In another analysis of the problem, Harold E. Sorg, director of research for *Eitel-McCullough,* declared that high-power tubes of the 50-kw. variety could be made available soon for the lower portion of the ultra-high bands and used effectively with high-gain antennas to provide the super powers required for coverage. And within one to two years, 50-kw. tubes could also be produced for the upper portion of the ultra-high bands (650 to 890 mc.), Sorg indicated.

Extremely pertinent data on the ultra-high situation was also offered by former FCC chief engineer George P. Adair, who discussed his tests on 600 mc. with W6XJD in San Francisco, California. Describing his transmitter, Adair said that a 3C22 was used in the last stage with 106 watts supplied to the plate circuit. The transmitting antenna was a radar type consisting of eight vertical dipoles with a gain of approximately 14 db. over an isotropic antenna or a power gain of approximately 15.4 over a single half-wave dipole. This resulted in an effective radiated power in the maximum of the major lobe of approximately 1000 watts.

Commenting on his results, Adair said that the shadow effect at 600 mc. was more pronounced than in the present band, but reception beyond line of sight was not impossible. He pointed out that in one case, it was possible to receive a signal 25 miles away, even though within four blocks of the transmitter there was a hill considerably higher than the transmitting antenna. The tests also revealed that ghosts were not a serious problem, corner reflectors serving as effective eliminators in most instances. Trees were quite troublesome during the tests, and it became apparent that ultra-high frequency receiving antennas will have to be elevated above trees, even though the distance to the trees is a half mile or more.

Analyzing standards in the ultra-high bands, Adair said that the question of standards is in many ways more important than propagation.

"In the past it has been necessary to adopt standards of allocation as well as system standards before sufficient study could be made of the problems," Adair said. "Admittedly there is a serious shortage of channels, but this shortage is not so great as to warrant adoption of standards which will for all time handicap TV in the ultra-high band.

"It is not being suggested that development in the ultra-high band be delayed but it is being suggested that all interested proceed with the development as rapidly as possible, consistent with the adoption of basic standards that will provide the best balance between available channels and technical quality of service, both with respect to the areas and populations served, and the best picture and sound, whether monochrome or color.

"There is no doubt that regardless

of what is done with respect to the ultra-high band, investment in television in the lower bands is already so great that there will be television on all or at least a good percentage of the lower bands for a long time to come. Therefore it is unrealistic to talk of any immediate abandonment of channels 2 to 13."

In another ultra-high test report, George H. Brown of *RCA Labs* revealed results obtained during the *RCA-NBC* 510-mc. experiments from Washington, which supported in the main the JTAC views that extremely high power is necesary in the high bands for satisfactory coverage. Brown stated that measurements made at over forty receiving locations indicated that radiated power of 1200 kw. would be required to produce a signal strength at half of the locations equal to that being received from low-band WNBW, and that at 70 per-cent of the locations, a 5000-kw. signal would be required for effective listening. The evaluation process will continue, Brown declared, with 100 or more receiving locations being established to study ultra-high characteristics. The transmitter being used for these high-band tests was described as the basic or *green* transmitter which can be used in color TV work.

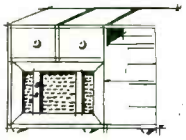
Former FCC Commissioner T. A. A. Craven, representing the *Cowles Broadcasting Company,* presented a unique allocation plan, which would provide for sixty-eight 6-mc. channels within the 500 to 890-mc. band, distributed among the smaller communities having but 25,000 population. Lower power transmitters would be used in this approach.

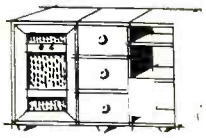
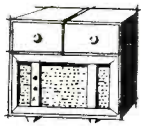
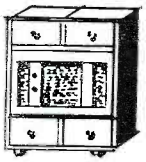
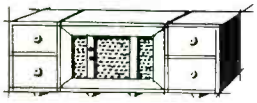
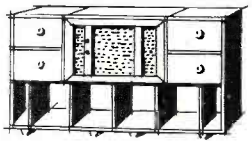
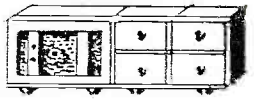
The Craven plan was similar to the *DuMont* idea, submitted by Thomas T. Goldsmith which suggested the immediate use of the ultra-high bands in those areas beyond the major trading areas now allocated, with about five channels per city to provide a competitive service.

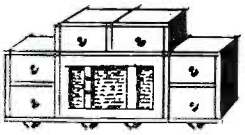
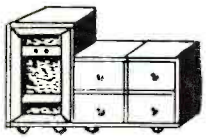
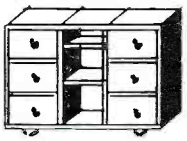
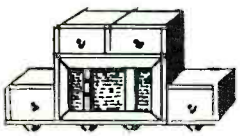
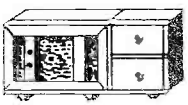
A WEEK BEFORE the ultra-high meeting took place, the Commission listened to testimony on the 2 to 13-channel allocation problem and the troposphere again loomed as a major factor. As cited a few months ago, Tom Goldsmith of *DuMont* had found that it will become more and more difficult to allocate and assure a minimum of interference unless the tropospheric effects are carefully considered. Commenting on this transmission characteristic, which appears to make it necessary to increase co-channel and adjacent channel separation to avoid tropospheric interference effects, Kenneth Norton of the Bureau of Standards said that the present spacing of co-channel stations 150 miles apart should be extended to 250 miles and adjacent channel separation be increased from 75 miles to about 125 miles.

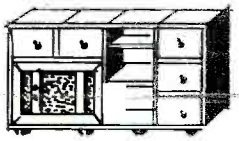
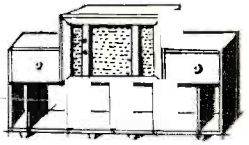
George Adair indicated that it was too late to consider the problem in

(*Continued on page* 156)



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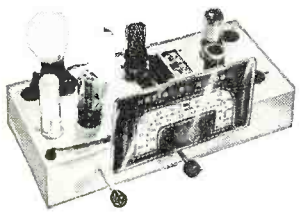

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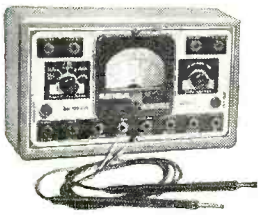

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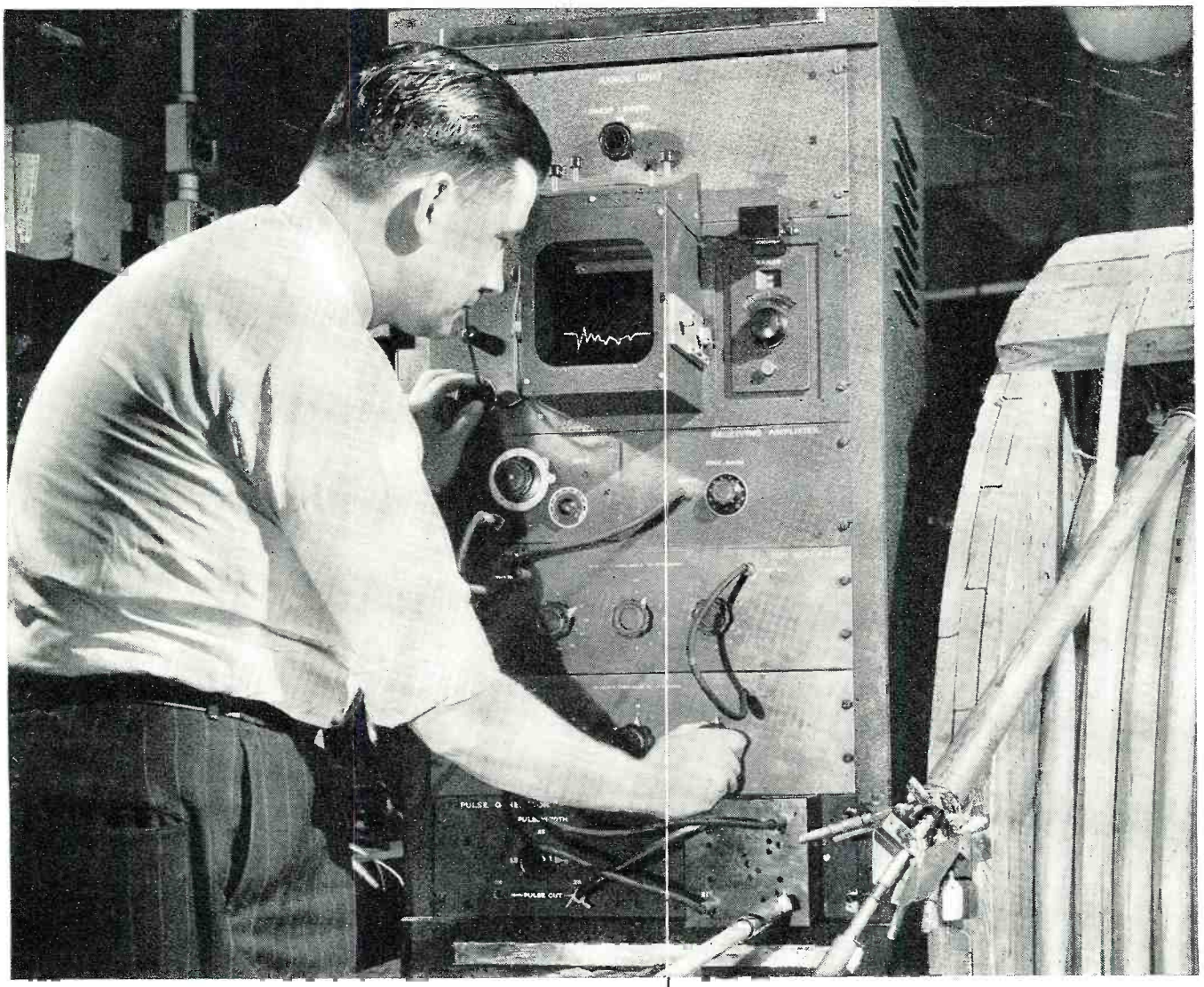

He asks an echo

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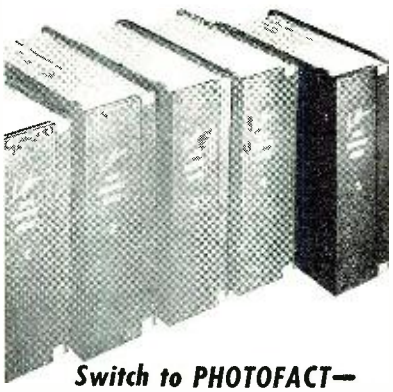

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Vol. 4. Covers models from Jan. 1, 1948 to July 1, 1948
Vol. 3. Covers models from July 1, 1947 to Jan. 1, 1948
Vol. 2. Covers models from Jan. 1, 1947 to July 1, 1947
Vol. 1. Covers all postwar models up to Jan. 1, 1947

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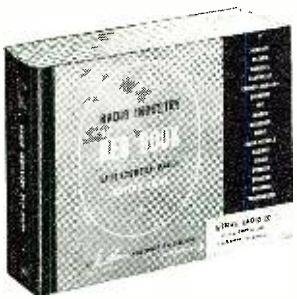

The Radio Industry RED BOOK

NOW—stop wasteful hunting through dozens of incomplete parts manuals. The RED BOOK tells you *in one volume* what you need to know about replacement parts for approximately 17,000 sets made from 1938 to 1948. Includes complete, accurate listings of all 9 major replacement components—not just one. Lists correct replacement parts made by 17 leading manufacturers—not just one. Covers original parts numbers, proper replacement numbers and valuable installation notes on: Capacitors, Transformers, Controls, IF'S, Speakers, Vibrators, Phono-Cartridges. *Plus*—Tube and Dial Light data, and Battery replacement data. 448 pages, 8½ x 11; sewed durable binding. ONLY..... **$3.95**

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Shows you exactly where to replace each tube in 5500 radio models, covering 1938 to 1947 receivers. Each tube layout is illustrated by a clear, accurate diagram. Saves time—eliminates risky hit-and-miss methods. 192 pages; handy index. ONLY.. **$1.25**

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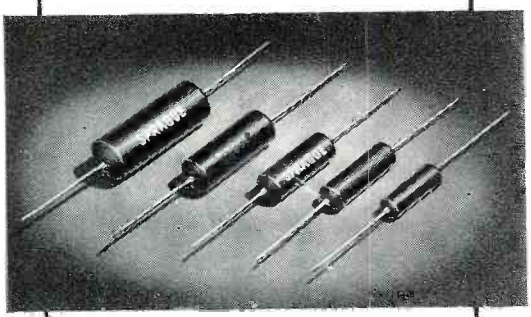

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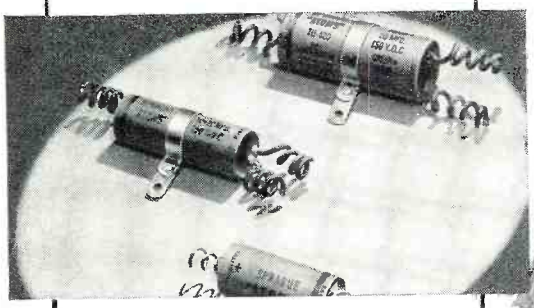

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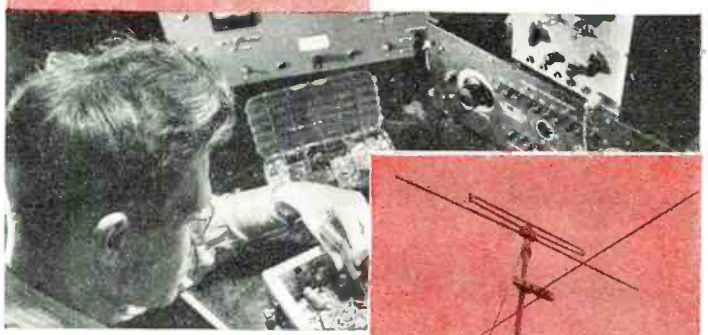
Practical New Home Study Course Teaches You to Install & Service TELEVISION and FM RECEIVERS



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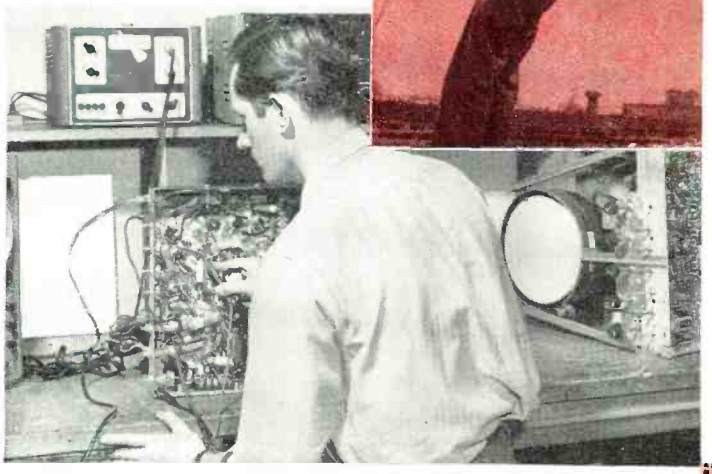

IF **TELEVISION** installation and repair is over your head, before many months roll by you'll be as obsolete as a variable grid leak or a 201-A tube! The shop without qualified FM or TV repairmen might as well close up and sell apples . . . because the repair business will go to the men with ability to do a scientific servicing job on EVERY KIND of receiver. The most conservative estimates indicate that about 800,000 TV sets will be produced this year—and experts tell us that within 4 or 5 years there'll be some 11,000,000 in use. FM figures are equally impressive: there will be 4,000,000 more radios with FM as we enter 1949.

There are thousands of good radio repairmen who don't know a blanking pedestal from a kinescope. For them, and for the man with limited experience who has real ambition and inherent ability, CREI's new practical course in Television and FM Servicing can mean **security** and increased income. The course was developed by the experienced educators and technical men who have made CREI famous for home study and residence school radio-electronic training. It is designed to teach what you need to know to install and repair TV and FM sets. It won't make you a television engineer—it won't make you a million dollars overnight. But it will give you systematic methods for FM—TV installation and maintenance; knowledge of TV fundamentals; lessons in basic radio math, meters, lenses and mirrors, inductive coupling and condensers at ultra-high frequencies; practical application of resonant circuits; TV tubes; FM receiver alignment, TV antennae; picture synchronization; TV trouble-shooting—and much more.

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Within the INDUSTRY

A. J. NELSON of Denver has been appointed manufacturer's representative for *Air King Products Co., Inc.*, Brooklyn manufacturer of radios, combinations, wire recorders, and television receivers.

As representative for *Air King*, Mr. Nelson will cover the states of New Mexico, Colorado, Wyoming, Montana, Idaho, Utah, and the trading area of El Paso, Texas.

Mr. Nelson served as a captain in the Signal Corps and served as a communications officer from 1941 to 1945 when he reverted to his inactive status in the Army.

* * *

W. N. GOODWIN, JR. recently retired from his post of vice-president in charge of research and engineering for *Weston Electrical Instrument Corporation* after 50 years' service with the organization.

He was presented a combination television set by his associates at ceremonies at which Edward F. West, chairman of the board, and Earl R. Mellen, president, presided.

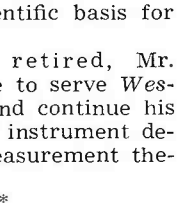
Joining the organization in 1898, after graduation from the University of Pennsylvania, Mr. Goodwin was selected, in 1906, by Dr. Edwin Weston, the founder, as chief engineer and director of research, and was eventually elected vice-president in charge of research and enginering.

During the years 1904-1908 Mr. Goodwin developed the basic mathematical equations for instrument design thus placing the manufacture of instruments on a scientific basis for the first time.

Although officially retired, Mr. Goodwin will continue to serve *Weston* as a consultant and continue his studies in the field of instrument design and advanced measurement theory.

* * *

GEORGE F. MURPHY has been appointed manager of the Equipment Development Works of *General Electric Company's* Electronics Department.



In this capacity, Mr. Murphy will head the activity which is responsible for the design and development of machinery and equipment for the department's manufacturing operations. Reporting to W. M. Barker, manager of manufacturing for the department, Mr. Murphy will have his headquarters in Schenectady.

Mr. Murphy has been employed by the company at Schenectady since 1913.

* * *

S. JOSEPH FERLA has been appointed to the post of New England District manager for *Operadio Manufacturing Co.* of St. Charles, Illinois.

Mr. Ferla received his electronics training at Tri-State College and advanced training at Cruft Laboratories at Harvard University. During the early part of the war, Mr. Ferla was connected with the War Department as a civilian engineer at Fort Knox. As the war progressed he joined the Armed Forces and served in the Psychological Warfare Division where he earned his captaincy.

* * *

JACK CHERRY is the new sales manager of *Philco Corporation's* Service and Parts Division.

During his 14 years' service with the company Mr. Cherry has served in various capacities. He started in the factory organization shortly after graduating from high school and became a field service engineer in 1939.

During the war, he was a supervisor of the radar-radio field engineers of *Philco* Service Division who served in all parts of the world. In 1945, Mr. Cherry was appointed a district sales representative handling sales of electrical appliance parts and accessories in Atlanta. Two years later, he was promoted to the position of field service supervisor for the company with headquarters in Philadelphia.

* * *

JOHN W. WALT has been appointed sales promotion manager of *Webster-Chicago Corporation* of Chicago.

Mr. Walt was formerly sales supervisor for the company's line of nylon needles. In his new position he will supervise sales promotion of the full line of *Webster-Chicago* products including wire recorders, record changers, and nylon phonograph needles.

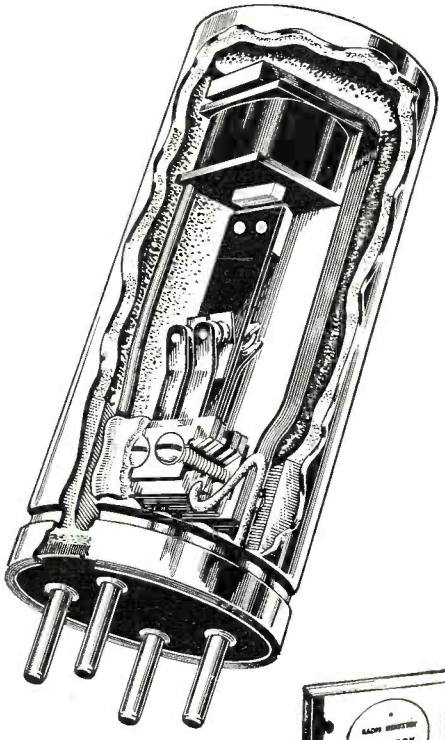
Formerly associated with *RCA, Westinghouse,* and *Associated Products, Inc.,* Mr. Walt joined *Webster-Chicago* a year ago.

* * *

LESLIE J. WOODS has been elected to the post of vice-president of *Philco Corporation's* Industrial Division.

The Industrial Division handles the development and sale of *Philco* auto-

As another year draws to its close, we pause in retrospect of what has gone behind . . . and think wishfully of what is yet to come. To all our friends we are anxious to extend the very warmest greetings of the seasons. It is our sincere wish that this holiday season hold every gladness for you and yours. And may the New Year ahead be one rich in happiness. Our thanks to you for past business favors, and your help in even further establishing the name RADIART VIBRATORS as the leader in the field. It is our pledge to continue to deliver the best in vibrators -- to keep faith with you — and your customers.



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mobile radios to the motor car industry and also sales of aircraft radio and radar equipment to the Armed Forces as well as industrial electronic and communications equipment developed and manufactured by the corporation.

Mr. Woods has been associated with *Philco* since 1925 in various engineering and sales positions. For the three years prior to the war, Mr. Woods was in Detroit with the Auto Radio Division and was made manager of the division in 1941. At the outbreak of war he was transferred to Washington to help direct *Philco's* war work. In 1942 he became vice-president and general manager of *National Union Radio Corporation*, at that time a *Philco* subsidiary. Following the war, Mr. Woods returned to *Philco* as manager of the company's Industrial Division.

* * *

BENJAMIN P. SHIRO is the new plant manager for *Stromberg-Carlson Company's* Erie, Pennsylvania plant which manufactures table radios and radio-phonographs.

Mr. Shiro was graduated in electrical engineering from the University of Chicago in 1924. He has been closely connected with the radio industry ever since, specializing in circuit and chassis design. He spent seven years in the engineering department at *Noblitt-Sparks Industries* and during the war was plant manager of the company's directional finding systems division.

He joined *Stromberg-Carlson* in 1944 to take charge of cabinet design, leaving a year later to found his own business which now manufactures transformers for the radio industry. He resigned as general manager a short time ago to return to *Stromberg-Carlson* while retaining a financial interest in the company he formed.

* * *

COLONIAL TELEVISION CORPORATION has officially announced a change in corporate name to *Vidcraft Television Corporation* with general offices at 780 East 137th Street, New York 54.

According to the company's president, Alfred Emerson, the change was made to avoid a conflict with another major manufacturer in electronics whose name is similar.

The *Colonial Television Corporation* was founded in December of 1946.

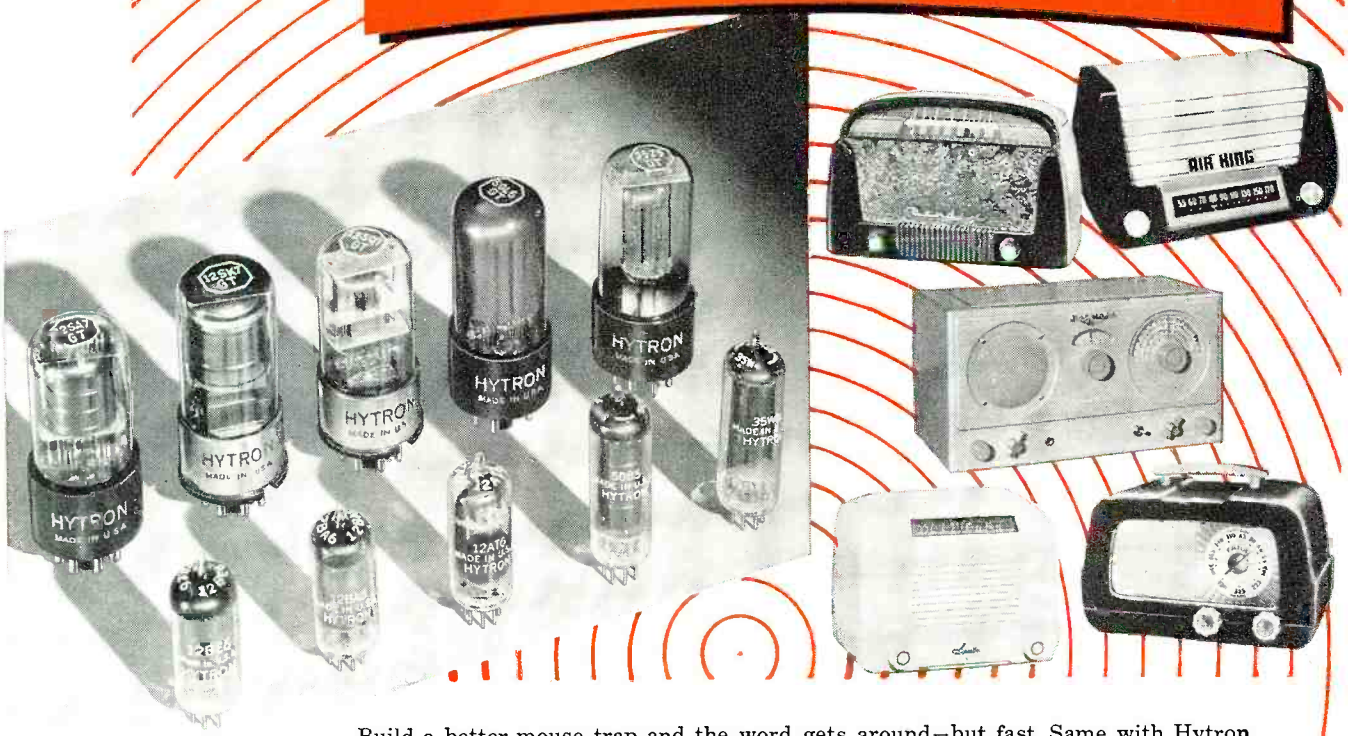
* * *

ADMIRAL CORPORATION of Chicago recently completed a two-story brick annex to its television equipment manufacturing plant which will allow an estimated 20 per-cent increase in production.

The first floor of the new building, constructed at a cost of $400,000, will be occupied by the cabinet storage and assembly department. The service section and radio parts assembly line will utilize the second floor space. The

(*Continued on page* 131)

The ALL-AMERICAN FIVE and HYTRON go together



Build a better mouse trap and the word gets around—but fast. Same with Hytron a-c/d-c tubes. Many years of experience. Many millions of tubes. Constant engineering co-operation with dozens of prominent radio set manufacturers. All help make Hytron a-c/d-c tubes better. Make it natural to think of Hytron when you think of the All-American Five.

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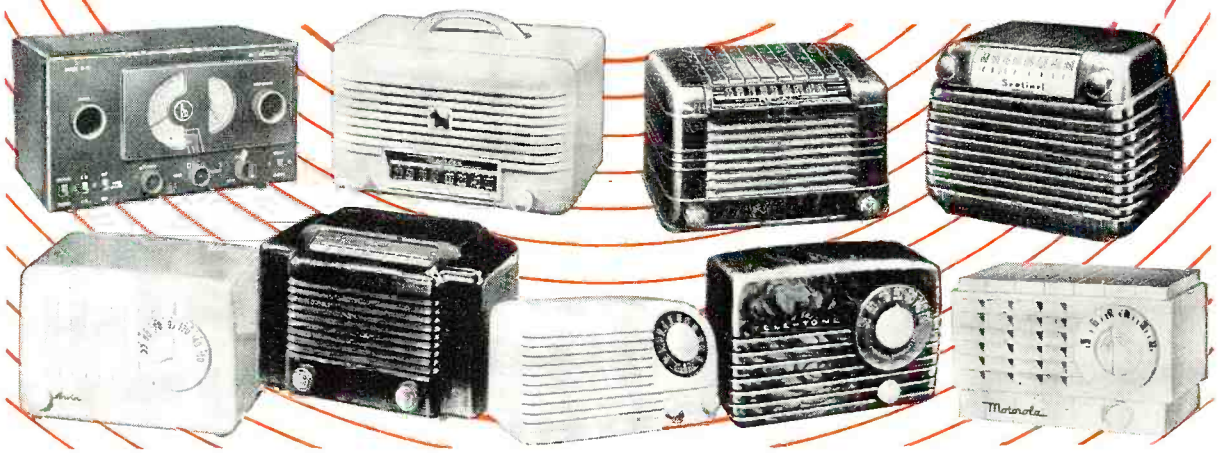

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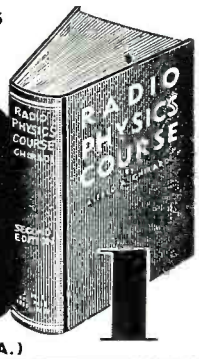

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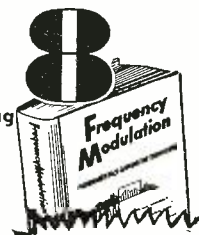

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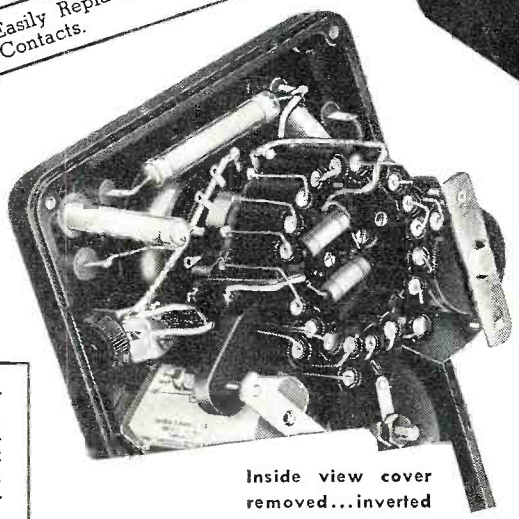

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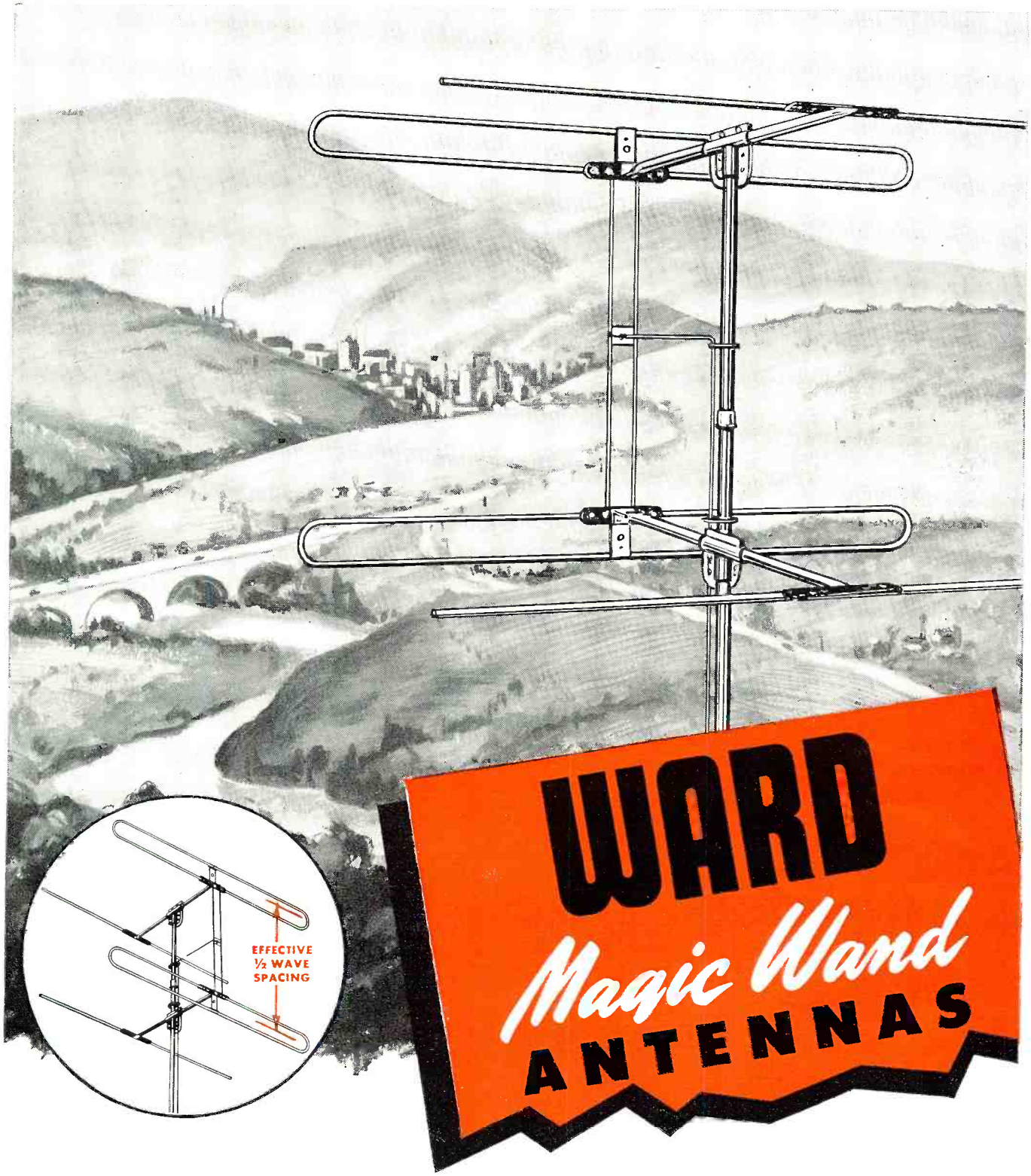

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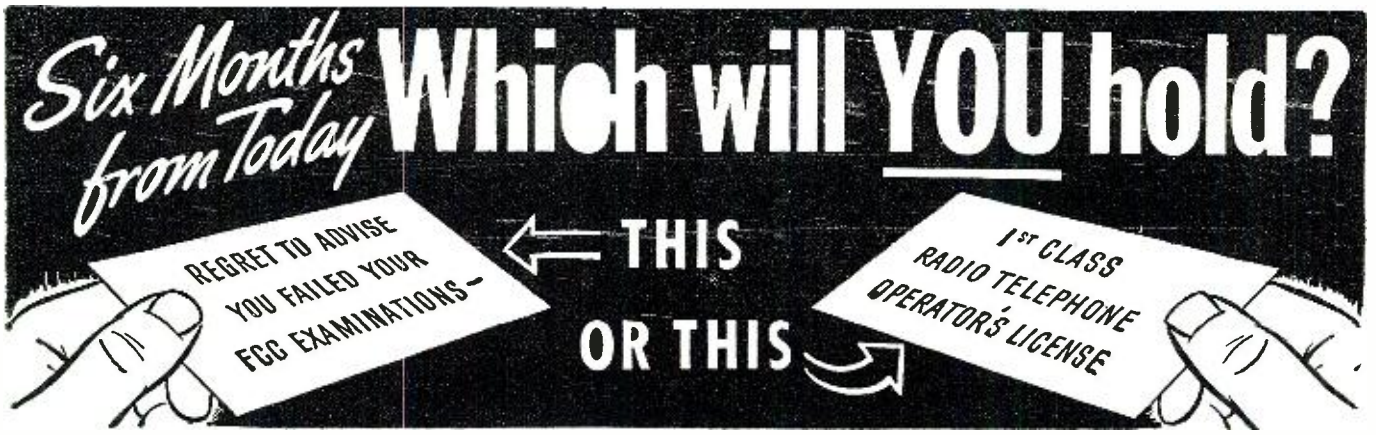

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"I was issued license Number P-2-11188 on November 4, 1947 at New York, N. Y. The next day I was signed on board a tanker as Radio (telegraph) Operator/Purser. Besides radio operating on board ship I handle the payrolls, etc., which is all over-time and brings my monthly pay up to between $500 and $650."
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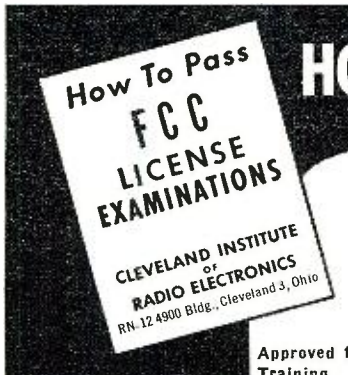

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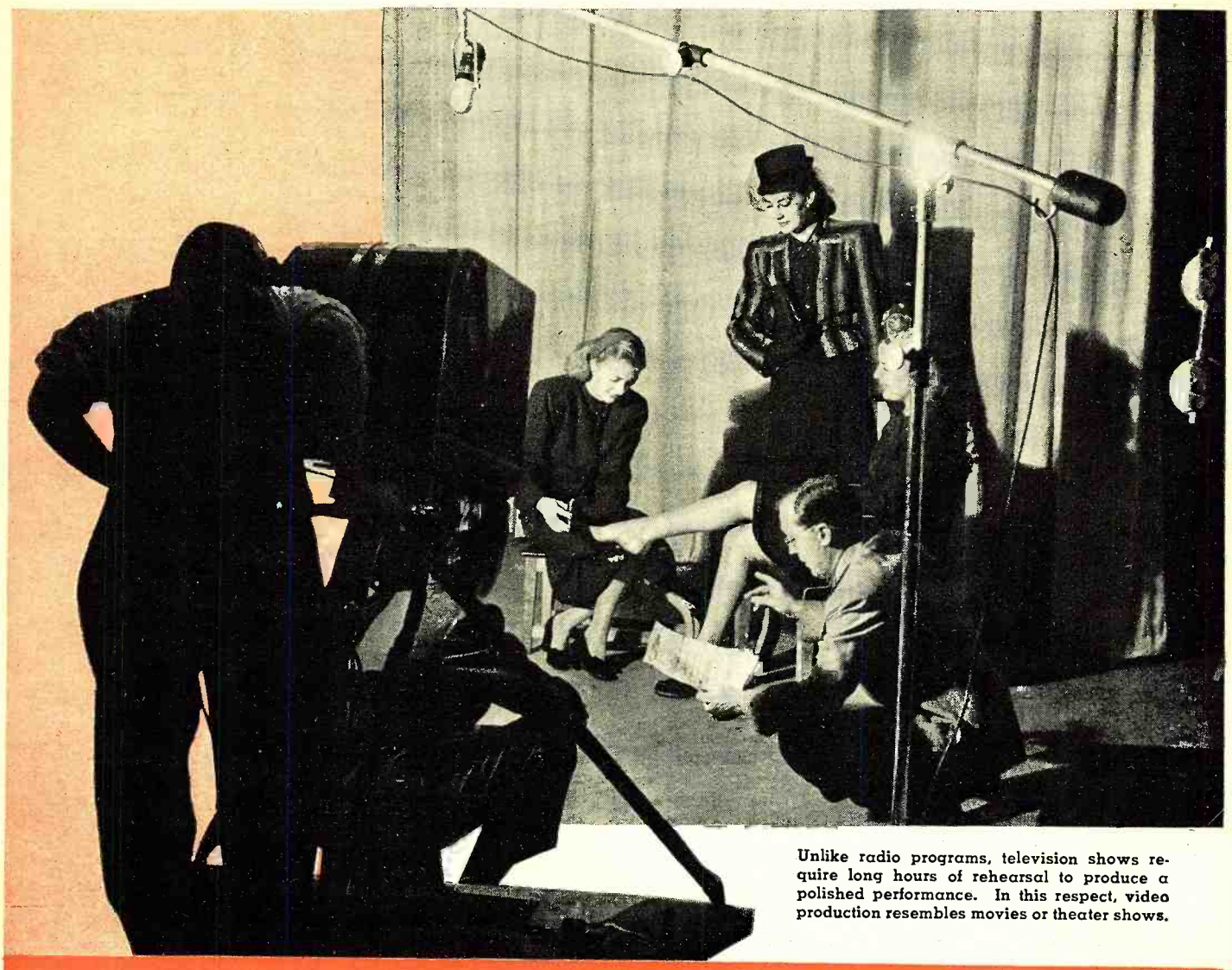


Unlike radio programs, television shows require long hours of rehearsal to produce a polished performance. In this respect, video production resembles movies or theater shows.

1948 - Year Of Television Progress

By
TOM GOOTÉE

An up-to-the-minute survey of existing and proposed TV facilities, receiver production, and market data.

THE arrival of television on the American Scene is as certain a success as it is sudden. Only a few years ago considered a technical possibility, today television is an accomplished fact—rapidly spreading from coast-to-coast to become a permanent part of everyday life. This is an exciting period of expansion, since television is destined soon to become a billion-dollar industry, ranking among the top ten of the nation.

Television is on the march. Recent progress in the development of broadcasting facilities and in the manufacture and distribution of TV receivers has been phenomenal. Although presently confined to the 22 large metropolitan areas which are serviced by one or more TV broadcasting stations, nearly 600,000 receivers are now in operation in homes, taverns, and other public places—according to RMA production and sales reports, current surveys, and reports from other reliable sources. More than 75,000 sets are expected to be produced during the month of November by a total of 78 different manufacturers. Seven new manufacturers are scheduled to start production of TV receivers during December and January.

Despite greatly increased production, however, the current demand for television sets far exceeds the available supply! This demand is virtually restricted to 22 urban areas. When other areas are serviced by new TV stations soon to go on the air, the demand for receivers may be of record-making magnitude.

The usefulness of any television receiver is primarily determined by the number of TV stations operating in the vicinity—within about 50 or 60

GEOGRAPHICAL SURVEY OF TELEVISION BROADCASTING STATIONS

(ON THE AIR AS OF NOVEMBER 1, 1948)

Location	Call	Channel	Ownership
CALIFORNIA			
Los Angeles	KFI-TV	9	E. C. Anthony
Los Angeles	KLAC-TV	13	KMTR Radio Corp.
Los Angeles	KTLA	5	Paramount
Los Angeles	KTSL	2	Don Lee Broadcasting
CONNECTICUT			
New Haven	WNHC-TV	6	Elm City Broadcasting
DISTRICT OF COLUMBIA			
Washington	WMAL-TV	7	Evening Star
Washington	WNBW	4	NBC
Washington	WTTG	5	DuMont
GEORGIA			
Atlanta	WAGA-TV	5	Fort Industry
ILLINOIS			
Chicago	WBKB	4	Balaban & Katz
Chicago	WENR-TV	7	ABC
Chicago	WGN-TV	9	Chicago Tribune
MARYLAND			
Baltimore	WBAL-TV	11	Hearst Radio
Baltimore	WMAR-TV	2	Sunpapers
MASSACHUSETTS			
Boston	WBZ-TV	4	Westinghouse
Boston	WNAC-TV	7	Yankee Network
MICHIGAN			
Detroit	WJBK-TV	2	Fort Industry
Detroit	WWJ-TV	4	Evening News
Detroit	WXYZ-TV	7	King Trendel Broadcasting
MINNESOTA			
St. Paul	KSTP-TV	5	KSTP, Inc.
MISSOURI			
St. Louis	KSD-TV	5	Post Dispatch
NEW JERSEY			
Newark	WATV	13	Bremer Broadcasting
NEW YORK			
Buffalo	WBEN-TV	4	Evening News
New York	WABD	5	DuMont
New York	WCBS-TV	2	CBS
New York	WJZ-TV	7	ABC
New York	WNBT	4	NBC
New York	WPIX	11	Daily News
Schenectady	WRGB	4	General Electric
OHIO			
Cincinnati	WLWT	4	Crosley
Cleveland	WEWS	5	Scripps-Howard
Cleveland	WNBK	4	NBC
Toledo	WSPD-TV	13	Fort Industry
PENNSYLVANIA			
Philadelphia	WCAU-TV	10	Phila. Bulletin
Philadelphia	WFIL-TV	6	Phila. Inquirer
Philadelphia	WPTZ	3	Philco
TENNESSEE			
Memphis	WMCT	4	Memphis Publ. Co.
TEXAS			
Fort Worth	WBAP-TV	5	Star Telegram
UTAH			
Salt Lake City	KDYL-TV	2	Intermountain
VIRGINIA			
Richmond	WTVR	6	Havens & Martin
WISCONSIN			
Milwaukee	WTMJ-TV	3	Milwaukee Journal

Table 1.

miles—of the receiving site. Stations at greater distances normally cannot be seen or heard satisfactorily with even the most expensive sets. For this reason, the owner of a set in Cleveland, for example, cannot receive programs direct from the TV stations in New York or Chicago. Similarly, a television set is useless in any small town, or in any rural district, which is beyond the normal range (about 50 to 60 miles) of TV transmitters operating in large cities and metropolitan areas.

This inherent limitation of every TV receiver—regardless of make or price—can only be overcome by the construction of more and more *local* TV broadcasting stations within range of such receivers. Within one year (December 1949), at least one TV station will be operating in all cities of fairly large population. In thickly populated metropolitan areas—such as New York, Chicago, and Los Angeles—as many as five TV stations will be in operation. But potential televiewers in isolated rural districts, in remote mountainous regions, and even in some small cities may not see-and-hear TV programs for six or seven years (post-1955). This might be due to either (or both) of two reasons: (1) the enormously high cost of operating a TV station, or (2) the lack of an available TV channel to be authorized by the FCC.

Television receivers are normally not sold in regions or areas which are not serviced by TV broadcasting stations. Once a station has been placed in operation in a new area, however, market-wise distributors and sales organizations are quick to provide TV sets capable of receiving programs from the station.

The newest thing in portable pick-up equipment for television is this General Electric mobile TV truck which provides complete facilities for on-the-spot telecasting.

Status of Stations

Unlike the early days of radio broadcasting with haywire equipment and low-cost operation, running a modern television station is no shoestring enterprise. Every new TV broadcasting station invariably requires an initial investment of close to *one million dollars* for transmitter and technical equipment, suitable studios, lighting and other facilities—long before actual operations commence.

Despite this economic hazard, more and more TV stations are being constructed in principal cities all across the country. As of November 1st, 1948, there were 42 stations operating on regular schedules and averaging about 25 hours per week on the air. A geographical survey of these stations is given in Table 1 with data on the assigned call letters, channel number, and ownership of each station.

This by no means constitutes the eventual total of TV stations operating on channels 2 through 13.

Construction permits have been granted by the FCC for an *additional* 87 TV stations, and at present these are in various stages of completion. A survey of these stations *now under construction* is given in Table 2 with an indication of the approximate date each station is expected to go on the air with scheduled programs.

Of immediate concern to owners *and to potential owners* of television receivers are the TV stations now on the air (see Table 1). Of future concern are the TV stations now under construction (see Table 2), which constitute the *only* stations likely to be constructed at the designated locations *for a period of at least two years.*

Upon completion, all of the stations now under construction will be authorized to operate on their assigned channels as indicated in Table 2. There is a possibility that no other TV stations will ever be assigned or authorized to operate on any of the channels 2 through 13. The reason for this is the extremely crowded condition of the twelve standard television channels, coupled with the fact that interference problems are increasing, requiring greater spacing between co-channel and adjacent-channel stations.

Future Stations

As early as January, 1948, it was evident that the channels originally

earmarked for television transmission were insufficient in number to accommodate all future stations. Despite the fact that TV signals are *normally* limited in range to about 50 or 60 miles, there is sporadic image interference between two stations using the same channel even when the two stations are separated by a considerable distance—exceeding several hundred miles. To further complicate the problem of channel allocation, more and more applications to construct new TV stations began to pour into the FCC offices in Washington.

In line with the continued expansion of the entire television industry, month by month the number of station applications increased at an alarming rate. Finally, on September 30th, 1948, with a backfile of 303 station applications still pending, the FCC officially "froze" the granting of further construction permits for a period of six months: until March 31st, 1949. Some idea of the magnitude of this chaotic condition is indicated by the graphs in Fig. 2.

This abrupt suspension of action on the huge number of pending or prospective applications was the immediate result of a technical hearing held by the FCC in Washington a week earlier, at which time technical experts representing all of the leading television corporations advanced the plea for utilizing ultra-high frequency channels *in addition to* the presently assigned channels 2 through 13.

Any shift to the higher frequencies would provide about 34 new television channels in the frequency band between 475 and 890 megacycles. Because of the nature of radio waves at such high frequencies, such a shift is more easily talked about than accomplished. Before channels in the band could be utilized effectively, entirely new techniques of generating and transmitting a television signal must be developed *and perfected* using altogether different types of tubes and other technical equipment. For the same reason, reception of channels in the ultra-high region would require TV receivers of an entirely new design. Present-day TV sets are incapable of receiving such signals, and would be limited to reception of only the channels 2 through 13.

The mechanics of incorporating the proposed ultra-high frequency channels are long and tedious, however. Even longer will be required to develop suitable tubes, transmitters, and receivers for operation in the 475-890 mc band. It is unlikely that a shift to the high frequencies could be accomplished in less than two years, and probably it will take much longer.

Television Reception

Despite future consequences of any shift to high-frequency channels, the boom in television transmitters and receivers continues unabated. An indication of the accelerated production of receiving sets is shown by the figures in Table 5 which presents *total* production and which was obtained by carefully evaluating data from reliable sources. A total production of 748,367 receivers will be reached early in October; by the end of the month almost 860,000 sets will have been made.

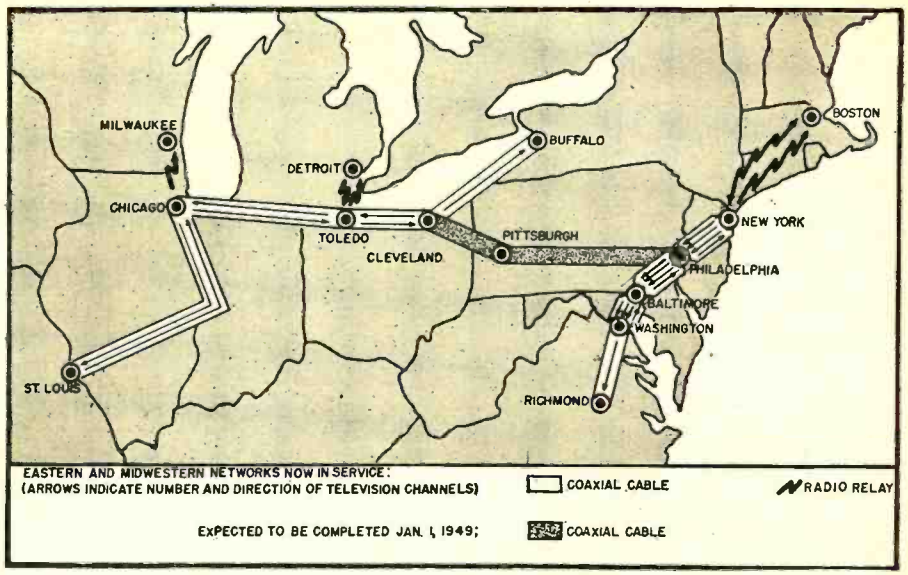


Fig. 1. Bell System TV network map showing coaxial cable and relay facilities as of Nov. 1948.

Table 2.

GEOGRAPHICAL SURVEY OF TELEVISION BROADCASTING STATIONS UNDER CONSTRUCTION

(ALL STATIONS LISTED WERE GRANTED FCC CONSTRUCTION PERMITS PRIOR TO SEPTEMBER 30, 1948)

Location	Call	Channel	Expected to Go on Air
ALABAMA			
Birmingham	WAFM-TV	13	Indefinite
Birmingham	WBRC-TV	4	July, 1949
ARIZONA			
Phoenix	KTLX	5	Indefinite
CALIFORNIA			
Los Angeles	KECA-TV	7	Dec., 1948
Los Angeles	KNBH	4	Dec., 1948
Los Angeles	KTTV	11	Indefinite
Riverside	KARO	13	Spring 1949
San Diego	KFMB-TV	8	Indefinite
San Francisco	KGO-TV	7	Jan., 1949
San Francisco	KPIX	5	Dec., 1948
San Francisco	KRON-TV	4	Dec., 1948
Stockton	KGDM-TV	8	Indefinite
DELAWARE			
Wilmington	WDEL-TV	7	Dec., 1948
DISTRICT OF COLUMBIA			
Washington	WOIC	9	Jan., 1949
FLORIDA			
Jacksonville	WJAX-TV	2	Late 1949
Jacksonville	WJHP-TV	8	Indefinite
Jacksonville	WMBR-TV	4	Late 1949
Jacksonville	WPDQ-TV	6	Fall 1949
Miami	WTVJ	4	Spring 1949
St. Petersburg	WSEE	7	Late 1949
GEORGIA			
Atlanta	WCON-TV	2	Fall 1949
Atlanta	WSB-TV	8	Fall 1949
ILLINOIS			
Chicago	WNBQ	5	Dec., 1948
Peoria	WEEK-TV	12	Indefinite
Peoria	WMBD-TV	6	Fall 1949
Rock Island	WHBF-TV	4	Indefinite
INDIANA			
Bloomington	WTTV	10	Spring 1949
Indianapolis	WFBM-TV	6	Spring 1949
Indianapolis	WUTV	3	Jan., 1949
IOWA			
Ames	WOI-TV	4	Fall 1949
Davenport	WOC-TV	5	Indefinite
KENTUCKY			
Louisville	WHAS-TV	9	May, 1949
Louisville	WAVE-TV	5	Dec., 1948
LOUISIANA			
New Orleans	WDSU-TV	6	Jan., 1949
New Orleans	WRTV	4	Dec., 1948
New Orleans	WTPS-TV	7	Fall 1949
MARYLAND			
Baltimore	WAAM-TV	13	Nov. 2, 1948
MASSACHUSETTS			
Waltham	WRTB	2	Early 1950
MICHIGAN			
Grand Rapids	WLAV-TV	7	Fall 1949
Kalamazoo	WKZO-TV	3	Indefinite
Lansing	WJIM-TV	6	Fall 1949
MINNESOTA			
Minneapolis]	KTRV	9	Spring 1949
Minneapolis	WTCN-TV	4	Spring 1949
MISSOURI			
Kansas City	WDAF-TV	4	Fall 1949
NEBRASKA			
Omaha	KMA-TV	3	Jan., 1949
Omaha	WOW-TV	6	Spring 1949
NEW MEXICO			
Albuquerque	KOB-TV	4	Dec., 1948
NEW YORK			
Binghamton	WNBF-TV	12	Indefinite
New York	WOR-TV	9	Spring 1949
Rochester	WHTM	6	Early 1950
Rome	WKAL-TV	13	Indefinite
Syracuse	WJTV	8	Fall 1949
Syracuse	WTTE	5	Indefinite
Syracuse	WAGE-TV	10	Fall 1949
Utica	WVTL	3	Indefinite
NORTH CAROLINA			
Charlotte	WBT-TV	3	Fall 1949
Greensboro	WTLE	2	Indefinite
OHIO			
Cincinnati	WKRC-TV	11	Spring 1949
Cincinnati	WCPO-TV	7	March, 1949
Cleveland	WXEL	9	Fall 1949
Columbus	WLWC	3	Dec., 1948
Columbus	WTVN	6	Spring 1949
Columbus	WBNT	10	Fall 1949
Dayton	WLWD	5	Dec., 1948
Dayton	WHIO-TV	13	Fall 1949
OKLAHOMA			
Oklahoma City	WKY-TV	4	Indefinite
Tulsa	KOVB	6	Fall 1949
OREGON			
Portland	KTVU	3	Indefinite
PENNSYLVANIA			
Erie	WICU	12	Dec., 1948
Johnstown	WJAC-TV	13	Fall 1949
Lancaster	WGAL-TV	4	Jan., 1949
Pittsburgh	WDTV	3	Dec., 1948
RHODE ISLAND			
Providence	WJAR-TV	11	Feb., 1949
TENNESSEE			
Nashville	WSM-TV	4	Fall 1949

TELEVISION RECEIVER INSTALLATIONS IN PRINCIPAL MARKET AREAS

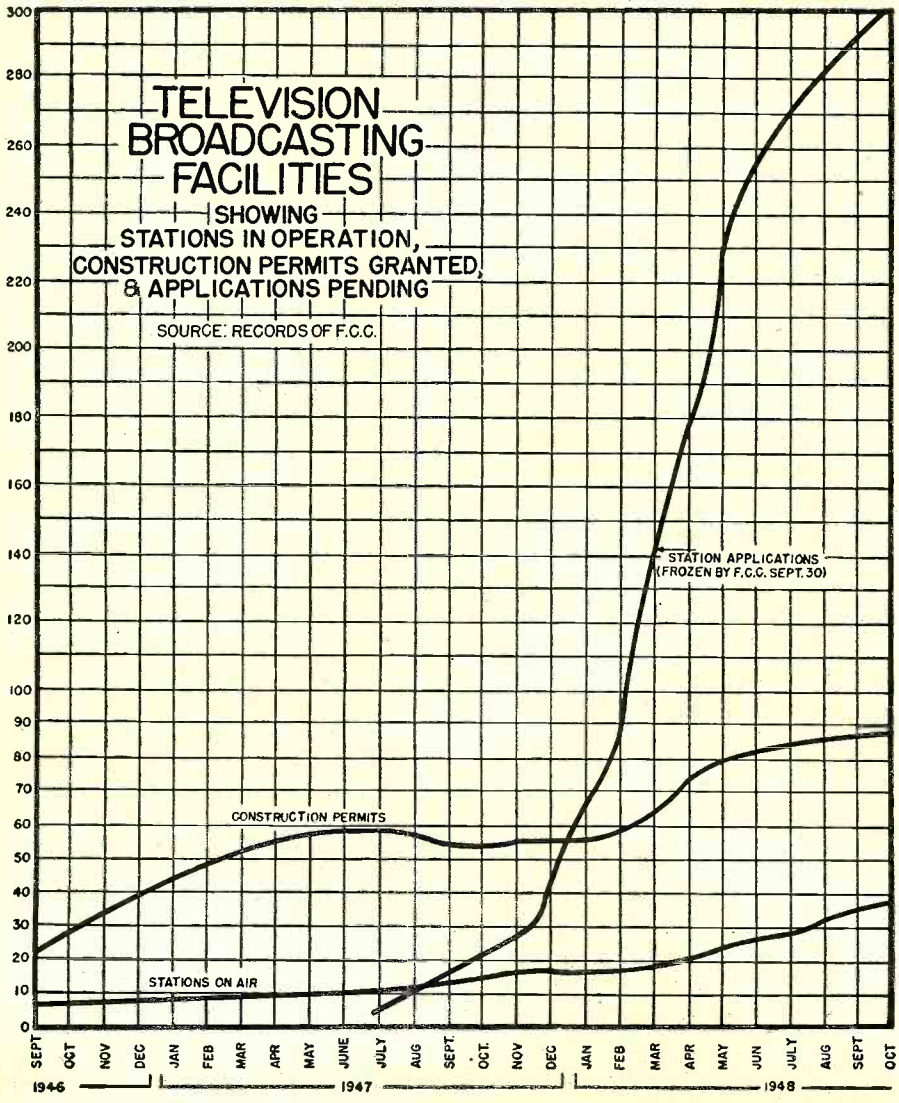
(Based on RMA and non-RMA production reports, compilations of independent research bureaus, dealer-distributor estimates, and reports from unofficial but reliable sources. As of November 1, 1948)

MARKET AREA	TOTAL TV SETS	HOMES	PUBLIC PLACES	OTHERS*
New York-New Jersey	285,300	261,650	17,300	6,350
Philadelphia	77,500	72,300	3,700	1,500
Chicago	41,650	32,850	7,500	1,300
Los Angeles-Hollywood	38,200	34,150	3,400	650
Washington	24,050	22,250	1,350	450
Baltimore	23,750	20,900	2,350	500
Boston	21,600	16,300	5,150	150
Detroit	12,900	9,350	3,350	200
Cleveland-Akron	11,350	8,450	2,650	250
St. Louis	10,100	7,600	2,350	150
Bridgeport-New Haven	9,800	8,300	1,450	50
Schenectady-Troy	7,350	6,250	1,000	100
Milwaukee	6,200	4,900	1,150	150
St. Paul-Minneapolis	6,100	5,450	600	50
Cincinnati	5,900	4,200	1,600	100
Buffalo	4,750	2,550	2,150	50
Richmond	2,400	2,150	250	—
Toledo	1,850	1,660	190	—
Atlanta	1,600	1,400	200	—
Dallas-Ft. Worth	1,150	950	200	—
Salt Lake City	750	600	150	—
Memphis	Figures not available			
TOTALS	594,250	524,210	58,040	12,000

* Includes installations in offices, hospitals, and private locations other than homes.

Table 3.

Fig. 2. Chart showing stations on the air, construction permits, and TV station applications.



An analysis of the distribution of TV receivers is given in Table 3, according to the principal market areas as of November 1st, 1948. The total known or verified TV installations are divided appropriately according to (1) homes, (2) taverns and public places, and (3) all other installations.

Receiver Production

Currently available to consumers are 197 different models of 1948-1949 TV receivers, ranging in (list) price from $99.00 to as much as $5000.00 for custom-built sets. Average list price of all existing models is approximately $700.00. More indicative of price trends, however, is the *average sale price* based on total sales of TV sets. During the spring of 1948 the average sale price of a television receiver was $502.00. But during the latter part of 1948 (October-November) the average sale price dropped to $375.00.

This downward trend can be attributed partly to lower list prices on some models, which in turn are due to more efficient manufacturing and distribution processes by the companies concerned. This usually comes about following a "shake down" period of from three to four months after a new set *or a new manufacturer* goes into full production. With TV sales volume sweeping upward (see Table 5) there is no immediate likelihood of competitive price slashing among established lines.

Although some economies in engineering design have been achieved in recent months, there remains the biggest single cost factor in TV receivers —the delicate, hypersensitive picture tube. An acute shortage of these tubes is the main bottleneck in present receiver production. Stockpiles of these tubes no longer exist, and the industry is now completely dependent upon current tube-production sources. These sources are inadequate because of the inability of the glass industry to keep up with the demand for blank envelopes necessary in the manufacture of TV picture tubes.

Of the 197 different existing receiver models, only 22 utilize image projection or reflection. Largest direct-view tube used is the 20-inch type 20BP4; smallest used is the 3-inch type 3KP4. Total number of all tubes range from 16 in the smallest sets to as many as 48 tubes in the console-combination models.

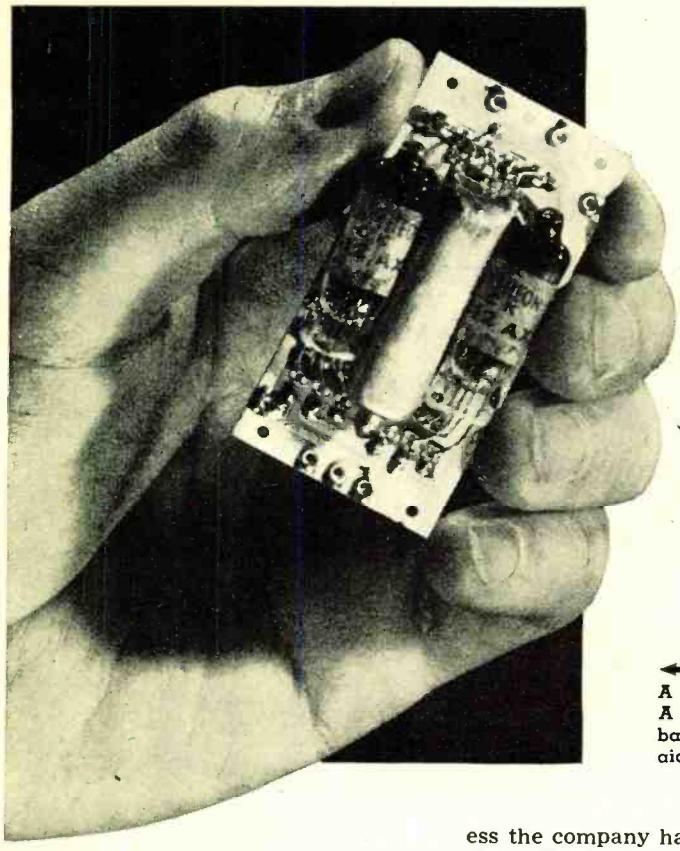
Large-screen television sets are popular in large living rooms, and in taverns and other public places. But small-screen receivers are a practical necessity in small living rooms, or locations where space is at a premium. The current sales volume of sets with relatively small viewing screens confirms this fact.

TV Programs

Retarded primarily by economic reasons, progress in TV station programming has fallen far behind TV technological progress.

Programs can be grouped into two

(*Continued on page* 173)



Printed Circuits Pass Rigid Laboratory Tests

New printed circuit techniques are past the experimental stage. They have proven practical particularly in units where space is at a premium.

A typical example of Centralab's Printed Electronic Circuit, A complete, 3-stage audio amplifier is printed on a ceramic base. Printed circuit techniques can be used for hearing aids, mike preamplifiers, and many other electronic devices.

THE production of Printed Electronic Circuits for industrial applications has now reached the point where many of these units are being incorporated in commercially-built hearing aids, electronic control equipment, and as sectional sub-assemblies in radio sets, television receivers, intercommunication devices, and in automotive test equipment. The cover picture on this month's issue of RADIO & TELEVISION NEWS shows a portion of *Centralab's* development and test laboratory for Printed Electronic Circuits. Don Zunker, one of *Centralab's* engineers, is shown testing a new amplifier which incorporates Printed Electronic Circuits.

The art of reducing electronic circuits consisting of wiring, condensers, and resistors to occupy the smallest possible physical volume, where the third dimension is practically eliminated, has come to be known as Printed Electronic Circuits (PEC).

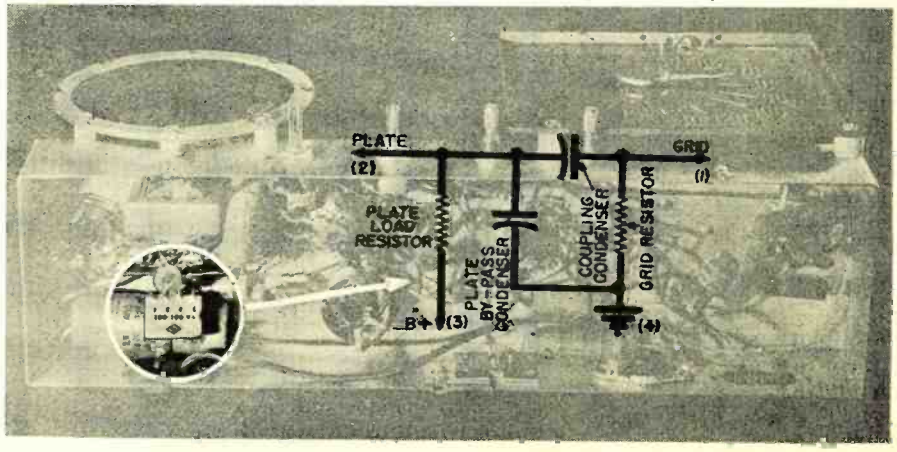
Centralab pioneered this process prior to World War II, as the normal production procedures used in the construction of their products were the essential techniques (wiring, resistoring and condensers) combined to produce Printed Electronic Circuits (PEC).

The first technique of PEC is the application of silver, or wiring, to a ceramic base. This is a refinement of the age old art of firing metal to ceramics, used at *Centralab* in the manufacture of ceramic resistors and ceramic condensers. The second technique is the application of resistance material to phenolic or ceramic insulation, again a refinement of a process the company has used successfully since 1922 in the manufacture of variable resistors. The third process is the use of high dielectric constant ceramic materials—pioneered by *Centralab* in the manufacture of ceramic condensers. The combination of all three techniques made it possible during the war to reduce the size of electronic circuits used in a proximity mortar fuze. This project was presented to the company by the Ordnance Division of the National Bureau of Standards, and by close collaboration it was possible to produce a small, light, and thoroughly dependable unit. The practicality and dependability of units produced by this method was demonstrated and definitely proved by this war project. It is only natural that this technique should be translated into the now many peacetime applications in electronics where physical size and mass weight must be small, and the reliability of the circuit function high.

Like all new processes, it has been slow to reach the market, in spite of the excellent record established during its wartime use. It is justifiably necessary for a manufacturer to prove that PEC meets all the rigid operating conditions of his product. Thus, there has been a period of two years since the war's termination, in which the process has been introduced to the electronic industry in various forms, and the proving time for many of these products has drawn to a close. PEC is now available to the general public in hearing aids, electronic control equipment, and as sectional sub-assemblies—time saving devices for manufacturers—in ordinary radio sets, television, intercommunication devices, and automotive test equipment. PEC

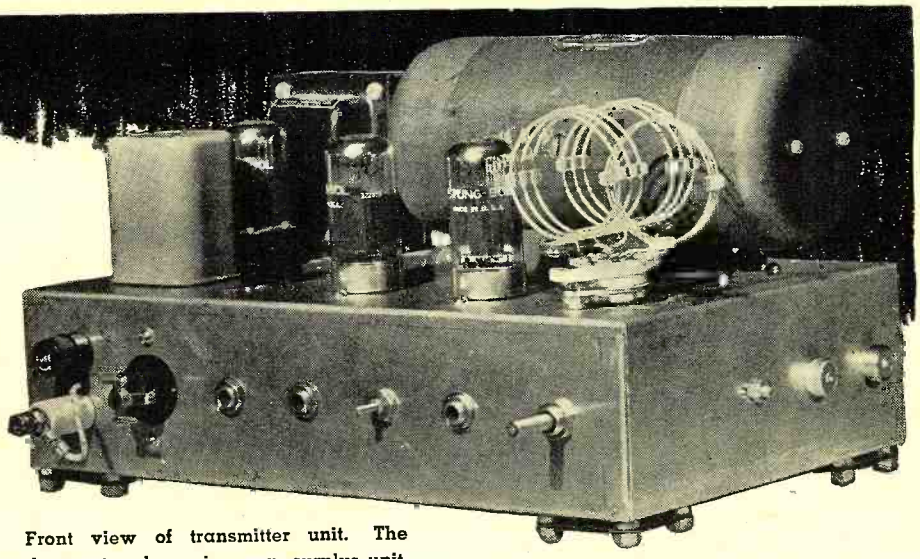
(*Continued on page* 130)

Printed electronic circuits are being used in full-sized as well as miniature equipment. The circled section shows a printed interstage coupling network used in one of Sonora's home receivers. The circuit diagram shows components incorporated in unit.



A Low-Cost Mobile Station

By
ROBERT LEWIS, W8MQU



Front view of transmitter unit. The dynamotor shown is a war surplus unit.

Part 2. Construction details for a 10-11 meter transmitter. The companion converter unit, for use with any auto radio, was covered last month.

AS WE promised in the November issue of RADIO & TELEVISION NEWS, we present a low-power mobile transmitter designed especially to accompany the home-made converter covered in November.

First let us examine the circuit of the little rig. Three tubes, all 7C5's, are used; one as a tri-tet crystal oscillator, one as a class C neutralized amplifier, and the third as a modulator. The oscillator uses a 20-meter crystal with the plate circuit tuned to the second harmonic in the 10-meter band. For the information of those not familiar with the 7C5, this tube is the lock-in equivalent of the popular 6V6GT. The main reason for using the 7C5 in the rig was its superior base insulation at high frequencies.

It will be noted that the circuit is extremely simple and straightforward, and that a minimum of parts are used. Starting with the oscillator, note that no tuning condenser is used in the plate circuit. Instead, a *National* XR50 slug-tuned coil is used, the tuning being done by varying the inductance. The output capacitance of the oscillator and input capacitance of the final amplifier are sufficient to make a tuning condenser unnecessary. Naturally the slug-tuned coil will retain its adjustment much better than a variable condenser.

The final amplifier is coupled to the oscillator by means of a variable mica trimmer condenser, which is set as low as possible to load the oscillator lightly and still permit adequate excitation—about half maximum capacity appears to be optimum. A split tank is used in the final amplifier plate circuit, in conjunction with a standard variable-link coil. Observation of the circuit will show that no r.f. chokes were used. Due to the low power used, along with the high resistance of the grid resistors and low driving requirements of the final, it was deemed unnecessary to use chokes in these circuits. All r.f. circuits are well bypassed where necessary.

The usual quarter-wave whip antenna was used with the rig, fed with RG29-U 52-ohm low-loss coaxial cable. A variable condenser having a maximum capacity of 100 $\mu\mu$fd. was inserted in series with the ground side of the coupling coil for the purpose of tuning out any reactance in the antenna circuit. The use of this condenser in any mobile rig is highly recommended.

Only one tube, a 7C5, is used in the audio section of the mobile rig. Average single-button carbon microphones, operating through mike-to-grid transformers, provide plenty of signal for full modulator output. Of course close talking is necessary to get full gain, but this is desirable when operating mobile because of the high noise level. The popular T17B service microphone is being used with the writer's rig. Button current is obtained from the car battery through an isolating filter consisting of a 100 ohm resistor and a 50 μfd. electrolytic condenser. First tests without any filter resulted in some noise getting into the microphone circuit. Incidentally, it might be suggested that the polarity of the electrolytic condenser be observed carefully in consideration of the fact that some cars have the positive side of the battery grounded, while others have the negative side connected to the frame. The microphone input transformer may be any single-button to grid transformer.

A modulation transformer having a power rating of ten watts and primary and secondary impedances of 5000 ohms is used. Jacks are provided in each cathode circuit for measuring cathode currents. Filament voltage for all tubes, as well as relay coil voltage and microphone button current are supplied through a 6-volt lead from the converter.

Plate voltage is furnished by a surplus dynamotor which delivers 250 volts at 100 ma. when operated on a fully-charged 6-volt storage battery. The dynamotor was originally intended for 12-volt operation but was easily converted to 6 volts by connecting the two sections of the field in parallel instead of series as designed. Primary voltage for the dynamotor is supplied directly from the starter terminal of the car through a No. 4 conductor, a 10-ampere fuse, and of course the relay contacts. The relay used in the rig was one of the popular d.p.d.t., ceramic-insulated jobs available on the surplus market. The original coil, intended for 24-volt operation was removed, and the spool wound full of No. 28 enameled wire, providing a very nice 6-volt relay. The contacts are ¼ inch in diameter and rated at 10 amps at 110 volts a.c., so they should carry the dynamotor current with ease. The second set of contacts is used to transfer the antenna from receiver to transmitter when sending. The relay is mounted close to the antenna circuit components, as can be seen in the sub-chassis photo, so that the coaxial line is interrupted very little.

So much for the general outline of the little transmitter. For a mechanical description we refer to the photos. The top view shows the parts arranged

R_1—100,000 ohm, 1 w. res.
R_2—30,000 ohm, 1 w. res.
R_3—1750 ohm, 10 w. res.
R_4—8000 ohm, 1 w. res.
R_5—500,000 ohm, 1 w. res.
R_6—100 ohm, 1 w. res.
R_7—250 ohm, 1 w. res.
C_1—30 μμfd. ceramicon cond.
C_2, C_4, C_5, C_9—.01 μfd. mica cond.
C_3—3-30 μμfd. trimmer cond.
C_7—Neutralizing cond. (National Type 600)
C_8—Dual tuning cond. (National STD-50)
C_{10}—.001 μfd. mica cond.
C_{10}—100 μμfd. APC trimmer
C_{11}—50 μfd., 50 v. elec. cond. (forms microphone current filter with R_6)
C_{12}—10 μfd., 50 v. elec. cond.
C_{13}—2 μfd., 600 v. oil-filled paper cond.
F—10 ampere fuse (Type 3AG)
RL—D.p.d.t. relay, 6 v. coil, ceramic insulation, 1/4" contacts
T_1—Single microphone-to-grid input trans.
T_2—Mod. trans., 5000 ohm plate to 5000 ohm load
L_1—12 t. #14 wire, 1/2" diam., 3/4" long, self-supporting
L_2—14 t. wound to fill National XR50 permeability-tuned coil form (plate circuit of oscillator tuned to resonance by adjusting core)
L_3—B & W Junior JVL-10 coil
J_1, J_2, J_3—Closed circuit jack
Dynamotor—6 volt d.c. input, 250 v. at 100 ma. output. (G.E. surplus unit used in original job, converted from 12 v. to 6 v. In cars having negative side of battery grounded, primary connections must be reversed as well as the polarity of C_{11})
Crystal—20 meter crystal. Osc. plate tuned to 2nd harmonic
Terminal Connections—1—To connection No. 1 in converter. Supplies 6 volts for transmitter filaments, relay coil, microphone current. 2—To connection No. 2 in converter. Lights pilot light in converter when dynamotor is running. 3—To connection No. 3 in converter. Goes to remote control switch on microphone, other side of remote switch grounded. 4—To connection No. 4 in converter. Goes to microphone button. 5—To hot side of car battery or starter switch (use heaviest wire possible). 6—Coaxial connector. Goes to receiver antenna input. 7—Coaxial connector. Goes to quarter-wave antenna.

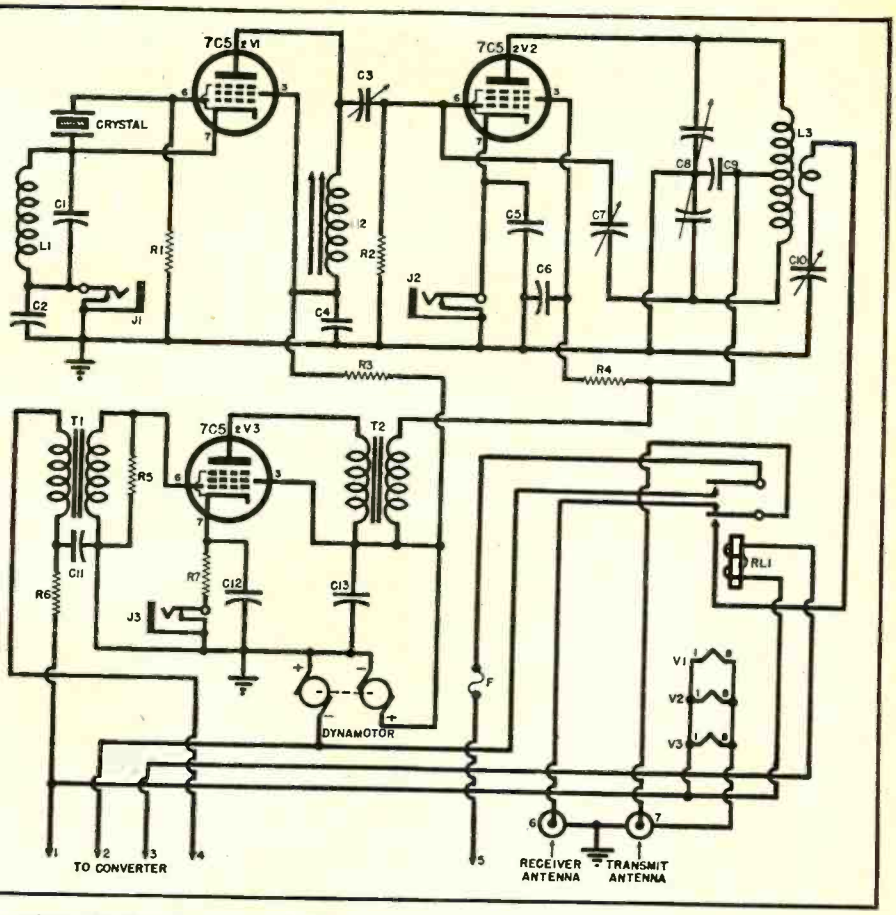


Fig. 1. Complete schematic diagram and parts list for mobile transmitter.

as follows: Left rear, modulation transformer; left center, 7C5 modulator; right rear, dynamotor. Lined up along the top at the front are the input transformer, crystal, 7C5 oscillator, 7C5 final amplifier, final tank coil. The right end, facing the camera, shows the antenna tuning condenser, and connectors for coaxial lines to antenna and receiver. From left to right on the front drop of the chassis are; fuse holder, 6-volt connector from battery, 4-prong *Jones* plug for remote-control cable, modulator cathode current jack, oscillator cathode current jack, oscillator plate tuning, final amplifier cathode current jack, and final tank tuning condenser.

The entire unit was built on a 12 x 8 x 3-inch aluminum chassis. If steel is used in similar jobs, it is advised that it be protected with paint or similar material, as bare steel would rust in short order in this type of service. A rubber shock mount is located at each corner of the chassis.

In wiring the unit, all d.c. leads were cabled and run in the corners, as shown. The r.f. leads, however, were run direct and with No. 14 solid wire. No r.f. leads are more than an inch or so long. Each bypass condenser was connected directly from its associated tube element to the nearest grounding point. Generous use of lock washers was made. This is good practice any time, but especially so in rigs which are subject to considerable vibration.

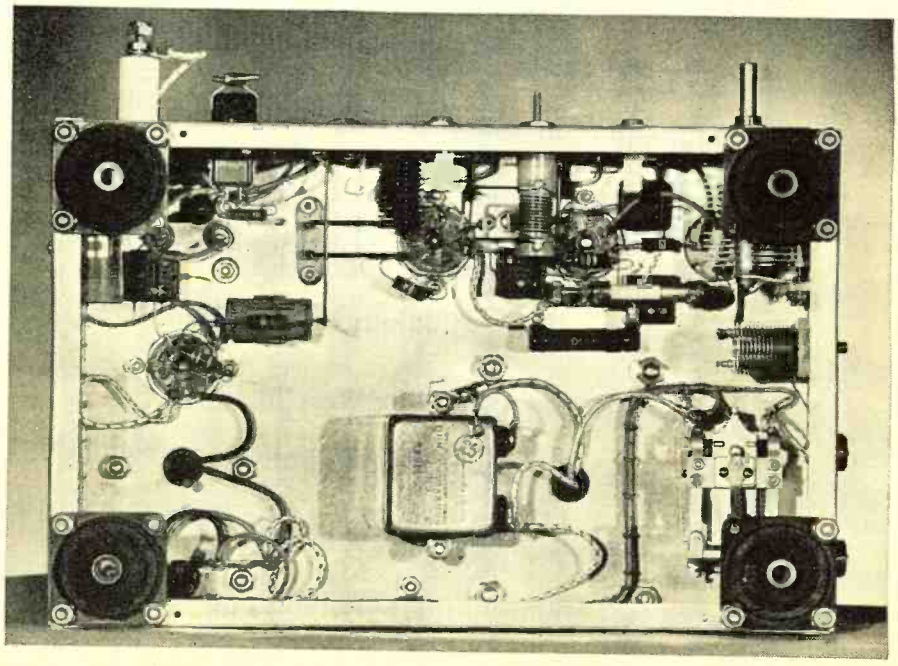
Number 20 stranded wire was used for all d.c. wiring except leads carrying dynamotor primary current, which are No. 10 stranded.

After construction was completed, the rig was tested in the car. On similar occasions, it might be more convenient to rent a battery or run heavy leads into the shack from the car and do the testing on the bench. After a preliminary check with the aid of an ohmmeter, the filaments and dynamotor were turned on.

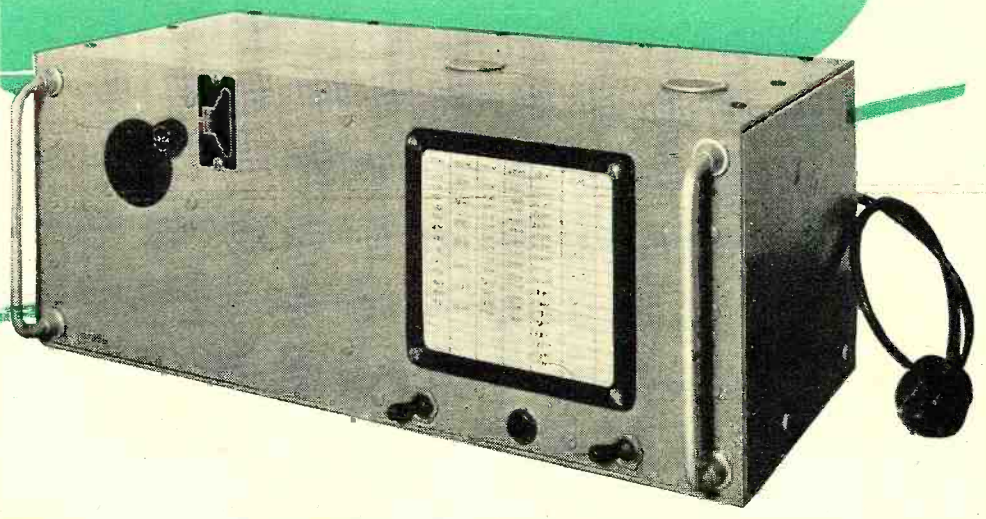
At this point it is wise to remove the plate and screen voltage from the final amplifier for neutralization. Insert a 20-meter crystal in the crystal socket and tune the oscillator inductance for

(*Continued on page* 177)

Under chassis view. Shock mounting for complete unit is advisable.



A Modern Variable FREQUENCY OSCILLATOR



Front view of a home-built v.f.o. which is constructed on a surplus TU-6B tuning unit aluminum framework.

By ROBERT C. MERRYMAN, W3FBB

A stable unit for the amateur which is based on the "Clapp" inductance-capacitance oscillator circuit.

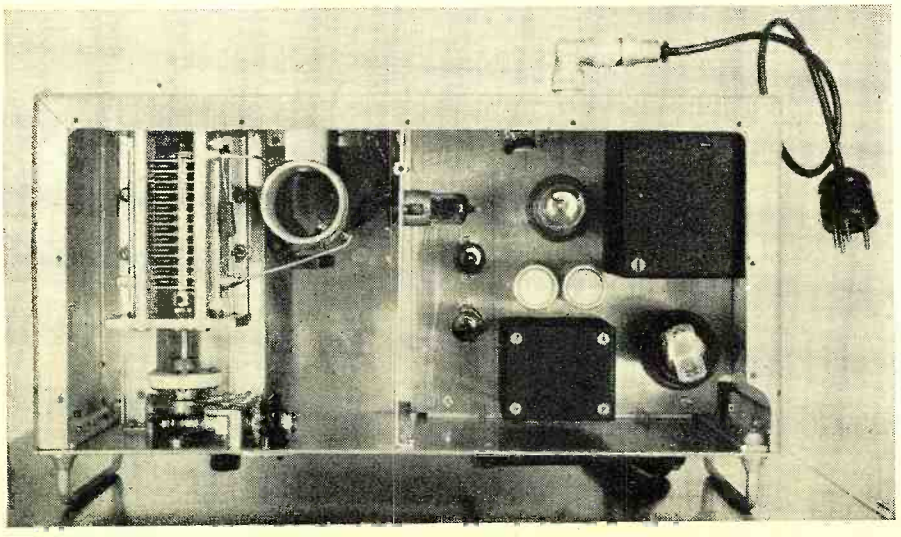
THIS article describes a variable frequency oscillator. More particularly, it describes a v.f.o. of exceptional stability, and of utmost simplicity.

It is well-known by those amatéurs working in our ever crowded ham bands that in order to have a decent ratio of calls to contacts, when using transmitters of modest power, and sometimes not too efficient antenna systems, that some means for varying the frequency within a given band should be used.

There are two possible ways of accomplishing this. First, crystal control with a plurality of crystals, using switching methods to cut them in and out of the circuit, and secondly, the more modern way, using a variable frequency oscillator.

The writer has heretofore leaned toward crystal control because of stability, but of late, realized that in my particular setup, namely, low power and an inside antenna, a v.f.o. would afford more contacts. With this in mind, I undertook a study of the v.f.o. art, as disclosed in the numerous magazines and handbooks, with the idea of picking out the salient features of all the various types of v.f.o.'s, and building up a unit that would be a composite "crystal substitute."

Top chassis view of the home-built v.f.o. Spacing of parts plays an important role in insuring complete stability under all operating conditions.



One article by J. K. Clapp, which appeared in the March 1948 issue of the *Proceedings of the I.R.E.*, entitled "An Inductance-Capacitance Oscillator of Unusual Frequency Stability," seemed to be what I was seeking. This oscillator proposed by Mr. Clapp, is quite similar to the Colpitts circuit, although utilizing an *L-C* series circuit in place of the inductor. The stability of this circuit depends to some extent on rigidity of construction and the temperature coefficient of the frequency determining components. However, frequency variations due to temperature changes will generally be found to be far less in this circuit than in conventional circuits now in common use.

The Clapp article was just what we were looking for, and we decided to build up our unit around the Clapp oscillator. A 6C4 miniature triode was decided on for the oscillator, and two 6AQ5's for the isolation stages. These isolation stages were added to minimize any tendency toward reaction on the oscillator. For break-in operation the oscillator, along with the first isolation stage, is keyed. The second isolation stage has additional cathode bias to keep the dissipation down during key-up periods. This stage is also provided with a switch, S_2, in the "B plus" lead to facilitate spotting frequencies, without putting the carrier on the air. This, of course, is accom-

plished by cutting the plate voltage from the output stage by means of switch S_2, and holding the key down. Another way of doing this would be to use a d.p.d.t. switch for S_2, and arranging it so that when the "B plus" is off, the key jack J_1 is shorted. However, not having a d.p.d.t. switch handy, I have to go through two motions to obtain the same results.

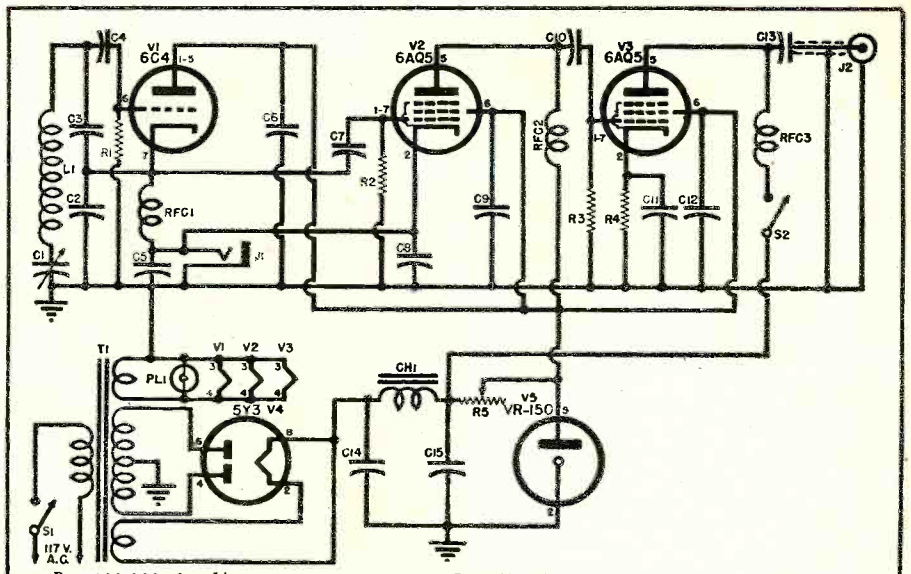
The unit described is built up in an aluminum frame that originally housed a TU-6B tuning unit of the surplus variety. A new front panel, together with bottom and top covers, was formed from 3/32" aluminum. The original panel served as a template for marking the numerous screw holes, and the cut-out for the worm gear tuning drive. Three additional holes were marked along the bottom right hand side to accommodate the two switches and the pilot light socket. When these holes were drilled and cut out, the panel was mounted in place and the various parts mounted thereon. The two handles and the calibration chart frame from the original unit were added to the panel to dress it up a bit. The partition dividing the frame in half was found to afford an excellent place to mount the 6C4 tube so as to have the socket portion in the condenser-coil compartment, making for short leads, and yet have the heat dissipating part of the tube in the right hand compartment, where the heat would have little or no effect.

The variable condenser, the capacity of which is probably around 150 $\mu\mu$fd., is the condenser used in the TU-6B. The coil, however, is wound on a 1¾" steatite grooved form, and consists of 24 turns of No. 18 silver plated wire. This is fastened to the rear wall of the frame by means of two pillar type insulators.

A subchassis of 3/32" aluminum was cut and mounted near the bottom of the right hand compartment by small aluminum angles, and supports the power supply components, together with the two 6AQ5 isolation stages. An *Amphenol* coax plug J_2 is fastened on the right hand side of the back wall, and provides means for coupling the output to the rig. This is done by fastening a five-prong male socket connector to one end of a short length of coax cable, and an *Amphenol* male connector to the other end. Also on the back wall, holes are drilled for the line cord and the key jack J_1.

The power supply furnishes 150 volts to the plates of the 6C4 and the first 6AQ5, and screen voltage for both 6AQ5's through the VR-150 regulator tube. The second 6AQ5 plate voltage is supplied direct from the filter output, and is approximately 300 volts.

After the unit is wired and tested, it should "kick off" immediately as there is nothing tricky about the circuit. The top and bottom plates are fastened in place by means of machine screws. Rubber feet are added to prevent the unit from scratching the receiver, where it reposes, and also to afford a small amount of shock mounting. The top has vent plugs or screens so that the heat generated by the tubes will escape.



R_1—100,000 ohm, ½ w. res.
R_2, R_3—50,000 ohm, ½ w. res.
R_4—150 ohm, 1 w. res.
R_5—5000 ohm, 25 w. adj. res.
C_1—From TU-6B unit (See text)
C_2, C_3—900 $\mu\mu$fd. silver mica cond.
C_4, C_7, C_{10}, C_{13}—100 $\mu\mu$fd. mica cond.
C_5, C_6, C_8, C_9, C_{11}, C_{12}—.01 μfd. mica cond.
C_{14}, C_{15}—8 μfd., 450 v. elec. cond.
L_1—24 t. #18 silvered wire on 1¾" dia. grooved form
CH_1—10 hy., 100 mil choke
RFC_1, RFC_2, RFC_3—2.5 mh. r.f. choke
T_1—Power trans. 300-0-300 v. @ 100 ma.; 6.3 v. @ 1 amp.; 5 v. @ 2 amps.
S_1, S_2—S.p.s.t. sw.
PL_1—Pilot lamp and socket
J_1—Closed circuit jack
J_2—Coaxial plug (Amphenol)

Fig. 1. Circuit diagram and parts list covering a stable v.f.o. unit.

With the components used, the frequency of 3000 kc. to 4000 kc. covers almost 2000 divisions of the total 2500 divisions on the tuning dial. This gives almost 2 divisions per kilocycle spread in the 80 meter band.

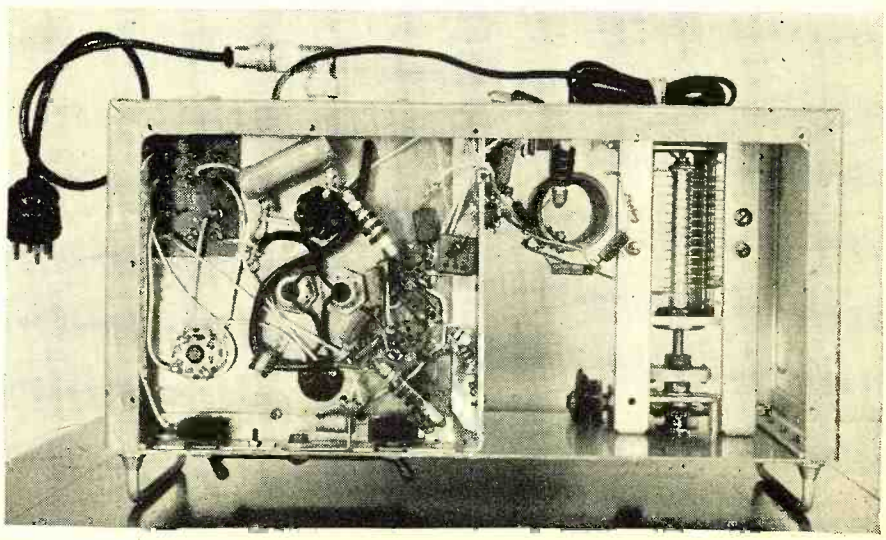
The output from this exciter is taken to the crystal socket of the rig through the coax cable mentioned previously. It is found that the excitation is more than ample to drive the 6L6 oscillator tube to full output. Naturally if a tritet, or grid plate oscillator is used in the regular rig, the cathode coil or choke will have to be shorted out, but this would have to be done if any type v.f.o. were used to drive it.

In order to check the stability, the unit was beat against the signals of WWV, and outside of the first minute in operation from a cold start, the stability was amazing. Even the drift during warm-up was far from bad, and we were very well satisfied.

As oscillator keying was used, it was thought that perhaps the keying would be a little chirpy. Much to our pleasant surprise, however, there was not the slightest trace of chirps or instability, and the v.f.o. follows a bug beautifully.

I am quite sure that anyone who builds up this little unit will be more than repaid for his work, and will have a v.f.o. that will equal or surpass most commercially built v.f.o.'s on the market today. —30—

Under chassis view of the v.f.o. Adherence to parts layout shown improves operation.



CITIZENS BAND OSCILLATOR

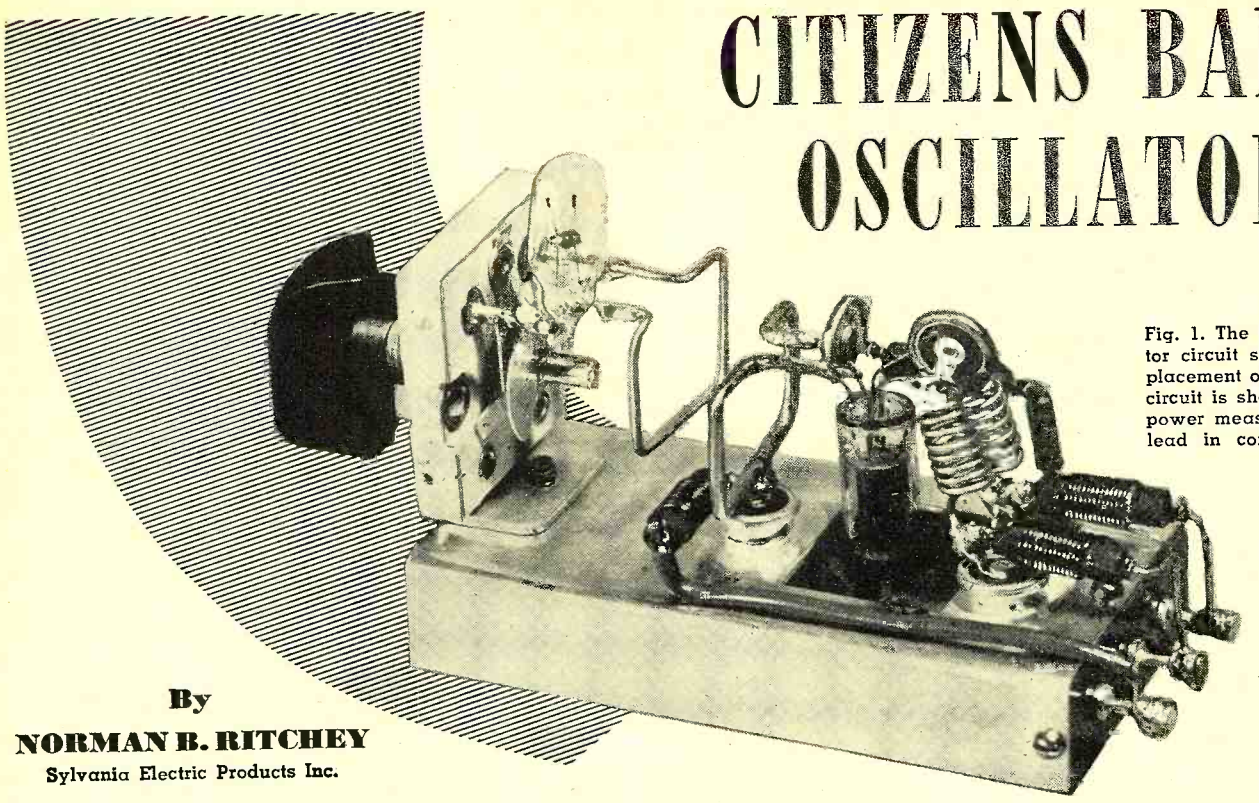


Fig. 1. The 6K4 oscillator circuit showing the placement of parts. The circuit is shown with a power measuring lamp lead in correct place.

By
NORMAN B. RITCHEY
Sylvania Electric Products Inc.

Design and operation of a compact Citizens Band oscillator for use in a "hand-portable" transceiver for Class B operation. The transmitter unit uses a 6K4 triode, a subminiature tube that will oscillate efficiently at 465 mc. Design considerations, performance data, modulator requirements, etc., are discussed.

THE recently inaugurated Citizens Radio Service opens a new field in radio communications. Class A service in the 460-470 megacycle band, with its required ±0.02% frequency stability, represents merely an extension of present techniques. The advent of the Class B Citizens Radio Band, however, makes possible the use of compact, "hand-portable" equipment.

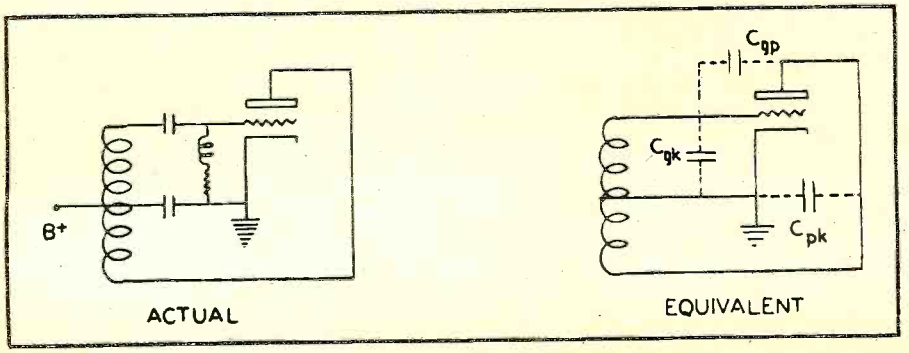
The Class B requirements are that the maximum power input to the final r.f. stage be 5 watts, that all operation (including tolerance and communication band) shall be confined to ±0.4% of 465 megacycles, and that all emissions outside the 460-470 megacycle band shall be attenuated at least 60 db. below the maximum level of emission within this band.

The greatest public appeal in the Citizens Radio Service lies in this Class B service where the equipment may be carried on the person, and in the ultimate case, worn in a manner similar to a hearing aid. This article, therefore, will discuss primarily the design of a compact, 465 megacycle oscillator circuit.

Few tubes exist at the present time which are capable of efficient oscillator performance in the 465 megacycle band. Most tubes which will oscillate at this frequency are quite large, quite expensive, and in general require more plate and heater power than is desirable for portable Citizens Band transceivers. The *Sylvania* type 6K4 subminiature triode offers great possibilities in the design of a successful Citizens Band oscillator. The tube is small (approximately ⅜ inch in diameter and 1½ inches long) and represents a saving in space over tubes of the lock-in or miniature series. The operating point of the 6K4, as a high-frequency oscillator, is such as to require reasonably low values of plate voltage and current ($E_b = 160$ v, $I_b = 20$ ma.) making a battery-pack plate supply practical. The radio-frequency power output (up to 0.75 watts) is adequate and the plate efficiency is approximately 24%. The allowable plate dissipation for the 6K4 is 3 watts and the maximum allowable plate current is 20 milliamperes. The heater power requirement is less than one watt (6.3 volts at 0.15 ampere). It is realized that the use of a cathode-type tube in a battery-operated transceiver may be questioned, but to date it has been possible to obtain greater output at higher efficiencies with less heating power in cathode types than in filamentary types at the Citizens Band frequency. The longer heating time of the cathode type is no disadvantage in transceiver applications where the r.f. tube is used both as oscillator and detector and is operated continuously.

Since space and weight are at a premium in hand-portable equipment, it was decided to concentrate on a lumped-constant circuit rather than a transmission-line circuit. The over-all dimensions of the completed oscillator, using the subminiature tube and lumped-constant circuit, are considerably smaller than could be realized if a quarter-wavelength transmission line were a part of the circuit. This

Fig. 2. A basic Hartley oscillator circuit and the equivalent circuit at v.h.f.



more compact circuit is used at some sacrifice of frequency stability with respect to thermal changes, but the oscillator stability can be made sufficient to comply with present regulations for Class B operation in the Citizens Radio Service.

The circuit used is a conventional Hartley oscillator from outward appearances, but at a frequency of 465 megacycles the effect of the interelectrode capacitances of the tube is such that the equivalent circuit looks like a Colpitts oscillator. This is demonstrated experimentally by the fact that moving the ground tap on the oscillator tank coil has no great effect on the performance (for grid-leak resistors greater than 4000 ohms). This indicates that the feedback is dependent on factors other than the turns ratio of the Hartley oscillator coil.

In the band of frequencies covered by the Citizens Radio Service, the inductance of leads within the tube cannot be neglected. In order to place the cathode at r.f. ground it would be necessary to use a method of series resonant bypassing. The cathode lead, in this method, is grounded through a condenser of such magnitude that together with the cathode circuit within the tube it constitutes a series resonant circuit. This requires that the d.c. potentials be applied to the cathode through radio-frequency isolation chokes. A circuit of this nature was constructed for experimental purposes.

Fig. 2 shows the resulting basic Hartley circuit, which has very poor efficiency at 465 megacycles. A Colpitts modification was tried in which the cathode was returned to the ground point through an isolating r.f. choke. Fig. 3 shows the resulting basic Colpitts circuit which also has very poor efficiency at 465 megacycles.

The time of transit of the electrons through the tube cannot be neglected at this frequency. The finite electron transit time may be quite a large percentage of the period of the 465 megacycle wave. This means that the phase shift through a tube is no longer 180° as in the low-frequency case. The phase angle between the input grid voltage and the output plate voltage must therefore be 180° plus the transit angle θ_t. It can be seen from Fig. 3 that the phase reversal of 180° through the tapped tank coil alone cannot provide feedback of the correct phase to sustain oscillations.

The foregoing analysis led to the investigation of some method of compensating for the transit-angle phase shift. Since it was not possible to realize satisfactory performance from either of the basic circuits at Citizens Band frequencies, an alternate circuit was devised which is a hybrid of both the Hartley and the Colpitts. The cathode is returned to ground through a tuned circuit which is resonant at some frequency higher than the operating frequency of the oscillator, and therefore performs a phase-shifting function. The circuit shown in Fig. 5 incorporating this phase-shifting net-

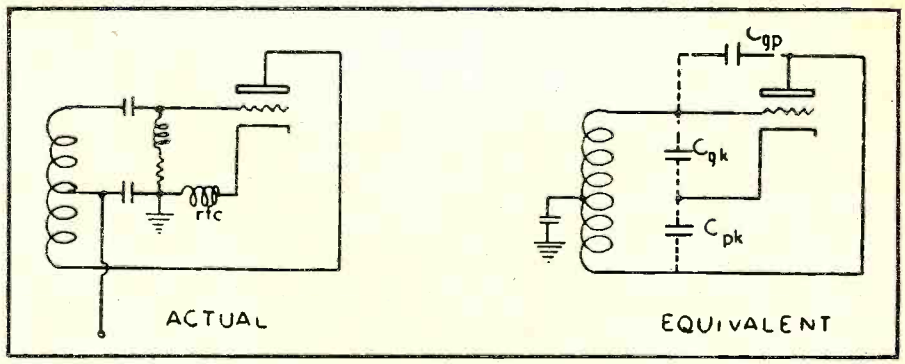


Fig. 3. A basic Colpitts oscillator circuit and the equivalent circuit at v.h.f.

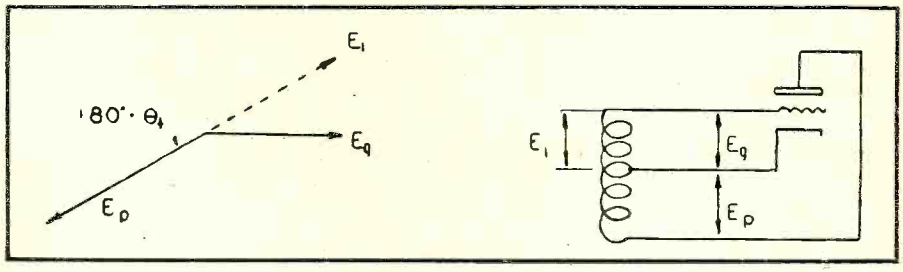


Fig. 4. Vector diagram showing how electron transit time can produce a feedback of incorrect phase in order to sustain oscillations.

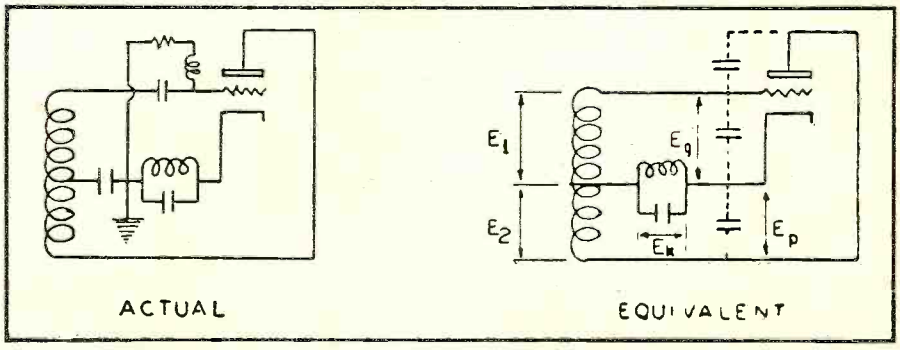


Fig. 5. Circuit diagram and v.h.f. equivalent of the hybrid circuit devised to compensate for transit time phase shift.

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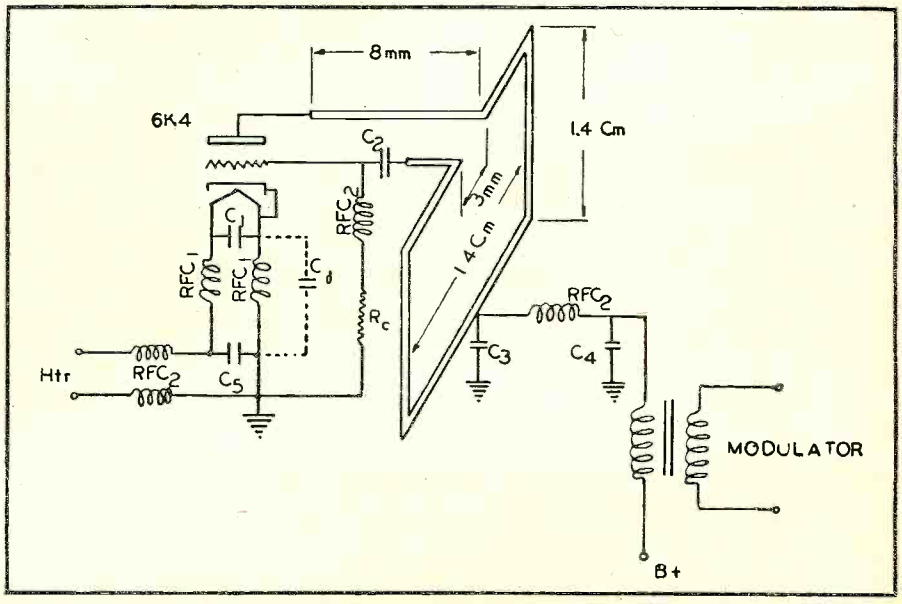
Fig. 6. Actual circuit diagram of resulting v.h.f. oscillator circuit. Values of the components used in circuit are given in the text.



R_c (Ohms)	E_{bb} (Volts)	I_b (Ma.)	Input (Watts)	R.F. Output (Watts)	Plate Diss. +Circuit Loss (Watts)	Eff. (%)
3300	130	20	2.60	0.60	2.00	23
4700	155	20	3.10	0.71	2.39	23
5600	160	20	3.20	0.77	2.43	24
6800	170	20	3.40	0.75	2.65	22

Table 1. Approximate oscillator performance under c.w. conditions at band frequencies.

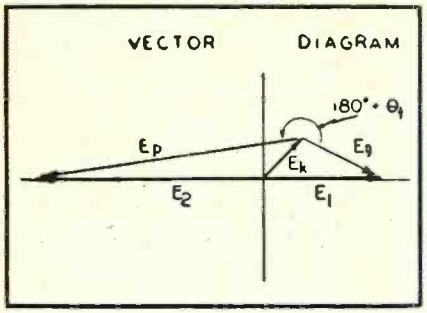


Fig. 7. Vector diagram showing phase shifting effect of the resonant cathode chokes in the hybrid v.h.f. oscillator circuit.

work has been quite satisfactory for both power output and efficiency. In Fig. 5

$$E_g = E_k + E_1$$
$$E_p = E_k + E_2$$
$$E_p = \mu E_g$$

where μ is complex at high frequencies due to transit time effects.

The effect of the all-important, phase-shifting cathode circuit is shown in the vector diagram in Fig. 4. The ground point in the circuit is taken as the origin of the coordinate system.

The voltages (Fig. 4) across each half of the tapped coil are 180° out-of-phase as they must be and the phase angle of 180° + θ_1 between E_g and E_p may still be satisfied.

The details of the oscillator circuit are shown in Fig. 6.

The following circuit components are the end product of this experimentation:

$RFC_1 = 7$ t. #22 wire self supporting, i.d. ⅛" spaced to cover ½", lead lengths ¼".

$RFC_2 = 13$ t. #24 wire wound on ⅛" dia. form (Allen Bradley ½ w. carbon res. of value greater than 10,000 ohms).

C_1, C_3, C_4, $C_5 = 500$ $\mu\mu$fd. *Erie* silver button mica cond.

$C_2 = 15$ $\mu\mu$fd. *Erie* silver button mica cond.

C_d = distributed capacitance across cathode chokes (0.3-5.0 $\mu\mu$fd.).

$R_c = 5600$ ohm, ½ watt res.

The tank coil should be tapped at the center with the load inductively coupled to the coil.

The load used for test purposes was a 6-8 volt panel lamp in series with a one-turn coupling loop and a small tuning condenser (constructed by splitting the stator of a two-plate midget variable condenser). The measurement of power was accomplished by placing a *Weston* photoelectric light meter near the panel lamp and recording the light meter indication. The oscillator was then turned off and d.c. power was supplied to the panel lamp through an ammeter and voltmeter. The d.c. voltage was increased until the lamp exhibited its previous brilliancy as indicated by the same reading on the *Weston* light meter. The d.c. power in the lamp then equalled the r.f. power.

Approximate oscillator performance under c.w. conditions at the Citizens Band frequency is given in Table 1.

The curves of Figs. 8 and 9 of r.f. output and efficiency versus grid resistance and supply voltage show that a point of optimum operation occurs at about 5600 ohms grid resistance and 160 volts plate supply.

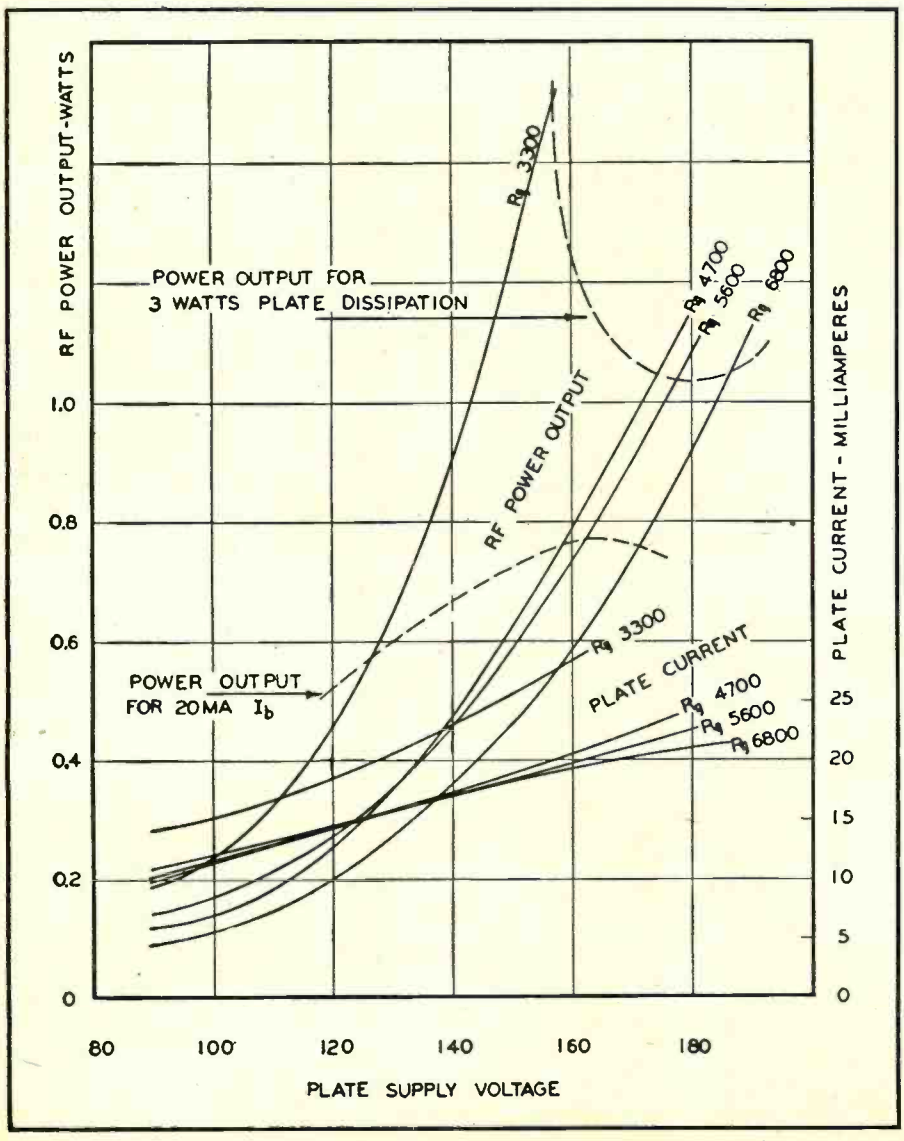
Some modification of operating conditions would be necessary for high-level modulation, but because of the frequency instability inherent in modulated oscillators of this type, it is desirable to limit the modulation level to approximately 30%.

The maximum oscillator frequency shift under 30% modulation is less than ± 0.086% (± 0.4 mc.). This degree of frequency shift, while within allowable limits for Class B Citizens Band service, is large enough to rule out the use of this modulated oscillator with high-selectivity receivers.

The frequency is also a function of plate supply voltage in a triode, high frequency oscillator. Measurements show a maximum frequency change of less than 0.086% (0.4 mc.) with a plate-supply voltage change of 10 volts. This indicates that satisfactory operation within the allowable ± 0.4% (± 1.86 mc.) of 465 mc. may be maintained over the normal life of the plate-supply batteries, if the oscillator is

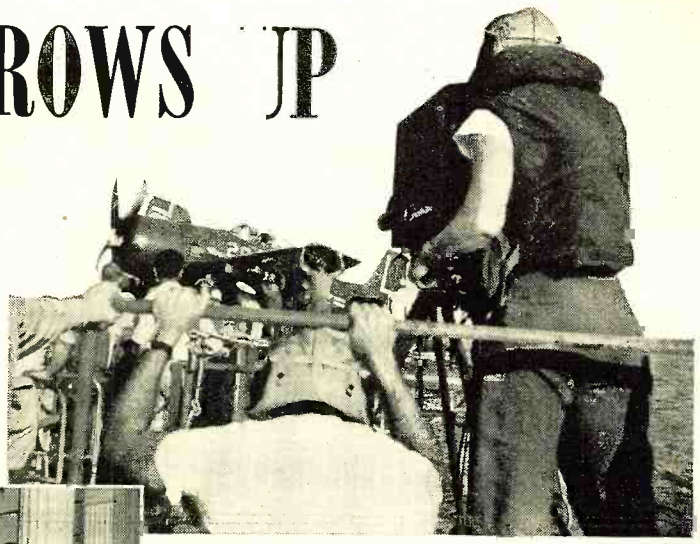
(*Continued on page* 180)

Fig. 8. Performance curves of 6K4 oscillator at 465 mc. as a function of supply voltage.

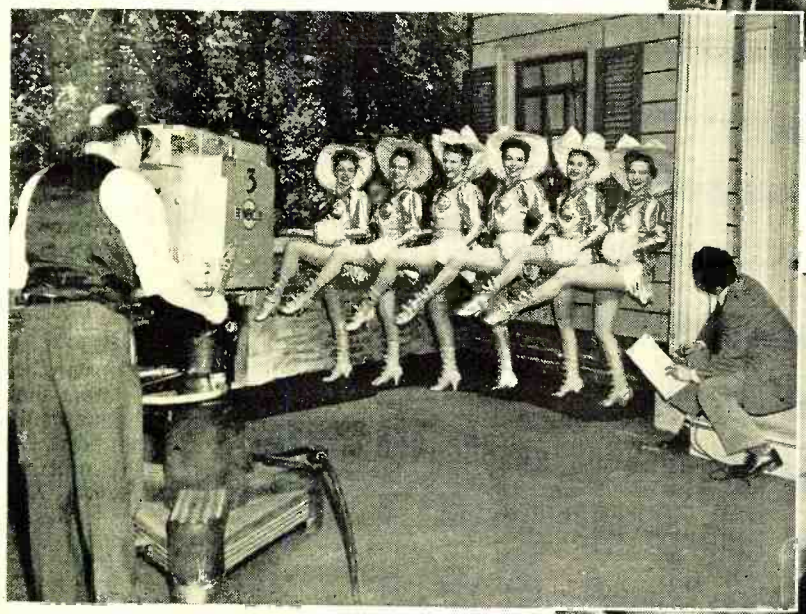


Television GROWS UP

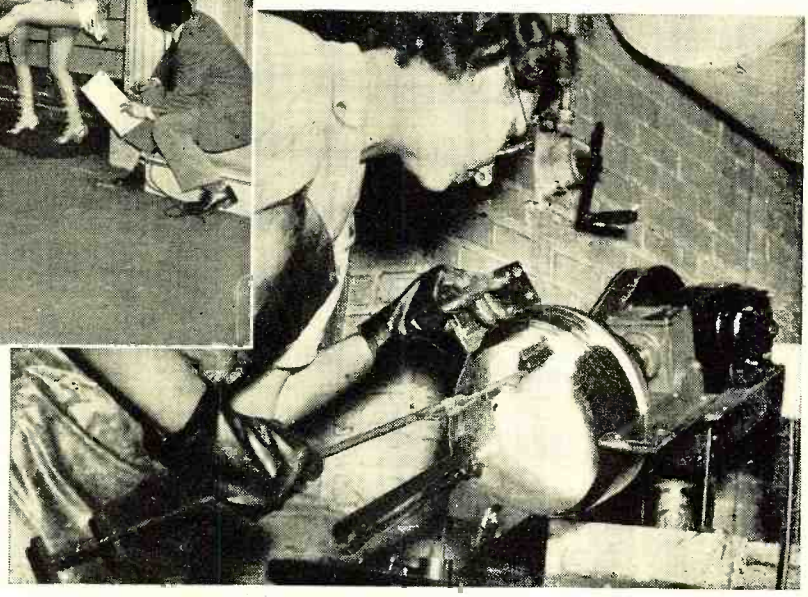
THE infant television industry is skyrocketing to new heights. Since the first of the year, the number of stations and sets have more than doubled. There are now 42 stations compared with 17 when the year began, with several more with test patterns on the air or ready to start. There are now more than 590,000 TV sets in use, and production and distribution is running slightly better than 15,000 sets a week. Manufacturers expect next year's output to be in the millions. There were only 6500 sets in use on Jan. 1, 1946. —30—



↑Aboard the U.S. carrier "Leyte," the television camera catches action as a Navy fighter plane prepares to take-off on a mock mission.



←Showgirls do their stuff before the television camera. Shows such as these often require days of rehearsals before performance.



A conductive coating, a mixture of graphite particles and water, is applied to television tube in General Electric Company's Buffalo, N. Y. plant. →

↓Robert M. Frazer, NBC development engineer, with the specially built motion picture camera used to "can" television programs for later use.

↓The control crew responsible for putting a program on the air usually consists of four men. In the foreground is the engineer. Others are asst. director, director, and technical director.

The RECORDING and REPRODUCTION of SOUND

By
OLIVER READ
Editor, RADIO & TELEVISION NEWS
and
ROBERT ENDALL

Part 22. Concluding article covering bass reflex cabinets, labyrinth cabinets, and infinite baffles.

WITHIN the past few years there has been a continual improvement in all phases of sound communication and reproduction. Microphones, electronic circuits and communication systems, and phonograph recording and pickup techniques have been improved to the point where they are now capable of reproducing music and speech with practically no loss in quality from the original, and with the introduction of almost negligible noise and distortion.

The weakest link in the entire sound reproduction system at the present time is the manner in which the loudspeaker is used to reconvert the electrical energy into sound. The reason for this, of course, is that the correct use of the loudspeaker for best reproduction would involve considerable extra expense in the design and construction of commercial radios and phonograph reproducers, and the manufacturer prefers not to go to this additional expense if he can possibly avoid it. The general public must accept this inferior reproduction, since it is fairly expensive to purchase a good quality loudspeaker system and have it connected to some standard model radio receiver. However, the radio experimenter and technician need not accept poor reproduction, because a good loudspeaker system that will give performance practically equal to the other components of the audio reproduction system can be easily constructed at home at relatively little expense. The purpose of this article is to give data and design information which will enable the average radio technician to construct a loudspeaker system which will give the maximum performance that can be attained from loudspeakers at the present time.

The common type of housing for loudspeakers is the conventional open-back cabinet which also contains the receiver-amplifier chassis and the phonograph mechanism. This arrangement is used in almost all receivers being sold at the present time, from the smallest table models to the large expensive consoles. In all cases the purpose of the cabinet is to provide a baffle for the loudspeaker, to prevent the sound from the back of the speaker cone (which is 180° out of phase with that from the front) from cancelling the sound transmitted from the front of the loudspeaker cone. When the sound path from the back of the speaker to the front is sufficiently long (as in the case of the large console cabinets) the low frequencies are reproduced; while in the midget radio cabinets the sound path from the back to the front is very small and the low frequencies are not reproduced because of the out-of-phase cancellation.

The most objectionable acoustical feature of such cabinets is the resonance in the enclosure behind the loudspeaker cone. The cabinet acts as an

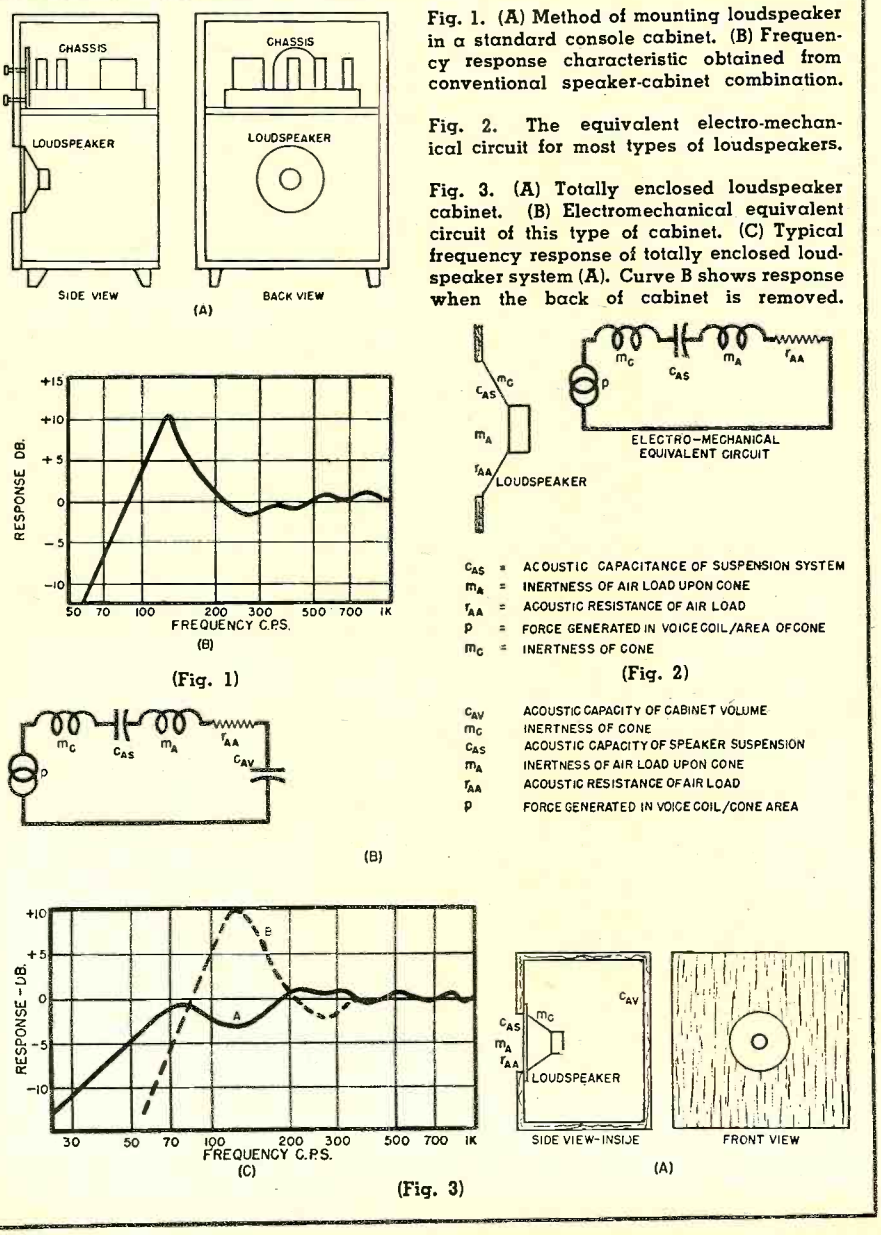


Fig. 1. (A) Method of mounting loudspeaker in a standard console cabinet. (B) Frequency response characteristic obtained from conventional speaker-cabinet combination.

Fig. 2. The equivalent electro-mechanical circuit for most types of loudspeakers.

Fig. 3. (A) Totally enclosed loudspeaker cabinet. (B) Electromechanical equivalent circuit of this type of cabinet. (C) Typical frequency response of totally enclosed loudspeaker system (A). Curve B shows response when the back of cabinet is removed.

TYPE	POWER HANDLING CAPACITY	FREQUENCY RESPONSE (cycles)	WEIGHT	SPEAKER DIMENSIONS	ENCLOSURE REQUIRED	RECOMMENDED CABINET DIMENSIONS (Sloping front)
755A 8" direct radiator	8 watts	70-13,000	Speaker 4¾ lbs.	Dia.—8⅜" Depth—3⅛" Baffle Hole Dia.—7"	2 cu. ft.	Width—16" Height—21" Top Depth—9¼" Bottom Depth—12"
756A 10" direct radiator	20 watts	65-10,000	Speaker 10 lbs.	Dia.—10¼" Depth—3¼" Baffle Hole Dia.—8$^{13}/_{16}$"	2½ cu. ft.	Width—19" Height—22" Top Depth—8⅞" Bottom Depth—11$^{15}/_{16}$"
728B 12" direct radiator	30 watts	60-10,000	Speaker 17 lbs.	Dia.—12$^{11}/_{32}$" Depth—3$^{25}/_{32}$" Baffle Hole Dia.—11"	3 cu. ft.	Width—21" Height—23¾" Top Depth—9¼" Bottom Depth—12⅜"
754A 12" direct radiator	15 watts	60-10,000	Speaker 17 lbs.	Dia.—12$^{11}/_{32}$" Depth—3¾" Baffle Hole Dia.—11"	3 cu. ft.	Width—21" Height—23¾" Top Depth—9¼" Bottom Depth—12⅜"

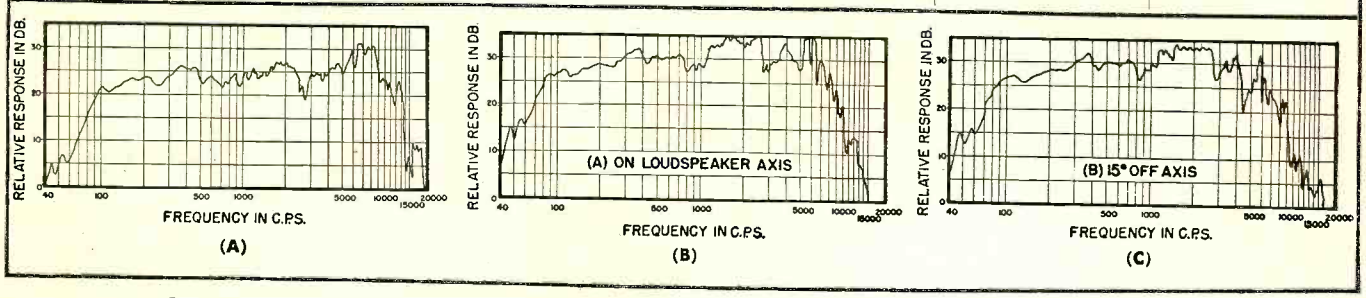


Fig. 4. Baffle requirements and dimensions for Western Electric 8, 10, and 12 inch speakers designed for use with totally enclosed cabinets. Frequency response curves shown are (A) for the Western Electric 8 inch (755A) speaker at a point on its axis; (B) and (C) for the Western Electric 12 inch (728B) speaker.

open-ended resonant tube (such as, for example, an organ pipe), and accentuates the loudspeaker response at its resonant frequency due to the increased efficiency of the acoustical system. This cabinet resonance causes a sharp peak in the response, generally in the range between 100 and 200 cycles, which very unfavorably affects the intelligibility and naturalness of the reproduced sound and is especially noticeable in the reproduction of music and male speech. This is the "boomy" quality which is so characteristic of almost all commercial radio receivers.

In addition to the "boomy" quality of the sound reproduction, the open-back loudspeaker cabinet has the following further disadvantages:

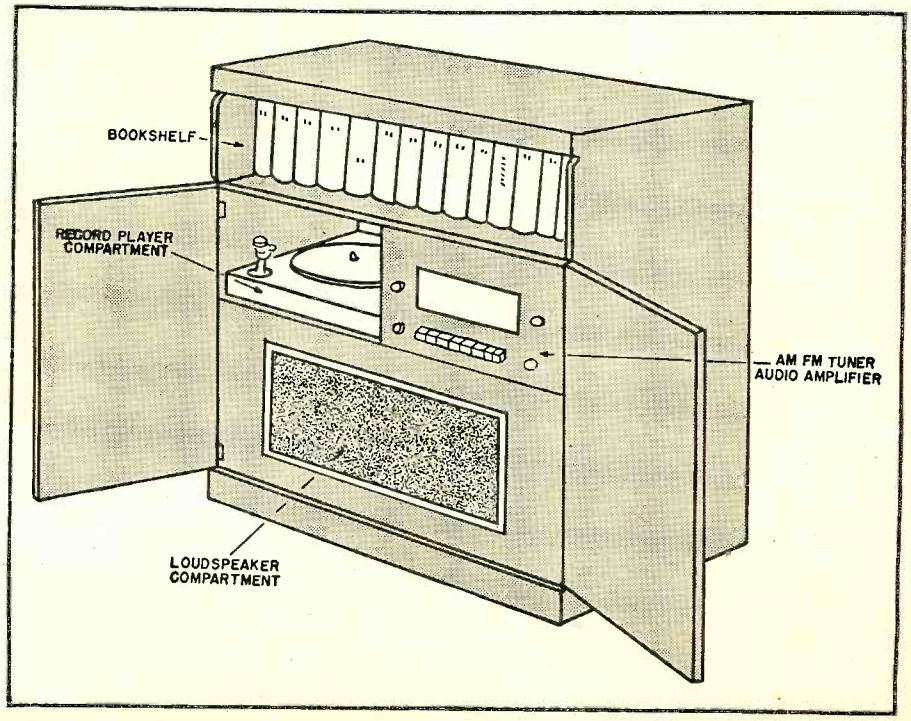
a. The loudspeaker has poor low-frequency response due to inadequate baffle area afforded by the cabinet.

b. There is insufficient acoustic damping of the loudspeaker diaphragm, resulting in overshooting of the moving system and consequent distortion.

c. Because of inadequate damping of the mechanical system, there is a large variation in the electrical impedance of the loudspeaker at its primary resonant frequency, which causes poor impedance matching and additional distortion in the output stage of certain types of amplifiers.

Electrical compensation in the amplifier frequency response to correct for the cabinet resonance is not entirely satisfactory, since it cannot damp the overshoot of the mechanical system on loud signals and does not improve the poor transient response which is characteristic of a system having such a peak in the response at one frequency. In addition, the peak in the response due to the cabinet resonance will change according to

Fig. 5. Sketch of a home-built radio-phonograph combination, using two RCA 7 inch accordion type loudspeakers housed in an infinite baffle enclosure.



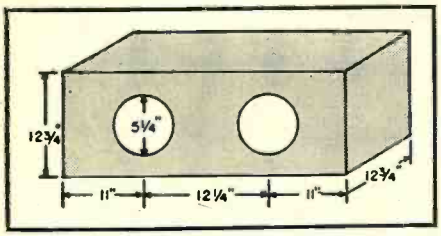


Fig. 6. Inside dimensions of infinite baffle loudspeaker enclosure of radio-phonograph unit shown in the sketch of Fig. 5.

whether the back of the cabinet is placed close against a wall, whether it is standing upon a bare hardwood floor or upon a soft rug, and with other such conditions of cabinet placement.

However, the above faults of the open-back cabinet loudspeaker mounting can be eliminated, and wide-range reproduction of sound with good frequency response and without undesirable peaks may be attained from loudspeakers by use of a properly designed housing for the loudspeaker. In general, proper design of a housing for best loudspeaker performance consists of incoporating acoustical networks in the cabinet to eliminate the faults of the open-back cabinet and to improve the loudspeaker characteristics.

The manner in which a loudspeaker cabinet may be made to act as an acoustical network to improve the speaker performance may best be understood by consideration of the electromechanical equivalent circuit of the loudspeaker as shown in Fig. 2. (It must be understood that this is not the electrical circuit of the loudspeaker itself, but is just an analogy by which the mechanical and acoustical properties of the loudspeaker are represented by electrical quantities.) Thus in this equivalent circuit the inductance m_C represents the mechanical inertia of the loudspeaker cone, the capacity C_{AS} represents the acoustic capacitance of the suspension system, and m_A and r_{AA} represent the inertia and acoustic resistance of the air load upon the cone. The pressure p of the generator in the acoustic system is the force generated in the voice coil divided by the area of the cone. Above the resonant frequency of this system the sound output is independent of frequency, while it falls off rapidly below resonance. The manner in which the acoustic network represented by the cabinet affects the response may be understood by considering it in relation to the loudspeaker equivalent circuit.

The simplest type of loudspeaker baffle is a cabinet with an enclosed back, as shown in Fig. 3A. By making the cabinet as rigid as possible and padding the inside with absorbent material, the sound from the back of the loudspeaker cone is completely prevented from reaching the front, therefore such a cabinet is sometimes known as an "infinite baffle" cabinet. The effect of such a baffle upon the loudspeaker response can be understood by reference to the electromechanical equivalent circuit shown in Fig. 3B. The cabinet volume has the effect of an acoustic capacity C_{AV}, which tends to lower the effective capacity in the circuit and raises the resonant frequency. The cabinet volume should, therefore, be made as large as is conveniently possible, so that it represents a large acoustic capacity and will have a minimum effect upon the resonant frequency of the system. It can be seen that the loudspeakers for which this type of cabinet is most suitable are those in which the resonant frequency is quite low, preferably in the neighborhood of 50 cycles or lower.

The frequency response of a typical "infinite baffle" loudspeaker system of the type shown in Fig. 3A and B is given in the curve labelled *A* in Fig. 3C. For comparison, the frequency response of the same system with the back of the cabinet removed is shown by the dotted curve labelled *B*. It can be seen from the curves that the use of the back-enclosed cabinet not only eliminates the peak due to cabinet resonance and gives a smoother curve, but it also extends the low-frequency response appreciably.

The "infinite baffle" cabinet may be used to good advantage with the *Western Electric* 8-inch, 10-inch and 12-inch loudspeakers (Types number 755A, 756A, and 728B) which have been designed for this type of enclosure, and with the *RCA* accordion-type loudspeaker which has a resonance of approximately 45 cycles. The baffle requirements of the *Western Electric* loudspeakers are given in the chart in Fig. 4, and the frequency response curves of the 8-inch and 12-inch loudspeakers are given below.

An infinite-baffle system which was built using two *RCA* 7-inch accordion-type loudspeakers is illustrated in Fig. 5. The dimensions of the loudspeaker encolusure are given in Fig. 6. However, these dimensions are not critical and were determined in this case by the dimensions of the cabinet which was already built.

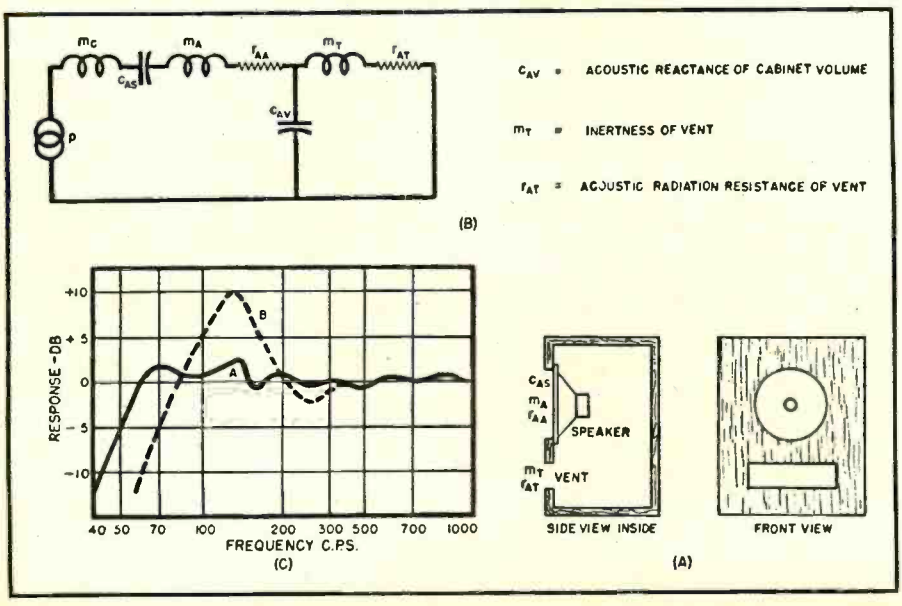
The infinite baffle type of loudspeaker mounting is widely used in commercial broadcast monitoring, where good quality of reproduction is essential. The system used in this case generally consists of a high-fidelity 12-inch loudspeaker mounted in a back-enclosed cabinet having a large front area (often as much as 6 ft. in width), and is mounted on a wall tilted at such an angle that the sound radiation is directed at the operator who is listening to the program.

Generally the low-frequency response of any loudspeaker is limited by the fact that the coupling between the cone and the air decreases at the very low frequencies. One of the methods of increasing the coupling is by using a large cone, which has the effect of increasing the radiation resistance. However, when the cone becomes too large the high-frequency response begins to decrease and additional expense is involved in attaining good high-frequency response. A simple and practical method of increasing the coupling to the air at low frequencies is by making the loudspeaker cabinet act as an acoustical network to perform this function. The manner in which this is generally accomplished is by causing the cabinet to act as a phase inverter so that the low-frequency radiation from the back of the cone may be added in phase with the sound from the front of the cone.

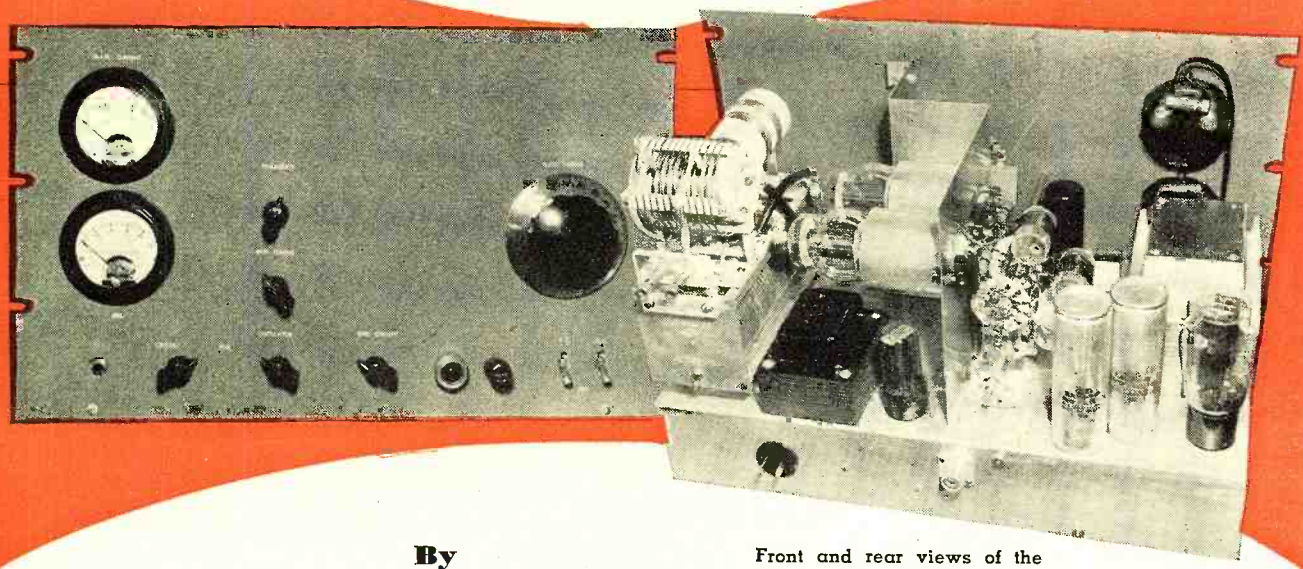
The simplest type of acoustic phase inverter is the vented box generally known as the "bass-reflex" baffle. It consists of a closed cabinet with an opening through which it is coupled to the air, and is represented by a capacity-inductance-resistance resonant cir-

(*Continued on page* 120)

Fig. 7. (A) Physical details of the bass-reflex loudspeaker cabinet. (B) Electromechanical equivalent circuit. (C) Curve A is a typical frequency response of a bass-reflex speaker system. Curve B is frequency response of an open-back cabinet having the same volume plotted on the same graph to facilitate comparison.



3.5-30 mc. Bandtuning TRANSMITTER



Front and rear views of the completed rig. Final tank assembly is shown at left rear.

By
OTTO L. WOOLLEY, W8SGG

Complete bandswitching offering the maximum in convenience for the medium or low power operator.

THIS transmitter was built to provide a completely self-contained unit of moderate power output that would afford a maximum of operating convenience for the amateur bands from 3.5 to 30 mc. Complete coverage of this frequency range is accomplished by bandswitching the driver tube and bandtuning the final tank. This type tank is a rather new development for ham use and the entire frequency range is covered by rotating the final tank condenser, tuning for the resonance dip as with conventional type tank circuits. The assembly is very compact and makes for a consolidated parts layout without undue crowding of components. The model shown runs at 120 watts input although the final stage is capable of taking an input of 150 watts when operated at maximum ratings. Provision is made for either crystal or v.f.o. control, the selection being made with a switch in the crystal stage. The entire transmitter is completely controlled from the front panel.

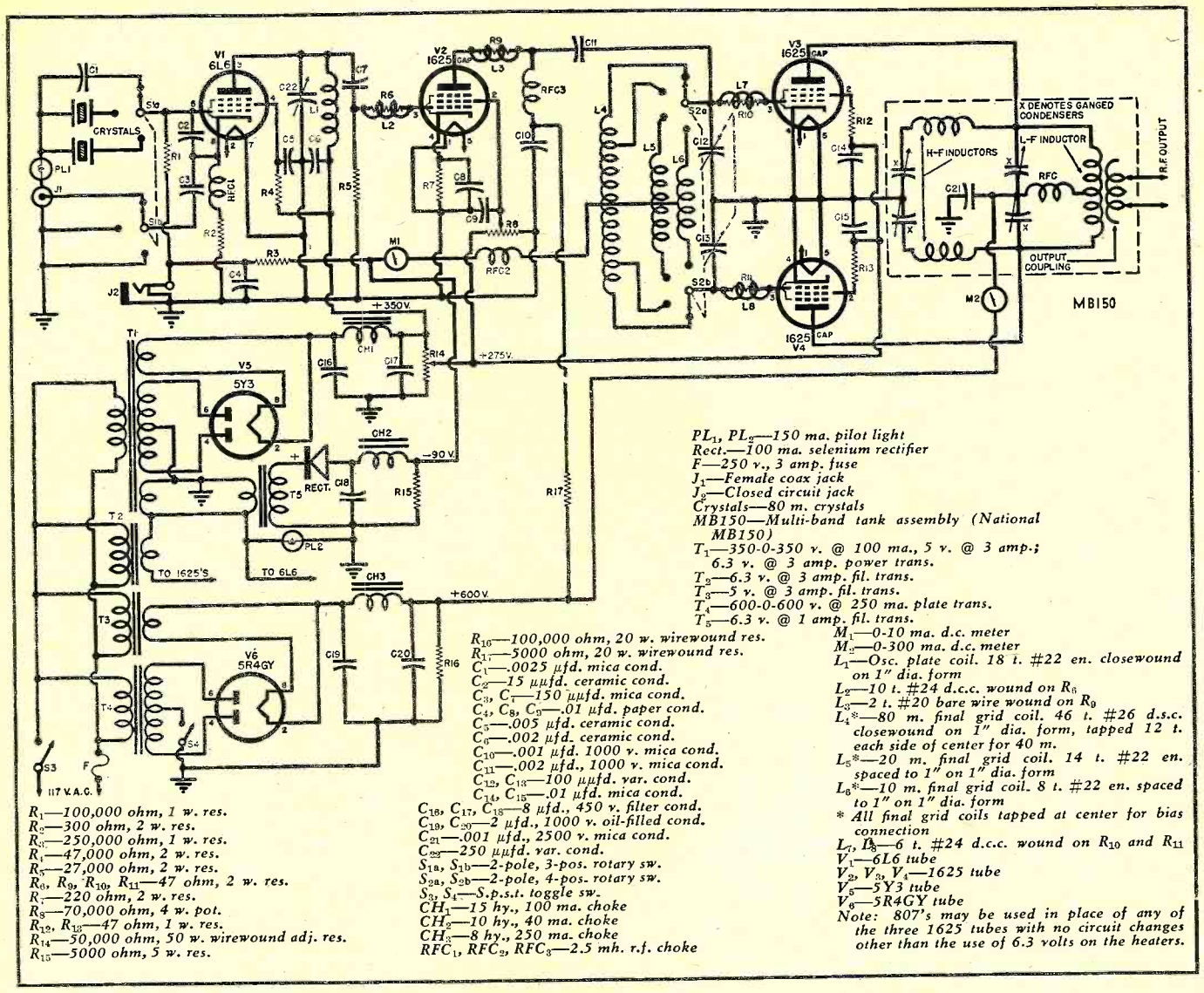
The circuit consists of a 6L6 crystal oscillator-v.f.o. input tube, a 1625 buffer-doubler-quadrupler, and push-pull 1625 final amplifier. These tubes have been available on the surplus market at a price that probably marks a new high in watts-per-tube-dollar. Metering is provided for the grid and plate of the final stage, the grid current to the final being used as an indication of buffer plate resonance. Inasmuch as the drive to beam power tubes is quite critical it was deemed advisable to provide an excitation control on the panel so the drive may be adjusted to the required figure of 6 ma. on each band. The available excitation is ample throughout the range of operation.

The transmitter is built on a 10" x 17" x 3" aluminum chassis with a 19" rack panel of Masonite which is set slightly off center from the chassis to furnish a more symmetrical control layout. The shield supporting the final amplifier tubes is 7" high by 6" long with two 3" x 3" right angles to shield the buffer tube. The r.f. wiring is done in a point-to-point manner while the a.c. and d.c. leads are dressed around the edge of the chassis whenever possible, the longer leads being laced together. The finished construction is quite open and all important voltage points are readily accessible for testing or measurement. Ceramic sockets are used for all r.f. tubes.

In the front panel view of the transmitter (shown above), the control markings are of the transfer type which are commercially available from amateur supply houses. The plate current meter is shunted to read 300 ma. at full scale. A 0-10 ma. meter would be ideal for the grid circuit although most of the lower range meters will give a sufficiently accurate reading for amateur purposes.

The rear view of the transmitter shows the low voltage power transformer and the 5Y3GT rectifier set under the final amplifier tubes. The high voltage transformer, condensers, and 5R4GY rectifier are at the right side and corner. Across the chassis backdrop is the a.c. male plug and the coaxial connector for v.f.o. input. The grid coils for the final may be seen wound on 1" diameter polystyrene tubing and supported by the connecting leads to the bandswitch. The buffer tube is hidden by the shield partition in this photograph. Although not evident in the picture, the final tubes are easily removed for testing or replacement.

The crystal oscillator is a hot cathode type designed to be used with 80 meter crystals. The switching arrangement selects either of two crystal frequencies with a third position for v.f.o. operation. In the v.f.o. position the 6L6 is converted to a grounded grid amplifier with the v.f.o. output fed into the cathode. This precludes any tendency toward oscillation, and with many v.f.o.'s will result in increased output either as a straight amplifier or as a doubler. The over-all performance of the crystal circuit is good, it is a persistent oscillator with low crystal current delivering large output when operating as a doubler. Cathode keying was originally intended for this tube, but after some experimenting with blocked grid keying the latter was adopted. In the case of cathode keying one point that



PL_1, PL_2—150 ma. pilot light
Rect.—100 ma. selenium rectifier
F—250 v., 3 amp. fuse
J_1—Female coax jack
J_2—Closed circuit jack
Crystals—80 m. crystals
MB150—Multi-band tank assembly (National MB150)
T_1—350-0-350 v. @ 100 ma., 5 v. @ 3 amp.; 6.3 v. @ 3 amp. power trans.
T_2—6.3 v. @ 3 amp. fil. trans.
T_3—5 v. @ 3 amp. fil. trans.
T_4—600-0-600 v. @ 250 ma. plate trans.
T_5—6.3 v. @ 1 amp. fil. trans.

M_1—0-10 ma. d.c. meter
M_2—0-300 ma. d.c. meter
L_1—Osc. plate coil. 18 t. #22 en. closewound on 1" dia. form
L_2—10 t. #24 d.c.c. wound on R_6
L_3—2 t. #20 bare wire wound on R_9
L_4*—80 m. final grid coil. 46 t. #26 d.s.c. closewound on 1" dia. form, tapped 12 t. each side of center for 40 m.
L_5*—20 m. final grid coil. 14 t. #22 en. spaced to 1" on 1" dia. form
L_6*—10 m. final grid coil. 8 t. #22 en. spaced to 1" on 1" dia. form
* All final grid coils tapped at center for bias connection
L_7, L_8—6 t. #24 d.c.c. wound on R_{10} and R_{11}
V_1—6L6 tube
V_2, V_3, V_4—1625 tube
V_5—5Y3 tube
V_6—5R4GY tube
Note: 807's may be used in place of any of the three 1625 tubes with no circuit changes other than the use of 6.3 volts on the heaters.

R_1—100,000 ohm, 1 w. res.
R_2—300 ohm, 2 w. res.
R_3—250,000 ohm, 1 w. res.
R_4—47,000 ohm, 2 w. res.
R_5—27,000 ohm, 2 w. res.
R_6, R_9, R_{10}, R_{11}—47 ohm, 2 w. res.
R_7—220 ohm, 2 w. res.
R_8—70,000 ohm, 4 w. pot.
R_{12}, R_{13}—47 ohm, 1 w. res.
R_{14}—50,000 ohm, 50 w. wirewound adj. res.
R_{15}—5000 ohm, 5 w. res.
R_{16}—100,000 ohm, 20 w. wirewound res.
R_{17}—5000 ohm, 20 w. wirewound res.
C_1—.0025 μfd. mica cond.
C_2—15 μμfd. ceramic cond.
C_3, C_7—150 μμfd. mica cond.
C_4, C_8, C_9—.01 μfd. paper cond.
C_5—.005 μfd. ceramic cond.
C_6—.002 μfd. ceramic cond.
C_{10}—.001 μfd. 1000 v. mica cond.
C_{11}—.002 μfd., 1000 v. mica cond.
C_{12}, C_{13}—100 μμfd. var. cond.
C_{14}, C_{15}—.01 μfd. mica cond.
C_{16}, C_{17}, C_{18}—8 μfd., 450 v. filter cond.
C_{19}, C_{20}—2 μfd., 1000 v. oil-filled cond.
C_{21}—.001 μfd., 2500 v. mica cond.
C_{22}—250 μμfd. var. cond.
S_{1a}, S_{1b}—2-pole, 3-pos. rotary sw.
S_{2a}, S_{2b}—2-pole, 4-pos. rotary sw.
S_3, S_4—S.p.s.t. toggle sw.
CH_1—15 hy., 100 ma. choke
CH_2—10 hy., 40 ma. choke
CH_3—8 hy., 250 ma. choke
RFC_1, RFC_2, RFC_3—2.5 mh. r.f. choke

Complete circuit diagram and parts list for constructing the 3.5-30 mc. transmitter.

has possibly not been given the consideration it merits is the voltage excursion of the cathode with respect to heater potential with the key open.

The cathode then tends to approach the screen voltage point resulting in a cathode-to-heater difference that may amount to several hundred volts, especially in the case where the screen voltage is obtained from a series resistor. One obvious remedy would be the use of a separate filament transformer for the oscillator allowing the transformer winding to float above ground. However, this necessitates an extra transformer with its attendant cost. Keying the screen grid lead will prevent abuse to the cathode-heater insulation, however this method requires the keying lead to be at high potential and sometimes gives rise to offensive clicks that may be hard to eliminate. In view of the foregoing evidence blocked grid keying was chosen. The amount of power broken by the key with this method is minute, minimizing sparking at the key contacts, and with the proper combination of *RC* in the keying circuit the keying characteristics may be varied over a very wide range. Time has not permitted us to fully explore the possibilities in this connection although the values given provide satisfactory keying. One factor that must be considered with this type keying is that crystal current rises with grid bias to a certain point, the rise being sufficient to cause fracture if the bias increase occurs at a slow rate. Therefore the blocking bias must be applied instantly as a matter of crystal protection.

The tank circuit of the 6L6 tunes to 80 or 40 meters by using a 250 μμfd. tuning condenser with a coil consisting of 18 turns of No. 22 enameled closewound on a 1" diameter form. Series feed is used for the plate voltage to this tube.

The usual precautions should be observed with the crystal switch wiring by keeping the leads short, and the switch should be of good quality, preferably with ceramic insulation and with contacts that provide a low impedance path for r.f. current.

The 1625 tube was chosen for the buffer stage because its double-ended construction allows it to fit in nicely with the physical layout employed. Parallel feed is used to supply plate voltage for this stage through RFC_3 and the r.f. is coupled to the final grid tank through C_{11} and tuned to the desired frequency with C_{12} and C_{13}. This stage works straightthrough, doubles, or quadruples as necessary, the desired range being selected by S_2, a two-pole, four-position bandswitch with ceramic dielectric. The screen voltage is regulated by the 70,000 ohm potentiometer R_8 which is used in this manner to control the excitation to the final amplifier. As mentioned before the drive is considerably in excess of requirements and only when quadrupling to 10 meters is it necessary to advance the control near the high end. Some instability was apparent when working straightthrough so the grid and plate terminals were loaded by means of suppressors L_2 and L_3. L_3 is in fact only a lengthened plate lead, and was wound on the resistor as a convenient means of application. The low screen voltage used when working straightthrough in this stage contributes to the stability.

The buffer tube is also used as a bleeder for the high voltage supply,

eliminating the need for a high wattage resistor and actually improving the regulation. More mils are put to useful work in this manner.

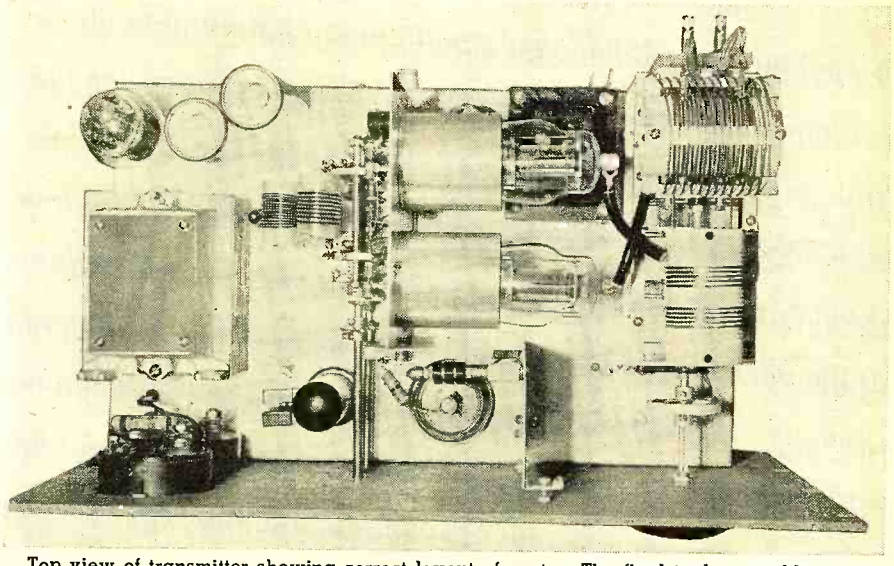
A high value resistance R_{16} is used to discharge the filter condensers. RFC_3 and the coupling condenser C_{11} are mounted on the shield surrounding the buffer tube.

The final amplifier stage is quite conventional with the exception of the final tank. The grid circuit is tuned with two 100 $\mu\mu$fd. condensers C_{12} and C_{13} which are ganged together. Due to the capacity of the buffer tube across one end of the grid tank the drive is not equal to the final tubes. This can be compensated for by meshing condenser C_{13} about 30 degrees ahead of C_{12}. After the rig has been put into operation this adjustment should be checked with proper operating voltages applied and with a dummy load such as a 75 watt bulb connected to the pickup link on the final tank. With the transmitter delivering power in this manner the screen current to the final tubes should be measured across resistors R_{12} and R_{13}. Quite likely it will be found that there is a considerable difference in the readings obtained, this difference being a measure of the inequality of the drive to these tubes. The ganging coupling between the grid condensers should be loosened and the condensers carefully tuned separately until the screen currents are equalized. When the point of balance has been determined the coupling should be carefully tightened, care being taken to maintain the proper setting. In practice it was found possible to balance out the difference in screen current to .2 ma. This balancing may also be done by putting a small variable condenser of 50 $\mu\mu$fd. or less in shunt with C_{13} and adjusting for the balance as described above. This method is convenient when a solid shaft, split stator condenser is used in the grid circuit.

The bias for the final is applied through RFC_2 to the center tap on the grid coils. The screen voltage is obtained from the low voltage supply.

Precautions against instability in the final consist of grid and screen suppressors and no trouble has been experienced with self oscillation or oscillations of a parasitic nature. The screen grids are bypassed with mica condensers using short leads directly to the cathode terminals, which are, in turn, returned to ground by direct leads to the rotors of the grid tuning condensers.

Connecting the final plate tank is a matter of four points of wiring. Two leads are affixed to the plate caps of the final amplifier tubes, one lead connects the high voltage supply to the frame of the final tank assembly, and the bypassing of the tank frame to ground with a .001 μfd. mica condenser completes the wiring. The bypass condenser should be of good quality and of ample voltage rating. It should be noted that the tank frame is at high voltage and must be insulated from the chassis in accordance with the manufacturer's recommendations. It is also advisable to use an insulated coupling in the drive shaft and if a metal panel or an uninsulated dial is used such a coupling is absolutely necessary.



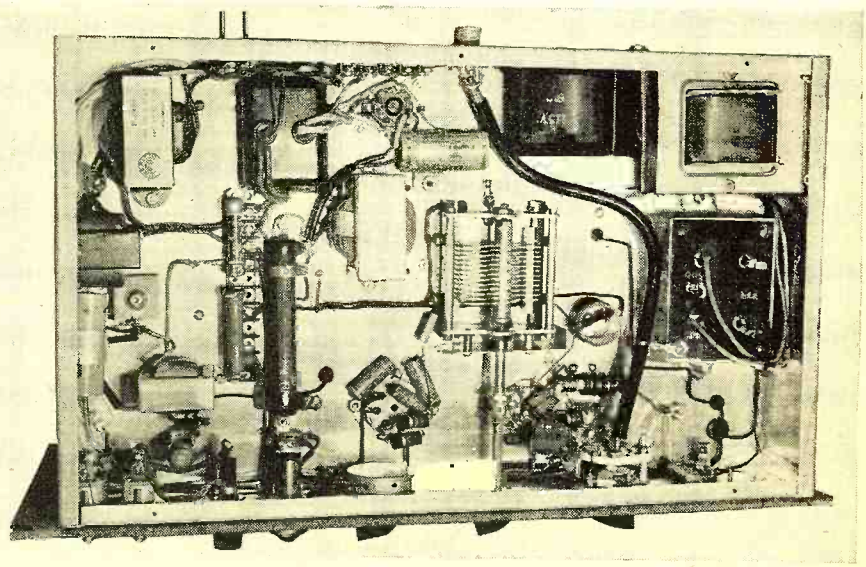
Top view of transmitter showing correct layout of parts. The final tank assembly sets flush with the right edge of the chassis. Extension shafts are used to drive the bandswitch, grid tuning condensers, and the final tank. The components associated with the plate circuit of the buffer-doubler may be seen fastened to the shield and a small angle bracket is used to fasten the front edge of the shield partition to the panel for additional support. The high voltage bypass C_{21} is fastened to the front of the final tank frame and is only partially visible. The RFC_2 for the grid coils is supported by a standoff insulator and is just visible to the left of the grid coils.

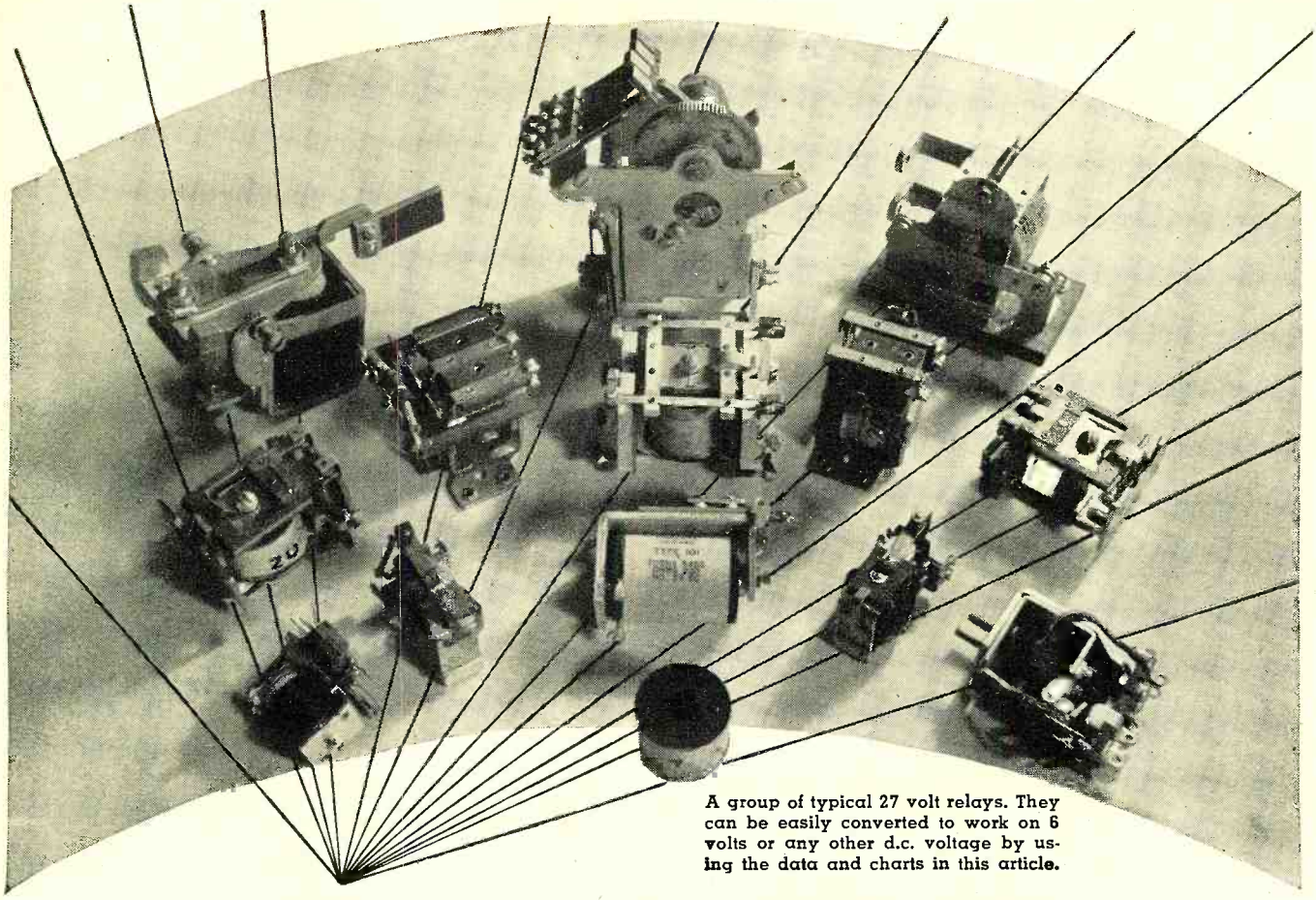
Resonating the final is done in the usual manner, tuning for the dip in final plate current. In tuning it is well to visualize two separate frequency ranges on the dial. The low frequency range covers the 80 and 40 meter bands, 80 occupying the space from about 5 to 30 on the dial while 40 runs from about 80 to 85.

The high frequency ranges are found in a similar manner with 20 meters running from 35 to 40 on the dial and 10 meters between 90 and 95. The tank also tunes to the 11 and 15 meter bands which are located on the high frequency range between 10 and 20. When tuning from maximum to minimum capacity the tank passes through

(*Continued on page* 102)

Under chassis view of the transmitter. Along the front of the chassis from left to right are the a.c. and d.c. switches, the fuse post, pilot light, excitation control, driveshaft for the 6L6 tank condenser, crystal v.f.o. switch, and key jack. The v.f.o. input cable is dressed close to the plate transformer. The high voltage filter choke is in the upper right corner. The various power supply transformers are placed around the edge of the chassis, the bias supply components on the far left. The selenium rectifier is fastened to the chassis floor. The majority of the a.c. and d.c. leads are dressed along the edges wherever possible to keep the wiring open and uncluttered. The bypass condenser C_6 for the 6L6 tank coil is mounted inside the coil form. The filter condensers are firmly anchored by straps. Barrier type terminal strips on the floor and backdrop provide a set of convenient tie points for a.c. and d.c. voltages.





A group of typical 27 volt relays. They can be easily converted to work on 6 volts or any other d.c. voltage by using the data and charts in this article.

CONVERTING D. C. RELAYS

By
ROBERT B. TOMER
W1PIM

These war surplus items are still available at relatively low cost. Conversion is not difficult.

IN CONVERTING some of the many fine pieces of surplus equipment to other uses did you ever look at all those relays and other solenoid operated devices and say with a sigh, "If only they weren't wound for 27 volts—."? Perhaps you need a 6 volt antenna changeover relay—the 522's have a perfectly good one all wired and ready to go,—on 27 volts! Or perhaps you'd like to operate all of the relays in some nice piece of automatic gear, but you don't want to build the necessary high current d.c. supply to do so. Why not run them all from high voltage, say 100 volts, at low current, then you could use any convenient power supply? Or perhaps you would like to convert a low voltage relay into a low current unit for operation as a plate current operated device, as in a photo timer or other thyratron controlled circuit.

All of these problems and many more like them have undoubtedly occurred to a lot of you as you carefully removed one relay after another from some piece of war surplus and tossed them aside as useless. But they are not useless! It is an easy matter to convert any d.c. relay or solenoid to operate on any voltage or current you wish. Sure, it involves rewinding, but all you need is a small hand drill and some wire, plus a few minutes of spare time. When you know what wire size to use, all you do is unwind the old wire and rewind the bobbin with new wire. You don't count turns and you don't worry about the way the wire lays in. You simply random wind a sufficient amount of wire to fill the bobbin to the same level as the old wire and it's ready for use on the new voltage.

The reasons for this simplicity of conversion are themselves very simple. Assuming that the relay is designed properly in the first place, it is made so that at its operating voltage a certain amount of current flows through the winding. This current, when multiplied by the number of turns, gives a figure known as "ampere turns." This is the figure which determines the amount of force developed by the armature for a particular mechanical design. Now if you wish to alter the design of the relay so that it will develop the same armature force at some other voltage or current, all you have to do is maintain the same ampere turns and the device will operate exactly the same as before.

In order to calculate the ampere turns for each operating voltage, it would be necessary to first determine the number of turns on the original winding, calculate or measure its resistance, calculate how many turns can be wound in the same space with some new wire size, calculate what resistance the new winding will have and then determine the new ampere turns. This is a tedious process, believe me, I've done it, but fortunately there is an easier way.

This will come as no surprise to anyone who has worked extensively with wire or winding problems, but like most such short cuts that are well-known "in the trade," very few of us ordinary mortals know anything about them unless we stumble across them, and they come to us as a revelation. Mathematically speaking

there is a very simple relationship between the common wire sizes and their resistance which is not exactly obvious when you start studying a set of wire tables, however it begins to show itself as soon as you make a few simple calculations. Wire sizes can be regarded in groups of three numbers. If you increase the wire size by three numbers, you will see that the resistance per 1000 feet is approximately halved. If you increase another three sizes it is halved again, etc. The same thing happens in the opposite direction of course. Three sizes smaller and the resistance is doubled. So far so good, but this is only part of the story.

If you are going to replace a given winding with wire of a new size, it is assumed that you will rewind in the same space occupied by the original winding. That is, you have a fixed cubic volume into which you must fit the new winding. You have the length of the bobbin and the depth of the winding and these will be the same regardless of what wire you use.

Looking at the wire charts again another fact becomes apparent. Changing the wire three sizes from any given wire, note the figure under the heading, "turns per inch." This should be for the same type of insulation as used on the original winding and will in most cases be plain enameled copper wire. The figure for turns per inch applies to a single layer winding and tells you the maximum number of turns that can be laid side by side to the inch. Since a relay or solenoid is a multilayer winding, we must square this figure to get the "turns per square inch." This will tell you the maximum number of turns that can be wound in a space one inch wide and one inch deep.

Now it will be noted that the turns per square inch also varies with each three wire sizes by a factor of 2. If you decrease the wire three sizes, you can wind twice as many turns in a square inch; six wire sizes and the turns per square inch is changed by a factor of 4. We noticed above that decreasing the wire size three sizes increases the resistance two times and in addition we now note that we are also able to wind twice as many turns, so the result is actually to increase the total resistance by a factor of 4. Increasing the wire size six sizes will decrease the resistance 4 times, but only one fourth as many turns will be wound in the same space, so the result will be a winding having only one sixteenth the original resistance.

From this information it becomes apparent that the wire behaves according to a simple logarithmic function, and this is true because when several points are calculated and then plotted on semi-log graph paper, the result is a straight line. By the use of this graph it now becomes a simple matter to alter any existing relay to any new condition of operation.

Take a very simple case, and perhaps one of the most common conversions. You have a typical relay designed for 27 volt operation and you want to use it on that new mobile rig which works from the 6 volt car battery. How many wire sizes must you change to?

First, consider the 27 volt rating as 24 volts (to simplify the arithmetic) and divide it by 6 volts to get the ratio of the voltage change required. This is obviously 4. Read 4 on the bottom of the chart and follow the line up until it intersects the "operating voltage" line, then read across. The answer is read on the left side of the chart in the number of wire sizes that must be changed. We see that 6 sizes are required and since the change is from a high voltage to a lower voltage, common sense tells us that the wire size must be increased. Always increase the wire size when going to lower voltages and decrease it when going to higher voltages.

This was a simple case. Suppose you have a relay designed for 12 volt operation and you want to operate it from 150 volts. Suppose you have measured the current at 12 volts and found it to be 750 mils. (You could measure the d.c. resistance and calculate the current.) What wire size change is necessary to convert this relay to 150 volt operation and how much current will it draw at that voltage?

The solution;

150/12 equals 12.5 voltage ratio.

12.5 voltage ratio, from the chart, is 11 wire sizes.

Find the new total resistance by reading across from 11 on the left side until the resistance-current line is intersected, then down to the bottom and read 160 —new resistance equals old resistance times 160.

New current will equal old current over 160; 750/160 equals 4.7 mils—new current.

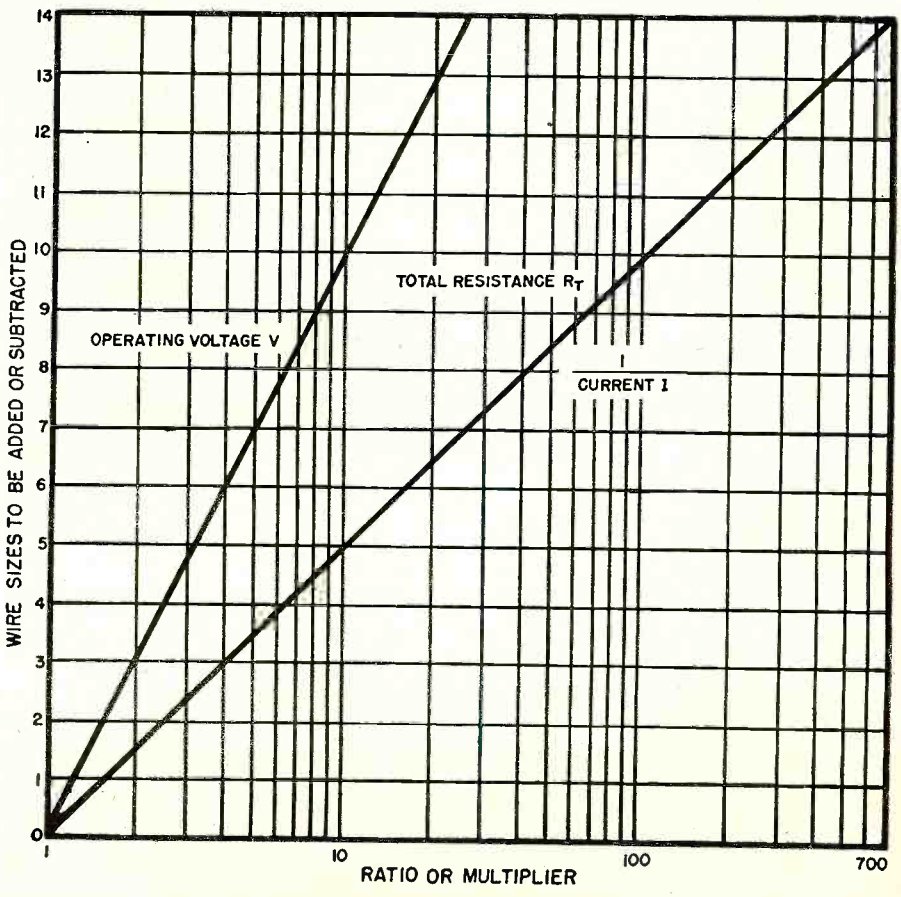
If the relay is rewound with a wire which is 11 sizes smaller (add 11 to the present wire size) it will operate on 150 volts at a current of 4.7 mils.

Throughout this discussion the reader has probably noted that no specific wire sizes have been mentioned, nor do they appear on the chart. That is because it is immaterial what wire size is used as long as the numerical relationship as to size is maintained. All that is required is to know the size of the original wire on the relay. This can be measured directly with a pair of micrometers by unwinding a small amount and measuring its thickness and then looking it up in the wire tables. An allowance should be made for the thickness of the insulation, but in the case of enameled wire this difference will usually be less than a full size and it is safe to assume that the nearest figure which is less than the measured size is the proper wire gauge.

If you are not able to procure mi-

(*Continued on page* 176)

Relation between wire size, voltage, and resistance for the condition of constant ampere turns and constant winding area.



RADIO SERVICE—A BUSINESS

By
RICHARD B. GRAF

With service competition on the upswing servicemen will have to give "plus service" and adopt time and money saving methods.

Fig. 1. A service counter serves the dual purpose of keeping the customers away from the workbench and improving the appearance of the radio service shop.

"LET'S get serious about this service game. The wartime "gravy-train" is long over; the woods are full of new servicemen, and we've got to wake up and face a lot of disturbing facts. Always remember, you're in this business to make money. So is the other fellow. You've got to have business volume to realize a substantial profit over increasing costs. Lots of us are back to the prewar headache of competition with "Jimmy Jones around the corner who 'fixes' radios," with "a guy up the street who fixes radios in his home just for the fun of it," and with any number of new shops starting up around us. All these people are out to make money too, and are a serious threat to business volume. There is a solution to this problem—you. You can get the business, plenty of it. It means work, personality, and a fair amount of "show."

First of all, look around your shop or store. Look at yourself. Put yourself in the place of a prospective customer. How about those windows, showcases, the workbench, the files? Is the place clean and orderly? Is the workbench piled with junk? A customer's reaction to your place of business is important. Word-of-mouth advertising means a lot. If your shop is a junk-heap you'd better clean it up now. You've got to present a neat business-like appearance too, all the time. People, our customers, notice little things. Women have a habit of watching *how* you talk, and not so much what you say about the repair job. Half of them don't know what you're talking about anyway, but will show interest if your manner is correct and if you appear to know what you're doing. Some customers are chiselers, who try to get as much free service as possible. Some of them squawk loudly when they are charged for an extra tube or part on a callback. You meet all sorts of people. Dealing with the general public is one of the hardest jobs in the world. Strange to say, *you* are one of the public! It's up to you to convince these customers that you know your job; that your prices are fair; that you have the equipment for the job; that you are interested in keeping them satisfied.

Let's talk about the *approach* to the shop. Keep customers away from your bench! One way to do this is to have a glass topped partition between the shop and store proper. Another way of doing this is shown in Fig. 1. This is a homemade showcase built against the shop wall, with a hinged window above it. The case is 12 inches deep by 40 inches wide. The front is heavy plate glass set into a moulding frame. The top of the case is a heavy plywood board that extends into the shop and serves as a counter. The case is lighted by three Lumiline lamps and includes two plate glass shelves. In the case are displayed samples of batteries, phones, crystal sets, keys, and other items designed to catch the eye of the experimenter. Inside, to the right of the window, is the billing machine and waiting-to-be-called-for file. All business is transacted at this window. A large piece of plate-glass is mounted on green felt atop the showcase. Under it are tube price lists, battery price lists, and other informative charts. Thus the customer can see prices and is less apt to squawk when buying.

At the end of the workbench, and so arranged as to attract the customer's glance, is a large bookcase. In this are all the manuals, catalogues, and books necessary for a first-class shop. A floodlight is mounted above the bookcase to show them up! See Fig. 3. The most important part of any shop is its library. This particular one is costly, but has paid for itself many times over. Every good manual, set manufacturer's dope sheet, or parts catalogue is filed on these shelves as soon as they're published.

Much has been said about the amount and kind of equipment a shop should have. This depends on several things. Just what type of work is to be done in the shop? Are you out for everything?—fans, clocks, washers, refrigerators, auto radios, home appliances? How many men are to use the benches? Is the shop for general repair work or strictly radio? Whatever the answer, the shop must be equipped to handle it. The amount of equipment depends on the number of men using it. Figs. 4 and 5 will give you an idea of what is necessary for a well equipped bench. This bench will accommodate three men. It is designed for home receivers only, including FM and television. All instruments are panel mounted, except for the large scope and one portable signal generator. The panels are masonite attached to wood frames with oval-

head Phillips screws and cup washers. They are easily removed. This bench has a place for everything and everything is kept in its place.

Every part of the shop discussed here is designed for fast, accurate servicing of home radio receivers and small appliances. No auto radio work is done or accepted, due to the shop's location.

Accurate records must be kept of all business transacted. For this purpose three filing card cabinets and a ledger are needed. This sounds like a lot of "paper-work" but is really very simple. The file cabinets are small and the system pays off. Most shops, including this one, guarantee all work for 90 days. This guarantee of course applies to actual parts used. Much time is saved and less confusion results if a system is followed like this: The work tag (Fig. 2) is in three sections. One section is a claim check which is given to the customer on receipt of the work. The center section is really a file card and contains all the information as to customer's name, phone, make of set, model number, date received, and complaint. This card is kept in the shop at all times. The top section of the tag is used to identify the work and is attached to the radio on completion. The center or file card section of the tag is placed in a "waiting file" near the shop entrance or counter.

The customer calling for his set presents the "claim check." This check is matched to the card in the "waiting file." If no card is found the set is not ready. If found the card is removed from the file and matched to the completed work tag. Then the card is placed in the "three month file." This file contains only cards dated for the previous three months. Each month the file is combed for over-dated cards. These are removed and placed in a current file. The "current file" is kept for two years, then destroyed. On the back of every card is a detailed list of parts used and trouble found. The cards serve as a perfect case history of the set and also can be used for repeat business.

In addition to the above mentioned files, this shop has a "New Set" file. In it are kept record cards showing new sets bought in the store. Each card gives purchase date, set name, model, serial and customer's name, address and telephone number. Sometimes customers forget when they bought a new radio, but a quick reference to the "New Set" file will show if their set is still in the guarantee period.

Whether the shop is owned by the store or privately, it's a good idea to keep a rough shop ledger. This ledger may be a school notebook or a standard bookkeeping ledger. In it are noted sales volume of parts and tubes, service income per week, and incoming stock. This record will give a fair estimate of the gross shop income for each week or month, or whether the business is paying.

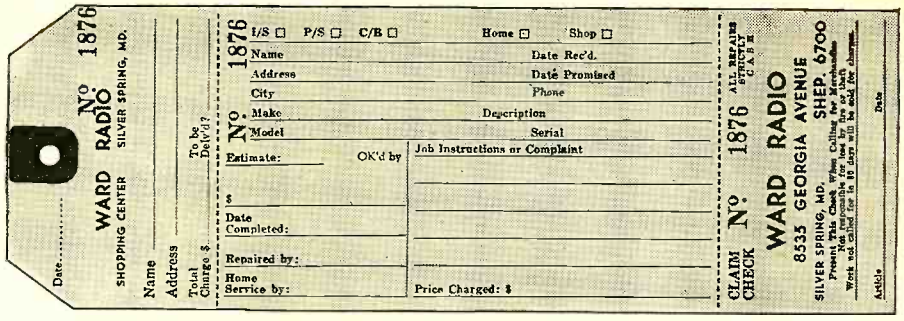


Fig. 2. A practical work ticket whose center section becomes a permanent file card.

At this writing, the shop shown in the photographs is now being brought up-to-date through the installation of new equipment. The new stuff will take care of television servicing. Sooner or later all well set up shops will have to handle television. The new equipment is not too expensive and will bring in a lot of highly profitable business. Along with this new service a great amount of "know-how" is necessary. I advise no one to enter the television game without a refresher course in the art, coupled with a thorough radio background.

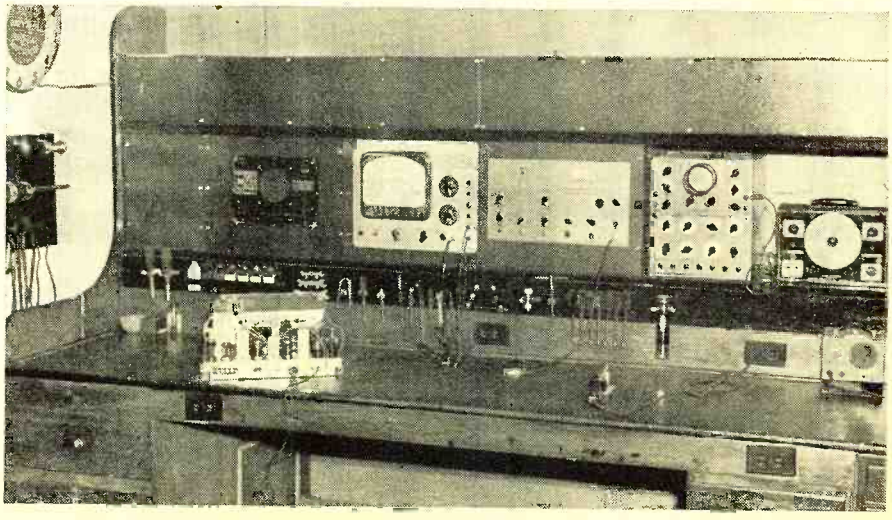
Television courses can be had from a number of places "free for nothing." That is, several of the large radio manufacturing companies have well planned courses of instruction for any serviceman who takes the time and trouble to attend them. I strongly advise every radioman to take advantage of these courses right away. Television sets are getting popular and cheaper. New stations are going up all over the country. All-day transmission will soon be established in most city areas. So get in this new game. Get what additional instruments are necessary to your layout so you can handle the job. Above all—get all the books, pamphlets, diagrams, and study courses you can right now.

Television servicing is not easy! The new art requires a man to be thoroughly familiar with a scope in the first place. A lot of us who own a good scope have let it gather dust on the shelf rather than take the time and trouble to use it for ordinary trouble-shooting. When FM came along it was dusted off and used now and then for alignment. Now the scope will become the most important part of your test panel layout. There are four instruments necessary for television work; i. e., oscilloscope, vacuum tube voltmeter, FM/AM signal generator, and a sweep generator.

(*Continued on page* 138)

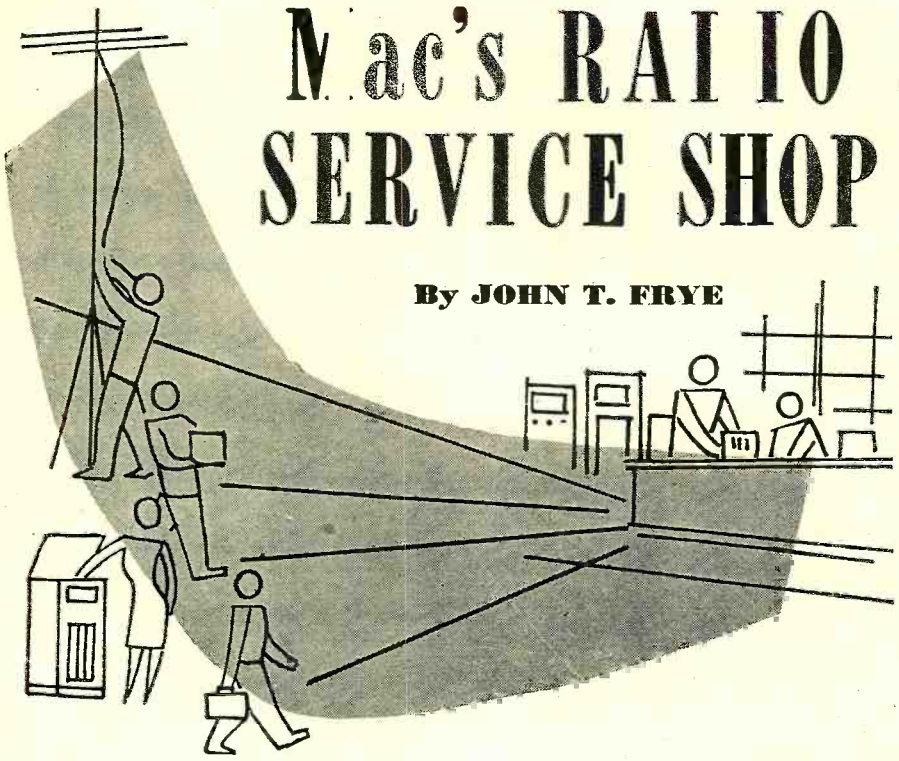
Fig. 3. All service manuals, catalogues and reference books are kept together in this handy bookcase. The entire case is floodlighted to dramatize it for the customers.

Fig. 4. View of one section of three-position test bench showing panel-mounted instruments.



Mac's RADIO SERVICE SHOP

By JOHN T. FRYE



A Trimmer Talk

BARNEY stood in the open door of Mac's Radio Service Shop and performed his awkward version of a buck-and-wing dance in an effort to clear his shoes of the first snowfall of the season. Mac and Miss Perkins, feeling the draught, looked up from the array of small radios, toasters, electric mixers, razors, and similar small appliances they were arranging on the display shelves for the Christmas season.

"Don't look now, Matilda," Mac said in a hoarse whisper that could have been heard for fifty yards, "but I think He-Who-Was-Raised-In-A-Barn is with us."

"Yes, He-Who, for goodness sakes come on in and shut the door," Miss Perkins said with a shiver.

"Well," Barney said, closing the door behind him and brushing some scattered snowflakes from his curly red hair, "if I am not appreciated here—"

"Ah, but you are, my boy, you are!" Mac broke in as he clutched the youth fondly by the arm and led him toward the service department. "We have lots of work with which to start the month, and I want to catch up on it and keep caught up right until the night of December 24th. If any of our customers have to have a 'silent night' on Christmas Eve because of a radio that is in a service shop, I do not want that shop to be ours. What's more, we are certain to have some frantic last-minute emergency calls, and the only way we can handle them will be for us to keep the decks cleared for action all this month. The holiday season is a period in which the granting or denial of a little extra favor can easily make or lose a loyal customer."

"I can take a hint, Boss," Barney said as he picked up his test leads.

"Before you start," Mac said, "I want to talk to you about aligning the tuned circuits of receivers. You have not done much of this sort of thing yet, but it is time you learned."

Barney put down the test prods and took a little notebook out of his pocket. "Fire when you are ready, Gridley," he said as he waited with a poised pencil.

"The first thing is to know what receivers to align and which ones to let alone. For the present, I do not want you to use the scope in aligning; so that means you will leave all FM and television sets for me. Neither will you try to align high-fidelity consoles or communications-type receivers. A wobbulated oscillator and a scope are required to do a first-class job on any of these."

"Gosh, what does that leave for me?"

"Only about ninety per-cent of all the receivers that come into the shop," Mac replied comfortingly. "There are few receivers that come into a service shop that cannot be improved by realignment. This is especially true if the i.f. transformers are subjected to a great deal of heat, such as is usually the case in a.c.-d.c. midgets. In some cases, where the rectifier or output tube is jammed right up against the i.f. can, the heat is so intense that it softens the wax on the windings and actually changes the inductance of the coils. It is impossible to keep such a set in alignment unless some of this heat can be kept from the windings."

"How do you do that?"

"By wrapping a couple of layers of thin asbestos around the outside of the shield-can and then by putting a heat-reflecting layer of tinfoil, shiny-side out, around that with a couple of pieces of Scotch-tape to hold everything in place."

"There are other causes of misalignment, though," he went on. "For instance, whenever a tube in the r.f. or i.f. circuits is changed from metal to glass, or vice versa, the associated tuned circuits should be realigned to compensate for the difference in tube capacities. Again, any time you have to disturb the wiring of these circuits, the difference in lead dressing is certain to upset the alignment. For example, when you install a new band-change switch, the alignment should be gone over carefully. It goes without saying that the installation of a new i.f., r.f., mixer, or oscillator coil should be followed by a complete realignment. Quite often, too, you will get a set in which the customer will tell you, 'I found some loose screws inside those little square cans and tightened them up, but that did not seem to help any.' More often, they will mess up the alignment and not say a word about it."

"Is there any way to check a receiver to see if it needs aligning?"

"You can make a rough check by noting the sensitivity and selectivity that the set has and by checking the dial alignment. *Bad* misalignment will usually show up as a shortcoming in one of these departments; however, since different receivers vary widely in these qualities, it is a good idea to put the signal generator on the i.f. channel and see if you cannot make an improvement."

"How do I hook the signal generator into the i.f. portion?"

"Go through a .1 μfd. condenser right to the grid lead of the mixer tube, which is usually reached most conveniently by hooking on to the stator section of the tuning condenser that tunes the grid circuit of the mixer. Disable the oscillator by clipping a .1 μfd. condenser from the stator of the oscillator tuning condenser to ground. See that the volume control is wide open, that the signal generator is tuned exactly to the correct i.f. frequency, and that its output is just sufficient so that the audio modulation can be heard. Your output meter should be clipped from the plate of the output tube to ground, and one of the lower ranges should be used so that the weak signal from the signal generator reads about half-scale."

"Why not hook the output meter across the voice coil?"

"Because it takes a relatively strong signal to produce much voltage—and that is what your output meter reads—at that point; and you want to keep the signal input at a minimum so that the a.v.c. action is not working and upsetting your observations. First adjust the i.f. output secondary, then the primary; next adjust the input i.f. coil secondary and then the primary; in short, always work from the detector

(*Continued on page* 140)

Equalizer and Preamplifier for Magnetic Phono Pickups

By
JOHN S. CARROLL

Equalization—the answer to the problem of providing a correlation between the pickup and recording

A WIDE variety of methods have been proposed for equalizing the highly popular magnetic pickups to the characteristics of the current commercial records. By taking advantages of the inherent characteristics of these pickups, an extremely simple and at the same time flexible preamplifier and equalizer can be built which does not require the use of specially wound, and expensive, inductances.

Two forms of equalization are possible in the preamplifier stage. The first is a rising bass characteristic, made necessary by the practice of recording modern discs with a constant amplitude curve below a certain frequency, and constant velocity above this point. The second equalization frequently desired is a high frequency roll-off, to be used with records having excessive surface noise or high-frequency distortion.

Bass Compensation

The simplest means of bass compensation consists of a frequency-selective feedback loop. Such a loop, correctly designed, can give a bass boost of approximately 6 db. per octave, with the turnover or point of inflection whereever desired. This loop consists of a condenser and resistor in series, and the point of turnover is usually taken as the frequency at which the capacitive reactance of the condenser is equal to the resistance of the series resistor. Above this point, the reactance of the condenser falls off rapidly, the feedback is essentially determined by the resistor alone, and the transmission of the loop is flat. Below this point, the reactance is mainly that of the condenser, and the transmission of the loop is decreasing at approximately 6 db. per octave. Since the feedback loop is degenerative, the result is a rising bass characteristic.

Most preamplifiers supplied for *G.E.* or *Pickering* cartridges have been equalized for a turnover point in the vicinity of 500 cycles. (The *G.E.* has a somewhat lower turnover; about 350 cycles.) However, commercial records are by no means uniform in this characteristic, and it is desirable to provide some adjustment to avoid either excessive bass or too little.

In the circuit shown, a 3-position switch connects one of three condensers into the feedback loop. In connection with R_6, these condensers provide turnover points as follows: C_5—800 cycles; C_6—500 cycles; C_7—300 cycles.

It will be found that the 300 cycle point is about correct for the new British *"ffrr"* records, which tend to have too heavy a bass with the usual equalization. 500 cycle turnover is correct for a large number of American records, while the 800 cycle point will take care of certain odd discs lacking in bass, or will provide a slightly heavier bass on standard records if desired.

Both *Pickering* and *G.E.* pickups are totally flat on a velocity basis when fed into the proper load. However, since the majority of modern records would still be too noisy if played with frequency response flat to 10,000 cycles, it is usually recommended that these pickups be connected into a load of somewhat lower resistance, which tends to slope off the high frequency response somewhat. In general, with the recommended loads, both pickups will be down about 3 db. at 10,000 cycles.

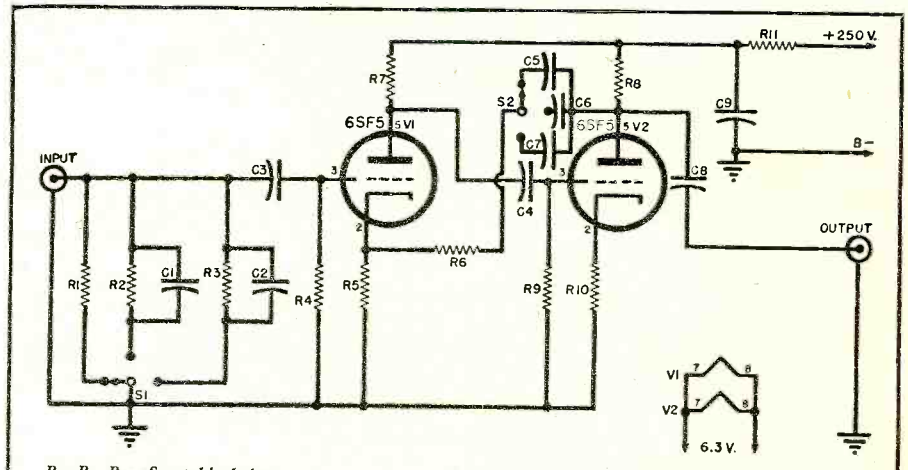
Most current recordings are being made with some high-frequency preemphasis, usually rising to a maximum of 6 db. at 8000 cycles. This provides some added brilliance in connection with the loss already mentioned, plus losses in the power amplifier, loudspeaker, etc.

However, in spite of all these losses, some records will prove to be unbearably noisy with these pickups and additional control is desirable.

Advantage is taken of the fact that

(*Continued on page* 175)

Circuit diagram of a preamplifier-equalizer for use with G.E. and Pickering pickups.



R_1, R_2, R_3—*See table below*
R_4, R_9—*1 megohm, ½ w. res.*
R_5, R_{10}—*2200 ohm, ½ w. res.*
R_6, R_7, R_8—*120,000 ohm, ½ w. res.*
R_{11}—*100,000 ohm, ½ w. res.*
C_1, C_2—*See table below*
C_3—*.1 μfd., 400 v. cond.*
C_4—*.01 μfd., 400 v. cond.*
C_5—*.0015 μfd. mica cond.*
C_6—*.003 μfd. mica cond.*
C_7—*.005 μfd. mica cond.*
C_8—*.05 μfd., 400 v. cond.*
C_9—*40 μfd., 450 v. elec. cond.*

	G.E.	*Pickering*
R_1	*6800 ohms*	*10,000 ohms*
R_2	*5600 ohms*	*7800 ohms*
R_3	*3300 ohms*	*4200 ohms*
C_1	*.012 μfd.*	*.008 μfd.*
C_2	*.04 μfd.*	*.03 μfd.*

The SOLOVOX

Servicing this popular home unit can provide a new source of revenue to servicemen.

The Solovox keyboard installed on a standard upright piano.

By PAUL M. MILLER

THE *Solovox* piano attachment is becoming more popular with piano owners every day. Many thrilling tones are produced by this versatile electronic musical instrument. Although the owners of these fine instruments are seldom acquainted with such technical terms as "oscillator drift" and "negative pulse," they do recognize that the tone is "flat" or "off-key" and look to a radio repairman for service. *Solovox* owners hesitate to entrust their instrument to just any radio serviceman that happens to be handy. They would rather (and who can blame them) be assured that the man who gets their *Solovox* to repair or adjust is thoroughly familiar with its operation and maintenance.

There are two models of the *Solovox*—the old and the new—the Model J and the Model K. Basically they are similar.

The Model K has a few circuit changes that eliminate some of the oscillator adjustments, and has a new family of clarinet-like woodwind tones, controlled by a "Mute" key.

The modern Model K will be discussed here.

The *Solovox* is essentially an oscillator, and it all starts out with the 6SJ7 oscillator tube. This one tube controls all the notes on the keyboard. The oscillator operates at the highest octave of the audio frequencies that the instrument features, from 2093 to 3951 cycles per second.

Fig. 1, the wiring diagram, shows the keyboard and the oscillator circuit. The keys are attached to the tuning condensers grouped in series at the extreme left of the diagram.

Pressing any key inserts a certain amount of capacity into the oscillator grid circuit and tunes the oscillator to a particular frequency. Note that all similar musical letters on the keyboard in the three octaves are paralleled and note also that the low, middle, and high octave sections of the keyboard are each attached to a separate tuning contact bar. The reason for this is immediately apparent realizing that all keys of the three octaves of the same letters are in parallel and would produce the same note when pushed down, if a tuning contact bar connected to a frequency divider were not present.

The note "C" (the first key) is the lowest frequency of the oscillator; the note "B" (the last key in the octave) is the highest frequency produced by the oscillator. The twelve condensers that tune the oscillator to the third or highest octave are all located in the "Vibrato box" attached to the keyboard. Examination of the diagram in Fig. 1 will reveal that in any octave on the keyboard there are twelve keys but only eleven contacts.

Key "B" in each octave has no contact.

When any one of the three "B" keys are depressed (or when no key is depressed) the oscillator is tuned to the highest frequency (3951 c.p.s.). The "C" keys tune the oscillator to its lowest frequency (2093 c.p.s.)

The oscillator tuning coil T_1 in Fig. 1, is the main tuning control of the *Solovox*. A powdered iron slug is moved in and out of the core of the coil, varying the inductance and therefore the frequency of the 6SJ7 oscillator. The only difference between this oscillator slug-tuned coil, and the oscillator coil in a receiver is that this slug has a long shaft and a knob on the end that extends to the outside of the cabinet so that the owner can "raise or lower the pitch" of the instrument. This is often necessary because few pianos are in perfect tune. Age of the piano, condition of piano and other factors will cause a noticeable difference between the piano and the *Solovox*—one of them will sound

(*Continued on page* 63)

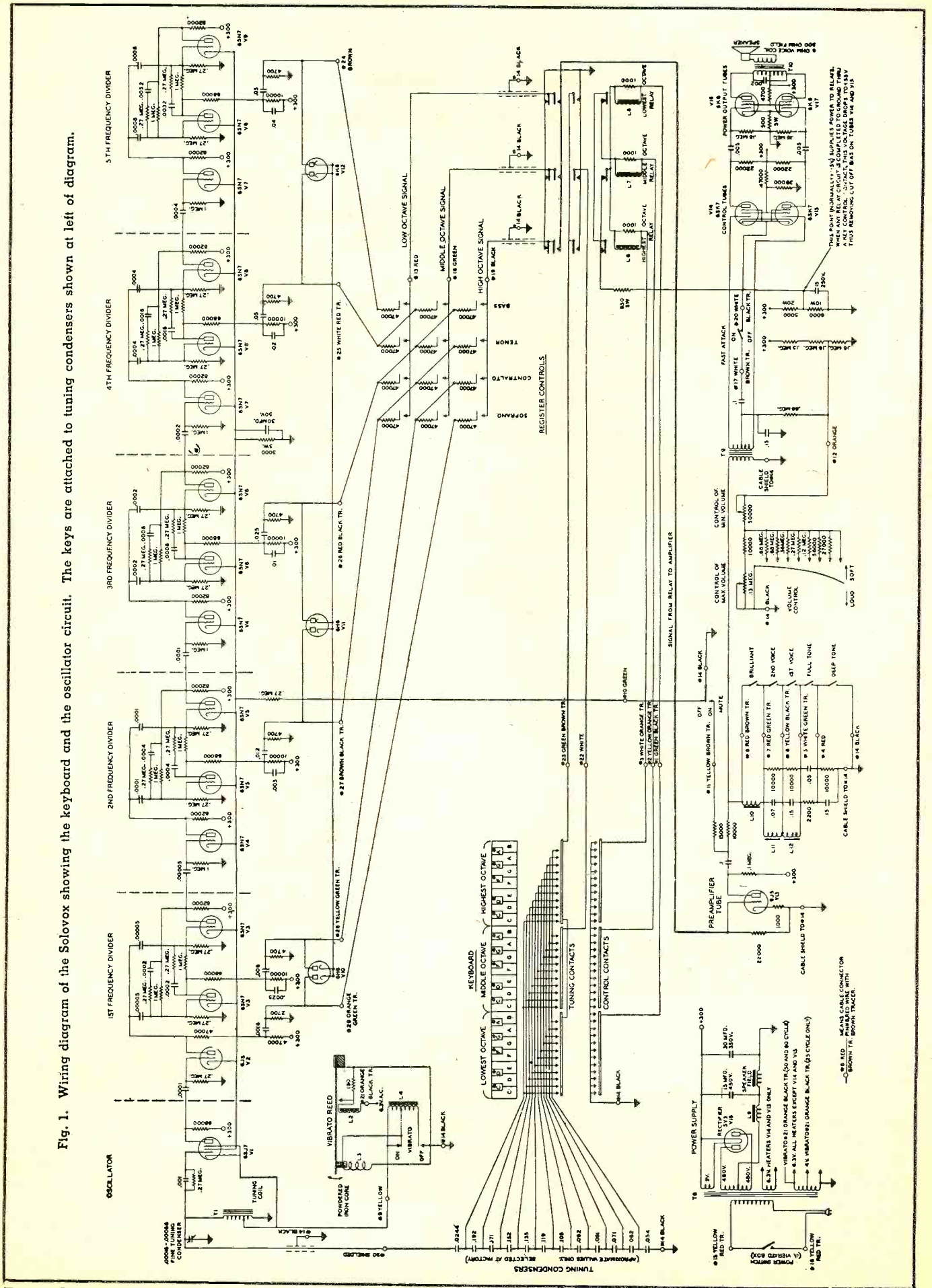
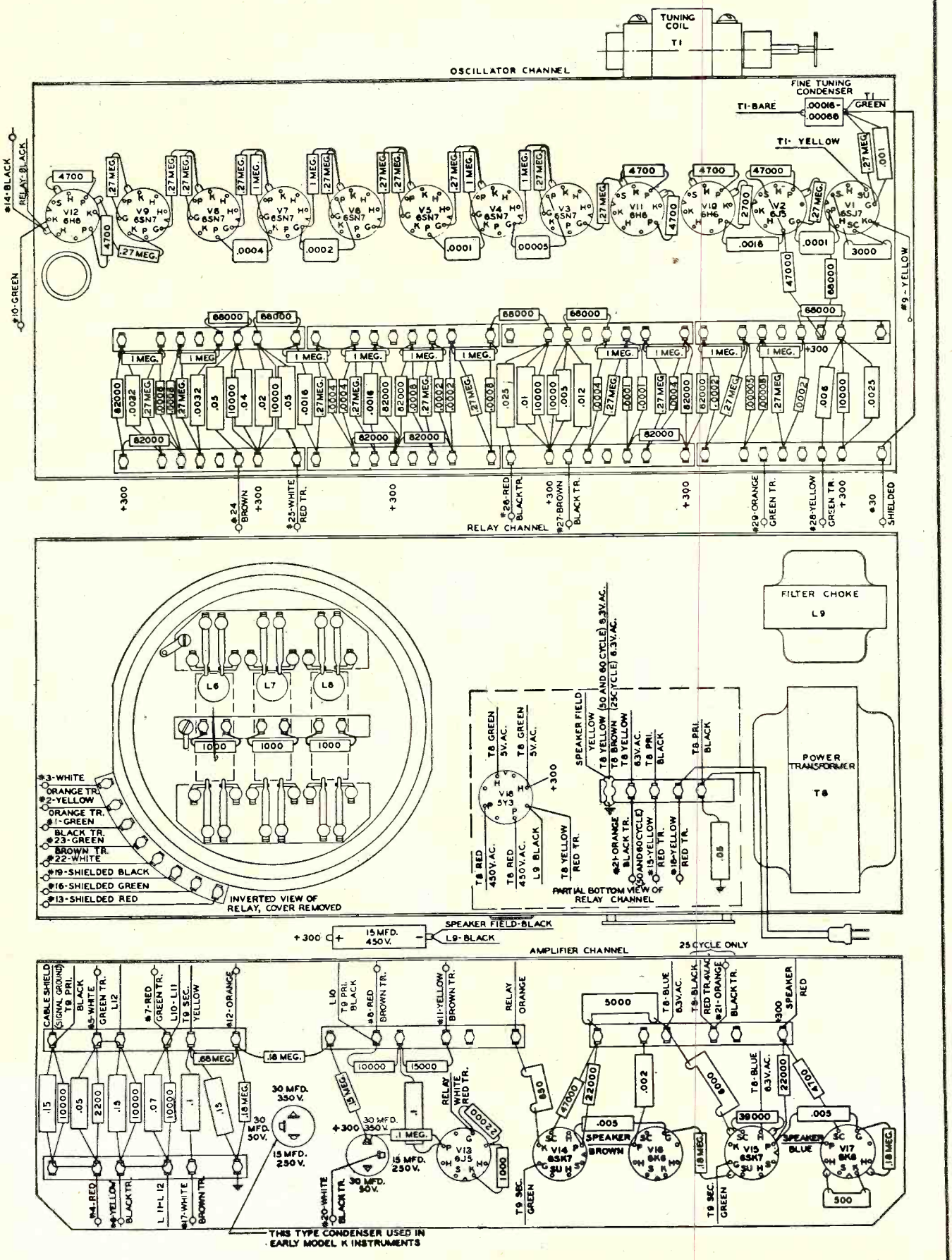


Fig. 1. Wiring diagram of the Solovox showing the keyboard and the oscillator circuit. The keys are attached to tuning condensers shown at left of diagram.

Fig. 2. Wiring diagram of the tone cabinet of the Solovox Model K.



flat. This oscillator adjustment permits the user to tune both to a harmonious balance.

The "Vibrato" effect is one of the outstanding features that make the *Solovox* a musical instrument instead of merely a multi-toned oscillator. Any audio oscillator operating at a fixed frequency produces a pure solid note. In the *Solovox* the individual notes seem to quiver or vibrate, producing a musical note that is pleasing to the ear. The vibrato effect is incorporated in the *Solovox* by means of a coil with a movable iron core connected to a reed that is driven back and forth rapidly, like an automobile vibrator reed. This varies the inductance of the coil in regular and even amounts. This coil is connected to the tap on the master oscillator coil and thus varies the frequency of the oscillator.

The reed is started automatically, that is, when the volume control is pulled out to start the instrument operating, it starts the reed vibrating and the magnetic drive keeps it going. It is a silent mechanism. The vibrato reed and its associated circuit can be seen in Figs. 1 and 3.

The Frequency Dividers

The output (2093-3951 c.p.s.) of the master oscillator is fed to a series of frequency dividers connected in cascade fashion.

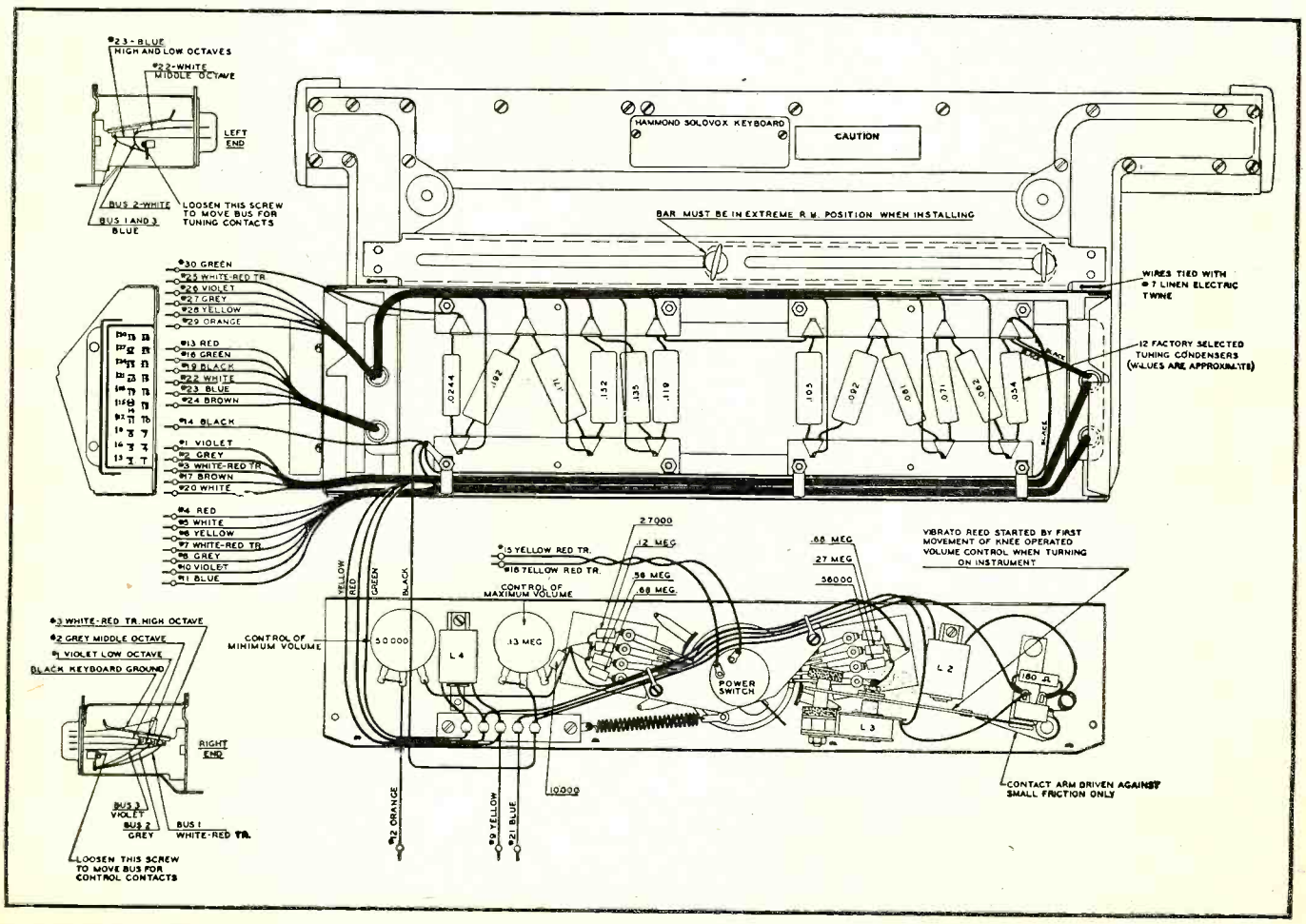
Close-up view of the Solovox keyboard as it is attached to the piano.

Each frequency divider divides its input frequency in half, producing a note one octave lower than its input note. Looking at Fig. 1 it is seen that each frequency divider stage is comprised of three triodes. In the first stage the 6J5 triode acts as a driver and pulse rectifier, supplying sharp and narrow negative pulses to actuate a symmetrical feedback tripping circuit made up of two triodes in one envelope (6SN7). The driver of the balance of the stages is one half of a 6SN7.

Either section of the twin triode can

(*Continued on page* 136)

Fig. 3. Wiring diagram of the Solovox keyboard unit.



RADIO NETWORK for RURAL AREAS

There is "no pasture in all New York State which is not a broadcasting point" with this trailer which the RRN calls "Nemo" and uses for on-the-spot broadcasting from remote areas.

This New York State net is supplying specialized radio programming to thousands of farm families.

FEELING that radio was not getting sufficient and specialized farm information to the farmers, that an exchange of ideas was not keeping pace with farming progress, and that city stations were not necessarily serving the farmers' exclusive interests, it was decided recently by ten farm organizations at Ithaca, New York that an FM radio network should be established to serve farm homes throughout New York State.

The result has been the establishment of the Rural Radio Network, Inc., wholly-owned by ten farm organizations, serving 118,000 farms in New York State. It is the first all-radio network of its kind in the United States and, in its final phase, incorporates every known means of communication to carry on its operation.

Station Locations

Stations in the network are located at Wethersfield, Bristol Center, Ithaca, DeRuyter, Cherry Valley, and Turin, New York. Each of these station's transmitter is located at an elevation of at least 2000 feet. It is also planned to establish full-time affiliates at New York City and Ogdensburg, New York, which means that the network may soon blanket the entire New York State area.

Elevation of the transmitting sites, which offers line-of-sight radio transmission from Albany to Buffalo, also points the way to television application, although the first job of the RRN is to serve by aural FM radio the New York State farm population. Each station has a 250-watt *General Electric* FM broadcast transmitter with effective radiated power of 1300 watts. This power radiation enables the service area of each station to overlap that of its adjoining neighbor and, of course, makes the radio network possible.

Two-Way Radio FM Installation

During the installation of the network, *G.E.* two-way radio communications equipment operating at 152-162 mc. was used. Later, *G.E.* made modifications in some of the units to permit their use as remote pickup gear. Jeeps and other mobile equipment, including a trailer ordinarily used for field-strength tests, were put into operation as adjuncts to network operations. Radio communication equipment in cars and at transmitter sites is used now by a floating force of three field engineers who keep the network running. Called an "intercom" system by RRN engineers, it can call a jeep or truck from one transmitter site to another in a matter of seconds. Another technical feature is the fact that the network can be reversed through the use of *G.E.* consolettes which enable a fast switch in the radio communication lineup. Thus programs,

The Rural Radio Network's "Nemo" trailer "on location" at one of the county fairs.

originating from any station, can be aired from the network.

The engineering staff, headed by Chief Engineer Donald K. deNeuf, consists of about 19 electronics technicians. Two are located at each station in the network, three are field engineers traveling in the trucks and jeeps, and four handle the master control and "remotes" at headquarters. It is a young staff and enthusiastically concerned with keeping the network in a state of highly efficient technical operation.

Coverage Techniques

Headquarters for the Statewide chain are located at Ithaca in the Ithaca Savings Bank Building. A *General Electric* ST (studios-to-transmitter) link beams programs from atop the headquarters building to a transmitter site at Connecticut Hill, 9½ miles southwest of Ithaca. There, the programs are put on the network and picked up by the other stations. High quality crystal-controlled receivers at each of the RRN stations pick up programs from headquarters and put them on the air simultaneously. Each station, in addition, can also originate programs, at which time the network is reversed, as noted previously. A "Nemo" trailer is used extensively for pick-up of programs covering county fairs, farm on-the-spot broadcasts, farm organization meetings, and other events as they happen. It is the boast of the network that "there is no pasture in New York State which is not a broadcast point for our network." The Nemo makes this statement a fact.

Transmitter Site Buildings

Feature of the network are the buildings located at each transmitter site. They are clean-cut white-painted structures built of poured concrete

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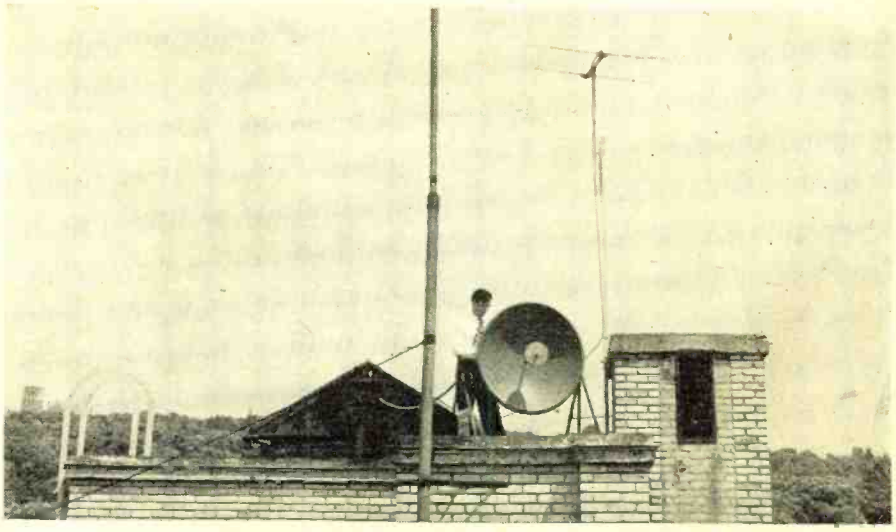
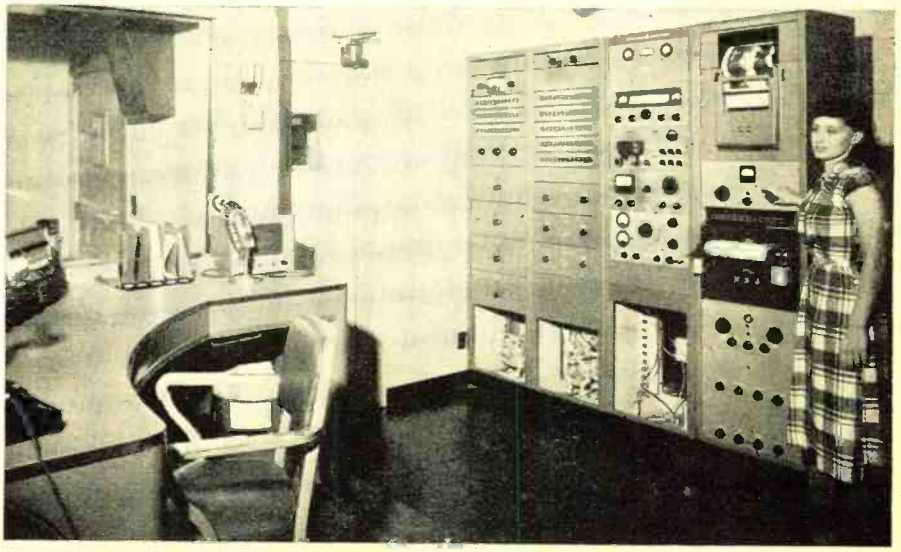


Engineer Tom Humphrey makes an adjustment on the studio-transmitter radio link microwave dish antenna which beams programs from atop the Ithaca Savings Bank Bldg. to Connecticut Hill, whence they are channeled to six other stations in net.

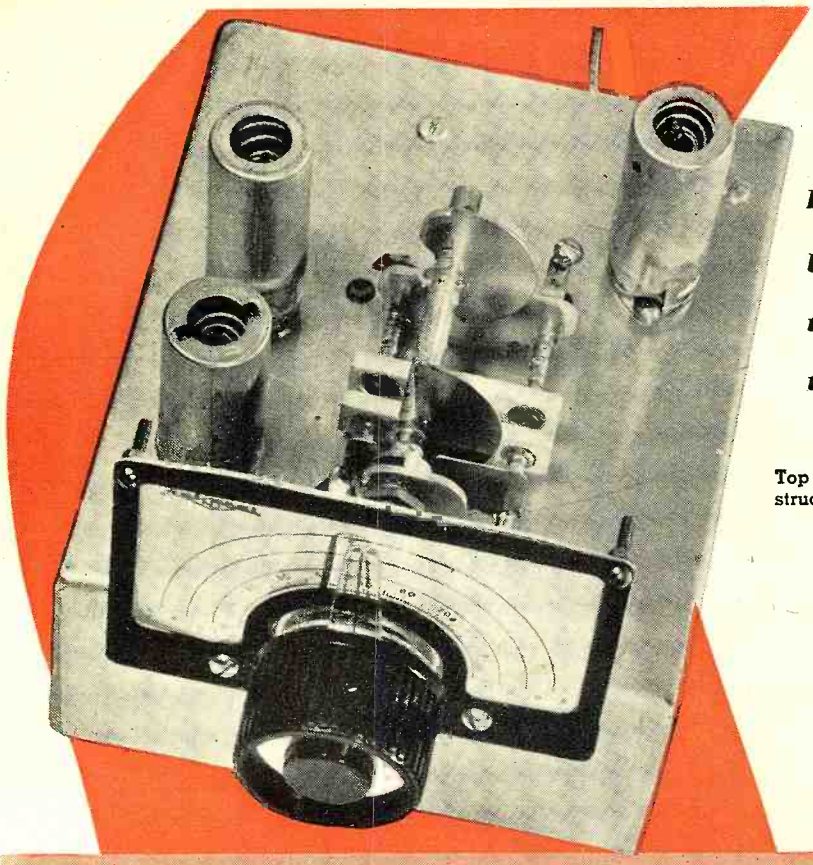
A soil-conservation program being broadcast in the studio of the Rural Radio Network at Ithaca offers advice to farmers. This is typical of services offered.

☆ ☆

The studio master control room in the Ithaca headquarters is complete with a two-studio consolette and audio-facilities cabinets which contain all of the equipment necessary for putting the Rural Radio Network programs on the air.



Typical transmitter house and antenna on the site at Connecticut Hill, about ten miles southwest of Ithaca. The building and tower are similar to those at other transmitting sites. The wind vane relays weather data to a meter in control room.



By
J. T. GOODE
Standard Coil Products Co.

Part 5. This 6 meter converter can be used on any receiver capable of tuning 14 mc. or with the all-wave tuner described in October issue.

Top chassis view of the home-constructed, high frequency converter.

Build Your Own COMMUNICATIONS RECEIVER

HIGH frequency converter construction differs somewhat from lower frequency construction. The main difference is lead length and parts layout..

The selection of component parts may mean the difference between success and failure.

In keeping with the original plan of designing a receiver that anyone with a basic knowledge of radio could build, the converter described in this article meets this requirement.

When this converter is used in conjunction with the equipment described in the earlier issues of this magazine, the sensitivity is approximately 3 microvolts with a signal-to-noise ratio of 10 to 1.

One of the best ways of getting into trouble with high frequency construction is to design a piece of equipment where one circuit's operation is affected by the tuning of another.

Experienced engineers can design such a circuit and obtain satisfactory results purely because of their experience. They are capable of analyzing difficulties that arise and make necessary changes to compensate for the interaction.

The design of the converter to be described was created for those who desire to construct their own equipment but may lack engineering experience and the necessary test equipment.

To improve image rejection it is necessary to increase the i.f. frequency so the image is greatly removed from the fundamental frequency.

A high frequency i.f. strip (14 megacycles) would require several stages to obtain sensitivity and then would lack selectivity. One solution to this problem is the use of a double superheterodyne.

This type of circuit has some disadvantages but these are largely eliminated when the tuning range of the converter is limited. The main difficulty is spurious frequencies generated by beats between the two oscillators incorporated in such a circuit.

By selecting a suitable i.f. frequency all of these spurious frequencies will fall outside the tunable range of the converter.

Another disadvantage is noise generated in a mixer stage. Since two mixers are required in a double superheterodyne a certain amount of noise is to be expected. By proper design this noise can be held within satisfactory limits.

A converter has three tuned circuits, i.f., oscillator, and antenna. If r.f. amplifier stages are used their tuned circuits will be the same frequency as the antenna circuit.

All of these tuned circuits will cause interaction if circuit capacities are not kept at a minimum. A 6J6 dual triode tube can be used in such a circuit but capacities between tube elements cause serious interaction between the tuned circuits.

By using three tubes each circuit is isolated and interaction is practically eliminated. This type of design allows the builder to build and test each circuit independently.

The oscillator circuit can be constructed and tested in order to insure its covering the desired frequency range. The i.f. tuned circuit is tuned to the desired frequency. The antenna circuit can be tuned with no pulling effect on the oscillator.

The frequency range of the converter is 49.5 mc. to 54.5 mc. The circuit consists of the following: 6C4 oscillator, 6C4 mixer, and 6AG5 r.f. amplifier.

The electrical function of the circuit is as follows: The antenna coil primary connects to the antenna terminal strip. The secondary of the coil connects to ground and grid of the 6AG5. Bias is furnished to this tube by cathode resistor R_1 and is bypassed by C_3.

Voltage is fed to the screen by resistor R_2 and is bypassed by condenser C_4. The plate circuit consists of a 50

μh. choke. Condenser C_5 and resistor R_5 form a plate filter network.

The output of the 6AG5 is connected to the grid of the mixer tube 6C4 by coupling condenser C_6. The mixer grid resistor consists of two resistors connected in series, R_3 and R_4. This voltage divider makes it possible to actually read the amount of injection voltage with a d.c. voltmeter without upsetting the circuit. Voltage is read across R_4 and this reading is multiplied by three for the correct voltage.

The plate circuit of the mixer tube 6C4 is tuned to 14 mc. by trimmer C_9 and shunt condenser C_8. The secondary winding of L_2 offers a low impedance circuit to feed the antenna input circuit of the receiver. Condenser C_7 and resistor R_6 provide a plate filter for the plate circuit of the mixer.

The oscillator circuit is conventional, using a 6C4 type tube obtaining feedback by means of a cathode tap. Condenser C_{2b} is the main tuning condenser and C_{12} is the oscillator trimmer. C_{11} is the grid coupling and R_8 the grid resistor. Resistor R_7 is used as plate filter and condenser C_{13} bypasses the plate completing the oscillator circuit.

Condenser C_{10} couples the oscillator to the grid of the mixer supplying injection voltage. This condenser actually is not used but due to stray pickup sufficient injection voltage appears at the grid of the mixer.

Mechanical layout is simple and straightforward. Tube socket layout is indicated in the photographs. Three holes are provided under the variable condenser to pass grid leads from the variable to the tube sockets.

The coils can be constructed out of material normally found in the average "junk box."

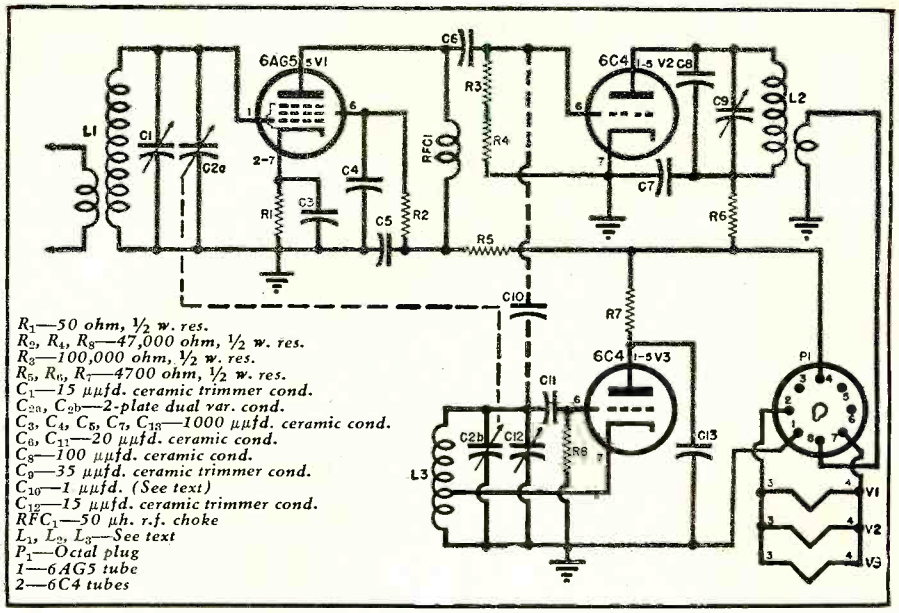
The antenna coil consists of 7½ turns of number 18 enameled wire wound around a ⅜" form. The spacing between turns is approximately 1/16". The antenna pickup coil consists of two turns of number 20 hookup wire with leads twisted to the point where they connect to the antenna terminals.

The oscillator coil consists of 6½ turns of number 18 enamel wire tapped at 2¼ turns from the ground end of coil, spacing 1/16". Coil is also wound over a ⅜" form.

The mixer plate coil is a *Miller* D-727-A antenna coil used in reverse. This coil is easy to duplicate. It consists of 7 turns of number 18 enameled wire spaced 3/32" between turns.

The secondary winding is 3 turns of number 36 enameled wire, wound close to the "B plus" end of the primary winding and is not space wound. The coil form diameter is 15/16". This coil is in no way critical as long as it will tune to 14 mc. when shunted by a capacity of approximately 100 μμfd. This will produce the low impedance which a triode mixer requires.

The following sequence should be followed in wiring. First connect all filaments in parallel. Mount the coils in the same positions indicated in the photograph.



R_1—50 ohm, ½ w. res.
R_2, R_4, R_8—47,000 ohm, ½ w. res.
R_3—100,000 ohm, ½ w. res.
R_5, R_6, R_7—4700 ohm, ½ w. res.
C_1—15 μμfd. ceramic trimmer cond.
C_{2a}, C_{2b}—2-plate dual var. cond.
C_3, C_4, C_5, C_7, C_{13}—1000 μμfd. ceramic cond.
C_6, C_{11}—20 μμfd. ceramic cond.
C_8—100 μμfd. ceramic cond.
C_9—35 μμfd. ceramic trimmer cond.
C_{10}—1 μμfd. (See text)
C_{12}—15 μμfd. ceramic trimmer cond.
RFC_1—50 μh. r.f. choke
L_1, L_2, L_3—See text
P_1—Octal plug
1—6AG5 tube
2—6C4 tubes

Circuit diagram and parts list covering the 6 meter converter unit.

Wire the oscillator circuit keeping in mind that short leads are highly desirable. Connect the oscillator plate bypass condenser to the same ground point that is used to ground the oscillator coil. Use number 18 bus bar wire for all coil connections. The use of flexible wire for these connections might lead to oscillator instability.

The mixer circuit is next to be wired. By placing a solder lug under the rear tube socket mounting screw a common ground point is established. The cathode, the ground end of grid resistor R_4 and the ground end of bypass condenser C_7 all connect at this one point. This prevents developing any ground loops.

The wiring of the r.f. stage is much the same as the mixer. Place a solder lug under the tube socket mounting screw located towards the front of the chassis. This becomes a common ground point for the screen bypass condenser, cathode condenser, cathode resistor, and tube socket center shield.

The coupling condenser C_6 connects directly from the plate prong of the r.f. tube socket to the grid of the mixer socket. Spare tube connections on the mixer socket offer mounting for the r.f. plate choke and screen resistor.

The ground point for the grid coil is a solder lug under the front mounting screw of the variable condenser. Bus bar wire is used to connect the variable condenser to the tube grid and grid side of the coil.

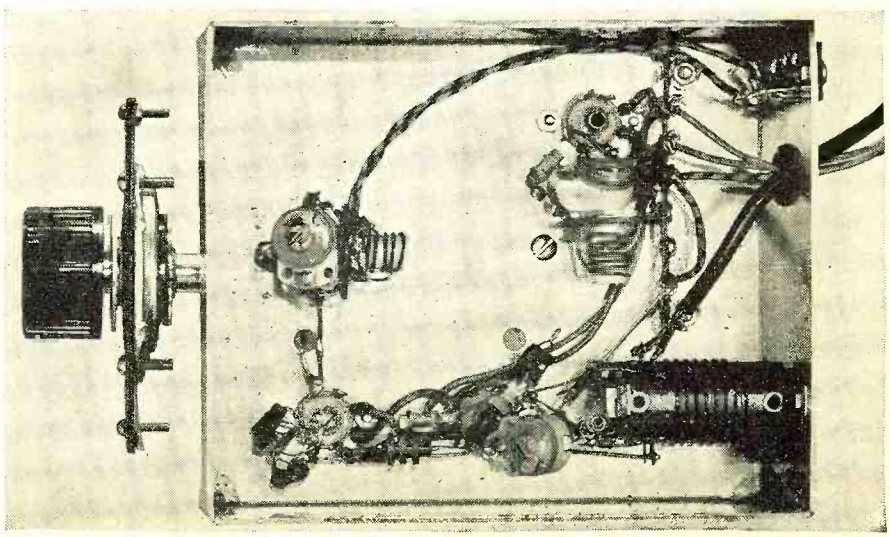
Trimmers for the coils are located right at the coils. The power cable can consist of flexible hookup wire or multiple wire cable. The output cable consists of *Amphenol* mike cable. All of these leads terminate in an octal plug.

Tuning Procedure

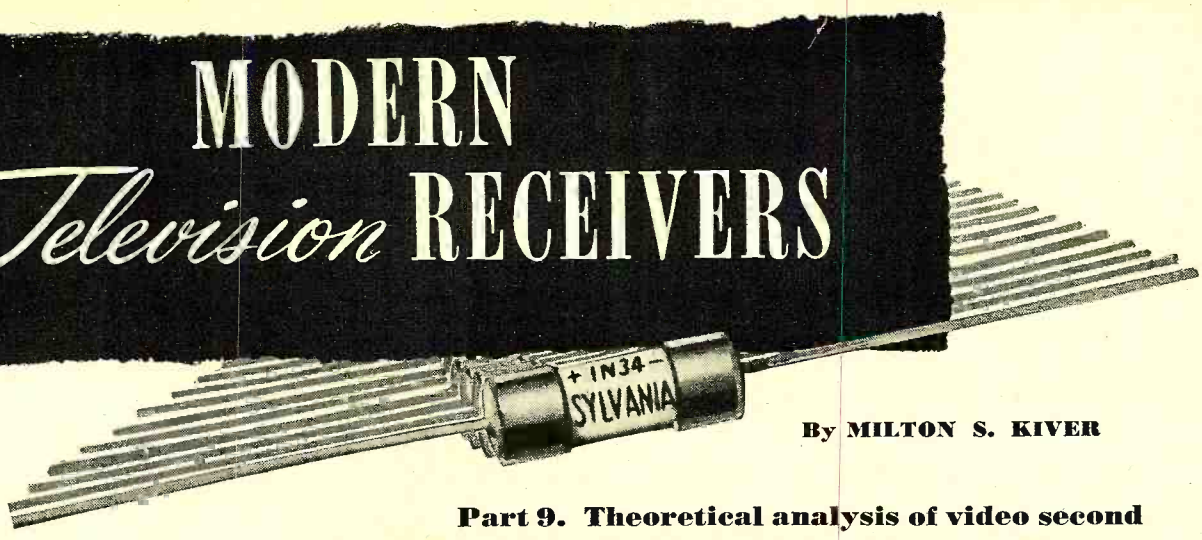
The alignment is simple if a signal generator is available. First feed 14 mc. into the signal circuit and ad-

(*Continued on page* 134)

Under chassis wiring detail. The chassis measures 5x6x2¼ inches.



MODERN *Television* RECEIVERS



By MILTON S. KIVER

Part 9. Theoretical analysis of video second detector circuits used in modern TV sets.

THE video information of a television signal amplitude modulates the carrier at the transmitter. One sideband, the lower, is then partially removed and the signal transmitted in this form. Because one sideband is partially removed, many servicemen are of the opinion that the form of the wave differs radically from the case where both sidebands are present. Actually, the difference, as viewed on an oscilloscope screen, is negligible and the incoming video signal appears as shown in Fig. 1. Since the signal is amplitude modulated, detection can be carried out in much the same manner as in any sound broadcast receiver. A single diode is sufficient. The demodulated video signal with its blanking and synchronizing peaks is developed across R_L. The form of the signal, when it enters the second detector, is shown to the left of Fig. 1. The rectified resultant is illustrated at the right. The effect of the diode tube is to remove half of the incoming wave. The filter circuit leading to the detector load resistor then removes the i.f. voltage, leaving only the video signal variations at the detector output.

The video output contains frequencies ranging from 10 cycles to 4.0 mc. With a detector circuit such as shown in Fig. 1, it would be difficult to attempt to pass all of the video frequencies because of the stray circuit and tube capacitances that are invariably associated with all electrical circuits. As the frequency of the signal increases, the reactances of these shunting capacitances decrease and soon more of the signal is flowing through these capacitances than through the load resistor. In order to maintain the high-frequency end of the video response, the circuit is modified in two ways. First, the load resistor value is made low. This reduces the effectiveness of the stray capacitance to provide shunting paths for the higher video frequencies away from the load resistor. Second, one or more peaking inductances are inserted into the signal path. These inductances resonate with the stray and tube capacitances, minimizing their effect on the signal.

A typical video second detector circuit, found in many current television receivers, is shown in Fig. 2. The incoming i.f. signal appears across L_1, changing the cathode voltage with respect to the plate. Whenever the cathode is negative with respect to the plate, current flows from the plate, through L_2 and R_1, in parallel, down through L_3 and R_2 (the load resistor) to ground and finally up through L_1 to the cathode. The two peaking coils in the detector load circuit are L_2 and L_3. Both coils, in conjunction with the low valued load resistor, maintain the response of this circuit up to 4.0 mc. The 39,000 ohm resistor across L_2 prevents this coil from overpeaking the high response. The coil may contain enough distributed capacitance to resonate at some frequency above 4.0 mc, thereby causing an unwanted rise in response. Insertion of the 39,000 ohm resistor loads the coil sufficiently to prevent this rise.

The same circuit (Fig. 2) may also be found with its plate and cathode connections interchanged. See Fig. 3. This circuit functions in precisely the same manner as the circuit of Fig. 2, and yet the voltage developed across its load resistor will not produce the same image as that of Fig. 2, if both voltages were applied to the same cathode-ray tube. Instead the video voltage obtained from the circuit of

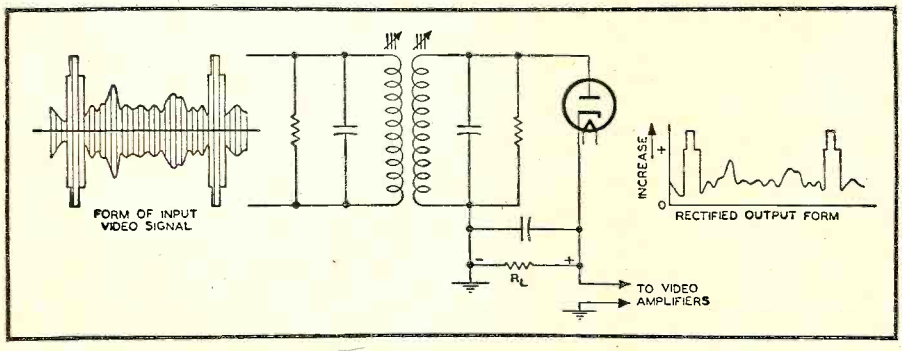


Fig. 1. A video second detector. In order to operate efficiently, peaking coils must be added to this basic circuit. See Figs. 2 and 3.

Fig. 2. A circuit diagram of a widely used commercial video second detector. The picture phase of the output signal is positive.

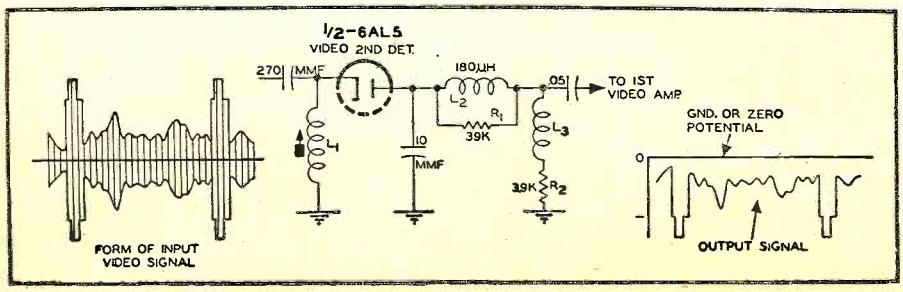


Fig. 3 would produce an image which would be a photographic negative of the image derived using the voltage from the circuit in Fig. 2. This is an interesting phenomenon and one which is peculiar to television. To understand it, we must understand more fully the action of the video signals at the cathode-ray tube.

Each voltage variation in the video signal produces a differently shaded spot of light on the cathode-ray tube screen when applied to the control grid of the cathode-ray tube. When the voltage is highly positive, it will permit many electrons from the cathode of the image tube to flow into the electron beam. This beam, striking the fluorescent screen, will produce a bright spot of light. When the video voltage becomes less positive, or more negative, the control grid potential in the image tube drops. Less electrons are now permitted to pass by the control grid and, of course, less electrons reach the screen. The spot shading, at this point, is possibly gray or even darker. Finally, when the blanking and synchronizing voltages are active at the control grid, no electrons should be able to reach the screen. Now, if we examine the video signal, Fig. 4A, we see that the signal voltage is most positive for the blanking and synchronizing pulses and least positive for the camera signal. If we applied this voltage to the grid of a cathode-ray tube, the brightest portions of the original image would now appear darkest, while the synchronizing pulses would produce the brightest spots. Obviously this is contrary to the desired conditions and the video signal, in the form shown in Fig. 4A, would not be suitable for direct application to the cathode-ray tube. What we must do is to reverse this signal to form shown in Fig. 4B. Here, the relative polarity of the video voltages is correct and a properly shaded image will appear on the screen.

To identify and distinguish between these two voltage forms, we call the one shown in Fig. 4A the negative picture phase and the signal shown in Fig. 4B the positive picture phase. The negative picture phase is the form the signal is placed in, at the transmitter, before its amplitude modulates the carrier. At the second detector in the receiver, the signal is rectified and must be reversed to the proper form (positive picture phase) by the time it is applied to the grid of the cathode-ray tube.

The output of the second detector can be either a positive or a negative picture phase, depending upon the manner in which the detector is connected. To illustrate, consider Figs. 2 and 3. In the first circuit we obtain a positively-phased video signal at the detector output whereas in the second circuit, the output is negative. Here is why.

In the incoming signal, the synchronizing pulses give rise to the greatest voltage. (This is due to the negative video polarity employed in

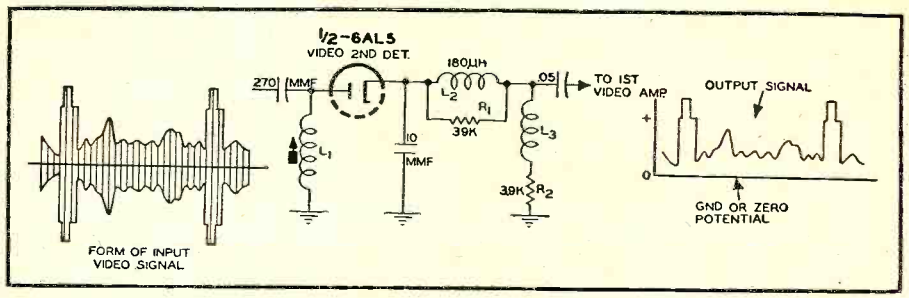


Fig. 3. The same circuit as shown in Fig. 2 with the exception that the tube terminals are interchanged to produce a negative phase output.

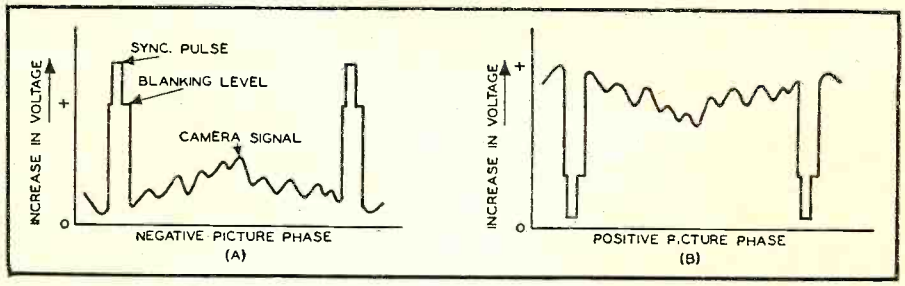


Fig. 4. Form of video signal in a negative (A) and positive (B) picture phase.

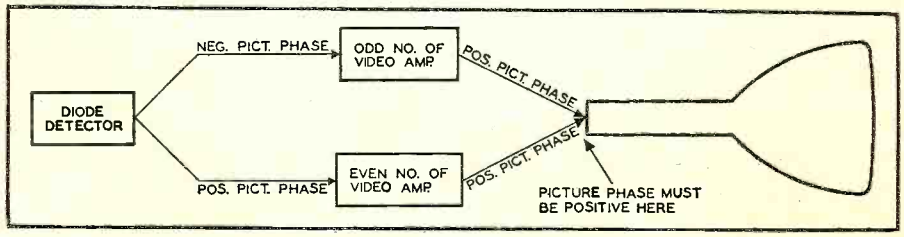
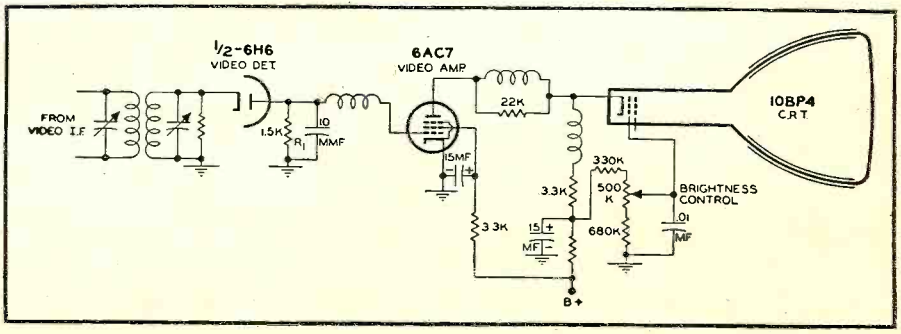


Fig. 5. Indicating how the number of video frequency amplifiers following the video second detector is dependent on picture phase of rectified signal.

American television. In England, positive video polarity is standard). At the diode detector, Fig. 2, the bottom half of the incoming signal, shown at the left of the illustration, is effective in causing current to flow through the diode. For all values of voltages in the top half of the signal, the cathode is more positive than the plate of the diode and the tube is non-conductive. The cathode is most negative when the bottom sync pulses are active and at these moments maximum current flows through the tube. The electrons flow from the diode plate down through L_2, L_3 and R_2 and back up the cathode. Hence, at this instant, the upper end of R_2 is most negative with respect to ground. When the camera signal is present, the cathode is not so negative and hence, less current flows. The result of this operation is to produce a positively phased signal across R_2. This is indicated in the illustration at the right in Fig. 2.

When the same incoming signal is applied to the diode detector circuit of Fig. 3, only the top half of the signal is effective in forcing current through the tube. Now the plate of the diode will be driven most positive when the upper synchronizing pulses are active and the voltage developed across R_2 will also be most positive at this moment. As a result, the signal obtained at the output of this detector is in the negative picture phase and, as such, is not suitable for direct application

Fig. 6. The video detector and video amplifier of the G.E. Model 801.



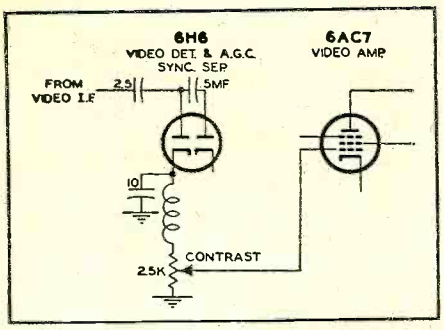


Fig. 7. The video detector of the Farnsworth Model GV 260 television receiver.

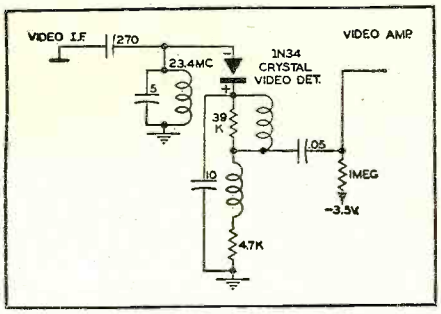


Fig. 8. The video second detector of UST sets is a 1N34 germanium crystal unit.

to the grid of the image tube. It must first be reversed to the positive polarity. Let us see how this can be accomplished.

The signal that is developed at the output of the diode detector is not strong enough to use directly at the picture tube. Hence, it is passed through one or two video frequency amplifiers. These amplifiers, as we shall see in a later article, are resistance-coupled amplifiers and the signal, in passing through these stages, is reversed by approximately 180°. Thus, if the video signal had a positive picture phase at the diode load resistor, it will have a negative picture phase at the output of the first video amplifier. With a second stage of amplification, the signal is brought back to the positive phase again.

As a general rule, then, an even number of video amplifiers is required if the picture phase across the diode load resistor is positive. For a negative picture phase at this resistor, an odd number of video amplifiers is needed to place a positively phased signal at the grid of the cathode-ray tube. These rules are illustrated in block form in Fig. 5.

The circuit of the video detector and the video amplifier of the *G.E.* Model 801 receiver (Fig. 6) appears, at first glance, to violate the foregoing rules. Examination of the video signal developed across R_1 reveals it to be positively phased. This would require 0,2,4, or some other even number of video amplifiers. Actually, only one is present. The mystery is resolved when we note that the output of the video amplifier is fed not to the control grid of the cathode-ray tube, but to its cathode. The above rules were drawn up with the tacit understanding that all incoming signals are applied to the control grid of the picture tube. This is the normal point of signal application. Signals applied to the cathode of a tube should differ by 180° from the same signals applied to the control grid, to produce similar results.

In the *Farnsworth* receiver, Model GV260, a negatively-phased signal is developed in the cathode leg of the diode detector. See Fig. 7. The diode load resistor is also employed as the contrast control, permitting the viewer to tap off as much voltage as he feels will produce a good image on the screen. Note that the contrast control is being used here very much like a volume control in sound receivers. This receiver also develops a.g.c voltage and feeds this back to both i.f. stages. Manual control of the amount of signal reaching the cathode-ray tube is then obtained through this contrast control.

In place of a diode tube, many television receiver manufacturers have substituted the new germanium crystal detector, 1N34. These new crystals, which were developed for radar, are well suited for operation up to 100 mc. The old catwhisker crystal detectors with which many oldtimers are familiar were much too critical in adjustment to be used for any such purpose. Furthermore, their large size produced a high internal capacitance which was detrimental to high-frequency operation. In the new germanium crystals the total capacitance from cathode to anode is only 3 $\mu\mu$fd. and this compares favorably with any of the miniature diodes.

Briefly, the theory of operation of a crystal is as follows: When two metals are brought into contact, electrons can flow as readily in one direction as another. However, when a metal is brought into contact with a certain class of materials known as semi-conductors, electrons flow more easily in one direction than in the other. When we apply an alternating wave to a circuit containing a crystal, more current will flow in one direction, with the result that an average current will be produced. Hence, rectification has occurred. In this respect the crystal is less efficient than a diode, since current can only flow in one direction through a tube. In the crystal, current flows in both directions, although considerably stronger in one direction than the other. The smaller current, which is not desired, offsets some of the rectified voltage developed across the load resistor thereby lowering the ratio of voltage output to voltage input. With this ratio decrease, the detector efficiency drops.

The 1N34 is rated for an average anode current of 22.5 ma. and a peak inverse anode voltage of 50 volts. These ratings are more than sufficient for detector operation.

A typical circuit, used in recent *United States Television* sets, is shown in Fig. 8. The section of the crystal rectifier marked with a minus sign is equivalent to the cathode of a diode tube. The other section, marked with a plus sign, represents the plate. On conduction, then, the maximum flow of electrons occurs from the negative to the positive plates. This is similar to any tube.

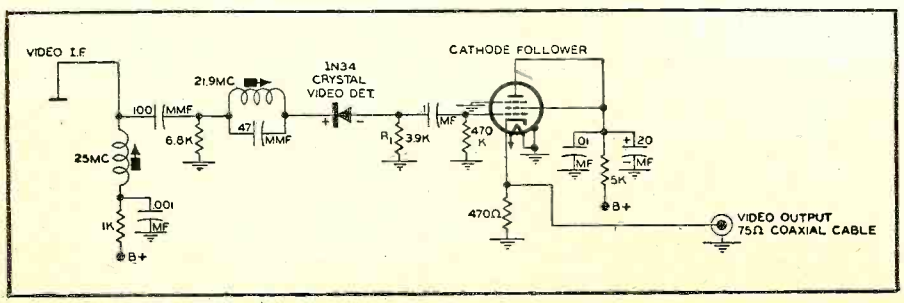
In *Industrial Television* receivers, the video detector is housed in one cabinet and the video-frequency amplifiers and the cathode-ray tube in another. In order not to lose or distort any of the rectified video signals between units, a cathode follower receives the signal output of the video detector and then transfers this to a 75 ohm coaxial cable. The circuit of the video detector (using a 1N34 crystal) and the 6AG7 cathode follower is shown in Fig. 9. The video signal developed across R_1 is positively phased and this polarity is not altered by the cathode follower. Hence, we would expect an even number of video-frequency amplifiers at the other end of the coaxial cable and further inspection of the circuit reveals this to be true.

The output from the video second detector consists of the image detailed variations plus the blanking and synchronizing pulses. This represents a complete video signal and with it we are enabled to run as many cathode-ray tubes as desired, each with its own group of video frequency amplifiers and system. Thus, many hotel television systems contain a central unit from which the video signal is fed to individual image tubes.

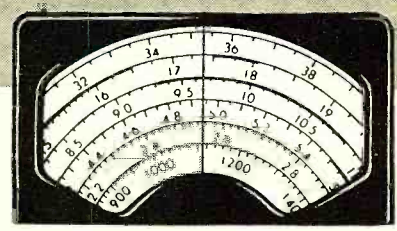
The shape of the crystal and its holder are generally such as to make it relatively simple to insert the crystal in the circuit in the wrong or opposite manner. The visual consequence will be an image that is a photographic negative of the desired image, with all the light values reversed. Hence, it is most important for the serviceman to carefully observe crystal polarity when placing these units into the circuit.

(To be continued)

Fig. 9. A video detector followed by a cathode follower. See text for explanation.



International SHORT-WAVE



***Compiled by* KENNETH R. BOORD**

WE ARE pleased this month to dedicate the *ISW Department* to *Radio New Zealand* and to present detailed data on shortwave outlets operating from Germany.

Radio New Zealand

Radio New Zealand, Wellington, is now on the air daily at 0200-0400* on 11.78 and 15.28, directed to Australia and the Pacific. James Shelly, director, has furnished us this information:

"On New Zealand's Dominion Day, September 27, *Radio New Zealand,* the Shortwave Division of the New Zealand Broadcasting Service, commenced its overseas service. *Radio New Zealand* aims to provide a service for the New Zealand Dependencies in the Pacific and for the Trust Territory of Western Samoa, and at the same time to offer a program of interest to listeners in other parts of the world. The transmissions, to start with, are limited to two hours daily—from 7 p.m. to 9 p.m. N. Z. Standard Time (0700-0900 GMT; 0200-0400 EST). *Radio New Zealand* is being received with good strength in the Pacific Islands to the north of New Zealand and in Australia, and to a lesser degree in New Guinea, the Netherlands East Indies, Malaya, India, or, in short in the Middle and Far East. Reception in other parts of the world will be improved when new aerial arrays, now on the drawing board, are constructed.

"The policy of the Shortwave Division is to provide a program with maximum entertainment value. Approximately three-quarters of the time on the air is being given to musical programs; talks and news sessions are brief, and we hope, interesting and entertaining. New Zealand is a small country—the latest census figures show the population as less than one and three-quarter million—and we are now conscious that we can claim few world famous musicians. However, New Zealanders have a healthy interest in music and the standard of performance will allow us to present many New Zealand artists from *Radio New Zealand.* Then, most visitors to this country find the music of the Maori people, with its strong melodic line, interesting and unusually pleasant to listen to, and some of the Maori mythology is good radio fare. So, the songs and stories of the Maori race will be heard at times from our studios.

"As a small country our voice is small in world affairs. However, New Zealand's social legislation is not unknown in other parts of the world, and with modesty, one of our designs will be to project the pleasant New Zealand way of life.

"Broadcasting in New Zealand is a State function and the programs for *Radio New Zealand* are prepared by the Shortwave Division of the New Zealand Broadcasting Service.

"Here are a few detailed program items of *Radio New Zealand:*

"A short bulletin of New Zealand news daily (except Sundays) 0330; New Zealand musicians are featured on Tuesdays 0215 and Saturdays 0340 in light musical entertainment; "Song and Story of the Maori," the attractive music and folk lore of the Maori people, Sundays 0240; "Listeners' Digest," a weekly radio magazine with a women's page, a page of music, and other items of interest, Saturdays 0300; "New Zealand, Pacific Playground," a session of travel information for the visitor to New Zealand, Sundays 0230; "Mail Box," with answers to letters and replies to questions, Thursdays 0230; short stories by overseas and New Zealand writers, Tuesdays 0300; each Friday at 0230 a play recorded in the Production Studios of the New Zealand Broadcasting Service; a series of talks covering a wide field of background information to New Zealand, Mondays 0300; news and recent developments from the farmers' point of view, Tuesdays 0230; "Leisure Hours in New Zealand," how New Zealanders occupy their leisure hours, their arts, hobbies, sports, Wednesdays 0300; "Through New Zealand," talks dealing with the New Zealand countryside, the coastline, outlying islands and the country-people, Thursdays 0300; commentators highlight the main sporting events of the week at 0230 Mondays; and "Pars From the Sporting Page," news paragraphs concerning sportsmen and sporting activities, is aired Wednesdays 0230.

"Studios of *Radio New Zealand* are at 38, The Terrace, Wellington, the capital city of New Zealand. They can be linked with all the medium-wave broadcasting stations in New Zealand so that programs originating in any part of the country may be available to overseas listeners.

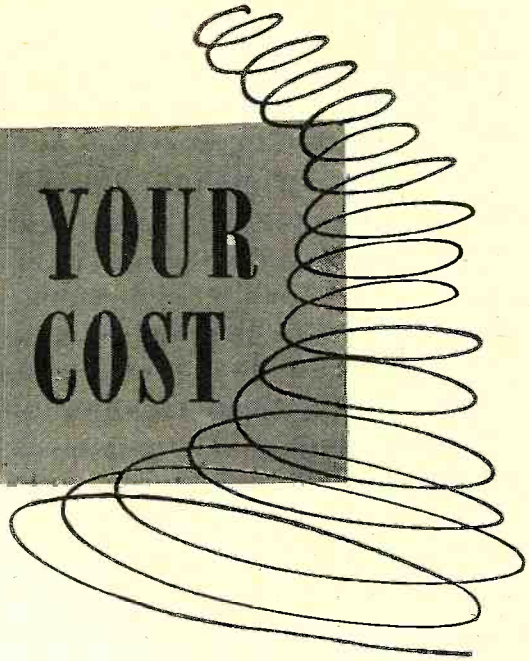
"The two transmitters used by the Shortwave Division are at Titahi Bay, some 17 miles from Wellington. Each transmitter has a radiated energy of 7.5 kilowatts. They employ high-level

(*Continued on page* 108)

(*Note: Unless otherwise indicated, all time herein is expressed in American *EST; add* 5 hours for *GCT.* "News" refers to newscasts in the *English* language.—K.R.B.)

Although New Zealand only recently began operation of an Overseas Shortwave Service, New Zealanders have long been ardent DX-ers. The group pictured here have gathered together at Invercargill to do a little community "listening in."

WATCH YOUR LABOR COST



By
FRED MERISH

A cost-control system assumes greater importance in these days of increased cost of doing business.

"I CAN'T understand why I haven't made more money," said Radio Serviceman Johnson when I showed him his profit and loss statement. "I watch my experience figures, I have a good estimating system, my servicemen are capable, I keep a close check on job costs and yet this statement shows that I made much less money than I had anticipated."

During the past few years we have had more than one complaint of this kind and investigation has usually disclosed that bad cost control of labor caused the trouble.

Labor cost has increased tremendously during the past few years, hence, it is a big item on the profit and loss statement of radio maintenance men. For this reason, they should be particularly careful about costing their labor sales because this outlay is now so high that it can cause heavy losses if labor management is bad.

Feeling that there is a need for clarification on this subject, we offer the following suggestions for corrective action based upon the weaknesses we have found in the costing of labor, highlighting the counsel with tables to simplify understanding.

Overhead piles up with the labor hour and unless labor is marked up enough and maintains a certain degree of efficiency, the overhead expense, which also has increased tremendously, can scuttle profits. The higher the labor cost, the higher the overhead expense, the greater the hazard of loss on labor through inefficiency of one kind or another.

Labor should carry at least 100 per-cent mark-up, whether sold alone or with parts or accessories. This is where some radio maintenance men fall down. When estimating or costing jobs for labor and materials, they allow about 40 per-cent margin. This margin may be satisfactory on parts or accessories, but it is not enough on labor because of the hazards attending its performance. The radio maintenance man should compute the margin separately on all labor and material costs.

Assuming that overhead is 30 per-cent of sales and the jobs costed under Table 1 are computed on a straight 40 per-cent margin basis, the results of Table 2 would apply.

If labor and materials are computed separately as shown under Table 1, then the figures of Table 3 would be the result:

Instead of $7.50 net profit, the serviceman would earn $13. At first blush, this seems quite a fat net, but the excess is a reserve against labor losses on jobs that are almost certain to materialize sooner or later. The wise radio maintenance man sets up a reserve against bad debts and depreciation. It is equally wise to play safe on labor, particularly today when it costs so much and losses may be relatively high. That 17.3 per-cent shown in Table 3 can be cut to 10 per-cent, or less, when averaged with other sales if labor cost gets out of hand on other jobs. Labor, by itself, has never been a very profitable commodity. It is less likely to be profitable now because of full employment and the slower pace that labor has set upon output. That is why busy radio servicemen must be doubly careful today, estimate profitably and cost their sales so that they can utilize maximum cost control over jobs.

First the serviceman should compile a profit and loss statement from his books as shown in Table 4.

If he figures his labor sales on the basis of 30 per-cent overhead he may lose money because overhead increases by the hour on labor, not on the basis of the selling price of the job. Suppose that this serviceman takes in a radio repair job, upon which he figured 100 per-cent mark-up. If he costed this job, the figures would be set up as shown in Table 5.

Based on the overhead percentage under Table 4, he would make a nice profit on the work provided the overhead cost per labor hour lined up with the overhead percentage to sales calculation. But, if his labor hour cost was $1.25 an hour, this is how the repair job should be costed. (See Table 6).

In addition, if he gave the customer a flat price and the workman took 2

(*Continued on page* 141)

Table 1.

Sales of labor	$55.00—100%
Cost of labor	27.50— 50
Margin on labor sales	$27.50— 50%
Sales of parts	$20.00—100%
Cost of parts	12.00— 60
Margin on parts	$ 8.00— 40%
Sales of labor	$55.00
Sales of parts	20.00
Sales of labor and parts	$75.00—100.0%
Cost of labor	$27.50
Cost of parts	12.00
Cost of labor, parts	$39.50 ..... 39.50— 52.7
Margin on parts and labor	$35.50— 47.3%

SAVE OVER ½ ON BRAND NEW GENERAL ELEC. TEST EQUIPMENT

Radio servicemen, School Teachers, Colleges and G.I. training schools. Here is the best deal in radio and electronic test equipment, in the U. S. today. All brand new factory cartoned, latest production of the General Electric Company. Priced to sell fast. Offered at a saving up to ⅔ off of the regular advertised price. Here is your chance to buy test equipment at the price you can afford to pay. Any piece of this equipment would make a nice Christmas gift, for anyone interested in radio.

McGEE OFFERS YOU A $195.00 VALUE

ALL WAVE FM SWEEP AM AND AUDIO SIGNAL GENERATOR

IF YOU NEED A SIGNAL GENERATOR DON'T PASS UP THIS VALUE

BRAND NEW GENERAL ELECTRIC YGS-3 AM-FM SIGNAL GENERATOR

$99.50 SALE PRICE

The G.E. YGS-3 is a complete test oscillator for AM-FM servicing. For 110 V 60 cycle operation. An internal mixer enables the operator to obtain any desired FM frequency within beat frequency range of the RF and FM oscillators. Good stability low distortion over the entire frequency range of audio test oscillator section from RF oscillator 100 kc through 150 mc in 7 bands. Modulation (internal) amplitude variable from 100 to 12,000 cps. FM oscillator fixed frequency, 1 megacycle. 0 to plus or minus 20 kc, 20 megacycle plus or minus 300 kc, 50 megacycle, plus or minus 750 kc. Frequency modulated output 0 to 200 megacycles. Crystal calibrator, 1 megacycle fundamental. Harmonics available to 50 mc. Audio oscillator, 100 to 12,000 cycles, continuously variable or fixed frequency of 400 cycles. Wein bridge type. Output voltage 4½ volts. Tube line up. 4—6AK6, rf oscillator, 6AG5, resonance modulator, 6SL7, Electron-ray tube amplifier, 6AF6, Electron-ray tube, 6SN7. Audio oscillator, 6J6, mixer, 9006, RF rectifier, 5Y3, power rectifier. This is the finest complete test oscillator we have ever seen. Complete with tubes. A $195.00 value, for only $99.50 net. A few of the YGS-3 are available for 110 or 220 volt 60 cycle current, net price $109.50.

GENERAL ELECTRIC CAPACITANCE RESISTANCE BRIDGE YCW-1

$59.50 VALUE

SALE PRICE $29.95

The General Electric YCW-1 is a $59.50 value. Wein bridge type capacitance resistance bridge. For 110 v. 60 cycle operation. Offered to you, brand new for only $29.95. An indispensable item for every service bench. A few YCW-1 are available for 110 or 220 volts, 60 cycle operation, net $34.95. Capacity range is from .000005 to 200 mfd. in 3 steps. Resistance range from 5 ohms to 20 megohms in two steps. Insulation resistance bridge 0 to 2500 megohms. Dimensions 9¾ x 12 x 7 inches. Shipping weight 20 lbs.

SILVER VOMAX MODEL 900

SALE PRICE $42.95

A $59.85 VALUE ANOTHER McGEE SCOOP

The original Model 900 Vomax by McMurdo silver, an electronic volt ohm meter. Regular price $59.85 now offered by McGee for only $42.95. All are brand new. Has 24 DC voltage ranges 0 to 3000 volts. 6 ranges of AC for frequencies up to 100 megacycles. DB scales. Measures resistance from .2 ohms to 2000 Megs. DC from 50 micro amps through 12 amps. An outstanding value. The Model 900 Vomax sale price only $42.95.

GENERAL ELECTRIC AUTO ANT. $1.69

General Electric swing angle car aerial same as Ward CF-6. A 3 sec. 68 in. extended ant. regular $5.45 list. Scoop price only $1.69 each. Snyder 3 section side cowl and with shielded lead. A scoop at only $1.49.

GENERAL ELECTRIC AUDIO OSCILLATOR YGA-4

$49.50 VALUE

SALE PRICE $29.95

Here is a red hot value. A good Audio oscillator at a price you can afford. Brand new General Electric YGA-4 Audio Oscillator. For 110 V 60 cycle operation, a $49.50 value for only $29.95, complete with tubes. No up to date service shop should be without one of these audio oscillators. A stable BFO circuit enables the YGA-4 to deliver low distortion voltages which remain constant within plus or minus 1 db over the frequency of 50 to 15,000 cycles. Dial calibration inaccuracies caused by tube changes or rough handling, can be corrected instantly by means of the "Zero Set" control and the electron-ray tube which indicates zero frequency difference between the two oscillators when the tuning dial is set to the index point. Thus, calibration accuracy can be maintained and checked at any time. Frequency range is 25 to 16,000 cycles, power output 50 milliwatts into 500 ohms. Output impedance is 500 ohms, distortion less than 3% above 200 cycles, less than 5% between 50 and 200 cycles, voltage output variation from 50 to 15,000 cycles (constant attenuation) plus or minus 1 db or less. Calibration 10 degrees C to 40 degrees C. 15⅛ x 10 x 6¾ inches. Shipping weight 31 lbs.

GENERAL ELECTRIC SINE OR SQUARE WAVE GENERATOR

YGA-2 $150.00 VALUE

SALE PRICE $59.95

Schools, Colleges, Servicemen, here is the most collosal value in the whole General Electric Test Equipment sale. A $150.00 value Sine or Square wave generator. For 110 V 60 cycle operation for only $59.95. Brand new, complete with tubes. Similar in appearance to the YGA-4 pictured above. YGA 2 for 110 or 220 volts 60 cycle current, $64.95, net. Frequency 20 to 20,000 cycles sine or square wave. Output power 400 milliwatts, output voltage, sine wave 20 volts. Output voltage square wave, 60 volts peak to peak. Harmonic distortion sine wave, less than 2% into 10,000 ohms, less than 5% into 1000 ohms. Attenuator continuously variable. Hum 60 db below maximum output. Accuracy, plus or minus 1 cycle below 33 cycles, plus or minus 3% above 33 cycles. 7⅛ x 9¾ x 16 inches, including cover. Shipping weight 43 lbs.

SALE OF MICROPHONES

Another red hot McGee Special. Crystal mike with 20 ft. of cable. Sale Price, $10.95.

Genuine high impedance dynamic mike with 20 ft. of cable. Sale Price, $12.95.

GENERAL ELECTRIC 3" OSCILLOSCOPE CRO-3A

$98.50 VALUE

SALE PRICE $49.95

WHY NOT ORDER THIS WITH THE YGS-3 OSC. SHOWN ABOVE

A Red Hot McGee Scoop. Brand new General Electric CRO-3A 3" Test Oscillator scope. For 110 V 60 cycle operation. The best scope value in the whole U. S. A regular $98.50 value for only $49.95. Complete with tubes. Get your order in now. A few CRO-3A scopes are available for 110 or 220 volts 60 cycle operation at $59.95. This unit has a sweep circuit from 20 to 30,000 per second adjustable by 7 point switch, with vernier for fine adjustment. High deflection sensitivity, vertical plates through amplifier .3 rms volts per inch, horizontal plates through amplifier .3 rms volts per inch. Maximum input volts 500 rms either amplifier. Input impedance 1 megohm in parallel with 45 mmf, vertical amplifier, 1 megohm in parallel with 50 mmf on horizontal amplifier. The viewing screen is a No. 3AP1 cathode ray tube with a green screen. All controls are conveniently located on the front panel. Frequency response of the vertical amplifier is 20 to 100 kc, horizontal 20 to 70 kc. Tubes used are in addition to the 3AP1. 1—884. 2—6AC7. 1—5Y3. The case is finished in gray wrinkle finish, with etched aluminum front panel. Wt. 35 lbs.

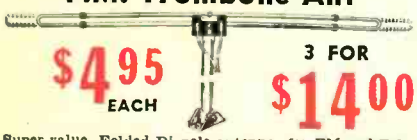
GENERAL ELECTRIC YMW-1A $24.95 20,000 OHMS PER VOLT

Here is a top value in a 20,000 ohms per volt, volt ohm meter. Brand new General Electric, a $39.50 value for only $24.95. Not pictured. Offered in a metal case with hinged lid, and rotary selector switch. AC and DC volts 0 to 1000 in 5 steps. Sensitivity 20K ohms per volt on DC and 1K per volt on AC. Output meter is the same as AC volts through .5 mfd 600v capacitor. Decibels—4 to 62 in 5 steps, level is 1 mw in 600 ohms. Resistance in 3 ranges 1 ohm to 20 megohms. DC current 0 to 500 ma in 4 steps and 0 to 50 microamps, meter is 4 x 4½ inches. Test leads are 48". Steel carrying case 10¼ x 9¾ x 4 inches. Uses 1 No. 2 flash cell and 2 7.5 volt C batteries. Shipping weight 15 lbs. Type YMW-1A Unimeter. High voltage multiplier YYW-1, General Electric, made for measuring voltages up to 10,000 volts. General Electric has developed this unit. When used with the YMW-1A Unimeter or similar 20,000 ohms per volt equipments, this multiplier gives accurate measurement. Neat in appearance, designed to give long efficient service. The YYW-1 is ideal for general service and laboratory servicing. Your net price $4.95. Extra for Multiplier.

Every Vibrator Guaranteed Best Values in U. S.

Replacement sync vibrator unit	$0.99
Standard 5 prong sync vibrator	1.49
6 prong reversible sync vibrator	1.99
7 prong reversible sync vibrator	1.99
7 prong, 2 volt G.E. vibrator	1.99
4 prong, off-set Delco vibrator	1.49
5 prong sync vibrator	1.49
4 prong vibrator for Ford	1.49

STROMBERG-CARLSON F.M. Trombone Ant



$4.95 EACH — 3 FOR $14.00

Super value. Folded Di-pole antenna, for FM and Television. Complete with 60 feet of twin 300 ohm line and 4 low-loss stand-off insulators. This folded di-pole covers frequencies 42 through 108 megacycles. Trombone action makes exact tuning to any one weak station. Furnished with adjustable mounting bracket. Has 5 foot mast. Made for Stromberg-Carlson. Stock No. Mt-300—Net $4.95. Weight 4 lbs. Individually packed.

VIBRATOR SCOOP!

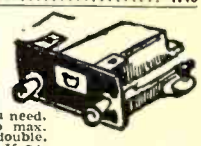
99c Each — 10 For $8.95

Standard size 4 prong vibrator made for uncle. Brand new. Has 8 contact for those standard or heavy drain car sets. Equal to vibrators of $4.50 list. Regular size can. This is the hottest value in a 4 prong non-sync vibrator in the U. S. Dealers and servicemen, order a good supply now!

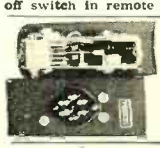
MALLORY 4-PRONG $1.29

Genuine 4 prong, 6 volt Mallory vibrator. 8 point, non-sync. A scoop at only $1.29 each. 10 for $11.90.

UNIVERSAL UNDER DASH CONTROLS $3.98



Attractive Under Dash Remote Control with choice of drive ratios, 8, 10, 12, 16, or 20 to 1. To find the ratio that you need, count the turns from min. to max. of the condenser gang and double. Specify ratio when ordering. If on-off switch in remote control, add $1.00 to the price.



Heavy Duty Vibrator — Made for 6-110 volt amplifiers. Freq. 60 CPS. Scoop Price.....$1.99
135 ma 6-110 volt conventional power transformer, with all windings; will run phono motor..$5.95
(Use with above vibrator)

MIKE $5.95

Crystal desk mike and stand. Head is detachable and will fit standard floor stand. A $10.00 value for only $5.95. Stock No. SS-T Net Price $5.95

MIKE $10.95 SCOOP

1st line high impedance dynamic mike. A $15.00 value, furnished with 20' mike cable. Net Price $10.95

CRYSTAL HAND MIKE $2.98

Crystal hand mike, with 10' mike cable. No provision for mounting. Ideal to have in the shop as a test crystal mike.

MIKE $10.95

Crystal mike, with 20' of cable. A full size mike worth 50% more than our price. Net Price $10.95

McGEE RADIO COMPANY — ORDER FROM THIS AD PRICES F.O.B. K. C. — *SEND 25% DEPOSIT — BALANCE C. O. D. 1225 McGEE ST., KANSAS CITY, MISSOURI*

THE COAX AL DUAL SPEAKER SYSTEM

WIDE RANGE RESPONSE 50 TO 10,000 C.P.S.

• NATIONALLY FAMOUS MAKE • EASY TO INSTALL • A PRICE YOU CAN AFFORD

THE SPEAKER FOR HIGH FIDELITY

Designed by one of America's finest speaker builders, for FM high fidelity radios, record players and P.A. systems. This speaker is incorporated in radios selling in the $500.00 bracket. It is especially designed 12" Alnico V magnet PM with built-in 3" Alnico V tweeter. The high-pass filter is concealed under the pot cover. Just hook to any 8 ohm voice coil. (Will hook in place of any house radio speaker, as most speakers have 8 ohm voice coils), only two wires to connect. Will handle approximately 18 watts. This coaxial PM speaker should sell for $35.00. Why buy an ordinary speaker, when we are offering a co-axial Alnico V PM for only $12.95? Latest 1948 production, not surplus. All speakers are guaranteed new and perfect. Stock No. 4-12X. Weight 8 lbs.

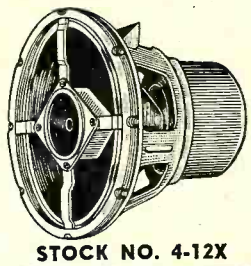
COAXIAL 12-INCH ALNICO V P.M. SPEAKER

TWO IN ONE

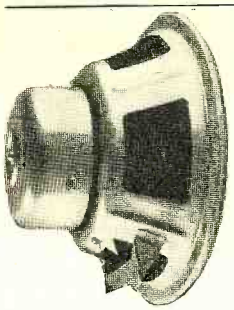
FREQUENCY RESPONSE 50 TO 10,000 CPS

REGULAR $27.50 LIST

$12.95 EACH TWO FOR $24.95



STOCK NO. 4-12X



Stock No. 15-KK

$35.00 LIST "JUKE BOX"

15-INCH ALNICO V P.M. SPEAKER

$10.95 EACH TWO FOR $19.95

Brand New 1948 Production by a Renowned Builder of Fine Reproducers

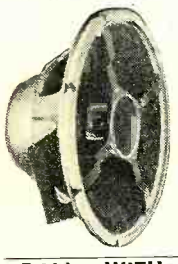
15-INCH PERMANENT MAGNET SPEAKER SCOOP OF ALL TIMES

Pre-War or Post-War, you never bought a speaker like this, for such a scoop price. Made by a nationally known builder of fine speakers. A full 15" 12½ oz. Alnico V magnet speaker of juke box quality. Has standard 8 ohm voice coil. Will take up to 18 watts average or 25 watts peak. Here is a speaker that will bring out those low notes. Latest 1948 production; not line through-outs. Every speaker is guaranteed new and perfect. We may not be able to continue this offer for long, so place your order now. Stock No. 15-KR. Weight 11 lbs. A $35.00 value for only $10.95.

"KING JUKE" 15 INCH 35-WATT ALNICO V P.M.

Model 15-LS. 15" 21½ oz. Alnico V Magnet PM Speaker. Will take 35 watts with ease. Thousands of dollars were spent in building the fine tools to produce this speaker. The 8 ohm voice coil is 1½" in diameter and has been heat treated and plastic coated. Constructed to eliminate loose voice coils, wires and wrapping. Made by a renowned builder of fine speakers. Truly the King of juke box speakers. Weight 15 lbs. Net Price $19.95, 2 for $38.00.

$19.95 TWO FOR $38.00



15-INCH COAX $25.00

The King Coax. A 21.5 oz. 15 inch Alnico V PM speaker with a built in high frequency tweeter. Will respond to from 50 to 12,000 cycles. This is a ruggedly built speaker with a curvlenier one piece molded cone. Built in high pass filter. Just hook to any 8 ohm output. Built by the maker of our ever popular 12 inch coax model 4-12X. This speaker has a retail list of over $60.00. We offer you our 5-15X 15 inch coax for only $25.00. Weight 20 lbs.

P.M.'s—WITH ADJUSTABLE CONES

The voice coils on these speakers are mounted to an adjustable metal rim, that can be shifted several thousandths of an inch. The cream of the speaker production. Nationally famous maker. More output per watt.

5"	1½ oz.	Alnico V magnet PM	$1.49
5½"	2.15 oz.	Alnico V magnet PM	1.98
6"	2.15 oz.	Alnico V magnet PM	2.49
6"	3.16 oz.	Alnico V magnet PM	2.98
8"	2.15 oz.	Alnico V magnet PM	2.98
8"	3.16 oz.	Alnico V magnet PM	3.98
12"	7 oz.	Alnico V magnet PM	6.95

EASY TO FIT IN—P.M. SPEAKERS

McGee offers the answer to your replacement speaker problems. All fully guaranteed first line run (not odds and ends), with Alnico V magnet and standard RMA 3.2 ohm voice coils. Cadmium plated with dust cover. The small size pots make them adaptable to tight places. All have the same size magnet width and depth. 2⅛" pot size only 1¼" by 1¾". Packed 24 to the case.

3½"	square frame 1 oz.	magnet speaker	$0.99
4"	square frame 1 oz.	magnet speaker	.99
4"	square frame 1½ oz.	magnet speaker	1.19
5"	round frame 1 oz.	magnet speaker	.99
5"	round frame 1½ oz.	magnet speaker	1.19
6"	square frame 1 oz.	magnet speaker	1.49
6"	square frame 1.47 oz.	magnet speaker	1.69

OUR LEADER ★ 12" COAXIAL PM SPEAKER

$9.95 TWO FOR $19.00

Model 12-RN—Our leader 12" coaxial PM speaker, with 3" tweeter. Equal to above model 4-12X except tweeter will not respond to as high a frequency. Matching network is built-in; hook to any 8 ohm output. Will take 15 watts. Weight 12 lbs. Net $9.95, 2 for $19.00.

BUY YOUR SPEAKERS FROM McGEE AND SAVE!

MAGNAVOX SPEAKER SALE!

A red hot McGee special. Latest 1948 production Magnavox auto radio replacement speakers. Same as used in original equipment. 4 ohm field and standard voice coils. Every speaker is guaranteed. They will take the wallop of any car radio.

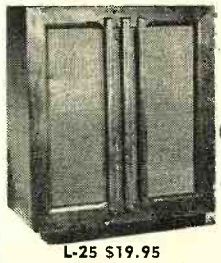
6" square 4 ohm field	$2.49
7" 4 ohm field	2.98
8" 4 ohm field	2.98
6x9" 4 ohm field	2.98

MAGNAVOX ALNICO 3 P.M. SALE

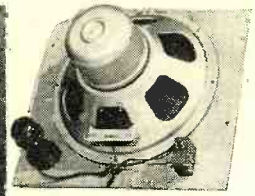
5000 Famous Magnavox permanent magnet Alnico 3 speakers. We are offering these first quality speakers to you, practically at manufacturers prices. These are latest 1948 production. All are guaranteed to be perfect; no rubbing cones.

5"	8 oz.	Alnico 3 magnet speaker, net	$1.79
8"	12 oz.	Alnico 3 magnet speaker, net	2.98
10"	20 oz.	Alnico 3 magnet speaker, net	4.95
12"	20 oz.	Alnico 3 magnet speaker, net	5.95

THEATRE TWIN SPEAKER $29.95



L-25 $19.95



BW-3L $29.95

Our sound laboratory has assembled this fine speaker combination. A super heavy duty 15" cinaudagraph Alnico V PM and a University Lab. trumpet type high frequency tweeter. Ready-cut plywood baffle and cut to fit grill cloth. All you do is bolt speakers to the baffle and connect in the 4 mfd. high pass filter. This combination will take 35 watts of audio and reproduce 40 to 10,000 cps. A speaker combination of theatre quality. Stock No. BW-3L. Net $29.95. If a baffle cabinet is desired, order the L-25 below. University Lab. high frequency tweeter trumpet with connecting instruction. Same tweeter as used on the above theatre combination. Net $11.76.

Walnut floor type speaker baffle. Size 12x22x26". Will accommodate either 12" or 15" speakers. Air relief cutouts in corner of grill. Weight 30 lbs. A $25.00 value for only $19.95. Stock No. L-25. Net $19.95.

POPULAR FIELD AND P.M. TYPES

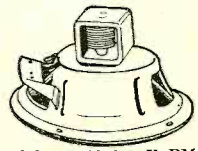
6" 1.5 oz. Alnico V PM speaker	$1.49
6" 2.15 oz. Alnico V PM speaker	1.98
4x6" 1.5 oz. Alnico V PM speaker	1.49
6x9" 3.16 oz. Alnico V PM speaker	2.98
10" 4 oz. Alnico V magnet PM speaker	3.95
10" 7 oz. Alnico V magnet PM speaker	4.45
12" 7 oz. Alnico V magnet PM speaker	4.95
For radio set and amplifier use. 12" 15 watt, 8 ohm voice coil Alnico V PM. A scoop for $4.95, 5 for	22.50
4" 450 ohm field speaker	1.89
5" 450 ohm field speaker	1.89
4" 4 ohm field speaker for auto sets	1.89
5" 4 ohm field speaker for auto sets	1.89
5" 450 ohm field speaker, with output transformer to match single 50L6 tube Utah	1.98
8" 450 ohm field speaker, with output transformer to match single 6V6 tube	2.25
8" 1000 ohm field speaker	2.95
6" square 1000 ohm field speaker, with 7000 ohm output transformer	1.95
12" RCA 450 ohm field speaker, ideal for console radio replacements	4.95

P.M.'s—WITH OUTPUTS ATTACHED

6½" 1.47 oz. Alnico V PM with PP 50L6 output	$1.95
5" 1.47 oz. Alnico V PM speaker with 50L6 output	1.49
5½" Utah, 2.15 oz. Alnico V PM speaker with output transformer to match 3Q5 tube	1.95
4"x6" Alnico V PM with 50L6 trans.	1.69
4" 1.47 oz. Alnico V PM with 50L6 trans.	1.49

"OUR LEADER" IN 12" P.M.'s

Only $4.95



12" 6.8 Oz. Mag. P.M. Speaker $4.95

Nationally known 12" 6.8 oz. Alnico V PM, with 1" 8 ohm voice coil. Will take 15 watts. Grey finish. Our leading 12" speaker. Stock No. CH-12. Net, $4.95.

12" 12 Oz. Mag. Will Take 20 Watts $8.95

Super heavy duty 12" 12½ oz. Alnico V magnet PM with 1¼" with 8 ohm voice coil. This speaker is equal to 60 oz. of old type magnet. Will take 25 watt peak. Stock No. CH-13—$8.95; two for $17.00.

McGEE RADIO COMPANY

ORDER FROM THIS AD PRICES F.O.B., K.C.

SEND 25% DEPOSIT—BALANCE C.O.D. 1225 McGEE ST., KANSAS CITY, MISSOURI

BUILD THIS HIGH FIDELITY RADIO

8-TUBES— 12" Coaxial Speaker $37.95

A COMBINED 2-BAND RADIO & 15 WATT P.A. SYSTEM

- 8-INCH SLIDE RULE DIAL
- PUSH PULL OUTPUT TUBES
- EVERY THING FURNISHED
- RECEIVES BROADCAST AND 19 to 49 METERS
- BASS BOOST TONE CONTROL
- CHASSIS SIZE 9½ x 11 x 8" HIGH
- BEST RADIO KIT VALUE IN THE WORLD

EVERY PART FURNISHED

Here is something new in radio. A real 15 watt power amplifier with bass and treble controls. Has extra gain stage for crystal or dynamic mikes. And on the same chassis, a standard superhet radio receiver. We furnish all parts, knobs, escutcheon plate and tubes: 6SA7, 6SK7, 6SR7, 6SN7, 6SJ7, two 6V6 and 5Y3. No cabinet. Extra care in designing the power supply section assures low hum level, making this unit ideal for recording as well as P.A. use. We furnish everything as well as schematic diagram and photos of the completed chassis. Weight 35 lbs.

PRK-24 Radio-Amp. Kit with 12" P.M. speaker. With tubes .....Net **$29.95**

CPR-15. Exactly the same kit as the PRK-24 kit, except it is furnished with a 12" Cinaudagraph wide range speaker. (Has built-in high frequency tweeter.) This is our finest kit.....Net **$37.95**

NATIONALLY FAMOUS GAROD PERSONAL RADIO

KIT Complete with Batteries **$14.95**

Size: 6½"x 3¼"x 4⅛" **Weighs Only 3½ Lbs.**

- Two-Tone Ivory, Red Plastic Cab.
- 4-Tube Superhet
- AVC.
- Two-Gang Cond., Lucite Dial
- Loop Aerial, Built-in Lid
- Looks like and is a Commercial Radio Kit
- Simple Assembly and Wiring Instructions

This kit is ready for immediate delivery. The same nationally known factory that manufactures tens of thousands of this radio, is line-producing this radio kit for us. Every part, from the cabinet down to the last resistor, is matched. The chassis is ready punched; all you do, is mount the parts and wire. This radio kit will assemble into a beautiful personal radio for you, just the same as it does for the factory. We furnish you a diagram, photograph of the completed chassis and full assembly instructions so that those with a minimum knowledge of radio may wire this kit. The beautiful case is made of metal with plastic hinged lid and snap-on back. The lucite face of the receiver has an inlaid gold design. The circuit is the conventional two gang superhet type, with A.V.C. Receives the broadcast band, 540 to 1650 KC. Uses miniature tubes: 1R5 converter, 1S5 detector A.V.C., 1T4 amplifier and 3S4 power amplifier. Alnico V PM speaker. The loop antenna is built in the lid. Radio comes on automatically when lid opens. Operates on self-contained batteries. Priced complete with tubes and 67½ volt "B" battery and flash cell (Not AC-DC). Nothing else to buy. Model X-45, Price $14.95. Include Postage for 6 lbs.

SCOOP MODEL X-45 PERSONAL PORTABLE KIT WIRED AND TESTED WITH BATTERIES. NET $17.95

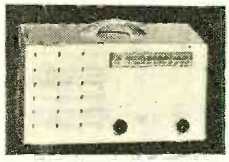
WALNUT ARM CHAIR CABINET

$29.95

WILL HOUSE CRP-15 KIT

Beautifully made walnut armchair cabinet. Outside dimensions 24" high, 16½" deep and 27" wide. Ample room for radio receiver 14" long, 9" high, and 10" deep. Will hold a changer up to 14" square. Will accommodate speaker up to 12". Has record album storage compartment. Hinged lid covers changer compartment. Cabinet AR-15, Net price $29.95, General Instrument changer $14.95, extra. Armchair cabinet in blonde finish. Net price $34.95.

4-TUBE BATTERY PORTABLE KIT $10.95



Portable Kit Model KP-Y. Housed in a leatherette case 12" x 7" x 7". Easy to build. Operated on self-contained B and A batteries. Receives broadcast 550 to 1600 kc. Incorporates a standard superhet circuit with AVC. Has 5" Alnico V PM speaker. Priced complete with batteries, schematic diagram and tubes 1R5, 1S5, 1T4, and 3S4. Not AC-DC, but straight battery operated. Has 2 gang condenser. Everyone should have one of these personal portables. Everything furnished. Kit KP-Y Net price $10.95.

BUILD A RADIO Like you would buy 5-TUBE KIT ONLY $9.95

Made from Detrola Components

A full size 5 tube superhet radio kit housed in a 13 inch wood cabinet with full plastic front. Lighted slide rule dial. Incorporates a standard 2 gang superhet circuit. Loop antenna, ready punched chassis, etc. This is another one of our line production radio kits. Every part is furnished including tubes. 14Q7, 14B6, 14A7, 50B5 and 35Y4. Diagrams, photos and instructions are included. 5" dynamic speaker. Receives broadcast 550 to 1650 kc. Weight 9 lbs. Kit model TF-6B. Net $9.95.

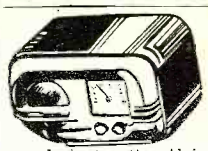
Model TF-6B wired and tested. Net $12.95.

DELUXE 3-WAY PORTABLE KIT $16.95

Similar in Appearance to the KP-Y Above

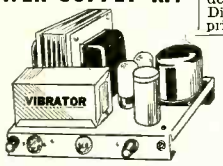
Model 3-ZB, 3-way portable kit. Has 4 tubes plus selenium rectifier. Complete with 300 hour battery pack and beautiful leatherette covered case 12" x 10" x 7". Build this powerful 3-way portable kit. Operates on 110 volts AC or DC or on self-contained battery pack. Receives broadcast 550 to 1600 kc. Incorporates a standard superhet circuit with AVC and loop antenna. Has 5" Alnico V PM speaker, 2 gang condenser. All parts and battery pack are furnished, including tubes. Disc rectifier, 1R5, 1S5, 1T4, and 3S4. Shipping weight 14 lbs. Net price kit model 3-ZB, $16.95.

4 TUBE RADIO KIT $6.95



4 tube AC-DC, TRF radio kit. Ideal for students and beginners. Every part furnished to build this kit, including tubes, diagram and photos. Has Alnico V PM speaker and tubes 12SK7, 12SJ7, 50B5 and 35W4. Plastic cabinet with airplane dial. Receives broadcast 550 to 1600 KC. This is the easiest type of radio to build. Kit Model TF-4 Net $6.95. Weight 6 lbs.

6-110 VOLT POWER SUPPLY KIT MAKES ANY AMP. WORK ON A STORAGE BATTERY $14.95

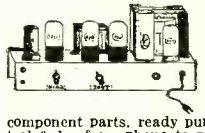


New Power Supply Kit adapts any amplifier to 6-110 volt operation. Kit includes all parts, tubes, transformer, vibrator, ready-punched chassis and diagrams necessary for you to build this 6 volt DC or 110 volt AC power supply. The average radioman should wire this unit in an hour or less. Supply furnishes from 110 volts 60 cycle, 350 volts DC at 135 mills, 6.3 volts AC. Also, from 6 volts DC it produces 110 volts 60 cycle AC to run a phono motor, record changer, or small AC-DC radio; 350 volts DC at 135 Mills. Instructions are furnished, to show you how this supply can be adapted to make any P.A. systems, up to 25 watts, operates on 6 volts DC or 110 volts AC. Switching is done in the power supply Everything complete, including 2-6X5 rectifiers. Kit 6-110KR. Net $14.95. Spare heavy duty vibrator, $1.95 extra.

6-110 volt amplifier kit. A companion unit to the power supply kit above. Utilizing PP 6L6 output tubes, unimatch transformer, inputs for microphone and phono pick-up. Kit includes 6-110KR unit shown above. Kit model 22-KR, net price $29.95.

12 WATT AMPLIFIER KIT, $10.95

Push Pull 6V6's Gain for Mike



KIT MODEL AC-12. 12 watt amplifier kit. Ideal for high quality record player as well as public address or recording amplifier. Matched component parts, ready punched chassis pan. One control fades from phono to microphone. Gain enough for crystal or dynamic microphone. 100 mil power transformer, for 110 volt AC 60 cycle operation. Priced complete with tubes: 2—6V6, 6SN7, 6SH7 and rectifier. Diagrams and photos furnished. Kit AC-12. Net $10.95. 12" Alnico 5 PM speaker $6.95 extra; crystal microphone and desk stand $4.95 extra.

The above AC-12 amplifier wired and tested ready to operate net $14.95. Specify Stock No. AC-1125. 12-inch Alnico V PM speaker $5.95 extra. Crystal mike and desk stand $4.95.

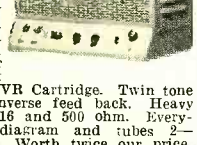
1949 MODEL AC-DC KIT $12.95

This is our latest and finest AC-DC radio kit. Receives Broadcast, 540 to 1650 KC. Has full length illuminated slide rule dial. Choice of Ivory or Walnut plastic cabinet. Full high efficiency 2 gang superhet circuit, with loop antenna. Ready punched chassis, full 5" PM speaker. Every part fits. Everything furnished, including tubes. 12SA7, 12SK7, 12SQ7, 35Z5 and 50L6. This kit will go together just like it would on the production line. Diagram, photos and instructions are furnished. Shipping weight 9 lbs. Kit model XA-49. Net $12.95.

20-WATT UTILITY AMP. KIT, $17.95

Build this 20 watt utility 110 volt AC, 20 Watt power amplifier. Ready punched chassis, size 12 x 6 x 2½ inches. Has two input circuits, one mike and one phono. Mike stage has 135 DB gain, for crystal or dynamic mike. Has bass and treble controls. Designed for use with PM speakers; has 8-16 ohm output transformer. All parts and easy-to-follow diagram furnished, including tubes: 2—6SN7, 6J5, 2—6L6GA, 5Z3. Kit Model 20-LX.....Net $17.95

30-WATT AMP KIT $29.95



Kit model RA-30. A complete 30 watt high fidelity Push pull 6L6 amplifier. Ready punched chassis with cover to match. Beautiful opalescent finish. Input for two mikes and crystal pick up. Perfect for the new GE VR Cartridge. Twin tone controls bass and treble. Inverse feed back. Heavy duty output trans for 4, 8, 16 and 500 ohm. Everything furnished including diagram and tubes 2—6SN7, 2—6C5, 2—6L6, 5V4. Worth twice our price. Build an amp you will be proud of. Kit model RA-30 Net $29.95. Furnished with a merit impregnated and shielded wide range output transformer with 4, 8, 16, 250 and 500 ohm secondary $5.00 extra.

JUKE BOX AMP KIT $24.95

Juke box amplifier surplus. All the necessary parts to build a juke box amplifier. Jumbo power transformer and output. This is a late model with two 6L6 output tubes. All necessary parts and diagram are included. Stock No. KV-7. Net Price $24.95, with tubes, 12" Alnico V PM speaker $5.95, extra. Inputs for Radio-VR-OR-XTAL pickup and mike.

AMERICAN AND FOREIGN KIT $14.95

550 to 1600 KC and 6 to 18 MC

This radio kit is housed in an attractive grey opalescent finished metal cabinet. Incorporates a standard 2 gang superhet circuit. Receives Broadcast (550 to 1600 KC) and foreign short wave (6 to 18 Megacycles). This kit is complete, nothing else to buy; just as all our kits. Ready-punched chassis. It will go together just as it would down a production line. Has full 5" PM speaker. Complete with tubes: 12SA7, 12SK7, 12SQ7, 35Z5, 50L6. Diagram, photos and instructions are furnished. Shipping weight 10 lbs. Kit model DT-5. Net $14.95.

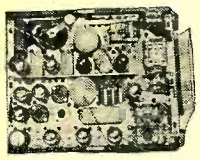
McGEE RADIO COMPANY

ORDER FROM THIS AD PRICES F.O.B. K.C.

SEND 25% DEPOSIT—BALANCE C. O. D. 1225 McGEE ST., KANSAS CITY, MISSOURI

DON'T PASS UP THE BC-645 450 MC TRANS. REC. NOW ONLY $7.95

GENERAL ELECTRIC BC-645A



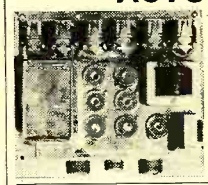
450 MEGACYCLE TRANS-RECEIVER With Citizen Band-Conversion Schematic

1000 TO SELL AT LESS THAN THE WORTH OF THE TUBES BRAND NEW

A small complete Transmitter and superhet receiver, for the 450 megacycle band. Diagrams for building AC power supply and conversion furnished. Ideal for MCW, CW or phone. The tubes (4-7F7, 4-7H7, 2-7E6, 2-6F6, 2-955 and WE-316A) are worth more than our sale price. BC-645 I.F.F. unit $9.95 each. Two for $19.00. Extra WE-316A tube 99c. 12 volt DC dynamotor (furnished all power) $2.95. BC-645 shipping weight 25 lbs.

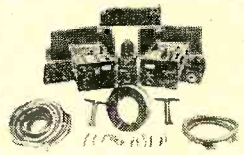
BC-645A $7.95 EACH TWO FOR $15.00

AUTO PILOT, SALVAGE SCOOP $1.00 EACH



HAS 6 HIGH RESISTANCE RELAYS

Auto pilot amplifier salvage scoop. Has 6 high resistance relays that operate in tube plate circuits on less than 8 mills. Also 4 controls. Choke cond., etc. Less tubes. Used but in good condition. Weight 12 lbs. Stock No. C-1T. Net **$1.00** each. Full remittance plus postage on this item.



SCR-518 RADIO ALTIMETER, $24.95 Complete, New, with 29 Tubes

Famous SCR 518 A Altimeter. Brand new factory cartoned. Worth over $900.00. Made by RCA. Complete as pictured. Has 29 tubes. Works in the 500 MC region. This is the complete unit. Transmitter, receiver, power supply and 3" scope indicator. Reads altitude up to 30,000 ft. Operates on 28 volts, D. C. Complete with tubes. 6SK7, 2 8012, 2 6SJ7, 6C8, 6SN7, 6F8, 23D4, 6V6, 10 6AC7, 3 2X2, 954, 955, 956, 6J5 and 3 in. CR tube 1808P. A RED hot scoop at only $24.95 complete. Weight 70 lbs.

2-METER TRANS-REC. ARC-4 $12.95

FOUR CHANNELS CRYSTAL CONTROLLED. ARC-4 for VHF frequencies 140 to 144 megacycles. There are 7 tubes in the transmitter: S32, two 1614, two 6V6 and two 6L6. The receiver section has 13 tubes: two 6AC7, four 6N7, three 12SJ7, two 12SQ7 and two 12A6. The unit is actually two receivers and one transmitter in one piece. One receiver is for standby use. Has built on dynamotor for 24 volt DC operation. Priced complete with tubes and four crystals and dynamotor. Hams convert this for two meter operation. It's a scoop at this price. Used, but good condition. Weight 30 lbs.

SCOOP 110 Megacycle Rec. .733D $6.95

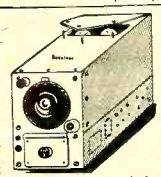
BC-733 D Localizer Receiver

Freq. 108-110 Mc; Tube complement; 10 tubes—1—12SQ7, 2—12SR7, 1—12A6, 1—AH7GJ, 2—12SG7, 3—717A. Now only $6.95

BRAND NEW. A RED HOT VALUE.

Apn-1 Radio Altimeter. A complete transmitter receiver for the 420 mc region, with tubes. Shipping weight 25 lbs. Price each **$9.95**

BC-458 TRANSMITTER SALE PRICE $5.95

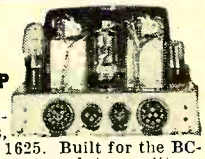


Brand new BC-458 Command Transmitters, with tubes. 5.3 to 7 mc. Only a few hundred left. Shipping weight 11 lbs. Scoop price **$5.95.** Brand new BC-454 3 to 6 mc Command receivers, with tubes, **$4.95** each.

Replacement tubular electrolytic condensers:

20-20 150v cond.	.29
20-20-20 150v cond.	.35
40-40 150v cond.	.39
50-30 150v cond.	.39
50-30-20 150v cond.	.49
50-30 150v, 25-25v cond.	.49

NEW BC-456 MODULATORS $2.49 A SCOOP



Brand new modulators with tubes, VR-150, 12J5 and 1625. Built for the BC-457 and BC-458 command transmitters. Less dynamotor **$2.49**

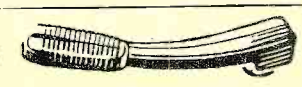
Used BC-456 modulator with tubes and 28 volt dynamotor **$2.95**

PULSE FORMING NETWORKS

Used in small radar modulators, available in three sizes, 67 ohms impedance, 7.5 Kilowatt rating.

H-603, one micro second, 200 pulses per second	$1.00
H-601, three micro seconds, 200 pulses per second	2.00
H-602, 16 micro seconds, 60 pulses per second	3.00

McGEE ALWAYS HAS THE BEST PRICES ON WIRE RECORDERS, MOTORS AND PICKUPS



BIG SAVINGS on CARTRIDGES

Astatic MLP-1 cartridge used in Webster Chicago and many other original equipment changers, with needles **$1.49**

Astatic MLI'-2 improvement over the MLP-1. Has quiet type QT needle, no surface noise. Scoop price **$1.95**

Standard L-40, L-26, cartridges, old standbys, thousands in use. Complete with rest clip. Each, **$1.49**

Astatic L-70, L-75, cartridges. Each, **$1.49**

Astatic L-72A 3½ volt output, used in one lung record players, etc. Also where tone networks are used. **$1.49.** 10 for **$13.00**

NJ-1 Nylon cartridge with permanent, but changeable needle. **$3.29**

RCA magic-tone cell, with permanent sapphire needle. Modernization kit replaces 95% of old cartridges in RCA radio phonographs, built during 1938 and later. 4 page instruction book included. A scoop at only **$1.95**

CRYSTAL PICKUPS ON SALE

Plastic arm Webster, light weight, normal output Sale price **$1.49**

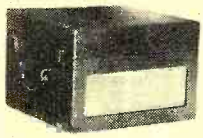
Astatic L-70 curved arm pickup **$1.95**

Shure glider, normal output pickup **$1.95**

Astatic O-7 straight arm off-set head pickup **$1.95**

COMPLETE PORTABLE WIRE RECORDER $69.95

With Webster Chicago Mechanism



Portable Wire Recorder Model GN-11. Has ready wired and tested 5 tube AC type amplifier with push-pull 6V6 tubes. Built-in eraser circuit. Input for crystal mike or phono pickup. Diagrams show how you can record from any radio receiver. 3 position switch enables you to quickly change from record to playback or conventional P. A. system. This amp delivers 12 watts of good clean audio. Here is what you get: Webster 79 recording mechanism, with 15 minute spool of wire, attractive leatherette covered case, 6" heavy duty PM speaker and wired and tested 12 watt AC wire recording amplifier. All you do is mount the amp, recording mechanism and speaker. Simple instructions furnished. Portable Recorder Model GN-11 Net **$69.95.** Crystal mike $4.95 extra.

DELUXE MODEL GN-12 $79.95

Deluxe Portable Wire Recorder Model GN-12. Has same features as the model GN-11, as well as a larger split leatherette covered case and a heavy duty 10 inch PM speaker. Deluxe Wire Recorder Model GN-12. Net **$79.95.** Crystal mike $4.95 extra. Recording Wire. 15 minute spool $1.30, 30 minute spool $1.95, 1 hour spool $3.25.

$4.69 G. E.

Genuine G.E. Variable Reluctance pickup with permanent needle; with jewel. This unit has been publicized so much, nothing need be said. Scoop price **$4.69.**

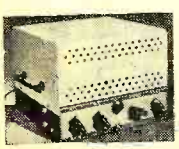
This item was listed incorrectly in our November ad.

$2.95 Caltron

Genuine Caltron Variable Reluctance pickup cartridge, with permanent needle. Mounts in as easy as the G.E. Use in many professional arms. As used in recording and studio work. Very Special Net price **$2.95**

PHONO NEEDLES AT LOW PRICES

Juke Box Needle. Long playing, 12 for.....	$ 2.39
Duo-tone 99 Sapphire needle 59c, 10 for....	4.95
Duo-tone Nylon $2.50 list needle. Net Price	1.25
Webster Chicago Nylon Ossium point needle, 10 for	12.50
Webster Chicago Nylon Sapphire tip needle, 10 for	17.50
Duo-tone Stellite cutting needle, each.....	1.20



30 WATT AMPLIFIER $32.95

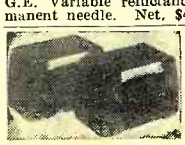
Atomite 30 watt amplifier, with 6 tubes; 2—6SC7, 1—6N7, 2—6L6, 1—5U4G. 2 microphone and phonograph input. Output transformer tapped for 2, 4, 8, 15 and 500 ohms. Two tone wrinkle finish nicely finished case. Stock No. PH2-25. Net price.....**$32.95**

SUPERHET BROADCAST TUNER for connection to phono amp. or P.A. system. Compact chassis 5x3½x3 inches. May be mounted inside the record player cabinet. Requires only three connections to amplifier. Uses 6SA7 or 12SA7; 6SK7 or 12SK7 and crystal diode. Complete with tubes, loop antenna, dial and instructions for connecting to any amplifier. Net $7.95. Specify if tuner is to be used with AC or AC-DC type amplifier.

G.E. VARIABLE RELUCTANCE PICK-UP AND PRE-AMP $6.95

Scoop—Pre-amplifier for General Electric Variable Reluctance pick-up. Easily connected to any AC or AC-DC amplifier. Wired and Tested with 6SC7 or (12SC7) tube. Diagram for connections is furnished. Specify whether you want pre-amplifier for AC or AC-DC use. Net price, Pre-amp. with Tube and G. E. Pick-up—$6.95.

G.E. Variable reluctance pick-up cartridge with permanent needle. Net, $4.69.



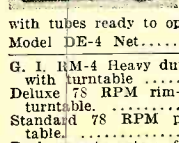
COMPLETE INTERCOM $14.95

XZ-29 Intercom Master and sub-station. Plastic cabinets with tubes and 50 feet of wire. A $25.00 value for only **$14.95.**

1948 MODEL—MIKE-BROADCASTER ONLY $7.95

Broadcasts 800 to 1500 KC from either a phonograph pick-up or a crystal or dynamic mike. Makes any radio receiver a P.A. system, record player or recording amplifier. Gives broadcast quality. Has fader control from mike to record, simulating a regular broadcast station. This is a powerful model; using 2-35B5, 12SJ7 and 35Z5 tubes. Priced with tubes and connecting instructions. Works on 110 volts AC-DC. Crystal mike and desk stand $4.95 extra. Model DE-5 truly a de-luxe mike-phono oscillator.

3-TUBE PHONO. OSC. ONLY $4.95



Model DE-4—Phonograph oscillator. Broadcasts from 800 to 1500 KC. Gain for any crystal pick-up. A new powerful circuit is used to assure plenty of power. Has variable gain control for proper modulation. Priced with tubes ready to operate, two 50B5 and 34W4.

Model DE-4 Net.....$4.95

G. I. RM-4 Heavy duty phono recording motor, with turntable .....A scoop at	$5.95
Deluxe 78 RPM rim-drive phono motor, with turntable. .....Special	2.95
Standard 78 RPM phono motor, with turntable. .....Special	1.95
Replacement motors for 90% of all automatic record changers.....$1.49, 2 for	2.79

McGEE RADIO COMPANY

ORDER FROM THIS AD
PRICES F.O.B. K. C.

SEND 25% DEPOSIT—BALANCE C.O.D.
1225 McGEE ST., KANSAS CITY, MISSOURI

McGEE HAS THE STOCK AND "LOW PRICES" ON RECORD CHANGERS

AERO	DETROLA	G. I.	FARNSWORTH	VM-400	SEEBURG
$12.95	$12.95	$14.95	$19.95	$19.95	$29.95

Get in on McGee's big December sale of automatic record changers. A good supply of everyone advertised at unbeatable values.

Latest Aero changer, made for Stewart-Warner. Equipped with the popular Webster high list bouncing pickup cartridge. Plays 10 12" or 12 10" records automatically. Base size 12x13". Scoop price $12.95, 2 for $25.00.

Ever popular Detrola changer. Base size 11½x12". Plays 10 12" or 12 10" records automatically. A scoop price $12.95, 2 for $25.00.

General Instrument automatic changer. Base size 10½x12". Plays 10 12" or 12 10" records automatically. A real value at only $14.95 each.

Farnsworth, 2 post automatic changer; complete with new variable reluctance cartridge. Net price, each $19.95.

V-M 400, twin post automatic record changer, will intermix 10" and 12" records. Scoop price, each $19.95.

Famous Triple Post Seeburg Intermix automatic changer, will play 10" and 12" records together. Net price, each $29.95.

Leatherette covered bases designed to fit any of the above changers $1.95 extra. Specify type of changer when ordering base.

DUAL SPEED AUTOMATIC CHANGERS

V-M Model 800-A plays both 33⅓ and 78 RPM records, for the micro-groove as well as the conventional records. One arm utilized for quick change-over. Base size 13½x14". Furnished with two permanent needles. Net price $22.95, 2 for $43.90.

V-M Model 400-C Deluxe model, dual speed changer for the standard as well as the 33⅓ RPM long playing records. Intermixes 10" and 12" records. Complete with two permanent needles. Base size 13⅞x12¼". Net price $33.95 each. 2 for $63.46.

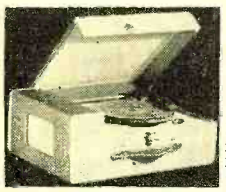
Webster-Chicago Model 256, dual speed; for the regular and micro-groove records. Base size 14x14". New "Tilt-O-Matic" cartridge. Net price $33.91. Webster-Chicago standard model 246, dual speed automatic changer for the micro-groove, or standard records. Base size 12x13½". Net price $29.25.

WEBSTER 56 WITH V.R. CARTRIDGE $22.95

Webster 156 changer. A real McGee scoop for only $22.95. Equipped with variable reluctance cartridge. These changers are brand new, but have been removed from new radios to be replaced with twin speed changers. Show slight mounting marks. Guaranteed to be new and in perfect condition. Net price $22.95.

RECORD PLAYER $13.95

Complete record player. Component parts shipped separately. Amplifier is ready wired and tested. Amplifier has three tubes, 12SQ7, 35Z5, 50L6. All parts are included, self-starting phono motor, crystal pickup, 5" heavy duty PM speaker and amplifier, with tone and volume control. Deluxe heavy wooden case is covered with brown leatherette and has chrome fittings and speaker grill. Stock No. CC-2. Net Price **$13.95.**

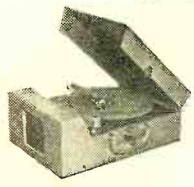


Deluxe Record Player $19.95

Our Deluxe portable record player, with a ready wired and tested push-pull 7C5, 4 tube amplifier, with tone and volume control. All parts are included, self-starting phono motor, heavy duty 5" PM speaker, crystal pickup and beautiful two-tone brown leatherette covered case, sturdily constructed of heavy plywood. Only a few minutes time is required to slip this unit together. Stock No. DL-3. Net Price **$19.95.**

Children's Player Kit $7.95

New, children's electronic player. Offered in kit form. Includes all material necessary. Attractive red plywood cabinet, self-starting phono motor and crystal pick-up, 4x6" PM speaker and parts to build 70L7 amplifier. Diagram included. Stock No. LJ-1. Net Price **$7.95.**



Portable Player Kit Scoop $9.95

Deluxe portable electronic record player kit. Includes all parts and easy to wire diagram. Comes complete with grey leatherette portable carrying case self-starting phono motor, pickup, 5" PM speaker and all necessary parts to build 70L7 amplifier. Stock No. CK-1. Net Price **$9.95.**

AUTOMATIC PLAYER KIT—$27.95

Automatic portable record player, with wired and tested push-pull 7C5 AC amplifier. Separate tone & volume controls. Leatherette covered case similar in appearance to the DI-3 pictured to the left. Equipped with the Aero Stewart-Warner Automatic changer. Shipped with amplifier and changer unmounted. Has 6" PM speaker. **Stock No. ARO-4.** Net price $27.95 each.

LP RECORD PLAYER ATTACHMENT $14.95

Model LP-38 Single record attachment for playing new micro-groove or standard records. You get a readycut walnut base, DM General Industries 33⅓ and 78 RPM phono motor, Astatic LP pickup for micro-groove records. Net price With additional pickup made by Shure for playing standard 78 RPM records, as pictured. Net price

General Industries Model DM, dual speed 33⅓ and 78 RPM, rimdrive phono motor. Made to play standard and long playing records. Net price $6.75.

General Industries Model DR, heavy duty rim-drive 33⅓ or 78 RPM phono motor. Net price $11.70.

POWERFUL SINGLE RECORD PLAYER Z-26. Housed in an attractive leatherette covered cabinet. Latest 78 RPM rim drive motor and light weight pick-up. Ready wired and tested 70L7 type tube amplifier. Tone and volume control. 5" PM speaker (Alnico V). This kit easily slips together. Priced complete with tubes and hook-up instructions. Kit Z-26.....Net **$9.95**

100 CARTONED and GUARANTEED RADIO TUBES for only $35.00

Popular GT tubes. All individually cartoned and branded Hy-Vac. Guaranteed best quality. Full replacement. These tubes meet the ever-growing need for low-cost service replacement and counter sales. Over 800,000 sold. A scoop item for the service dealer.

39c EACH IN SMALLER QUANTITIES

117P7 GT	3V4	5Y3 GT	25L6 GT	1T4	12SF7	6X4	6C4
32L7 GT	6C5	6K6 GT	7017 GT	1L4	6F5	6BJ6	6AU7
12A8 GT	12SA7 GT	6Q7 GT	117L7 GT	1U4	6J5	6AK5	6AG6
12K7 GT	12SK7 GT	6V6 GT	117Z3	1R5	6SJ7	6BH6	——
25Z6 GT	12SQ7 GT	6X5 GT	12AT6	1S5	12SJ7	80	12AU6
6A7	35L6 GT	6SA7 GT	12BA6	3Q4	6AJ5	——	12AU7
47	35Z5 GT	6SD7 GT	12BE6	3S4	6SF5	19T8	12AT7
12F5 GT	50L6 GT	6SK7 GT	35W4	1B4	6BA6	——	12SN7
6S8 GT	6K7 GT	6SN7 GT	35B5	12K8	6BE6	12S8	6SL7
6P5 GT	6A8 GT	6SQ7 GT	50B5	12A6	6AT6	6AL5	——

49c EACH FOR 75% OF YOUR RADIO TUBE NEEDS

Better Buy Those 12, 50 & 35 Volt Tubes Now Before Prices Raise

Every Tube Guaranteed Standard Brand Cartoned and Uncartoned Sylvania

12AH7	9002	6V6 GT	1T4	50B5
27	9003	6X5 GT	1R5	2525
26	1625	6AB7	1S5	2526
78	6SA7	12AT6	6R7	6D6
76	6SC7	12BA6	6L7	6C6
3S4	6SF7	12BE6	7Z4	6J7
5U4G	6SQ7	12H6	12SQ7	77
5Y3G	6SH7	12J5 GT	12SR7	6K5 GT
6AC7	6SJ7	12SG7	50L6	6A3
6C5	6SK7	12SH7	12SK7	483
6H6	6SL7	12SJ7	25L6 GT	2051
6J5	6SG7	12SA7	35L6 GT	2525
6K7	6SN7	12SL7	35Z5 GT	6B4
9001	6SR7	12SC7	35W4	6C4

POPULAR 1½ VOLT LOCTALS

59c each 10 for $5.50

Guaranteed 1½ volt loctal tubes, regular $2.65 list, now offered at the ridiculous price of only 59c each, 10 for $5.50.

1LN5 1LD5 1LH4 1LC6 1LA6 1LB4

Manufacturers Type Octal 1½ V. Tubes 59c EACH

Guaranteed top quality 1½ volt tubes at a big saving.

1N5 1H5 1A7 1A5 3Q5

50A5 OR 35A5 SYLVANIA 69c EACH

New metal WAA 6L6 tubes. Good except are rusty due to storage in a damp place. 49c each, 10 for $4.50.

12SG7, WAA metals, good, but rusty. 19c each, 10 for $1.50.

First line metal OZ4. This is a hot value at only 69c. 10 for $6.50.

6L6 metal glass or popular GA, while they last $1.09, 10 for $10.00.

Manufacturers Type Tubes

HYTRON & TUNG-SOL, ETC.

PER CARTON OF 100 TUBES **$45.00**

No Broken Cartons

Guaranteed first line manufacturer tubes Tungsol or Hytron in factory packages. 100 to the carton. These tubes list at $1.65. Figure the saving at a discount of better than 60-10-10-and 10, actually less than present day manufacturers cost. Sorry, these tubes are sold in cartons of 100 of each type only. If you want less than 100 of one number use list of 49c tubes shown above. Net price on these tubes, 100 for $45.00.

12SA7, 12SK7, 12SQ7, 35Z5, 35L6, 50L6, 6SA7, 6SK7, 6SQ7, 6V6.

50,000 GENUINE Loctal Tubes

49c EACH 100 FOR $45.00

Guaranteed—Manufacturer's 1st Line Sylvania

35Y4	7E5	7B6	7C5
14A7	7E7	7A7	7Z4
14Q7	7H7	7F7	7Y4
14B6	7C7	7N7	

The above loctal tubes were made by the originator of loctals. 1st grade and guaranteed, full replacement. A purchase of 50,000 enables us to offer these $2.20 list tubes to you for only 49c each; $45.00 per hundred.

McGEE RADIO COMPANY

ORDER FROM THIS AD PRICES F.O.B. K. C.

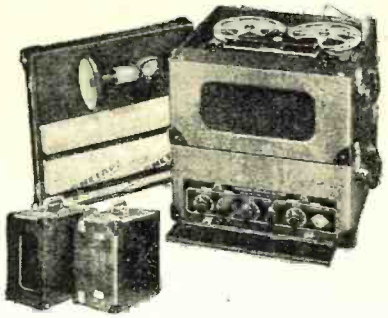
SEND 25% DEPOSIT—BALANCE C.O.D. 1225 McGEE ST., KANSAS CITY, MISSOURI

What's New in Radio

PORTABLE TAPE RECORDER

The Magnephone Division of *Amplifier Corp. of America* has introduced a new two-section portable "Twin-Trax" magnetic tape recorder, the Model 710-B.

The portable recording and playback unit is comprised of two matching



leatherette-covered portable cases which are easily attached at location to make one compact single recorder unit, measuring 16½ inches wide by 16¾ inches high, and 15 inches deep.

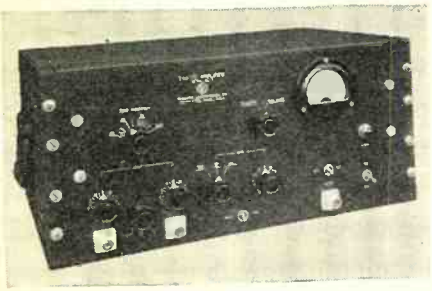
One case contains the tape handling mechanism and speaker while the second case houses the 10 tube recording and playback amplifiers with supersonic bias and erase circuits on a single chassis. The first case weighs 29 pounds while the amplifier unit weighs 32 pounds.

For full information on the Model 710-B write to the Magnephone Division, *Amplifier Corp. of America*, 398-2 Broadway, New York 13, New York.

BROWNING AMPLIFIER

Browning Laboratories, Inc. has announced production on the TAA-16 amplifier, a specially designed unit useful in the determination of standing wave voltage ratio when used in connection with square law detector probes and slotted waveguides.

Two inputs, selectable by switch for



rapid comparison, are available. Operating frequencies are from 500 to 5000 cycles and operation can be wide-band or highly selective as needed. The selective network is panel-tuned through the previously mentioned range. The output meter is calibrated directly in standing wave voltage ratio. An external meter may be used if desired.

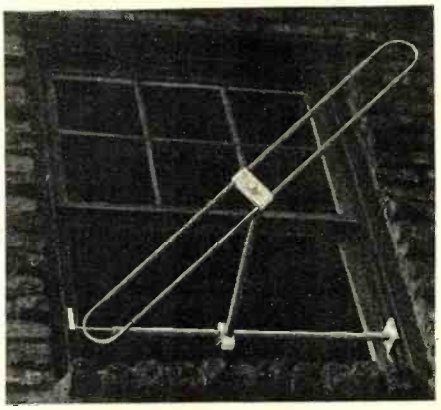
Full scale meter readings are obtained with 15 microvolts at the input under wide-band operation, while 10 microvolts signal will produce this result under selective operation. The power supply is electronically regulated for good stability. Good shielding permits full gain to be used without disturbance from noise or 60 cycle harmonics generated in the unit.

The TAA-16 amplifier is supplied in a cabinet and is suitable for rack mounting. For further details write *Browning Laboratories, Inc.*, Winchester, Mass.

"GYRO-TENNA"

Public Operating Corporation of New York has recently introduced the "Gyro-Tenna," an easily-installed antenna for FM and television.

The new unit, when installed, can be adjusted downward or upward, outside the window, in a full 180 degree arc. The folded dipole may be rotated in a



complete 360 degree circle or folded downward on either side, or at any angle. The folded dipole may also be lengthened or shortened by simply sliding the rounded ends in or out like a trombone. These ends may be unscrewed, if desired, and removed to form a single dipole and reflector.

The "Gyro-Tenna" has been designed to stimulate over-the-counter sale of television receivers and to facilitate sales and installations in apartment houses or other locations where permanent installations cannot be made.

For full information on the "Gyro-Tenna" write *Public Operating Corporation*, 100 West 42nd Street, New York, New York.

TV ANTENNA BOOSTER

Bud Radio, Inc., is now in production on a new television antenna booster which has been designed to increase gain and to provide brighter and sharper pictures.

The booster is said to eliminate much of the interference caused by other types of radio stations as well as building up the tuned-in television pic-

ture so that it is sharp, clear, and steady.

The new unit comes in two models, the TAB-98 which is designed to operate on all channels and the TAB-99 which operates on Channels 2 to 6 inclusive.

The booster has a self-contained power supply with the pilot light, the entire unit being housed in an aluminum cabinet with a brown finish. The Model TAB-98 has two antenna inputs which eliminates the necessity for disconnecting the antenna when changing from low to high channels.

For complete information write Department F, *Bud Radio, Inc.*, 2118 East 55th Street Cleveland, Ohio.

"ISOTAP" TRANSFORMER

A new tool for radio servicemen which permits speedier servicing of a.c.-d.c. receivers, provides greater on-the-job safety, and offers a number of other advantages to the radio shop is the new "Isotap" Variable-Voltage Isolation Transformer introduced by the Tube Department of *Radio Corporation of America*.

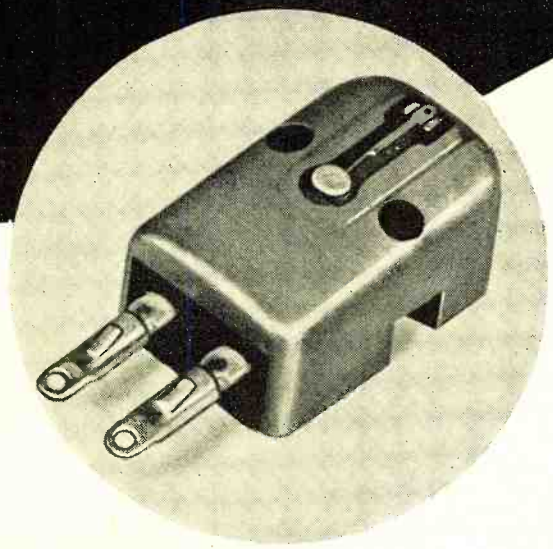
The Model WP-24A has an adjustable voltage-tapped primary and secondary. With this tap arrangement, the primary can be set for the prevailing power line voltage and the secondary receptacles in the instrument will then provide a choice of a 117 volt normal supply, a 105 volt low supply, or a 130 volt high supply, under medium load conditions.

The new "Isotap" provides protection against shocks from a.c.-d.c. chassis to ground, and prevents damage to test equipment. By placing the instrument between the power supply and the radio receiver being tested or the test equipment being used, shorts are eliminated between chassis and ground and between two separate chassis.

Line noise, which may interfere with servicing, is reduced by the unit which has its secondary conductively isolated from the primary. In areas with high

It's here!

The NEW General Electric Variable Reluctance Cartridge for Long Playing Records



- Specifically designed for the new long playing records... high compliance... low mass stylus assembly
- Equipped with 1 mil tip radius sapphire stylus
- Can be used with standard G-E preamplifiers

Place your order today!

General Electric Company, Electronics Park, Syracuse, New York

You can put your confidence in—

GENERAL ELECTRIC

166-610

or low line voltage or noisy powerlines, the "Isotap" can be permanently installed to provide radio reception in customers' homes.

The new unit measures 5 7/16 inches by 4⅜ inches by 4¼ inches and is housed in a steel blue-gray hammeroid case. It is available through *RCA* parts distributors.

PORTABLE REMOTE AMPLIFIER

A lightweight, portable remote amplifier designed to provide high fidelity audio pickup facilities for AM and FM broadcast programs, has been announced by the Engineering Products Department of *Radio Corporation of America*.

The new three-channel amplifier, designated the Type BN-2A, is expected to find wide use in remote pickups of sporting events, street programs, political and social meetings, park concerts and similar gatherings as well as in small broadcast studios, and as an emergency unit in large studios.

The amplifier is designed with a

built-in power supply for use with standard 115 volt, 60 cycle outlets, although there are facilities for battery operation when desired. The three amplifier channels use *RCA* Type 1620 indirectly-heated tubes, shock mounted to insure low microphonics and maximum protection from the vibration often experienced during remote broadcasts. Each channel offers an over-all gain of 92.5 db., more than adequate for any application.

High level mixing is used throughout, reducing microphonics and general noise level. The unit has capacity for four microphone inputs, the third and fourth switchable to channel 3.

The amplifier measures 14½ inches long and weighs only 29 pounds. For complete details on the Type BN-2A write the Engineering Products Department, *Radio Corporation of America*, Camden, New Jersey.

ASTATIC PICKUP

The Astatic Corporation of Conneaut, Ohio, has announced the availability of the new FL-33 pickup and the LP-33 crystal replacement cartridge for use with the new *Columbia* LP Microgroove discs.

The LP-33 crystal cartridge, which has a permanent sapphire needle with .001 inch tip radius for Microgroove

(*Continued on page* 125)

520 Sq. In. PICTURE

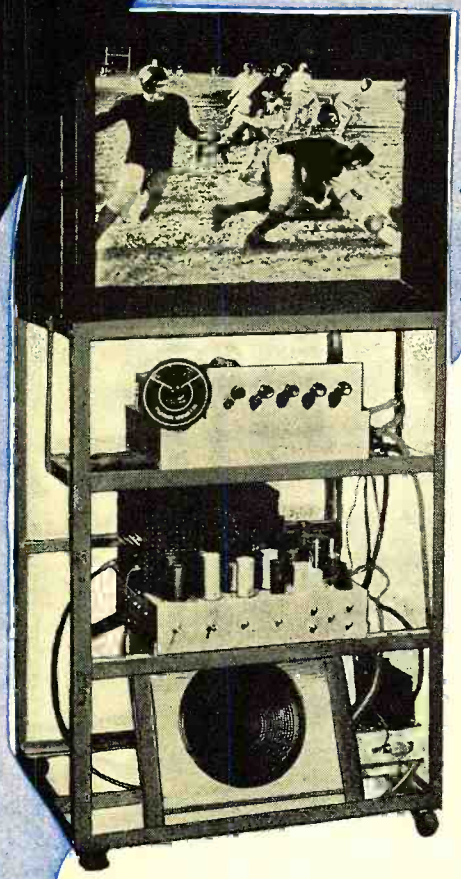
PROJECTION TELEVISION

IN ASSEMBLY FORM

COMPLETE WITH RACK

20 x 26" Screen

TELEVISION ASSEMBLY CO.



Bausch & Lomb f:1.9 Projection Lens

37 R.C.A. TUBES

DUMONT INPUTUNER

12" P.M. SPEAKER

Pre-wired & Pre-tuned Picture I.F. & Sound I.F.

Pre-wired 30 KV Tripler Fly Back Power Supply

Eastman Kodak Projection Screen

Aluminum Coated Top Mirror

AUTOMATIC GAIN CONTROL

EXPRESSLY DESIGNED
Metal Rack, Hood and Picture Frame

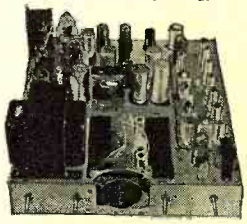
For realism, clarity, definition and **BIG SCREEN** Televiewing, the pictures produced by this unit have no equal!

This screen is absolutely flat, precluding curvature distortion anywhere in the picture. Picture tones are true black, grey and white—high in brilliance, yet absolutely glare-free!

MANUAL OF INSTRUCTIONS AND SCHEMATIC DATA

Prepared and Edited by JOHN F. RIDER PUBLISHER, INC.

10"-
12"-
15"



DIRECT-VIEW TELEVISION

Both Champion and Standard Models are supplied with 13 tube Picture IF and Sound IF (Pat. Pend.) completly wired, tested, aligned, and tubed, mounted on a separate chassis ready for use. Champion models are supplied with the Dumont Inputuner giving continuous tuning for all 13 channels plus FM Radio. Standard Models are supplied with a standard tuner which will handle 13 channels, completely wired ready for use with above unit. All Television Assemblies are complete with all components, schematics, and pictorial diagrams supplied.

CABINETS

CABINETS for all Television Assembly Co. models are available. Details and prices furnished upon request.

SEE YOUR LOCAL NATIONAL PARTS DISTRIBUTOR

TELEVISION ASSEMBLY CO.

540 BUSHWICK AVE.
BROOKLYN 6, N. Y.

Features THAT MAKE HEATHKITS

HEATHKIT FM and TELEVISION SWEEP GENERATOR KIT

A necessity for television and FM. This Heathkit completely covers the entire FM and TV bands 2 megacycles to 230 megacycles. The unit is 110V 60 cy power transformer operated. Uses two 6J6 tubes, two 6C4 tubes and a 6X5 rectifier. An electronic sweep circuit is incorporated allowing a range of 0 to 10 MC. A sawtooth horizontal sweeping voltage and phase control are provided for the oscilloscope.

The coils are ready assembled and precision adjusted to exact frequency. As in all Heathkits, the best of parts are supplied, Mallory filter condenser, zero coef. ceramic condensers, all punched and formed parts, grey crackle cabinet, 5 tubes, test leads, etc. Better get it built now and be ready for the FM and TV business. Shipping wt. 6 lbs.

$24.50

Nothing ELSE TO BUY . . .

KITS THAT FIT

Heathkit chassis are precision punched to fit the quality parts supplied. The grey crackle aluminum cabinet and the two color panels are die punched to assure proper fitting. Many builders have written marveling at the ease with which assembly can be accomplished.

The chassis are specially engineered for easy assembly and wiring—there are no small light corners which cannot be reached—the ends of the chassis are left open in order that installation of parts and soldering can be done with both hands.

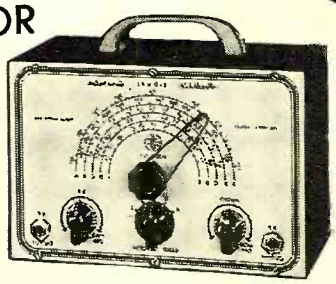
COMPLETE INSTRUCTION MANUALS

Everyone is pleased at the thorough instructions covering the assembly of each Heathkit instrument. Every detail of the assembly is covered, together with sections on the use of the instrument and trouble shooting instructions in case of difficulty. Actual photos of the assembled instrument enable fast and accurate assembly, clear schematics and pictorial diagrams of the confusing parts such as rotary switches enable the wiring to be completed quickly.

Heathkit SIGNAL GENERATOR KIT . . .

$19.50

Nothing ELSE TO BUY

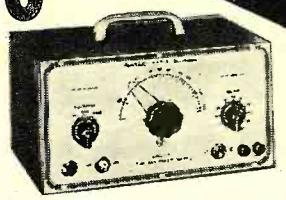


Every shop needs a good signal generator. The Heathkit fulfills every servicing need, fundamentals from 150 Kc to 30 megacycles with strong harmonics over 100 megacycles covering the new television and FM bands. 110V 60 cycle transformer operated power supply.

400 cycle audio available for modulation or audio testing. Uses 6SN7 as RF oscillator and audio amplifier. Complete kit has every part necessary and detailed blueprints and instructions enable the builder to assemble it in a few hours. Large easy to read calibration. Convenient size 9" x 6" x 4¾". Shipping weight 4½ lbs.

Heathkit SINE AND SQUARE WAVE AUDIO GENERATOR KIT . . $34.50

The ideal instrument for checking audio amplifiers, television response, distortion, etc. Supplies excellent sine wave 20 cycles to 20,000 cycles and in addition supplies square wave over same range. Extremely low distortion, less than 1%, large calibrated dial, beautiful 2 color panel, 1% precision calibrating resistors. 110V 60 cycle power transformer, 5 tubes, detailed blueprints and instructions. R.C. type circuit with excellent stability. Shipping Wt. 15 lbs.

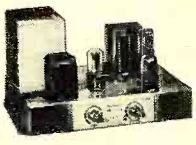


Nothing ELSE TO BUY

HEATHKIT HIGH FIDELITY AMPLIFIER KIT

$14.95

Build this high fidelity amplifier and save two-thirds of the cost. 110V 60 cy transformer operated. Push pull output using 1619 tubes (military type 6L6's), two amplifier stages using a dual triode (6SL7), as a phase inverter give this amplifier a linear reproduction equal to amplifiers selling for ten times this price. Every part supplied; punched and formed chassis, transformers (including quality output to 3-8 ohm voice coil), tubes, controls, and complete instructions. Add postage for 20 lbs.



12" PM Speakers for above..... 6.95

Mahogany Speaker Cabinet 14½" x 14½" x 8" 8.75

110V A.C. MILITARY RECEIVER POWER SUPPLY KIT

$5.95

Ideal way to convert military sets. 110V 60 cy. transformer operated. Supplies 24 Volts for filament—no wiring changes inside radio. Also supplies 250V D.C. plate voltage at 50-60 MA. Connections direct to dynamotor input. Complete with all parts and detailed instructions. Shipping wt. 6 lbs.

110 V. A.C. TRANSMITTER POWER SUPPLY KIT

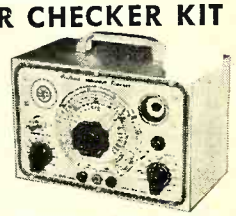
For BC-645, 223, 522, 274N's, etc. Ideal for powering military transmitters. Supplies 500 to 600 Volts at 150 to 200 MA plate, 6.3 C.T. at 4 Amps, 6.3 at 4 Amps. and 12V at 4 Amps. Can be combined to supply 3-6-9-12 or 24 Volts at 4 Amperes. Kit supplied complete with husky 110V 60 cycle power transformer, 5U4 rectifier, oil filled condensers, cased choke, punched chassis, and all other parts, including detailed instructions. Complete—nothing else to buy. Shipping Wt. 22 lbs.

$14.50

HEATHKIT CONDENSER CHECKER KIT

$19.50

Nothing ELSE TO BUY



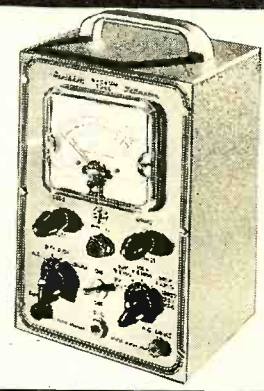
Checks all types of condensers, paper mica—electrolytic—ceramic over a range of .00001 MFD to 1000 MFD. All on readable scales that are read direct from the panel. NO CHARTS OR MULTIPLIERS NECESSARY. A condenser checker anyone can read without a college education. A leakage test and polarizing voltage of 20 to 500 volts provided. Measures power factor of electrolytics between 0% and 50%. 110V 60 cycle transformer operated complete with rectifier and magic eye tubes, cabinet, calibrated panel, test leads and all other parts. Clear detailed instructions for assembly and use. Why guess at the quality and capacity of a condenser when you can know for less than a twenty dollar bill. Shipping wt. 7 lbs.

The HEATH COMPANY

BENTON HARBOR 15, MICHIGAN

IDEAL TEST INSTRUMENTS

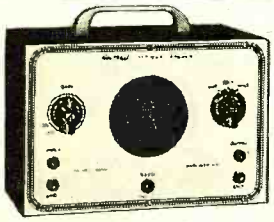
HEATHKIT VACUUM TUBE VOLTMETER KIT



Everything you want in a VTVM. Shatterproof solid plastic meter face, automatic meter protection in burn-out proof circuit, push pull electronic voltmeter circuit assuring maximum stability. Linear DC and AC scales. Complete selection of voltage ranges starting with 3 Volts full scale up to 1,000 Volts. Isolated DC test prod for signal tracing and measurements of voltage while instrument is in operation. An ohmmeter section accurately measuring resistance of 1/10 ohm to one billion ohms *with internal* battery. Extremely high input resistance 11 megohms on all ranges DC and 6.5 megohms on AC. All these features and many more are the reasons hundreds of radio and television schools are using Heathkit VTVM's and recommending them to all students. Like all Heathkits, the VTVM kit is complete, 110V 60 cy power transformer, 500 microamp meter, tubes, grey crackle cabinet, panel, test leads, 1% ceramic precision divider resistors and all other parts. Complete instruction manual. Better start your laboratory now, and enjoy it all winter. Shipping Wt. 8 lbs.

Nothing ELSE TO BUY!

$24.50



HEATHKIT SIGNAL TRACER KIT

Reduces service time and greatly increases profits of any service shop. Uses crystal diode to follow signal from antenna to speaker. Locates faults immediately. Internal amplifier available for speaker testing and internal speaker available for amplifier testing. Connection for VTVM on panel allows visual tracing and gain measurements. Also tests phonograph pickups, microphones, PA systems, etc. Frequency range to 200 MC. Complete ready to assemble. 110V 60 cycle transformer operated. Supplied with 3 tubes, diode probe, 2 color panel, all other parts. Easy to assemble, detailed blueprints and instructions.

Small portable 9" x 6" x 4¾". Wt. 6 pounds. Ideal for taking on service calls. Complete your service shop with this instrument.

$19.50

Nothing ELSE TO BUY

HEATHKIT 3-TUBE ALL-WAVE RADIO

$8.75

An ideal way to learn radio. This kit is complete ready to assemble, with tubes and all other parts. Operates from AC. Simple, clear detailed instructions make this a good radio training course. Covers regular broadcasts and short wave bands. Plug-in coils. Regenerative circuit. Operates loud speaker. Add postage for 3 lbs. $8.75

110-Volt AC Operation

HS 30 Headphones per set.....$1.00

2½" Permanent Magnet Loudspeaker 1.95

INTERPHONE 2-WAY CALL SYSTEM KIT

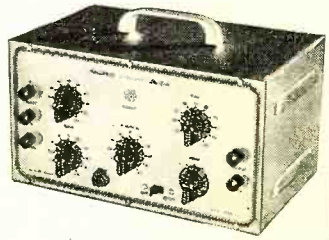
Ideal call and communication system for homes, offices, factaries, stores, etc. Makes excellent electronic baby watcher easy to assemble with every part supplied including simple instructions. Distance up to 1/5 mile. Operates from 110V A.C. 3 tubes, one master and one remote speaker. Shipping Wt. 5 lbs.

$14.50

Heathkit ELECTRONIC SWITCH KIT

DOUBLES THE UTILITY OF ANY SCOPE

An electronic switch used with any oscilloscope provides two separately controllable traces on the screen. Each trace is controlled independently and the position of the traces may be varied. The input and output traces of an amplifier may be observed one beside the other or one directly over the other illustrating perfectly any change occurring in the amplifier. Distortion—phase shift and other defects show up instantly. 110 Volt 60 cycle transformer operated. Uses 5 tubes (1—6X5, 2—6SN7's, 2—6SJ7's). Has individual gain controls, positioning control, and coarse and fine sweeping rate controls. The cabinet and panel match all other Heathkits. Every part supplied including detailed instructions for assembly and use. Shipping weight 11 lbs.



$34.50

Nothing ELSE TO BUY

COMPLETE KITS

When you receive your Heathkit, you are assured of every necessary part for the proper operation of the instrument.

Beautiful cabinets, handles, 2 color panels, all tubes, test leads where they are a necessary part of the instrument, quality rubber line cords and plugs, rubber feet for each instrument, all scales and dials ready printed and calibrated. Every Heathkit is 110V 60 cy. power transformer operated by a husky transformer especially designed for the job.

BEST OF PARTS

You will find many famous names on the parts in your Heathkit. Mallory switches and filter condensers, Chicago Transformer Corporation and Electrical Assembly Transformers, Centralab Potentiometers, Belden Cable, IRC and Allen Bradley resistors, G. E. tubes, Cinch and Amphenol sockets with silver plated contacts, Deflance variable condensers, Eby binding post and many other quality parts. The finest of parts are used to assure long trouble-free service from Heathkits.

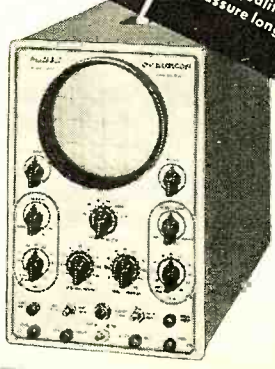
New 1948 HEATHKIT 5" OSCILLOSCOPE KIT

A necessity for the newer servicing technique in FM and television at a price you can afford. The Heathkit is complete, beautiful two color panel, all metal parts punched, formed and plated and every part supplied. A pleasant evening's work and you have the most interesting piece of laboratory equipment available.

Check the features—large 5" 5BP1 tube, compensated vertical and horizontal amplifiers using 6SJ7's, 15 cycle to 30 M cycle sweep generator using 884 gas triode, 110V 60 cycle power transformer gives 1100 volts negative and 350 volts positive.

Convenient size 8½" x 13" high, 17" deep, weight only 26 pounds.

All controls on front panel with test voltage and ext. syn. post. Complete with all tubes and detailed instructions. Shipping weight 35 pounds. Order today while surplus tubes make the price possible.



Nothing ELSE TO BUY

$39.50

ORDER DIRECT FROM THIS AD.

WE WILL SHIP C. O. D.

Add Postage for Weight Shown

The HEATH COMPANY

★ ★ ★ . . . BENTON HARBOR 15, MICHIGAN

Buy HEATH SURPLUS Now!

ALL QUANTITIES LIMITED SUBJECT TO PRIOR SALES

APN/1 RADIO ALTIMETERS

NO. 200. The last chance to get a complete new 14 tube radio altimeter. Contains 420 Mc. transmitter and receiver, power supply, range switches, two antennas, meter indicator, all plugs and instruction manual. This unit makes excellent amateur station as it is right in the band. Shipped in original export crate. Weight 87 lbs.

$34.50

BC 645 GENERAL ELECTRIC TRANSCEIVER

NO. 201. Complete 15 tube transmitter-receiver. Ideal for new citizens band 460 Mc. for communication between office and car, home, boat, etc. Conversion article in August ELECTRONICS Magazine. Brand new in original G.E. cartons with tubes. Add postage for 25 lbs.

$19.50 . . . 2 for $35.00

ACCESSORIES FOR BC 645

PE101C Dynamotor for car use ..... $ 3.95

110V 60 Cycle Power Supply for home or office use....$14.50

RCA NAVY COMMUNICATION RECEIVER

NO. 202. The last of these beautiful RCA sets. Covers 195 Kc. to 9.1 Mc. continuously. Supplied complete with tubes, control box, tuning unit, 24 Volt dynamotor, band change motor, plugs and circuit diagram. Superheterodyne circuit covers aircraft, broadcast, short wave, marine, foreign broadcasts. Has sharp or broad I.F.'s B.F.O., etc. Shpg. Wt. 30 lbs.

$29.50

G.E. BC 375 TUNING UNIT

NO. 203. Model TU10B covers 10 Mc. to 12.5 Mc. New complete with aluminum cabinet. The best buy of surplus. Over $30.00 worth of new variable condensers, coil, dials, switches, etc. Add postage for 20 lbs.

$2.49

G.E. 50 AMP CIRCUIT BREAKER

$2.95 EACH— 3 FOR $7.50

NO. 204. New General Electric 50 Amp 220 Volt AC circuit breakers. 100 Amp when used on 110V. Add postage for 4 lbs.

BC 347 AIRCRAFT INTERPHONE AMPLIFIER

NO. 205. Interphone amplifier contains 6F8 tube, Ouncer transformers, diagrams, etc. in aluminum cabinet. Add postage for 4 lbs..... **$2.95**

T32 TABLE MICROPHONE

NO. 210. One of the Army's best. Built by Kellogg, ideal for factory call system, public address, amateur use. Brand new in original cartons. Add postage for 5 lbs. **$2.95**

MINIATURE ELECTRIC MOTOR

NO. 211. Tiny Delco motor only 1" x 1¼"x2" 10,000 RPM. Operates from 6 to 24 V. Excellent for models. Add postage for 1 lb. **$2.95**

P. E. 103 6 VOLT DYNAMOTOR

NO. 212. Dynamotor only from PE 103 power supply. Input 6 or 12 Volts, output 500 Volts at 160 MA. Brand new original cartons. Shipping Weight 29 lbs.

$5.95

274N COMMAND SET ACCESSORIES

NO. 238. 5" PM Speaker with output transformer matching headphone output.....$2.80

NO. 239. Dual receiver rack FT277A with connecting plugs.....$1.00

NO. 240. Single transmitter rack FT234A $1.00

NO. 241. Spline shaft for tuning command receivers. Allows use of regular tuning knob on BC 453-4-5 receivers .....$ .39

BC 451 CONTROL BOX

NO. 236. Control box for 274N transmitters. Contains proper cw-voice switch, 4 channel switch, power switch, mike jack and telegraph key.

Add postage for 2 lbs.....$1.95

G. E. 1,000 VOLT 350 MA DYNAMOTOR

NO. 213. An ideal dynamotor for mobile operation in taxicabs, police cars, sound systems and amateur stations. Supplies above voltage from 12 Volts or 500V. at 350 MA from 6 Volts. Complete with starting relay, and fuses. New. Our Dynamotor A. Shipping Weight 72 lbs.

$5.95

DM-36 DYNAMOTOR

NO. 215. Western Electric 24 Volt input, 220V. at 60 MA out. With filter assembly. Shipping Weight 6 lbs..... **$2.95**

POWER TRANSFORMER *Specials*

NO. 226. Primary 117V. 60 cycle. Secondaries supply 746 V.CT at 220 MA, 6.3V. at 4.5 A., and 5V. at 4A. Will handle 13 tube radio receivers. Supply is limited, order early. Shipping Weight 11 lbs. each.

$3.95 . . 3 for $9.95

OUTPUT TRANSFORMER

NO. 227. Push pull 6V6's to 6 - 8 ohm voice coil excellent characteristics,..... **3 for $1.95**

TRANSMITTER TRANSFORMER

NO. 228. The transformer for Transmitter Power Supply, 600 Volt at 200 MA and 4 Amp. filaments of 3 to 24 Volts. Also 5 Volts at 4 amperes for rectifier Shipping Weight 12 lbs..... **$9.50**

MILITARY POWER TRANSFORMERS

NO. 229. Convert your military receivers without rewiring the filament. "A" type supplies 500 VCT at 50 MA, 5V. at 2A. and 24V. at ½ A. "B" type supplies 500 VCT at 50 MA, 5V. at 2A. and 12V. at 1 Amp. State whether A or B type desired. Shipping Weight 4 lbs..... **$2.95**

METER SPECIAL

NO. 237. Brand new DeJur Model 312 0-800 M.A. D.C. Square 3" 0-10 M.A. basic meter with built in shunt. Probably the best buy ever offered in a surplus meter. Shipping Weight 1 lb..... **$2.95**

G.E. BC 306 ANTENNA TUNING UNIT

NO. 231. Matches any aerial to 150 Watt transmitter, used on BC 375. Brand new. Add postage for 20 lbs..... **$2.95**

W.E. BC456 MODULATOR

NO. 217. Modulator from 274N command transmitters contains 3 husky relays, 3 tubes, VR150, 1235 and 1625. Brand new. Add postage for 11 lbs. **$3.95**

A-62 ARMY PHANTOM ANTENNA

NO. 206. Contains tuning condenser, coil, resistors, tuning dial, tuning indicator, binding posts, steel case, useful for building amateur transmitter. Add postage for 8 lbs..... **$1.95**

BE 77 TELETYPE TEST SET

NO. 218. Contains zero center volt-milliammeter, switches, relays, voltage divider resistors, neon indicator, etc. Excellent foundation for radio tester. Shipping Weight 10 lbs.

$7.95

BENDIX MN 20E DIRECTION FINDER LOOP

NO. 219. Ring type loop excellent for use on boat or aircraft. Extremely rugged construction. Low impedance manual type. Add postage for 8 lbs. **$9.95** EACH

BENDIX MR9C COMPASS CONTROL UNIT

NO. 207. Tuning and control unit for Bendix MN 26 radio compasses contains tuning dial, band switch, crystal switch, AVC switch, volume control, fuses, phone jacks, etc. Shipping Weight 5 lbs. **$9.50**

LP 18C DIRECTION FINDER LOOP

NO. 220. Motor driven streamline pod type loop used on automatic direction finders. Has Selsyn transmitter and motor, fits most military direction finders. Add postage for 20 lbs..... **$14.50** EACH

BC731 CONTROL BOX with Weston Model 476 AC Voltmeter

NO. 208. Excellent buy in motor control box. Size 8"x10"x5½". Contains Weston 0-150V. AC 3½" voltmeter, motor storting switch, 28 fuses all 30 Amp 110V. and 8 fuse holders. Fuses and holders alone worth the price. Shipping Weight 18 lbs..... **$7.95**

KIT SPECIALS

POTENTIOMETERS

NO. 232. Kit of 10 excellent shaft type potentiometers good variety **$1.95**

SOCKETS

NO. 233. Kit of 20 high quality sockets several different types..... **$1.00**

PE 125 TRANSMITTER POWER SUPPLY

$12.95

NO. 223. Operates from 12 to 24 Volts and supplies 500 Volts at 160 MA. Extremely rugged construction used in Army tanks. Complete with fuses — relays — filters, etc. Ideal for boats. Shipping Weight 73 lbs.

FM PUSH BUTTON TUNER

NO. 224. Brand new ten push button tuning assembly from Army FM receiver. Contains 4 gang 100 MMF silver plated tuning condenser. Add postage for 10 lbs. **$2.50** EACH

RG 8/U FLEXIBLE COAXIAL CABLE

4¢ PER FOOT

NO. 225. Standard television lead in 52 ohm. Any length up to 1,000 ft. Add for postage.

HOME WORKSHOP GRINDER KIT

NO. 230. Easily assembled 110V AC or DC ball bearing fully enclosed motor from Army surplus dynamotor. Purchaser to make simple changes and shaft extensions, detailed instructions and all parts supplied. Motor approximately 5,000 R.P.M. Ideal for tool-post grinder, flexible shaft tool, model drill press, saw. Shipping Weight 6 lbs.

$3.95

HEARING AID HEADPHONES

NO. 216. The Army's best — eliminate flat ears and outside noise. Complete with transformer for conversion from low to high impedance. With cord and plug complete.

Add postage for 1 lb..... **$1.00**

TELEVISION CONDENSERS

NO. 221. Tobe triple .2 MFD 4000 V.D.C. Filter used on Army rodor. Ideal filter for H.V. television set. Add postage for 3 lbs..... **$3.95**

NO. 222. G.E. Pyranol capacitor .25 MFD 6000 V.D.C. Porcelain insulated, an outstonding buy for high voltage filters. Add postage for 3 lbs..... **$3.95**

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STANCOR FILAMENT TRANSFORMER

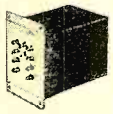
NO. 242. Heavy duty Stancor No. ST355 supplies 5V at 6 Amps, 5V at 3 Amps and 5V at 3 Amps from 220V 60 Cy. primary or ½ above from 110V. Cased type. Ship. Wgt. 7 lbs. Each **$1.50**

G.E. THYRATRON TRANSFORMER

NO. 243. New G.E. Transformer supplies 2.5V at .100 KVA, has 3KV insulation 100V 60 cy. primary. Shipping Wgt. 13 lbs. Each **$9.50**

RCA SATURABLE REACTOR TRANSFORMER

NO. 246. New RCA No. CRV30531 AC current 750 MA DC current 2 Amperes. Rated 1.75 henries. Shipping wgt. 4 lbs. Each **$1.00**



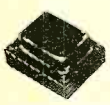
12.6V POWER TRANSFORMER

NO. 247. New cased 110 V 60 cy. Power Transformer. Supplies 440V Ct. at 60 MA, 6.3V at 2A. and 12.6V at 1 Amp. Excellent for military sets. Shipping Wght. 6 lbs. Each **$1.95**

RCA INPUT TRANSFORMER

NO. 248. Heavy duty RCA No CRV-30529. Input has primaries 600 to 200 and 25 ohms secondary 250,000 ohms C.T. Shipping Wgt. 2 lbs. Each **$1.00**

REPLACEMENT POWER TRANSFORMER

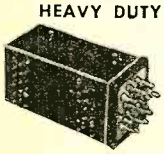


NO. 251. Excellent value transformers made by one of largest transformer companies. 110V 60 cy. Primary supplies 746 V Ct. at 150 MA. 5V at 4A and 6.3V at 4.5 Amps. Shipping Wgt. 7 lbs. Each **$2.95**

FEDERAL POWER TRANSFORMER

NO. 252. New cased 110V 60 cy. Power Transformer. Supplies 480V CT at 50 MA and 6.3 V at 2.1 Amps. A beautiful transformer. Shipping Wgt. 4 lbs. Each **$1.50**

HEAVY DUTY 6-12-24 VOLT VIBRATOR



NO. 253. A husky vibrator used on army transmitter. Rated 30 amperes at 6 Volts 220 cycle with contacts for 12 and 24 Volts, Synchronous type, has many industrial applications. Ship. Wgt. 3 lbs.

4 CHANNEL PUSH BUTTON TUNER

NO. 254. Permeability tuner from BC 728 containing RF, first detector, and oscillator coils. Covers 2 to 5 MC. Complete circuit diagram furnished. Shipping Wgt. 2 lbs. Each **$2.50**

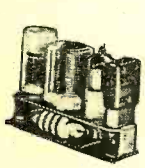
CONDENSER SPECIAL

NO. 255. An ideal oil filled power supply filter used in army 16 tube unit, has 2.5, 2.5 and 5 MFD all at 600V D.C. rating. Shipping Wgt. 3 lbs. Each **$1.50**

TELEVISION CONDENSER

NO. 256. Aerovox Hyvol .05 MFD at 7500V. rating. Excellent television coupling condenser with mounting bracket. Shipping Wgt. 3 lbs. Each **$3.50**

BC 746 TUNING UNIT

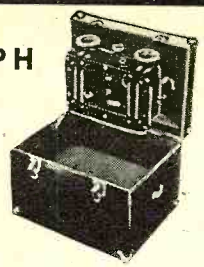


NO. 257. Plug in transmitter tuning unit from army Walkie Talkie. Contains antenna and tank coils, tuning condenser, transmitting and receiving crystals. Ideal transmitter foundation. Shipping Wgt. 1 lb. Each **$1.00**
(Same as above except transmitter crystal in 80 meter amateur band.....$2.50 each)

T30 THROAT MICROPHONE

NO. 258. Makes excellent contact microphone for musical instrument or vibration pick-up. Shipping Wgt. 1 lb.....$1.00 each
Extension cord with switch for above .....$ .50 each

BRAND NEW ARMY AIR FORCE ASTROGRAPH



NO. 259. The case of this unit makes the finest tool and service kit ever designed. Plywood construction, 14 x 11 x 10" high, with 8 covered compartments in the bottom for repair parts, leather handle, steel reinforced covers, hinged lid. Also excellent as case for radio phonograph, movie projector, camera, shell case, fishing kit, picnic kit, etc. The astrograph itself, (which cost the government $125.00) makes an excellent contact printer, and can be used for a foundation for enlarger, strip map holder, etc. The case alone worth twice the give-away price of **$3.95**

AN27/ARN5 ANTENNA

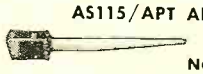
$9.50

NO. 260. Standard blind landing antenna system. Brand new in original crate. Ship. Wgt. 14 lbs.

AS114/APT ANTENNA SYSTEM

NO. 261. New blade type antenna complete with case assembly, in original carton. Shipping Wgt. 9 lbs. **$7.50**

AS115/APT ANTENNA SYSTEM



$7.50

NO. 262. New blade type antenna complete with case assembly, in original carton. Ship. Wgt. 11 lbs.

AT38A/APT RADAR ANTENNA

NO. 263. New radar dome type antenna with mounting base and connections, in original carton. Ship. Wgt. 11 lbs. **$14.50**

AN104A BLADE ANTENNA

$1.50

NO. 264. Standard blade antenna used on many military fighting planes with coaxial connection at base. Shipping Wgt. 3 lbs.

BENDIX MT51C TRANSMITTER CONTROL BOX

NO. 235. Contains channel switch, emission switch, send receive switch, power switch and indicators for Bendix aircraft transmitters. Ship. Wgt. 3 lbs. **$5.50**

BC 670B REMOTE CONTROL BOX

NO. 265. Motor starting control box has starting and stopping switch, indicator, cable and plug. Wooden case. Ship. Wgt. 6 lbs. Each **$1.95**

BK 22 RELAY ASSEMBLY

NO. 266. Used on SCR 269 Radio Compasses. Contains stepping and control relays — junction box of aluminum. Brand new. Ship. Wgt. 7 lbs. Each **$3.95**

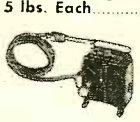
HEINEMANN CIRCUIT BREAKER

NO. 267. Heavy duty type 7 Amp. 24 Volt D.C. Many uses around shop. Shipping Wgt. 2 lbs. Each **$1.00**

CUTLER HAMMER MOTOR FIELD CONTROL

NO. 285. Rated 10 ohms. 3.2 Amps. Maximum. 6½" diameter with knob and mounting feet, can be used to regulate generator output voltage. Shipping. Wgt. 5 lbs. Each **$2.50**

PENN THERMO RELAY



NO. 268. Thermo Relay with a range of 45° to 100° complete with 5 Ft. flexible cable to immersion bulb. Shipping Wgt. 6 lbs. **$3.50**

B & W 11 to 14 MC TANK COIL

NO. 281. Plug in type used on BC 610 Transmitter. New, original cartons. Shipping Wgt. 2 lbs. Each **$1.50**

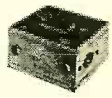
DM 64A 12 VOLT DYNAMOTOR

NO. 269. Input 12V at 5 Amps. Output 275 Volt 150 MA. New. Shipping Wgt. 7 lbs. Each **$5.50**

DM 32A COMMAND SET DYNAMOTOR

NO. 270. Part of 274N Command Receivers. Input 28 Volts, output 250V at 60 MA. Shipping Wgt. 4 lbs. Each **$5.50**

DM 21 12 VOLT DYNAMOTOR



NO. 271. Used in Army BC 312 Communication Receiver. Input 12 Volts at 3.3 Amps. Output 235 Volts at 90 MA. New, original cartons. Shipping Wgt. 8 lbs. Each **$5.50**

PE94C SCR 522 POWER SUPPLY

NO. 272. Complete dynamotor power supply for the SCR 522, operates from 28 Volts. Complete with controls, filters, etc. Original carton. Shipping Wgt. 34 lbs. Each **$8.75**

PE101C BC645 POWER SUPPLY

NO. 273. Complete power supply for BC 645. Operates from 12 or 24 Volts. Supplies both AC and DC required. Shipping Wgt. 13 lbs. Each **$3.95**

DM 35 12 VOLT DYNAMOTOR

NO. 274. New input 12 Volt at 18.7 Amperes. Supplies 675V at 275 MA or ½ above voltage from 6 volts. Excellent for auto use. Shipping Wgt. 11 lbs. Each **$7.50**

PE 86 DYNAMOTOR

NO. 214. A popular 28 Volt receiver dynamotor used on present military equipment. Supplies 250V at 60 MA. Shipping Wgt. 4 lbs. Each **$5.50**

GN 58 HAND GENERATOR

NO. 275. Makes excellent home lighting plant, operated by wind propeller, waterfall, gas engine, or hand crank. Reduction gear allows full output at slow speed; supplies 6 volts at 2.45 amp., 425 volts at .115 amp. New. Add postage for 28 lbs. Each **$7.95**
Handles for GN 58.....$ .50 each
Connecting cord for GN 58 with plugs CD1086.....$1.50 each

COLLINS AUTOTUNE CONTROL HEAD

NO. 278. Brand new controls used on the ART/13, 100 Watt, Transmitter. Types 7, 8, 10, and 11 available. Get a spare while available as new cost is over $22.00 each. Shipping Wgt. 3 lbs. Price any type (mention when ordering). Each **$4.50**

MC 432 VHF ANTENNA LOADING UNIT

NO. 279. Contains 2 pole, 5 position rotary switch with silver ceramic variable condensers, and coils for matching VHF Transmitter to AN109 antenna with 50 ohm line. Many useful parts. Shipping Wgt. 2 lbs. Each **$1.50**

I48 OUTDOOR TELEGRAPH KEY

NO. 280. Rugged enclosed type for outdoor use, built for army to withstand hard useage. Complete with cord and PL55 plug. Shipping Wgt. 2 lbs. Each **$2.00**

ONE KILOWATT ADJUSTABLE ANTENNA LOADING COIL

NO. 282. Huge porcelain coil 4" diameter 8¼" long, has 5 sliders for adjustments. Shipping Wgt. 5 lbs. **$3.50**

300 MA SELENIUM RECTIFIERS

NO. 209. Rated 300 MA at 36 Volts, complete with mounting brackets. Shipping Wgt. 1 lb. ..... 3 FOR $1.00

DUAL SELENIUM RECTIFIER

NO. 283. Two units mounted on single bracket, each section rated 15V. at ½ Amp. Shipping Wgt. 1 lb. 2 FOR $1.00

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The HEATH COMPANY

★ ★ ★ . . . BENTON HARBOR 15, MICHIGA

It Was A Humme..

By JOHN T. BAILEY

Even at the lower broadcast frequencies a one-half inch common ground can cause plenty of trouble.

HE SAID it had a hum. It certainly did. It sounded like every harmonic of the line frequency plus a dirty, growling garble on the signals. For a little 5 tube a.c.-d.c. set it put out quite a wallop but it was all hum. In a moment of weakness I told my neighbor I would fix it for him. Next time I'll be more careful but anyway I learned something for my trouble. This is how it happened.

The circuit was conventional—an a.c.-d.c. 5 tube super using a 6A8, a 6SK7, a 6SQ7, a 25L6 and a 25Z6. I took the chassis out and tested the tubes. They were OK with no evidence of cathode shorts or leakage. The filter condensers were bad as I suspected so I replaced them with the proper values, put the tubes back and proceeded to line up the set. Everything seemed to be normal except that I heard an intermittent hum. Reversing the line plug didn't help. Sometimes it seemed as if it was tunable and again it didn't. I checked the line bypass condenser on the suspicion that the line was modulating the signal. Sure enough the bypass condenser was open. I replaced it and gave the set a final check. The hum was still there! Just a nice steady hum of a level a little too high to tolerate.

I didn't think I could convince my neighbor that this amount of hum was normal in this set but before I finished I reached a point many times when I was ready to tell him anything if he would only take it away.

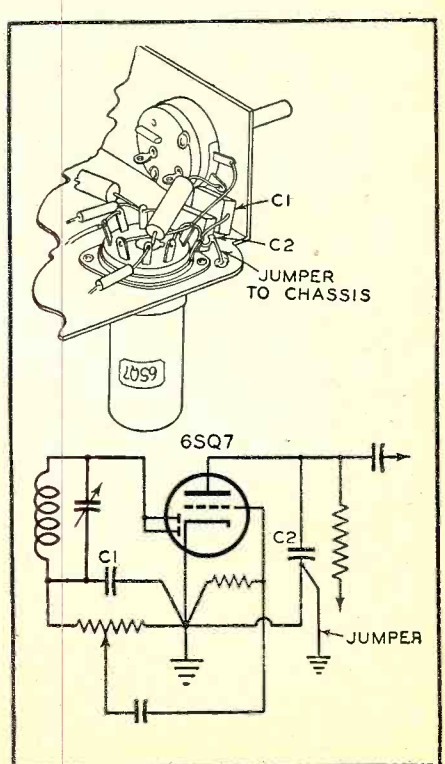
By this time I knew I had a bad actor on my bench but my local reputation was at stake so I determined to find out what was causing the trouble. I replaced all the tubes—no improvement. Then I turned the set off, turned it over and replaced all bypass condensers, turned it on and the hum was gone.

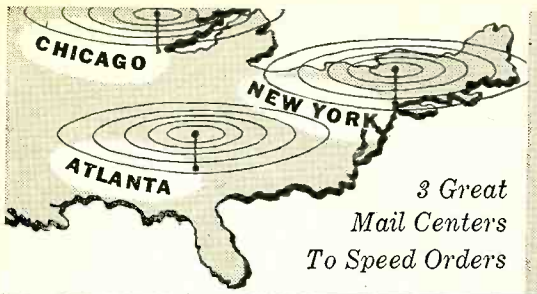
Wonderful I thought, but which condenser was it? The old ones all checked OK. So one by one I put the old ones back, testing between each replacement. Yes, you guessed it. No hum with the original condensers back in the set. This was one of the low points in my morale. Then I reached over the set to give the dial a twist and, by mistake, turned the volume control to zero. Presto, the hum was back. From that point on I worked on the set hot so I wouldn't lose the hum again. The volume control checked OK but I changed it anyway—no improvement. It was obvious now that the trouble was localized in the audio end, probably the 6SQ7 stage, but no amount of probing or tugging on wires would stop the trouble until I disconnected the plate bypass on the 25L6. That killed the hum but it didn't make sense so I put it back and continued the search.

This, I think, marked the second low point in my morale. I was completely frustrated but soon things began to look better.

The next step was not intentional. I dropped my screwdriver into the chassis. My immediate reaction was to get it out fast before something went up in smoke. However, I was frozen with hands outstretched. The hum was gone! Holding my breath, I took a good look. The metal screwdriver blade was jammed into the wiring and was shorting a bare wire to chassis. My hopes sunk quickly when I saw that that bare wire was a ground wire anyway and was securely grounded to the chassis. Carefully, I lifted the screwdriver and the hum returned. I put it back and the hum stopped. I held a wire jumper in my

Fig. 1





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ELECTRO NEWS

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TV, FM, LP "IN THE BAG" SAYS CLAUS!

New radio-electronic developments high on gift lists this year, W2 Xmas chief reveals, in exclusive interview.

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If you can use a little extra do-re-mi, check the prices below carefully. You can save more than just a few pennies, for each one of these items is a very special value. Quantities are limited so rush your order today.

COMPLETE ENTERTAINMENT CENTER

with wire recorder & playback 10 watt P.A. system

new and exclusive

It's the most versatile all-around unit ever designed for home, professional and business use. It makes high-fidelity wire recordings from microphone, from radio, from record player. These compact wire spools can be played back thousands of times, or they can be instantly "erased" to be used over and over again! You can "monitor" and control volume while you're recording, like a professional. And presto, change-o! Mount the speaker into the detachable cover: you have a hi-fidelity speaker-baffle unit. In a matter of several seconds, you can convert it into a powerful 10 watt P.A. System.

A combination like this would ordinarily cost you well over $300. But you can now buy it for only $159.50, because Lafayette designed it and built it themselves.

DOZENS OF USES

Compact! You can carry it to parties, family gatherings, meetings! So inexpensive, nearly every home or office can afford one! Such high fidelity that even the most critical music lover will want it. 35N22559R..... **$159.50**

Howard FM tuner—For concert-quality FM recordings. 30N22492R (Mahogany). Designed to fit directly into entertainment center case $32.63

Record spools: 35N16311R. 15 min. cap. 1.50
35N16312R. 30 minute capacity.... 2.25
35N16313R. 60 minute capacity.... 3.75

NEW POCKET RADIO

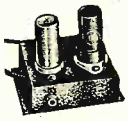
SPLENDID VALUE

Slips into coat pocket—just enough extends to tune. Built-in antenna, self-contained flashlight cells. Good vol. on local stations. Covers broadcast band with additional range. Uses 2-1S4 mini tubes in standard regenerative-detector circuit transformer coupled to AF output stage. Case easily made. Less tubes, batteries, headset. No. 32N24516R — shpg. wt. 5 lbs. **$5.85**

8" PM SPEAKER – 21 oz. MAGNET

High quality PM speaker at a money saving low price. Excellent replacement unit for hi-fidelity radios and P.A. systems. 21 ounce magnet handles 10-12 watt output. Voice coil impedance 8 ohms.
No. 99N7018R—Shpg. wt. 4 lbs.... **$3.95**
No. 99N7019R—10" PM Speaker.. $3.45 ea.

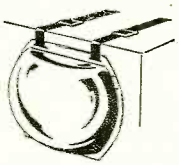
SPECIAL PRE-AMP KIT



For use with G. E. Pickup

Build your own pre-amplifier kit for use with the new G.E. variable reluctance or Pickering Pickup cartridges. Finished model is as fine a bass and treble compensated pre-amplifier as any available. Plate and filament power are received from associated receiver or amplifier. Complete with chassis, resistors, condensers, 6SC7 tube, full instructions. **$3.95**
No. 32N24536R—Wt. 2 lbs.....

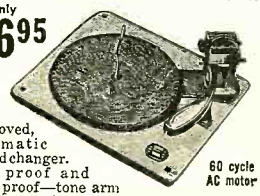
BEST BUY IN TV LENS



Now you can enlarge your television picture area as much as 3 times original size! New strap-mounting plastic magnifying lens fits any model, requires no special installation. Enlarges 7" screens to size given by 10" tube, 10" screens to size given by 12" tube. **$10.95**
No. 31N24477R—for 7" tube...
No. 31N24478R—for 10" tube..... $13.50

REDUCED PRICE ON THIS AUTOMATIC RECORD CHANGER

only **$16.95**

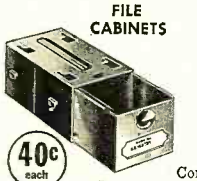


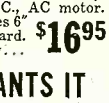
Improved, automatic record changer. Jam proof and child proof—tone arm can be moved at any time without jamming unit or changing adjustments. Plays records manually or automatically. Plays ten 12" or twelve 10" records at one setting. Single control for simple operation. Lightweight crystal tone arm assures hi-fidelity. Constant-speed 110 V., 60 C., AC motor. Base—11½" x 13½". Requires 6" above and 2" below panel board. **$16.95**
No. 99N9593R—12 lbs. Only...

60 cycle AC motor

EVERYBODY WANTS IT ALL-STEEL MULTI DRAWER

BUILDS INTO FILE CABINETS





THEY HOOK TOGETHER ON ALL SIDES

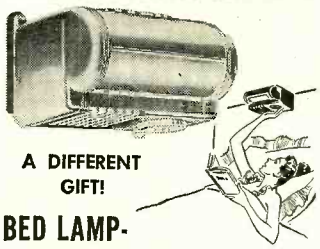
40c each

Convenient storage for small parts. Each unit constructed with tongue and slot designed to interlock with other units at top, bottom or side. Units may be fitted and securely locked around existing fixtures for economy of space. Each drawer has handy pull and holder for contents card. All-steel, 2⅜" x 2¼" x 5". **$3.60**
No. 18N22381R—Wt. 10 oz.—10 for

TV PROGRESS REPORT

Washington: Recent FCC ruling which halts consideration of 302 TV applications, for six months at least was prompted by the desire to improve service of present stations. It has been found that stations in adjacent cities operating on the same channel, or even on nearby channels have been interfering with each other. Wayne Coy, FCC chairman says that in no event will the usefulness of TV sets now on the market or in private ownership be impaired. The 37 TV stations now on the air, and the 86 in various stages of construction are not affected by the ruling.

TV is racing ahead and the FCC feels that it is better to check and make revisions now, in allocations, etc., than later on. The industry is in agreement with Chairman Coy when he says: "Our belief is that television is going to be a terrific service." If you want to take a quick glance at some of the best values in TV, get the Lafayette Concord Bulletin on TV ... it's ready now.



A DIFFERENT GIFT!

BED LAMP-RADIO

Here's a Christmas gift that shows imagination and good sense too! It's a beautifully-designed Bed Lamp & Radio combination. Enables her to read under light that's kind to her eyes—while she listens to her favorite band. Superhet circuit. Built-in "air-magnet." Complete broadcast band coverage. AC or DC. Lamp has frosted lens for glareless light. Lamp and radio operate separately or together, as desired. Streamlined walnut bakelite. Brackets fit any type of bed. It's a $29.95 value. **$21.95**
No. 1-533R. Shpg. wt. 9 lbs.....

Television sets, FM receivers and tuners and the new Long Playing record players are in for a heavy play this Christmas, according to advance info from the North country. This seems to be in line with the growing emphasis on practical, useful gifts. You don't have to be run over by Santa's sled to know that it's extra smart these days to buy where your buck looks and acts bigger. So just in case you're a skeptic, match Lafayette-Concord values against others ... you'll see why Santa has set up shop here.

GIVE *YOURSELF* THIS VALUABLE XMAS GIFT it's FREE!

If you could talk to the hundreds of thousands of Lafayette - Concord catalog shoppers, you'd soon find out why this is the bible of the industry. First of all, prices on the average are lower. Secondly, stocks are complete—don't forget L-C is the largest parts organization in the world. Then there are the thousands of odds and ends, the parts and tools you need and want fast.

SO GET YOUR COPY BY RUSHING THE COUPON

Lafayette-Concord has issued millions of copies of catalogs during the past 29 years. None have been so exciting. Television, High Fidelity, LP, FM, Public Address, Ham Gear, Test Equipment ... you name it — and dollars to doughnuts you'll find more of it in this big book than anywhere else. All you need do is clip the coupon below and shoot it back to us on a penny postal. We've a hunch you'll count this new Lafayette-Concord catalog among your most worthwhile gifts this Xmas.

W2? ATTENTION EXPORTERS W2?

Orders from our many friends outside of the U. S. will get even faster handling if they are addressed to the Export Division.

ORDERING

Many of our friends shop in the famous L-C outlets listed below. If you are anywhere in the neighborhood, drop around. We are never too busy to say hello.

MAIL ORDERS

P. Post rates are kept to a minimum because your order is sent from the warehouse nearest you ... another L-C money saving service.

SHOP IN PERSON AT ANY ONE OF OUR OUTLETS:

NEW YORK
100 Sixth Avenue
542 E. Fordham Rd., Bronx

CHICAGO
901 W. Jackson Blvd.
229 W. Madison St.

ATLANTA
265 Peachtree St.

BOSTON
110 Federal St.

NEWARK
24 Central Ave.

LAFAYETTE-CONCORD Dept. RL-8
901 W. Jackson Blvd., Chicago 7
100 Sixth Avenue, New York 13
265 Peachtree Street, Atlanta 3

MAIL NOW!

☐ Please rush FREE catalog No. 89.

☐ Please send FREE Xmas Gift Catalog.

☐ Please send FREE Television Bulletin

☐ Please fill the following order:

☐ No. 35N22559R	@	$159.50
☐ No. 30N22492R	@	32.63
☐ No. 35N16311R	@	1.50
☐ No. 35N16312R	@	2.25
☐ No. 35N16313R	@	3.75
☐ No. 32N24516R	@	5.85
☐ No. 99N7018R	@	3.95
☐ No. 99N7019R	@	3.45
☐ No. 32N24536R	@	3.95
☐ No. 31N24477R	@	10.95
☐ No. 31N24478R	@	13.50
☐ No. 99N9593R	@	16.95
☐ No. 18N22381R	@	3.60 for 10
☐ No. 1-533R	@	21.95

I enclose $..... in postal note, money order or check. Will remit few cents postage when order is received.

Name.....

Address.....

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

AFAYETTE-CONCORD

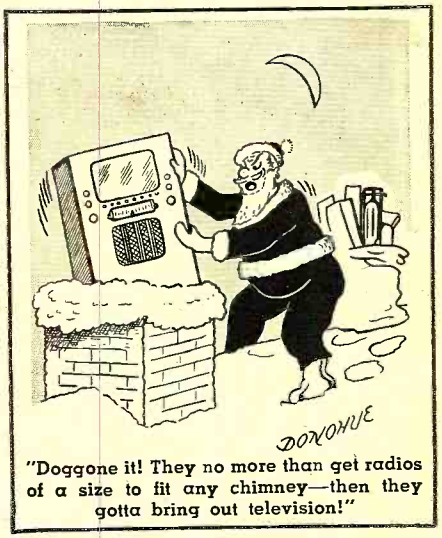
world's largest radio supply organization

hands and shorted the two points but the hum remained. I soldered a short jumper between the two points with no better results. This was getting to be mighty exasperating. Was it possible that a screwdriver was an essential part of this chassis and nothing else could be used to eliminate hum?

Reference to Fig. 1 will reveal the wires referred to. The 6SQ7 socket has a ground lug as a part of its flange and all nearby ground wires were connected to it, including the ground ends of the mica bypass condensers across the volume control and from the 6SQ7 plate.

Aha! I thought—a cold solder joint. So I melted it down with plenty of heat and flux but, again, no improvement. I soldered the rivet head and the socket flange to the chassis and still the hum persisted. This was hard on my patience, to be so close to the answer but unable to lick it.

Could it be that I had a common reactance consisting only of the socket lug? Maybe I did. Thereupon I soldered a jumper from the chassis right to the point where the lead comes out of the bakelite case of the mica bypass from the plate of the 6SQ7. Hurrah! My set was fixed! Yes sir, ½" common leads are important at broadcast frequencies too! —30—



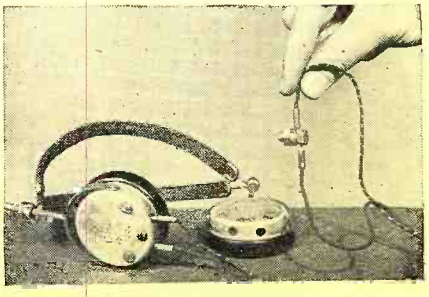
"Doggone it! They no more than get radios of a size to fit any chimney—then they gotta bring out television!"

TEMPORARY REPAIR

SINCE headphones are wired in series —when the wiring in one phone opens up, shorting out, such phone will give temporary service on the other one.

An easy method of doing this is by means of a small solderless connector of the type used by electrical workers.

See illustration. . . . . H.L.



Here's Real News!

AC-DC TELEVISION MADE POSSIBLE FOR THE FIRST TIME

Trend Is to New Low Prices for Lighter, Smaller 7" and 10" TV Sets

SMALL, COMPACT POWER SUPPLY HANDLES AM-FM-TV COMBINATION

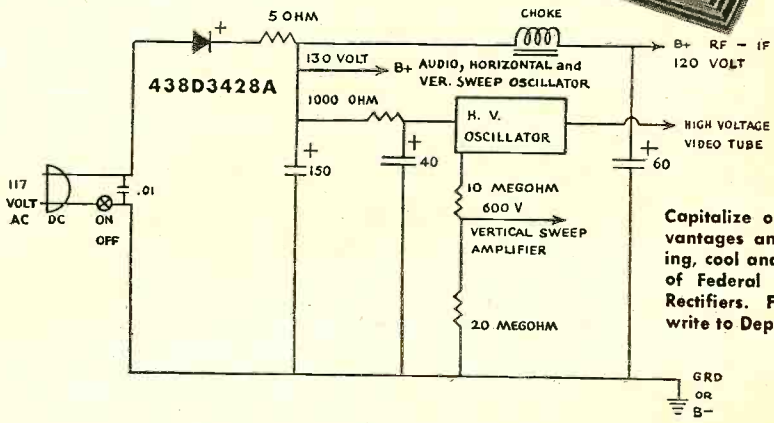
All Resulting from Federal's New Miniature 500 MA Selenium Rectifier

438D3428A

YES, this mighty miniature makes big television headlines! Its hitherto unapproached power-handling capacity promises a virtual revolution in television design. Think of the possibilities . . . a single Selenium Rectifier power supply able to handle an AM-FM-TV combination . . . AC-DC television . . . drastic reductions in size, weight and price of 7" and 10" sets.

These important savings result not only from the small size of this new Federal Miniature Selenium Rectifier, but its elimination of large, heavy, expensive transformers and expendable rectifier tubes in the power supply. What's more, it can be used with smaller condensers with lower voltage ratings.

Here's the diagram of a suggested circuit for an AC-DC power supply for 7" and 10" electrostatic deflection tubes.



Capitalize on these design advantages and the instant starting, cool and efficient operation of Federal Miniature Selenium Rectifiers. For technical data, write to Department F359.

KEEPING FEDERAL YEARS AHEAD... is IT&T's world-wide research and engineering organization, of which the Federal Telecommunication Laboratories, Nutley, N. J., is a unit.

Federal Telephone and Radio Corporation

SELENIUM and INTELIN DIVISION, 900 Passaic Ave., East Newark, New Jersey

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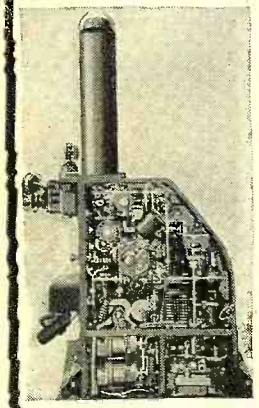
INDUSTRIALS! EXPERIMENTERS! Look at these EXCLUSIVE "G&G" BUYS!

JUST RELEASED!
B-29 BOMB SIGHT
ASSEMBLED BY SPERRY GYROSCOPE CO.



HUNDREDS OF USES

THOUSANDS of VALUABLE PARTS

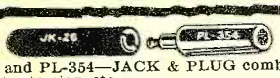
Cost to U. S. Govt. $21,000 Cost to You

$188.50

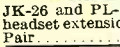
Recently declared a war surplus item, this bomb-sight is now selling at a ridiculously low price! As parts or as precision units, this P-4 Computer can be used to make instrument and machinery repairs, in manufacturing and assembling, in home and industrial workshops. It can be used in teaching aeronautics, engineering, navigation, physics, optics, mechanics, etc. An invaluable machine for

EXPERIMENTERS	LABORATORIES
PHYSICISTS	TECH INSTITUTES
SCHOOLS	ENGINEERS
RESEARCH MEN	REPAIRMEN
MECHANICS	MANUFACTURERS
OPTICIANS	ELECTRICIANS

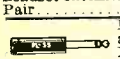
Comes in three units—the main body and two attachable periscopes, 22 and 68 inches high, alternate parts of an intricate optical system made by Eastman-Kodak Co. Main body is 35x25x14 inches. Contains at least 8 27 VDC motors, electric heater and temp. control, precision sextant, dozens of switches and controls, hundreds of fine gears and driving rods all types. Shipping wt. 250 lbs.



JK-26 and PL-354—JACK & PLUG combination, for headset extension, etc. Pair **29c**



PL-55—Standard 2-circ. phone plug, fits all phone jacks. Each **27c**



PL-68—Standard 3-circ. mike plug, fits all 3-way mike jacks. Each **16c**

140 MMFD MIDGET TUNING CONDENSER
Long shaft. Lots of 3, each **44c**

118 MMFD TRANSMITTING CONDENSER
Very Special Ham Value! 31 plates, Airgap .109". Overall length 4⅛", ceramic insulation, normal list price $11.85 ..... Each **99c**

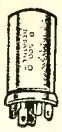
BEEDE DC METER, new, black bakelite case. 3" round 0-1000 DC Ma. Special **$1.95**

Wonderful Condenser Buys!

Oil-Filled Metal Cased Condensers
All Brand New—Perfect—Standard Makes

.1 mf 400V	14c	4.0 mf 600V	79c
.5 mf 600V	17c	3-3 mf 600V	88c
2.0 mf 600V	34c	.25mf6000V	$1.79
1.0 mf 1000V	49c	8 mf 1000V	2.25
1.0 mf 1500V	69c		

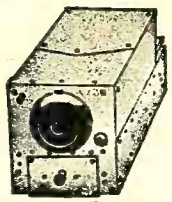
FP TYPE FILTER CONDENSERS
Standard Makes—Brand New



30 mfd 50 V	12c
100 mfd 50 V	17c
40/40/20 mfd 150/150/25 V	35c
8 mfd 500 V	38c
16 mfd 500 V	49c
8x8 mfd 500 V	59c
20/20 mfd 450/25 V	59c
50 mfd 350 V	55c

TUBULAR 50+30 Mfd 150V
NEW ..... lots of 12, 19c ea.
20 Mfd 200 V INVERTED CAN SCREW MT 29c
4/3 Mfd 400/475 V Round Metal Can Comneg 39c
60 Mfd 110 V 60 cy. AC motor start Cond. round metal can 99c

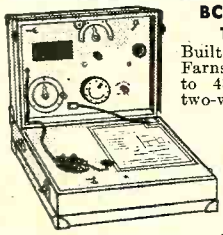
ARMY AIRCRAFT RECEIVER— BC-946-B



Covers 520 Kc to 1500 Kc Broadcast Band. 6 Tubes: 3—12SK7, 1—12SR7, 1—12A6, 1—12K8. Designed for dynamotor operation; can be easily converted to 110 volt or 32 volt use. Two IF Stages. Three-gang tuning con. BRAND NEW, in sealed carton, with tubes and instruction manual, less dynamotor **$22.50**

Dynamotor DM-32A $2.95

SMASH VALUES IN RADIO		RECEIVERS
BC-453—RCVR	Used $10.95	New $17.95
BC-454—RCVR	Used 6.95	New 8.95
BC-455—RCVR	Used 7.95	New 8.95
BC-456—MOD	Used 2.95	New 3.95
BC-457—XMTR	Used 6.95	New 8.95
BC-458—XMTR	Used 6.95	New 7.95
BC-459—XMTR	Used 16.95	New 19.95
BC-696—XMTR	Used 16.95	New 19.95

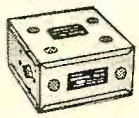


BC148 RECEIVER-TRANSMITTER

Built for Sig. Corps by Farnsworth. Range 3960 to 4360 Kc. Complete two-way communications. Operates on batteries or hand generator. CW operation, handkey on base. Entire unit in two hinged parts. (Xmtr & Revr, and Battery compartment) closes down to 15½"x14½"x8½" overall. Less tubes and batteries. Operating instructions included. Used, clean. Each **$5.95**

STROMBERG TELEPHONE

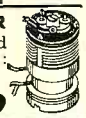
It's a real desk type carbon microphone, with press-to-talk switch. Very massive construction, cord and plug included. Specially priced **$3.95**



DM-21-M DYNAMOTOR

Made for Sig. Corps by Pioneer. Input 14 volts 3.3 amps. Output 235 volts @ 90 Ma. Built-in radio noise filters. Housed in metal can 6"x5½"x3⅛". Wt. 10 lbs. BRAND NEW. Your Cost **$3.25**

PHILCO VOLTAGE REGULATOR



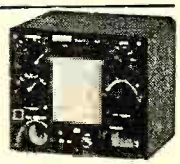
Type "B." Volts input 21-30, load amps 5.0. Reg. Volts 18.25. Compact: 3" dia. 4" long. BRAND NEW. Terrific value at **$1.69**

TRANSMITTING DYNAMOTOR

Navy type. Brand new. Very heavy construction. 12/24 volts input @ 4/2 amps. Output 500 volts at 50 Ma. We have only a few left at this sensationally low price! **$2.95**

ASTATIC CRYSTAL PICKUP, with L-70 crystal cartridge **$1.55**

RCA AVT-112A AIRCRAFT XMTR



2500 to 6500 Kc, 6 tubes, compact, powerful, operates on 12 volt source. Complete with manuals. Less crystal, BRAND NEW ... **$19.50**

BC-404-C VHF RECEIVER (Brand New)
102-110 Mc range. Complete with 12 tubes, for 110 volt 60 cycle operation. Power supply included. In original cases. **$27.50**

Please include 25% Deposit with order—Balance C.O.D. MINIMUM ORDER $3.00.

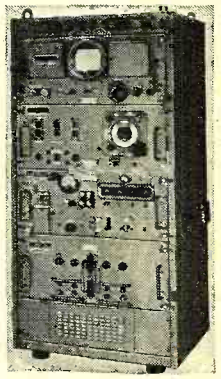
G & G GENUINE MAJESTIC
RADIO PARTS SERVICE
53 VESEY STREET · NEW YORK 7, N.Y.

UHF ANTENNA AN80-A

Suitable for 400 Mc citizens' band, fine for UHF experimenters. 5¼" flat antenna rod, mounted on porcelain base, with mounting plate and right angle feed through. Brand new. Special at **$0.69**

SENSATIONAL Smash Value!

COMPLETE I.F.F. Equipment RC-188-A



Bargain opportunity of a lifetime! This I.F.F. equipment originally cost about $20,000 . . . now buy it for a tiny fraction of cost! Easily converted for Television. Complete assembly consists of Control unit with 5" C.R. Tube, transmitter and receiver assembly (157 to 185 Mc). Indicator unit, and Power Supply (450 watts), operating on 110 volts, 60 cycles AC. All assembled, ready to operate. 62 Tubes included: 8—6V6GT, 9—6SL7GT, 14—6SN7GT, 1—5CP1, 2—9006, 1—6Y6G, 2—6E5, 1—100TH, 2—6J5, 2—2C26, 1—3E29, 1—6H6, 7—6AG5, 3—6AK5, 1—6C4, 3—2X2, 1—6X5GT, 3—5U4GT. Overall size 55" high, 28" wide, 20½" deep. Shpg. weight 855 lbs. Your cost complete, BRAND NEW, in original packing **$195.00**

SETCHEL-CARLSON Beacon Radio Receiver BC-1206-C

Receives A-N beam signals, operates on 24-28 V DC. 5 Tubes: 3—14H7, 14R7, 28D7. Tunes 195 to 420 Kc. Size 4"x4"x6⅝" wide. 4 lbs. In original carton. BRAND NEW **$7.95**

LM-7 FREQ. METER

195 to 20,000 Kc modulated, complete with tubes and crystals, less power supply. Navy type, used, good condition. **$49.50**
Less calibration book.

PE-104-A VIBRATOR POWER SUPPLY

Works on 6 volt or 12 volt battery. Supplies 84 volts and 51 volts DC, also 1.4 volts "C" bias. Size 7"x4"x3¾". Fits BC-654 (SCR-284) exactly. Can be used to operate many types of receivers now on market. ALL BRAND NEW. Very low price **$9.95**

R-89/ARN-5A GLIDE PATH RECEIVER

332-335 Mc, complete with relays, 7—6AJ5, 2—12SN7, 12SR7, 28D7, 3 crystals, 6497, 6522, 6547 Kc. 90 and 150 cycle bandpass filters. Xtal-cont. local osc. Fine for making intermodulation checker; Broad band pass on 20.7 Mc ideal for Television. Entire unit housed in beautiful cabinet. This is a once-in-a-lifetime buy! ONLY **$10.95**

LOOK AT THESE PM SPEAKER BUYS!

Alnico V, 4" PM, less trans.	$1.30
Alnico V, 5" PM, less trans.	1.45
Alnico V, 6" PM, less trans.	1.95
Alnico V, 8" PM, less trans.	3.25
Alnico V, 10" PM, less trans.	4.75
Alnico V, 12" PM, less trans.	5.25
Alnico V, 6" PM, with trans.	2.35
Alnico V, 8" PM, with trans.	3.65
Alnico V, 10" PM, with trans.	4.65

6V6—Midget Output Trans. 42c
50L6—Midget Output Trans 42c
ACDC—Chokes 32c

INDUSTRIALS! EXPERIMENTERS! Look at these EXCLUSIVE "G&G" BUYS!

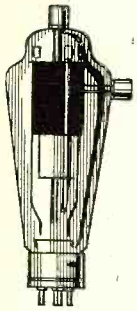
EIMAC 304TL

Brand New JAN inspected
Tremendous VALUE!

88¢ each

Lots of 4 or more
Order now, while stocks last!

GE THYRATRON FG-105



Brand New
MERCURY RECTIFIER

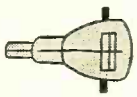
Individually boxed in factory sealed cartons. List Price $40 your cost

11.95 each **While They Last!**

For continuous rectifier and welder control service. Tetrode type, indirectly heated cathode; 10000 V peak, 10000 V peak inverse. Av. Max. current 6.4 amps continuous, 2.4 to 4 amps welder control service.

SPECIAL!

SPERTI R-F Vacuum Switch



Famed Collins Xmtr Antenna Switch. 9200 peak volts. 8 amperes. BRAND NEW! Only..... **$1.69**

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All brand new, original cartons

5BP1—Lots of 4, each	$1.79
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OTHER TUBE VALUES

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1625	$0.35	245	$0.24	12SJ7	$0.65
RK60	.60			6A7G	1.10
12J5GT	.35	226	.24	955	.75
484	.38	19	.38	6K7	.59
224	.24			6K8	.55
227	.21	559	.95	12SQ7	.49

BD-71 TELEPHONE SWITCHBOARD

US Army, magnet monochord 6 trunk type. Each trunk has cord, jack, drop, and 2-way lever key. Built-in ringer, head and chest set for operator. Wonderful for camps, motels, tourist courts, mines, oil fields, timber operations, etc. Can be used with EE8 field phones at right.
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BD-72 SWITCHBOARD

Similar to above but for 12 trunks.
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15 Tubes 435 To 500 MC

BRAND NEW!

$9.95

2 FOR $19.50

The electronic equipment that saved many lives in the war. Set can be modified to use for 2-way communication, voice or code, on following bands: ham band 420-450 mc, citizens radio 460-470 mc, fixed and mobile 450-460 mc, television experimental 470-500 mc. 15 tubes (tubes alone worth more than sale price!): 4 — 7F7, 4—7H7, 2—7E6, 2—6F6, 2—955 and 1—WE316A. Now covers 460 to 490 mc. Brand new BC-645 with tubes, less power supply in factory carton. Shipping weight 25 lbs.

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Shure model T-17 mike 200-ohm carbon single button, with press-to-talk switch, 5-ft. rubber cord and plug. BRAND NEW, individually packed, lots of 3, each..... **$1.19**

HEADPHONES—*All Brand New!*
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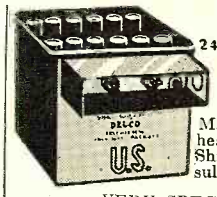

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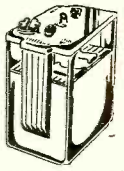

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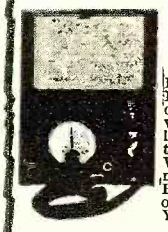

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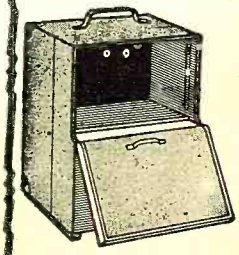

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AUDIO OSCILLATORS

By HARVEY P. ELISBERG

IN THE hope that some of my experiments with signal generators and audio oscillators will prove useful to other readers of RADIO & TELEVISION NEWS, I have described several circuits which have worked well for me.

Fig. 1 is a one-tube signal generator which provides for external modulation from a source such as a phono pickup or audio oscillator, or may be self-modulated. By using a 456 kc. coil, useful harmonics reached the 10.7 mc. FM i.f. value. The generator features blocked-grid modulation. The 330,000 ohm resistor is shunted across the 15 megohm resistor to increase the tube current without the necessity for removing the oscillator bias. This will charge the .05 μfd. condenser negatively and block the grid at an audio rate. This resistor should be kept close to the designated value.

This condenser and the screen grid resistor form a time constant for the audio generator. By varying the condenser value, the audio frequency which

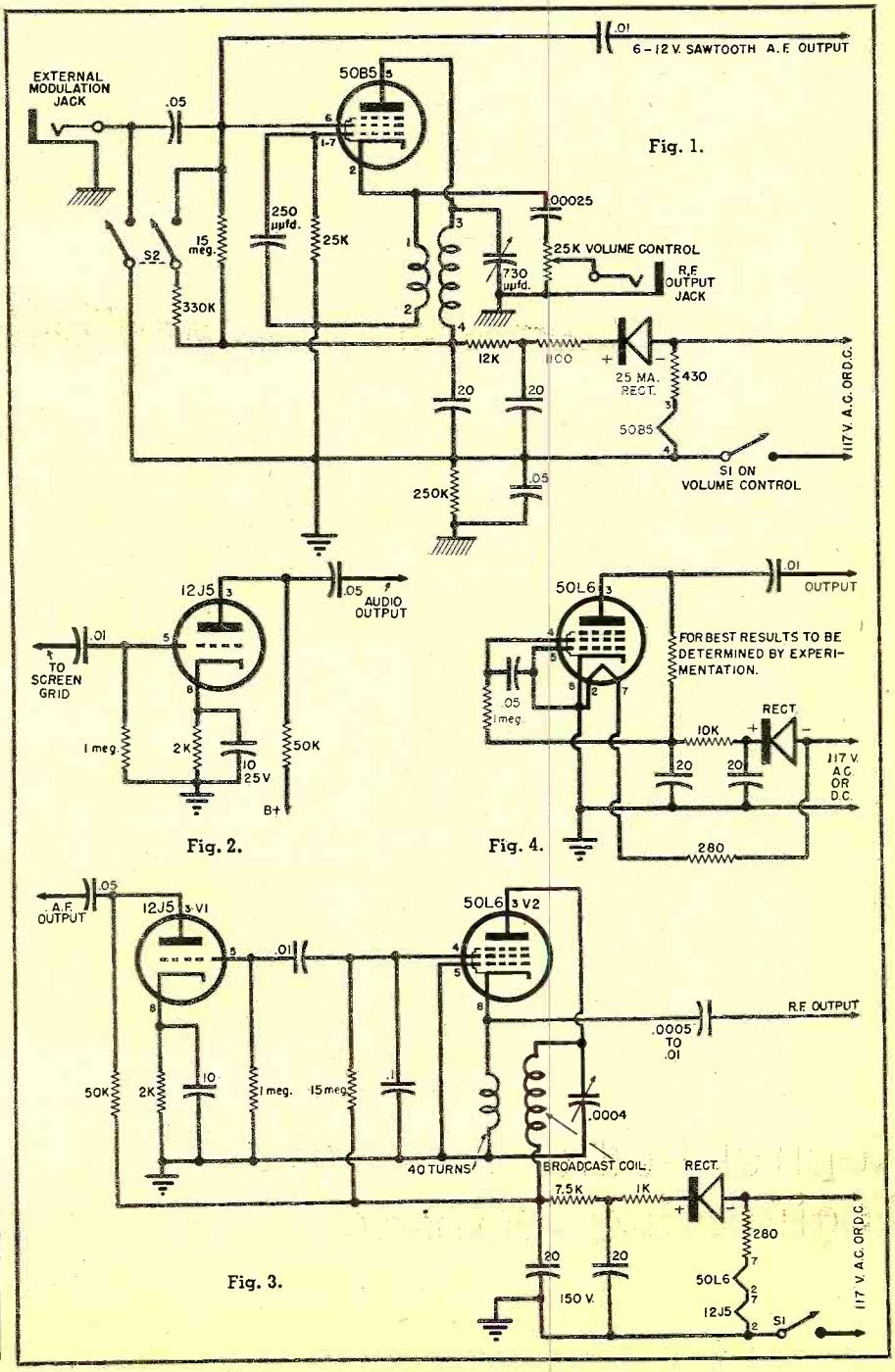

Fig. 1.

Fig. 2.

Fig. 4.

Fig. 3.

is modulating the radio frequency circuit within the tube, will also be varied. The only defect detected was that the radio frequency output was rich in harmonics. However, in most cases, the generator can be used for alignment and tracing. Note the simplicity of the circuit which is due to the use of few parts. The r.f. output can be taken from the cathode for better frequency stability. In cases where the audio signal (which may be coupled from the screen grid through a .01 μfd. condenser) may not be great enough for output stages or speaker requirements, an audio amplifier incorporating a 12J5 (as shown in Fig. 2) may be added.

When the audio amplifier is used, it may be necessary to increase the condenser (from the 50B5 screen grid) value to .1 μfd. or .05 μfd. so as to adjust the time constant to a more usable frequency.

The circuits of Figs. 1 and 2 may be combined, with some modifications, as shown in Fig. 3. In this circuit the 50L6 serves the same function as the 50B5 shown in Fig. 1. This circuit, while a little more complicated than that of Fig. 1 alone, will justify the effort involved in building it up. Here the 15 megohm screen resistor and .1 μfd. condenser serve as the time constant circuit for the audio oscillator.

Fig. 4. is a circuit of a simple audio oscillator. It will be noted that the audio output is not a sine wave but a pulse effect (or saw-tooth) which may be useful in checking audio circuits. This circuit uses either a 50L6 or a 35L6 tube. This circuit will produce the same type of audio signal provided by the other circuits discussed. —30—

ALUMINUM BASE DISCS

THE aluminum base discs that are used for recording in radio stations can be put to work around the shop and home.

The heavy 12 and 16 inch discs are the most useful. If these discs are placed in a steam bath, or used as the lid for a pan of boiling water, in about five minutes the plastic material may be peeled off (with the help of a knife to start the peeling process), leaving the aluminum base mirror smooth.

Three large discs fastened one above the other on a door provide a cheap but useful full length mirror. Reels for movie film or magnetic tape can be fashioned from two 10 or 12 inch discs, with the aid of a round piece of wood glued to the center. The aluminum itself is quite useful for small subassemblies and shields.

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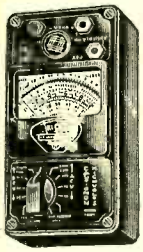

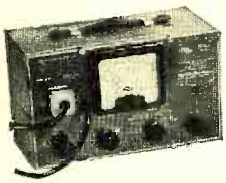

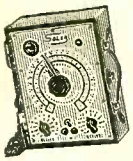

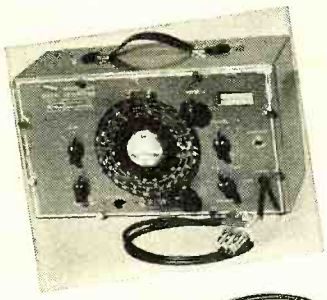

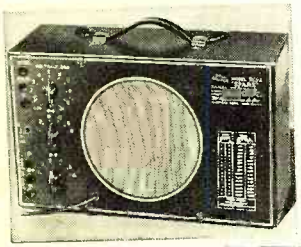

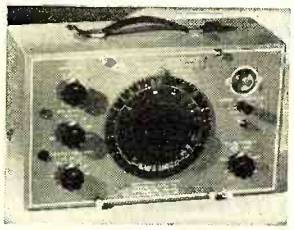

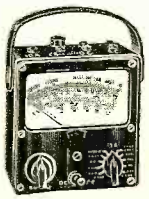

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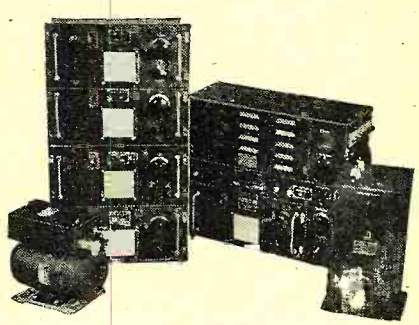

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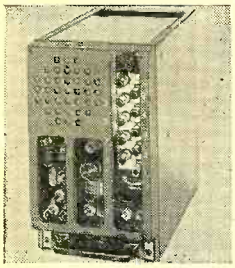

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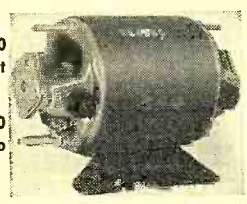

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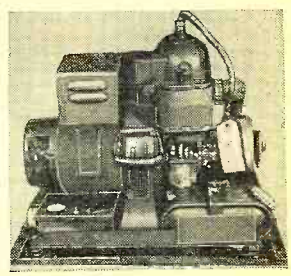

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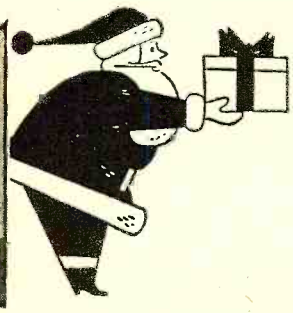

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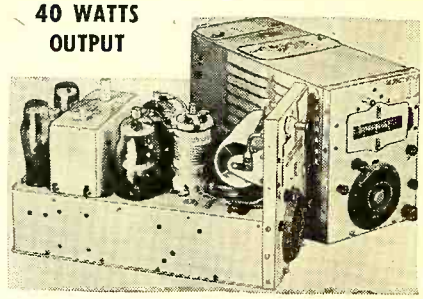

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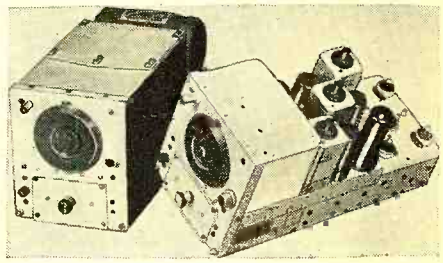
BC-457 75 meters with slight conversion.....$7.95 ea.
BC-458 40 meters with slight conversion.....$7.95 ea.

These transmitters are used but in good condition. Only a few left, so order TODAY WHILE THEY LAST.



SUPER-HET RECEIVERS

These receivers are used but in excellent condition. Hurry, only a few left. Makes a FB with our 6 volt dynamotor for mobile use, etc. Ideal stand-by or companion for your shack.

75 meter receiver BC-454
40 meter receiver BC-455 **$6.95**

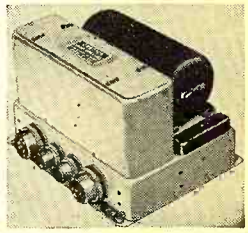
Baby Sitter & 2-Way INTER-COM

Only $19.95

Price includes master station, one remote, and 50' of wire. Rig it up as a "listening post" in the baby's room. Use it for 2-way talk between offices, in factories, stores, gas stations, or around the home. Operates on 110v. AC. or DC.

SPEECH AMPLIFIER

Modulator for Transmitter



High Volt. DC Power Supply Model unit, BC-456-A or B with dynamotor DM-33-A, plugs and tubes. Approx. wt. 17 lbs. Tube line-up, 12J5GT, 1625, VR150, and many other parts make this ideal purchase for spare parts alone. Diagram furnished. **$3.75**

HEADPHONE ADAPTERS MC-385

(4 for $1) 30c

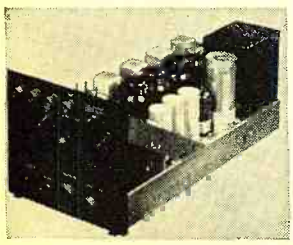
From high to low impedance, 4000 to 600 ohms; contains matching transformer.

HEADPHONE EXTENSION CORDS

25c

Approx. 72" long; rubber covered; with JK-26 and PL 55 plugs.

APN-4 RCVR — SCOPE POWER SUPPLY



4 switch-selected screw driver tuned RF channels; IF freq. 1050 kc, band-width 45-60 kc; RF freq. 16 2000 kc. Tubes: (2) 2Y2, (3) 6B4, (4) 6SK7, (1) ea. 5U4, 6SU7, 6SA7, 6H6, VR150. Makes fixed tuner for med. freq. police calls or PA system. Has power supply for 5" scope, with 400 cycle trans. Electronic-controlled low v. supply; delivers 260 vdc, 150 mils. reg. to .01%. Power supply alone worth more than price..... **$12.50**

•SAVE C.O.D. CHARGES and speed your order by remitting in full or 25% deposit. Please don't send money for postage, we ship "transportation charges collect". These prices supersede all previous prices. Write every month for BARGAIN BULLETIN.

TRANSFORMERS

for conversion of SCR-274-N trans. & Rec. to 115v. AC

#1 POWER XMFR:
Pri—115v 60 cycle; Sec.—500v CT @ .06 amp.; 24v @ ½ amp.; 6v @ ½ amp. Your cost only $3.90

#2 FILAMENT:
Pri—115v 60 cycle; Sec. 1—14v @ 7½ amp. Sec. 2—14v @ 7½ amp. Series 28v @ 7½ amp. Your cost only $4.50

#3 FILAMENT:
Pri—115v 60 cycle; Sec. 24v. @ 2 amp. Your cost only $2.25

TUBES! TUBES! TUBES!

BRAND NEW! ORIGINAL CARTONS!

12A6	69c	OD3-/VR150	75c
12SR7	69c	6AK5	79c
12K8	69c	12SA7	69c
12SK7	69c	77	59c
12SF7	69c	78	59c
1625	89c	89	59c
1626	79c	38322	$1.19
1629	89c	6SN7	89c
12J5-GT	69c	6SL7	89c
TUBES IN BULK			
6SJ7	39c	10-Y	39c
6SJ7	39c	211	49c
6K8	39c		

Write for quantity discount on purchases of 50 or more tubes. MINIMUM TUBE ORDER, $3.00

R & M RADIO COMPANY

1426 N. QUINCY ST. DEPT. RN-128 ARLINGTON, VIRGINIA

BE SURE TO WRITE FOR BARGAIN BULLETIN

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

DO YOU KNOW?

By DAVID SCOTT

1. What is meant by interlaced scanning?

A. *Interlaced scanning is the process of traversing the televised object row-by-row, left-to-right in alternate lines.*

2. What is the purpose of interlaced scanning?

A. *The purpose of interlaced scanning is to reduce flicker.*

3. In TV what is the picture repetition rate?

A. *Thirty complete pictures are sent per second. This is broken by interlaced scanning into 60 sets of alternates.*

4. How many lines are there in a TV picture?

A. *A TV picture is scanned into 525 lines of 262½ alternate lines.*

5. What is a field? A frame?

A. (a) *A set of 262½ alternates is called a field.* (b) *A set of 525 alternates is called a frame. This is one complete picture.*

6. What are sync signals?

A. *Sync signals are signals employed to keep the receiver in step with the transmitter in scanning motions.*

7. What are horizontal sync signals?

A. *Horizontal sync signals are those signals at the beginning of each line.*

8. What are vertical sync signals?

A. *Vertical sync signals are those signals at the beginning of each field.*

9. What is a mosaic?

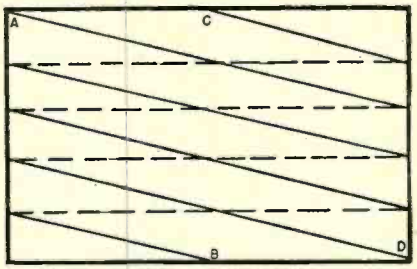
A. *A mosaic is the plate in the camera pick-up tube on which the scene is focused. It consists of a flat plate of mica on which are millions of insulated globules of silver. These are treated with a layer of caesium oxide and are thereby endowed with photoelectric properties.*

10. Describe the action of a mosaic.

A. *Light falling on the mosaic releases a negative charge from the silver caesium globules in proportion to the light falling on them. As a result the plate assumes an electrical charge deficiency whose distribution is the same as that of the light on the televised object. To restore the equilibrium of the plate a stream of electrons directed by two pairs of deflections coils (horizontal and vertical) scans the plate. With each restoration of charge, the potential of the plate assumes a rapid succession of different values each being a measure of the brightness of the various picture elements. This restoration is done line by line with interlaced scanning and hence the picture comes off as a string of varying potentials.*

11. Describe the action of odd-line interlacing.

A. *Using 525 lines means that each scanning field has an odd number of lines, 262½. Reference to the diagram will show the reason for the odd number 262½. It makes in-*



terlacing easier. Starting at "A" the spot scans the image and due to the ½, (262½), the spot ends its course at "B." Then going up to "C" it starts scanning again on the odd interlaced lines and terminates at "D." This completes one frame of interlaced scanning. The spot then returns to "A" to commence a new frame.

12. What is the horizontal scanning rate?

A. *Thirty frames times 525 lines equal 15,750 complete lines and retraces which must be formed each second. Hence the horizontal scanning rate is 15,750 c.p.s.*

13. What is the vertical scanning rate?

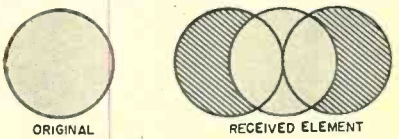
A. *The vertical scanning rate is 60 c.p.s. to match the interlaced field repetition rate of 60 per second.*

14. What are the basic defects of image analysis?

A. *Basic defects of image analysis are: 1. Aperture distortion; 2. Linear displacement; 3. Non-linearity of scanning.*

15. What is meant by aperture distortion?

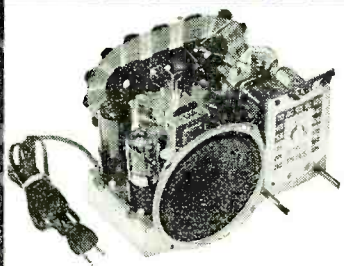
A. *Aperture distortion results when the scanning spot is the same size as the picture element. Hence the potential on the plate begins charging when the element first begins being overlapped by the spot,*



reaches a maximum when dead on, and then begins to subside as the spot moves off. The picture element when received is then broader than the original, this broadness being caused by the fact that the scanning spot is the same width as the original element. This distortion is reduced by using very narrow scanning beams and shading electrical circuits for emphasizing blacks and whites.

(To be continued)

ROCK BOTTOM PRICES!
ON ALL TOP QUALITY ITEMS



CORONET 5 Tube Superheterodyne Receiver Kit

- Complete with plastic cabinet and carrying handle.
- 117V, AC-DC operated. Power supply rated at 30W.
- Tube Lineup—12SA7, 12SK7, 12SQ7, 35Z5, 50L6.
- Tuning range—540-1700 KC. Designed for fullest selectivity along entire band.
- Built-in loop antenna.
- All parts engineered to fit; no additional cutting or drilling to do.
- Nothing else to buy except solder. Kit packed complete including tubes.

This kit combines an excellent educational program with many hours of building and listening pleasure; particular stress being placed upon ease of construction. Easy step by step instructions are furnished, along with pictorial diagrams and voltage and resistance charts for efficient maintenance and further experimentation. Many circuit features employed by big name manufacturers are employed to make this set, when completed, comparable to *any* 5 Tube AC-DC Radio now on the market.

LIST PRICE $11.95

Dealers, educational institutions, write for quantity discounts.

F.M. CONVERTER CHASSIS

Completely wired except for adapter. Converts from 42-50 MC F.M. band to 88 —108 F.M. Band. Brand new but needs aligning. 7N7, schematic and aligning instructions furnished.

$1.90 each ..... **10** for **$17.50**

CONTROLS

Less switch. ¼" dia. shaft x 5/16" or longer. 5K, 10K, 50K, 100K, 250K, 1 meg., 2 meg., 4 meg. Choice } **19c** **10 for $1.70**

With switch. ¼" dia. x 1 ¼" or longer. 5K, 25K, 100K, 250K, 500K, 1 meg., 2 meg. Choice } **39c** **10 for $3.50**

SPECIAL

.5 meg. with switch, mfg. by CTS. ¼" dia. shaft x ½" long.

10 for **$2.50** ..... **100** for **$22.50**

HOOK UP WIRE

	Per C	Per M
#12 Stranded	$1.15	$9.00
14 Stranded	1.05	8.50
16 Stranded	.95	7.50
18 Choice Sol or Str	.75	6.50
20 Choice Sol or Str	.65	5.50
22 Choice Sol or Str	.55	3.75
24 Choice Sol or Str	.45	3.50

VARIABLE CONDENSERS

Single Gang. 8.5-370.3 mmfd. Complete with Vernier geor drive. 1 3/8"x1 13/16"x3 3/16". ¼" dia. shaft.
50c ea ..... **10** for **$4.50**

50-110 mmfd, 27-150 mmfd, 31-360 mmfd triple section condenser.
50c ea ..... **10** for **$4.50**

#2 section, 140 mmfd, each section, for F.M.
75c ..... **10** for **$6.75**

Midget Variable, 30 mmfd. Single section with ¼" dia. x 10" shaft.
35c ..... **10** for **$3.00**

75 mmfd. Single Section. ¼" dia. x ½" shaft.
35c ea ..... **10** for **$4.50**

50 mmfd. Single Section. ¼" dia. x 4 ¾" shaft.
50c ea ..... **10** for **$4.50**

TRIMMER

275-550 mmfd. **10** for **80c** ..... **100** for **$6.50**

PANEL BEARING ASSEMBLY

¼" dia. shaft x 4 1/8". Can be cut to desired length. Complete with brass bushing, lock nut and "C" washer.
10 for **$1.50** ..... **100** for **$11.50**

1/8" Dia. Banana Plug and Jack; 10 plugs and 10 jacks for **$1.00** ..... **100** Sets for **$8.50**

SOCKETS

7 Prong Miniature. Wafer type. 7/8" mtg. center.
10 for **65c** ..... **100** for **$5.25**

7 Prong Miniature. Molded bakelite. With locking ring. **10** for **80c** ..... **100** for **$6.75**

4 Prong. Black molded Bakelite. With locking ring.
10 for **60c** ..... **100** for **$5.25**

5 Prong. Saddle Mount. 1 ½" mtg. center. Brown bakelite. **10** for **60c** ..... **100** for **$5.25**

6 Prong Black Molded Bakelite with locking ring.
10 for **60c** ..... **100** for **$5.25**

8 Prong Loctal. Saddle mount. 1 5/16" mtg. center.
10 for **60c** ..... **100** for **$5.25**

Octal Socket. Amphenol. 1 5/16" mounting center.
10 for **60c** **100** for **$4.00** **1000** for **$32.50**

SHAFT COUPLINGS

¼" to ¼" Bakelite. 1" dia.
¼" to ¼" Ceramic. Less Set Screws.
¼" to ⅜" Metal
Choice of any **10** for **$1.25** ... **100** for **$10.00**

FUSE HOLDER

Type HCM. for 3AG or 4AG Fuse.
10 for **$1.25** ..... **100** for **$10.00**

FUSE MOUNT KIT

Contains: 1 double fuse mount and 3 5-Amp. 3AG fuses and hardware.
10 kits for **$1.50** ..... **100** for **$12.50**

Female A.C. Panel Outlet. Fits standard A.C. Plug.
10 for **$1.00** ..... **100** for **$8.50**

JONES PLUG

8 contact. Male and Female, used, in good condition.
10 for **$2.25** ..... **100** for **$20.00**

HI FREQUENCY CHOKE ASSORTMENT

.5 Microhenry to 1.6 Millihenry. **25** ass't. for **$1.00**

I. F. TRANSFORMERS

20.7 M.C., Iron Core. 1 ¼"x1 ¼"x2 ½".
10 M.C. Slug Tuned. 1 ¼"x1 7/8"x4 ½".
1600 KC. Double Slug Tuned. 1 7/8"x1 ¼"x4 ¼".
456 KC. Double Slug Tuned. 1 3/8"x1 7/8"x4½".
30 M.C. Trimmer Tuned. 1 3/8"x1 ¾"x4".
Any **10** for **$2.50**

MIDGET 150V BY-PASSES

Mfg. by Dumont. Choice of .02, .05, .1.
Any **20** for **$1.00**

BUFFER CONDENSERS

1600 W.V. made by nationally advertised firm.
Choice of .01, .015, .02 ..... Any **7** for **$1.00**

MAGNET WIRE

#18	**60c** per lb.	#33	**$0.95** per lb.
#20	**65c** per lb.	#34	**1.00** per lb.
#21	**70c** per lb.	#36	**1.05** per lb.
#22	**75c** per lb.	#37	**1.10** per lb.
#23	**80c** per lb.	#38	**1.15** per lb.
#27	**85c** per lb.	#39	**1.20** per lb.
		#40	**1.25** per lb.

LITZ WIRE

7/41, 7/44, 10/41, 15/44.
Choice ..... **$1.50** per lb.

CELANESE COVERED MAGNET WIRE

#26, #28, #35, #38.
Choice ..... **$1.00** per lb.

SINGLE COTTON ENAMELED WIRE

#12, #18, #22.
Choice ..... **75c** per lb.

SHIELDED WIRE

#20 Stranded, 1/32" rubber covered, copper shielded.
Per 100' **$1.25**

TERMINAL STRIP ASSORTMENT

One, two, three and four-lug strips.
35 assorted **$1.00**

THROAT MIKE

#T-30-M, **25c** ea ..... **10** for **$2.25**

LOOP ANTENNA

Standard for 5 tube AC-DC Set.
10 for **$1.00** ..... **100** for **$8.75**

OUTPUT X FORMER

Standard Transformer for 50L6 to 3.2 with voice coil.
10 for **$2.50** ..... **100** for **$19.00**

12V VIBRATOR PACK

Output 270V D.C. @ 65 Ma. Less 6x5 rectifier.
Each **$2.95**

SOLDERING IRON

100 Watt, 110V AC, Each **$1.50**

P.L. 68 Plug. 3 Circuit ..... **10** for **$1.00**
P.L. 540 Plug. Short, 2 Circuit ..... **10** for **$1.00**
JK-26 Tubular Jack. Fits P.L. 540 .... **10** for **$1.00**
JK-34A Open Circuit Jack. Fits P.L. 55. **10** for **$1.00**
Mallory Type Phono Jack ..... **20** for **$1.00**
Closed Circuit Jack. Fits P.L. 55 ..... **10** for **$1.00**

TERMS: *All items subject to prior sale. Prices subject to change without notice. A 25% deposit required on all C.O.D. orders. All shipments made F.O.B. Chicago, Illinois.*

IRVING JOSEPH

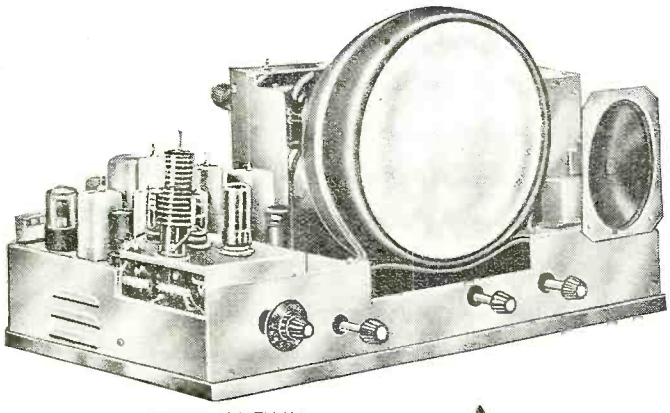
215 S. Halsted St.,
Chicago 6, Ill.

TRANSVISION

New TV KITS and CABINETS

STANDARD and CUSTOM-TYPE MODELS at LOW COST

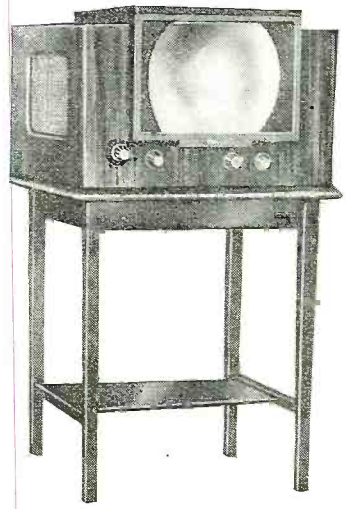
NEWEST in TELEVISION DESIGN • BIGGEST IN VALUE



Model 10A TV Kit

Featuring

- **PICTURES UP TO 150 SQ. INCHES**
- **CONTINUOUS TUNING ON ALL 12 CHANNELS**
- **LONG-RANGE RECEPTION**



▲ New 10" TV KIT

at amazingly low price!

The new **Transvision Model 10A** electromagnetic TV Kit gives a bright, stable 52 sq. in. picture. Has 10" picture tube, and **CONTINUOUS TUNING UNIT** (shown on the right hand page) **on all 12 channels.** Its high sensitivity makes for improved long-distance reception; especially good on high channels. Complete with all-channel double-folded dipole antenna and 60 ft. of lead-in wire.

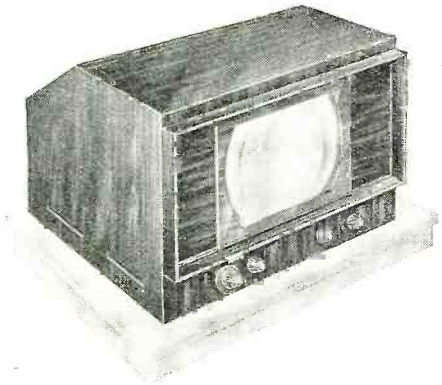
MODEL 10A TV KIT, less cabinet . . . . . **Net $199.00**

MODEL 12A TV KIT, same as above, but has a 12" picture tube . . . . . **Net 263.00**

◀ **NEW STREAMLINED CABINETS** for Transvision **Model 10A or 12A TV Kit.** Made of select grain walnut with beautiful rubbed finish. Fully drilled, ready for installation of assembled receiver.

Walnut Cabinet for 10A or 12A (Specify) . . . . . **Net $44.95**

Mahogany and Blonde slightly higher.



New streamlined cabinets for Models 10A or 12A TV Kits, designed by Hal Bergstrom.

New 150 Sq. In. TV Kit

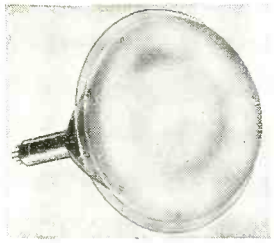
Model 10CL, with Roto-Table

This new **Model 10CL** is a 10" electromagnetic TV Kit, equipped with an **all-angle lens** (with color kit) giving a picture of **150 sq. in.** The image is clearly **visible from a very wide angle of vision, because of this specially designed lens.** Also has the new **CONTINUOUS TUNING UNIT** shown on the right. This kit comes COMPLETE with CABINET, LENS, and ROTO-TABLE; also double-folded dipole antenna (all channel) and 60 ft. of lead-in wire.

MODEL 10CL TV Kit . . . . . **Net $299.00**

EASY TO ASSEMBLE . . . NO TECHNICAL KNOWLEDGE REQUIRED

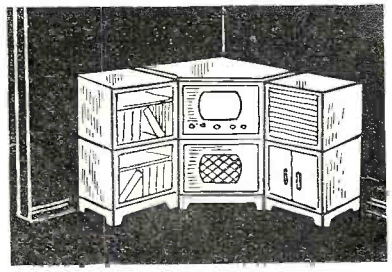
Transvision's simple step-by-step Instruction Sheet makes assembling a TV Kit a pleasure. Each kit comes **complete with all-channel double-folded dipole antenna and 60 ft. of lead-in wire.** ***Nothing else to buy!***



TRANSVISION ALL-ANGLE LENSES for ALL TV SETS. Give picture sizes up to 150 sq. in. **Exclusive patented feature makes image visible from wide angle.** Lenses come with adapter for installation on ANY 7" or 10" picture tube, and with color kits. **All-Angle Lens** for 7" tubes (gives 75 sq. in. picture), **Net $21.95. All-Angle Lens** for 10" tubes (gives 150 sq. in. picture), **Net $32.50.**

ASSEMBLE Your Own CABINETS

Transvision's "MODULAR" Cabinets come in knock-down, unpainted units, offering an unlimited range of combinations, including even a bar. Finish them off to suit your taste and need.

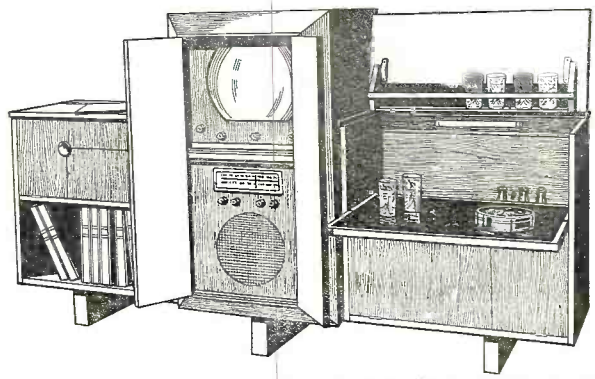


Corner piece, shown above, has room for **TV, Phono, Record Storage,** and open **Book Case.**

COMPLETE . . . . . **Net $84.00**

For other units and prices, write for "Modular" Catalog.

"CUSTOM-ART" CABINETS Made to Order. Radiomen, Dealers—Here is a beautiful line of exclusive, **custom-built cabinets,** designed and completely built in our factory, and finished to your customers' specifications . . . at very reasonable prices.



Shown above is Transvision's "Modern Comprehensive" which has provision for TV/FM/AM, Record Changer, Album Shelf, Bar, and Concealed Wine Cellar. For further details on the complete line, **write for FOLDER No. D-1.**

GET into the TELEVISION BUSINESS in a BIG WAY

Radiomen, Servicemen, Dealers . . . Transvision offers you, through your jobber, a 3-point **Dealer Plan** for making big money in television: (1) Sell **TV sets constructed by you from Transvision Kits.** (2) Sell exclusive **Custom-Built Jobs** with beautiful "Custom-Art" Cabinets. (3) Sell **"packaged" Transvision TV Products,** including Kits, Components, and Accessories. For FULL DETAILS about this amazing plan, **WRITE FOR FOLDER No. D-1,** or ask your jobber.

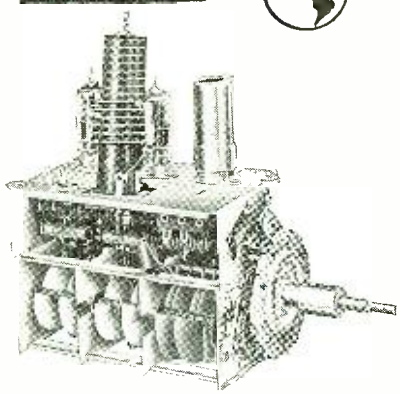
FREE 162 p. TELEVISION COURSE with purchase of any Transvision TV Kit . . . You don't need this course to assemble a Transvision Kit, because the job is easy enough and our instruction sheet is simple and clear. BUT, if you want a **good introduction to television fundamentals** as a basis for further study, the **Transvision Television Home-Study Course** is ideal. Remember, you pay nothing extra for this course. Ask your jobber.

***For FREE 20 p. TV BOOKLET and 8 p. CATALOG, SEE YOUR TRANSVISION JOBBER . . . . . ***

TRANSVISION New TV INSTRUMENTS

TUNERS, BOOSTER, and ACCESSORIES

For Every Television Installation Requirement



NEW 12-Channel TV Tuner

CONTINUOUS TUNING

Model CT-1 (part #653), for TV channels 2 to 13, is notable for its high gain, sensitivity, excellent image rejection ratio, and **CONTINUOUS TUNING** feature. May be used with any 7", 10", 12" or 15" kit.

Model CT-1 TV Tuner . . . . . **Net $32.50**

Model TT-2 (part #301-1 or #301-2) covers **all TV channels, also FM band** (88-108 mc.). Available for 7", 10", 12", or 15" kits. Specify tube size.

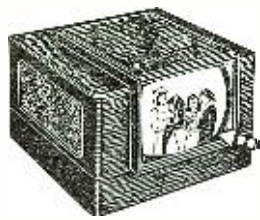
Model TT-2 TV/FM Tuner . . . . . **Net $34.95**

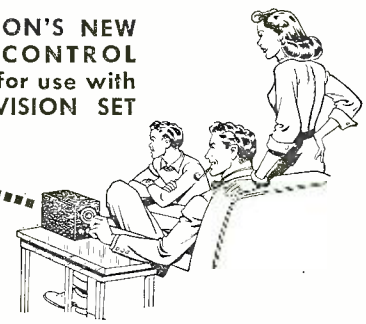
TRANSVISION ALL-CHANNEL TELEVISION BOOSTER

CONTINUOUS TUNING

To **assure television reception in weak signal areas,** or areas which are out of range of certain broadcasting stations, Transvision engineers have designed this new booster. It **increases signal strength on all television channels.** Tunes all television channels **continuously.** Can be used with any type of television receiver. Unusually high gain in upper television channels.

Model B-1 . . . . . **List $39.95**





TRANSVISION'S NEW REMOTE CONTROL UNIT KIT—for use with ANY TELEVISION SET

OPERATES *ANY* TELEVISION SET from a DISTANCE up to 50 feet.

Now you can sit back in your easy chair, a comfortable distance away, and operate your TV set. This new **Transvision REMOTE CONTROL UNIT** turns **ANY SET on, tunes in stations, controls contrast** and **brightness, turns set off.** Especially ideal for commercial installations where the TV set is inaccessible.

TUNER UNIT is a high gain, all-channel, **CONTINUOUS TUNING UNIT** (about 50 microvolt sensitivity). **Supplied in KIT form** . . . easy to assemble in about an hour.

Model TRCU Remote Control Unit Kit with 25-ft. cable . . . . . **Net $44.50**

Also available without cabinet . . . . . **Net 42.50**

TRANSVISION FIELD STRENGTH METER

Saves ½ the cost of TV installations

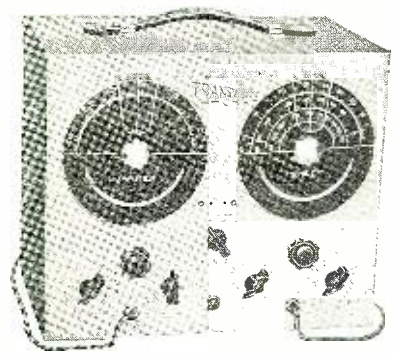
Improves Installations! Saves ½ the Work! Has numerous features and advantages, including —(1) Measures actual picture signal strength . . . (2) Permits actual picture signal measurements without the use of a complete television set . . . (3) Antenna orientation can be done exactly . . . (4) Measures losses or gain of various antenna and lead-in combinations . . . (5) Useful for checking receiver re-radiation (local oscillator) . . . (6) **12 CHANNEL SELECTOR**. . . (7) Amplitudes of interfering signals can be checked . . . (8) Weighs only 5 lbs. . . . (9) **Individually calibrated** . . (10) Housed in attractive metal

carrying case . . . (11) Initial cost of this unit is covered after only 3 or 4 installations . . . (12) Operates on 110V, 60 Cycles, AC.

Model FSM-1, complete with tubes . . **Net $99.50**

TRANSVISION TELEVISION and FM SWEEP SIGNAL GENERATOR

Complete frequency coverage from 0-227 MC with no band switching. . . . Sweep width from 0-12 MC completely variable. . . . Accurately calibrated built-in marker generator.



OUTSTANDING FEATURES: (1) Frequency range from: 0-227 MC . . . (2) Dial calibrated in frequency . . . (3) Sweep width from 0-12 MC completely variable . . . (4) Self-contained markers readable directly on the dial to .5% or better. (No external generator required to provide the marker signals) . . . (5) Crystal controlled output makes possible any crystal controlled frequency from 5-230 MC . . . (6) Plenty of voltage output—permits stage-by-stage alignment . . . (7) Output impedance 5-125 ohms . . . (8) Directly calibrated markers, 20-30 MC for trap, sound and video IF alignment . . . (9) RF for alignment of traps for IF channels when a DC voltmeter is used as the indicating medium . . . (10) Unmodulated RF signal to provide marker pips simultaneously with the main variable oscillator . . . (11) Markers can be controlled as to output strength in the pip oscillator . . . (12) Power supply completely shielded and filtered to prevent leakage . . . (13) All active tubes are the new modern miniature type . . . (14) Phasing control incorporated in the generator . . . (15) Operates on 110V, 60 Cycles, AC.

Model SG . . . . . **Net $99.50**

All Transvision Prices are fair traded; subject to change without notice. Prices 5% higher west of the Mississippi.

TRANSVISION, INC., Dept. RN, **NEW ROCHELLE, N. Y.**

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235 N. Broad St.

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STAR RADIO
409 11th St., N.W.

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TRANSVISION OF CHICAGO
1002 S. Michigan Ave.

HOLLYWOOD, CALIF.
TRANSVISION OF CALIF.
8572 Santa Monica Blvd.

Bandtuning Transmitter

(*Continued from page* 53)

the bands as follows: 80, 20, 15, 40, 11, and 10. It might be thought that tuning would be quite critical but in practice this has not proved to be the case even with a straight dial. However a vernier dial may be installed if the builder likes.

The efficiency of the tank based on r.f. current measurements into a dummy load runs from 65 to 70 percent on all bands when the final tubes are drawing the rated maximum of 200 ma. The pickup coil on the tank is equipped with clips so that the impedance of various feed lines may be easily matched.

Modulation may be applied using either FM or AM. In the case of frequency modulation the transmitter may be excited through the v.f.o. input connection, using any of the various frequency or phase modulation methods available. To apply amplitude modulation the high voltage supply lead should be opened and a suitable modulating power applied in the conventional manner. However, due to the fact that the screen voltage is obtained from a separate source it is necessary to insert a small filter choke of about 10 or 15 hy. in the screen supply lead between R_{11} and the screen grid terminals of the final amplifier tubes so the screen grid will modulate itself. To compute the audio power required for modulation the d.c. input to the screen must be included with the plate input.

Add the screen and plate current and divide into the plate voltage to secure the load impedance figure for the modulation transformer.

In the spirit of ham tradition the power supply was built from components on hand and is consequently a bit more complex than would be the case if multiwinding transformers were used. Such transformers are available as stock items. The power needed is from 600 to 750 volts @ 225 to 250 ma., 350 volts @ 100 ma., 6.3 volts a.c. for the 6L6 filament and the pilot lamp and 12.6 volts a.c. for the 1625 filaments. The bias supply consists of a 6.3 volt filament transformer running backwards to supply 110 volts of isolated a.c. This voltage is brought to ground at one side and the second terminal feeds into a selenium rectifier connected to deliver negative voltage, which is filtered across C_{18} and through CH_2 and applied to the grid leak R_{15}. Without excitation the protective bias measures –90 volts. With excitation a portion of the protective bias is washed out and the operating bias measures slightly more than –100 volts with the rated grid drive to the final.

The power supply is fused with a 250 volt, 3 amp. fuse in the primary lead. Switch S_1 allows the operator to cut the high d.c. voltage when desired. This allows the oscillator keying to be checked without putting a signal on

DYNAMOTORS

Type	Input Volts	Input Amps.	Output Volts	Output Amps.	Radio Set	Price *
BD 77 KM	14	40	1000	.350	BC 191	$20.00N 12.50LN
PE 73	28	19	1000	.350	BC 375	24.50N
DM 21	14	3.3	235	.090	BC 312	3.45N
DM 210X	28	1.6	235	.090	BC 312	3.45N
DM 25	12	2.3	250	.050	BC 367	2.49LN
DM 28R	28	1.25	275	.070	BC 348	8.95
DM 33	28	7	540	.250	BC 456	5.50
DM 42	14	46	515	.110	SCR 506	6.50LN
			1030	.050		
			2 '8			
PE 55	12	25	500	.400	SCR 245	5.25LN
PE 86	28	1.25	250	.060	RC 36	3.95
PE 101 C	13/26	12.6/	400	.135	SCR 515	8.95
		6.3	800	.020		
			9 AC 1.12			
BD AR 93	28	3.25	375	.150		4.95N
23350	27	1.75	285	.075	APN-1	3.50N
35X045B	28	1.2	250	.060		3.50N
ZA .0515	12/24	4/2	500	.050		3.95N
B-19 pack	12	9.4	275	.110	Mark 11	9.95N
			500	.050		

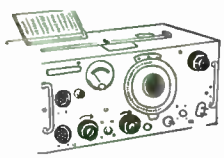
*N—New LN—Like New

INVERTERS

PE 206-A. Input: 28 VDC @ 38 amp. Output: 80 volts @ 500 volt-amps, 800 cycles, Leland, New, complete with enclosed relay, filter, instruction book $12.50

PE 218: Input: 25-28 VDC @ 92 amps. Output: 115 volts @ 1500 volt-amps. 380-500 cycles. New, Hermetically Sealed $49.95

TEST SET 159TPX



Measures frequency between 150 & 200 mc. by heterodyne method. Power of Xmtr can be directly measured. Measures DC voltages up to 500 Volts. Original operation on 110 V. 400 cy. but conversion kit makes it operable on 110 V. 60 cy. new, complete with tubes, crystal, cal. chart, antenna, meter and data for 110 V. 60 cy. operation $29.95

SCR 610 11-10 METER PORTABLE/MOBILE RIG

SCR 610 portable transmitter-receiver, 27 to 38.9 mc, crystal controlled, using FM for efficient operation. Unit consists of Xmtr-rcvr BC 659 and power supply PE 97 . . . operating from 6 or 12 vdc. Slightly used, excellent condition. Less Xtals, Antenna, Handset $25.00

30' U.S. ARMY SIGNAL CORPS RADIO MASTS

Complete set for the erection of a full flat top antenna. Of rugged plymold construction telescoping into 3 ten-foot sections for easy stowage and transportation. A perfect set-up for getting out. Supplied complete: 2 complete masts, hardware, shipping crate. Shipping wt. approx. 300 lbs. Sig Corps #2A2289-225-A. New ..... $39.50 per set

INSTRUCTION MANUALS

BC 312, BC 342 ..... $1.25
SCR 281 ..... $1.25
ZA Eqpt 1.00
BC 460 ..... 1.00
Mark II 1.00
SCR 508 ..... 1.00
SX-32 ..... 1.00

XMTR TUNING UNITS

For BC 610: TU-47 (2-2.5 mc.); TU-48 (2.5-3 mc); TU-53 (8-12 mc). Each $1.75
For BC 223AX: TU-17 (2-3 mc); TU-18 (3-4.5 mc). Each $1.95
BC 306-A, Antenna Loading unit for BC 375 & BC 191 ..... $2.75
6-section ceramic capacitor, 10 -460 mmf, 400 vdc originally used for collins ART-13 xmtr. ..... $.69

HEADSETS

Dynamic mike and headset combination. A high quality, efficient unit, used in B-19 tank Xmtrs. Mike and phones complete, new $2.75
B-15 headsets: 8000 ohms impedance, rubber cushions. Comes with 8' cord and plug PL 55. New $2.95

CROSS POINTER INDICATOR

Dual 0-200 microamp. movement in 3" case. Each movement brought out to 6-term, receptacle at rear. Originally used in 1LS equipment. New **$5.50**

QBG-1, ECHO RANGING DRIVER-RECEIVER

Complete underwater sound signal transmission and reception unit with range of 200 to 600 yds. and freq. range of 16 to 27 kc. New, complete with battery box in chest, less projector $125.00

6-VOLT RELAY PANELS

Comes complete with relays mounted on bakelite panel with 25 terminals:
1—SPST (NC) 1—DPST (NO)
1—SPST (NO) 2—DPST (Make 1, break 1)
Board Dim: 10" L x 6" W x 2⅝" D $9.95

TUNABLE PACKAGED "CW" MAGNETRONS

QK 61 2075-3200 mc.
QK 60 2800-3025 mc.
QK 62 3150-3375 mc.
QK 59 2675-2900 mc.
NEW, GUARANTEED, ea. $65.00

KLYSTRONS

723A/B $12.50
707B w/CAV 20.00
726-A 15.00

MAGNETRONS

TUBE	FRQ. RANGE PK.	PWR. OUT.	PRICE
2J31	2820-2860 mc.	265 KW.	$25.00
2J21-A	9345-9405 mc.	50 KW.	25.00
2J22	3267-3333 mc.	265 KW.	25.00
2J26	2992-3019 mc.	275 KW.	25.00
2J27	2965-2992 mc.	275 KW.	25.00
2J32	2780-2820 mc.	285 KW.	25.00
2J38 Pkg.	3249-3263 mc.	5 KW.	25.00
2J39 Pkg.	3267-3333 mc.	8.7 KW.	25.00
2J55 Pkg.	9345-9405 mc.	50 KW.	25.00
5J21	24,000 mc.	50 KW.	55.00
5J30			39.50
714AY			25.00
720BY	2800 mc.	1000 KW.	50.00
720CY			50.00
725-A			25.00
730-A			25.00

MAGNETS

For 2J21, 725-A, 2J22, 2J26, 2J27, 2J31, 2J32 and 5J31 ..... Each $8.00
4850 Gauss, ⅝" bet. pole faces, ¾" pole diam. ... 8.00
1500 Gauss, 1½" bet. pole faces, 1⅝" pole diam. ... 8.00

TYPE 1619 VACUUM TUBES FIL. 2.5V. @ 2 AMP.

TYPICAL OPERATING CHARACTERISTICS

	Class "C"	Class AB2 (2 Tubes)
PLATE VOLTS	400	400
SCREEN VOLTAGE	300	300
PLATE CURRENT	75 ma	75/150 ma
SCREEN CURRENT	10.5 ma	6.5/11.5 ma
GRID VOLTAGE	−55	−16.5
GRID CURRENT	5 ma	...
GRID DRIVE	.36 W	4 W
POWER OUTPUT	19.5 W	36 W

WHILE THEY LAST ..... $5.21 ea. or 5 for $1.00

GREAT TUBE VALUES

01-A	$ .45	5F17	$3.50	530	$90.00	1624	$ .85
1B24	4.85	5J32	8.00	531	45.00	1629	.35
1I15	.55	5J30	39.50	532	3.95	1961	5.00
1N5	.69	6AC7	1.00	559	4.00	8012	3.95
1T4	.69	6C4	.58	562	90.00	9002	.65
2C21	.69	6G	2.00	615	.89	9004	.47
2C22	.69	6J6	1.00	703-A	7.00	9006	.47
2J21-A	25.00	6K7	.55	704-A	.75	CEQ 72	1.95
2J22	25.00	6L6GA	1.00	705-A	2.85	EF 50	.79
2J26	25.00	6SC7	.70	707-B	20.00	F-127	20.00
2J27	25.00	6SL7	1.00	714AY	15.00	FC 258A	
2J31	25.00	6V6	.79	715-B	12.00		165.00
2J32	25.00	7C4	1.00	720BY	50.00	FC 271	40.00
2J38	25.00	7E5	1.00	720CY	50.00	GL 562	75.00
2J39	25.00	7E6	.72	721-A	3.60	GL 623	75.00
2J55	25.00	10Y	.60	723-A/B		GL 697	75.00
3J31	55.00	12A6	.35		12.50	ML 100	6C.00
2X2/879	.69	12GP7	14.95	724B	1.75	QK 59	65.00
3A4	.65	12K8Y	.65	724-D	2.50	QK 60	65.00
3BP1	2.25	12SF7	.49	725-A	25.00	QK 61	65.00
3C24	.60	12SR7	.72	726-A	15.00	QK 62	65.00
3C30	.70	15R	1.40	800	2.25	*RCA932	.65
3D6	.79	28D7	.75	801-A	1.10	VR 91	1.00
3CP1/S1		30 (Spec.)		804	9.95	VR 130	1.25
	3.50		.70	815	2.50	VR 135	1.25
3D21-A	1.50	45 (Spec.)		836	1.15	VR 137	1.25
3DP1	2.25		.59	837	1.95	VU 120	1.00
3EP1	2.95	39/44	.49	843	.59	VU 134	1.00
3FP7	1.20	35/51	.72	860	15.00	WL 532	4.75
3GP1	3.50	227A	3.85	861	40.00	WN 150	3.00
3I5	.79	225	8.80	874	1.95	WT 260	5.00
5BP1	1.20	268-A	20.00	876	4.00	twith cavity	
5BP4	4.95	355-A	19.50	1005	.35		5.00
5CP1	3.75	417A	22.50	1613	.95	*Photocell	
				1619	.21		

LEAR AVIA POWER UNITS

TYPE 133-C

24 vdc drive, 90:1 gear ratio, High power. Originally designed for landing gear retraction. Bicycle type sprocket for multi-purpose drive. Large quantity available $16.50

POWER EQUIPMENT

STEP DOWN TRANSFORMER: Pri: 440/220/110 volts a.c. 60 cycles. 3 KVA. Sec. 115 v. 2500 volt insulation. Size 12"x12"x7" $40.00
PLATE TRANSFORMER: Pri: 117 v. 60 cy. Sec. 17,600 v. @ 144 ma. with choke. Oil immersed. Size: 26"x 29"x13". Amertran $120.00
FIL. TRANSFORMER: Pri: 220 v.a.c., 60 cy: .05KVA. Sec. 5 v.c.t., 34,000 v. test $24.50
FIL. TRANS. UX6899: Pri: 115 V. 60 cyc. Sec: Two 5 v. 5.5 amp wdgs. 20KV Test $24.50
"TRANSTAT" VOLTAGE REG.: 11.5 KVA, 0-115 vac, 60 cy, 100 amps $75.00
VOLTAGE REG.: Transtat, Amertran type RH 2 KVA load, input: 90/130 v. 50-80 cy output 115 v $40.00
ITE CIRCUIT BREAKER: 115 A, 600 V $15.00
KS 9668: Pri: 115 v. 60 cy 1 phase, tapped to give 2750/2470/2240 v. on sec. at 750 ma., no CT. 7,000 v ins. $34.50

COMBINATION TRANSFORMERS

(All primaries 117 v. 60 cy)

T2G167: 650 v. 2 ma; 650 vct 65 ma; 6.4 v. 4 amp; 6.4 v. 6 amp; 2.5 v. 1.75 amp. (Ideal for pair adapter applications.) $7.50
#5104: 800 vct, 150 ma; 5 v 3 amp; 6.3 v. 6.25 amp $7.95
KS 8931: 585 vct. 86 ma; 5 v. 3 amp; 6.3 v 6 amp $5.85

30 MC. I.F. STRIPS

Overall gain: 25 db or more. Bandwidth: 4 Mc plus or minus. 4 mc at 3 db down. Center Freq: 30 mc plus or minus .5 mc. Current drain: 30 ma plus or minus 3 ma. NEW, LESS TUBES $17.50

MICROWAVE PLUMBING

DIRECTIONAL COUPLER: CG-176/AP. 20 db nominal. Type "N" fitting ..... ea. $25.00
TRANSMISSION LINE PRESSURE GAUGE, 0-15 lbs. ..... ea. 3.50

3 CENTIMETER

15 DEG. TWIST, 3 centimeter, 6" long $10.00
12" SECTION, 45 deg. twist, 90 deg. bend 6.00
11" STRAIGHT WAVEGUIDE SECTION, choke to cover. Special heavy construction, silver plated 4.50
5 FT. SECTIONS, choke to cover, silver plated .. 14.50
18" FLEXIBLE SECTIONS 17.50
"E" and "H" PLANE BENDS 12.50
BULKHEAD FEED THRU'S 15.00
THERMISTOR, D-164699, for mounting in "X" band guide 2.50

MICROWAVE TEST EQUIPMENT

TS-238 GP, 10 cm. Echo box with resonance indicator and micrometer adjust cavity. 2700 to 2900 Mcs with calibration chart as shown $85.00
3 CM WAVEMETER. Micrometer head mounted on X-Band guide. Freq. range approx. 7900 to 10,300 Mc $75.00
TS 108-AP dummy load $65.00
"X" BAND calibrated attenuator $85.00
SHIELDED KLYSTRON tube mounts with rough attenuator outputs $90.00

MODULATOR UNIT BC 1203-B

Provides 200-4,000 PPS. Sweep time: 100 to 2,500 microsec. in 4 steps, fixed mod. pulse, suppression pulse, sliding modulating pulse, blanking voltage, marker pulse, sweep voltages, calibration voltages, fil. voltages. Operates 115 vac, 50-60 cy. Sliding pulse variable in phase up to 2,500 microsec. Amplitude of suppression pulse adjustable between 10 and 35 v., and width variable between the limits of 10 microsec. or less to 1,800 microsec. or more at a recurrence rate between 200 and 300 cps. Provides various types of voltage pulse outputs for the modulation of a signal generator such as General Radio #804B or #804C used in depot bench testing of SCR 695, SCR 595, and SCR 535. New. $125.00

LABORATORY ACCESSORIES

SPERRY KLYSTRON TUNER Mod. 12 ..... $2.00
SINE POTENTIOMETER, GE. #251 X 96 or W.E. #KS 15138 L01 ..... $3.50
CG 27, TYPE "N" CABLE ASS'Y, 3' long, male to female $2.50
PH-SHIFTING CAP., 180 deg. W.E. #D-150734 .. $2.50
KLYSTRON SOCKETS for 723 A,B, and similar types, 2 for $1.00
LINE INSERTION ATTENUATOR, type OAX-1, 20 Db. attenuation, with 3-contact plug and socket (amphenol 168-5) $2.25
TS 115/APS-2F 10 CM ANTENNA in lucite ball, with type "N" fitting $4.50
OAJ NAVY TYPE CYT66ADL, ANTENNA in lucite ball, with Sperry fitting $4.50
10 CM. FEEDBACK DIPOLE antenna, in lucite ball, for use with parabola $8.00
CP 14 APS-15A COMPUTER. Compiles slant range-ground range against altitude $15.50
CURSOR DIAL ASSEMBLY for 7" CR tube. Azimuth calibrated to 360 deg. Roller bearing mechanism $12.50
BC 701-A RADAR RECEIVER. Part of SCR 521 and ASE eqpt. 176 mc operation, receives bilobed search and homing patterns. Complete with tubes and antenna switching motor $37.00
BC 704A—Ind. for ASE eqpt. "L" scope, with all tubes $17.50

DELAY NETWORKS

W.E. #D-168184, .5 microsec. 2000 pps. 1200 vdc. 1800 ohms $4.00
W.E. #D-165997, 1¼ microsecond $7.50

COAX CABLE

RG 18/U, 52 ohm imp. armored ..... $0.51/ft.
RG 24/U, twin coax, 125 ohm imp. armored ..... .50/ft.
RG 28/U, 50 ohm imp. pulse cable. Corona min. starting voltage, 17 KV ..... $0.50/ft.
RG 35/U 70 ohm, imp. armored ..... .50/ft.

COAX CONNECTORS

831SP	$0.35	UG 21/U	$0.85
831AP	.35	UG 86/U	.95
831HP	.15	UG 254/U	.75
		UG 255/U	.85

Hemedell male to type "N" male adapter 1.25
RT ANGLE Sperry fittings 1.00

RADIO-SONDE TRANSMITTER T-49/AMT-1

Airborne miniature transmitter designed for 72 mc. size: 2" x 2" x4½", wt.: 6 ounces. 3A5 tube used as modulated oscillator. Requires 3 v. for fil. 67½ v. B plus. Frequency may be modified to cover amateur frequencies. Good Basic Unit for Flywieght Xmtr. New, in weather proof cardboard case, with 3A5 tube $2.95

the air, but when making this test the excitation control should be kept well down toward the low end to avoid exceeding the screen dissipation ratings of the buffer tube. The final tubes are protected because no excitation will reach them with the plate voltage off the buffer stage.

A 5R4GY tube is used as rectifier in the high voltage supply. This well-engineered tube is running well within ratings in this application and does a bang-up job.

As mentioned previously the plate and grid circuits of the final are metered. A 0-10 ma. meter is ideal for the grid and a 0-300 ma. for the plate, however other ranges may be used if on hand, and shunts may be used to increase the range of low current meters. No meter is provided for the first stage and when the rig is first put into operation the resonance points for the 80 and 40 meter bands on the oscillator tuning dial may be noted for future reference. As with all crystal oscillators the keying should be checked while tuning. Best keying will generally be obtained with the oscillator tank slightly detuned toward the low capacity side. With crystals of normal activity it will be found that the crystal stage may oscillate throughout the tuning range of the tank condenser, this is apparently a normal characteristic of the circuit and does not necessarily denote an abnormal condition.

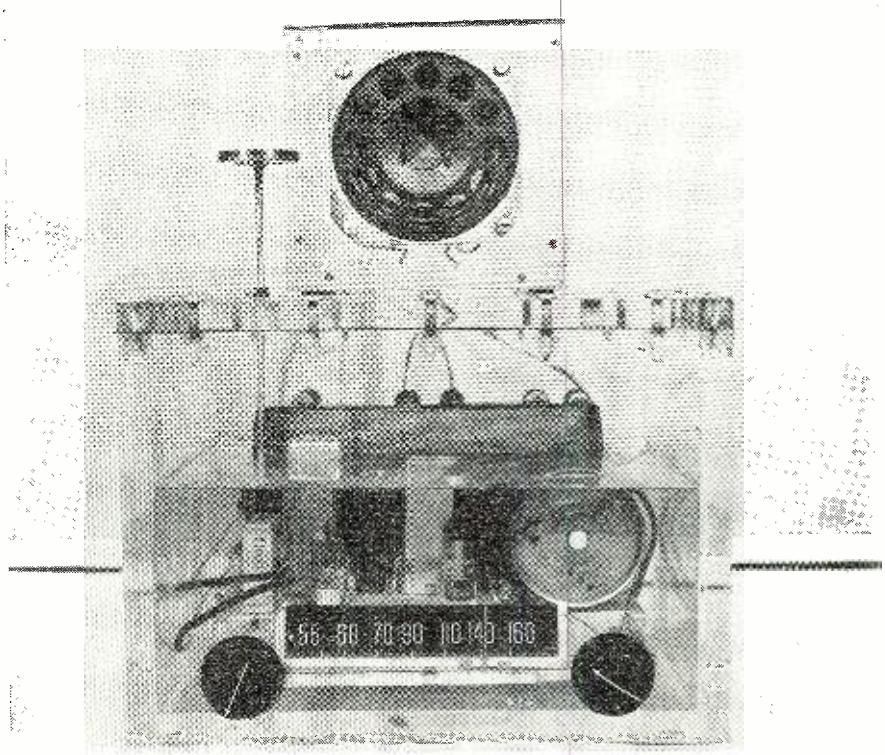
The tuning of the transmitter is quite straightforward, the crystal stage is first set to deliver the wanted frequency, the buffer stage is resonated as noted by the increase in grid current to the final and the final is then tuned for the plate current dip. For instance assume 20 meter output is desired from an 80 meter crystal or v.f.o. The 6L6 is tuned to double to 40, the buffer bandswitch set for 20 meter output, the buffer tuned to resonance, the excitation control set to deliver 6 ma. to the final grid and the final resonated. After the loading has been brought to the desired value with the loading clips or an antenna coupler the excitation should be touched up. The drive is critical and there is nothing to be gained by exceeding the recommended value. As a matter of fact excessive drive can be just as injurious to this type tube as too much plate voltage or other abuse.

The 807 tube may be substituted for the 1625 and will do exactly the same job. The different socket and filament voltage requirements should be considered of course.

The rig as shown has been thoroughly air tested using a half-wave 80 meter Zepp antenna fed with 300 ohm twin-lead from an antenna coupler. Working from a mediocre location in the peak of the QRN season all sections of the States have been worked on the 40 meter band, and on 20 meters Canada, Europe, Africa and Pacific islands have been worked along with many locals. Reports have been most gratifying in every case.

For a compact, table-top rig the over-all performance leaves little to be desired. —30—

While it isn't recommended that you take the family radio into the bathtub with you, this particular radio doesn't suffer a bit from the liquid in which it is immersed. The liquid is Freon refrigerant which cools the hot spots and permits placing the components closer together. It is one of the experiments being made by engineers of the Air Materiel Command Electronic Sub-Division's Components and Systems Laboratory in their effort to reduce the size of electronic equipment used in aircraft.



OHMITE *Little Devil* RESISTOR ASSORTMENT

IN RUGGED *All-Plastic* CABINET

REGULAR PRICE FOR RESISTORS
$10.00
NO CHARGE FOR CABINET

Servicemen's Assortment Contains 125 Selected ½-Watt Little Devil Composition Resistors in 40 Separate Compartments

Here's a handsome, sturdy, all-plastic resistor cabinet you'll be proud to have in your shop—and one that will save you hours of valuable time. The new cabinet is molded of solid plastic and has five drawers with eight compartments in each drawer. It is extremely compact—only 9" long, 4-¾" high, and 5-¼" deep. Factory-packed in the cabinet is a serviceman's assortment of 125 carefully selected Ohmite "Little Devil," ½-watt, individually marked, insulated composition resistors, in the 40 values (10 ohms to 10 megohms) most frequently used by servicemen. The assortment is offered at the price of the resistors alone—the cabinet is furnished without extra cost!

You'll need one or several of these handy cabinets in your shop to protect your resistors and to help you find resistance values quickly. What's more, they provide visual stock control so you can avoid duplicate inventories or unnecessary trips to your distributor. Order your assortment and cabinet from your jobber, today!

CAN BE STACKED ON EACH OTHER

A dovetail joint is provided on top and bottom of each cabinet so they can be stacked one on top of another.

QUANTITIES AND RESISTANCE VALUES IN THE SERVICEMAN'S ASSORTMENT

Quantity	OHMS	Quantity	OHMS	Quantity	OHMS	Quantity	OHMS
1	10	3	1000	1	33000	10	0.47 meg.
1	15	1	1500	5	39000	1	0.68 meg.
1	27	1	2200	10	47000	10	1.0 meg.
1	47	3	2700	1	68000	1	1.5 meg.
1	100	5	4700	1	82000	1	2.2 meg.
1	150	1	6800	10	0.1 meg.	1	2.7 meg.
1	270	10	10000	5	0.15 meg.	1	3.9 meg.
1	330	3	15000	1	0.22 meg.	1	4.7 meg.
1	470	5	22000	10	0.27 meg.	1	6.8 meg.
1	680	10	27000	1	0.33 meg.	1	10 meg.

Stocked by Leading Distributors

OHMITE MANUFACTURING CO., 4885 FLOURNOY ST., CHICAGO 44

Be Right with OHMITE

RHEOSTATS • RESISTORS • TAP SWITCHES

LARGEST WAR SURPLUS STOCK-

PREAMPLIFIER BUY

External source of power supplies this compact aluminum case only 5¾"x4"x2½", containing dual triode power tube 6F8G, inside the case, not standing out from it, and all brand new, in original packing, for only..... **$1.29**

MICROPHONE BUY

T-24: Hand-held mike, carbon, with push-to-talk switch, brand new, far superior to older styles. SPECIAL. F.O.B. Los Angeles, only **79c**

24,000 OHM HEADSET

P-16: Has long cord, needs no extension, ends in standard plug PL-55. Very high impedance. Brand new. SPECIAL..... **95c**

HS-16: Brand new **$1.49**

ALTIMETER TRANSCEIVER RT-7/APN-1

Frequency 418-462 Mc FM, with 14 tubes: 3—12S17, 4—12SH7, 2—12H6, 1—VR150, 2—955; 2—9004; 27 V. Dynamotor, used in working condition **$7.95**

SELSYN INDICATORS

For use with beam rotators for indication of direction of beam. Operate from 15-24V 60 cycle AC supply. Small model, 3 inch diameter, only **$2.45**

3" SELSYN INDICATOR

With direction selector dial. BRAND NEW. F.O.B. Chicago, only..... **$1.49**

Large model. 5 inch diameter, only..... **$4.95**

400 CYCLE AUTOSYN MOTOR

Ideal for indicating direction of antenna systems—BRAND NEW .....Each **$2.95**

MD-7 modulator for above transmitter, with push-pull tube, brand new with dynamotor **$4.95**

PE-117 UNIVERSAL POWER SUPPLY

6 or 12 volt input; output 145 volts and 90 volts; less vibrator, voltage regulator and rectifier tube; ideal mobile power supply unit; excellent condition. F.O.B. Chicago, only, ea. **$2.95**

Complete **$6.95**

OUTPUT TRANSFORMER

Hi-Fi; used is Scott-made Navy receiver. Fully potted. Pri. 5000 ohms, output secondary 600 ohms CT, inverse-feedback secondary 60 ohms CT ONLY **$1.49**

DYNAMOTORS AND INVERTERS

BD-77—Dynamotor Unit 14v in. 100v 350ma out, with relay fuse box and filters. F.O.B. Chicago only **$5.75**

DM-21—Dynamotor: Part of BC-312 and BC-314 14v in. 235v 100 ma out..... **$2.47**

PE-101-C—Dynamotor Unit: 12 or 24v in. outputs 800v, 20 ma. 400v, 135ma, 9v, 1.1A..... **$2.75**

PE-55—Dynamotor Unit: 12v in. 16 amp. 500v out. 200 ma F.O.B. Chicago only..... **$3.75**

PE-206—Inverter Unit: rotary converted, 28v in. 80v at 500 VA, 800 cy. out. F.O.B. Chicago only **$3.95**

DM-32A—Each **95c.** 3 for..... **$2.00**

DM-25—12v input, 250v @ 50ma output, ideal for command receivers. New..... **$3.95**

IA53—12v-24v input, output 500v @ 50ma, ideal for 6 volt installation, lightweight, new.. **$2.95**

DM-35—12v input, 625v output @ 285ma, used, good condition **$4.95**

EICOR TYPE—14v in, 400v, 200ma out, with mtg. rack, brand new **$14.95**

DM-34—12v in, 220v, 80ma out, as used on the tank receivers BC-603 and BC-683..... **$2.95**

MISCELLANEOUS BARGAINS

Condenser, Pyranol 2 MFD, 4000 V **$4.95**

Command Transmitter BC-457, brand new, 4 to 5.3 mc **$7.95**

RA-87: Rectifier, selenium, input 95—125V or 190-250V, 50/60 cy. Output 115 V dc, 400 ma and 115V ac, 4.35 A. Used, excellent..... **$14.95**

CD-307: Extension cord, 6 to 8 feet long, for headsets HS-23, HS-33, etc. PL-55 on one end, JK-46 on other end. Brand new.. **69c**

ANB Receiver: Low-impedance, magnetic type, use as under-pillow speaker. **39c**

New, each .....

T-27/APT-3

Another noise-modulated radar jamming transmitter, companion to the APT-2. 85-135 mc. Power output 9 to 12 watts. M.O.P.A. type transmitter. Built with 4 demountable sub-chassis: R.F. Osc.; R.F. Amp.; photoelectric noise source, video amplifier and modulator; power supply. Tubes are: 1—829B RF Amp., 1—832 RF Osc., 1—931A phototube, 2—6AC7 video amp, 1—6AG7 mod., 1—5R4GY rectifier. Brand new, in original export case, with all tubes and handbook. **$10.95**

F.O.B. Chicago, only .....

T-26/APT-2

Radar jamming transmitter, 450-710 mc. Heising amp.-mod, by noise from 931A photo-tube. Output 3 to 7 watts. All controls on front panel. 2—6AC7 and 1—6AG7 video circuit supply random noise, with pass band of 20 kc. to 4 mc. to the 807 mod. 2—368AS tubes in a push-pull ¼-wave transmission-line osc. circuit supply the RF. Power furnished by 2—5R4GY and 1—2X2 tube. Contains 27vdc blower. Input 27vdc and 75-85v or 105-125v, 400 to 2600 cy. Brand new in original export case, with all tubes and handbook. Don't let this get away from you—Order today! F.O.B. Chicago, only. At only... **$9.95**

AN/APT5 ULTRA HIGH-FREQUENCY TRANSMITTER Brand New

400-1500 Megacycle Transmitter, made for U.S. Govt., complete with the following tubes: 2—6AC7, 1—6L6, 2—829, 1—931A, 1—6AG7, 1—522 Ultra high freq. tube. Complete with high freq. cavity, 1 blower to cool the 522, 1 time delay relay, 2 filament trans. cond. and many other component parts for ultra high frequency work. It has a frequency checker, complete Lecher wires, with slider and sensitive bulb for checking the wave length. Contains instruction book. Wt. 118 lbs. **$49.95**

F.O.B. Chicago, only .....

RADAR ANTENNA

AS-69: fish-hook type radar antenna assembly: can be used with APT-2, APT-3 and APT-5. NEW. F.O.B. Chicago, only..... **$2.95**

COMMAND SET SCR-274 MEDIUM FREQUENCY

Excellent condition. F.O.B. Chicago, only **$29.95**

Complete installation with 2 transmitters, 3 receivers, racks, tubes, crystals control box and plugs.

COMMAND RECEIVERS and TRANSMITTERS

(274N Series)—Complete with Tubes

T-20/ARC-5 same Freq. **$5.95**

BC-457, NEW .....

BC-456 MODULATOR. Brand New..... **$2.95**

BC-1206-C BEACON RADIO RECEIVER

Designed to receive A-N beam signals. 24-28 VDC 21.6 watts. Tube complement: 14H7 or 14A7, RF amplifier; 14H7 or 14J7, mixer; 14A7 or 14H7, IF amplifier; 14H7, detector and 1st audio amplifier, 28D7, output amplifier, 195 to 420 kc, 4" high x 4" wide x 6⅝" long—wt. 3 lbs., 4 oz. **$5.95**

BRAND NEW in original carton.....

ANTENNA THERMO-COUPLE METER

BC-442; 0-10 amps, with extra relay and 50 MMFD 5000 Volt condenser . . . used with command transmitters. BRAND NEW. **$1.95**

SELSYN METER TO INDICATE POSITION C-71A/APQ-13

Contains 2" meter, FS-100uA, Weston 506, 0-300 V, 0-30 MA, with 6 precision resistors, as external multipliers and shunts; toggle switches, push switches, rotary switch, pots, knobs, etc. GOOD CONDITION. F.O.B. Chicago, only **$4.95**

SCR-522 CONTROL UNIT

BC-602-B, brand new, export packed. 1 "off" push-button switch, 4 channel-selecting push-button switches, 5 pilot lamp assemblies with pilot bulbs and film dimmer and lever switch with locking control. With Schematic..... **98c**

RECEIVER-TRANSMITTER BC-620

FM Mobile Transmitter-Receiver operates from 6 volt vibrapack, 20.0 to 27.9 Mc; easily converted to 10-meter freq. 28-29.7 MC.

New. F.O.B. Chicago, only **$14.95**

Used. F.O.B. Chicago, only..... **$9.95**

2-METER TRANSMITTER SCOOP!

The famous AN/ARC-5 VHF Transmitter (T-23/ARC-5), brand new 100-156 mc but less tubes, crystals, and the holders for the 832A tubes. Furnished with complete schematic, 4 Xtal-controlled channels selected by 3 motor-driven turrets. Motor can be spun by hand for manual band switching or driven by low-power rectifier power pack. Tubes required are 2—1625 and 2—832A. Don't pass this up at ONLY..... **$4.95**

R-89/ARN-5A

Glide path receiver. Crystal control of local oscillator. 332-335 mc, complete with relays, 7—6AJ5, 1—12SR7, 2—12SN7, 1—28D7, and 3 crystals: 6497 kc, 6522 kc, 6547 kc. 90-cycle band-pass and 150-cycle band-pass filters, excellent for making an intermodulation checker. Beautiful cabinet and chassis as foundation for many interesting experimental and construction projects. Broad pass band on 20.7 mc IF's ideal for television. Schematic furnished. **$6.45**

Used, excellent. Only.....

New **$12.95**

BC-733-D

Localizer receiver of the blind landing system. Companion to the glide path receiver. Also contains 90 and 150 cycle band-pass filters. 108.3 to 110.3 mc. by relay selection of crystals in the local oscillator. Wide pass-band on 6.9 mc IF's ideal for FM. Has a wonderful AVC system using rectified output of an RF oscillator as power supply for 100 volt DC bias. With relays, crystals, and 10 tubes: 3—717A, 2—12SG7, 1—12SQ7, 1—12A6, 1—12AH7, 2—12SR7. Schematic furnished! Condition: Used, excellent, F.O.B. Chicago, only **$3.95**

New F.O.B. Chicago, only..... **$9.95**

VEEDER-ROOT METER AND CASE

Counts up to 1000. **59c**

F.O.B. Chicago, only. Each.....

HAND-TYPE MICROPHONE RS-38

Carbon type, with PL-68 plug, **$1.95**

BRAND NEW .....

Used **$1.00**

BC-645 TRANSMITTER-RECEIVER

BRAND NEW . . . 15 tubes interrogator-transmitter designed for airborne use. 435 to 500MC frequency range. With some modifications the set can be used for 2-way communication, voice or code, on the following bands: ham band: 420-450mc; fixed and mobile: 450-460mc; citizens radio band: 460-470mc; television experimental: 470-500mc; complete with all tubes, including WE Doorknob tube. Size 10½x13½x4¾". **$9.95**

Net wt. only 25 lbs. Your cost..only

DYNAMOTOR FOR ABOVE Model PE-101-C **$2.75**

RADIO PARTS

Assorted Bypass Condensers, 400-600WV **$4.29**

100 for .....

100 Resistors ⅛ to 1 watt..... **95c**

Electrolytic condensers 50-30, 150 Volt 10 for **$2.89**

½ and 2 Meg. Volume Controls 1" shaft with switch, each 39c 10 for..... **3.00**

½ Meg. Volume Controls 1" shaft without switch, 10 for **1.95**

Crystal Pick-up, new light wt. .....each **1.79**

Heavy Duty 12" PM Speaker. NEW..each **5.95**

All shipments F.O.B. Chicago or Los Angeles unless specified. 20% Deposit required on all orders. Minimum order accepted $5.00.

California and Illinois residents, please add regular state sales tax to your remittance.

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OFFERED AT LOWEST PRICES!

BRAND NEW TUBES

304TL.....ea. 90c—four for $3.00

3B24	$ 0.95	801A	$ 0.95	12K8	$0.69	5BP1	$1.39	9001	$0.49
3B24W	.95	869B	19.95	12SR7	.59	5FP7	1.39	9002	.49
3B26	.95	872A	1.95	12AT6	.49	864	.49	9003	.49
6G6G	.69	2C26A	.69	832A	2.95	954	.49	9006	.49
6H6GT/G	.49	1N5GT	.69	837	1.95	RK34	.39	7193	.39
6SS7	.72	211	.69	838	2.95	35W4	.39	4AP10	1.95
28D7	.69	12SN7	.49	839	2.95	1625	.39	110 VAC Neon Light	.39
250R	2.95	12A6	.39	5BP4	2.95	1629	.39	Amperite 10T1	.39
705A	2.95	12C8	.49						
726A	14.95	12J5	.39						

W.E. 700A Magnetron. 680-710 mc, 100 KWPk Pwr. output **$24.95**

WRITE FOR LOT PRICES!

BLOWER MOTOR

24V AC or DC, small portable with fan, ideal for defroster or ventilator unit. 17,000 RPM. BRAND NEW..... **$1.95**

THE LAZIEST Q-5'er

FL-30, used when flying radio range. RANGE-VOICE-BOTH switch selects 1020 cps pass ONLY, or voice freq. minus 1020 cps, or by-passes filter completely. Put in series with low-impedance head-set when listening to 1 kc MCW or use with adapter for high-impedance output to low impedance phones. BRAND NEW..... **95c**
FL-8 ..... $1.95

FILTER CHOKES—All Fully Enclosed

3.7 H. @ 145 MA. DC., 125 ohms DC. Res. 4 MTG. Studs, each..... **59c**
100 mi 10H..... 59c

APN-1 RADIO ALTIMETER

Complete 420 MC transmitter-receiver unit, complete with all plugs, indicators. BRAND NEW. F.O.B. Chicago, only **$34.50**
AN/PRS-1 MINE DETECTOR—BRAND NEW $9.50

BC-929-A

Contains power supply 110 V. 400 cycles, has 7 tubes such as 3CP1, brand new, complete with tubes. Each **$17.95**; Used. F.O.B. Chicago, only, each..... **$14.95**

R-78/APS-15

Has 45 tubes, one 5" scope tube, one 2" scope tube, has 3 meters, 4 power supply units 115 v 400 cycles, complete with tubes. F.O.B. Chicago, only, Each..... **$39.50**

COMPASS RECEIVER MN-26

Remote control commercial type navigational receiver. Indicates direction of any desired transmitting station. 3 bands—frequency range: 150 Kc to 1500 Kc. has 12—6 V. type tubes. Brand new, original cost $600. Now **$24.95**

Accessories for Above:

Loop MN-20	$9.25
MN-28 Control Box	7.25
MN-52 Loop Control Unit	4.45
Loop Transmission cable—168" long	9.95
MC-124 Flexible Shaft	2.45
IN-4D Left-right Indicator	9.95
Set of 3 plugs	4.60
MN-40 Navigators Indicator	12.95
AS/138 streamlined loop antenna	10.95

PLUGS YOU NEED

PL-103: For your BC-348 receiver. Fits all models ..... ea. **69c**
PL-59, 60, 61, 62: For BC-375-E or BC-191 ea. **50c**

OIL-FILLED CONDENSERS

.25 MFD at 1500 VDC	59c
2 MFD 220 VAC	29c
.5 MFD at 750V AC	29c
2 X .25 at 2000V DC	29c
3000 MFD at 3V DC (electrolytic)	19c

REMOTE POSITION INDICATING SET

6-12 V. 60 cycles. 5 inch indicator with 0-360° dial. Heavy duty transmitter.

Indicator	each $4.95
Transmitter	each 2.95
Set	7.95

HS-33 (Red plug), low impedance. Used, almost like new. With rubber cushions 8000 ohms or 200 ohms..... **95c**

POWER YOUR RIG FROM AC

RA-34 RECTIFIER. Makes a ground xmtr of BC-191, the 12V version of BC-375-E. Convert BC-375-E to 12V by changing heater link switches and relay connections, power it with RA-34. Input 105-125 or 210-250V. 60 cy. Outputs: For plates, 1000V filtered dc at 350 ma; for relay and mike, 12V filtered dc at 2.4 A; for heaters, 12V ac at 14.25 A. With tech. manual. Used, excellent condition. F.O.B. Los Angeles, only **$59.75**
With meters and adjustable hi-voltage output $85.00

SCR-522-A

Transmitter, receiver, rack and case. 100-156 mc. 4-channel, xtal controlled, easily converted for variable tuning. Used, excellent condition. With schematic..... **$34.95**

SURPRISE PACKAGE

20 lbs. assorted radio parts—$25.00 Value—only **$1.95**

ARB RECEIVER

Famous Navy ARB (CRV46151) receiver, 195-9050 kc, in four bands, 6-tube, 3 microvolt sensitivity, CW or MCW, MVC or AVC, Sharp or Broad selectivity. With 28V dynamotor. A NATURAL FOR MARINE USE or for adaptation to AC power supply. Used, excellent condition. Each **$19.95**
Remote control boxes ..... Each $2.95

SOCKET FOR 5BP1 OR 5BP4

2ZS6S1.2 For magnal-based CR tubes. With leads attached. New. Each **95c**

BD-71 ARMY TELEPHONE SWITCHBOARD

Magneto monocord, the simplest type, 6 trunks (loops). Each loop has a cord, a jack, a drop, and a 2-way lever key. Has built-in ringer and head and chest set for operator. Ringing from distant end of a loop operates the drop. Ideal for camps, motels, oil-field or timber operation, etc. Condition; used, good. Price is ridiculously low, only **$12.95**

BD-72 ARMY TELEPHONE SWITCHBOARD

Same as BD-71 described above, except larger; for 12 trunks. Condition; used, good. Only **$19.75**

SCR-625 MINE DETECTOR

Portable, in sturdy suitcase container. Detects metallic objects (ferrous or non-ferrous) to a depth of approx. 6 ft. Find outboard motors on the bottom of resort lakes, locate underground piping, etc. Complete with instruction manual. New, in original packing... **$39.95**
Used, excellent condition..... $29.95

EE-8 ARMY FIELD TELEPHONE

Sturdy, highest quality telephone at less than price of a better-class toy. With ringer. Requires only two flashlight batteries for each phone and two wires between each phone. Excellent condition, used. Each..... **$7.95**

A CATHODE-RAY HONEY

AN/APN-4 Indicator: Uses 5CP1. Loran, convert to test scope, panadapter, etc. Contains extremely accurate 100 kc xtal to time sweeps and marker pips at 2, 20, and 100 kc. Two parallel horizontal sweeps, obtain time differences between signals, between half-power points on pass-band curves, and numerous other scope uses. Experimenters' delight! Use the counter circuits to try the new system of FM demodulation (July Proc. IRE), or to time camera shutters, 25 tubes. Condition; used, excellent. With schematic **$39.95**

ANTENNA MASTS

Each section 38" long, screw together as follows: MS-49 (tip section) into MS-50, MS-50 into MS-51, MS-51 into MS-53 into another MS-53 or into the mounting base. Make as long as you please by adding MS-53's. BRAND NEW, per section..... **35c**
MP-48 vehicular base, ceramic insulator, spring flexing section, fits MS-53..... $2.45

AN-23-A ANTENNA

35' 12-strand, all-weather ins. wire, with snap-hook and connector on each end. Hook together for various all-wave hi-gain combinations. F.O.B. Chicago, only **49c**

AN-21 ANTENNA WIRE

100' roll 12-strand all-weather ins. wire. F.O.B. Chicago, only..... **49c**

PIONEER GEN-E-MOTOR

Self-excited, delivers 450 vdc, 100 MA, driven by 18v dc or ac. Long shaft, gear. New, less dust covers on ends. F.O.B. Chicago, only **$1.89**

BEST SURPLUS BUY OF THE YEAR

Receiver, converts to 2, 6, 10 and 11 meters, plus 88-108 mc AM/FM, plus xtal-controlled freq. meter! Independent front-panel dial control for each of 4 rf & osc tuning sections working into a single 2.85 mc IF strip. Self-contained xtal calibrator/heterodyne freq. meter gives choice of 1000 or 100 kc check points incorporating a locked-in multivibrator exceptionally rich in harmonics, used both for transmitter and receiver calibration. For home or mobile or for new aviation VHF channels. Complete with 4" panel speaker, 12v dynamotor and lab-standard 1000 kc xtal. Used, excellent condition, with schematic and complete conversion instructions, only **$34.95**

HEADSET SPECIAL HIGH-IMPEDANCE UNIT R14

Convert your low-impedance headset to high-impedance. HS-23 by switching to R14 receiver units. New, per pair. F.O.B. Los Angeles, only **69c**

A SWEET OSCILLOSCOPE DEAL

ASB-7 Radar Indicator Unit: For conversion to test scope or for use as modulation monitor. Has standard test-scope CR tube. H Cent. V Cent. Brll, Foc, Gain, and range selection switch. External power source was used. Tubes: 4-6AC7, 3-6H6, 1-5BP1. Condition: used, excellent. LOOK AT THIS PRICE; F.O.B. Los Angeles, only **$9.95**

RADIO SCHOOL SPECIAL

BD-57-A code practice switchboard. Has built-in motor alternator supplying 400 cycle tone for up to twenty student positions. All cords and plugs supplied. F.O.B. Chicago, only..... **$12.50**

RADAR TRANSMITTER

ASB-7: Airborne search unit, 0-70 miles, 515 mc. External power supply was used. Condition: used, excellent. F.O.B. Los Angeles, only **$12.95**

All shipments F.O.B. Chicago or Los Angeles unless specified. 20% Deposit required on all orders. Minimum order accepted $5.00. California and Illinois residents, please add regular state sales tax to your remittance.

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International Short-Wave

(*Continued from page 71*)

modulation, using two 889R type tubes as Class B modulators and two 889R type tubes as the final modulated r.f. stage. They cover a frequency range of 6-22 mc. and a change in frequency can be made in less than two minutes.

"As the initial program service is primarily intended for Australia and the Pacific, all the present aerials are designed for a total beam width of 68 degrees. The majority of the aerials consist of two-tier, two-bay half wavelength long horizontal radiating elements with reflectors. The earlier aerials have the radiating elements spaced a half wavelength in the vertical plane while the later slewable beams for the Pacific Service are designed with a vertical spacing of .7 wavelength. All radiating elements consist of a three-wire centre-fed Kraus structure."

At present the 0200-0400 EST transmission is over ZL3, 11.78, and ZL4, 15.28, but at times ZL2, 9.54, may be substituted for the 19-meter outlet. The 11.78 channel appears to be heard well in most parts of North America and in many other parts of the world; the 15.28 outlet is audible only in scattered areas, it appears from reports received from ISW monitors.

Mr. Shelley informs me that *Radio New Zealand* will be pleased to receive letters from listeners offering suggestions for programs; all correct reception reports are verified by a QSL card from The Director, Radio New Zealand, P. O. Box 3045, Wellington, New Zealand.

Our heartiest congratulations and best wishes for the years ahead go to *Radio New Zealand!*

* * *

Radio In Germany

While German short-wave outlets have recently been in the process of making changes, we have gathered together from authentic sources the best available current data which we list below:

U. S. S. R. Zone—"Radio Volga," 7.611, Berlin, for occupation forces, mainly relays Moscow, scheduled 2300-0700, 0800-1800.

Central German Radio, 9.729, Leipzig, scheduled 2200-0215 (2300-0215 Wednesdays and Saturdays), 0500-1730 (sign-off varies considerably and on Sundays normally operates 2200-1730); may announce in German as "Mittel Deutscher Rundfunk, Leipzig Sender;" relays medium-wave Leipzig Sender on 785 kc. and also takes some programs from Berliner Rundfunk and Dresden; QRA is Sender Leipzig, Springerstrasse 24, Leipzig N. 22 (Soviet Zone), Germany.

At last report, Berliner Rundfunk, 6.072, Berlin, was off the air.

French Zone—Southwest German Radio, on 9.675, location unannounced, and Baden-Baden on 6.322, scheduled 2300-0150, 0430-0730, 0900-1700 (Sun-

New Supreme ELEV S ON Manual

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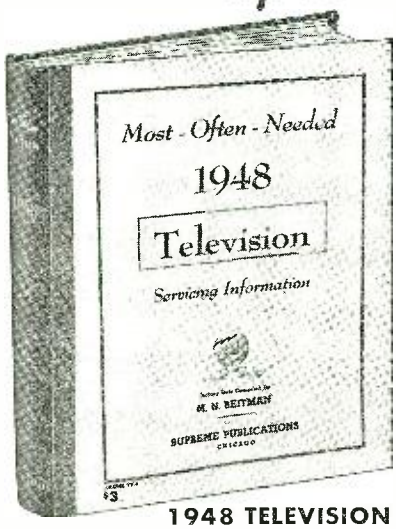

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Compiled by M.N.Beitman, radio engineer, teacher, author & serviceman.

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days and Mondays 2300-1700, Saturdays 2300-0150 and 0430-1900); may announce in German as "Sudwestrundfunk, Baden-Baden;" relays mainly medium-wave Baden-Baden-Freiburg on 827 kc.; QRA is Sudwestrundfunk Zentrale Baden-Baden, Hotel Kaiserin Elisabeth, Molkestrasse 5, Baden-Baden (French Zone), Germany.

British Zone—Northwest German Radio, 7.290 (recently moved from 6.115), Elmshorn, scheduled 2300-0430, 0500-1730 (Saturdays to 1800), Sunday schedule is 2300-1730; may announce in German as "Nordwestdeutscher Rundfunk, Hamburg-Elmshorn;" relays mainly medium-wave Hamburg on 904 kc.; uses 50 kw. power, but with an omni-directional antenna for Europe; in the U. S. suffers interference from the BBC's outlet on 7.280; QRA is Nordwestdeutscher Rundfunk, Rothenbaumschausse 132/134, Hamburg 13 (British Zone), Germany.

U. S. Zone—Frankfurt, 6.170, Frankfurt-a-M., scheduled 2300-0245, 0415-0745, 0900-1630; 0015-1630 (Sun.); 2300-0245 (Sat.), 0415-1700 (Sat.); 2300-0215 (Wed.), 0415-0810 (Wed.); 0900-1700 (Wed.); relays medium-wave *Radio Frankfurt* on 1195 kc.; Signals are rather weak in U. S., obscured by static and severely QRM'd by Paris, 6.200, around 0000-0015; QRA is Radio Frankfurt, Information Control Division, Radio Branch, 10/33 Eschersheimerlandstrasse, Frankfurt-a-M. (U. S. Zone), Germany.

Munich, 6.194, is scheduled 2300-0705, 0830-1800 (Saturdays and Sundays at 2300-1800).

Radio Stuttgart, 6.180, scheduled 2300-0330 (Wednesdays to 0400), 0430-0715 (Tuesdays and Thursdays to only 0700), 0855-1630 (Wednesdays to 1700); 2300-1700 (Sun.); 2300-0330 (Sat.); 0430-1700 (Sat.); relays medium-wave *Radio Stuttgart* on 574 kc.; thus far, has not ben reported heard in the U. S.; QRA is Radio Stuttgart, Radio Branch, Information Control Division, Office of Military Government for Wurtemberg-Baden, 145 Neckarstrasse, Stuttgart (U. S. Zone), Germany.

* * *

Piccard Expedition

From R. J. Villela, ISW monitor in Sao Paulo, Brazil, comes word that the Piccard-Cobyns Expedition to West African coast for submarine exploration sailed on the Belgian Ship *"Scalpis"* from Antwerp on September 13, bound for the Gulf of Guinea. Prof. Piccard intended to descend to a depth of 4000 meters in a 10-ton sphere known as "Bathyscaphe," with first attempt scheduled for October 5. Just in case any reader may have picked up signals from this Expedition, here is further information supplied by Mr. Villela:

The *"Scalpis"* was heard on approximately 12.510 in c.w. with a call of ONSF, contacting OST, Ostende, on the same frequency. Ostende passed along a dispatch from Leopoldville, Belgian Congo, planning a special contact for October 3 at 0300, when Leo-

poldville was to use OTP, 20.040 and the *"Scalpis"* was to answer on 18.000 (these contacts may have been for phone or phone-c.w.). Belgian ships sometimes use phone to OST around 1630 on approximate frequencies of 6.200, 11.200, 12.340, 12.510, and 16.750 (varies), Mr. Villela explains; OST may answer on approximate frequencies of 5.100, 11.050, 12.510, or 16.750.

* * *

"Annual" Available

The Shortwave Listeners' Annual (1948) is now available direct from the publishers for 90 cents; for one dollar membership in the International Short Wave League will be included; anybody ordering the annual who would like a sample copy of *Short Wave News* may have it gratis on request. QRA is Amalgamated Short Wave Press, Ltd., 57, Maida Vale, Paddington, London W. 9, England.

* * *

Club Notes

Sweden—Karl-Ake Bergstrom, Sweden, informs me that the Scandinavian DX-Club now has more than 625 members.

United States—The board of directors of the Grand National Radio Society, Box 57, Cassadaga, New York, has effected this organization for the coming year—Edward Shirley, president; George H. Jacobs, presidential aide; Walter Downes, vice-president; Charles Eaton, vice-president, and J. I. Vaught, secretary.

* * *

This Month's Schedules

(NOTE: *Some stations are still in the process of returning to winter schedules; therefore, you may find a few stations operating now one hour later than they were when the following schedules were compiled.—K.R.B.*).

Anglo-Egyptian Sudan—Omdurman, 13.320, and Khartoum, 9.670V, still have English session Fridays (*only*) 1230-1300; good signal in England. (Harrison)

Angola—Kary, Pa., recently heard Radio Clube de Angola, Luanda, on 9.470 and 8.087 (both measured), to 1720 when signed off with "A Portuguesa," giving two calls only one of which was distinguished (CR6RL, for the 8 mc. outlet, formerly on 7.299); 9.470 is CR6RA according to official sources. Both signals were unusually strong, although the 8.087 channel was later covered by a powerful c.w. signal; 9.470 had slight QRM from Ankara's TAP, 9.465. (Normal daily sign-off for Angola outlets is 2100.)

Antarctica—R. J. Villela, Sao Paulo, Brazil, sends along this data—"At present, the busiest Antarctic station on phone work is the Chilean base of O'Higgins; is scheduled for regular phone contacts Saturdays 1330 and Sundays 1530 or 1200, with the Santiago 'experimental' station CE8BV, approximately 15.400, which is operated by amateur CE3AE; then uses frequency of 16.665 (varies) and amateur call of CE7ZA/CE7ZB; may also use phone occasionally at the c.w. schedules with RAC7, the Chilean Army Radio in Santiago, 15.750 (ap-

prox.) at 0730 and 1600 on 16.665V when the 'official' call, CCW1, is employed. Phone QSO's of the O'Higgins base, with CE8BV, Santiago, are chiefly for chats by personnel of the base with their families. CWW1, O'Higgins base, has been heard around 0800 at times with special transmission for 'Radio La Americana,' CB960, Santiago, 9.600 (listed officially on 9.593), through RCA7, Army Radio, Santiago, on 15.75; CCW1 used 16.66 (varies); CE920, 9.200, 'Radio Militar Austral,' Punta Arenas, has been heard with program dedicated to the O'Higgins base at 2030, including direct interviews with the base ('base militar O'Higgins en la Antartida chilena'), answered on approximately 6.850; during tests that followed, O'Higgins base used for a time 5.735 instead of 6.850V."

Mr. Villela also reports that VIS2, Sydney, Australia, contacts the Heard Island base of the Australian Antarctic Expedition, VJH2, at 0700; uses automatic c.w. on approximately 12.720; VJH2 answers on 12.255; ZRS, Marion Island, Prince Edward group, approximately 13.370, contacts VJH2 at 0800 in c.w.; Marion Island is operating on amateur band (20 meters) with call ZS1MI. Frequency of the British antarctic base is approximately 12.685.

Argentina—A late list of short-wave stations in this country, furnished by Bergstrom, Sweden, reports 5.985 and 6.065, LRS1, De la Red Splendid, 50 kw.; 6.090, LSX, Radio de Cordoba, Cordoba, 300 watts (*NEW*); 6.120, LRX1, Radio El Mundo, 1 kw.; 5.900 and 6.180, LRM, Radio Aconcagua, 10 kw.; 9.315, LRS, De la Red Splendid, 25 kw.; 9.545, LRY, Radio Belgrano, 50 kw.; 9.690, LRA1, Radio del Estado, 10 kw.; 6.145 and 11.880, LRT, Radio de Tucuman, Tucuman, 10 kw. (*NEW*); 15.290, LRU, Radio El Mundo, 25 kw.; 17.720, LRA5, Radio del Estado, 10 kw.; and on FM, 92 mc., Radio del Estado, 1 kw.; LRR, Rosario, is no longer broadcasting on either short- or medium-wave, it was stated.

According to Hans Leven, Brazil, LRU, Radio El Mundo, is scheduled 1200-1600; Radio El Mundo transmits on short-wave in parallel with LR-1, medium-wave, on these wavelengths—LRX, 9.660, 0600-2200; LRX-1, 6.120, 0600-1200, 1600-2200.

Australia—Radio Australia has inaugurated a *new* service at 1200-1330 in German for Europeans using VLA8, 11.76, VLB2, 9.650, and a *new* frequency for VLC8, 7.240; this new service is for Displaced Persons Camps in Europe and loudspeakers are being set up in camps there.

Austria—Pearce, England, reports *Radio Wien* in parallel on 7.245, 11.785, 9.665 at 0045. He says KZCA, 7.220, Salzburg, is heard well around 0100; sometimes gives call as KOFA (Linz).

Bechuanaland Protectorate—ZNB, 5.900, Mafeking, has been heard on a Sunday in Ohio at 0600-0635; man announcer; program of recordings 0600-0625, gave a few SABC *(English)* news comments at 0625, then played a re-

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cording of "God Save the King" when leaving the air 0635; signals fair with some QRM, slight fade. (Sutton)

Brazil—Bergstrom, Sweden, has received this data from Fortaleza—PRE9, 1200 kc., *RCA Victor* transmitter, 10 kw.; ZYN6, 6.105, Marconi transmitter, 5 kw., and ZYN7, 15.165, Marconi transmitter, 5 kw.; scheduled Monday through Friday 0900-1200, ZYN6; 1500-1555, ZYN7; 1605-2030, ZYN6; Saturdays, 0900-1500, ZYN6; 1510-1600, ZYN7; 1610-2030, ZYN6; Sundays, 0700-2030, ZYN6; QRA is Caixa Postal 222, Fortaleza, Ceara, Brazil.

Hans Leven, Sao Paulo, Brazil, tells me that on April 5 of this year Brazil added a new short-wave outlet to the older medium-wave transmitter of "Radio Ministerio da Educacao," Rio de Janeiro, of the Ministry of Health and Education; first tests were on 9.500; then, because of interference, the frequency was changed to 11.950 with call PRL-5; now using 9.768 with call PRL-4; programs, all in Portuguese, are relayed from medium-wave PRA-2, 800 kc., with exceptions given below; schedule is 0500-1200, 1300-1400, 1500-2130; at 1300-1400 and 1900-1915, press dispatches are read at dictation speed over the short-wave outlet *only*. PRL7, 9.720, belongs to "Radio Nacional," Rio de Janeiro, and has nothing to do with the state-owned and non-commercial PRL-5. Parallel transmission of PRL5 and PRL-7 is *only* in the period 1730-1800 when an information broadcast comes from the "Agencia Nacional" over *all* Brazilian radio outlets; the "Agencia Nacional" is a press agency of the Ministry of Justice and Internal Affairs in Rio de Janeiro; the broadcast from this source consists of the official bulletins of the Presidency of the Republic, the Senate, Deputy Chamber, and general news from the country; begins and ends with "Flag Anthem" and *not* the National Anthem ("Ouviram do Ipiranga"); this transmission also is made over stations placed at the disposal of "Agencia Nacional"—PSF, 14.690, PSH, 10.220, PSL, 7.935; press dispatches over PRL4 at 1300, 1900 also originate with "Agencia Nacional."

British Guiana—ZFY, 6.000, Georgetown, gives daily program schedule 1812; signs off 1945. (Ferguson, N.C.)

Burma—Radio Rangoon may have a *new* transmitter on the air; at least it has been heard using 9.543 and 6.035 in parallel mornings to 1015 sign-off; news 1000; now uses Burmese National Anthem as signature. (Dilg, Calif.)

Cameroon—Radio Douala, 9.160, is heard with weak signal in New Foundland 1430-1600. (Peddle) FIA-6, 11.270, Douala, calls Paris for traffic 0810. (Sutton, Ohio)

Canada—Winter schedule of Canada's International Service is to Europe 1000-1125 on CKNC (17.82) and CKCX (15.19); 1125-1130 on CKNC; 1130-1400 on CKNC and CKCS (15.23); 1400-1420 on CKCS; 1420-1500 on CKCS and CHOL (11.72); 1500-1515 on CHOL; 1515-1830 on CHOL and CKLO (9.63). To Australia and New Zealand (in *English*), Sundays *only*, on CHOL (11.72) and CHLS (9.61) at 0345-0530. To Latin America and the Caribbean, 1845-1930 (*English*) on CKCX (15.19); same time in Spanish on CKRA (11.76); 1930-2030 in Portuguese, 2030-2130 in Spanish, 2130-2145 in French, and 2145-2200 in *English*, all on both CKRA, CKCX. These schedules became effective October 31.

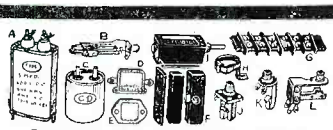
At the time this was compiled, CFRX, 6.070, Toronto, Ontario, was off the air; may be temporary.

Celebes—Radio Makassar, 9.55, now signs off 1000 with a "Goodnight Song" in Dutch. (Dilg, Calif.)

Ceylon—ZOH, 4.900V, Colombo, is heard in England around 1100-1200; BBC news relay 1100 followed by news analysis; no announcement or anthem at closedown. (Pearce)

Chile—CE920, 9.200, Punta Arenas, now is announcing as "Radio Militar Austral" instead of former "Radio Ejercito de Punta Arenas;" scheduled

Arthur T. Cushen, 212 Earn Street, Invercargill, is an internationally-known DX-er. Long a contributor to DX publications, Art has won many radio competitions "Down Under" and is currently editing the house organ for the newly-formed New Zealand Radio DX League.



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E	.0004	2500	.35	E	.0062	1200	.40
E	.00047	2500	.35	D	.008	600	.25
E	.00055	600	.30	D	.0082	2500	1.00
D	.00089	1200	.25	E	.01	500	.25
D	.001	500	.20	D	.01	600	.30
D	.001	750	.20	D	.01	1200	.60
E	.0012	600	.20	E	.01	1200	.60
D	.002	1200	.30	D	.01	2500	1.25
E	.002	2500	.75	E	.01	2500	1.25
D	.003	600	.25	E	.013	1200	.65
E	.003	600	.25	E	.015	2500	1.30
E	.0035	2500	.75	E	.02	600	.45
D	.0039	2500	.85	D	.026	500	.65
E	.0043	2500	.95	D	.03	600	.98
D	.005	600	.30	E	.03	600	.98
E	.005	600	.30	E	.03	1200	1.45
D	.005	1200	.40	E	.033	600	1.10
E	.005	2500	.95	E	.033	1200	1.90
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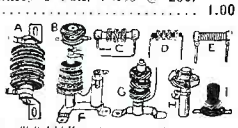

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(B) SICKLES 85MH/250ohms/ceramic form..... 70c
(C) NATIONAL R300/1mh/300ma/10ohms@ 28c; 4 for..... 98c
(C) Two 2.5MH/125ma&.01&.002cdsr&Resist 45c
(D) 5MH/300 ma, pi wound..... 29c
(E) MILLER 2½&5mtr/2.5MH/.27ohms/1A@25c; 5 for 98c
(F) NATIONAL R152/80 & 160 mtrs/4MH/600 ma/10 ohms 98c
(G) SICKLES HF 20MH/200ma75ohms..... 49c
(H) Hash Chokes for MercuryVaporRec@25c; 5 for 98c
(I) SICKLES 1.5MH/200ma. ea. 25c; 5 for..... 98c

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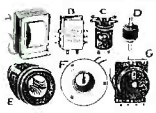

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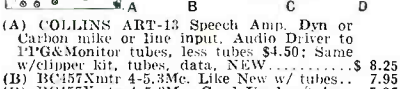

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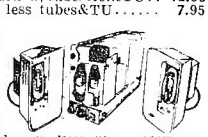
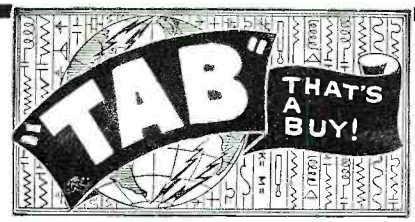
(D) BC375Xmtr. Good Used w/tubes&oneTU.. 12.95
(D) BC375orBC191 as is, less tubes&TU..... 7.95

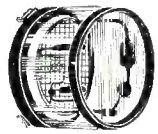
PHOTOFLASH & 2 KRYPTON lamps. New Air Corps 1503 Set, Contains Power Supply'lamps, reflectors, HV rectifier, condensers 50mfd, HV-xformer, relay. Light output 12 million lumens, up to 30000 flashes. For Color & BW film. KIT includes instruction&PARTS to convert from 24VDC to 115AC oper'n. SPECIAL..... $53.95
1"FLASH 1503&Rectified Pwr Supply for 115VAC operation READY TO WORK..... $99.50
1"FLASH Krypton lamps (2)&Reflector 2 for 15.90



PHOTOFLASH CONDENSERS
8mfdGE/660VAC/3000VDC intermittent..4 for $11.95
16mfd/660/660VAC/3000VDC intermitten..... 7.95
15mfd/330VAC/2000VDC intermittent 4.50
25mfd/330VAC/2000VDC intermittent 7.95
16mm/PAN/50Film GSAP Camera 54 for..... 5.49
16mm/PAN Film GSAP Camera 10 for..... 1.49



TUBE SPECIALS—JAN & STANDARD



SNOOPERSCOPE INFRARED. Image-Converter Tube HiSensitivity simplified design 2" dia. Willemite screen—Resolution up to 350 lines/in. Complete data & Tube.

"TAB" SPECIAL $10.98
Any Tube Below..... EACH
6C1, 12A6, VR92..... 23c
954, 956, 957 33c; 10 for $2.98; 100 for..... $25.00
388, 955, 1625, 9001, 9002, 9006..... 40c
2X2, 5U4G, 6H6, 6H6GT, 6SA7GT, 7C4/1203A..49c
1LN5, 1P5GT, 6AC7, 6K6GT, 6SH7, 6SN7GT, 6V6GT, 12SG7, 24G/3C24, 826, 1613/6F6X, 2050 ..... 69c
2C40/446A, 6K5GT, 6L7, 6SL7..... 75c
6AB7/1853, 6AG5, 6AK5, 211C, 215A, 866jr..... 89c
5T4, 6B4G, 807, 816, 866..... $1.15
3BP1, 5FP7, 9JP12 ..... 1.49
9LP7, 710A/8011 ..... 2.69
G.E. GL431A similar 7C29/1KW, HF RF..... $7.95
REL36 ACORN similar 6J1 grid grid, SPECIAL..98c
WRITE for COMPLETE TUBE List & Send us All Tube inquiries & ORDERS—Quantity Prices.

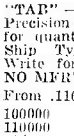
LAMPS, PILOT LIGHTS, SOCKETS

TUNGAR* BULBS	Aviation Lgts	SOCKETS for
20X672* . 2.95	C1249/12VGR	2X2HV... .30
199698* .. 2.95	25 for ..1.00	705/715 .. .69
289881* .. 2.50	Sealed Beam	803/304T. .90
MAZDA PL**	4522/250W 1.49	807 ..... .27
46**Box 10 .50	4560/600W 3.50	813 ..... .69
47**Box 10 .50	NEON BULBS	829/832 .. .25
49**Box 10 .60	NE2—	866 ..... .24
64** @.. .07	100Qty.. 4.50	872/211... .49
56/T4** .. .15	NE16/991. .25	Diheptal .. .69
10 for ... 1.39	NE51/NE20 .08	Magnal ... .59
100W/	Qty 100—	Loktal
20V** .25	NE20... 6.00	495SL ... .24
313/28V** .10	Acorn Sockets	Octal 78S8. .06
323/3V** .10	5 for.... 1.00	Octal 49S8 .15
		Min 59500. .12
		Min & SH .25

LAST SECOND SPECIALS!

IF XFORMERS 456 Kc Double slug tuned Shielded ..... ea. 39c; 3 for $1.00
FM & TV IF Xformer 10-14 Mc double slug tuned. Shielded..... ea. 59c; 2 for 98c
2x0.5x0.3 mfd OIL CNDSR 200VDC, 8 for..... 1.00
ASTATIC L82B Pickup Assy incl. cartridge..... 1.49
AMPHENOL Magic Eye Housing Assy incl. Escutcheon 69c
VOM SWITCH SP 21 pos, Silver cont 36c 6 for 1.49
EVEREADY Hevi-Duty Minimax Battery BA43p/o SCR/.84 90/40/1½ Volts w/octal socket & handle, 2⅝x4¾x6¼". 7.3 lb. Late '47 Date. Ea. $1.39; 2 for $2.49; 10 for..... $10.00

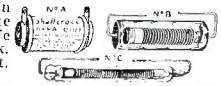
XTAL DIODES & THERMISTORS—NEW



1N34 $1.08; 2 for $2.10; 10 for..... $ 9.85
1N21, 21A, 22, 23, 23A ea $1; 12 for.. 10.00
1N21B, 1N26...$2; 10 for 17.50
1N35 Dual Diode 2.29
D168391 Therm Compensator $2; 3 for 5.00
D170396 HF pwr meas 90c; 3 for..... 2.50
1C Bulb Time Delay 90c; 3 for..... 2.50

PRECISION RESISTORS

"TAB" — Specialists in Precision Resistors. Write for quantity prices. We Ship Types In Stock. Write for complete list. NO MFR'S CHOICE.



From .116 to 99,000 ohms.....30c TEN for $2.50

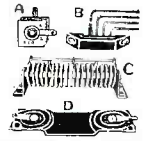
100000	155000	238000	3525000	575000
110000	166750	240000	380000	600000
115000	169360	245000	400000	620000
120000	180600	265000	402000	621000
125000	185000	268000	422000	654000
130000	200600	275000	458000	750000
135000	201000	294000	478000	761300
140000	220000	307500	500000	800000
145000	225000	314000	520000	900000
147000	229000	330000	521000	930000
150000	235500	333500	570000	950000

ABOVE SIZES, EACH.....40c TEN for $3.50

Megohms—1	2	3.673	4.5	11.5
1.2	2.855	3.9	5	12.88
1.5	3	4	9.05	20
1.8	3.5	4.23	10	

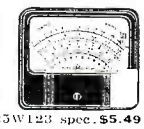
ABOVE SIZES, EACH.....75c TEN for $6.50
Vacuum Precision Hivolt Resistors (C) .12, .25, .6, .75, .85, .99, 1, 1.5, 2, 3, 3.75 megohms.
SPECIAL, each $1.00.....TEN for $7.50
MEGMAX 10 or 12 Meg/10KV/9W each $1.35; 10 for 10.00
MVZ81RC 30Meg/25KV/20W each $1.98; 6 for.. 10.00
MFB1051RC 1Meg ½% accyJAN-R29 $1.98; 6 for 10.00
Weston 20Meg/½% accy 20KV V'mtr stick. 29.95

RECTIFIERS, Bridge (C)



In	Out	Amps	EACH
18V	14V	1.35	$2.49
18	14	3.5	3.49
18	14	5	4.85
36	28	.32	1.49
36	28	3.5	6.75
36	28	5	7.50
90	75	.15	1.49

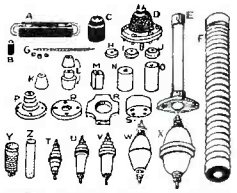
(A) Selenium FEDERAL 100 ma 81c; 200 ma $1.08
(B) Bridge rect. 210Vin/190out/40 ma..... .79
(C) Sel C.T. 36Vin/28 out/1.5 amps..... 1.49



METER 200 MicroampDC GE 4" Sq. 5 scales AC&DCV&ohms Red& Black K.E. pointer. NEW. $6.95
METER 50 MicroampDC 4" Sq. VOM 5 scales, 9 ranges ACDCV& DCma&DBRed&Black K.E. pointer, used in GE Unimeter..... $9.49
METER—10+6 DB WESTON 506 6MW/600 ohms BKlt Csd JAN MR25W123 spec. $5.49

Range	Description	EACH
5 Ma	TuningWeston2½" BKlt Csd.....	$ 1.49
1 Ma	DeJur 2½" BKlt Csd.....	3.95
10&40 Ma	2in1 Hidamping1"Weston½%...	12.95
25 & 2.5 Ma	GE Galvnmtr zero ctr.....	3.95
1 Amp	RF 2½" GE BKlt Csd.....	3.95
5or9 Amps	RF 2½" GE/Wstg B'Csd.....	3.49
750 Ma	RF 2½" Csd&couple Weston ...	3.49
15 Amp	DC 2½" Csd Hoyt	2.95
240 Amp	DC 50 MV mvt 2½" B'Csd AN..	2.49
30 Volt	DC AN 2½" B'Csd Westinhs.....	2.49
2000or500V	DC 1000 ohms/V 3½" B'C WE..	4.95
10000 V	DC 1000 ohms/V 3½" B'Csd..	12.95
150 Volt	AC 2½-125cyc 2½"Wstg&GE....	3.95
7.5 Volt	AC 3½" BKltSq. RA35 Westg..	4.49
15 Volt	AC 3½" BKltSq. Weston476....	4.95
0-200 & 100-0-100 Microamp Twin Mvt Aircraft Type		2.95
1-82 360° Bendix Autosyn.....		4.95
TestLeads&Clips 8ftInsltd30amp 49c; 3 for....		1.20
Test Leads & Red & Blk insltd Prods. HiQlty		.49

INSULATORS

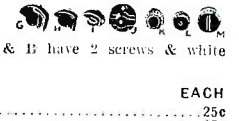


A, B, C, D are glazed brown, others steatite. Length or height in inches. Then base diam. or width if square. STAND-OFF & PILLAR TYPES all tapped both ends (Type E has mtg. flange & 2-clamp screw taps). Type S has 4 thd. holes on ⅜" rad. ea. end. Type F is ridged hi-voltage hollow type. LEAD-IN & THRU PANEL TYPES—size of 2-section types is top section only. Type D is single cup with metal mtg. flange & hardware, Type P is ridged single cup with 3-hole mtg. SPACER, BUSHING & COUPLER TYPES have shoulders. Type G is coax "fish-spine" bead type. Type Q (Beehive) is 4-hole mtd. ¼" I.D. Type R has 2 thd. holes on each of 4 wings.

Type	Size	EACH
STAND-OFF, PILLAR		
E	3x1	.89c
E	8x1	$1.49
F	1⅜8x2¼	2.98
F	1⅜2x2½	3.49
F	2⅛8x3	3.98
K	1x1	12c
M	1x⅜	9c
M	1¼x1⅛	12c
N	⅜x⅜	4c
N	½x⅜	4c
N	⅝x⅜	4c
N	13⁄16x½	5c
N	1x½	9c
N	1x¾	10c
N	1⅛x5⅛	9c
N	1¼x¾	9c
N	1¼x1⅛	10c
N	1⅜x½	11c
N	1⅜x¾	12c
N	1½x1¼	15c
N	2x1⅛	18c
N	2x¾	23c
N	2x1	25c
N	3x¾	25c
N	4x½	25c
N	4x1¼	35c

Type	Size	EACH
N	4½x¾	35c
N	6¾x1	45c
S	1x1⅜	12c
STRAIN TYPES		
A	⅜x⅞	10c
Ball	End, 3x1¼	10c
LEAD-IN THRU PANEL		
C	2x1½	12c
D	1⅛x2¼	49c
L	⅝H, ¼" hole	7c
L	⅛H, ½" hole	7c
L	¾H, ¾" hole	10c
P	1½x2⅛	20c
T	½H, ½" hole	12c
U	1H, ½" hole	10c
V	1¼H, ½"hole	12c
W	⅞x1¼	23c
W	1⅛x1¾	29c
X	1⅝x2½	49c
SPACERS, COUPLING		
G	3⁄16x3⁄16	1c
H	⅛x9⁄16	4c
I	3⁄16x⅝	4c
J	¼x¾	4c
Q	¼x2¼	10c
R	⅝x2½	10c

KNOBS — BAKELITE, black, for ¼" shaft, brass bushing, setscrew types. Sizes are max. OD for round types, length for pointer types. D has white pointer, A & B have 2 screws & white indicator.



Type	Size	EACH
A	2"	25c
B	1½"	15c
C	1⅛"	10c
D	1⅛"	15c
E	1"	7c
G	1½"	15c
H	1¼"	8c
I	1¼"	8c
	⅜" Shaft	
A	2"	25c
C	1½"	15c
	¼", less bushing	
J	1⅝" FOCUS	15c
K	1⅜"	5c
L	1⅛"	5c
	¼" Spring Clips, brown	
M	1⅛"	5c
	WOOD, ¼" clip type, specify blonde or brown.	
E	1"	5c
F—PHONE JACK COVER, spring action		15c

1900-2200, suffers from CWQRM. (Villela, Brazil)

China—Chinese stations have returned to standard time; thus, Nanking outlets now run to around 1015; XGOY, Chungking, runs to around 1150, is on 15.17 to about 0835 and remainder of time uses 11.913. Nanking appears to be using 11.88 in parallel with 15.105 mornings now; the 11.88 channel may have replaced 9.73 which has not been reported to me as heard lately. The "nightly" *English* newscast carried over most Chinese s.w. outlets is now at 0900.

XGAF, 11.680, is usually a fair signal in New Zealand from 0400. (Clark)

In general, reception from Chinese outlets is improving as winter sets in.

XGIO, 8.433, Nanking, "Ching Yuen Chuan Wu," is scheduled 0700-0800, 1000-1100. (Major, W. Australia)

Colombia—Bogota's *new* Emisoras Nuevo Mundo, HJKF, 9.520, now announces schedule of 1000-2300. (McPheeters, La.)

Stark, Texas, and McPheeters, La., report *Radio Pacifico,* 6.055, Cali, at 1030-2230; seems to occupy the spot formerly used by HJFK, "La Voz de Pereira," Pereira, and uses call HJEX; Pereira is officially listed as HJFA on 6.054 with 1 kw.; HJEX formerly used 4.865 and is officially listed there still with 2.5 kw.

Cuba—COCD, 6.130, Havana, "La Voz del Aire," signs off in *English* at 0100. (Smith, Calif.)

Cyprus—JCKW, 7.220, is now transmitting from Nicosia; heard in Sweden at 1700. (Bergstrom) Nilsson, Sweden, reports this one from 2200 and says that at 2300 it is jammed by KZCA, Salzburg, Austria. Has been heard by Kary, Pa.

Czechoslovakia—Prague's 15.32 outlet is heard in England with call at 0950, followed by newscast in Czech. (Pearce) Call is OLR5B.

Prague's OLR3A, 9.55, has news 1645, excellent level. (Boice, Conn.) Is fine signal here in West Virginia, also.

Denmark—On October 1, King Frederik IX inaugurated the Danish Overseas Service from Copenhagen; it is scheduled daily (may not be Saturdays) for Danes in North America on 9.520 at 1900-2030; news around 2000; later will expand service for Danes in other parts of the world, and will add *English,* French, and Spanish periods. Wants reports from anywhere in the world.

Dominican Republic—HI1N (relaying HIN, medium-wave) on 6.050 is the station formerly using 6.244; signs off 2145 and begins daily transmission 1000; uses slogan "La Voz del Partido Dominicano" as well as "Emisoras Unidas," and closes down by saying they are broadcasting from Ciudad Trujillo where repose the bones of Christopher Columbus. (McPheeters, La., Stark, Texas)

Ecuador—HCJB, Quito, now has a program each Sunday at 0100-0200 especially for Spain (transmitted on 5.993, 9.957, 12.455, 15.115); first of this

LEEDS
The Home of RADIO

GREENLEE PUNCHES

Attention all Hams. Here is a Punch you've been looking for. It will cut a 2⅞" Hole, perfect for the mounting of 3" Meters. This Punch will cut up to ⅛" thick steel..... **$12.95**
We also carry a complete line of Radio Chassis Punches in stock.

SELSYN MOTORS

115 Volt AC 60 cycles. Transmitters only. Can be used to turn small beam antenna or as indicators only. 3½" Diameter x 5½" High. Net Weight 10 lbs. Special per Pair—

$5.95

STEP DOWN TRANSFORMERS

Input 220-250 Volts 60 cy.
Output 110-125 Volts 60 cy.
Primary cord and plug, Secondary, Receptical.

80 watts	P-61	$ 4.80
150 watts	P-62	6.45
250 watts	P-63	8.25
500 watts	P-64	10.65
1000 watts	P-65	20.25

TUBES

3C24 Triode 100 Watts output: 6.3 Volts 3 amp. Filaments 2000 Volts plate @ 75ma. Each 39c.....10 for **$3.50**
2x2/879 Rectifier 2.5 Volts 1.5 amp. ..... **.49**
5BP1 5" Cathode Ray Tubes.....$1.29
3BP1 3" Cathode Ray Tubes..... 1.45

WIRE

No. 10 Copper Enamel, 100 Ft. Lengths. Each	**$1.75**
No. 12 Copper Enamel, 100 Ft. Lengths. Each	**1.25**
No. 14 Copper Enamel, 100 Ft. Lengths. Each	**.83**
300 Ohm, Twin Lead Plastic covered, per 100 Ft.	**1.95**
RG-59U 72 Ohm Coaxial Cable, 7c per Ft., per 100 Ft.	**6.75**

PLATE TRANSFORMER

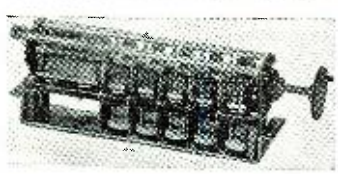
Primary 115/230 Volt. 25-60 cycle. Secondary 820 Volts Center Tapped at 775 Ma. Hardly any voltage drop at 950 Ma. Completely shielded. Dimensions 6⅝ x 6⅝ x 7⅛. Net weight 36 lbs. Special **$7.95**

HEINEMAN CIRCUIT BREAKER

Magnetic Type 5 Amp. Size **95c**

SOCKETS

Low Loss Steatite Wafer Sockets for 829, 832, and 813 Tubes .....Each **73c**



VARIABLE CONDENSER

6 Gang; 1 section of .00025 Mfd, 4 sections .000035 Mfd, 1 section of .00005 Mfd; with 5 air trimmers of 15 to 25 Mmfd capacity. This condenser is all silver plated. Each, only **95c**

SURPRISE OFFER

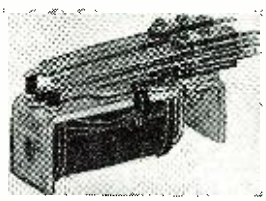
Add $1 to any order you send and get 10 boxes of R.C.A. Parts.

ISOLATION TRANSFORMERS

P-96 117 Volts to 117 Volts 60 cy. 40 watts.....	$ 3.60
P-97 117 Volts to 117 Volts 60 cy. 80 watts.....	5.10
P-98 117 Volts to 117 Volts 60 cy. 100 watts.....	9.30
P-99 117 Volts to 117 Volts 60 cy. 250 watts.....	17.70

RELAYS—CS DIFFERENTIAL

Dual coil with armature pivoted between coils. All contacts normally open. Operates 220-250 Volts. 8000 Ohms each coil, contacts S.P.D.T. Controls rated 2 amps. at 110 VAC. Ideally suited for balanced or bridge type circuits where limited current or power is available. Will withstand 12 G Vibration up to 60 cycles at 35,000 feet altitude. Special low price **88c**



MULTIPLE CONTACT

Telephone Type #882—2 windings. Each 125 ohms.
#881—Single winding. 12500 ohms.

49c

FILAMENT TRANSFORMER

Primary 115/230 volt 60 cycle. Secondary 5 volts at 15 Amps., 5000 volt insulation. Swell for 35T, 75T, 100TH, 250TH, HK-54, etc. Completely shielded dimensions 4¼ x 5 x 5⅛. Net Weight 10 lbs. Special **$3.95**

SHURE X-TAL MIKE & STAND

Made to list for $16.00
Our Special Price..... **$5.50**

DM—43A DYNAMOTOR

Manufactured by G. E., New. Input 24 V. @ 23 amps. 7500 RPM; output 515/1030/2/8 V. @ 215/260 milliamps; filtered. Special **$2.95**

SMALL ITEMS YOU MAY BE LOOKING FOR

Shielded Phone Plug.....	$0.30
10 for	2.50
Arc 5 Banana Plugs. Per Doz.....	.10
Per 100	1.00
⅛ Amp. 3 AG Fuses. Per Doz.....	.25
1 Amp. 3 AG Fuses. Per Doz.....	.25
1/100 Amp. 8 AG Instrument Fuses. Per Doz.	.50
110 V. Pilot Assembly.....	.39
6 V. Pilot Assembly.....	.19
¼ Watt Neons Double Contact Bayonet Base	.20
Per 100	15.00

POTENTIOMETER WIRE WOUND

100,000 ohm, precision made. G.R type, 25 watt, 5½" diameter. Brand New. **$1.95**

CORNELL-DUBILIER TYPE EB 9160

16 Mfd. 450 W. V. Electrolytic in can with mtg. nut. Special..... **79c**

If not rated 25% with order, balance C.O.D. All prices F.O.B. our warehouse New York. No order under $2.00. We ship to any part of the globe.

LEEDS RADIO CO.

Dept. RN12
75 VESEY STREET
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OHMITE LITTLE DEVIL ASSORTMENT

in all-plastic cabinet. Includes 125 selected ½ watt Resistors in 40 different values (10 ohms to 10 megohms). Cabinet is 9" long x 4¾" high x 5¼" deep..... **$10.00**

We also carry a complete line of ohmite rheostats, variable resistors, dummy antennas, etc.

STANDARD STEEL CHASSIS

4 x 4 x 2 Black Crackle.....	$0.59
6 x 14 x 3 Black Crackle.....	1.06
10 x 14 x 3 Black Crackle.....	1.44
10 x 17 x 3 Black Crackle.....	1.44

STEEL CASES

4 x 4 x 2 Black Crackle.....	$0.67
4 x 5 x 3 Black Crackle.....	.79
6 x 6 x 6 Black Crackle.....	1.03
12 x 7 x 6 Black Crackle.....	1.91
15 x 9 x 7 Black Crackle.....	2.65

OIL FILLED CONDENSERS

4 Mfd. 600 Volt D.C. Sprague.....$	.49
8 Mfd. 1,000 Volt D.C. Tobe.....	1.69
0.5 Mfd. 600 Volt D.C. Bathtub. Each	.19
10 for	1.50
7.5 Mfd. 330 Volt A.C. G.E.	.98
2 Mfd. 10,000 Volt D.C. C. D.	13.95
1 Mfd. 750 V. Sprague.....	.25
Dual .1 Mfd. 600 V. CD Type DYR, each	.19
Per 100	10.00

BIAS TRANSFORMER TYPE KS 8779

Completely shielded. Insulator Terminals.
Primary 115 Volts 60 cycle
Secondaries 180 V. @ 20 Ma.
300 V. @ 20 Ma.
6.3 V. @ 1.2 amps.
5.1 V. @ 7 amps.
Special **$1.95**

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Type 20: 115 V. input, 0-135 V. output @ 3.0 amps. 0.4 KVA.....	$12.50
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series broadcast brought some 60 letters in less than two weeks; incidentally, on a test program of February 29, HCJB received more than 500 letters from all parts of the world.

HCJB is carrying out tests to Europe on Tuesdays *through* Fridays around 1500-1600 (may start as early as 1430) on 17.890 which is a provisional channel for the present; *reports on reception of this outlet are welcomed from any place in the world,* to HCJB, Casilla 691, Quito, Ecuador. (I believe the 17.900 transmitter is working with 10 kw.)

Egypt—SUX, 7.863, Cairo, is usually heard at fair strength in New Zealand around 1430. (Gray)

French Morocco—Sutton, Ohio, reports CNR3, 9.082, Rabat, at 1600-1645; news in French 1615.

Gambia—British sources say Bathurst's *"Radio Gambia"* will be back on the air soon on 9.530; QRA is Electrical Branch, P.W.D., Gambia, West Africa. (Harrison)

Germany—*"Radio Volga,"* 7.611, Berlin, relaying Moscow, has been picked up by Kary, Pa., on measured 7.610 from tune-in at 2150 until after 1750; heard relaying Moscow's German-language service to 2147 at which time concluded with usual "Republic of the Free;" then continued in Russian with typical folk songs to past 1730; fair level but bad QRM.

Leipzig, 9.729, now signs on 2200 instead of 2300; has news in German 2200, after sign-on with male rendition of a German song with orchestral accompaniment, which number is *always* played. (Ormond, N.C.)

Greece—*Radio Athens,* 15.345, still sends a good signal to North America 1730-1830, news near start. (Hagen, Ala.)

Guatemala—Worris, N. Y., reports TGWA, 9.760, and TGWB, 6.430, were heard recently at 2330-0000 with a program in *English* called "Guatemala Marches On;" I have noted recently that TGWA has been announcing more frequently in *English* than formerly; congratulations to "La Voz de Guatemala!"

India—Current AIR schedules are—DELHI—VUD2, 10 kw., 7.290, 2130-2330; 9.630, 0200-0400 (0200-0430 on days of educational broadcasts); 9.630, 0630-0800; 4.960, 0815-1230. VUD3, 5 kw., 9.670, 2040-2245; 17.760, 0200-0400; 17.760, 0715-0745; 9.670, 0800-0830; 15.290, 0845-1130; 6.110, 1200-1245. VUD4, 10 kw., 11.850, 2040-2200, 2215-0145, 0215-0315, 0430-0800; 9.590, 0830-1100, 1115-1230; 7.290, 1730-1825. VUD7, 100 kw., 15.160, 2040-2145, 2215-0230, 0315-0345, 0500-0945, 1000-1100, 1115-1230. VUD8, 7.5 kw., 21.510, 2215-0230, 0500-0830, 0900-1110, 1115-1230. VUD9, 7.5 kw., 15.350, 2215-0230, 0340-0400, 0430-0830, 0900-1110, 1115-1230. VUD10, 20 kw., 9.630, 2040-2100; 17.830, 2215-0230; 21.510, 0315-0345; 17.830, 0430-0700; 7.290, 0800-0930. VUD11, 20 kw., 11.760, 2040-2200; 15.290, 2215-0030, 0130-0145, 0200-0400, 0500-0700, 0715-0745; 6.010, 0800-0830; 9.630, 0900-1110; 4.860, 1200-1245.

Bombay—VUB2, 10 kw., 7.240, 2100-2300; 9.550, 0130-0400; 7.240, 0550-0845; 4.880, 0900-1230.

Calcutta—VUC2, 10 kw., 7.210, 2030-2230; 9.530, 0200-0430; 9.530, 0600-0800; 4.840, 0815-1200.

Madras—VUM2, 10 kw., 7.260, 2030-2230; 9.590, 0200-0430, 0530-0630; 4.920, 0700-1200.

Israel—Kol-Yisrael, 6.835, Tel Aviv, now has news 1415, leaves the air 1430 "until 1:45 p.m. tomorrow afternoon." (Pearce, England)

Italy—Rome's program in *English* scheduled for every *third* Sunday is now at 1000-1030 on 9.63, 11.81; other Sundays presumably uses other languages for this period. (Pearce, England)

Jamaica—ZQI, Kingston, has been carrying out tests on 6.070 around 1600-1730 and 1900-2200; wants reports. Has been heard well in East and has been picked up by Dilg in California. Carries some BBC relays. Formerly used 4.950 and 3.480 for these respective daily beams.

Japan—JKE, 9.605, Tokyo, has been heard relaying WVTR (AFRS) around 0200-0347 when it leaves the air suddenly in the middle of music, with no closing announcement; announces JKD, 6.015, as in parallel. (Alcock, Kentucky) In a letter to Stien, Calif., Armed Forces Radio Station WVTR, APO No. 500, % Postmaster, San Francisco, California, USA, listed schedules— "JKD, 6.015, 1630-0905; JKE, 9.605, 1630-0515; and JKE2, 4.860, 0515-0905, relaying WVTR, 870 kc., Tokyo." These stations are operated by the Troop Information and Education Section, Headquarters 8th United States Army, Tokyo.

Java—Dilg, Calif., has identified the station on about 7.300 as *Radio Indonesia*, Soerabaja, formerly known as *Radio Remsi Soerabaja;* last year it used 7.274 in winter and this summer employed 13.359; the 7.300 channel appears in dual with Soerabaja on 4.365; sign-off is 0930 and normally "Aloha" is used as signature but at times "Song of the Islands" has been heard; probably opens around 0500 or 0600; uses Mandarin, Balinese, Javanese, and Indonesian Malay.

Kenya—Nairobi, 4.850, was heard on a Sunday recently at 1210 giving details of the week's programs; still quotes frequency as 4.885 but is heard closer 4.850; schedule Wednesdays and Saturdays is 1000-1500, other days 1000-1400. (Pearce, England) Swedish sources list Nairobi on 4.850 at 0500-0600 (Saturdays 0500-0615), 1000-1400 (Wednesdays, Saturdays 1000-1500) carrying *English* programs; and on 6.050 at 1200-1300 or 1310 with Indian programs, and on Sundays at 0200-0600 with British Forces programs.

Korea—Fern, Hawaii, reports Pyongyang, 7.775, North Korea, heard in parallel with 4.400 at 0300-0830, 0900-1030; Korean throughout except for Chinese 0330-0400; Dilg, Calif., also hears this one but places frequency closer to 7.800. Call is JWM.

(*Continued on page* 160)

Recording of Sound

(*Continued from page* 50)

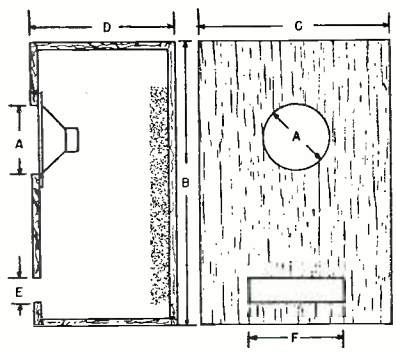
cuit as shown in the electrical equivalent circuit of Fig. 7B. The design conditions which have been found to give satisfactory results in the design of such baffles are that; *a.* the resonant frequency of the vented enclosure should be approximately the same as that of the loudspeaker, and *b.* the aperture or area of the vent should approximate the effective radiating surface of the loudspeaker. When the cabinet and vent dimensions are suitably chosen, the sound radiated from the vent is practically in phase with that from the loudspeaker, so that the low-frequency response is extended and a smoother frequency response characteristic is obtained. The frequency response of a typical bass-reflex loudspeaker system is shown in curve *A* of Fig. 7C; for comparision, the frequency response of the loudspeaker in an open-back cabinet having the same volume is shown by the dotted curve labeled *B*.

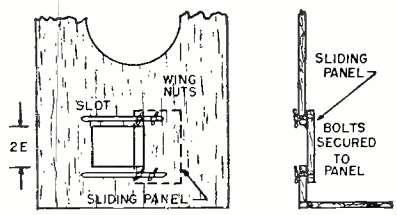
The bass-reflex loudspeaker cabinet is widely used in high-quality sound reproducing systems. It is being used commercially with excellent results with loudspeakers ranging in size from 8-inch to the large 18-inch low-frequency units of dual systems of the type used in theaters and auditoriums. It is also one of the most satisfactory types of loudspeaker enclosure for home construction, since it is quite simple to construct and lends itself easily to modification to compensate for variations in speakers and in listening conditions. The chart in Fig. 8 gives the various physical values and dimensions for the design of bass-reflex cabinet for any of the good standard and high-fidelity 8-inch, 10-inch, 12-inch and 15-inch loudspeakers in general use at the present time. The drawing which accompanies the chart in Fig. 8 also shows the manner in which the resonant cabinet characteristics may be adjusted to compensate for listening conditions.

The listening conditions in most living rooms are far from ideal, since various factors such as the distribution of furniture, rugs and draperies, the size and shape of the room, the reflective and absorptive capacity of the various exposed surfaces, and the position of the loudspeaker in the room will affect the listening conditions appreciably. In many cases the ideal flat, linear response may not be the most desirable, and certain corrections should be made in the frequency response to compensate for the room characteristics. When a bass-reflex baffle is used, this may be done

Fig. 8. Dimensions for constructing a bass-reflex loudspeaker cabinet. Note that the housing is to be made of rigidly constructed ¾ inch plywood with felt padding behind speaker.

LOUD-SPEAKER SIZE	TYPICAL COMMERCIAL LOUDSPEAKERS	OPEN-ING	OVER-ALL CABINET DIMENSIONS			VENT DIMENSIONS	
		A	B	C	D	E	F
8 INCH	Jensen P 8 SH General Electric S800D, S810D, S818D Utah SP 8 JW	6½" diam.	23"	17¾"	10¼"	3"	9¼"
			Enclosed volume = 2800 in.³			Area = 28 in.²	
10 INCH	Jensen P 10 SH General Electric S1001D	8½" diam.	28½"	22"	12½"	4"	12½"
			Enclosed volume = 5700 in.³			Area = 50 in.²	
12 INCH	Jensen P 12 SH General Electric S 1201 D Utah SP 12 LW	10½" diam.	34"	26"	14¾"	5¼"	16½"
			Enclosed volume = 10,000 in.³			Area = 86 in.²	
15 INCH	Jensen P15-NH JAP-60 JHP-52	13¾" diam.	41"	30½"	17¼"	7¼"	21"
	RCA LC-1A	15⁵⁄₁₆" diam.	Enclosed volume = 16,200 in.³			Area = 150 in.²	





Details of the sliding panel by which the vent opening in the bass-reflex cabinet may be adjusted in order to change the resonant frequency of the cabinet unit.

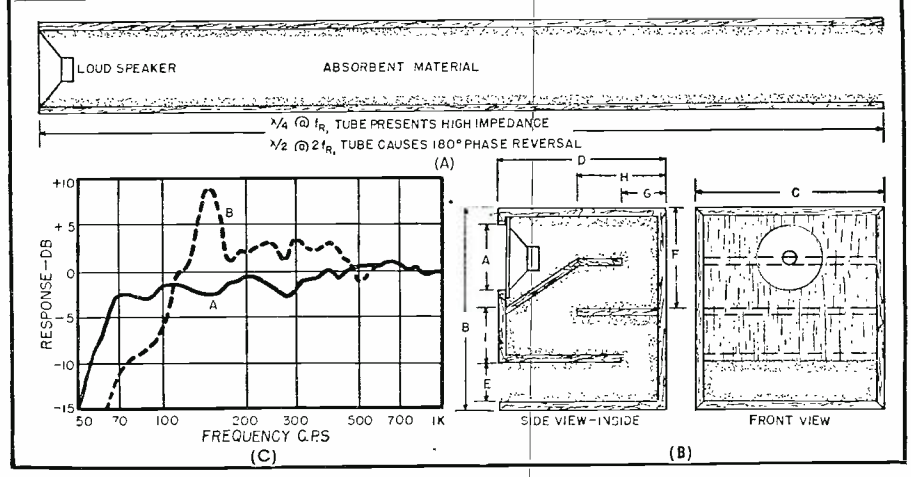
directly in the loudspeaker system by use of the method shown in Fig. 8. By making the vent in the box adjustable as indicated, the resonant frequency of the baffle may be adjusted over a wide enough range to make the necessary compensations in the low frequency response of the loudspeaker. Once the speaker is installed in its cabinet and placed in its normal position in the room, the adjustment of the desired opening is best done by ear until the response of the system sounds best for such program material as a broadcast of a symphonic orchestra or the reproduction of good records.

Another type of resonant phase inverter cabinet makes use of the distributed constants of a line instead of using the lumped constants of the bass-reflex vented box. The method of using a resonant line instead of lumped inductance and capacity is probably familiar to anyone who has done any work or experimentation in radar or in ultra-high-frequency amateur communication, where parallel lines and coaxial lines are used as tuned circuits instead of using the standard lumped inductance-capacity tuned circuits which are used at lower frequencies. The same method may be used in the design of acoustic resonant circuits for use with loudspeaker baffles. The manner in which this is accomplished is illustrated in Fig. 9. An absorbent-walled tube is coupled to the back of the loudspeaker at one end, and is open to the air at the other end. At the frequency for which the tube is one-quarter wavelength long, the tube sees a low impedance at the open end and therefore presents a high impedance to the back of the loudspeaker cone. Thus, by choosing the length of the tube so that it is a quarter-wavelength at the resonant frequency of the loudspeaker suspension, the resonance of the speaker is damped in the same manner as with the bass-reflex cabinet. At double the resonant frequency, the tube is a half-wavelength long and the phase is reversed, therefore the sound through the tube is in phase with that from the front of the loudspeaker and the response is increased. The tube lining absorbs almost all of the sound above about 150 cycles, therefore the higher resonances have no effect.

The principle of the resonant acoustic tube is adapted for use as a loudspeaker baffle by folding the tube in the manner shown in Fig. 9B so that the total outside dimensions are practical for use as a cabinet in the home or studio. A loudspeaker cabinet of this type is known as an "acoustical labyrinth." In general the cross-section of the tube is approximately the same or a little smaller than the effective radiating area of the loudspeaker. Fig. 9 gives the various values and physical dimensions for the design and construction of "labyrinth" baffles for the same loudspeakers which are given with bass-reflex cabinets in Fig. 8. The precise manner in which the tube is folded to form the

Fig. 9. Dimensions for constructing labyrinth loudspeaker cabinets. (A) Method by which a resonant tube is used to improve loudspeaker performance. (B) Labyrinth speaker cabinet formed by folding the resonant tube. (C) Curve A is a typical frequency response of a labyrinth loudspeaker system. Curve B is the frequency response of the corresponding open-back cabinet system for comparison. Note: In assembling, be sure to nail and glue all joints securely. Front may be screwed on.

LOUD SPEAKER SIZE	SPEAKER OPENING	OVERALL CABINET DIMENSIONS			PARTITION POSITIONING					MATERIAL
	A	B	C	D	E	F	G	H	I	
8 INCH	6½" diam.	17"	14"	11½"	3"	9½"	2½"	5"	3¾"	½" plywood ½" felt padding
10 INCH	8½" diam.	21¾"	17"	14"	4½"	10½"	4"	5"	3"	¾" plywood ¾" felt padding
12 INCH	10½" diam.	27¾"	21"	16¾"	6"	13½"	5¾"	6¼"	5"	¾" plywood 1" felt padding
15 INCH	.....	35"	25"	21"	7"	18"	6½"	7½"	4"	¾" plywood 1" felt padding



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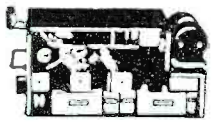

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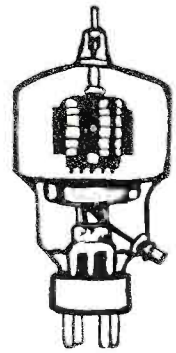

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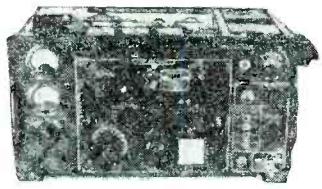

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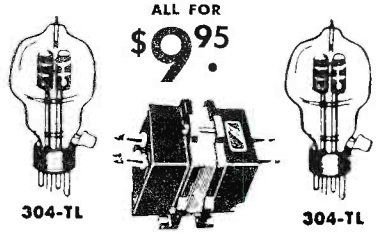

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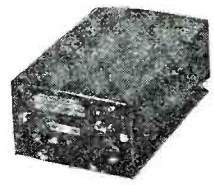

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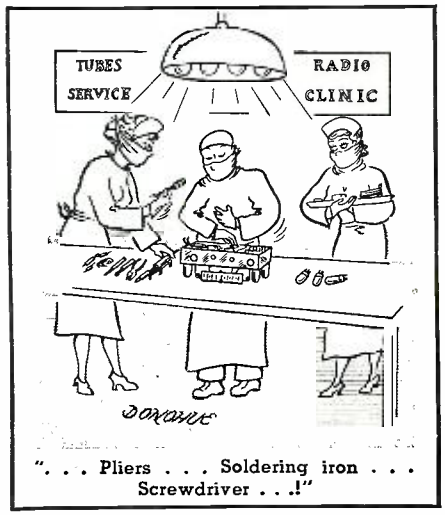
labyrinth baffle is not important as long as the length and the cross-sectional area are correct, therefore the tube may be folded in any manner which fits the individual requirements. The design data which is given in Fig. 9 covers just one of the many ways in which the tube may be folded.

The author has constructed a labyrinth baffle of this type using a *Jensen* 8-inch high-fidelity loudspeaker (type No. PM8SH) which has given excellent results. It has been tested by listening comparison with various high-quality loudspeaker systems, and has been found to be almost indistinguishable from some of the best of the expensive studio monitoring loudspeakers even at very loud home-listening sound levels.

The labyrinth type of loudspeaker enclosure has the advantage over the bass-reflex cabinet that for the same loudspeaker it occupies a considerably smaller space. The bass-reflex cabinet has the advantage that it is simpler and less expensive to construct, and can be tuned over a certain frequency range by adjusting the vent opening. Therefore the choice of which type of loudspeaker baffle to use in any specific case depends upon the individual requirements. If space is not an important factor and expense is, then the bass-reflex cabinet is best to use. If space is limited, then the acoustical labyrinth cabinet should be used. If a loudspeaker with a low resonant frequency is used, then the infinite baffle cabinet can be used to good advantage.

When a good loudspeaker is used in the proper type of baffle according to the information given in this article, the listener will be able to obtain remarkable naturalness and clarity of sound reproduction which is at the present time attained only by the most expensive commercial loudspeaker systems.

"The Recording and Reproduction of Sound" has been based on material from the author's book "The Recording and Reproduction of Sound" to be published by Howard W. Sams & Co., Inc., 2924 East Washington Street, Indianapolis 6, Indiana. —30—

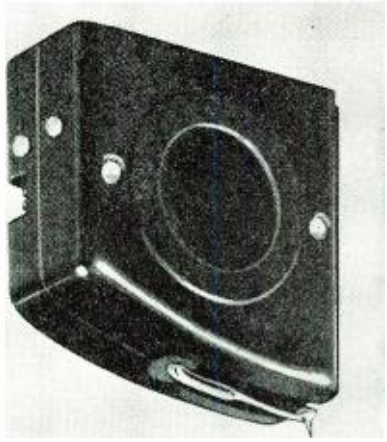


". . . Pliers . . . Soldering iron . . . Screwdriver . . .!"

What's New in Radio

(*Continued from page* 80)

recordings, is readily interchangeable with a companion cartridge LP-78 for playing conventional 78 r.p.m. records. The cartridges may be changed in seconds because they fit firmly into position in the pickup on the same slip-in principle by which the cap and



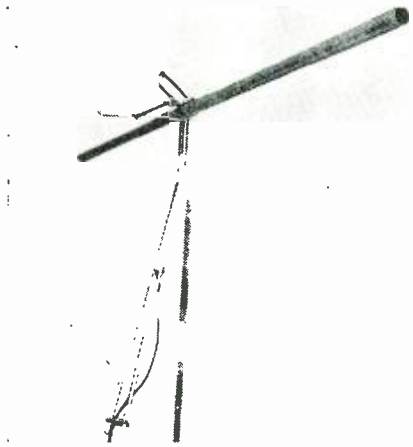
body of some modern fountain pens are joined. By merely slipping in either cartridge, the user has the proper pickup for 78 or 33⅓ r.p.m. records and at the same needle pressure of five grams.

For further information on either the FL-33 pickup or the LP-33 crystal replacement cartridge write to *The Astatic Corporation*, Conneaut, Ohio.

NEW VEE-D-X UNITS

LaPointe Plascomold Corporation of Unionville, Connecticut has announced several new additions to its line of antennas and accessories.

A new antenna, known as the "Sky Monitor," has been designed for use in prime and near fringe TV areas. This unit offers broad-band characteristics



and reasonably high gain. It also provides a tunable "*Q*" section for matching line impedance and permits the user to orient the high channels independently of the low channels. Polyethylene is used for insulation at all points of high frequency.

The company also announced a new "all-angle" antenna mast mount made

of cast aluminum. This unit has been designed so that the mast may be inserted into the mount and the antenna attached to the mast while the installer stands on the ground. The entire unit, mast and mount, is then swung into position on the rooftop or side of the building by means of guy wires.

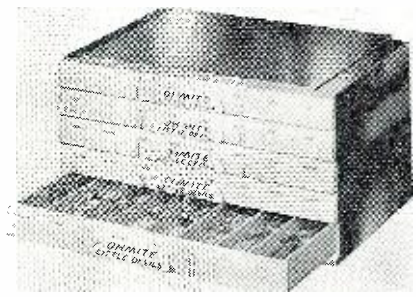
A new manual antenna rotator designed for permanent attachment on masts was also introduced. Designed to clamp firmly around the antenna mast the rotator has a 12 inch long handle to provide the necessary leverage required for rotating the antenna. Lightweight, made of cast aluminum, it will withstand the most severe weather conditions without rusting.

For full details on any or all of these products write *LaPointe Plascomold Corporation,* Unionville, Connecticut.

RESISTOR ASSORTMENT

To provide servicemen and experimenters with a neat and convenient method of storing composition resistors, *Ohmite Manufacturing Company* of Chicago is offering a new servicemen's resistor assortment in a modern plastic cabinet.

The assortment consists of 125 selected *Ohmite* "Little Devil" individually marked insulated composition



resistors of the ½ watt size. These resistors are furnished in 40 resistance values from 10 ohms to 10 megohms and represent the types most frequently used by the radio serviceman in his daily work.

The resistors are factory-packed in a compact cabinet with five drawers and eight compartments in each drawer. Resistance values are clearly printed in front of each compartment so the desired resistor can be located instantly.

For complete information on this new resistor assortment write *Ohmite Manufacturing Company,* 4835 Flournoy Street, Chicago, Illinois.

INDOOR TV ANTENNA

The Radion Manufacturing Co. of Chicago has announced the availability of the new "Teletena," an indoor television antenna which will retail in the low price class.

Designed specifically for indoor use with modern television receivers, the antenna is a dipole type with telescoping arms which cover all 12 channels. The unit may be attached to the regular antenna terminals on the TV re-

BLEEDER RESISTOR 50,000 ohm 100 Watt **49c** Ea.

R-H-S
SPECIALS OF THE MONTH

UTC OUTPUT TRANSFORMER
Pentode to 8 ohm, 128 ohm and 500 ohm line. 12 Watts.
TYPE G2 ..... **98c** ea.

1 K.W. POWER SUPPLY KIT

2500-0-2500 Volts @ 500 MA
or
2000-0-200 Volts @ 500 MA
(oil-filled Xformer from BC610) ..**$39.95**

1—Swinging choke	14.95
1—Smoothing choke	7.95
1—Filament Xformer	9.95
2—2 Mfd.—3000v Condensers, each	3.45
2—872A Tubes each	1.95
2—Plate Caps for 872A...each	.20
2—Sockets for 872A.....each	1.19
2—Hash Filter Chokes.... pr. .79	
All Parts New! Reduced to	**$79.50**

SELENIUM RECTIFIERS
Full Wave Bridge Type

INPUT	OUTPUT		
up to 18v AC	up to 12v DC	½ Amp.	**$0.98**
up to 18v AC	up to 12v DC	1 Amp.	**1.95**
up to 18v AC	up to 12v DC	5 Amp.	**4.45**
up to 18v AC	up to 12v DC	10 Amp.	**7.45**
up to 18v AC	up to 12v DC	15 Amp.	**9.95**
up to 18v AC	up to 12v DC	30 Amp.	**14.95**
up to 36v AC	up to 28v DC	1 Amp.	**3.45**
up to 36v AC	up to 28v DC	5 Amp.	**7.45**
up to 36v AC	up to 28v DC	10 Amp.	**12.45**
up to 36v AC	up to 28v DC	15 Amp.	**18.95**
up to 115v AC	up to 100v DC	.25 Amp.	**2.95**
up to 115v AC	up to 100v DC	.6 Amp.	**6.95**
up to 115v AC	up to 100v DC	5 Amp.	**19.95**
up to 115v AC	up to 100v DC	3 Amp.	**12.95**

OIL CONDENSERS
NATIONALLY ADVERTISED BRANDS
All Ratings D. C.

2x.1mfd.	600v	**$0.35**	1mfd.	2000v	**$0.95**
.25mfd.	600v	.35	2mfd.	2000v	**1.75**
.5mfd.	600v	.35	4mfd.	2000v	**3.75**
1mfd.	600v	.35	15mfd.	2000v	**4.95**
2mfd.	600v	.35	4mfd.	2500v	**3.98**
4mfd.	600v	**.60**	2mfd.	2500v	**2.49**
8mfd.	600v	**1.10**	.1mfd.	2500v	**1.25**
10mfd.	600v	**1.15**	.25mfd.	2500v	**1.45**
3x.1mfd.	1000v	.45	.5mfd.	2500v	**1.75**
.25mfd.	1000v	.45	.05mfd.	3000v	**1.95**
1mfd.	1000v	**.60**	1mfd.	3000v	**2.25**
2mfd.	1000v	**.70**	.25mfd.	3000v	**2.65**
4mfd.	1000v	**.90**	1mfd.	3000v	**3.50**
8mfd.	1000v	**1.95**	12mfd.	3000v	**6.95**
10mfd.	1000v	**2.10**	2mfd.	4000v	**5.95**
15mfd.	1000v	**2.25**	1mfd.	5000v	**4.95**
20mfd.	1000v	**2.95**	.1mfd.	7000v	**2.95**
24mfd.	1500v	**6.95**	3mfd.	4000v	**6.95**
.1mfd.	1750v	**.89**	2mfd.	3000v	**3.45**
.1mfd.	2000v	**.95**	2x.1mfd.	7000v	**3.25**
.25mfd.	2000v	**1.05**	.02mfd.	12000v	**9.95**
.5mfd.	2000v	**1.15**	.02mfd.	20000v	**11.95**

HIGH CAPACITY CONDENSERS

10,000 mfd.—25 WVDC	**$6.95**
2x3500 mfd.—25 WVDC	**3.45**
2500 mfd.—3 VDC	**.39**
3000 mfd.—25 WVDC	**2.49**
2x1250 mfd.—10 VDC	**1.25**
1000 mfd.—15 WVDC	**.99**
200 mfd.—35 VDC	**.59**
100 mfd.—50 WVDC	**.49**
4x10 mfd.—400 VDC	**.89**
4000 mfd.—18 WVDC	**1.95**
4000 mfd.—25 WVDC	**2.95**
4000 mfd.—30 WVDC	**3.25**

FILTER CHOKES
HI-VOLTAGE INSULATION

8 hy @ 550 ma....	$7.95	25 hy @ 3 ma....	$3.45
8 hy @ 300 ma....	3.95	1 hy @ 800 ma....	14.99
25 hy @ 160 ma...	3.49	30 hy @ 250 ma...	2.45
12 hy @ 050 ma...	2.25	10 hy @ 200 ma...	1.98
30 hy @ 70 ma....	1.39	15/20 @ 85 ma....	1.59
.05 hy @ 15 amps..	7.95	15 hy @ 125 ma...	1.49
.1 hy @ 5 amps....	6.95	15 hy @ 100 ma...	1.39
4 hy @ 600 ma....	5.95	8 hy @ 50 ma.....	.29
200 hy @ 10 ma...	3.49	30 hy Dual @ 20 ma.	1.49
600 hy @ 3 ma	3.49	8/30 hy @ 250 ma..	3.50
.065 hy @ 2.5A....	2.49	10 hy @ 100 ma...	1.29

RADIO TUBES
NEW! STANDARD BRANDS!

1B24	$1.95	726A	$4.50	1Q5GT	$ .95
1B26	4.95	800	1.69	1R5	.79
1B29	.89	801A	.49	1S4	.69
1N21	.59	802	2.95	1S5	.59
1N23	.59	803	5.95	1T4	.59
1N34	1.60	805	3.95	3Q4	.59
1P24	.89	807	1.19	3Q5	.69
2AP1	2.39	808	1.95	5S4	.59
2C22	.19	809	1.98	5Y4GT	.49
2C26	.29	810	6.25	6A7	.59
2C40	.74	811	1.49	6A8GT	.59
2C44	1.29	812	1.39	6AG5	.79
2C46	3.75	813	5.25	6AG7	.98
2D21	1.59	814	2.75	6B4G	.95
2J21	12.95	815	1.45	6BG6G	1.49
2J22	12.95	816	1.10	6C6	.49
2J26	9.95	826	.49	6D6	.49
2J31	14.95	829B	4.85	6F5GT	.49
2J32	14.75	832A	2.95	6F6GT	.49
2J36	24.95	833A	29.50	6F6	.59
2J37	18.95	836	.79	6H6GT	.39
2J38	14.75	837	1.49	6J5GT	.42
2J39	18.95	838	2.95	6J5	.55
2J40	18.95	841	.50	6J7GT	.55
2J46	18.95	843	.39	6K6GT	.49
2J49	26.95	845	3.29	6K7GT	.55
2J51	69.50	851	12.95	6L6G	.95
2J54B	18.95	860	1.98	6L6	1.23
2J55	18.95	861	11.95	6L7	.79
2K25	24.95	865	.79	6Q7GT	.55
2K28	8.95	866A	.85	6SA7GT	.49
2V3G	.79	866JR	1.10	6SC7	.55
2X2	.39	869B	28.75	6SF5GT	.59
3AP1	2.79	874	.69	6SH7	.49
3BP1	1.39	876	.39	6SJ7GT	.49
3B22	.59	878	1.89	6SK7GT	.49
3B24	.69	884	.79	6SL7GT	.59
3B26	1.95	885	.78	6SN7GT	.59
3CP1	2.95	902P1	5.95	6SQ7GT	.49
3C22	19.95	905	4.95	6V6GT	.49
3C23	2.49	923	.69	6X5GT	.59
3C24	.39	954	.35	7A8	.69
3C30	.59	955	.35	7B7	.69
3C31	1.49	956	.45	7C5	.59
3DP1	2.25	957	.35	7C6	.59
3D21A	1.50	958	.35	7H7	.49
3E29	3.39	1611	.98	7Y4	.49
4B24	2.25	1613	.58	12A8GT	.63
4E27	12.95	1616	.75	12AT6	.49
5AP4	4.75	1619	.21	12AU6	.75
5BP1	1.10	1622	1.59	12BA6	.59
5BP4	4.95	1624	.85	12BE6	.59
5CP1	2.95	1625	.19	12J5GT	.49
5D22	18.95	1626	.25	12J7GT	.49
5FP7	.85	1629	.19	12K7GT	.49
5JP1	11.95	1630	3.95	12Q7GT	.59
5J29	18.95	1638	.69	12SA7GT	.49
5J30	18.95	1654	1.98	12SF5GT	.49
5LP1	11.95	1851	.89	12SF7GT	.59
5R4GY	.89	2050	.75	12SJ7GT	.49
5T4	.69	2051	.45	12SK7GT	.49
5U4G	.45	8005	2.29	12SQ7GT	.49
5V4	.72	8011	.65	12SR7GT	.49
5X4	.59	8012	1.98	14A7	.69
5Y3	.35	8013	.89	14B6	.69
5Z3	.55	8014	6.95	14Q7	.69
5Z4	.79	8016	1.39	24A	.49
6AB7	.95	8020	.89	25L6GT	.49
6AC7	.59	8025	4.98	25Z5	.47
6AK5	.89	9001	.39	25Z6GT	.45
6AL5	.59	9002	.35	26	.45
6C4	.25	9003	.35	27	.49
6D4	1.29	9004	.29	30 Spec	.39
6J4	3.95	9005	.39	32L7GT	1.19
6J6	.89	9006	.29	35/51	.59
6Q5G	1.25	CK1005	.29	35A5	.59
7EP4	17.95	CK1006	.69	35L6GT	.49
10Y	.39	CK1090	1.49	35W4	.39
12A6	.25	EF50	.50	35Y4	.69
12DP7	13.95	F123A	12.95	35Z3	.57
12GP7	12.95	F127A	17.50	35Z5GT	.39
15E	.89	F128A	69.50	36	.79
15R	.89	F660	39.50	41	.52
75TL	3.49	FG81A	4.75	42	.49
100TH	9.95	FG105	7.95	43	.52
211	.35	FG238B	39.50	45	.52
227A	3.75	GL146	10.95	47	.74
231D	1.49	GL605	39.50	50A5	.89
249C	1.75	GL697	29.50	50B5	.59
250TH	19.49	HY75	1.25	50L6GT	.49
304TL	.99	HY615	.49	50Y6GT	.59
304TH	3.95	ML100	49.50	56	.54
316A	.35	ML101	99.50	59	.95
327A	4.95	ML502	99.50	70L7GT	1.29
350B	1.95	VR75	.89	71A	.59
368AS	2.95	VR90	.65	75	.52
371B	.99	VR105	.65	76	.49
450TH	29.95	VR150	.65	77	.49
527	8.95	VT127A	2.49	78	.49
531	2.50	VU111	.49	80	.35
559	.75	024	.59	81	1.55
703A	2.95	1A5GT	.49	82	.89
705A	1.85	1A7GT	.59	83	.89
706CY	18.95	1H5GT	.54	83V	.89
714AY	6.95	1N5GT	.59	84	.59
715B	8.95	1LA4	.95	89	.69
715C	18.95	1LA6	.95	117L7GT	1.15
717A	.59	1LB4	.95	117P7GT	1.15
721A	.59	1LC6	.95	117Z3	.49
723A/B	5.95	1LD5	.95	117Z6GT	.69
724A/B	1.75	1LE3	.95		
725A	7.45	1LH4	.79		
		1LN5	.79		

All Tubes guaranteed, except for open filaments, shorts and broken glass, for which we check before shipment.

500 WATT POWER SUPPLY KIT
(Ideal for BC-191 & BC-375-E)

1—Transformer—Pri: 105/250v AC 60 cyc in. 5v Steps Sec: 1120-0-1120v @ 500 MA 2½v CT @ 10 AMPS	
12v @ 14 AMPS	
17v @ 2½ AMPS	
32v @ .025 AMPS.....	**$32.50**
2—Filter Chokes @ $7.95 ea....	**15.90**
2—Condensers 3 Mfd @ 2000v DC @ $4.45 ea.....	**8.90**
2—866 Tubes @ $.89 ea.....	**1.78**
2—Plate Caps Ceramic @ $.20 ea.....	**.40**
2—Sockets @ $.20 ea.....	**.40**
1 Pair Hash Filter Chokes.....	**.79**
Extra Special Buy	**$49.50**

TRANSFORMER—115 V. 60 Cy.
HI-VOLTAGE INSULATION

371Ov @ 10 ma.; 2x2½v @ 3A.....	$ 9.95
2500v @ 15 ma.....	6.50
2500v @ 4 ma.; 2½v 2A. 6.3v @ 1 amp..	7.95
2-3[illegible]v @ 15 ma.....	5.50
1750v @ 4 ma.; 6.3v @ 3A.....	6.50
1600v @ 4 ma.; 700v CT @ 150 ma.; 6.3v @ 9A.....	7.95
525-0-525v @ 60 ma.; 925v @ 10 ma.; 2x5v @ 3A; 6.3v @3.6A; 6.3v @2A; 6.3v @ 1A	7.95
515-0-515v @ 175 ma.; 5v @ 3A; 2.5v @ 5A	5.95
500-0-500v @ 25 ma; 262-0-262v @ 55 ma.; 6.3v @ 1A; 2x5v @ 2A.....	4.49
500-0-500v @ 100 ma.; 5v CT @ 3A.....	4.95
425-0-450 @ 300 ma.; 140-0-140 @ 100 ma.; 36v @ 1A; 6.3v @ 5A; 5v @ 3A; 110/220 Dual Pri.....	8.95
450-0-425 @ 200 ma.; 150-0-150 @ 100 ma.; 40v @ 1A; 6.3v @ 5A; 5v @ 3A; 110/ Dual Pri. tapped.....	7.50
400-315-0-100-315v @ 200 ma.; 2.5v @ 2A; 5v @ 3A; 6.3v @ 9A; 6.3v @ 9A.....	6.50
400-0-400v @ 200 ma. 5v @ 3A.....	4.95
350-0-350v @ 150 ma.; 5v @ 3A; 6.3v @ 6A; 78v @ 1A.....	4.95
385-0-385-550v @ 200 ma.; 2½v @ 2A; 5v @ 3A; 3x6.3v @ 6A—PRI. 110/220.....	7.95
350-0-350v @ 150 ma.; 5v @ 3A; 6.3v @ 7.5A; 6.3v @ 3A.....	4.99
350-0-350v @ 35 ma.....	1.45
340-0-340v @ 300 ma.; 1540v @ 5 ma.....	5.95
335-0-335v @ 60 ma.; 5v @ 3A; 6.3v @ 2A; 0-13-17-21-23v @ 70 ma.—PRI. 110/220	4.95
325-0-325v @ 120 ma.; 10v @ 5A; 5v @ 7A	3.49
300-0-300v @ 65 ma.; 2x5v @ 2A; 6.3v @ 2½A; 6.3v @ 1A.....	3.49
250-0-250v @ 100 ma.; 2x6.3v @ 4A; 6.3v @ 5A; 6.3v @ 1A.....	4.95
150-0-150 @ 80 ma.; 150 @ 40 ma.; 6.3v @ 3.5A; 6.3v @ 1A.....	1.98
250v @ 55A; 150v @ 2.13A; 5v @ 5A...	5.95
120-0-120v @ 50 ma.....	.98
80-0-80v @ 225 ma.; 5v @ 2A; 5v @ 4A.	3.95
2½v @ 6A.....	3.50
3x18v @ 2A.....	3.95
13.5v CT @ 3.25A.....	2.95
3x10.3v @ 7A; CT.....	9.95
12.6v CT @ 10A; 11v CT @ 6.5A.....	7.95
3x6.3v @ 1A; 2x6.3v @ 2A; 10v CT @ 10A; 12.6v CT @ 1A.....	4.95
6.3v @ 12A; 6.3v @ 2A; 115v @ 1A.....	3.95
6.3v @ 10A; 6.3v @ 1A.....	3.50
6.3v @ 1A; 2½v @ 2A.....	3.45
5v @ 20A; Dual 110v PRI.....	3.49
6.3v @ 21½A; 6.3v @ 2A; 2½v @ 2A...	5.95
5v—190A.... $17.50 6.3v @ 1A....	.98
5v—115A.... 14.95 8v CT 1A.....	.98
2.5v @ 20A... 3.49 6v @ 15ARMS	2.98
6.3v CT @ 3A; 5v CT @ 4A.....	4.25

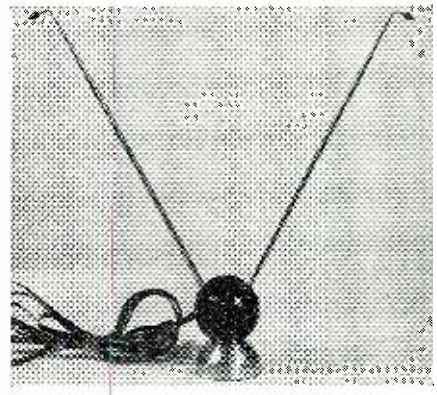
All Prices Subject To Change Without Notice

All merchandise guaranteed. Mail orders promptly filled. All prices F.O.B. New York City. Send money order or check. Shipping charges sent C.O.D. Minimum order $5.00. 20% Deposit required with all orders.

RADIO HAM SHACK Inc.
189 GREENWICH STREET . NEW YORK, N. Y.

ceiver. To provide maximum performance from the "Teletena," the set-owner adjusts the length of the arms to a specific channel, and rotates the base until the unit is on line with the telecast signal.

The Model A antenna unit comes in black plastic and polished aluminum and will also be available in walnut



and brass. It may be mounted on top of the receiver or mounted on the wall or ceiling by means of concealed brackets, if desired.

For further details on the Model A "Teletena," write *The Radion Manufacturing Co.*, 1137 Milwaukee Avenue, Chicago 22, Illinois.

BOWERS TV SIGNAL BOOSTER

Two new television signal booster models have been introduced by *Bowers Battery & Spark Plug Co.* of Reading, Pa.

Both of the new units have been thoroughly field-tested and the company reports that the high gain of these units provides clear, steady pictures in weak signal areas and permits reception of additional stations.

The model TB-26 preamplifies Channels 2 to 6 while the Model TB-213

covers the complete range of channels from 2 to 13.

The booster is housed in a deep brown wrinkle finished case which blends or harmonizes with most room furnishings.

Bowers Battery & Spark Plug Co., Reading, Pa. will provide complete details and prices on request.

PLASTICON COMPONENTS

A new line of "Plasticon" TS capacitors and "Plasticon" TS pulse-forming networks has been introduced by *Condenser Products Company* of Chicago.

The TS capacitors are designed for use at ultra-high temperature d.c. applications and for r.f. bypassing and coupling duty. The dielectric in these capacitors consists of "Teflon" film and "Silicone" fluid. Both materials are unusually temperature-stable and have low dielectric losses.

The pulse forming networks are particularly valuable in applications where the unit must operate at high ambient temperatures of from 150 degrees C up. The dielectric does not fatigue under pulse duty. "Plasticon" networks are said to be smaller and lighter than conventional circuit components. They can be designed for individual applications.

For full information on these new components, write *Condenser Products Co.*, 1375 North Branch, Chicago, Illinois.

REPLACEMENT LINE

Chicago Transformer Division, Essex Wire Corp., of Chicago has announced the addition of a replacement transformer line to its stock transformer business.

This new line represents the company's first entry into the replacement

parts field. Included in the line are power transformers and chokes, driver, speaker matching, interstage, and output transformers in a range of practical ratings. Quality construction throughout, RMA color-coded leads, tinned lead ends, and standard-dimension mountings are featured.

For complete data write *Chicago Transformer Division, Essex Wire Corp.*, 3501 Addison Street, Chicago 18, Illinois.

SPRING-MAKER

General Cement Manufacturing Company of Rockford is currently in production on a new "Speedex" spring maker which has been especially developed for the radio serviceman.

This new unit may be used with any size wire and can make springs of any desired diameter, pitch, number of coils, etc. A simple screw adjustment varies the pitch instantly. Both compression and extension springs can be made.

For full details on the spring maker, or other items in the company's complete line of radio chemicals, hardware, tools, kits, etc. write direct to *General Cement Manufacturing Company*, Rockford, Illinois.

-30-

Printed Electronic Circuits

(*Continued from page 39*)

is playing a very important part in the reduction of size and the insurance of dependable service for the citizens communications receivers and transmitters. One unit already approved by the FCC will make possible the wartime dream of the personal "Walkie-Talkie."

The process is briefly the screening of silver in a definite wiring pattern upon a piece of steatite ceramic material. This is then fired back to pure metallic silver at a temperature of 1400° F., thus making a continuous metallic path adhering to the steatite ceramic with a tensile strength of 3000 lbs./sq. inch. The resistors are applied by a screening method—cured at 600° F.

The advantages of such a method come through the reduction in physical size of the circuit. Furthermore, each circuit is identical to the original or master, having been produced by a photographic reproduction of the circuit itself and applied somewhat in the manner of lithography. Since the basic materials of the circuit are ceramic, and the processing is at elevated temperatures, the PEC is impervious to humidity and extremes of temperature within the normal operating ranges for electronic equipment. Further, it produces electronic circuits as a packaged item, and reduces to a minimum the number of connections which have to be made by a manufacturer of finished equipment. Its flexibility is proved through the fact that it can be brought down to a simple circuit involving only two components, or expanded to embrace the entire group of circuit components, plus wiring for a complete amplifier or radio circuit.

There are relatively few limitations to the manner in which PEC can be applied. These will obviously diminish as their use and application grows. PEC, therefore, has become one of the important contributions to the art of electronics—whether it be for entertainment, communications, or industrial application. —30—

Microtone's hearing aid unit which uses sealed power amplifiers consisting of 12 Centralab "Filpecs" molded into two units.

During the two-day Television Lighting Conference held recently at General Electric Lighting Institute, Nela Park, Cleveland, 84 representatives of TV and broadcasting companies saw light brought to many production problems. During a brief recess during the sessions the photographer found George Stoetzel, director of lighting and live television for Columbia Broadcasting flanked by Richard Blount (left) and Frank Carlson (right) G.E. illuminating engineers. They were discussing a new technique developed at Nela Park designed to eliminate the need for special facial make-up in TV production. It is done with filters.

Within the Industry

(*Continued from page 28*)

new annex adds 66,000 square feet of floor space to the 260,000 square feet of space the company now occupies in its one-story main plant. Access to the new building will be through the main plant.

* * *

DANIEL E. HARNETT has been named director of engineering for *Emerson Radio and Phonograph Corporation* of New York.

Mr. Harnett joins the *Emerson* organization from *Harnett Electric Corporation* of Port Washington, Long Island, where he served as president.

Prior to going into business for himself, Mr. Harnett served eighteen years, several as chief engineer, with the *Hazeltine Electronics Corporation.* At *Hazeltine* he developed eleven patents which are well-known in the radio industry.

* * *

G. V. ROCKEY, a well-known figure in the radio industry, passed away recently in New York.

At the time of his death, Mr. Rockey was associated with *British Industries Corp.* of New York City. During his career in the radio parts field he was associated with *Daven Co., P. R. Mallory Co.,* and from 1932 to 1945 with *Meissner Manufacturing Co.,* as vice-president and sales manager. He joined *British Industries Corp.* in 1945.

* * *

EDWIN A. FREED has been appointed manager of electronic components sales to equipment customers of the *RCA* Tube Department.

Mr. Freed has been equipment sales representative for the New York and New England territories since 1945. He has been associated with the radio business in manufacturing, purchasing, merchandising, and selling since 1922, having started with the original *Freed-Eisemann Radio Corporation.*

He joined *Radio Corporation of America* in 1942 as supervisor of the Material Control Section at the Lancaster Tube Plant. He became a member of the Equipment Sales organization in 1945.

* * *

LECTROHM, INC., longtime manufacturer of vitreous enamel resistors and electric solder pots, has moved to new and larger quarters in Chicago's Clearing District.

The move to the new quarters means a faster and more efficient production

setup for *Lectrohm*. Operations have been streamlined and geared to meet the new demands of the electrical and electronic field.

The company's new address is 5939 Archer Avenue, Chicago 38, Illinois.

* * *

WILLIAM J. HOPKINS has been appointed to the post of eastern division manager for *Sylvania Electric Products Inc.'s* renewal tube sales department of the Radio Tube Division.

Mr. Hopkins was formerly the New England sales representative for the *Burgess Battery Company* of Freeport, Illinois.

In order to handle his new territory adequately, Mr. Hopkins has established his headquarters at Baltimore, Maryland.

* * *

CLAROSTAT MFG. CO., INC. of Brooklyn has moved its plant for the manufacture of resistors, controls, and resistance devices to Dover, New Hampshire.

Associated with the industrial life of Brooklyn for over 25 years, the company's operations in Brooklyn had become so widely scattered as to complicate management and production routines.

The new location permits *Clarostat* to operate under a single roof. The plant in Dover is a four story building over a block long. Offices, plant, and warehousing are now consolidated in a single building. The new factory is entirely modernized with up-to-date illumination, fire sprinkler system, and in part with air conditioning. Over 250,000 square feet are available for the company's manufacturing operations.

* * *

RICARDO MUNIZ of Rutherford, New Jersey has been appointed to the post of general manager of the Television Receiver Division of *Allen B. Du Mont Laboratories, Inc.* of Passaic and Clifton, New Jersey.

Mr. Muniz previously served as technical assistant to Leonard F. Cramer, vice-president of the company, and prior to joining *Du Mont* had extensive administrative and technical experience in electronic manufacturing with the *Monston Manufacturing Co., Espey Manufacturing Company, Radio Navigational Instrument Co.*, and with *International Business Machine Company.*

* * *

THE ASSOCIATED RADIO SERVICE MEN OF N.Y., INC. has launched an ambitious training program for its members.

The new program covering the Fall and Winter-Spring seasons 1948-49, includes twelve lectures dealing with all

phases of television, both theoretical and practical.

Among the firms supplying speakers for this series of lectures are *John F. Rider, Publisher; Delehanty Institute; Howard W. Sams & Co., Inc.; Westinghouse Electric Corporation; Beta Electronics Co.; Transvision Inc.; Bendix Radio; Hickok Electrical Instrument Co.; Sylvania Electric Products Inc.; Kay Electric Co.; Radio Service Dealer;* and *U.S. Television Mfg. Corporation.*

The subjects to be covered include antennas, front ends and i.f. systems, video amplifiers, horizontal and vertical sync circuits, low and high voltage power supplies, cathode-ray tubes and circuits, alignment and test equipment (four sessions), and servicing and test equipment (two sessions).

* * *

W. J. BARRON is the new jobber sales manager of *Merit Coil & Transformer Corp.* of Chicago.

Mr. Barron has been associated with the *Burgess Battery Company* of Freeport, Illinois for the past twelve years with the exception of three and a half years spent in the Signal Corps during the war.

His wide acquaintance in the jobber field as well as his broad experience with transformers in radio and communications make him particularly qualified to handle *Merit's* line of replacement transformers.

* * *

SREPCO, INC. is the newly organized Ohio corporation which was formed to take over the assets and liabilities of *Standard Radio and Electronic Products Company,* now dissolved.

Officers of the new company include Lyndon Francis, president and treasurer; John G. Hain, vice-president; F. O. Arnold, secretary; and H. E. Ruble, assistant-treasurer.

Srepco, Inc. will continue business in the location occupied by *Standard Radio and Electronic Products Company* at 135 E. Second Street, Dayton, Ohio.

Harry Friedman, former president of *Standard Radio,* has been retained to serve as consultant to the new corporation.

* * *

RAYMOND E. PATTEN, director of design of the *General Electric Company's* appearance design division and one of the nation's foremost industrial designers, died recently in the Norwalk (Conn.) hospital. He was 51.

Mr. Patten had been associated with the electrical industry since 1928 and with General Electric since 1930. He was born in Malden, Massachusetts and graduated from M.I.T. He began his career as an industrial designer with *Hume Body Corp.* of Boston where he created custom bodies and automobile appointments. He was also associated with the *Dayton Wright Co.* and *Packard Motor Car Co.* —30—

Communications Receiver

(*Continued from page* 67)

just mixer plate trimmer C_9 for maximum output.

If a peak cannot be reached with the trimmer it will be necessary to change the value of C_5 so that it will.

The next adjustment is to tune the oscillator circuit to the desired frequency. With the main tuning condenser closed adjust the oscillator to 64 mc. This can be checked with a frequency meter or wavemeter. Open the main tuning condenser and the frequency should be 68 mc., or more.

Next connect a 20,000 ohms-per-volt voltmeter across grid resistor R_1. A reading of approximately .3 volt should appear. This would mean the injection voltage was approximately 1 volt due to the voltage divider action of the two grid resistors. If stray coupling is not sufficient to produce this amount of injection voltage a 1 $\mu\mu$fd. condenser connected in the circuit as C_{10} will do the trick.

A hole in the chassis is provided to connect this condenser from the oscillator main tuning condenser to the grid of the mixer tube. This hole provides for extremely short lead length. If such a condenser is not available two pieces of hookup wire twisted will supply the necessary capacity and also provide a means of adjustment.

Next tune the signal generator to 50 mc., close the variable condenser and adjust C_1 for maximum output.

From this point on the oscillator trimmer can be adjusted to give the desired band coverage. Experiment with different amounts of injection voltage and adjust for maximum sensitivity. The amount of injection voltage will not be critical.

If slight inductance adjustment is desired this can be accomplished by pushing together or spreading the coil windings.

There are no critical values in the entire circuit. It is advisable to use ceramic condensers throughout. These condensers have excellent high frequency characteristics where some micas do not.

When the converter has been completely tested cement the coil turns in place.

If this equipment is used in conjunction with the receiver described in earlier issues, voltage regulation is supplied by the other equipment.

This equipment can be used with any receiver capable of tuning to 14 mc. In this case it would be advisable to add a VR-150 regulator tube to the chassis.

The converter was checked using a *Hallicrafters* S-22-R receiver. The sensitivity was 10 microvolts with a signal-to-noise ratio of 5 to 1. No attempt was made to check the alignment of the S-22-R so higher sensitivity may have been available. When used with the regular receiver the sensitivity was 3 microvolts with a signal-to-noise ratio of 10 to 1.

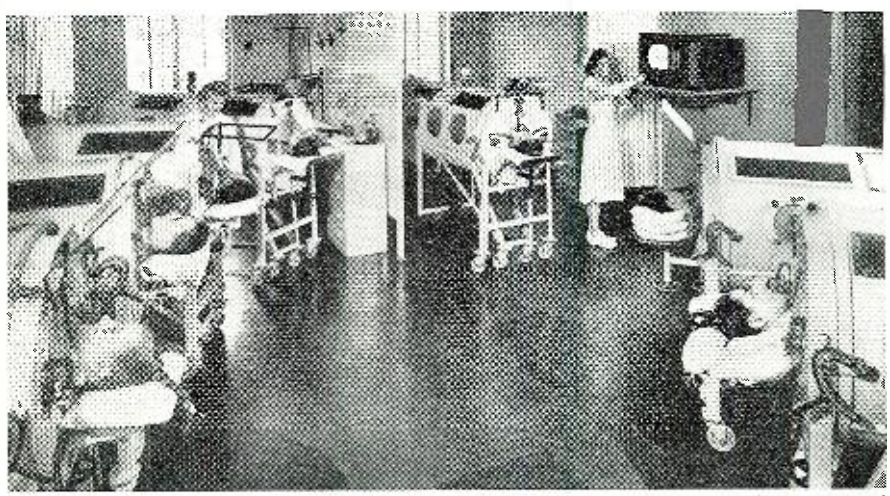
The image ratio was approximately 50 to 1. This image rejection is fair for such frequencies but is not all that could be desired. This is not too important since the circuit is a double superheterodyne.

The image does not fall in any amateur band. There will be a limited number of signals that could cause image interference. Such interfering stations would be fixed frequency. If image interference does develop all that is necessary is to select another i.f. frequency and make necessary adjustments in the converter. This would place the interfering stations outside the image range.

By eliminating an additional tuned circuit in the grid of the mixer or the plate of the r.f. stage, the converter construction was greatly simplified and there was no indication of regeneration. Selectivity is not too much of an item since the majority of the selectivity is governed by the selectivity of the receiver i.f. channel.

(To be continued)

The tedium of lying in an iron lung has been dispelled for polio victims at the Baltimore Children's Hospital School by a Stromberg-Carlson television receiver with a 12-inch screen. The TV set was presented to the hospital by the Baltimore Rotary Club. The institution has the largest concentration of iron lungs in U.S. Special mirrors above the patients' heads enable them to view the video screen.

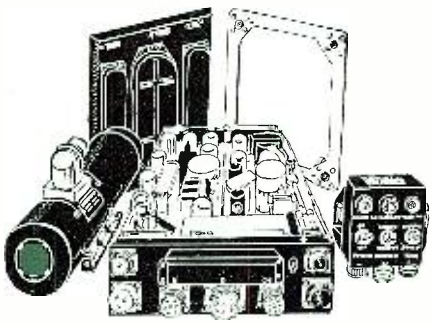


STAHL SEZ!

There's a Reason Why We Add Hundreds of New Names to our ever-growing list each month. Look at these Values!

TRANSMITTER-RECEIVER

Navy Model ABA-1 (CG-43AAG)
Army Model SCR-515A
Known as the BC-645



450 MC—15 TUBES, Brand New

Can be easily converted for phone or CW 2-way communication. Covering the following bands: 420-450 MC ham band, 450-460MC for fixed or mobile, 460-470MC for citizens, 470-500 MC television experimental. Size 10½x13½x 4¾. Contains 15 tubes: 4—7F7, 1—7H7, 2—7E6, 2—6F6, 2—955, 1—WE-316A door knob.

Here is what you get:

BC-645 with 15 tubes
Dynamotor Keyer Unit, CWD-21AAX
Remote Control Unit, CG-23ABJ
Instruction Book

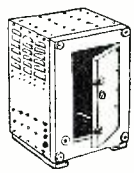
$12.95 Complete

Complete set of plugs, antennas and rack mountings for control box..... **$3.95**

Voltage Regulator

G.E. 110 to 220V AC, 400 cycle, single phase-.15 amp-20 W; 0-7.2 ohms/2.75 amp; black wrinkle finish; metal case..... **$4.95**

Standard Rack Cabinets



Heavy gauge steel, gray crackle finish; panel opening 19" wide, 27" high, 15" deep; weight 150 lbs..... **$12.95**

Blank Calibration Books

For BC 221—Frequency from 125KC to 20000 KC printed in 10 divisions—68 pages, aluminum cover, spiral bound **$1.50**

Oscilloscope

3"—BC991B—can be rack mounted; operates on 6VDC or 110VAC. Complete with 2—6H6; 4—6SF5; 1—6SJ7GT; 1—6SL7GT; 2—5Y3GTG; 1—3P1; in original export packed cases.

Brand New.... **$49.50**

COMPLETE SET of spare tubes same as above plus 1 extra 3P1 in export packed case..... **$12.50**

Navy Standard Battery

Made by Gould Storage Battery Corp. 6 volt 15 amp hour. Excellent for motors, motorcycles, amateurs, experimenters, radio servicemen, etc. Shipped dry, with complete instructions for charging. 4⅝" wide, 4¾" deep, 6¾" high. Shipping weight 12 lbs. While they last..... **$4.95**

Battery Acid—1275 Sp. Grav.

Can be used in any storage battery—in hermetically sealed bottles.
36 oz. bottle..... 79c
92 oz. bottle..... $1.95

METERS
ALL BRAND NEW

☆

SPECIALS

Westinghouse Bakelite Case

2" Round 0-10V-AC-DC	$2.75
2" Round 0-30 Mil DC	2.25
3" Round 0-1 Mil DC with bad & good colored scale; can be used in tube checker	Each $3.45
3" Square 0-3 amp RF	
3" Square 7.5 V-AC	
3" Round 0-15 Mil DC	
3" Round 0-50 Mil DC	
3" Round 0-100 Mil DC	
3" Round 0-150 Mil DC	
3" Round 0-200 Mil DC	
3" Round 0-150 V AC	

WESTON Bakelite Case

2" Round 0-75 amp antenna current Indicator with external couple	$2.75
2" Round 0-10V output, portable; in small wooden case	4.95
2" Round 0-500V DC external multiplier	4.75
3" Round 0-3 amp RF surface mount	3.75
3" Round 0-5 amp external thermo couple	8.50
3" Round 0-150V AC 400 cycle	3.45
3" Square 0-130V AC 60 cycle	3.45
4" Square 0-20 Mil DC	4.75
4½" Round 0-5 amp AC with an 0-200 amp scale	3.95

G.E. Bakelite Case

2" Round 0-15V AC-DC	$2.50
3" Round 0-30	3.95
3" Round. 1 Mil. full scale 0-5 DC—KV; 0-10 DC—MA	3.45

WESTERN ELECTRIC Bakelite Case

3" Round 50-0-50; 5 Mil, full scale	$3.50
3" Round 100-0-100 Mil DC	3.45
3" Round 20 amp DC charge & discharge	3.45

MISCELLANEOUS

3" Round Beede 0-1000 Mil DC	$ 1.95
3" Round Triplett 0-150V AC 60 cyc	3.45
3" Round Burlington 0-75 amp AC	3.45
3" Round, 0-200 Mil. DC	3.45
Roller Smith portable lab 0-15V DC with handle; 5½x6x3½	19.50
Roller Smith portable lab 0-150 Mil DC with handle: 5½x6x3½.	19.50

RADAR JAMMING TRANSMITTER

Ultra High Frequency
Band width 3½ meg. wide

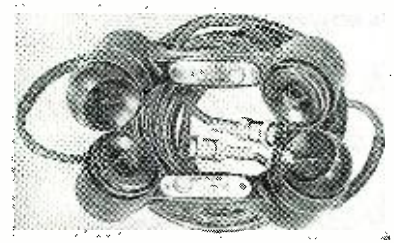
1—931A
2—6AC7
1—6AG7
2—703A
1—807
2—5R4GY
1—2X2

Range 500-700 Meg.

Simple to convert to many uses. Has 10 tubes, contains blower and motor to cool tubes. Brand New and complete with all tubes. Weight approx. 50 lbs. Size 21" l. 10½" w. 7¾" h. in metal case.
Special—While they last.. **$19.95**

SOUND POWER
HAND SETS TS-10

For your antenna installations, you must use—Hand Sets Breast Sets.
TS-10 Sound power hand sets, in original packing. Brand New. Each $15.00.
2 for **$27.95**
RCA-CRV-51019 Hand sets, self-contained battery operated. Uses 4 pen light batteries. Excellent for Television Antenna installation. Sold in pairs only..... **$15.00**



Sound Power head & chest sets. Leaves hands free to work. Consists of head set & chest mike. 2 sets complete..... **$19.50**

WESTERN ELECTRIC CRYSTALS 1N23, 35c each; 3 for..... **$1.00**
HIGH POWER quartz Crystal units, type CF5, 5000 KC. Complete with holder..... **1.95**
ANTENNA for SCR522..... 69c

TRIODE 24G/3C24

100W output. Fil. 6.3V-3A-Plate dis. 25W max plate volts 2,000. Max Ma 75. Here is a real bargain in surplus tubes. One of these tubes will give 100 watts output. Two of them will take ¼ kw. input. Stock No. 3C24—Each..... **39c**
10 for..... $3.50

JEFFERSON TRANSFORMER

Step down (or up) power circuit transformer double wound 230V input 50-60 cycle, to 115V output, .250KVA. Weight 17 lbs..... **$7.95**

SOLAR TRANSFORMER

Step down (or up) transformer, 200V center tapped to 110V; 60 cycle; cap. V.A. 50; metal case, black wrinkle finish; 7 lbs..... **$3.95**

CONDENSERS

G.E.	0.35MFD	5000V	$1.50
G.E.	1MFD	2000V	.75
Sprague	1MFD	3600V	.95
Sprague	3MFD	4000V	5.95
Sprague	1MFD	1000V	.39
Sprague	0.5MFD	1500V	.29
Aerovox	.02MFD	8000V	1.49
Aerovox	2MFD	3000V	2.95
C. D.	.05MFD	200V	.19
Solar	.25MFD	2000V	.39

IFF EQUIPMENT

1293B Signal Corp Scope Unit

Consists of 5" Cathode Ray Tube and 24 Tubes 1221A Indicator consists of high & low Voltage supply—8 tubes, electric eye & Selsyn indicator 110V-60 cycle AC—can be converted into an excellent scope. Shipping weight 500 lbs. Brand New in Original Case. Special..... **$49.50**

MICHAEL STAHL, INC., Worth 4-2882

39 VESEY ST. New York 7, N. Y.

All Mdse. new unless otherwise specified

Prompt Delivery—25% deposit required on C.O.D. order. Shipped F.O.B. New York. Write Dept. RN-12

The Solovox

(*Continued from page* 63)

be conducting at any one particular moment. When one triode is conducting, it is drawing plate current and the resulting voltage drop across the plate load resistor biases the other triode to cut-off and holds it there until the driver sends another negative pulse to the grids of the twin triode. Since one triode is already in a cut-off condition, this negative pulse will have no effect on it, but it will drive the other triode to cut-off condition. When this triode suddenly stops conducting and therefore stops drawing plate current, a positive pulse is produced at the plate terminal of this triode.

This positive pulse appears at the grid of the second triode and it starts to conduct. The instant it starts to conduct and draw plate current, a negative pulse is produced at its plate and this negative pulse is fed back to the grid of the first tube to insure a cut-off condition until the next cycle.

The next input pulse from the driver will have no effect on the first triode (this time) but drives the second triode to cut-off and then starts the first triode conducting. From this it can be seen that two input cycles are necessary to produce one output cycle. This looks rather complicated as it is written in a lot of words, but following the action on the diagram makes it very simple.

The output of the second triode in any divider stage is fed to the grid of the driver of the next stage. Note that the coupling condenser values are doubled in the progressive stages as the frequency is halved.

Now we press a key on the keyboard, a "C" key for instance. Any one of the "C" keys we push down will tune the oscillator to the same frequency by inserting the .0244 μfd. condenser in the strip of twelve, and tuning the oscillator. The oscillator is oscillating and activating all of the frequency divider stages. Let us assume that the audio system is silent for a moment—waiting for the system to select one note out of many that are ready to be admitted, while we follow the path of the note that we chose.

Underneath the keyboard tuning contacts on the diagram are the "Control Contacts." If we depressed the "C" key in the lowest octave, the No. 3 or lowest octave relay is actuated, and all of the frequency dividers are tuned to "C" by the capacitance that is thrown into the grid circuit of the 6SJ7 oscillator tube.

Off the plate of the second frequency divider comes the signal and down to the low octave section of the "Register Controls" through a 47,000 ohm resistor and through the relay to the grid of the preamplifier tube and on into the control tubes to the audio output 6K6's. At the same moment we pressed the key the low octave relay went

into operation and removed the cut-off bias from the control tubes—permitting the signal to enter. This action is described in detail later in the article.

Sound Effects

That note we just released through the *Solovox* was a single note (for purposes of explanation). Now how do we get those beautiful organ tones and other sound effects that create depth and fine tone qualities? When we depressed the key to send our "C" note on its way through the circuit, we also tuned all of the frequency dividers, as noted before, to "C"—but in different octaves. The output of the rest of these dividers is not used at present but if we want the above effects all we have to do is to add the output of one or more of these dividers to the preamplifier input by pressing the "Contralto," "Tenor," "Bass" buttons, and the signals (an octave apart) come through the 47,000 ohm resistor, mix with the original signal, and the composite signal goes on into the preamplifier input grid.

Naturally if two keys are pressed on the keyboard in any octave, some undesirable notes would be created if it were not for a section of the relay that prevents this by selecting only the lower pitched note in such cases.

Between the preamplifier tube and the volume control on the diagram is a switch labeled "Mute." It is shown in the normal position in the diagram, grounding the 6H6 cathodes. Throwing the switch on disconnects the diodes. The odd harmonics of the frequency dividers, which sound like a clarinet, are then produced.

Following the preamplifier is a group of condensers, resistors, and chokes and the controls labeled "Deep Tone," etc., that insert various combinations of resistance, capacity, and inductance into the line to change the characteristics of the signal going to the power amplifiers. For instance; the "Full Tone" contact attenuates some of the high frequencies but does not affect the low or medium frequencies. Other combinations affect the "curve" of the note in other sections. Similar to the tone and treble controls in a radio or public address system, the effects are very pleasing to the ear.

Remembering the "vibrato," magnetically driven reed, we can readily appreciate the range and tone of the *Solovox*. This vibrato reed might be compared to an FM sweep generator, but mechanical in operation and in the audio frequency range.

Control Tubes

Almost any amplifier will pick up and amplify hum, microphonics, and other noises of an undesirable nature, but in the *Solovox*, a unique circuit arrangement prevents any such disturbances from sounding through the speaker—when no key is pressed the *Solovox* is perfectly silent. The normal cathode voltage on the 6SK7 control tubes is 175 volts positive cut-off.

This bias voltage is obtained from the resistors forming the voltage divider attached to the cathodes, the 5000 and 6000 ohm resistors.

When a key is pressed, the relay shunts the 6000 ohm resistor with the resistance of the relay coil, reducing the bias voltage to about 55 volts and the control tubes are no longer cut off, and the "gate is open" for the note to pass through.

The 15 μfd. condenser in parallel with the divider prevents surges, plops, and clicks and makes the entry and departure of the note into the control grids smooth. Fast attack and slow attack is obtained by throwing the .1 μfd. condenser in series with the cathode in or out of the circuit.

Although the depressing of any key throws this cut-off bias off the control tubes, it determines only the matter of signal or no signal, and not *how much* signal. This is taken care of by the volume control which is also part of the voltage divider furnishing bias to the control tubes. This group of resistors in parallel determines how much operating bias and therefore regulates the gain. It is not an ordinary volume control and not subject to the vagaries of such.

A variable control of minimum volume and maximum volume is incorporated in series with this master volume control and is set for the customer's preference. They will vary according to the customer and the location of the instrument. These adjustments may require setting (resetting) if the *Solovox* is moved, for instance, from the living room of a private home to a large auditorium with quite different acoustics.

Full understanding of "How It Works" will enable most servicemen to satisfy many of the customer complaints that will arise—by making a few simple adjustments that the customer does not know about, or has forgotten. Often the instruction book gets lost or mislaid and the owner brings the instrument in for service rather than trust to memory.

Any serviceman who plans on going out after *Solovox* business, and there is plenty of it, should have *all* the dope before attempting any repairs or adjustments.

—30—

Radio Service

(*Continued from page* 57)

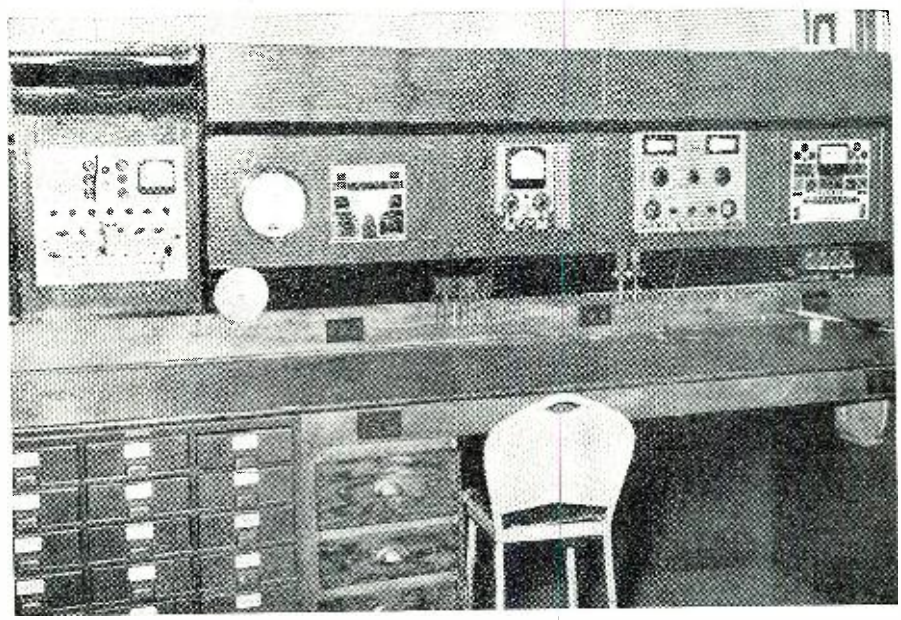
Television service will tie-in perfectly with your regular work, provided you have the equipment and knowledge necessary. Charges for this type of service will be high, in accordance with the high cost of the sets. Installation of television antenna arrays is a business by itself!

Test instruments are all expensive. Some of them are out of sight for most of us—but—please select the best you can. Stay away from these bargain testers, the pretty but cheaply made ones. A good instrument, though costly, will be accurate and last longer, and will add to your prestige as a radioman.

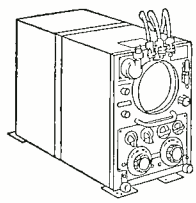
The following is a list of instruments for the up-to-date service shop. They are suggested as a means of fast, accurate and profitable work. The well equipped shop should have; a test speaker, a v.t.v.m., a signal generator, oscillograph, tube tester, and a sweep signal generator (for television).

In addition to these instruments, the shop should have a portable tube checker and multimeter. These can be of the cheaper variety as they are used for outside work and are subjected to much abuse. —30—

Fig. 5. Another view of the test bench. By panel-mounting all test instruments the workbench surface is kept clear and the servicing work is expedited.



CHRISTMAS SPECIALS *from* PHOTOCON

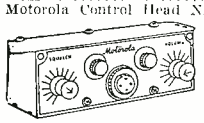


APN4 — Complete with Indicator, Receiver, Plugs, Mounts and operating instructions. NEW $55.00

APN4 — Indicator with Tubes and Crystal. NEW $37.50

APN4 — Receiver — contains power supply. NEW $17.50

REEL-RL-20—For antennas, clothesline, etc.....$0.20
HS-23—Used ..... .69
HS-33—Used ..... .89
Headset Adapter MC385 High to Low Impedance.. .35
Extension Cord—CD-307A NEW with PL 55 and JK-26 ..... .49
Motorola Control Head NEW 2.50



K-7—GUN MOUNT ASSEMBLY, ideal mount for beam antenna, cable control, NEW..$5.95

50 Ft. RG34U with connector, NEW $2.95

250 Ft. PHOSPHOR BRONZE stranded transmitting antenna wire, NEW $3.95
100 Ft. STEEL MEASURING TAPE, NEW.... 5.95
65 Ft. GUY ROPE, pulley ring and snap..... .65

SCR-522—TRANSMITTER AND RECEIVER, Good condition, Tubes $35.00
PLUGS—Set for SCR-522 ..... 4.00
BC-631B—Jack Box ..... .79
BC-629B—Jack Box ..... .79
PE-94C—Dynamotor for SCR-522. NEW $4.95 USED 2.95
AN-104—Antenna STEEL $1.95. COPPER 2.95
BC-602—Control Box. NEW 1.00

PL-55—PLUG N-1. $0.24; 5 for .....$ 1.00
AN-160—ANTENNA, N-1, 2,000-6,000 kc; 9 insulators and jumpers. 100 ft. long..... 1.00
BC-733D—GLIDEPATH RECEIVER. NEW.... 9.95
T-17—MIKE. NEW $1.50; USED..... .75
SCR-274—Remote tuning head, 3 crank..... 1.00
WESTON MODEL 45 AMMETER, 0-15-150 d.c. amps. NEW 49.00
DYNAMIC HEADSET and mike, P.O. Mark II. NEW 1.95

ARB RECEIVER 195-9050KC. 28VDC. NEW—COMPLETE $44.95

BC-224—RECEIVER, 12 V.D.C. Input, Excellent condition $79.50

IDEAL MOBILE POWER SUPPLY

PE237—Heavy duty vibrator power supply, 6, 12, or 24v input. 525v, 95ma; 105v, 42 ma; 6.5v, 2 amp; 6v, 500 ma; 1.3v. 450 ma; small supply 100v, 17 ma; 1.35-450 ma with tubes, shock mounted—brand new.....$29.50

7 Ft. CORD CD 1086 for PE237, GN58.....$1.95

BC-1306 SMALL COMPACT TRANSMITTER

3800-6500 kc, 3A4, 2E22, less cover. Can be used with PE237, GN58. NEW.....$9.95

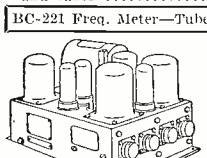
BC357A—BEACON Receiver, 75 mc, tubes N-1..$ 3.45
G. E. BATTERY CHARGER; Tungar 6RB6B17, 12 battery, 12 amp; 24 battery, 6 amp, N-1... 67.50
MN26 RADIO COMPASS RECEIVER, tubes 150-1500 KC, U-1 $18.95; U-2..... 14.95

HS-33 HEADSET—NEW

Individually Boxed $3.25

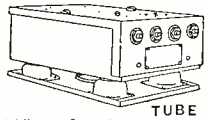
PE-120A POWER SUPPLY—NEW with tubes....$9.75
PE-120A POWER SUPPLY—USED less vibrator and tubes 2.50

BC-221 Freq. Meter—Tubes, Crystal. Excellent.$49.50



INTERPHONE AMPLIFIER — CMX50128A — 12 Volt, 6 watts output P.O. TCS equipment. NEW with tubes and dynamotor $9.50

BC1206A—Detrola. NEW 4.95



Interphone Amplifier BC-709; Ideal for Aircraft, booster for telephones, etc. N-1 .....$4.50

TUBE SPECIALS

1A5	$ 0.55	25Z5	$0.55	304TL	$ 0.90
5U4G	.55	3B24	.69	316A	.79
6A6	.89	4E27	4.95	707B	9.50
6AC7	.59	WL530	39.50	717A	.69
6AJ5	1.00	VR150	.90	726A	7.50
6AK5	.79	EF50	.50	750TL	49.00
6B8G	1.05	E1148	.90	807	1.25
6H6	.60	RK34	.60	849	39.00
6K7G	.60	VT127A	2.95	872A	1.00
6K8G	.90	2x2	.75	874	.69
6L6G	.90	12x3	.50	1616	1.00
6SL7GT	.89	5BP1	1.15	1625	.40
6SN7	.55	5BP4	2.50	1626	.25
6V6GT	.72	75TL	2.50	1629	.25
6X5GT	.55	211	.50	9002	.75
12A6	.25	249C	1.75	876 Ballast, 6 amp.	.69
12K8	.88	250TH	17.50	Tungar.	2.95

GIBSON GIRL SCR 578B transmitter for sending distress signals from boats. Transmitter complete with balloon, hydrogen generator, kite, and installation manuals.
NEW—Export packed $25.00
NEW—Domestic packed 22.50
Transmitter only, tubes..... 6.50
Balloon M-278A $1.50. Parachute M-390A... 3.50
Box Kite M-237A $2.00. Bag BG-155A..... 1.95
Antenna RL-48—Flexible Copper Wire $1.95
Bag BG-109A. Less accessories..... 1.00
Signal Light M-30SB ..... .30
Bag BG-110A 1.00

HS-30—Ear Plug Headset. New $0.95. Used....$0.50
MATCHING TRANSFORMER, HS-30..... .50
THROAT MIKE, $0.50; HAND KEY, NEW..... .50

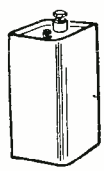
APN-1—ALTIMETER INDICATOR—Basic movement 0-1 ma. 5 ma shunt, 270° scale. An excellent basic G. E. movement for constructing your own meters. N-1..$1.95

METER RECTIFIER, full wave midget Selenium. 10 volts. 30 ma. N-1 .....$0.29

12 In. CERAMIC INSULATORS, 1 In. Diam N1 .....$0.25
12 In. CERAMIC SPACER. N-1..... .20

CD-501A CABLE for PE103A-BC654A.....$1.95
FRAME MOUNTING BC654A-103A..... 4.95
RM-29—REMOTE CONTROL UNIT. NEW.... 8.75
TS-13—HAND SET. NEW $3.95; USED..... 2.50
MAST BASE MP45 ..... 1.95

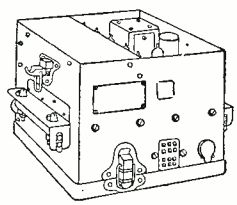
.25 Mfd.-20,000v G. E. Pyranol Cap. N-1.....$9.95
Johnson Variable Capacitor 250 F20. N-1..... 1.95
.001 MICA Condenser-Cornell-Dub. 4500v 5 amps 5000 KC ..... .50
.01 MICA Condenser 1200 v. D.C. 2500 v. Test.... .20
.02 PAPER Condenser 400 v. D.C. ..... .07
.02 PAPER Condenser 1600 v. D.C. ..... .10
2x.1 Oil Condenser Bathtub ..... .15



HS-30 HEADSET COMBINATION. HS-30 Headset, 78" Cord, Matching Trans., PL-55 Plug. New $1.95

PHOTOFLASH CAPACITOR, 25 mfd., 2000v. N-1 .....$10.00
6 COND. PLASTIC CABLE for Photoflash, N-1, per foot $0.35

LS3 SPEAKER .....$ 8.75
MICROPHONE—Astatic J.T. 30. NEW..... 5.95
MEGAPHONE—With Battery operated amp. NEW 44.50



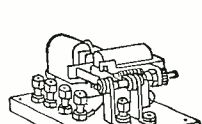
BC464 TARGET RECEIVER, 5 channel remote control, battery case and ant. 68-73 MC-N-1 .....$14.95

400 Cycle Inverter—Winco PU-16/AP Input 24v, 60 amps. Output 115v 6.5 amps. single phase. NEW $20.00

GSAP 16 MM CAMERA, f3.5 lens, converted with viewfinder, battery case. EXCELLENT CONDITION ...$49.00

CRANK FOR 274N RECEIVERS.....$0.60

BC-348—MOUNTING BASE, Postpaid.....$2.50
BC-348—OUTLET PLUG, Postpaid..... .80
BC-348—MNTG, BASE and Outlet Plug, Postpaid 3.00



ALLEN BRADLEY B-400 4 pole relay, 10 amps., 600 V.A.C., contacts, 110v-60 cycle coil, N-1 .....$4.95

T-32—Desk Mike, N-1 $3.50. U-1 .....$1.95
AN73—7' ANT. TELESCOPES to 12". N-1 $2.50. U-1 .....$1.50
OVERLOAD RELAY-Potter Brumfield, 10 ma. 5,000 ohm D.C. trip; 115v A.C. 60 cy. reset. NEW $3.95

EE-8 TELEPHONE FIELD SETS with handset and ringer N-1 $15.00 ea. $28.00 pr; U-2 $10.00 ea. $18.00 pr.; U-3 $7.00 ea.; pr. $13.00

HANDIE-TALKIE TEST SET I-135E—New Condition $35.00
SOUND POWERED CHEST SET. N-1.....$5.95
SOUND POWERED HAND SET TS-10. N-1 $15.00 ea.; pr. $25.00

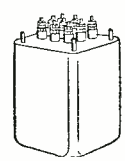
RM-13—REMOTE CONTROL UNIT contains EE8, handset, 1 stage amplifier, Weston DB meter. Used, 115v A.C. $15.00

DB-Meter Weston model 301, #23-600 ohms.....$5.95

HAND PUMP—Used for drying coax. lines, instruments, etc. Navy No. CPR-10198-B, Ashcroft 0-30 lb. gage. Tank for drying agent, air hose, shut off valve, hand pump, Tell-tale silica gel, NEW.....$9.95

ANTENNA KNIFE switch, S.P.D.T. .....$ 0.49
AUDIO CHOKE-1 Henry 800 ma. 15,000v Test., U-1 ..... 12.50
SURPLUS RADIO CONVERSION MANUAL; 115 pages of circuits and data. Postpaid.... 2.50
HAND SWITCH-SW141T with extension cord CD-318B, PL 68, Throat Mike Plug. NEW.. .29
RCAF—Interphone Amplifier—24v. D.C. Input #10D/4239 ..... 8.75

522 TEST SET IE-19A—In wooden chest. Complete, Tested O.K. $225.00



TRANSFORMERS:
5v at 190 amperes 115v, 60 cycle, Input. U-1.....$12.95
PEERLESS A-4233Q line matching 50/125/200/500 ohms, N-1 .....$1.50

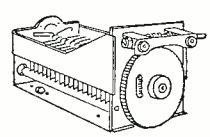
200-0-200 at 50 ma., 6.3v 3 amps. output. 115 volt, 60 cycle input. (illustrated) N-1 .....$2.50
100 watt Class B modulation transformer P.O. BC375, N-1 .....$2.95

1st, 2nd, 3rd: I.F. from SCR 522, 12,000 k.c. 35c; 3 for $1.00
2nd & 4th I.F. from BC 348, 930 k.c. 35c; 3 for 1.00
I.F. Transformer from SCR 300 35c; 3 for.. . 1.00

CRY tuning unit 2.3 to 4.2 M.C., ideal M.O., P.A. and antenna tuning unit for mobile 75-80 meters, N-1 .....$ 7.50
Radio phone control unit type CAN U-23423 complete with Handset, N-1..... 20.00

1-Minute Timer and Contactor

BC 608 contactor unit, spring-wound clock assembly with 1-minute phosphorescent sweep hand and contactor mechanism $2.95



100 mmf variable capacitor with anti-backlash gear drive P.O. 274N transmitter. NEW $1.00

BC 375 TRANSMITTER, complete with 7 tuning units, dynamotor, and tubes. NEW.....$55.00
BC 375 TRANSMITTER ONLY, used, less tubes 9.50
100 AMP. TRANSTAT, 2 gang 0-115 volts, Catalog No. 29145. NEW..... 69.50

CODE: N-I—NEW; USED LIKE NEW; U-I—USED EXCELLENT COND.; U-2—USED GOOD. TERMS: F.O.B. Pasadena, unless postpaid. No C.O.D.'s under $5.00. 25% deposit on ALL orders. All C.O.D. shipped by Rail Express. Send full price with order and we will ship by fast truck, transportation collect. Minimum order $2.00. Californians include 2½% sales tax.

PHOTOCON SALES

1062 North Allen Avenue, Pasadena 7, Calif.

Mac's Service Shop

(*Continued from page 58*)

toward the mixer. As you adjust each screw, make sure that you are able to pass *through* a peak adjustment on each tuned circuit. If you are not able to find a setting from which the signal output falls off when the adjusting screw is turned *either way*, that circuit is not in alignment, and something is wrong."

"For instance?"

"You may have shorted turns in the coil; there may be something wrong with the trimmer; an a.v.c. or plate bypass condenser may be open so that the bottom end of a winding is left 'floating'; or there may be a high-resistance connection in the winding. The important thing is to find out *Why*, if you cannot secure a peak. Not all of the peaks will be as sharp as others, though. For example, the loading effect of the diode on the secondary of the output transformer causes this circuit to tune quite broadly. Another thing that makes a difference is the setting of the trimmers. When they are nearly at maximum capacity, a slight movement of the adjusting screw will have a marked effect on the tuning, giving the appearance of sharp tuning that is not present when the capacitance is near minimum."

Mac glanced at the wall clock and exclaimed, "We had better cut this lecture short and get to work. I'll try to condense the rest of it for your little book:

"Locate the peak by moving the adjusting screw both clockwise and counter-clockwise, but always make the *final* adjustment a clockwise one. This will prevent a trimmer plate from catching on a thread of the adjusting screw and holding there until at some later date it slips off and throws that circuit out of adjustment.

"Keep the output meter on scale by backing off the signal generator output. Do not turn back the volume control or change the meter to a higher range.

"If, in lining up the i.f.'s, the set wants to oscillate, try putting the signal generator on the grid of the i.f. tube and aligning the output transformer; then transfer the generator to the grid of the preceeding tube and align the transformer that follows it. Keep doing this until all the i.f. transformers are aligned.

"Use the v.t.v.m. to locate unknown trimmers. Oscillator trimmers and padders, as well as r.f. trimmers, can be located readily by running a strong r.f. signal into the antenna and tuning the receiver to the frequency of this signal. Then, when the r.f. probe of the v.t.v.m. is touched to the various trimmers, those in use will show a reading, the strength of which will reveal their circuit position.

"When possible, duplicate the antenna system used by the customer in aligning r.f. circuits. If he uses a

ground connection on the antenna post, do the same. A short piece of wire on the signal generator 'hot' lead will radiate enough energy to be picked up by the receiver for alignment purposes.

"If you cannot do this, employ the standard dummy antenna between the generator and the set.[1] In aligning sets with loop antennas, make sure the antenna is in its normal position with respect to the chassis and that no foreign metallic objects are in the field of the loop to upset it when aligning. A radiation loop can be used on the signal generator, or simply a few feet of wire as a radiation antenna."

As Mac paused, Barney stuck the end of his pencil into a bottle of carbon tetrachloride and made a loud hissing sound as he did so.

"Okay," Mac said with a grin; "we'll stop there for the time being after I have made one last remark; all I have told you is *general* information that is to be used only when you lack *specific* alignment instructions from the manufacturer. When this latter kind of information is available in the service manual, it should be followed to the letter."

[1] A standard dummy antenna consists of a 200 $\mu\mu$fd. condenser between the signal generator and a parallel circuit that uses a 20 millihenry coil shunted by a 400 $\mu\mu$fd. condenser in series with a 400 ohm resistor. The output of this connects to the antenna post of the receiver.

Watch Your Labor Costs

(*Continued from page 72*)

hours and 10 minutes to do this job, he would lose money on it even with a 100 per-cent mark-up on labor cost. Watch the overhead cost per labor hour as well as the mark-up on labor. You can compute the labor hour cost by dividing the working hours of your mechanics each month into the monthly overhead. The more mechanics you have the lower the overhead chargeable to each hour of their time, but the maintenance man with many me-

Sales of labor and parts	$75.00—100%
Cost of labor and parts	45.00— 60
Margin on sales	$30.00— 40%
Overhead	22.50— 30
Net profit on sale	$ 7.50— 10%

Table 2.

Table 3.

Sales of labor and parts	$75.00—100.0%
Cost of labor and parts	39.50— 52.7
Margin on sales	$35.50— 47.5%
Overhead	22.50— 30.0
Net profit on sales	$13.00— 17.3%

Sales	$5,000—100%
Cost of labor and parts	3,000— 60
Margin on sales	$2,000— 40%
Overhead	1,500— 30
Net profit on sales	$ 500— 10%

Table 4.

Selling price of repair job	$5.00—100%
Cost of labor	2.50— 50
Margin on sales	$2.50— 50%
Overhead	1.50— 30
Net profit on repair job	$1.00— 20%

Table 5.

chanics can burn his fingers worse than the maintenance man with one mechanic unless he has fixed his selling prices on labor to give him an adequate spread for profit.

The radio maintenance man must pay the same overhead whether he sells parts and accessories with labor or does just a mechanical job. In effect, the sales of accessories on labor jobs do not carry an overhead at all because the burden is charged to labor and the entire margin on the accessories is the net profit. This "balloons" profits the same as the unit sale for the grocer. Often an increase of only a dime in the grocer's unit sale can double his net profit.

If a serviceman sold only labor, his profit and loss statement would look something like Table 7.

If he had sold accessories, $20 worth for every $100 in labor sales, which isn't high, his profit and loss statement would like like that of Table 8.

This maintenance man could increase dollar profits 80 per-cent by maintaining an accessories - to - labor ratio of only 2 to 10, or 1 to 5. The higher the ratio of parts and accessories to labor, the greater the increase in net profit, and so, the serviceman should watch this ratio and keep it at its most profitable level.

Overhead expense is mighty high today. Trying to cut it by direct means is hard. The best way to cut overhead is to attack it indirectly by selling as much radio goods as possible with labor to reduce the burden in ratio to sales. Under Table 7, the overhead is 40 per-cent of straight labor sales. Under Table 8, the ratio is 33.3 percent of labor and accessories sales. Where the labor ratio is high in proportion to radio goods sold, the overhead is usually higher in percentage to sales than when the ratio is reversed. Tables 7 and 8 illustrate this.

Between the estimate and the profit and loss statement, a lot of things can happen to labor cost. Delays, breakdown of equipment, bad management, "soldiering," etc., must be watched carefully, but this is not the all of labor control. The radio dealer or maintenance man must get enough margin on labor sales, he must cost his labor sales separately from parts and accessories, he must watch his overhead cost per labor hour and keep the ratio of parts and accessories to labor sales on the most profitable plane, otherwise, like Radio Serviceman Johnson, when he gets his profit and loss statement, he may wonder why he didn't make the net profit he had anticipated.

—30—

Selling price of repair job	$5.00—100%
Cost of labor	2.50— 50
Margin on sales	$2.50— 50%
Overhead—2 labor hours at $1.25	2.50— 50
Net profit	000000000000

Table 6.

Sales	$1,000
Cost of labor sales	500
Margin on sales	$500
Overhead	400—40%
Net profit	$100—10%

Table 7.

Table 8.

Sales of labor		$1,000
Sales of accessories		200
Total sales		$1,200—100 %
Cost of labor	$500	
Cost of accessories	120	
Total cost	$620	620— 51.7
Margin on sales		$580— 48.3%
Overhead		400— 33.3
Net profit		$180— 15.0%

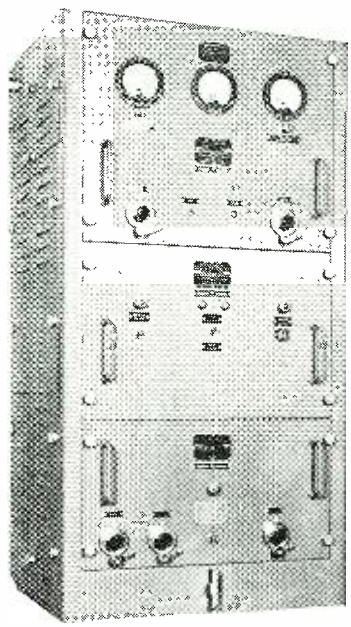
UNUSUAL BUYS

in SURPLUS ELECTRONIC EQUIPMENT

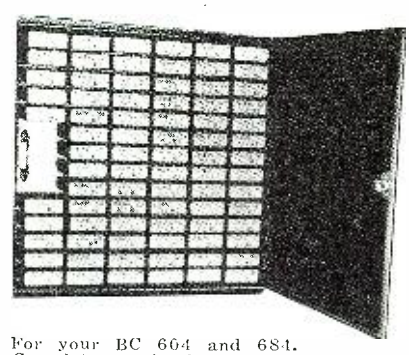
NEW—*all complete with accessories*

limited quantities —act fast

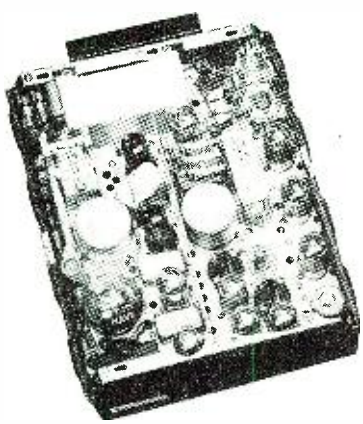
POWER at any frequency EIMAC 527. Big brother of the 127 A and 327 A tubes. Packed in sturdy cartons and cushioned in spring supports. Phenomenal price of **$4.95** each.



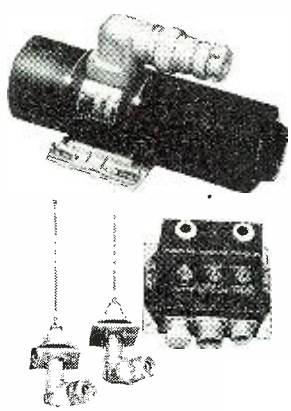
The BG responsor for shipboard or shore use. Plug in 110 volts, AC, 60 cycles. This unit breaks down into a wonderful rectifier unit, excellent VHF receivers and transmitters, or countless other uses. Only 244 sets on hand. Priced at **$69.50** these won't last long.

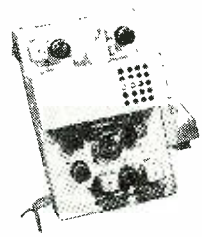


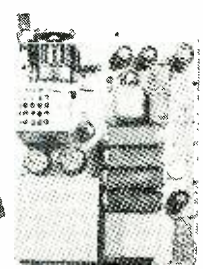
For your BC 604 and 684. Complete set in drawer type case. **$12.50.**



SCR 515A (Navy ABA-1) airborne IFF equipment, **complete** with cables, dynamotor, antennas, tubes, ready to operate on 470-493 megacycles. FREE CONVERSION INSTRUCTIONS for Citizens Band. Only 380 sets on hand. **$25.00.**







A treasure of electronic parts! The YJ-1, 2 channel, automatic radar beacon, operating on 110 or 220 volts, 50 or 60 cycle, AC. Works on 176 mc and 515 mc simultaneously. Complete with 20 foot mast, cables, and power unit. Priced at only **$62.50,** and only 93 sets available.

Relay, slow release, used in telephone, stepper, delay and control circuits. 200 ohm coil, manufactured by Clare Co., at **$1.45.**

Your own ringer telephone system with brand new RM-29 hand crank generators and a TS-13 handset, both for **$11.90.** RM-29 ringer unit only, **$8.95.**

Not rebuilt . . . but BRAND NEW EE-8 field phones, in original cartons. Only **$16.95** for these superb instruments, ready to use in any tough service. Complete with handset, less batteries.

1300 feet of copper wire, 4 conductor, on a steel reel! Only **$25!** Spiral four (CC-358), all copper, steel mesh sheath under neoprene cover, flexible, low loss, ideal for light power, telephone, extension cords, etc. Slightly used but excellent condition. Quantity prices, too.

Your own telephone switchboard, a BD-72 for 12 separate lines or a BD-71 for only 6 lines. BD-72 boards only **$18.00** each; BD-71 boards only **$15** each. Use with EE-8 field telephones. A head and chest set included FREE with each order.

All prices are FOB shipping point. Order from address nearest your city. Terms: cash with order on unrated firms, individuals. Others, 25% with order, balance COD. Samples on display at all three locations.

WESTERN ELECTRONICS COMPANY
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ELECTRONIC CORP. OF NEBRASKA
331 North Hastings St.
HASTINGS, NEBRASKA

ELECTRONIC SERVICE COMPANY
119 South Sixth Street
LOUISVILLE, KENTUCKY

Rural Radio Network

(*Continued from page 65*)

and cinder block to make them serviceable during the rigorous New York State winters. Radiation-heated, they contain a complete broadcasting studio, two-car garage, basement, generator room, furnace room, shop-and-kitchen combination, and sleeping quarters for any of the engineering staff who might be snow- or storm-bound on the transmitter site.

Another little-known point in connection with these transmitter buildings is that each has a rain gauge and wind-direction velocity instrument atop the roof. These, combined with a number of other instruments, will be utilized to make available to the U. S. Weather Bureau at Albany regular meteorological observations from these 2000-foot mountaintops. The Weather Bureau is already providing RRN with detailed localized weather forecasts, especially for New York State, to help them with this job.

Programming Techniques

The network's main programming policy is to give farmers information and entertainment they want when they want it—this policy dictates all programs.

Ithaca is known as the fountainhead of farm information for New York State because the headquarters of various farm groups are located there and because of its proximity to the New York State College of Agriculture and Experiment Stations. This is the reason Ithaca was chosen as the headquarters and origin point for the Rural Radio Network and it helps their programming techniques tremendously.

Head of this department is Robert Child from *General Electric's* WGY at Schenectady who brings to the network a world of experience as director of farm programs. Rather than resting on old tried-and-true techniques, Child makes it a point to visit farm meetings, learning just what the farmers want in their programs. One evening this month he learned that Hawaiian music, strangely enough, is very popular with the farmers and they would like more of it.

A special effort is made to properly time all programs. For example, women's programs are at 1:00 p.m., not at 2:00 p.m. when chores usually occupy the farm wife's time. For the man of the house, the period from noon until 1:00 is considered the best time of the day (with the exception of evenings), because the farmer is having lunch and is not out in the fields.

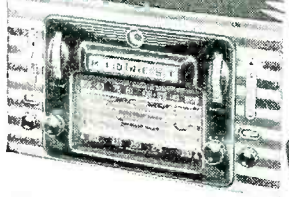
The network programs highlight fine music and straight reading of carefully-selected stories, in place of soap operas. Bonafide farmers and experts from the ten sponsoring farm organizations discuss farmers' problems daily. Some fifteen other agricultural agencies also send guest speakers regularly.

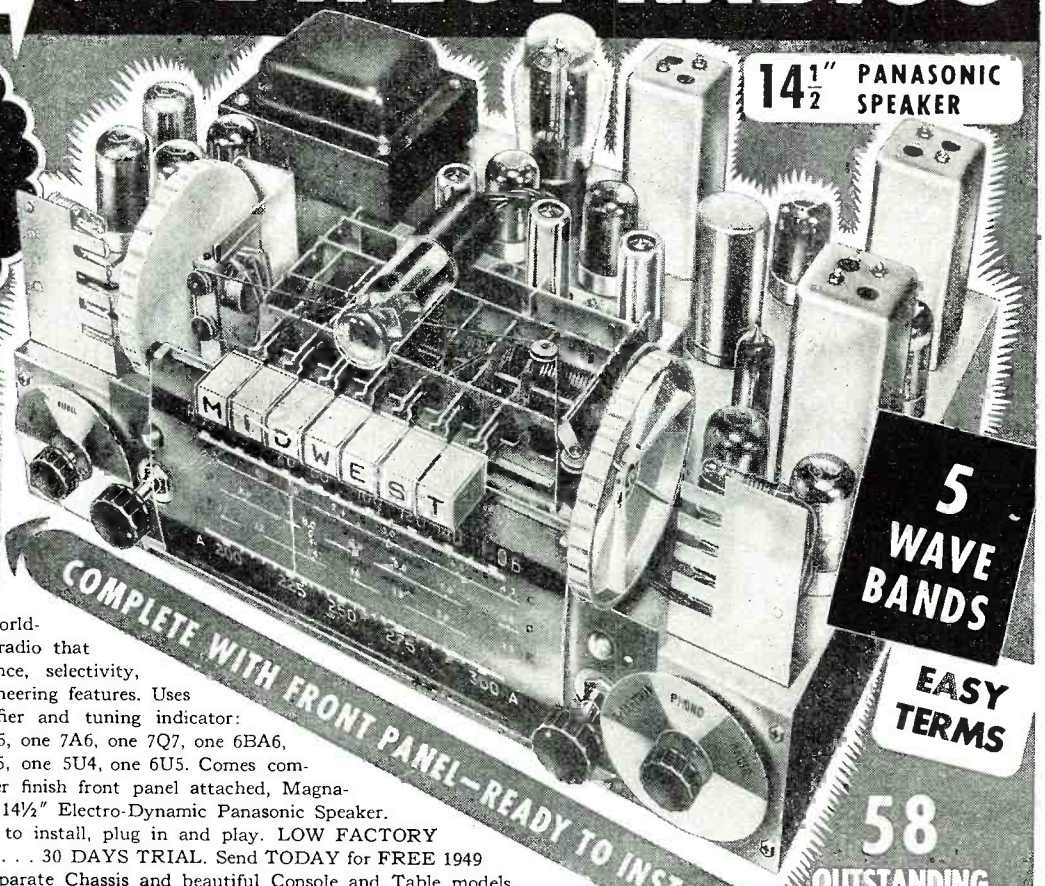
LOW FACTORY PRICES!

...on the Sensationally NEW 1949 MIDWEST RADIOS

NEW SERIES 16 SUPER DE LUXE AM-FM CHASSIS

30 DAYS TRIAL





14½" PANASONIC SPEAKER

5 WAVE BANDS

EASY TERMS

COMPLETE WITH FRONT PANEL—READY TO INSTALL!

Here is the last word in radio engineering . . . a powerful, world-ranging, magnificently-toned radio that is unsurpassed for performance, selectivity, sensitivity, and advanced engineering features. Uses these latest-type tubes, rectifier and tuning indicator: three 7A7, three 7A4, two 7C5, one 7A6, one 7Q7, one 6BA6, one 6BE6, one 6C4, one 6AL5, one 5U4, one 6U5. Comes complete with satin stripe copper finish front panel attached, Magna-Tenna Loop Aerial and giant 14½" Electro-Dynamic Panasonic Speaker. Requires only a few minutes to install, plug in and play. LOW FACTORY PRICES . . . EASY TERMS . . . 30 DAYS TRIAL. Send TODAY for FREE 1949 Midwest Radio Catalog of separate Chassis and beautiful Console and Table models.

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FLASH-O-MATIC
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SYMPHONY GRAND

AM-FM Radio-Phonograph with TELEVISION Audio Switch-Over and NEW Intermix AUTOMATIC RECORD CHANGER

A Magnificent musical instrument and a masterpiece of cabinet design—the finest Midwest Radio in 29 years of manufacture. Offers world-ranging radio reception and newest automatic Intermix Record Changing Phonograph. Uses Series 16 Super DeLuxe AM-FM Chassis. Giant 14½" Panasonic Speaker; Tri-Magnadyne Coil System; Built-In Loop Antenna. Other luxurious console and table model cabinets available with Series 16, 12, and 8 chassis—on Easy Terms and 30 Days Free Trial.

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Market reports, right off the wire from New York City, are bought. It is claimed that many hours are saved this way. No program is safe from an interruption with a newsworthy report on markets or weather which will help the farmer in any way. A special programming feature during Farm Safety Week was the ringing of an unearthly-sounding gong every time a farmer was hurt in the field. They announced this as "grim harvest." For instance, about 12:30 p.m. one day, a farmer caught his arm in a hay-loading machine and was rushed to the hospital. About 1:10 the "grim harvest" gong was rung on the RRN.

Children's programs have no "Superman" or "Jack Armstrong," but rather, specialize in dramatization of such books as "Treasure Island" for one age group, and interviews on farm youth project achievements for another age level. A good time to get the teen-age audience's participation is found to be about 4:45 p.m., about the time they get off the school bus and are changing their clothes before helping their father in the barn before supper. The Rural Radio Network's time signal is the chimes from a mantel clock made in 1880.

At first the Rural Radio Network had trouble reaching farmers because there were few FM sets available. Now several nationally-known radio firms are very much interested in getting their sets out to RRN listeners. An arrangement was worked out whereby manufacturers make sets and the *GLF* stores market them. Right now there is available for farm use a needed high-sensitivity receiver and an omnidirectional antenna. This equipment is both sold and promoted by the *GLF* store and is often purchased when the farmer is buying feed or other necessary farm products. —30—

PUBLIC TV SHOWINGS ILLEGAL SAYS COLUMBIA LAW REVIEW

THE practice of exhibiting television programs in taverns, hotels, motion picture theaters, dance halls, and other public places can be legally stopped, according to an article in the current issue of the Columbia Law Review. Author of the article is David M. Solinger, New York attorney, who represents a variety of interests in the radio and advertising fields and is a member of the board of directors of Gimbel Brothers, Inc.

The article, entitled "Unauthorized Uses of Television Broadcasting," is believed to be the first authoritative analysis of one of the major problems arising from the rapid growth of the television industry.

Mr. Solinger thinks the courts will decide in the near future "whether the air is free or whether a telecaster may limit, restrict and control what he originates." Television broadcasters are already endeavoring to limit and restrict use of their programs to home consumption, he points out, because they "obviously do not believe that the air is free and that strangers may capitalize on their efforts and investments."

Typical of the problems that have developed in recent weeks are the following, according to the Law Review article:

"May a tavern pick up a television program for the entertainment of its customers without authorization from those who originate the telecast? May a hotel furnish television to its guests in private rooms rented, perhaps, at a premium, or in its public halls, without the consent of the telecaster? May a motion picture theater entertain its patrons by making television programs available, either on its regular motion picture screen or elsewhere in the theater, without authority? May an unauthorized motion picture be made from a television performance; and may such motion picture be exhibited without the consent of the originator of the telecast?"

To date there has been only one series of inconclusive legal tests of these and other problems, the article continues, noting that "the interested parties have thus far been squeamish about seeking a court test."

Examining the legal aspect of television broadcasting rights, Mr. Solinger discusses absolute property rights, unfair competition, "equitable servitudes" and unauthorized telecasts.

Television is protected by statutory and common law copyrights, he states, as well as by other common law property rights.

"An owner of a television receiver," he writes, "by performing a program in a tavern, hotel, restaurant, private auditorium, or motion picture theater, has thereby infringed on the common law copyright of the creator of an original literary property in the program to the same degree as he would have infringed had he reproduced the material on his own stage with his own live cast."

In the case of news events, clearcut decisions will have to be made as to what constitutes news, the article states, because "there can be no private property right in news as such." Even if sports events are considered news, public exhibitions of televised sports programs may be restrained by the courts on grounds of unfair competition, Mr. Solinger believes.

Broadcasters of television programs are also protected by "equitable servitudes," according to the article. An example is the standard announcement opening and closing programs, to the effect that the broadcasts are for home reception.

"To obtain judicial acceptance of an equitable servitude on a telecast, the television broadcasters may have to overcome a traditional judicial lag based on a long line of unfavorable precedents. But when the courts are ready to acquiesce in the telecasters' analysis of the public policy involved, the courts have available the necessary tools to enforce any equitable servitude they may deem socially and economically desirable," Mr. Solinger contends.

The article concludes with a summary of legal devices available to prevent unauthorized use of television broadcasts and notes that similar results could be obtained by legislation. Existing legal tools should be sufficient, however, to "resolve whatever conflicts of interest may arise." —30—

Technical BOOKS

"UNDERSTANDING TELEVISION" by Orrin E. Dunlap, Jr. Published by *Greenberg, Publisher,* New York. 125 pages. Price $2.50.

By this time most of our readers should be familiar with Mr. Dunlap's books dealing with the subject of radio in a non-technical manner.

His new book dealing with television is written along similar lines and is both entertaining and enlightening. The author covers such subjects as the steps which led up to television, how television works, what performers should know about television, etc. Four chapters have been devoted to a television "I.Q." quiz, a television glossary, a listing of video stations on the air, and a television bibliography.

The book is well illustrated with 40 photographs covering all phases of television from coaxial cables to programming. For the layman, the prospective set buyer, and tyro television performer this book is an excellent handbook and a thoroughly readable reference.

* * *

"PRACTICAL DISC RECORDING" by Richard H. Dorf. Published by *Radcraft Publications, Inc.,* New York. 96 pages. Price $.75 paper.

This is a practical handbook for the radio enthusiast dealing with the methods and techniques of making high-quality disc recordings.

The book covers such subjects as recording system elements, the disc, the motor and turntable, the feed mechanism, the cutter, constant amplitude vs. constant velocity, the stylus, the sound source, the amplifier, preliminary adjustments, equalization, making a good recording, record playback and duplication, and recording troubles.

The author has assumed that his readers have a working knowledge of radio but little or no acquaintanceship with recording techniques. All phases of recording have been thoroughly covered in easy-to-understand language. The text is lavishly illustrated with photographs of equipment as well as circuit diagrams and line drawings.

A glossary of recording terms is a particularly valuable addition to the text material. Servicemen and home recordists should find this little handbook of assistance in making good recordings and in building up their recording equipment.

* * *

"RADIO RECEIVER DESIGN" (Part II) by K. R. Sturley. Published by *John Wiley & Sons, Inc.,* New York, 468 pages. Price $5.50.

Part II of this book is a logical extension of Part I, first published in 1943. It contains all of the theoretical and practical information necessary for the design of a.f. amplifiers and power supplies, a.g.c. and a.f.c. systems, and FM receivers, as well as a

great deal of information on television receivers.

Each section is broken down into logical subdivisions; for example, the audio section covers resistance- and transformer-coupled stages, tone control circuits, power output stages, and feedback circuits. All of the stages in an FM receiver are discussed, with particular emphasis on various types of detectors.

The chapter on television reception includes a basic discussion of all of the various components in a television receiver.

At the end of each chapter is an extensive bibliography for further study of the particular subject.

Although written by an Englishman and dealing with English tubes and components, practically all of the material is directly applicable to American methods and techniques. —30—

MOTOROLA WINNERS

WINNERS in Motorola's $50,000 Car Radio Sales Carnival were announced recently by the company in Chicago.

Kierulff & Co. of Los Angeles and Motorola-Chicago tied for first place in Group 1. Porter Burgess Co., Dallas, turned in the winning performance in Group 2, while MacDonald Auto Supply of Amarillo, came in first in Group 3.

According to William H. Kelley, general sales manager of the company, the great majority of the 72 distributors in the contest topped their 100% quotas, and that car radio sales, as a result of the contest, were 25% above normal for the summer period.

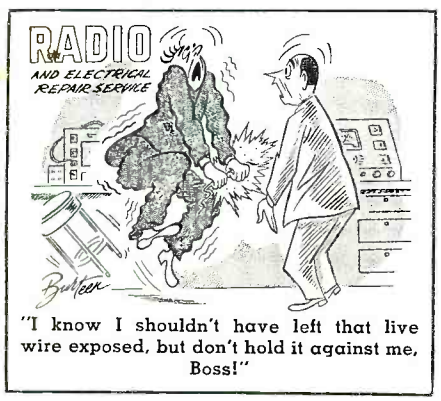
Besides cash, prizes in the contest included three new Chevrolets, silverware, major household appliances, sporting goods, and baby carriages. —30—

WIRELESS ASSN. MEETS

THE next meeting of the Quarter Century Wireless Association will take the form of an informal dinner at historic Fraunces Tavern, Broad and Pearl Streets, New York, the evening of December 3rd.

The Association, whose president is John DiBlasi, W2FX, now has more than one-hundred members and is rapidly becoming world-wide in scope. Among the latest hams to sign up is George E. Sterling, W3DF, a Federal Communications Commissioner.

Membership in the organization is open to present holders of amateur licenses who were active hams not less than twenty-five years ago. —30—



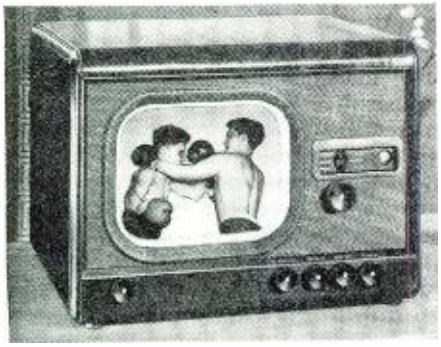
"I know I shouldn't have left that live wire exposed, but don't hold it against me, Boss!"

NEW RECEIVERS for Winter Market

CROSLEY VIDEO

The *Crosley Division, Avco Manufacturing Corporation,* has introduced a new table model television receiver, the "Spectator 9-407."

The receiver offers a full 72 square inch picture viewing screen on its direct view 12 inch cathode-ray tube. FM broadcast reception is provided in



addition to all-channel television reception. All controls are on the front panel for easy, simplified operation.

The mahogany cabinet measures 22½ inches by 19½ inches by 16 inches.

An all-electronic circuit that automatically controls picture synchronization, and which keeps pictures steady and clear even through electrical disturbances, is incorporated on the new chassis.

For additional information on the "Spectator 9-407" and other receivers in the company's video line write *Crosley Division, Avco Manufacturing Corporation,* Cincinnati, Ohio.

DUAL RECORD PLAYER

Markel Electric Products, Inc. of Buffalo, New York is in production on the "Duo Playmaster" a new record player that plays both sides of records automatically without turning them over.

The unit is available to fit every radio-phonograph combination or with

a wood finish cabinet base for simple attachment to any radio. The "Duo Playmaster" will automatically play both sides or one side of records without interruption in sequence. It automatically plays 12 ten inch or 10 twelve inch records, one side, both sides, continuously, and without turning them over. In this way both manual and automatic albums can be played in the correct sequence.

The pickup cartridge is of the semi-permanent twin stylus type whose output is simply and easily adaptable to conventional amplifiers. The unit utilizes a new push-off post type of record mover so that the records can't chip. The bent spindle is spring mounted to reduce record wear.

The "Duo Playmaster" will be handled through jobbers but for additional details on the unit write *Markel Electric Products, Inc.,* Duo Playmaster Division, Buffalo, New York.

REMOTE CONTROL UNIT

Sightmaster Corp. of New Rochelle, New York is merchandising its new 1949 line of television receivers which feature several interesting innovations.

One of the units uses a small and inconspicuous remote control box to operate the television receiver. The picture appears on the "Sightmirror" which becomes a decorative wall mir-

ror when the set is not in operation. There is no cabinet, no tables, or no visible dials.

The company also introduced the "Manhattan 15" and the "Pandora" both models featuring the "Sightmirror."

For full information on the line write *Sightmaster Corp.,* 385 North Avenue, New Rochelle, New York.

LARGE-SCREEN VIDEO

Television Assembly Company of Brooklyn, New York recently debuted its new custom-built projection television receiver, the Model P-520.

Featuring a 20x26 inch picture, the receiver projects a head and shoulders picture that is actually life-size. The receiver, however, is so compact that it may be installed in the wall of the room leaving only the dials and picture screen visible.

Using the *Bausch and Lomb* refractive system employing an F1.9 lens and an *RCA* 5TP4 tube (a five inch tube), the receiver is said to provide faithful reproduction of the transmitted picture. The flyback power supply system assures a steady, clear picture at all times, according to the company.

Almost universal in mounting possibilities, the receiver requires only an eighteen inch depth for installation at its deepest point.

The receiver covers all television bands and employs a *DuMont Inputuner* to provide complete coverage of all FM radio bands as well.

Further information on the Model P-520 is obtainable from *Television Assembly Company,* 540 Bushwick Avenue, Brooklyn 6, New York.

REMOTE CONTROL TV UNIT

Industrial Television, Inc. has announced a new television viewing unit, the Sussex-10.

The new unit is designed for remote control applications in homes, hospitals, taverns, and hotels. It may be added to existing *ITI* remote control installations or used in conjunction with a wide variety of standard television receivers to provide a remote viewer.

Utilizing the 10BP4 cathode-ray tube with a metal and plastic cabinet, the new viewer is the lowest priced viewing unit in the company's line.

For full details on the Sussex-10 (Type No. IT-22R) write to *Industrial Television, Inc.,* 359 Lexington Ave., Clifton, N. J.

TABLE COMBINATION

The Receiver Division of *General Electric Company* has announced a new table model radio-phonograph equipped with an automatic record player and the company's Electronic Reproducer.

The mahogany cabinet, with a full-length lid, is trimmed with a metal grille which forms the entire front of the Model 118. The phonograph and the radio controls are beneath the lid.

Powered by five tubes in addition to the rectifier, this receiver has a 5¼ inch Alnico 5 loudspeaker, and a built-in "Beam-A-Scope" antenna.

The phonograph record-changer will automatically play 12 ten inch or 10 twelve inch records. The single control, located near the tone arm, includes a start-stop switch and a means by which any record can be rejected after it has begun to play.

When Your Electronic Problem Hinges on a TRANSFORMER

Transformers
Impedance Matching
Bridging • Filament
Input • Output
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Components
Jacks • Jack Panels
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When your circuit calls for a transformer response of ±½ db from 30 to 15000 c.p.s.—with low transmission loss and low harmonic distortion—for such applications as AM and FM broadcasting and high quality music reproduction . . . investigate ADC Quality Plus Series.

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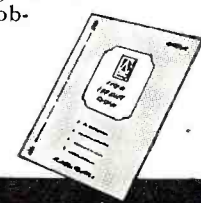
From this experience you may feel confident that an ADC transformer can give the quality performance you need regardless of the specification. *Note* the catalog line of transformers and other components listed on the left.

Write today for your copy of **ADC**'s catalog 46

For difficult or unusual transformer problems, send us your requirements. Our engineers will work with you to develop the most practical solution.



AUDIO DEVELOPMENT

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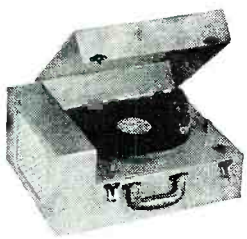

ELECTRIC PORTABLE PHONOGRAPH

Leatherette Covered 2 Watt Amplifier. Plays 12 inch records with cover closed. 5 inch Alnico 5 Speaker. Rim drive constant speed. Self starting motor. High fidelity pickup. Size 17"x13"x7½". List Price $29.95.

NET PRICE $15.95
LOTS OF THREE 14.95

SPECIAL PURPOSE RADIO TUBES

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3B24	1.95	7BP7	3.95	876	.80
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3HP7	3.95	28D7	1.95	2051	.98
5AP1	3.95	371B	2.95	VT-52	.95
5CP7	13.95	701A	4.95	211	.95

SPEAKERS

4" PM Speaker $1.25
5" PM Speaker 1.25
6" PM Speaker 1.98

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½ meg with switch ..... 3 for 99c

TERMS: 25% with Order—
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All new tubes. 100% guaranteed. Individually boxed.

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0A4G	$0.96	1T5GT	$0.96	6F5GT	$0.60	6X5GT	$0.54	12K8	$0.65	36	$0.90
01A	.60	1V	.80	6F6	.72	6Y6G	.85	12SA7GT	.65	37	.65
0Y4	1.72	2A3	1.15	6F6G	.60	6Z7G	1.40	12SC7	.80	38	.80
0Z4	.80	2A4G	1.15	6F7	1.15	6ZY5G	.80	12SF5	.65	39/44	.96
1A3	.80	2A5	.80	6F8G	1.15	7A4	.65	12SF7	.72	40	.80
1A4P	1.40	2A6	.96	6G6G	.96	7A5	.65	12SG7	.72	41	.60
1A5GT	.65	2B7	.96	6H6.GT	.60	7A6	.65	12SH7	.80	42	.60
1A6	1.15	2X2	1.15	6J5.GT	.54	7A7	.65	12SJ7	.60	45	.60
1A7GT	.72	3A4	.72	6J6	.96	7A8	.65	12SK7GT	.60	45Z3	.65
1B4P	1.40	3B7/1291	.96	6J7	.72	7B4	.65	12SL7GT	.85	45Z5GT	.65
1B5/25S	1.15	3D6/1299	.96	6K6GT	.54	7B5	.65	12SN7GT	.80	46	.96
1C5GT	.80	3Q4	.80	6K7.G	.60	7B6	.65	12SQ7GT	.60	47	.85
1C6	1.15	3Q5GT	.85	6K8	.85	7B7	.65	12SR7	.80	48	1.40
1C7	1.15	3S4	.72	6L5G	.96	7B8	.65	12Z3	.96	50	1.40
1D5GP	1.40	5R4GY	1.15	6L6GA	1.15	7C5	.65	12Z5(6Z5)	1.15	50A5	.80
1D7G	1.15	5T4	1.40	6L7	1.15	7C6	.65	14A4	.96	50B5	.72
1D8GP	1.40	5U4G	.54	6N7	.85	7C7	.65	14A7	.80	50L6GT	.60
1E5GP	1.40	5V4G	.85	6P5GT	.80	7E6	.65	14B6	.80	50X6	.80
1E7GT	1.40	5X4G	.65	6Q7	.72	7E7	.80	14C7	.80	50Y6GT	.65
1F4	.96	5Y3GT	.45	6R7	.96	7F	.96	14H7	.80	53	.96
1F5G	.96	5Y4G	.54	6RSGT	.65	7F7	.80	14J7	.96	56	.65
1F6	1.40	5Z3	.65	6S7	.96	7G7	.96	14N7	.96	57	.72
1G4	.96	5Z4	.96	6SA7.GT	.60	7H7	.72	14Q7	.80	70L7GT	1.15
1G5G	.96	6A3	.96	6S8GT	.85	7J7	.96	14R7	.80	71A	.72
1G6GT	.96	6A4/LA	1.15	6SB7-Y	.85	7K7	.96	14W7	.96	75	.60
1H4G	.80	6A6	.96	6SC7	.72	7L7	.80	19	1.15	76	.60
1H5GT	.60	6A7	.72	6SD7GT	1.15	7N7	.80	24A	.80	77	.60
1H6G	1.15	6A8GT	.72	6SF5	.72	7Q7	.65	25A7	1.15	78	.60
1J6G	.96	6AB7	1.15	6SF7	.72	7V7	.96	25L6GT	.60	79	.96
1L4	.72	6AC7	.96	6SG7	.72	7W7	.96	25Z5	.54	80	.45
1LA4	.96	6AD7G	1.15	6SH7	.80	7X7		25Z6GT	.54	81	1.40
1LA6	.96	6AF6G	.96	6SJ7	.60	(XXFM)	.96	26	.65	82	.96
1LB4	.96	6AG5	.96	6SK7.GT	.60	7Y4	.65	26A7	1.15	83	.96
1LC5	.96	6AG7	1.15	6SL7GT	.85	7Z4	.65	27	.54	83V	1.15
1LD5	.96	6AK5	.96	6SN7GT	.80	12A	.65	30	.72	84/6Z4	.65
1LG5	.96	6AL5	.72	6SQ7	.60	12A5	1.15	31	.96	85	.80
1LE3	.96	6AL7	.96	6SR7	.65	12A6	.96	32	1.15	89	.80
1LH4	.96	6AQ7	.80	6SS7	.65	12A7	1.15	32L7GT	1.15	117L7GT	1.40
1LN5	.96	6AT6	.54	6S?7	.96	12A8	.72	33	1.15	117N7GT	1.40
1N5GT	.72	6B4G	.96	6SV7	1.15	12AH7GT	1.15	34	1.15	117Z3	.65
1N6	.72	6B7	1.15	6T7G	1.15	12AT6	.60	35	.72	117Z6GT	.85
1P5GT	.80	6B8G	1.15	6U5	.72	12BA6	.65	35A5	.65	VR-90	.96
1Q5GT	.96	6C4	.60	6U6	.65	12BE6	.65	35L6GT	.60	VR-105	.96
1R4	.96	6C5	.60	6U7G	.65	12C8	1.15	35W4	.45	VR-150	.96
1R5	.72	6C6	.72	6V6	1.15	12H6	.65	35Y4	.65	9001	.80
1S?	.85	6C8G	1.15	6V6GT	.72	12J5GT	.54	35Z4GT	.54	FM-1000	1.15
1S5	.65	6D6	.60	6V7	.96	12J7GT	.72	35Z5GT	.45	HY-117	1.15
1T4	.72	6E5	.80	6W7G	.96	12K7GT	.60				

FRANKLIN-ELLIS CO.

1313 West Randolph Street
Dept. RN-12 Chicago 7, Illinois

For additional information on the Model 118 write the Receiver Division, *General Electric Company,* Electronics Park, Syracuse, N. Y.

SMALL CONSOLE

The Magnavox Company's "Duncan Phyfe" radio-phonograph combination has been especially designed to meet the needs of the small home owner or the apartment dweller.

The cabinet woods are maple, finished either in regular red maple or mahogany and the console measures 33"x28"x15½". Components include a *Magnavox* 210B chassis for AM broadcasts, a 12 inch speaker, and a modern automatic record changer with a *Magnavox* low pressure crystal pickup. The cabinet provides storage space for up to 85 records.

A feature of the new console is its "fall front" horizontal door which opens to reveal the radio control panel

and at the same time provide a track for the record changer to be placed in a loading position.

The Magnavox Company, Fort Wayne, Indiana will supply additional data on request.

ZENITH LP UNIT

Zenith Radio Corporation of Chicago is currently marketing its new record playing unit which incorporates twin "Cobra" tone arms for playing both the new Microgroove and standard records.

A dual-speed turntable functions with the tone arms and can be set for either 33⅓ or 78 r.p.m. The unit is

operated by a simple hand switch keyed in two colors to match the related tone arms.

The green tone arm, for the long-playing discs, is lighter in weight than its twin and has a pressure of only 5 grams. The standard "Cobra" tone arm exerts a pressure of only ⅔ ounce. In both of these units a retractable-type filament is used instead of a needle or crystal.

The new record playing unit is being featured in ten of the company's radio-phonograph combinations. For full de-

tails write *Zenith Radio Corporation*, 6001 W. Dickens Avenue, Chicago 39, Illinois.

THEATER TELEVISION

A new theater television projector of advanced experimental design has been demonstrated by *Radio Corporation of America* to delegates attending the recent TESMA-TEDPA convention in St. Louis.

The new projector is greatly reduced in size and weight yet is capable of showing a 20 by 16 foot television picture. Engineering of the new projector stemmed from the development of a 7 inch kinescope for operation at 80 kilovolts. The smallest kinescope previously designed for operate at the high voltage required for theater-size image projection had a picture face 12 inches in diameter. Use of the 7 inch tube has made possible a reduction from 42 inches to 20 inches in the diameter of the spherical projection mirror, largest single component, with comparable shrinkage of dimensions of the entire optical system.

The new equipment consists of two units, the main housing containing the reflective optical system, video amplifier, deflection circuits, and 80 kilovolt power supply while an auxiliary console, which may be located at a remote operating point, contains the control panel and low-voltage plate power supply.

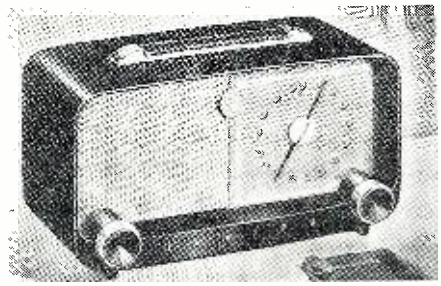
Additional information on the new projection unit is available from the Engineering Products Department, *Radio Corporation of America*, Camden, New Jersey.

NEW TABLE MODEL

One of the outstanding units in *Zenith Radio Corporation's* new table model radio line is the Model 5D811.

This deluxe "Consoltone" AM table radio features a 4 inch Alnico 5 PM

speaker, a new "Flexo-grip" carrying handle, and four tubes plus a power rectifier. A built-in "Wavemagnet"



facilitates reception. The set tunes the complete broadcast band from 535 to 1620 kc. Bass tone compensation and automatic volume control are also featured. The fashion-styled cabinet in walnut, ebony, or antique ivory plastic has a large tuning dial and an on-off indicator. The radio measures 7¼" x 12⅛" x 6" and operates on either a.c. or d.c.

For added information on the Model 5D811 write *Zenith Radio Corporation,* 6001 W. Dickens Avenue, Chicago 39, Illinois.

DEWALD COMBINATION

DeWald Radio Manufacturing Corp. of Long Island City has just announced the availability of the company's new dual-speed phonograph and radio combination.

Designed to handle both standard and Microgroove recordings, the phonograph features a self-starting, silent, oversized motor, an *Astatic* crystal pickup, fidelity compensation, and large turntable to accommodate 12 or 10 inch records with the lid closed.

The radio has 5 tubes plus rectifier in an improved superheterodyne circuit. A large dynamic speaker, illuminated easy-vision slide rule dial, automatic volume control, built-in loop antenna, vernier tuning, and tone modulation are added features of the radio.

The set is housed in a compact streamlined luggage-type cabinet with completely concealed radio unit. Both phonograph and radio are easily accessible for use. The Model B-614 measures 17" x 8⅛" x 14".

Additional information and price

will be furnished by *DeWald Radio Manufacturing Corp.,* 35-15 37th Avenue, Long Island City 1, New York. Please specify the Model B-614. —30—

FURTHER DETAILS ON THE BELL LABORATORIES' TRANSISTOR

ADDITIONAL technical details on the "Transistor" have been recently released by Bell Telephone Laboratories.

The term "Transistor" was derived from the fact that the unit is essentially a resistor which can amplify electrical signals as they are transferred through it from input to output terminals. The "Transistor" is, in reality, the electrical equivalent of a vacuum tube amplifier. However, there the similarity ceases. It has no vacuum, no filament, no glass tube. It is composed entirely of cold solid substances.

The blown-up cutaway view of the "Transistor" is shown in Fig. 1. The unit comprises two separate points of contact made on a block of semiconductor material which, in this particular case, is germanium. The contact wires are each about two one-thousandths of an inch in diameter and are separated from each other at their points of contact to the germanium by about two-thousandths of an inch.

Although designed essentially as an amplifier of voice, carrier, and pulse modulating frequencies, the unit may also be used as an oscillator. Since there is no filament to heat, the "Transistor" goes into oscillation as soon as the device in which it is used is operated. A circuit diagram of a "Transistor" used as an oscillator is shown in Fig. 2.

Experimental work at Bell Telephone Laboratories has thus far revealed that the device may be used as a telephone amplifier, a video signal amplifier, an oscillator, and as a substitute for vacuum tubes in radio receiver circuits, etc. —30—

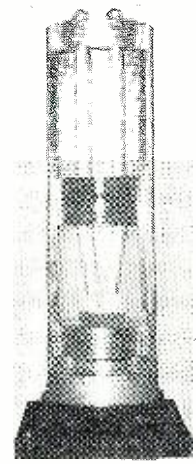
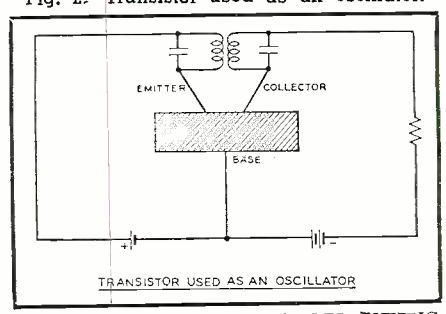


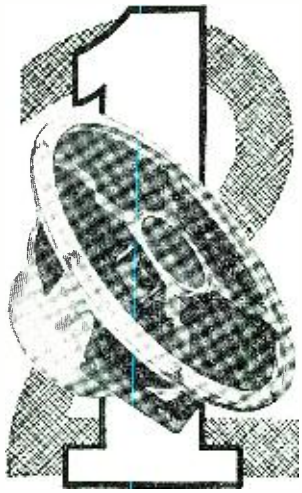
Fig. 1. Blow-up, cutaway model of the Bell Telephone Laboratories' "Transistor." The linear scale is approximately 35 to 1.

Fig. 2. Transistor used as an oscillator.



TRANSISTOR USED AS AN OSCILLATOR

THE CINAXIAL SPEAKER



TWO IN ONE

The economical dual-speaker system . . . a 3-inch high frequency speaker mounted in the cone of a 12-inch low frequency speaker . . . to reproduce the entire signal.

Model CIN 12A (above) covers the range from 50 to 15,000 c.p.s., handles the output of a 10-watt wide range amplifier.

List price $27.50 for immediate delivery

Give your F.M. and television listeners the quality they expect!—With the speaker built expressly for their needs.

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ARC-5 RECEIVER
·19 to .55 mc. The best Q-5'er! The receiver with 85 kc. I.F.'s. Used. Guaranteed in excellent condition. **$8.95**

BD 77 DYNAMOTOR
Input: 12 VDC. Output: 1,000 VDC at 350 mills. Wt. 51 lbs. Brand New. **$4.95**

RM-29A TELEPHONE SET
Complete with handset less batteries. Uses standard 4½ V "C" batt. Wt. 16 lbs. Only takes 2 to have your own phone system. Brand new in canvas bag, $9.95 ea Pr. **$19.50**

BRAND NEW METERS
0-15 volts AC, Roller-Smith, 3-inch round. Special at. **$3.49**
0-800 mills, DC, De Jur, 3-inch square. Special at. **$4.49**

3-CHANNEL OSCILLATOR
Audio oscillator with built-in vacuum tube keyer. Will furnish audio signal for transmission of local keying signals over telephone lines to remotely key any transmitter at other end by means of a tone keyer or similar vacuum tube keyer. Complete with instruction book and schematic. Minus tubes. Operates on 120 volts AC 50/60 cycles. BRAND NEW in original box. **$12.95**

VHF ARC-5 TRANSMITTER
4 ranges. Turret coil switching. A 100, 124 MC; B 122, 146MC. C 122, 146 MC; D 132, 156 MC. Used, complete with tubes. **$12.95**

ELECTRONIC MEGAPHONE
Complete! Conventional-type amplifier. Dry-battery operated. Easy to carry. Use for PA, picnics, fairs, ship loading and construction jobs 1,000 uses. Only. **$19.95**

FL. 8 FILTER
The famous Lazy Q-5'er. Wt. 1½ lbs. Brand New. **$1.39**

BC 1100-A TRANSMITTER
With remote control. 4-channel, 1.5—10 mc. Wt. 700 lbs. Size: 40 cu. ft. Phone: 50 watts. C.W. 75 watts. Power input: 115 V.A.C. 60 cycle, single phase. NEW with exposed cases. Less tubes. **$295.00**

BRAND NEW TUBES

6 AC7	$ .59	957	$ .39
6 K7	.39	9003	.39
807	1.09	371-A	1.19
1616	.79	371-B	2.75
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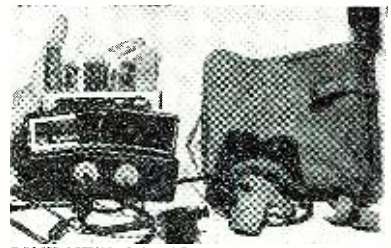
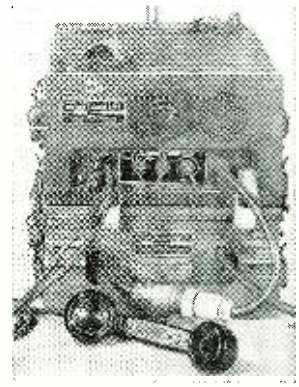
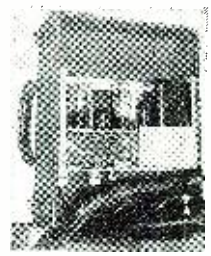


NAVY "WALKIE TALKIE." Model "M" series, 2.3 mc to 4.5 mc crystal controlled receiver-xmitter. Ideal for hams, forest service, foreign trade, marine, etc. Uses 7 peanut tubes and ordinary dry batteries that fit into same case. Wt., less batteries, 6 lbs. With all tubes, mike, headset, antenna, carrying bag, diagram and 2 matched xtals.
LIKE NEW, **2 for $58.00,** Each. **$29.95**

20 to 28 MC FM PORTABLE TRANSCEIVER. BC-620 for 11 and 15 meters; can be extended to 10 meters by adjust. IF's; similar to BC-659 at right, but without speaker or handset.
NEW, orig. boxes. **$19.95**
LIKE NEW. **14.95**
Accessories for BC-659 and BC-620
Crystals for BC-659, any channel 27.0 mc to 38.9 mc or for BC-620, channels 20 mc to 27.9 mc, ea. **$1.00**
Adapter M-399 for alignment of either set, NEW. **1.50**
Battery BA-41 for bias and mike, unused. **$0.65**
Battery Case CS-78 w-plug, U-2. **1.75**
Handset TS-13 w-PL-55 and PL-68, U-1* **3.95**
Diagram BC-659 or BC-620. **.65**
Shock-mount Rack FT-250, U-1 **2.50**
Alignment Tool TL-207, U-1. **.95**





VIBRATOR POWER SUPPLY PE-120 for BC-659 and BC-620; operates from 6, 12 or 24 v. depending on vibrator. With 12 or 24 v. vibrator, battery cable and plug. UNUSED **$12.95** U-1 **$9.95** U-2. **$7.95**

SOUND-POWERED HANDSET TS-10 with cord and plug. NEW, per pair. **$27.95**

INTERPHONE AMPLIFIER BC-347 aircraft type. Input: 200 ohm to single or push-pull plate. Complete with 6F8G tube, 2 hi-fidelity ouncer xfmrs, etc., in case 2½"x4"x6". BRAND NEW, orig. cartons. **$2.95**

CIRCUIT BREAKER, 115 v. 60 cycle, 120 amp; part of RA-38 Rectifier, UNUSED. **$19.95**

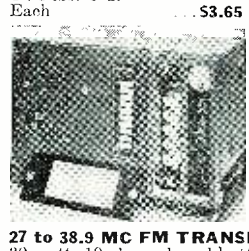
SWITCHBOARD BD-9, portable 4 cord w-drops, U-2 **$4.95** BD-11, 12 line, U-2. **$9.95**

VIBRATOR, 6 pront 6 volt sync. Mallory No. 538C for BC-1335 mobile set. NEW. **$2.49**

PORTABLE TELEPHONE EE-8, checked and guaranteed U-2. **$9.95**

20 to 28 MC FM RECEIVER BC-603 for 11 and 15 meters; can be tuned to 10 meters with slight modification; superhet, BFO, squelch; 10 pushbuttons and manual tuning. Makes fine 10 meter converter or I.F. strip for 88 to 108 Mc wide-band FM; with all tubes, speaker, case, diagram. FREE CONVERSION INSTRUCTIONS for 88 to 108 Mc FM; also easy change to 115v AC. UNUSED, repacked, with dynamotor. **$22.95**
USED, good, with dynamotor. **15.95**
USED, without dynamotor. **12.95**

TELEGRAPH SET TG-5, bat. operated; includes key, earphone, buzzer, bell and sensitive relay, in case 7"x5"x4". 8 lbs. U-2.
Each. **$3.65** Two for. **$6.95**



20 to 28 FM TRANSMITTER BC-604 for 11 and 15 meters; can be operated on 10 meters by use of proper xtal; 10 channel pushbutton xtal controlled; with all tubes, meter, diagram, case and covers; less xtals;
Used, excellent w/dyn. **$19.95**
Used, good, w/dyn. **14.95**
Used, good, without dynamotor. **11.95**
Extra 12 volt dynamotors; DM-34 for rec., U-2. **3.95**
DM-35 for xmtr U-2. **4.95**
Set of 80 xtals in drawer for BC-604 (when bought with BC-604) **12.95**

27 to 38.9 MC FM TRANSMITTER BC-684. looks like BC-604 above. 30 watt, 10 channel pushbutton controlled; with covers, all tubes, meter, diagram, less xtals.
U-1 with dynamotor. **$34.95** Without dynamotor. **$32.95**
U-1 with dynamotor. **29.95** Without dynamotor. **27.95**
Choice of xtal for any channel. **1.00**
Set of 80 xtals in drawer (specify range 27-34.9 MC or 31.9 to 38.9 MC). **$16.95**

PORTABLE PUSH-BUTTON RECEIVER BC-728, covers 2 mc to 6 mc; four push-buttons, 7 peanut tubes, two vibrators, built-in speaker, self-contained power supply requires one 2 volt wet cell (not furnished). In carrying case. U-2, cases need paint. **$12.95**

*U-1: used, excellent; U-2: used, good

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ELECTRONIC SUPPLIES
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Spot Radio News

(*Continued from page* 18)

those areas now being served by TV. The difficulty can be minimized, he said, by the use of directional antennas and allocation of power according to the needs of the areas and of the areas of the other stations which would be affected.

FCC Chairman Wayne Coy stressed the importance of the tropospheric problem in his opening remarks at the hearing, stating that if changes are to be made to reflect current information about tropospheric propagation, in our Standards of Good Engineering Practice, it would seem logical that an engineering conference should be held to discuss methods of measurement of this transmission peculiarity.

"Such a conference might well include engineers interested in the v.h.f., TV, and FM services," Coy declared. "The methods of measuring tropospheric effects are mutually applicable to these services. Data on tropospheric propagation now in the hands of the Commission can be put into shape for early distribution. . . . A reasonable period of time for study of this information would seem to be 30 days, and so we might think in terms of a general engineering conference in November. Following such a conference, two further engineering conferences could be held. . . . It seems to me that the minimum amount of time required for the revision of the Commission's standards and rules is in the order of six months. Nine months might well be taken as a better estimate of the time that will actually transpire. . . . It seems obvious that if we are to pursue the procedures I have been talking about, the processing of applications will necessarily need to be held up, pending the adoption of a final rule on a new allocation plan."

It became quite obvious that Chairman Coy was intimating that an allocation freeze would be called soon, and it was a few weeks later, the announcement being made at an unprecedented special press conference, with Mr. Coy officiating. A review of the evidence submitted at the hearings was presented, Mr. Coy pointing out that witnesses had shown how tropospheric interference might affect existing and proposed stations, and suggested the use of directional antennas and increased power and offered conflicting proposals for closer or wider spacing between TV stations. In view of this testimony, continuation of an allocation program under the present setup appeared to be a poor engineering practice, Coy indicated, and thus the FCC decided to temporarily withhold grants for construction. This ruling will not affect permits already granted, Coy said, and does not mean that there'll be a rupture of present operations. When the freeze is off, probably next March, TV stations on co-channels and adjacent

channels will undoubtedly be separated many more miles than at present.

Industry, in the main, has approved the freeze, believing it will permit receiver distribution stabilization and general relief in supply to many areas.

THE ALLOCATION STAGE took on a new tenant, a week after the TV hearings, the mobile radio services. Here, too, interest was keen, with representatives of over 100 cities, associations, corporations, fire and police departments, light and telephone utilities, bus groups, railroads, taxicabs, airlines, oil-well operators, newspapers, film companies, broadcasters, telecasters, etc., appearing.

With allocations in five bands to be considered (25-30, 44-50, 152-160, 72-76 and 450-460 mc.) and strong claims for these bands being made by the witnesses, it appeared as if the FCC would be faced with a mountainous puzzle, which might take a row of months to solve. In the order calling for these hearings, FCC proposed nineteen exclusive channels for remote pickup in the 25-30 mc. channels, deletion of sixteen channels presently assigned in the 30 to 40-mc. band, elimination of fourteen shared channels proposed earlier in the 152-162 mc. band and the addition of twenty channels in the 450-460 mc. band.

Presenting the broadcasters' view on the proposed allocations, Neal McNaughten, assistant director of the NAB department of engineering, said that the nineteen frequencies between 25 and 30 mc. do not adequately replace the sixteen channels in the 30 to 40 mc. band, which the FCC proposes to give to industrial, public safety, domestic public, and land transportation services.

McNaughten said that the 26-mc. frequencies are subject to long-range interference and are also subject to interference from existing diathermy equipment, and are thus not suited for high-fidelity program purposes, but could be used for cue and circuit line-up channels.

Discussing the proposed use of the 450-452 mc. band for remote pickups, McNaughten said that, as indicated at the TV hearings, there is a lack of knowledge of the propagation characteristics at these high bands, and it would thus be inadvisable to make any definite type of assignments, particularly for program service. However, it does appear feasible to use these frequencies for "walkie-talkie" remote pickup services, he said, and for this purpose a minimum of twenty-one channels would be required, a portion of which could be shared with other services.

A rather novel approach to the allocation difficulty was offered by Daniel E. Noble, director of research for *Motorola*. The priority principle of allocations was suggested by Noble, with channels being allocated on the basis of *utility-of-use priority ratings*, with the ratings including the impor-

tance of the allocations to national defense, public safety, influence upon national economic security, and contributions to the public convenience.

The FCC plan was spanked sharply by Cranston Williams, general manager of the American Newspaper Publisher's Association, who declared that channels had been set aside for many commercial enterprises, but newspapers were omitted. Such an omission was a "flagrant disregard of the public service nature of news dissemination," Williams declared. The present experimental channels, over which news reports and photographs may be transmitted directly from reporters' autos to city desks, should be placed on a permanent basis, Williams pointed out.

The railroads also disagreed with the FCC plan, which would eliminate nineteen of the sixty channels now assigned to the roads. J. M. Souby, general solicitor of the Association of American Railroads told the FCC that the railroads need more frequencies, not less, and that the sixty frequencies requested is equal to only one-half the space of a TV channel. During one phase of the testimony, when Souby indicated that "essential services" such as railroads should come ahead of "luxury" or "amusement" services which he applied to TV, Souby was told by FCC Commisioner E. M. Webster that TV keeps the public informed and he didn't know of anything that takes precedence over an informed public.

SIGNIFICANT ADVANCEMENTS IN TV, FM, and facsimile were recorded during the early months of the Fall season, TV reception possibilities being successfuly demonstrated aboard a speeding train and plane, and simultaneous FM and facsimile broadcasting effectively displayed at a special viewing and listening test of a newspaper.

The plane and train tests were initiated in Washington, the plane being a *Capital Airlines'* DC-4 operating between Washington and Chicago, and the train, the *Baltimore and Ohio* "Marylander" running between Washington and Jersey City. In the plane, a *Philco* console receiver was used, mounted on an elevated platform permitting viewing by all passengers. Front and rear antennas were used and switched in and out to provide maximum pickup. During one run, Washington stations were picked up as the plane left the airport, and ten minutes out Cleveland TV stations were tuned in and retained until a short distance from Chicago, when video signals from this city were switched on to the screen.

The train tests were also quite intriguing, with excellent results obtained during a substanital portion of the run. Employing a TV receiver with a turret type front end, intercarrier circuitry and a rapid automatic gain control system, linked to a pair of hairpin dipoles shaped like a ram's horn, developed by *Bendix* engineers, it was

possible to tune in stations in Washington, Baltimore, Philadelphia, and New York with unusual picture and sound fidelity. To minimize picture distortion, engineers used a direct-coupled video amplifier with provision for clipping all impulse noise.

Power for the train set was supplied by a 32-volt to 110-volt inverter, similar to the types used on two-way railroad radio systems.

FCC Commissioner Frieda B. Hennock, who was a visitor during one of the trial runs, appeared quite impressed with the results.

At the FM-FAX demonstration, conducted jointly by WFIL-FM, the *Philadelphia Inquirer* station and *Radio Inventions,* three members of the FCC were viewers and listeners, George E. Sterling, Rosel H. Hyde and Edward M. Webster. FCC Acting Chief Engineer John S. Willoughby also attended. All were enthusiastic with the operation of the system which provided an eight-page facsimile edition of the newspaper and simultaneous presentation of transcribed and live music.

Based on pioneering developments of John V. L. Hogan, the duplexing process, utilizing a frequency-shift subcarrier operating within the range of 22.5 (black) and 27.5 kc. (white) which does not impair the 50-15,000 cycle quality of the FM broadcast, doubles the usefulness of the assigned FM channels and sets the stage for an interesting new era for sight and sound. .....L.W.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946, OF RADIO & TELEVISION NEWS, PUBLISHED MONTHLY AT CHICAGO, ILL., FOR OCTOBER 1, 1948.

State of Illinois, } ss.
County of Cook }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Arthur T. Pullen, who, having been duly sworn according to law, deposes and says that he is the Business Manager of Radio & Television News and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily, weekly, semiweekly or triweekly newspaper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the act of August 24, 1912, as amended by the acts of March 3, 1933, and July 2, 1946 (section 537, Postal Laws and Regulations), printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, William B. Ziff, 185 North Wabash Ave., Chicago, Ill.; Editor, Oliver Read, 185 North Wabash Ave., Chicago, Ill.; Managing Editor, Wm. A. Stocklin, 185 North Wabash Ave., Chicago, Ill.; Business Manager, A. T. Pullen, 185 North Wabash Ave., Chicago, Ill.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) Ziff-Davis Publishing Company, 185 North Wabash Ave., Chicago 1, Ill.; William B. Ziff, 185 North Wabash Ave., Chicago 1, Ill.; B. G. Davis, 185 North Wabash Ave., Chicago 1, Ill.; A. Ziff, 185 North Wabash Ave., Chicago 1, Ill.; S. Davis, 185 North Wabash Ave., Chicago 1, Ill.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are: Modern Woodmen of America, Rock Island, Ill.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the twelve months preceding the date shown above is..... (This information is required from daily, weekly, semiweekly, and triweekly newspapers only.)

ARTHUR T. PULLEN, Business Manager.

Sworn to and subscribed before me this 28th day of September, 1948.

[SEAL]

EVELYN BYLICA, Notary Public.
(My commission expires April 24, 1950)

International Short-Wave

(*Continued from page* 119)

Hardy, Calif., says "HLKA, 7.935, puts in a fair to good signal, heard best from around 0500 to sign-off which seems to vary from 0805 (Sundays) to 0832 (other days); features talks and music, still no *English* except for identification which usually is 'HLKA, Seoul, Korea,' each 15 minutes; 3-tone chime on half-hour; also heard on the hour occasionally with announcement, 'This program comes to you from the United States of America.' " Is heard erratically in Eastern U.S.

In England, Pearce hears HLKA sign-on around 1557 with Eastern music; gong at 1600, followed by Western recordings; talk 1630.

Lebanon—Beirut still lists frequency as 8.036 (37.36m.). (Pearce, England)

Malaya—BFEBS, Singapore, has replaced 11.730 with 11.850; heard at 0600 with BBC news relay from General Overseas Service. (Kary, Pa., Balbi, Calif.) At 0600 announces channels of 11.850, 9.690, and 6.770 in parallel; Kary has measured 25-m. *NEW* outlet as 11.848.

Radio Australia lists these schedules for *Radio Malaya,* Singapore— 2330-0030 (*English*) on 7.200; 0030-0130 (Malay), 7.20; Saturday and Sunday, 0230-0530 (*English*) on 6.135; daily, 0530-0715 (Malay), 4.825; daily, 0900-1030 (*English*), 4.825 and 4.985; daily 2330-0045 (Chinese) on 6.135; 0715-1030 (Chinese) on 4.780; on Monday, Wednesday, Friday has special broadcast (in Chinese) to Chinese schools at 2230-2330 on 7.200, 6.135. Kuala Lumpur, 6.025, is scheduled 0030-0130 (*English*); 0745-1030 (*English*); 0715-0745 (Malay); 0230-0300 (Chinese). All *Radio Malaya* transmitters are on the air on Saturdays at 2030-2330.

Manchuria—XNNR, 7.098 (measured), may announce 7.100, Harbin, is scheduled 0500-0935 (some days may run late as 1005). News at 0800-0810 when announces "This is the new Chinese station XNNR (or XNAR?) in liberated Manchuria; we are operating on frequencies 42 m., 7.100 kc., and 284.4 m., 1055 kc. You have been listening to the news in English which is broadcast daily at 9 p.m. local time or 1300 GMT." (Major, W. Australia) First reported to me by Dilg, Calif.

Mauritius—Swedes report V3USE, Forest Side, was testing on September 25-29 on 7.340 at 2100-2215 and 0545-1145. (Nilsson)

Monaco—Radio Monte Carlo, 6.035, is heard in Louisiana at 0100-0200 in French with French news 0100-0110, then has American and French recordings to 0200, then news again. Can not be heard until Vera Cruz, 6.030, leaves the air 0000; good signal. (McPheeters) Heard in Alabama at 0115-0300; all-French, strong signal to 0215 when fades. (Hagen)

Mongolia (SOVIET)—Fern, Hawaii, reports a station in this country heard on 8.330 at 0400-1000 in Mongolian, in

parallel with outlet on 5.265. (The 5.265 outlet is officially listed as Ulan-Ude, Buryat Mongol S.S.R.)

Mozambique—The Portuguese program of Lourenco Marques is heard signing on at 1100 with weak signal on 4.830; the 3.49 channel appears to have been given up. (Fern, Hawaii) CR7BJ, 9.654V, is heard with a fair signal signing on with rooster and cuckoo calls and chimes at 0000; at 0030 has popular American music to sign-off 0100; no *English* noted. (Hagen, Ala.)

Northern Rhodesia—ZQP, Lusaka, on 9.710, 7.220, 3.914, is scheduled Mon., Tues., Wed., Sat. at 1000-1200; Thur., Fri., 1000-1300; Sun., 0400-0530, 1930-1130. (Major, W. Australia)

Norway—LLG, 9.61, Oslo, is heard irregularly on West Coast from 0100 on. (Balbi)

Pakistan—Major, W. Australia, has received this information from *Radio Pakistan,* Karachi—"We are broadcasting on 6.075 on a vertical dipole with its centre /4 above ground. The transmitter is located at Karachi (24 degrees 55 minutes N, 67 degrees 0 minutes E). The power fed into the antenna is 250 watts. This is a sort of experimental transmitter and we shall be glad to have more reception reports from that part of the world. Yours is the first from Australia. These reports will help us in designing our services for the two 50 kw. shortwave transmitters which we propose to put up early next year. Our service schedule is 2100-2300 (Sundays 2100-2330), 0200-0330, and 0700-1230. News in *English* is broadcast daily at 2130, 0300, 1030." Letter was signed by S. A. Aziz, Research Engineer. Major comments that while *Radio Pakistan* says it is using 6.075. he is hearing it on 6.062. Gillett, South Australia, placed the frequency close to 6 080.

Panama—Radio Balboa, 6.060, Panama City, although announcing *"Radio Balboa,"* gives QRA as Aptdo. 1929, Ciudad de Panama (Panama City); on the air 1400-2200. (McPheeters, La., Stark, Texas) Is officially listed as HORT, *"Radio Indoamericana,"* Panama City, 1 kw.

HOLA, 9.505, Colon, has Armed Forces Hour *(English)* at 2200-2300 on Saturdays, features an all-request record show. (May also be on other nights.) (Kary, Pa.)

Philippines—Radio Australia some time ago reported KZOK, Manila, on *announced* frequency of 10.000, heard around 0230 in Chinese with identification at 0300, 0330, 0400, and 0430. However, American DX-ers say this station is still using approximately 9.693. Two transmitters?

KZRH, 9.640, Manila, is heard in England from sign-on at 1600, with market reports, news, and then dance music. (Pearce) Usually is fair to good level early mornings in Eastern U.S.

KZFM, 11.84, Manila, is heard in California by Stien as early as 0200; I have heard this one recently quite readable here in West Virginia as late

as 0700; uses singing commercials *(English)*. Has been heard in California by Dilg on 6.170 with headline news 0745.

Dilg, Calif., comments that KZPI, 9.503, Manila, may have increased power since signals are much improved lately; heard mornings.

Portugal—The North American transmission in Portuguese from Lisbon, in addition to being heard over CS2MF (former CSW7), 9.730, is also now heard over CS2MA (ex-CSX) on 6.375 at 1900-2030; good signals on both channels. (Kary, Pa.)

Portuguese Guinea—CQM7, 7.947 (measured), Bissau, is heard in Pennsylvania from after 1700 to sign-off at 1800 with "A Portuguesa," the Portuguese National Anthem; schedule appears still 1630-1800; announcement is "Aqui Bissau, estacao de onda curta en frequencia 7,948 kc., compreimento de onda 37.76 metros, Emissora da Guine." (Kary)

Samoa—Arthur Cushen, N.Z., airmails me that Radio Station ZM2AP, Broadcasting Organization, Administration of Samoa, Apia, Western Samoa, has transmissions on 1420 kc. *(and irregularly on 7.700)*; announces as "2AP, Apia, Western Samoa"; has sessions in Samoan and *English;* schedule for medium-wave outlet is Sundays 0030-0330; Mondays 0130-0230; Tuesdays 0030-0330; Mondays and Tuesdays also at 1500-1600; Wednesdays also at 1600-1700; Thursdays at 0030-0330, 1500-1600; Saturdays at 0030-0330; the 1500-1600 periods are educational and are not broadcast during school holidays.

Sumatra—Radio Australia reports *Radio Indonesia,* Madurka, now on 6.741 daily 0230-1030, all announcements in Javanese; identifies often; varies in frequency as high as 6.770.

Sweden—Winter schedule for Swedish DX programs direct from Stockholm are Saturdays 0215, 6.065, 9.535; 1000, 10.780, 15.155; and 2000, 6.065, 9.535.

On West Coast, Balbi reports SBT, 15.155, and SBP, 11.71, signing on daily except Sundays 0015, fade out around 0200.

Syria—Radio Damascus, 12.000, is heard in New Foundland 1215-1630. (Peddle)

Tangier—Radio International is heard by Kary, Pa., around 1630 on 6.210, fair signal but has severe QRM from aircraft radio on same channel.

United States—WRUL informed Worris, N.Y.—"The new 250 kw. amplifier will be in service some time next year, but about the middle of November we expect to use it at 100 kw. It will not replace any transmitter, but will be used to increase the power of WRUW." At present, power of this series is—WRUX, 7 kilowatt; WRUW, 20 kilowatt; WRUA, WRUL, WRUS, 50 kilowatt.

Uruguay—CXA19, 11.835, *"Radio el Espectador,"* begins evening transmission 1800. (McPheeters, La.)

U.S.S.R.—Tashkent. 6.825, has news for India at 1200-1230 on Sun., Wed., Fri. (Pearce, England)

Vatican—HVJ, 9.660, heard with news 1000 with 15.095 in dual; 5.970 and 9.660 with *(English)* talk 1315; later broadcasts are heard on 5.970 and 11.685 with French at 1345. (Pearce, England)

Yugoslavia—Radio Belgrade, 6.100, now has news daily at both 1230 and 1545 (formerly was at 1530). (Pearce, England) Also reported by Nilsson, Sweden.

* * *

Last Minute Tips

Balbi, Calif., says XGOA, Nanking, signs on its 5.985 outlet at 0600; news 0900; signs off around 1030; fair to ex-

Capital Airlines hostess Joy Geddes tunes in the World Series game on the non-stop "Constitution" flight from Chicago to Washington. Marking a "first" in airline history, Capital Airlines installed the set in cooperation with the Philco Corporation. It is planned to extend TV service to all Capital planes.

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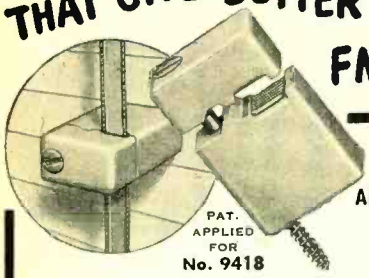

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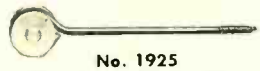

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Insulated Screw Eye. Overall length 7-1/4", 5/16" insulator hole.

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RCA No. MI-12433. Heavy duty Alnico V magnet. Ridged cone. With universal output transformer for single tubes (4000, 8000, 1600 ohm taps). Ruggedly built and has good frequency characteristics. Only a limited quantity. Stock up and save. Wt. 5 lbs.

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OIL FILLED X' MITTING CONDENSERS 10 MFD.—600 V.

An exceptionally good buy for hams. This brand new General Electric Filter condenser is pyranol filled and has tinned lug terminals with heavy bakelite insulators on top. Size: 4¾ x 3¾ x 1¾". Shpg. wt. 2 lbs.

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Popular open frame type filament transformer rated 1 ampere at 6.3 volts. Insulated leads. Only a limited quantity at the unusually low price quoted below. Stock up while they last. Shpg. wt. ¾ lb. 1½ x 2⅜ x 1⅝".

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Model TC-10 Multitester: A compact, efficient, low cost voltohm-milliameter that's ideal for the beginner for general service and test work. Compact only 6 x 3¼ x 2", it uses a D'Arsonval type meter with 2% accuracy. Ranges: A.C. and D.C. Volts 0-5-15-150-1500-3000 and 0-1.5 amps. Ohms D.C. Current 0-5-50 ma. 0 100 and 0-100000. Oak case. 3 lbs.

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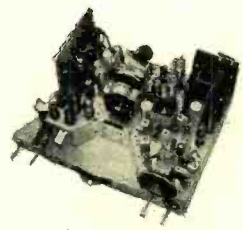

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Complete . . $205.00
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All flush mounting, double shell type with insulated leads. Primaries for 110/120 volts, 50/60 cycles a.c.

140 MA. UNIT $2.65
RCA No. M-143821: delivers 680 volts c.t. at 140 ma.; 6.3 volts c.t. at 3.0 amps.; 5 volts at 2.0 amps. 5 lbs.

160 MA. UNIT $2.95
RCA No. M-145915: delivers 720 volts c.t. at 160 ma.; 6.3 volts c.t. at 4.0 amps.; 5 volts at 3.0 amps. 5 lbs.

200 MA. UNIT $3.95
RCA No. M-141098: delivers 800 volts c.t. at 200 ma.; 6.3 volts at 3.3 amps.; 5 volts at 3.0 amps. Static shield. 7 lbs.

90 MA. UNIT $2.95
THORDARSON: 700 volts c.t. at 90 ma.; 6.3 volts c.t. at 3.5 amps.; 5 volts at 3.0 amps. Shpg. wt. 4 lbs.

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The fastest, most efficient way to mount your television, FM or amateur antenna. Complete — nothing else needed. Comprises heavy duty metal bracket with two clamps for antenna mast, turn-buckles, straps and all hardware. Shpg. wt. 4 lbs.

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TELEVISION BOOSTER—ALL CHANNEL

Well designed, this unit increases signal strength and helps bring in weak stations. Easy to install (takes just a few minutes). Especially helpful in marginal areas. Housed in wood cabinet. Complete with tubes and all instructions. Shpg. wt. 4 lbs.

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A SINGLE ANTENNA FOR ALL TELEVISION AND F.M. BANDS

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- Unidirectional pattern. No side lobes on either band.
- Essentially uniform response, 54 to 88 Mc. and 174 to 216 Mc.
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Hempstead 2-9200

cellent signal. Balbi says XGSO, 15.105, Nanking, is heard from 2100 on, news 2230, and signs off around 2255; fair signal.

Pearce, England, informs me that the Rebel Greek Station often moves from 6.830 to approximately 6.720, news in French 1400.

The *"Sharq-al-Adna"* outlets formerly at Jaffa, Palestine, are now at Limassol, Cyprus, according to official sources.

OTC-2, 9.768, Leopoldville, Belgian Congo, is reported to now have a DX program each Wednesday at 1500. (Skoog, Sweden)

Hagen, Ala., flashes to me that he has heard *Radio Beirut,* Lebanon, on 6.090, signs on 0600, runs to 0800; strong signal; popular American music 0600-0615; then classical music; announces "Radio Beiret" in French; no *English* heard; at 0630 they play native music; signal grows weak towards end of transmission; *not heard on Sundays.*

Balbi, Calif., reports a Shanghai station on 7.56, signs off 0900; signals weak to fair, may be a Chinese Army outlet.

XURA, 7.222, Tai-Pei, Formosa, is coming through at 0400-0530 in Alabama with weak signal; no *English* heard. (Hagen)

Swedish sources report a Greek station on 8.090 with daily news transmission in Greek at dictation speed 1430-1500. (Nilsson, Sweden)

JKG, 9.695, and JKF2, 9.655, have replaced JVW and JVW3 early evenings; JKC, 7.257, and JKA, 7.285, are heard from 0100 on. JKD, 6.015, and JKE2, 4.860, sign off 0905 (1000 on Sats.). (Balbi, Calif.)

Oslo now announces as *"Radio Norway"* instead of *"Norwegian State Broadcasting."* (Worris, N. Y.)

HC1GQ, 9.163, *"Nariz del Diablo,"* Quito, Ecuador, sent QSL-letter. (Bergstrom, Sweden) Frequency of this one is officially listed 9.190.

ZBW3, 9.525, Hong Kong, opens 0530; BBC news relay 0600; good signal in New Zealand. (Gray)

Pearce, England, reports a "Forces Program" heard on about 8.000 on Fridays (*only*) concluding with "American Hour" at 1330-1430 when signs off with "American March"; mentions nothing but "Corps of Engineers"; phone station has been heard before broadcast giving call of JJOY; also he has heard JJOY1 on 8.020 mentioned. *Can anyone identify this one?*

Switzerland's HER3, 6.165, Berne, has replaced HER6, 15.305, to North America, 2030-2230. HLKA, 7.93, Korea, is heard on West Coast from 0400 to 0905 sign-off. (Balbi, Calif.)

From *Oslo Radio,* Worris, N. Y., has received this data—"Outside our one-hour transmission every night from 2000-2100 (15.17, 11.735, 9.61), especially designed for our merchant marine and Norwegians abroad, we have no other special broadcasts of shortwave. But our State Network programs are partly being transmitted on short-wave too, especially because of our fishermen in the North Sea and in

the North Atlantic; that will be on frequencies in the 16-, 19-, 25-, 31-, and 49-meter bands at 0130-0230, 1300-1330, and 1530-1630."

Major, W. Australia, reports XAET (or XHET?), Korea, on 11.400, from 0630 to closing down 0800; no *English* at 0630-0800, but *English* has been heard when this outlet was used for calling San Francisco's KWC.

Arthur, W. Va., reports that stations of the Ontario Hydroelectric Power (Ontario, Canada) are often heard weekdays in contact with each other; CHX, Toronto, is the main office of the concern; chief stations are CHN, Cameron Falls; CHX, Toronto; CHY, Ear Falls, which work on 5.795, 6.925, 7.525, 9.060, 9.210, 10.230 (usually use 9.06 and 10.23 mornings); CY2E, Longlac, CZ4H, Waboose Dam, CZ4F, Summit Dam, work on 2.100, 6.925, 7.525.

The Latin American station heard "day and night" on 19.470 is a harmonic of HI2T, 9.735, Ciudad Trujillo, Dominican Republic, *"La Voz del Yuna."*

QRA of XRRA, Peiping, is The Peiping Broadcasting Station XRRA, 3 Hsi Change Ar Chieh, Peiping, China. (Kary, Pa.)

At deadline, Kary, Pa., had just received this letter from A. W. Dean of the Near East Arab Broadcasting Station, P.O. Box 219, Limassol, Cyprus —"Things were a little hectic in Palestine during the last week before evacuation and, what with one thing and another, I was not sorry to get away. I was able to remove the station to Cyprus with the minimum damage and loss and, although we had to go out on small stuff during the changeover period, all the original 7½ kw. transmitters will be back on the air by November 1. My engineers had quite a time and it is to their credit that we did not lose one minute of program time during the changeover from Palestine to Cyprus. I'm afraid I can't give you much information about the services for Palestine and Trans-Jordan now; the set-up is rather fluid and varies from day to day. We monitor all we can get, of course, but it requires a lot of searching around the bands. In any case, everything appears to be on low power. We rely for the most part on dispatches from our own correspondent in Amman. Our schedule from November 1 on is—2255-0135, 9.650, 6.170, 6.135; 0530-1000, 11.720, 9.650, 6.170; 1045-1515, 9.650, 6.170; 6.135; news at 2300, 0030, 1100, 1330, 1345; and news at dictation speed 0100, 1115." (*Note:* I presume "news" is in Arabic at times indicated.—K.R.B.)

In verifying my report on its initial 17.890 tests, HCJB stated rig is 10 kw. transmitter used on 12.455 at other times; tests are at 1500-1600 (2000-2100 GMT) beamed on Europe on Tuesdays (Swedish), Wednesdays (French), Thursdays (*English*), and Fridays (Spanish); said "our future plans concerning this frequency naturally depend on the outcome of the tests but you can be sure we will let

you know at once as soon as we decide on any regular schedule on 16-metres"; want reports from *anywhere* in the world on these 16-m. tests—to HCJB, Casilla 691, Quito, Ecuador.

Winter schedules of *Radio Moscow* to North America (in *English*) are announced for 0745-0815 on 11.960, 11.720, 9.600, 9.560, 9.540, 7.360, 6.290, 6.150; 1820-1930 on 15.230, 11.880, 11.720, 7.360, 7.290; 2100-2215 on 15.230, 11.880, 11.720, 9.600, 7.360, 7.290 and *possibly* 7.210; latter transmission is a *new* one. (Hankins, Pa., Fargo, Ga.) (*Note:* Moscow makes frequent changes in frequencies in this service and I suggest readers listen around sign-off at 1930 on 11.72 when schedules and frequencies normally are given in detail.—K.R.B.)

BBC winter schedules to North America are listed GWH, 11.80, 0600-0800; GST, 21.55, 0800-0900, 0915-1215, 1300-1445; GWG, 15.11, 1400-1600; GRF, 12.095, 1500-1615; GWH, 11.80, 1615-2215; GRH, 9.825, 1615-2215, GSI, 15.25, 1615-2245; CSB, 9.51, 1930-2215; GSI and GSB are for West Coast.

Kary, Pa., says call letters of ZCA, 18.890, Tel Aviv, have been changed to 4XA21, which *probably* means that ZCB, 18.350/18.375 is 4XB21, and that ZCC, 14.700, is now 4XC21. Transmitter is *RCA* type 4331 with maximum power 1400 watts, but actually radiating *only* 900 watts.

Dilg, Calif., says the station around 11.73 or 11.74 at 0830 in Chinese is USSR and should not be mistaken for Singapore which has left 11.73 for 11.85 (approx.) where it, too, has Chinese 0830.

According to Swedish DX program, Stathmos Athinon, Athens, is transmitting on 6.117 from around 1300 to 1630 with output of 7.5 kw.; Rabat, French Morocco, has been heard on a *new* frequency of 6.005 from 1730 to 1830, good strength in Sweden; *Radio Omdurman* has been heard on *new* frequency of 9.550 (this one jumps around continuously, it seems!—K.R.B.)

Berlin RIAS, 6.080, more recently has been signing on 0000 instead 2300. (Kary, Pa.)

Swedish sources say *Radio Pakistan* has moved to 6.210, heard 1030-1045; list *Radio Rangoon* on 9.542 at 0030-0230, 0700-1015; report an Angola outlet on 7.590 heard from 1130 on; say the station around 8 megacycles on Fridays only at 1300-1430 is American Armed Forces Radio in Greece; (this may be one reported by Pearce, England, as announcing as "Corps of Engineers," and/or may be one reported earlier by Swedes as heard at times with news in Greek at dictation speed; they first said on 8.090 with this Greek news daily 1430-1500—K.R.B.); another Swedish report is that Baghdad operates transmitters on 7.090 and 7.062, heard on one of these outlets at 1130. (Swedish DX session via McPheeters, La.)

In verifying for Stien, Calif., Batavia, gave QRA as "Stichting Radio Omroep i.o.; Hfdkantoor": Koningsplin Z 17, Batavia, Java, N.E.I.

Rome, 15.12, heard with news around 1915, good signal in Wisconsin. (Stibb)

Paris is heard well in California in 2015-2045 transmission to U. S. on 9.55, 11.70; first 15 minutes in *English*. (Stien)

Gunnar Nygaard, *Radio Norway,* has notified Kary, Pa., that *Radio Norway* hoped to be able to start transmissions on a 13-meter channel this fall, may be in operation there by this time; did not indicate schedule for this 21-megacycle radiation.

Finally, last-minute tips from Kary, Pa., are BBC, London, heard on "unlisted" 7.200 with relay of "Voice of America" to Eastern Europe around 1630-1730; announced 41.67 meters. XEUW, 6.020 Vera Cruz, Mexico, is now in clear since HJCX, 6.018, is now off that spot; is blotted out, however, around 2230 when Kiev's carrier comes on; aside from latter, suffers slight sideband QRM from HC1CR, 6.025, Ibarra, Ecuador. LRU, 15.290, Buenos Aires, now heard in clear to 1600 sign-off; signals only fair and subject to some sideband QRM from BBC's 15.300. VP4RD, Port-of-Spain, Trinidad, is finally back on assigned 9.625. All-request Armed Forces Show carried by HOLA, 9.505, Colon, Panama, is on *daily* instead of just Saturdays as first reported. CBFX, 9.630, Montreal, is back on the air in parallel with CBFW, 6.090, nights, but former is badly QRM'd; news in French 2145-2200; full schedule not known but an old schedule was 0630-2230. H12A, formerly 6.786, is now on measured 7.217, announcing "La Voz de Releccion, La Voz del Pueblo," location is Santiago, Dominican Republic. HJKF, 9.520, and HJKD, 6.000, Bogota, Colombia, close-down 2300; both have fine signals during final hour of transmission.

* * *

Acknowledgement

Many thanks for the FB reports received during 1948. May 1949 be a year of peace, prosperity, and brilliant DX for you all. I always am glad to receive reports from readers in any part of the world; active ISW monitors receive a monitor's certificate each year. QRA is 948 Stewartstown Road, Morgantown, W. Va., U.S.A. . . . . K.R.B.

AFCA NEWS

This Association is a patriotic non-profit organization, with chapters in most of the larger cities, dedicated to developing and maintaining efficient personnel, commissioned, enlisted, civilian, for the supply (including design and development), installation, maintenance and operation of communications and electronic equipment for Army, Navy and Air Force and their supporting civilian activities. It publishes a magazine "SIGNALS" at its national headquarters in Washington. Every American interested in any way in communications is eligible and invited to join.

AFCA News

1949 Annual Meeting

At a conference at the Navy Department on October 4th, final decision was made to hold AFCA's annual meeting in Washington on April 4th and 5th and, possibly, the 6th. The conference was attended by Admiral Earl E. Stone, Chief of Naval Communications, and members of his staff; representatives from the Naval Research Laboratory, Bureau of Ships, Public Relations Office and Bureau of Aeronautics; and President F. G. Macarow and Secretary E. C. Cover of the Washington Chapter, as well as General S. H. Sherrill, AFCA Executive Secretary.

Tentative plans call for a meeting of the AFCA Council and Board of Directors on the afternoon of April 4th, with the banquet that evening. The general business meeting will be held on the 5th, followed by demonstrations and exhibitions of Naval equipment at the research laboratories, Anacostia Naval Air Station, the Naval Gun Factory and other points in the Washington area.

Research and Development Board

The following officers of AFCA were invited to attend the symposium on Communications Research in Washington on October 11th, 12th and 13th: Directors Lee De Forest, F. B. Jewett, Julius Stratton and Harold A. Zahl, and Executive Secretary S. H. Sherrill.

Annual Industry-Army Day

At a meeting on September 2nd, the Coordinating Committee for Armed Forces Associations selected January 28th and Boston, Mass., as the time and place for the 1949 Industry-Army Day meeting. Lt. Col. George T. Cottle, representing the Boston Chapter of AFCA, is in charge of initial plans for the meeting.

Civil Defense Planning

AFCA Executive Secretary conferred on September 13th with Mr. Russell J. Hopley, Director of Civil Defense in the National Military Establishment. The AFCA committee on radio amateurs for emergency use sub-

mitted its tentative plan through national headquarters for consideration by Mr. Hopley's Board. The part that communications will play in civil defense will be described in a special article in the March issue of the AFCA magazine "SIGNALS."

Special Committee

Maj. Gen. Spencer B. Akin, Admiral Earl E. Stone, Maj. Gen. F. L. Ankenbrandt, Brig. Gen. A. W. Marriner and Col. W. W. Watts have accepted AFCA President Sarnoff's invitation to serve on a special committee, under the chairmanship of Mr. William J. Halligan, to determine ways and means of broadening the scope of AFCA and increasing its membership.

Area Representative

Mr. William H. Mansfield, Asst. Vice President of the *Southern Bell Telephone & Telegraph Co.,* Atlanta, has been appointed Southeastern Area Representative of AFCA.

Chapter Notes

Oklahoma A&M College

The first fall meeting of the Oklahoma A&M Chapter was held on September 24th. The following officers were installed: George E. Thurmond—President; William Preston—Vice President; Capt. Milton M. Berry—Treasurer; and W. D. Manahan, Secretary. -30-

SET OUTPUT CLIMBS

FIGURES just released by the Radio Manufacturers Association indicate that radio set production is again on the increase.

RMA member-companies produced 64,953 television receivers in August for a new monthly record and an increase of almost 10,000 over the July output. Average weekly production of 16,238 TV sets in August showed an increase of 51 per-cent over the weekly production for the first half of the year. The August production brings television set output to 399,938 since January 1st.

FM-AM set production by RMA member-companies totalled 110,879 in August to record the largest output of this type of receiver since last March.

To date 881,180 FM-AM sets have been produced since the first of this year and 8,082,736 AM sets of all types for a total of 9,363,854 radio receivers manufactured from January 1st through August, 1948. -30-

"We been using this toaster for two years now, Ma, and I still don't taste no difference in the bread!"

Manufacturers' Literature

Readers are asked to write directly to the manufacturer for the literature. By mentioning RADIO & TELEVISION NEWS, the issue and page, and enclosing the proper amount, when indicated, delay will be prevented.

"SERVIT SELECTOR"

Burndy Engineering Company of New York City has just published a handy reference guide, the "*Servit* Selector" which helps to simplify the choice of the correct type of *Servit* (split-bolt connector) for various conductor combinations.

The *Burndy Servit* used for taps, deadends, service entrance, motor lead and junction box connections is supplied for copper, Copperweld, aluminum, A.C.S.R., Amerductor, Amersteel, steel, and for combinations of different conductor metals.

A copy of the "*Servit* Selector" may be secured from *Burndy Engineering Company,* 107 Bruckner Boulevard, New York 54, New York. Ask for Bulletin 48Q3.

BOOKLET FOR BROADCASTERS

The Superior Electric Company has issued an informational booklet of special interest to AM, FM, and television broadcasters.

Entitled "EM," the booklet deals with automatic regulation of line voltage input to broadcasting equipment. It is designed to show that line voltage variations have a direct bearing on the life and efficiency of transmitter tubes and associated apparatus and that by proper regulation expenditures for tube replacements can be reduced appreciably.

For copies of Bulletin 448 write *The Superior Electric Company,* 311 Hannon Street, Bristol, Connecticut.

INSTRUMENT DATA

Bradshaw Instruments Co. of New York is currently offering a copy of a new data sheet covering the Model 10-P "Range Master," the Model 10 "Range Master," the Model 30 multitester, and the Model 300 signal generator.

Included is descriptive material on each instrument, ranges, size, sensitivity, etc. Prices are also included.

A copy of this four-page data sheet may be secured by writing *Bradshaw Instruments Co.,* 348 Livingston Street, Brooklyn 17, New York.

LAFAYETTE-CONCORD CATALOGUE

Lafayette-Concord Radio, the largest radio parts organization in the world which was formed through a merger of *Radio Wire Television* and *Concord Radio,* is now distributing the new combined 1949 catalogue to servicemen, hams, etc.

This 180 page book lists radio, television, high fidelity, and amateur equipment; public address systems, parts, etc. Literally thousands of items have been included in this new catalogue which is available without charge on request.

Address requests for a copy of catalogue No. 89 to *Lafayette-Concord Radio* at either Chicago 7, Illinois; New York 13, N. Y.; or Atlanta 3, Georgia.

HAM INDUCTORS

E. F. Johnson Co. of Waseca, Minnesota is offering copies of its new catalogue "Air Wound Ham Inductors" to interested amateurs.

The catalogue introduces a new and comprehensive line of ham inductors and plug-in swinging link assemblies which bring to the amateur efficiency equalling that of commercial and broadcast components, according to the company.

Instructions are provided in the new catalogue which enable the amateur to select the correct coil, as well as the correct link, for his individual application.

This 8-page catalogue is profusely illustrated and includes coupling network data as well as an operating voltage graph for correct tube-inductor matching.

Copies of "Air Wound Ham Inductors" are available from *E. F. Johnson Company,* Waseca, Minnesota.

TUBE REFERENCE

The 1949 edition of the *RCA* Tube Department's "Tube Reference and Calendar" is now on the press and will soon be available through *RCA* tube distributors for issue to radio dealers and servicemen, engineers, and technicians.

The 19th annual edition of this widely used notebook has been completely revised and expanded to include valuable television service data and new, up-to-date information on tubes and batteries.

Of special interest in the new edition is the television data prepared by John Meagher, the Tube Department's television specialist. This includes information and charts on television channels and carrier frequencies, television signal data, television receiver alignment, test pattern analysis, and air path distance of reflected signals.

This "Tube Reference and Calendar" will be available only through *RCA, RCA Victor,* and *Cunningham* distributors.

STANCOR TRANSFORMERS

A 4-page circular describing the company's line of "HF" and "WF" high fidelity transformers has just been issued by *Standard Transformer Corporation* of Chicago.

The data sheet pictures three of the transformer cases and describes ten different units in the "HF" and "WF" line. Specifications include application data, primary impedance, secondary impedance, response ±1 db., maximum primary d.c. unbalance, maximum level in db., hum pickup reduction, mounting, shipping weight, and list price on the "HF" series. Information covering application, primary impedance, secondary impedance response ±2 db., mounting, shipping weight, and list price on the "WF" series is also included.

This new line of high fidelity transformers has been especially designed for the audio designer, engineer, and amateur. Copies of the catalogue will be forwarded to those making their request to *Standard Transformer Corporation,* Dept. H, Elston, Kedzie & Addison Streets, Chicago 18, Illinois.

PLUG-IN STRIPS

Of interest to dealers is the new catalogue CF-2 just issued by *National Electric Products Corp.* of Pittsburgh, Pennsylvania.

This 8-page catalogue describes the company's line of 3 and 6 foot standard lengths of redesigned multi-outlet branch circuit assembly which is particularly suitable for store, office, display window, show room, assembly bench, or residential installation.

Electrical outlets at both 6 and 18 inch intervals along the raceway are pictured and described in this publication. Also covered are the fittings required in making an installation such as elbows, junction box covers, end blanks, and fill-in strips to use behind radiators and other inaccessible places.

A copy of Catalogue CF-2 will be forwarded on request. Address *National Electric Products Corp.,* Chamber of Commerce Bldg., Pittsburgh 19, Pennsylvania.

HAMMARLUND CATALOGUE

The Hammarlund Mfg. Co., Inc. has announced the availability of a new 16-page catalogue covering its line of capacitors and components.

Designed especially for engineers and technicians who design radio and electronics equipment, the new catalogue contains elaborate detailed drawings and photographs which present complete and precise information on every item. Emphasis is placed on miniaturization of components and equipment. A large number of the items listed are especially designed to conform to present-day requirements of both military and commercial services.

The catalogue is printed in two colors and is a standard 8½x11 inches. A copy may be obtained by writing to *The Hammarlund Mfg. Co., Inc.,* 460 West 34th Street, New York 1, New York.

"REPS" ROSTER

Copies of the 1948 complete roster of The Representatives of Radio Parts Manufacturers, Inc. are now available

and will be supplied free of charge to any manufacturer of radio and electronic parts and equipment who makes his request on his business letterhead to L. C. McCarthy, Secretary of The Representatives, 9 South Clinton Street, Chicago 6, Illinois.

The 72-page booklet lists more than 350 members of the organization both alphabetically and by geographical locations. Data also includes information concerning the number of travelers associated with each representative, listing of the warehouse facilities he provides, and any type of specialized selling in which he engages.

ATTACHMENT BULLETIN

Ettco Tool Company, Inc. of Brooklyn, New York has just released a new 6-page bulletin fully describing the latest line of *Ettco-Emrick* tapping and threading attachments for drill presses.

The bulletin lists the seven sizes of attachments made by the company for No. 0 to ¾" taps and No. 6 to ⅝" dies.

Included in the publication are prices and details of speed, capacities, and construction, as well as a table to simplify the selection of quill clamps to be used with these attachments on any standard drill press.

Copies of the bulletin are available on request. Write for Bulletin No. 22, *Ettco Tool Company, Inc.*, 594 Johnson Avenue, Brooklyn 6, New York.

MOBILE EQUIPMENT

Communications Company, Inc. of Coral Gables, Florida is currently offering a copy of its new brochure covering the company's all-new low drain v.h.f. FM two-way mobile radio equipment.

Designed specifically for police and taxicab installation, the new equipment is fully described in the bulletin. Several pages have been devoted to a presentation of the special features of the equipment while a fourth page contains a complete technical description of the receiver, power supply and transmitter sections. Several photographs show the complete installation in the vehicle.

For a copy of the bulletin describing the Model 275-C mobile unit write to *Communications Company, Inc.*, Coral Gables 34, Florida. —30—

DONOHUE

"I believe we'll save its cost in golf balls the first season!"

Television Survey
(*Continued from page 38*)

broad classifications. The first includes programs originating at some point outside the television studio. Usually unrehearsed or "spontaneous," these programs include all sporting events, parades, conventions, and special or historic events.

The second type of program originates entirely within the studio. Drama, variety shows, and similar "live" programs are usually intermingled with a variety of "canned" film shows.

The enormous costs involved in televising all "live" talent programs—particularly good dramas and musical variety shows—eliminate many of them from the tiny operating budgets of most new TV stations. Success in television is measured with the dollar yardstick. The very existence of television depends upon its effectiveness as an advertising medium. The sale of goods *via video* is the prime requisite for improved programs—whether entertainment or educational. Like radio broadcasting, television must "pay its way"; but the program production costs of television compare more closely to motion picture costs rather than to radio.

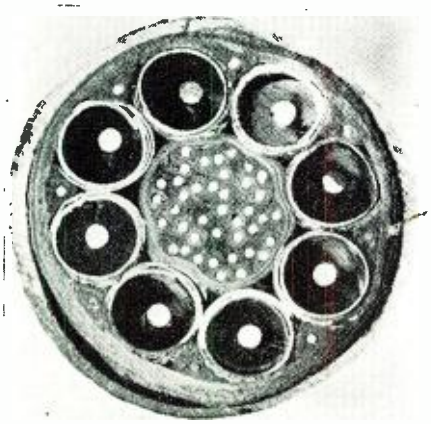
FREQUENCY RANGES OF TELEVISION CHANNELS

(As frozen by the FCC for a period of 6 months beginning September 30, 1948)

LOW BAND		HIGH BAND	
Channel	Freq.	Channel	Freq.
1	Not in use	7	174-180 mc.
2	54-60 mc.	8	180-186 mc.
3	60-66 mc.	9	186-192 mc.
4	66-72 mc.	10	192-198 mc.
5	76-82 mc.	11	198-204 mc.
6	82-88 mc.	12	204-210 mc.
		13	210-216 mc.

Table 4

Section of a typical 8-tube coaxial cable, showing arrangement of conductors. Cable of this type has been plowed in between Buffalo and Cleveland as part of Bell System's Midwestern Television Network.



Although this enormous economic obstacle is likely to impede any progress toward immediate improvement of TV programming, all is not too gloomy.

With increased production and sales of TV receivers an accomplished fact, advertisers will turn to television in much greater numbers when assured an audience of great size. The use of film is also a factor in reducing program costs of a TV station. But the most significant solution to the economic problem of TV programming is network operation.

Most efficient network facilities are the coaxial cable lines—with supplementary radio relay links—of the *Bell System*. In this respect eastern and midwestern TV stations are more fortunate than those stations isolated from existing *Bell* networks. Shown in Fig. 1 are the Eastern and Midwestern Networks of the *Bell System*, which are now in full operation. Other coaxial cable lines are under construction but will not be completed until late 1949 or early 1950. Most radio relay systems are operated experimentally, and the principal *commercial* television networks will utilize coaxial cable wherever possible.

TOTAL TV SET PRODUCTION

	1947	1948
Jan.	5,981	33,001
Feb.	6,878	39,477
Mar.	7,303	57,350
Apr.	8,675	50,972
May	9,559	55,194
June	12,632	70,788
July	11,007	61,697
Aug.	13,511	71,448
Sept.	35,991	97,014
Oct.	26,062	110,000 (est.)
Nov.	26,548	
Dec.	32,279	
Prior to Jan. 1, 1947..		15,000
TOTAL		858,367

Table 5.

-30-

The third monthly prize in the Hytron Servicemen's Contest (for July) was won by Sidney C. Patrette of San Jose, California. Mr. Patrette (left) received his award from Russ Hines (right) Hytron representative, while Frank Quement of Frank Quement, Inc., watches the ceremony with interest. The July winner has been a customer of Mr. Quement's, the Hytron jobber, for 15 years.

Pickup-Preamplifier

(*Continued from page* 59)

the pickup itself is predominantly inductive; according to the manufacturers, the *G.E.* pickup has an inductance of 100 mh. and the *Pickering* 120 mh. If a condenser is shunted across these pickups, a resonant filter is formed and the result is a low pass section having much sharper cut-off than the usual *R/C* tone control circuit. Depending on the *"Q"* of the circuit, which will be modified in a manner to be explained, roll-offs of from 15 to 25 db. per octave can be obtained.

If a condenser alone is placed across the pickup, a sharp peak will be produced at a frequency just below cut-off, due to resonance. This may be avoided by shunting the condenser by a properly chosen resistor, which will give a smooth drop-off without peaks or dips at the resonant frequency. The combinations can be switched in as shown.

Again a 3-position switch is used. The first position, using a resistor chosen approximately correct for the characteristic load of the pickup, gives an essentially flat high-frequency response, dropping approximately 3 db. at 10,000 cycles. The value given for each pickup is that recommended by the manufacturer.

Position 2 is designed to be down 3 db. at 6500 cycles and to cut off quite sharply beyond this point. Position 3 is down 3 db. at 3500 cycles and 25 db. at 10,000.

In general Position 1 will be found satisfactory for vinylite and very high quality shellac records such as the *"ffrr"* and certain laminated American types. Position 2 will give good results with most run-of-the-mill American shellac records in good condition. Position 3 will have considerable high-frequency loss but will make very noisy shellac records fairly tolerable.

Notes on the Preamplifier

Since considerable preamplification is required to make up for the equalization in use, high-mu triodes are recommended. This amplifier has been built with a pair of 6SF5's or a single 6SL7. Either is satisfactory, though the 6SF5's tend to have less hum, higher gain and apparently better high-frequency response.

R_{11} and C_9 in combination form a decoupling filter, so that plate voltage may be borrowed from any amplifier or radio receiver. In addition, it applies additional filtering to this voltage and reduces hum to some extent. Since the amplifier has a very high gain, hum is a problem, and shielding should be very carefully carried out.

If the 6.3 volt heater voltage is not taken from another amplifier, be sure to ground the center tap of the transformer used. However, most amplifiers can supply the extra filament current needed and it is assumed that

the grounding of the center tap has been done in the main amplifier. If, instead, one leg of the filament has been grounded, it may be necessary to experiment with grounding one or the other leg of the amplifier tube heater to determine which has less hum.

Only 2 or 3 ma. of plate current is needed and either .3 or .6 amp. at 6.3 volts on the heater, depending on whether one or two tubes are used.

—30—

Converting D.C. Relays

(*Continued from page 55*)

crometers, then you can calculate the wire size accurately enough for all practical problems. First, measure the resistance of the original winding. Next measure the outside diameter of the winding and then the inside diameter—you may have to wait until after the relay is unwound in order to accurately measure the inside core, but if you can estimate it with reasonable accuracy it will probably be close enough.

Subtract the inner radius from the outer radius, divide this figure by 2 and add to the inner radius. This will give the average turn radius. Multiply this by 2×3.1416 to get the length of the average turn. Next, measure the length of the winding and its depth. The depth of the winding will be the difference between the inner and outer radii. Multiply the length and depth of the winding to get the square winding area. Now make a try at the wire size. From inspection or pure intuition, make a guess at the wire size you think is on the original winding. Perhaps an actual example will make this part clear. Suppose the d.c. resistance of a certain relay is 200 ohms. The o.d. is 1" and the i.d. is ⅜". The length of the winding is 1.25". Following the above, we find that the average turn diameter is ⅝". The average turn is 2" long and the square winding area is .4". After looking at the wire on the relay it is decided that maybe it is No. 30 enameled. From the wire tables we see that No. 30 wire will wind 90 turns per inch—squared, this is 8100 turns per square inch. The relay in this example has .4 square inches winding area, so .4×8100 =3240 turns could be wound at an average length of 2" per turn (previous calculation above) or 6480" total length. Divided by 12 we see that if this relay were wound with No. 30 wire it would contain 540 ft. of wire. Again referring to the wire tables we see that No. 30 wire runs 105 ohms per 1000 ft. and therefore 540 ft. would have a resistance of 57 ohms. Since the measured resistance of this relay was found to be 200 ohms, we know that our guess was incorrect, however, we can now determine what the true size is by referring to the chart shown on page 55.

The calculated resistance differs from the measured resistance by a factor of approximately 4. Referring

to the bottom side of the chart, read up from the figure 4 to where the vertical line intercepts the resistance line and then read across.

On the left side we read the figure 3. This means that the true wire size differs from No. 30 by three sizes, larger or smaller, and since the true resistance is higher than the calculated resistance the wire must be smaller than No. 30 and is therefore, No. 33. This is exactly right as the example chosen was an actual relay.

Through the use of this chart the conversion of relays is made very simple and many new uses can be found for otherwise idle equipment.

-30-

Mobile Station

(*Continued from page* 41)

minimum oscillator cathode current. A sensitive wavemeter is handy during this period as it can be used to determine the correct harmonic and also for detecting r.f. in the final tank when neutralizing. If the coils are wound as specified, only the second harmonic should be available in the oscillator plate tank, and the 10-meter band should be resonated with the tuning slug about three-quarters of the way in. Now, with no load on the final tank coil, swing the final plate tuning condenser through resonance and note if the wavemeter indicates r.f. in the final at any point. If it does, adjust the neutralizing condenser until no r.f. is apparent at any setting of the final tank. Interested readers who plan to construct a similar unit can judge the setting of the neutralizing condenser by referring to the sub-chassis view. About 16 threads of the screw remain outside the end of the condenser. With neutralization complete, apply plate and screen voltage to the final and tune the tank to resonance. Adjustment of loading and antenna tuning condenser should be done after the rig is installed in the car and is in operation with the permanent antenna system, as various lengths of feeders will result in different settings. With all stages of the transmitter tuned to resonance and the antenna connected, the variable link should be pushed into the final tank coil just far enough to begin to show loading. Then adjust the antenna tuning condenser for maximum loading. With this adjustment the antenna is now presenting a pure resistive load to the final tank, and the link can be pushed in further to give desired final amplifier cathode current. A reading of about 45 ma. will be correct for the 7C5 final amplifier. With 250 volts on the plate, the power input will be in the vicinity of 11 watts. In class A audio service, the 7C5 is rated at 4.5 watts output, which will modulate the final very nicely. It will be noted that the plate and screen of the final are modulated simultaneously. At a plate voltage of 250, the modulator tube should draw about 45 ma. With the final grid cou-

pling condenser adjusted so that the oscillator is drawing 20 ma. at resonance, ample drive is available for the final grid, as the 7C5 requires but a fraction of a watt.

After the rig is operating normally, it would be wise to check the modulation percentage to determine the speaking distance from the mike. As you will note, no volume control was used in the modulator stage, as the gain appears to be just right with the 7C5 operating at full input from a carbon mike. The author found that when speaking in a normal voice about 1 inch from the mike he could get 100 per-cent modulation, as indicated on his home-built combination wavemeter and modulation-meter.

The subject of installation can be covered only generally here, as the desires of each ham and the requirements of each automobile vary considerably. Therefore the writer will describe his own installation in hope that some readers will benefit from the information.

The converter, which was described in last month's issue, was mounted on the left side of the steering column under the dash, by means of the bracket which is shown in the photos. Incidentally, the bracket is not bolted directly to the converter cabinet, but is shock-insulated from it by rubber grommets. The cabinet fits nicely in this space and clears the emergency brake lever comfortably. This location proved most convenient in this particular instance from the standpoint of handy tuning and freedom from interference with driving operations. Short shielded cables were run over the steering column to the broadcast receiver. Remote control cables were run through a rubber-grommeted hole in the fire wall and back to the transmitter through a length of rubber hose clamped under the car. If a quantity of talcum powder is distributed through the hose before installation, it will be much easier to run the wires through it. Incidentally, the remote control wires might best be shielded. If not they might pick up noise and convey it back to the converter during receiving periods. With shielded remote control wires, no objection can be seen to running other wires through the hose for back-up lights or other accessories.

The two most logical locations for the transmitter are in the trunk or on the shelf back of the rear seat. The rig described herein is so compact that it is entirely feasible to place it on the shelf. The biggest advantage in using this location is, of course, better protection from the weather and dirt. Also the rig can be kept under better observation if inside the car. The rig may be mounted on the shelf with bolts through the center holes in the rubber shock mounts. It is advisable to use lock washers under mounting nuts to prevent them from loosening up with vibration. The rig should be grounded to the car body with a piece of flexible shielding. Of course the outside con-

ductor of the coaxial lines should be grounded at both ends.

The best location for the antenna from the standpoint of uniform coverage is on top of the car. However, this involves considerable work including the undesirable features of drilling holes in the top and having to take down part of the roof unholstery. The most commonly used antenna mounting is on the rear bumper or side of the trunk. This location causes the radiation pattern to assume directional characteristics. Usually the best direction for transmission is over the top of the car. Field strength measurements on the author's station bear out this fact.

This particular rig has been in operation only a week at this writing, and all contacts but one have been on ground wave. The little 10-watt seems to be doing a fine job and appears to be getting out as well as higher-powered rigs. Coverage of 10 to 15 miles on ground-wave communication has been experienced while traveling on trunk-line highways in Sunday traffic. Several times this distance has been worked from quiet locations. Although the 10-meter band has been in a slump as far as DX is concerned, it opened up long enough a few days before this writing to permit a QSO with YN1EP in Nicaragua. This contact was made as the result of a CQ while driving on a main through highway during early evening traffic. This choice piece of DX certainly proves that high power is not necessary to work out. The author will gladly exhibit a QSL card to any "Doubting Thomases."

Looking at the low-cost mobile station from a financial standpoint, it certainly does show large dividends in satisfaction for the investment in dollars.

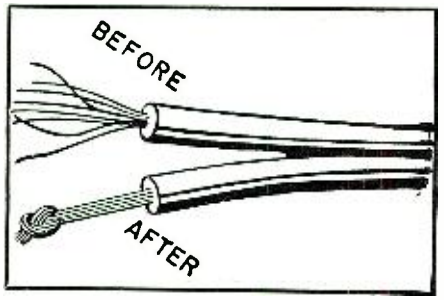
—30—

SAFETY TIP

A NEAT and safe way of treating the bare ends of wires to prevent accidental contact is shown in the illustration.

First, cut back the insulation an inch longer than normally then tie a knot at the desired spot and presto! you have a connection that can be safely used to connect to a plug, connector strip, etc. without the usual dangerous frayed ends that often result in serious damage to electrical equipment. W.M.D.

Suggested method for insuring neat and safe wiring in home constructed radio equipment. By knotting ends, hazard of inadvertent short-circuits is removed.



Citizens Band Oscillator

(*Continued from page 46*)

tuned 0.5 mc. lower than the upper limit of the tolerances with fresh batteries.

The wide-band characteristics of superregenerative receivers, together with their simplicity, make them practicable for Class B Citizens Band service in conjunction with the oscillator described. In transceiver applications, the type 6K4 tube is capable of superregeneration with minor changes in the oscillator circuit shown in Fig. 6. A reduction of plate-supply voltage (to 30-70 volts) and an increase in grid resistance above ½ megohm change the circuit to a sensitive superregenerative detector. The present opposition of the radio industry to superregeneration is entirely justified on the basis of spurious radiation interference. Superregeneration is admittedly a poor solution to the problem of portable receiver design, but at the moment it seems to be the only answer to the problem of high sensitivity with low weight, small space and minimum battery drain.

A modulator for use with this oscillator will require an audio output of approximately 500 mw. for 30% amplitude modulation of the carrier. Frequency modulation can be accomplished by several methods. The simplest is the sound-powered vibration of a metallic diaphragm in close proximity to the oscillator tank loop.

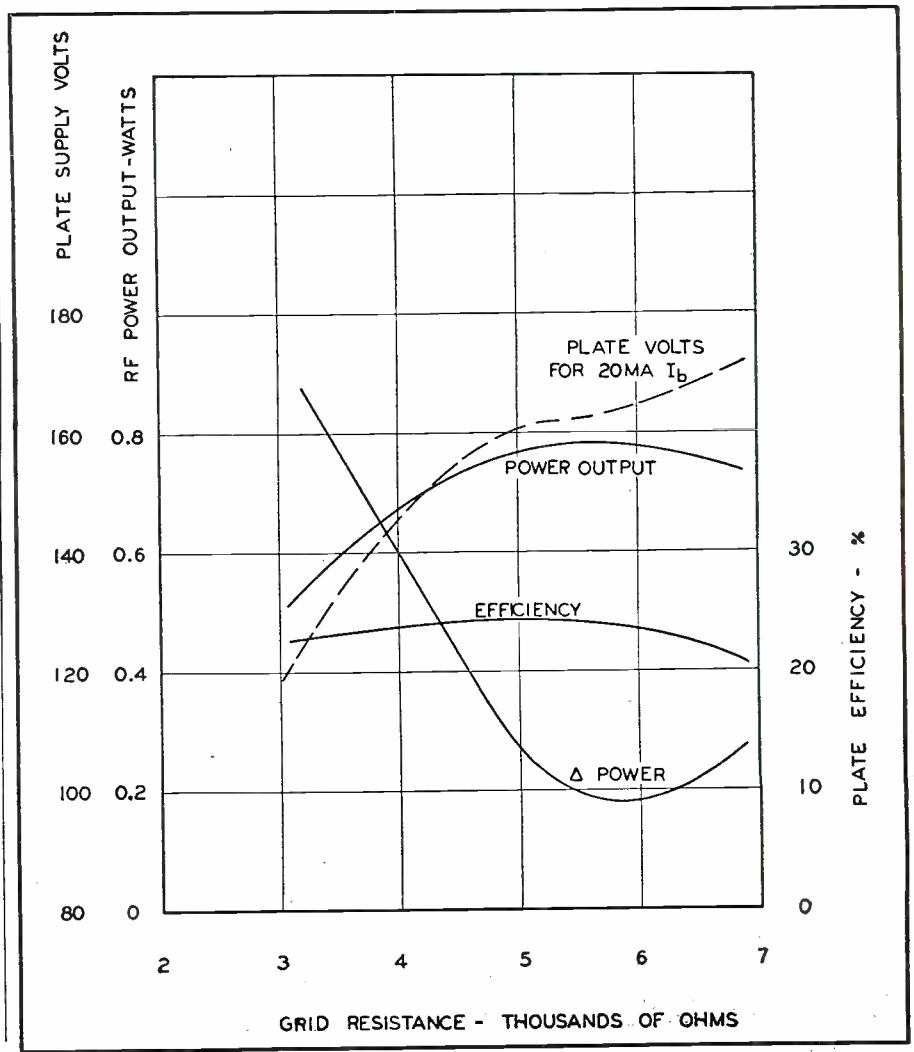
Conclusion

The 6K4 is capable of ¾ watt r.f. output at 465 megacycles with plate efficiencies of approximately 24 percent. It uses a standard 6.3 volt, 0.150 ampere heater, and the ratio of r.f. output to heater power is about 0.80.

So far, the small size of the 6K4 has been mentioned as of advantage only in compact, "hand-portable" equipment. There is some advantage to be gained even in fixed station operation if the r.f. section of the transmitter is located at the antenna to eliminate cable losses. Even relatively good high-frequency coaxial cable has attenuation of 5 to 10 db. per hundred feet at 465 megacycles. This means that up to 68% of the r.f. power generated may be dissipated in an antenna feeder only fifty feet long. The same ratio of attenuation holds true for receiver antenna lead-in cable.

The 6K4 is small enough to allow

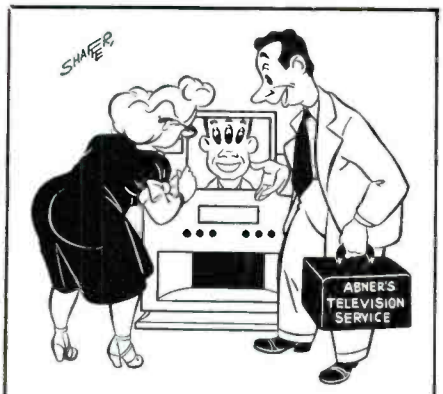
Fig. 9. Performance of oscillator as a function of grid circuit resistance.



the mounting of a weatherproof output stage right at the antenna. This tube, under c.w. conditions, can deliver 0.75 watt of usable r.f. power with a plate input of 3.2 watts. The same radiated power at the end of fifty feet of RG—8/U coaxial feeder would require 2.4 watts of r.f. from an oscillator tube capable of almost 10 watts input.

It might also be of advantage to locate the receiver preamplifier, local oscillator, and converter at the antenna in order to avoid attenuation of the received signal. The RG—8/U cable has an attenuation of only 1 db. per hundred feet at an intermediate frequency of 30 megacycles compared to approximately 5.5 db. per hundred feet at 465 megacycles. The increase in receiver sensitivity gained by such an arrangement would be approximately equal to the use of another r.f. amplifier stage.

The problems involved in remotely tuning such input stages would limit their application to special cases. —30—



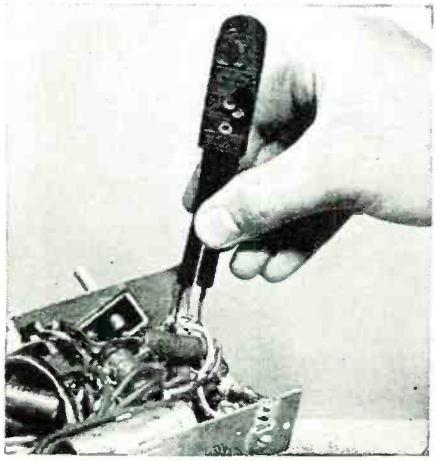
"There's nothing wrong with your set mam—he does have three!"

LOCATE OPEN FILAMENT

THE a.c.-d.c. receivers which have all tube filaments wired in series will fail to operate if the filament of any one of the tubes becomes open.

To save time in removing tubes and testing one at a time with an ohmmeter to detect the tube with open filament, a neon test lamp may be placed across each tube filament quickly—with the set turned on.

When the lamp "glows"—that is the tube with the open filament. . H.L.



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SALE

NEED 25B8 tubes? Complete replacement instructions, no socket changes, $1.00 postpaid. Witzel, 181 Cobb Terrace, Rochester 10, N. Y.

1 ALTEC Lansing 604 Duplex Speaker, complete with dividing network. Excellent condition. $150. Donald Keiser, Gladbrook, Iowa.

NATIONAL 100XA Receiver, two Amplifiers, 18" Jensen Cabinet speaker, Webster record changer. Make offer. Austin, 2416 Wells Road, San Diego 2, Calif.

VARIABLE Condensers. Broadcast band Superhet, 2500 new factory packed 40c each. Kingston Electronics, 21 Delta Place, Kingston, N. Y.

SX 42 EXCELLENT condition. Sell $180. Bill Robertson, 55 Edgemont, Asheville, N. C.

CLOSE-OUT $15.00 Battery Tester $5.95. For 1½-3 volt batteries. Attractive, well-constructed; 8"x5"x3", tri-color scale. Money-back guarantee. Modelectric Products, Asbury Pk., N. J.

AUDAK Pro-5 pickup, 500 ohms. List $108.00. Also UTC HA-101-X transformer (500 ohms to grid). Write J. E. Fankhauser, 329 Lee St., Iowa City, Iowa.

RIDERS manuals six through fifteen; Radio City tube tester model RCP 804A; Monitor Crystaliner; all used. Make offer. Grinnell's, 476 California Ave., Palo Alto, Calif.

ENCLOSED Relay Racks. Par-Metal ER-213 panel space 19x36¾". Brand new, black only, $22.50. Electronic Service Co., 119 S. 6th St., Louisville, Ky.

SELENIUM bridge rectifier units, rated 13 volts 6 amps. Each $3.00. Two for $5.00. Postpaid. B. L. Meyer, 4244-24 Ave. So. Minneapolis 6, Minn.

HALLICRAFTER S-40A, absolutely like new, $75. James Hook, 2905 Bonnell S.E. Grand Rapids, Mich.

GIVE Hallicrafters Receivers. Lay-away. Easy. Tel. 6-3800. Atlas Radio Jobbers, Nashville, Tenn.

12B8 AND 25B8 Tubes: Adaptors using 2 miniature tubes (6AT6 & 6BA6 for 12B8 and 12AT6 & 12BA6 for 25B8). Takes less space than original tube, and adaptor fits in same socket. Nothing else to buy, just plug in & it works. Sold on money-back guarantee. 12B8 or 25B8 unit, complete, $2.49 each; 10 units for $22.50. Write for new free bargain catalog. Commercial Radio, 36 Brattle St., Boston, Mass.

HEARING Aids. Zeniths, others. All used but working. Make miniature transmitters or receivers. Complete with cords, ear piece. $20 ea. Shelby Instrument, 321 W. 7th, Long Beach, Calif.

NEW cartoned tubes 39c each. 1A5gt, 1L4, 1R5, 1S5, 1T4, 2A4G, 2V3G, 3S4, 3V4, 5Y3gt, 6AJ5, 6AK5, 6AQ5, 6AQ6, 6AT6, 6BA6, 6BE6, 6BH6, 6BJ6, 6C5gt, 6J5gt, 6K6gt, 6SA7gt, 6SK7gt, 6SQ7gt, 6V6gt, 6X4, 7E5, 7Q7, 12A6, 12AT6, 12BA6, 12BE6, 12A8gt, 12J7gt, 12SF7gt, 12SK7gt, 12SL7gt, 14J7, 25L6gt, 26, 31, 32L7gt, 35B5, 35W4, 36, 47, 50B5, 70L7gt, 89, 80, 117L7gt, 117P7gt, 117Z3. Write for bargain flyer. Henshaw Radio Supply, 3619 Troost, Kansas City 3, Missouri.

BAUSCH and Lomb f1.9 Television Projection lens. Like new, $100.00. Harold Kratz, 414 York Ave., Lansdale, Pa.

RADIO Sales and Service Business. New equipment, low overhead, no competition, small midwest town with large servicing area, housing available. Write B. L. Sadler, Clear Lake, Wis.

274N DIAGRAMS, $1.00 full set. RU-17, BC-229 coilsets for broadcast band. $1.00, postpaid. Aerotronics, Box 706, Station H, Los Angeles 44, Calif.

NEW, Fisher Dynamic Noise Suppressor Amplifier. Unable to use, not licensed for our business, $200 cash. You pay transportation. Wired Program Service, 221 Williams Street, Watertown, N. Y.

TELEVISION Antennas. The latest Hi-Frequency, all channel, simplex, kit, $12.50. Super-"X"-Co., Box 193, Belmar, N. J.

GRILL Cloth. Celanese, light and dark pieces. 1000 square inches for $1 bill. Write for list of lowest priced national brand parts in nation. Bursma Radio, Route 5, Grand Rapids, Mich.

LOWEST Prices. Radio Tubes, parts. Bargain lists, 3c. Potter, 1314 McGee, Kansas City 6, Mo.

V.O.M. ASSEMBLY, consists of 18 wire-wound non-inductive, precision resistors mounted and fully wired on low-loss, wafer-type, rotary switch, ready to connect to your meter to make highest grade instrument. While they last, price, $2.50. Radioco, 1110 Marshall Bldg., Cleveland, Ohio.

WRITE Dept. RN18 for our free wholesale list of Radio parts & accessories. R. C. Radio Parts & Distributing Co., 731 Central Ave., Kansas City 6, Kans.

BUY it wholesale. Television Sets, Typewriters, Cameras, Electrical Appliances, etc. Gilbert, 35 Cameron St., Everett 49, Mass.

HALLICRAFTERS ARR5, 27-145 Megacycles, new, 110 A.C., $95. Make offer. Sobey, 7893 Marlborough, Parma, Ohio.

PHOTO Electric Relay and Amplifier Kit, includes emissive type gas photocell, sensitivity control, SPDT relay, amplifier, punched chassis, condensers, resistors, diagrams, etc. Industrial type circuit applicable to counting, sorting, burglar alarms, advertising displays, window demonstrations, Xmas tree or model railroad control. Visible and infra-red sensitive. Special $7.50 Postpaid. Electric Controls Co., 3002 Fulton St., Brooklyn 7, N. Y.

COAXIAL Cable. Identical characteristics as RG-58/U. Send dime for 3 foot sample. Harry H. Van Dick, Box 236, Little Falls, New Jersey.

WANTED

G. I. FLYER motor model 818 double field two speed: also Blue Flyer model E, contact W. Dacosta. Sound Dept., WOR, New York 18, N. Y.

SITUATIONS WANTED

SELECTED group of men, graduates of well-known trade school, desire employment in Radio Field. Will travel anywhere. Qualified in radio servicing, installation, test instruments, circuit operation, etc. Contact Placement Dept., Eastern Technical School, 888 Purchase Street, New Bedford, Mass.

HELP WANTED

INSTRUCTORS in Electronics and Radio. Prefer former Navy Radio Technician instructors willing to locate in the Detroit, Mich., area. Write to Box 452, % Radio & Television News, 185 N. Wabash, Chicago, Ill.

CORRESPONDENCE COURSE

USED Correspondence courses and books bought, sold, rented and exchanged. Catalog free. Lee Mountain, Pisgah, Alabama.

AMATEUR radio licenses. Complete code and theory preparation for passing amateur radio examinations. Home study courses. American Radio Institute, 101 West 63rd St., New York 23, N. Y.

PRINTED CIRCUITS: Learn to design and repair the new printed radio circuits. Conducting ink kits, instructions: Standard $3, Super $5 (with silver ink). Cash or M.O. Microcircuits Company, Dept. 4C, New Buffalo, Mich.

PORTABLE-Suitcase size radio shop, build it and double your income. Write for literature. Grand Federal, Argentine Box 57-N, Kansas City 3, Kans.

PATENT ATTORNEYS

LANCASTER, Allwine & Rommel, Registered Patent Attorneys. Patent practice before U.S. Patent office. Validity and Infringement investigations and opinions. Booklet and form "Evidence of Conception" forwarded upon request. Suite 414, 815 15th St., N.W., Washington 5, D. C.

MISCELLANEOUS

JOIN "Royal Order of Paul Bunyon," membership certificate and magazine $1.50. Paul Bunyon Association, 1800 Frazier St., R 4, Madison 5, Wisc.

RUBBER Stamps, any copy circular. Jones, 1210 N. Dudley, Utica, N.Y.

PHONOGRAPH Records, 20c. Catalogue free. Paramount, N-313 East Market, Wilkes-Barre, Pa.

RADIOMEN, Servicemen, Beginners. Make more money, easily, quickly. $250 weekly possible. We show you how. Information free. Merit Products, 216-32R 132 Ave., Springfield Gardens 13, N. Y.

RADIO Diagrams AM 30c, SW & FM 60c, Television $1.00. State Manufacturer and Model number. Kramer's Radio Service, 36 Columbus Ave., New York 23, N. Y.

NEW AIRLINE EQUIPMENT

UNITED AIR LINES are installing new v.h.f. ground receivers at key points along its 10,700 mile system in order to provide greatly increased range and eliminate interference inherent in other types of communications equipment.

The new equipment, replacing war surplus sets, will pick up messages from aircraft as distant as 175 miles. The sets are expected to make a great contribution to speed, safety, and over-all efficiency through their ability to receive landing requests, weather, and route information more clearly and at more extreme ranges than ever before.

Special filters in the receivers will eliminate noise from automobiles, aircraft engines, and high tension lines. Installation of the initial order for 20 units has already been completed in such key cities as New York, Chicago, Cleveland, and Denver.

-30-

ERRATA

We have quite inadvertently assumed an FCC prerogative, which is not ours to take. In the October article, "S Meters," we assigned the call-letters WØLQS to Don M. Wherry, the author. That call belongs to Don V. R. Drenner of Coffeyville, Kansas, and has since 1946. Mr. Wherry's call is WØDEX. Our apologies to both Mr. Drenner and Mr. Wherry.

* * *

There are two errors in Fig. 2, page 51 of the article, "Build Your Own Communications Receiver," Part 2, appearing in the September issue of RADIO & TELEVISION NEWS. In the parts list, the values of C_{16} and C_{17} should be 200 $\mu\mu$fd. mica or ceramic instead of 100 $\mu\mu$fd. The second error involves S_1. Positions 1 and 2 of the center section of S_1 should be tied together. In addition, a .05 μfd. condenser should be inserted in series with the lead from the junction of R_{11}, R_{15} to position 1 on S_1.

* * *

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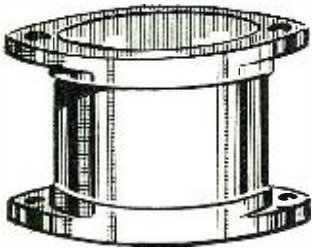
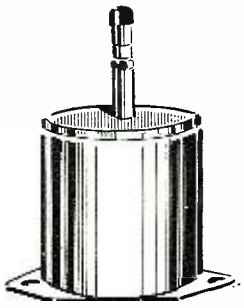
DEC. 1948

TRANSMITTING *Mica* CONDENSERS



STYLE "AA"



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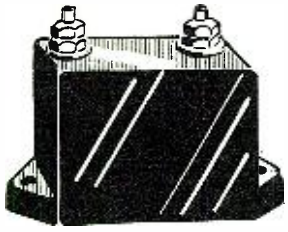

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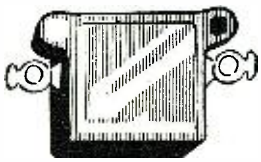
STYLE "C"



STYLE "D"

SPECIAL LOW PRICES FOR IMMEDIATE SALE AND DELIVERY

We have literally hundreds of thousands of these top quality standard type transmitting mica condensers in stock for immediate delivery at a fraction of their original cost. Every condenser is brand new and carries the name of a fine nationally known manufacturer.

Despite the unusually low prices, these mica condensers, like all Wells Components, are fully guaranteed. Be sure to order sufficient quantities for your requirements.

Cap Mfd	Wrkg. Volt.	Price Each
STYLE "AA" CONDENSERS		
.04	1000	$3.50
.02	3000	4.50
.002	35000	15.00
STYLE "A" CONDENSERS		
25 MMFD	10,000	$1.65
STYLE "B" CONDENSERS		
.0000425	5000	$0.80
.00005	3000	.75
.00007	1140	.70
.00003	3000	.75
.00004	3000	.75
.00009	3000	.75
.000091	3000	.80
.000107	3500	.85
.0001	3000	.85
.00015	6000	1.15
.00015	5000	1.05
.0001	5000	.85
.000175	3000	1.05
.0002	1430 AC	1.00
.0002	5000	1.05
.00022	5000	1.05
.00025	5000	1.10
.0003	3000	.95
.00036	5000	1.10
.0004	3000	.95
.0004	5000	1.10
.00047	3000	1.00
.0005	3000	1.00
.0005	5000	1.15
.00055	5000	1.15
.00056	3000	1.00
.00056	5000	1.15
.000625	3000	1.05
.0007	3000	1.05
.00075	5000	1.15
.0008	5000	1.15
.0008	3000	1.00
.00095	5000	1.15
.001	4500	1.25
.001	3000	1.15
.001	5000	1.30
.00125	2000	1.10
.0011	5000	1.35
.0015	3000	1.10
.0015	5000	1.40
.0018	2000	1.10
.002	3000	1.10
.002	5000	1.40
.002	6000	1.75
.0024	3000	1.15
.0024	5000	1.50
.003	3000	1.60
.003	5000	1.70
.004	3000	1.50
.005	2500	1.40
.005	5000	1.70
.0056	3000	1.30
.006	3500	1.45
.0068	3000	1.40
.008	3000	1.45
.01	2500	1.60
.01	5000	1.95
.0125	6000	2.00
.02	3000	1.70
.025	2500	1.60
.047	2500	1.75
STYLE "C" CONDENSERS		
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.00005	2500	.40
.0001	2500	.40
.0001	1250	.35
.0001	600	.25
.00015	2500	.40
.00015	1250	.35
.000175	2500	.40
.000175	1500	.35
.0002	2500	.40
.0002	1500	.35
.0002	600	.25
.00022	2500	.45
.00022	1250	.35
.00024	2500	.45
.00025	2500	.45
.00025	1200	.35
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.00039	2500	.50
.0004	2500	.45
.0004	1200	.35
.0005	2500	.45
.00051	2500	.55
.00056	2500	.55
.000575	1500	.60
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.0007	1250	.45
.0008	1250	.45
.0008	1000	.35
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.001	1200	.40
.001	600	.35
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.0018	1200	.50
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.0039	1250	.55
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.004	1250	.45
.0043	2500	.65
.0045	1000	.45
.0047	1250	.55
.0046	500	.45
.005	2500	.60
.005	1250	.45
.005	600	.35
.0051	2500	.65
.0051	1200	.45
.0056	2500	.65
.0056	1200	.45
.006	2500	.65
.006	1200	.45
.0068	1200	.55
.007	500	.35
.008	1200	.45
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.01	600	.40
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.015	600	.35
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.02	600	.35
.025	1250	.55
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.04	1000	.45
.04	600	.35
.047	1200	.50
.047	600	.40
.056	1000	.55
.06	1000	.50
.073	500	.40
.09	1000	.55
.09	600	.45
.1	1000	.60
.1	600	.45
STYLE "D" CONDENSERS		
.00004	600	$0.20
.0001	1250	.25
.0001	600	.20
.00015	1200	.25
.00015	600	.20
.000175	1000	.30
.0002	1200	.25
.0002	600	.20
.00025	2500	.35
.00025	1200	.25
.00025	600	.20
.0004	2500	.35
.0004	1200	.25
.0005	2500	.35
.0005	1200	.30
.0005	600	.20
.00051	2500	.35
.00052	2000	.35
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.0006	2500	.35
.0006	1200	.25
.0006	600	.20
.00065	600	.25
.0007	600	.25
.0008	1000	.35
.00085	1200	.35
.001	2500	.40
.001	1250	.35
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.015	1250	.40
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.02	2500	.50
.02	1200	.35
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.03	1200	.35
.033	1200	.35
.04	1000	.35
.04	600	.30
.047	1200	.40
.047	600	.30
.056	1000	.35
.06	1000	.40
.073	500	.30
.09	1000	.45
.09	600	.35
.1	1000	.50
.1	600	.35

This is only a partial listing. Write or wire for information on types not shown and for receiving set micas and silver micas.

We advise distributors to order immediately from this ad. Our standard jobber arrangement applies.

Manufacturers and Distributors: Write for our complete Mica Condenser Listing No. 103A.

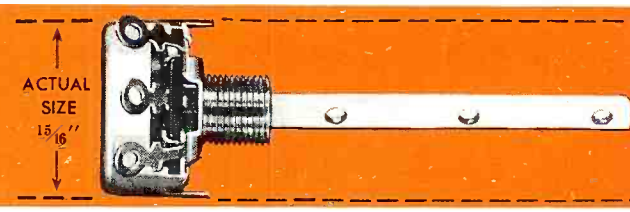
WELLS SALES, INC.

320 N. LA SALLE ST., DEPT. R-12, CHICAGO 10, ILL.

PRINTED IN U.S.A.

Get Acquainted with the Little Fellow with the BIG Advantages

The All New Mallory Midgetrol



Offers These BIG Advantages . . .

BIGGER MARKET — The small size of the Mallory Midgetrol lets you service portables, auto radios and small AC-DC receivers which require 15/16" controls.

SIMPLER INSTALLATION — The unique shaft design of the Mallory Midgetrol saves installation time with *all* types of knobs.

SIMPLER STOCKING — Electrical characteristics let you use the Mallory Midgetrol to replace 1⅛" as well as 15/16" controls. Stocks are further reduced because no special shafts are needed.

Both mechanically and electrically, the Mallory Midgetrol is amazingly quiet. Tests prove it *stays* quiet! And the Mallory Midgetrol offers nine *all new* features.

It's the NEW Standard in Carbon Controls. See your Mallory distributor.

- NEW SIZE
- NEW DESIGN
- NEW SHAFT
- NEW EXTENSION
- NEW SWITCH
- NEW ELEMENT
- NEW CONTACT
- NEW TERMINAL
- NEW TWO-POINT SUSPENSION

P.R. MALLORY & CO. Inc.

MALLORY

CAPACITORS . . . CONTROLS . . . VIBRATORS . . .
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VIBRAPACK POWER SUPPLIES . . . FILTERS
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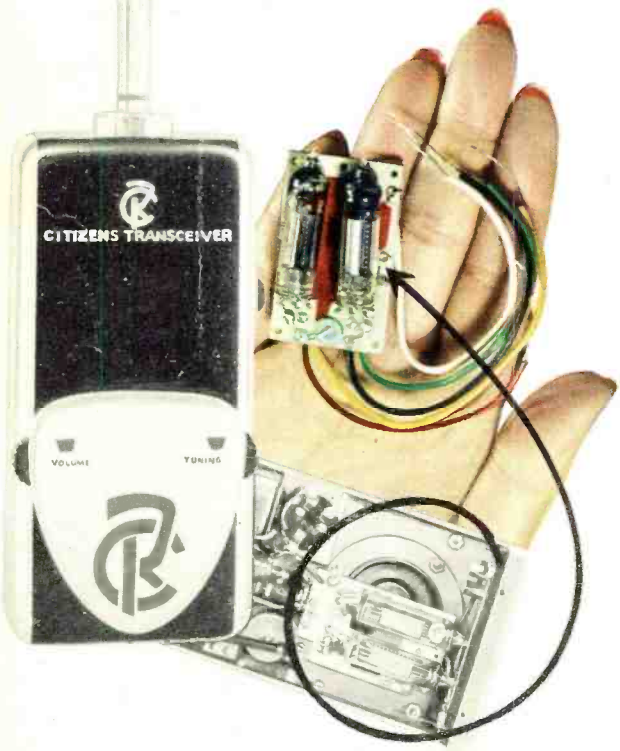
APPROVED PRECISION PRODUCTS

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

CITIZENS RADIO TRANSCEIVER USES

Sylvania sub-miniature tubes!

The farmer in the field and his wife at home will be able to converse with ease by using these new, lightweight transceivers equipped with Sylvania sub-miniature tubes!



TINY Sylvania sub-miniature radio tubes, smaller than a lady's little finger, are big reasons why the Citizens Radio Transceiver measures only 6″ long, not quite 3″ wide, 1¼″ deep, and weighs only eleven ounces!

Sold in sets of two, these tiny two-way transceivers with a range of several miles are tuned to 465 mc. Among the many who want these handy units are police and fire departments, surveyors, farmers, hunters, industrial users, rangers and those who wish boat-to-home and auto-to-home communications.

Sylvania's extensive radio tube research and manufacturing skill have made Sylvania sub-miniature tubes the choice of Citizens Radio Corporation, Cleveland, for this revolutionary, civilian transceiver. Sylvania Electric Products Inc., Radio Tube Division, Emporium, Pennsylvania.

SYLVANIA ELECTRIC

RADIO TUBES; CATHODE RAY TUBES; ELECTRONIC DEVICES; FLUORESCENT LAMPS, FIXTURES, WIRING DEVICES; LIGHT BULBS; PHOTOLAMPS