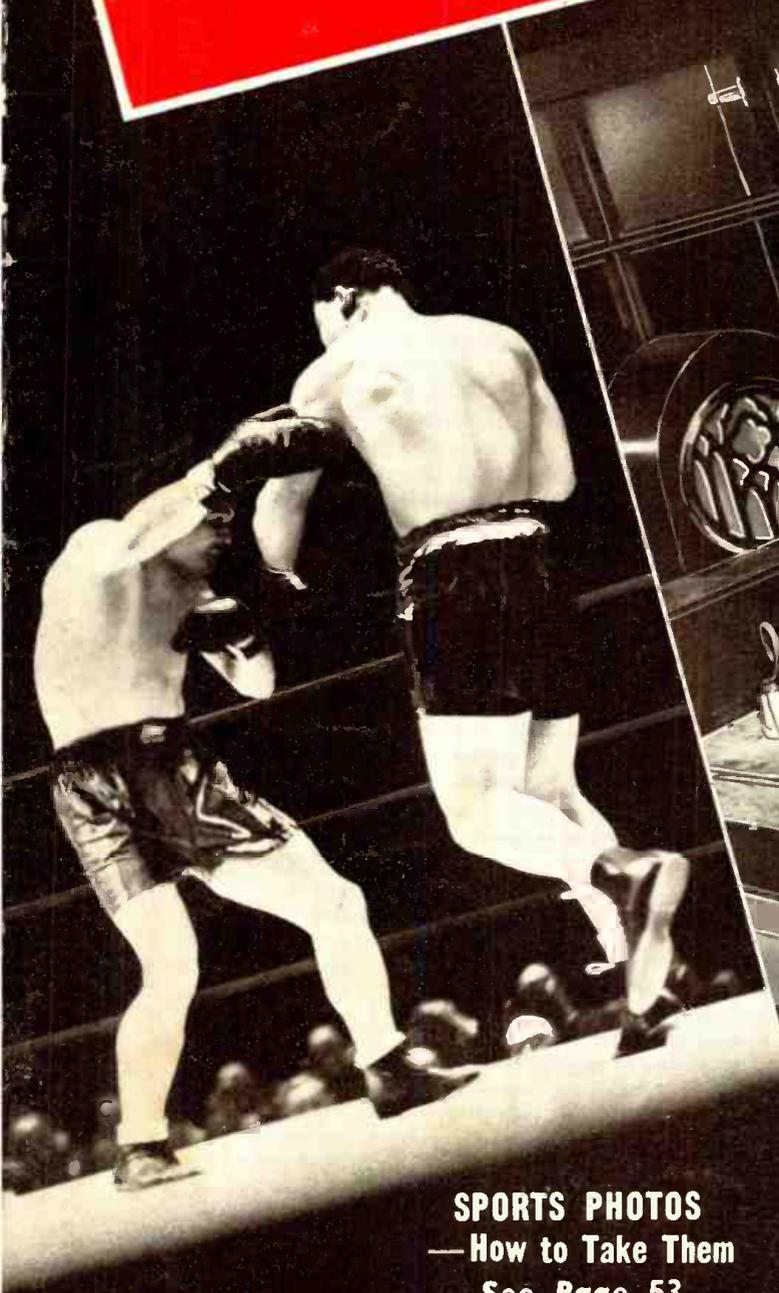


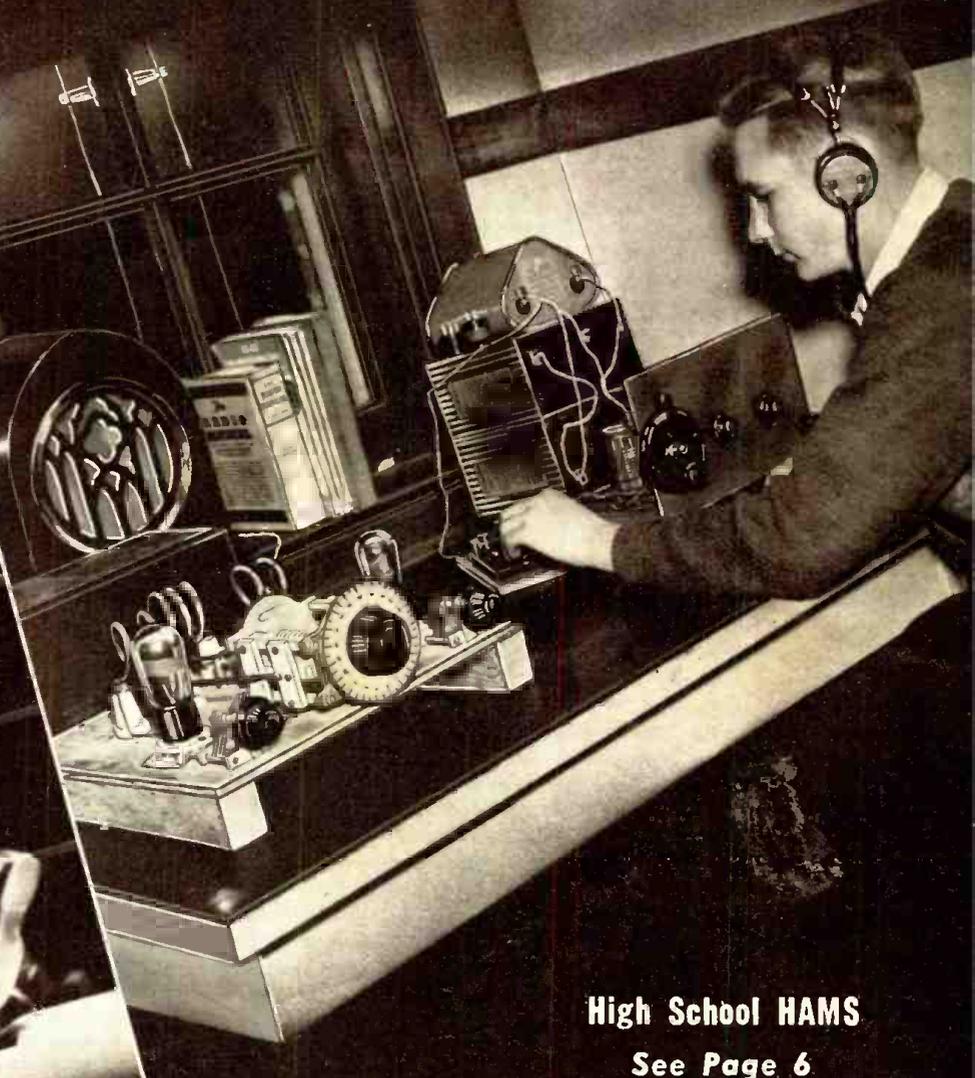
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See Page 53



High School HAMS
See Page 6

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1940

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RADIO & TELEVISION

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This Number marks
the **TENTH** Year
of
Continuous
Publication
of
RADIO & TELEVISION

May — 1940
Vol. XI No. 1

HUGO GERNSBACK, Editor
H. WINFIELD SECOR, Manag. Editor
ROBERT EICHBERG, Television and
Photo Editor

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An A.C.-D.C. Frequency Meter, E. Barber, VE3AWR
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Frequency Modulation Adapter—Ricardo Muniz, E.E.
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Cover Composition by Hugo Gernsback and Thos. D. Pentz. High School "Hams" . . . see page 6. Sports Photos—How to Take 'Em, W. C. Greene . . . page 53.

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...AND TO THE PEOPLE!



Carved now in marble in America's most noble memorial, are the immortal words of the Gettysburg Address. Few even among those gathered on the battlefield heard them as they were spoken. Days, weeks, and even months and years were consumed before the speech traveled to all parts of the world. Radio would have winged it *to the people* instantly.

A Service the Family of RCA Might Have Rendered

THE Family of RCA has kept a good many dates with history. As we shape our plans for presenting all sides of the issues of democracy *to the people* in this election year, we recall one date with history we wish we could have kept. It was before our time.

Just suppose there could have been an NBC microphone before the speakers at Gettysburg! Then the greatest words ever spoken by an American would have received an instantaneous world-wide hearing. Out over the two major National Broadcasting Company networks! Across the world via R.C.A. Communications, the radio message service of the Radio Corporation of America! To ships at sea through the radio services of Radiomarine!

The assembled crowd on the battlefield would hear each word clearly, impressively, thanks to a sound system developed in RCA Laboratories and built

by the RCA Manufacturing Company. Listeners everywhere would hear a lifelike reproduction of the speech on RCA Victor radios. And motion picture audiences would listen to the address recreated by the RCA Photophone Magic Voice of the Screen.

Record lovers would, of course, turn to Victor for a higher fidelity recording of the American masterpiece. And the Gettysburg Address would be relived time and time again on RCA Victrolas.

You may be sure that the members of the Family of RCA will continue to dedicate themselves to their responsibilities *to the people*. Whatever radio can do will be done to further the cause of government "*of the people, by the people, for the people.*"

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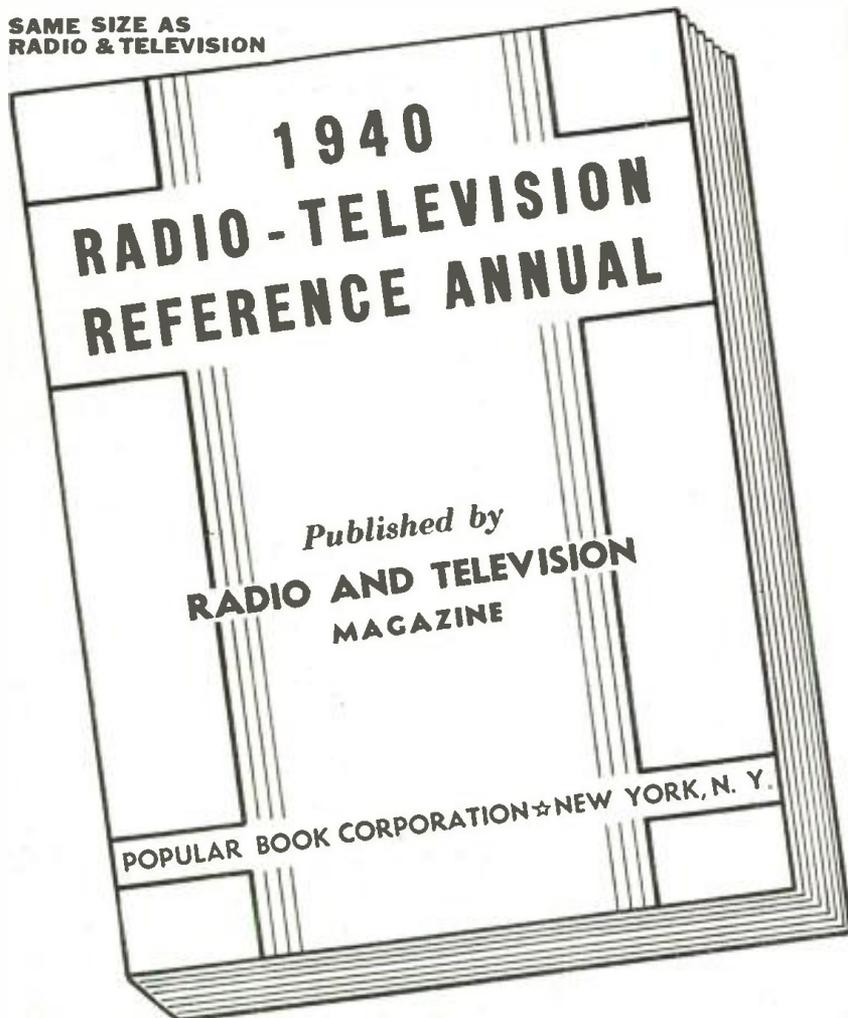
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The 1940 RADIO-TELEVISION REFERENCE ANNUAL has 68 pages, large size 8½ x 11½, with over 170 illustrations. The contents of this book has never appeared before in handy book form. Its pages cover practically every branch of radio sound, public address, servicing, television, construction articles for advanced radio men and technicians, time and money-saving kinks, wrinkles, useful circuit information, "ham" transmitters and receivers, and a host of other data.

The Annuals have always been regarded as a standard reference work for every practical branch of radio operation and service. This 1940 edition ably sustains this reputation. Every radio man wants a copy of this valuable book. Just as this book will be of unquestionable value to you, so, too, will every monthly issue of RADIO & TELEVISION. This magazine brings you big value every month. It keeps you intelligently informed about new developments in radio and television. You want the news, want it fully but concisely, want it first—that is why you should read RADIO & TELEVISION regularly.

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"HAM" SECTION

Ultra-High Frequency Antennas—The Beginner's Low-Cost Xmitter—Modulator Meter—Phone Monitor—The Beginner's "Ham" Receiver—2½ Meter Acorn Transceiver.

TELEVISION

How to Build a 441 Line T.R.F. Television Receiver—Useful Notes on Television Antennas.

MISCELLANEOUS

Simple Photo-Cell Relay Set Up—Making a Burglar Alarm—How to Build A.C.-D.C. Capacity Relay—How to Make a Modern Radio Treasure Locator.

USEFUL KINKS, CIRCUITS AND WRINKLES

Making a Flexible Coupler—Two-Timing Chime—A Simple Portable Aerial—An Improvised Non-Slip Screw-Driver. NOTE: The book contains numerous other useful kinks, circuits and wrinkles, not listed here.

(approximately)

45 ARTICLES

(approximately)

170 ILLUSTRATIONS

68 BIG PAGES

RADIO & TELEVISION
99 HUDSON STREET
NEW YORK, N. Y.

HUGO GERNSBACK, EDITOR

H. WINFIELD SECOR, MANAGING EDITOR

Vol. XI

May, 1940

No. 1

Television Audience Sees City *Through Plane's Eyes*

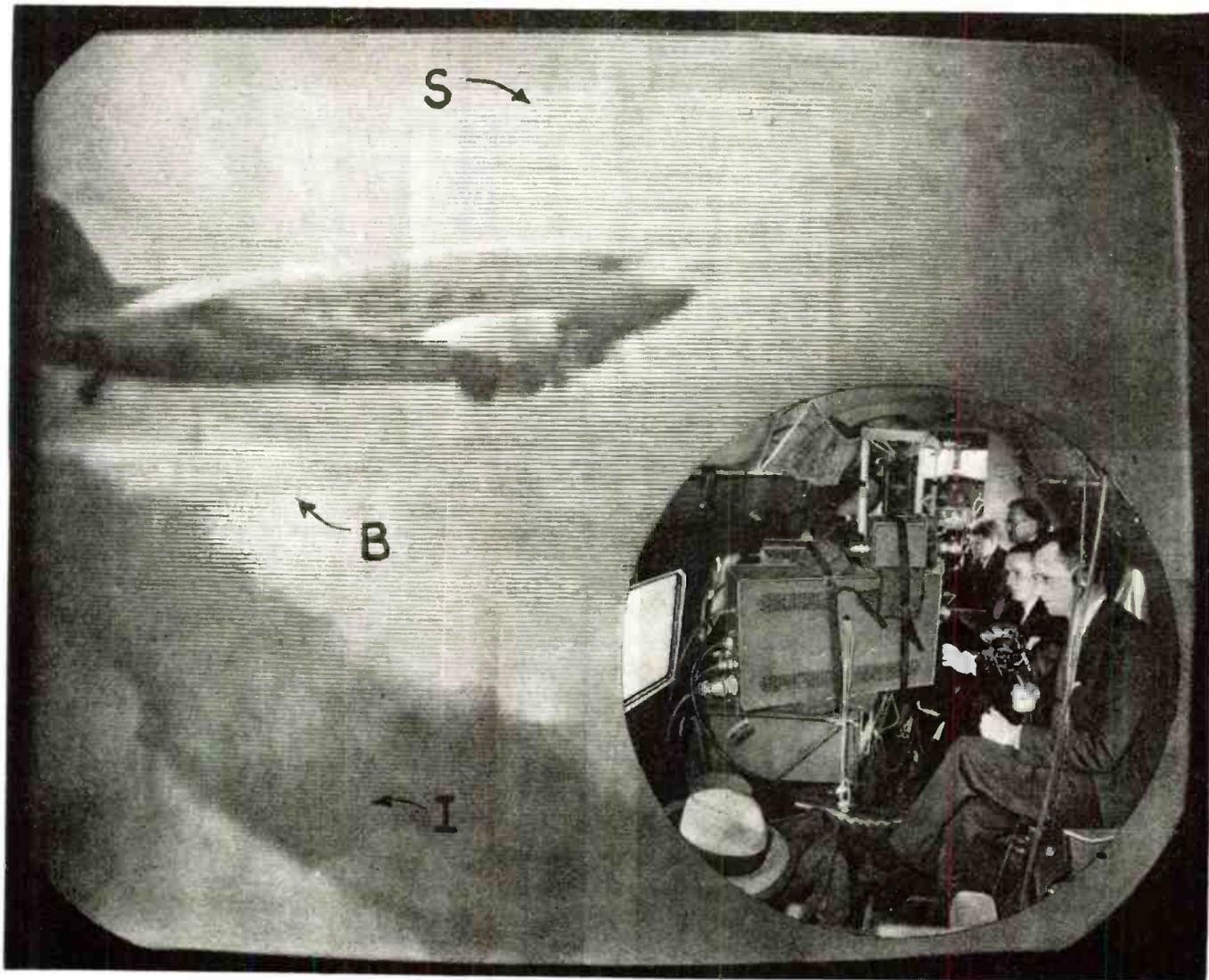
● ABOUT 10,000 viewers saw a remarkable television broadcast recently when a large United Air Line plane, equipped with an NBC television camera of the newest type, flew over New York City. Army and Navy officers watched the demonstration with a great deal of interest, as this was one of the first real tests of what

Below—Actual televised scene showing another plane in the picture. The plane with the television transmitter was flying over Welfare Island (I). The Queensboro Bridge (B) is seen, also in the distance the skyscrapers (S) of New York City. Inset—television camera and transmitter aboard plane. Photo by W. Haussler, NBC.

the television eye could do when installed aboard a plane.

It required but little vision to see crewless bombing planes in the future, directed by television and transmitting back to the directing post at headquarters, views of the enemy territory.

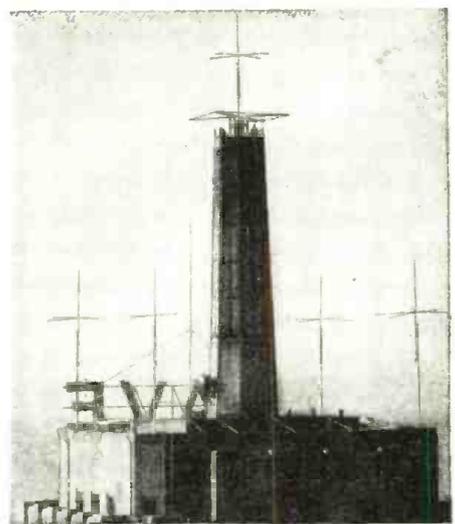
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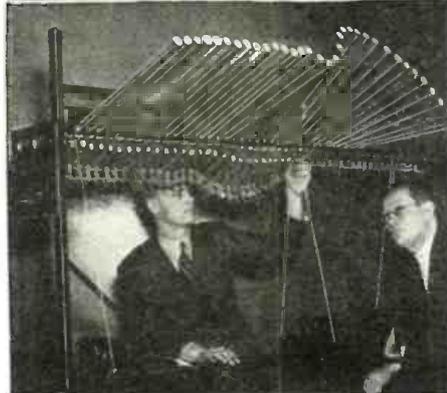
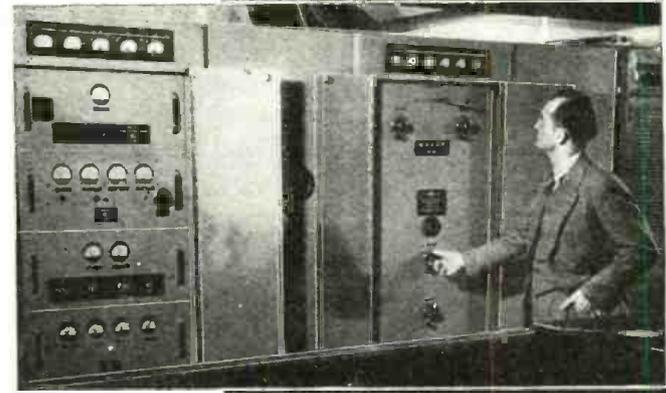
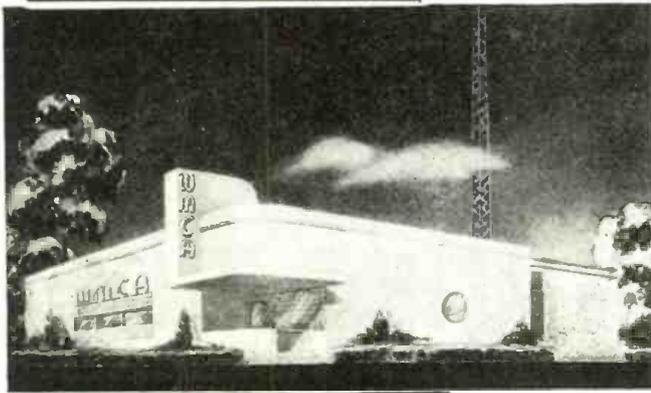
Hold at arm's length to see this image as viewers saw it.

WORLD WIDE RADIO DIGEST

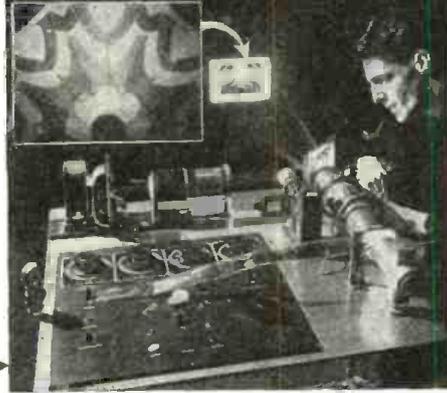
WTMJ, transmitter of the *Milwaukee Journal* in Milwaukee, Wis., has blossomed out with a new rod radiator as shown atop the antenna in the picture at the right. On the roof are receiving antennas for programs relayed from a mobile truck to the regular broadcast station. Below, at right, is a photo of the station's new frequency modulation transmitter which will feed the rod radiators.



WMCA is constructing a new 5,000 watt transmitter at Kearney, N. J. Picture below at left shows the architect's drawing of the new ultra-modern building which is being constructed of terra cotta with glass brick walls instead of windows. The building with its three 325 foot antenna towers and ground system will cover 30 acres. Special piling runs 90 feet down to a firm base. Thirty miles of copper wire are used in the ground system.

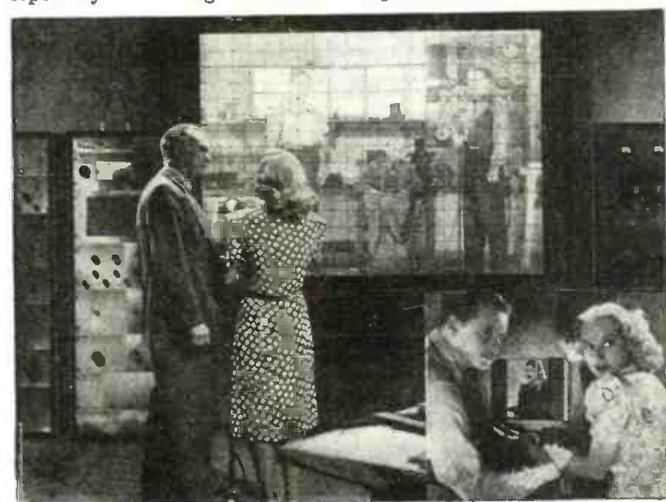


WAVE FORM is shown in slow motion by the ingenious device pictured at the left, which uses 56 aluminum arms driven by springs and motors. This apparatus was invented by C. F. Wagner of Westinghouse (right) assisted by A. I. Keto (left). It demonstrates what happens when various external factors affect a radiated wave.



KALEIDOSCOPE interludes now enliven W2XBS television transmissions. The device producing them, with its inventor, W. C. Eddy, Video Effects Engineer of NBC, is shown at the right. Eighteen months were required to develop this instrument. The kaleidoscopic patterns are recorded on film, then projected.

"TELEVISION SPY" is a feature film dealing with the possible use of long range television transmissions in war and espionage. The picture, two scenes of which are shown below, also forecasts large screen television of the future and should be especially interesting to television experimenters.



HIGH SCHOOL HAMS at the Tahoma High School in Maple Valley, Wash., are receiving instruction in the operation of a 150-watt amateur station (W7PU), built under the direction of C. E. Sutton (standing, right), WPA Instructor. Sixteen boys worked on the station (below), which cost \$6.57.



W2USA—World's Fair, New York

Antenna Layout Details

Arthur H. Lynch, W2DKJ

Managing Director, W2USA Radio Club



Photo by Stanley McMinn, W2WD.

Mrs. Key Kibling, W2HXQ, "mans" W2USA's Big Bertha. It's a National NC-600 Transmitter and HRO Receiver, used in conjunction with a Premax, full-wave, W8JK, vertical, rotary beam—and has brought reception reports from all over the world.

In this second article on the World's Fair station by Mr. Lynch, interesting details of the elaborate array of antennas are given.

● **LAST** month we gave you the background of the organization which conceived and carried into being the aims and instrumentalities for what we believe is a shining example of what an amateur radio station can be. Without attempting to secure any special favors from the F.C.C. or any of the commercial radio companies—other than a loan of some apparatus, from companies which make equipment for the amateur—we wanted to demonstrate what suitable organization could accomplish with facilities which are available to all amateurs. We wanted no special frequencies, because we wanted the operators who handled traffic for us, to meet exactly the same kind of problems they would have to overcome in their own stations; there is a vast difference between handling traffic on cleared channels and handling it through interference.

We wanted no land-wire hook-ups between our station and those stations which were to handle outgoing relays for us. Neither did we want to take advantage of the satisfactory receiving conditions to be found at some of those stations and have them relay incoming messages to us by any means other than those available to all other amateurs. That might be considered by some to be a short-sighted policy, particularly when it is remembered that the interference level from man-made static is extremely high at our station, in the Hall of Communications.

Commercial Facilities Not Used

Several large commercial radio and wire organizations offered to cooperate with us, to the extent of permitting us to set up remote receiving stations and remote transmitter control stations, at various points of vantage, within a radius of some twenty-five miles from the Fair Grounds, and two of them went so far as to offer the necessary equipment for carrying the service

Below—Just a few of the interesting QSL cards received by W2USA



Most Famous Amateur Station Heard in All Countries

to our station over wires which they would provide. We are happy to record these offers of co-operation, but believe that it is desirable to follow our original program.

We hasten to mention, however, that serious consideration was given to the establishment of remote receiving and control points, but our plan was to use *radio* for the relays rather than wires.

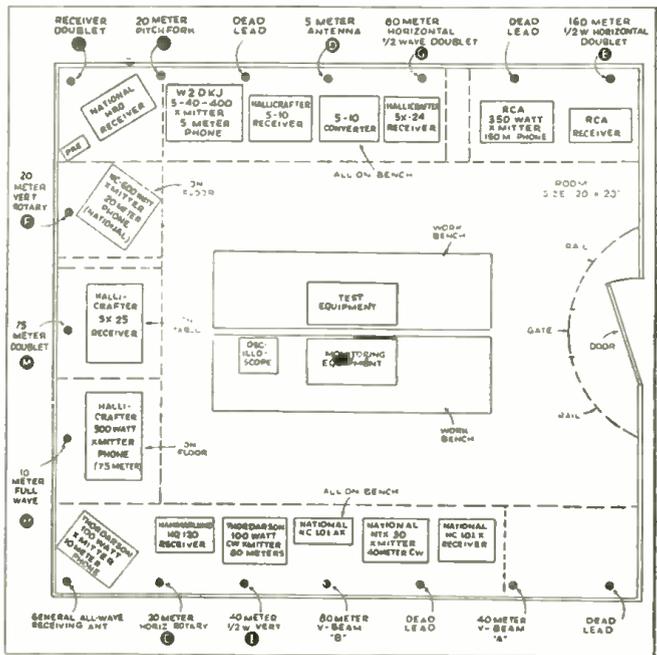
It does not seem to us to be a very satisfactory or intelligent use of some of our amateur bands which have long-distance capabilities when stations just a few miles apart use them for traffic-handling, and, often without even a thought about that portion of the regulations which says that the minimum power for a given satisfactory contact shall be used.

For that reason, most relaying, where the distance to the relaying station was short, was handled on one of the ultra-high frequencies. Several very significant facts were gleaned from this activity. When the new regulations made it necessary for all the stations operating on the 5 meter band to have suitable frequency stability, many of the fellows, who had been transmitting with unstable rigs, of one sort or another, deserted that band. That left us with what might well be considered a clear channel.

From the time the station was put into operation—just before Christmas, 1938—until the Fair opened, on April 30th, 1939, we confined all our operations, both incoming and outgoing, to 5 meters. Many stations, in the vicinity of the Fair Grounds, assisted us, during that period, in the following manner. They would pick up our five meter signal and pass it through their own transmitter, on one of the other bands. Then they would pick up the incoming transmissions, on the same band and feed them through their five meter transmitter, to us. In that way, we were able to take advantage of several excellent remote receiving locations as well as several transmitters which could use very much more power than we had available at the time.

Delays

In spite of the fact that we had some excellent co-operation from the majority of amateurs in the metropolitan New York area—to say nothing of the fine help we had from amateurs throughout the

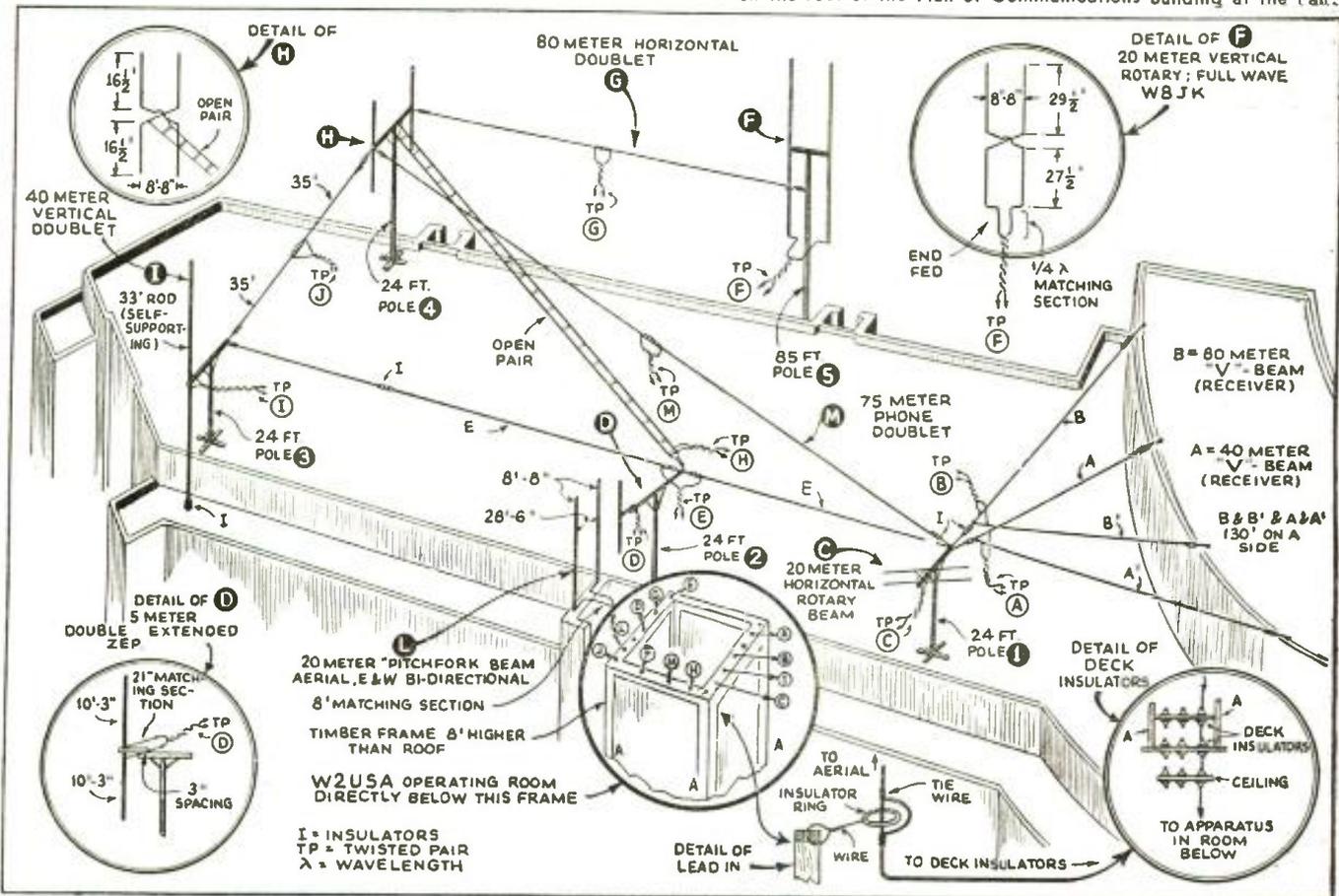


Above—Plan view of the radio operating room at station W2USA at the New York World's Fair, showing the arrangement of the various transmitters and receivers.

country and even in foreign countries, there were many occasions when it was difficult for us to explain what seemed to be unwarranted delays, in providing facilities for additional services.

Before any of our aerials could be put up, their design had to be presented to the Board of Design, whose duty it was to keep
(Continued on page 33)

Picture below shows the unique arrangement of the various directive antennas on the roof of the Hall of Communications Building at the Fair.



Constructing an Efficient Television Antenna

Charles R. Leutz

Author of "Super-Heterodyne Receivers," "Modern Radio Reception" and "Short Waves"

Efficient antenna, relatively inexpensive and simple to build, can be used for all ultra-short wave work as well as for television reception. A double doublet with reflectors, it increases signal pick-up and reduces interference.

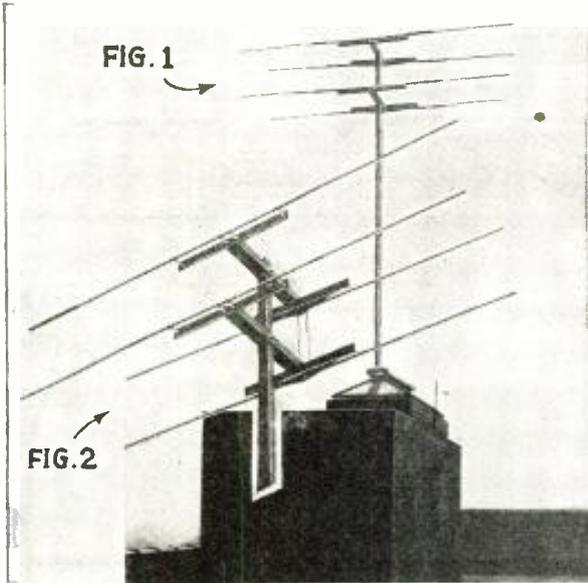


Fig. 1 shows erected antenna assembly; Fig. 2, close-up of double doublet with reflectors.

● IN commercial radio engineering practice, both in the case of transmitters and receivers, the antenna system costs on an average, at least 15% of the entire installation. In comparison, it is not unusual to find television receivers costing from about two hundred dollars to several times that amount, being operated with a simple inefficient makeshift di-pole and of course

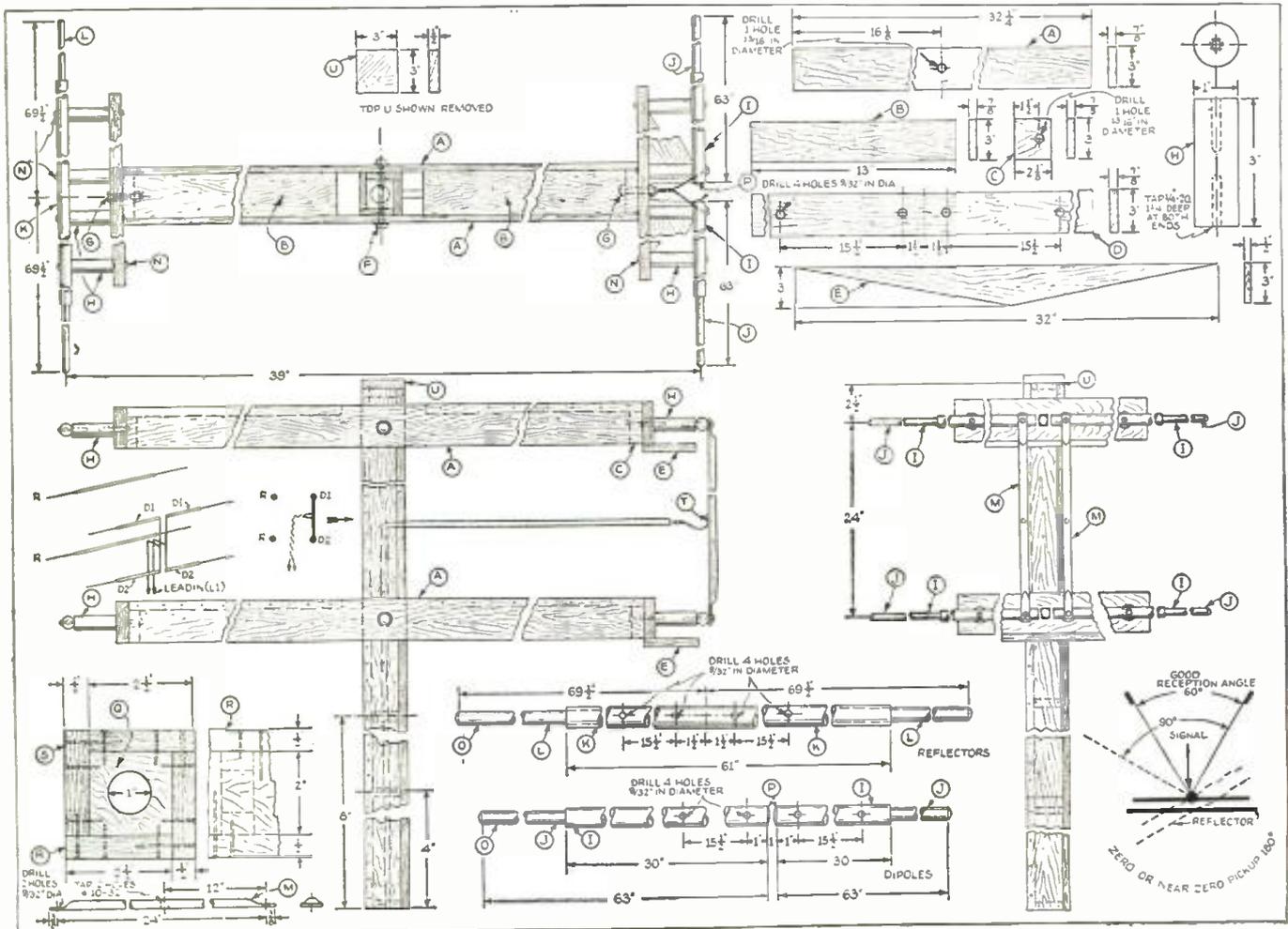
efficient television antenna and a properly designed unit will not only improve reception in the desired directions but will also exclude interference. The feature of eliminating interference from over as wide an angle as possible is very important, not only as a possible means to exclude automobile ignition and similar disturbances, but also to prevent the reception of unde-

giving generally unsatisfactory results.

sired interfering "ghost" signals from other distant television transmitters. As television activities expand and the number of transmitters is increased, the problem of "ghost" signals may become very severe and more attention will have to be given to the matter of directional antennae, possibly both for transmission and reception. These "ghost" signals have already been received in the United States from a European television transmitter.¹

Only recently an attempt was made to
(Continued on page 35)

Construction details of the efficient, noise reduction antenna.



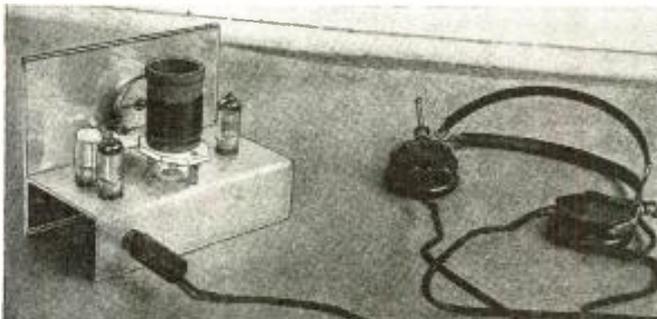


Get Europe or South America with 3 ft. Aerial on this

3-Tube "Ocean-Hopper"

Makes a Swell Portable

Harry D. Hooton, W8KPX



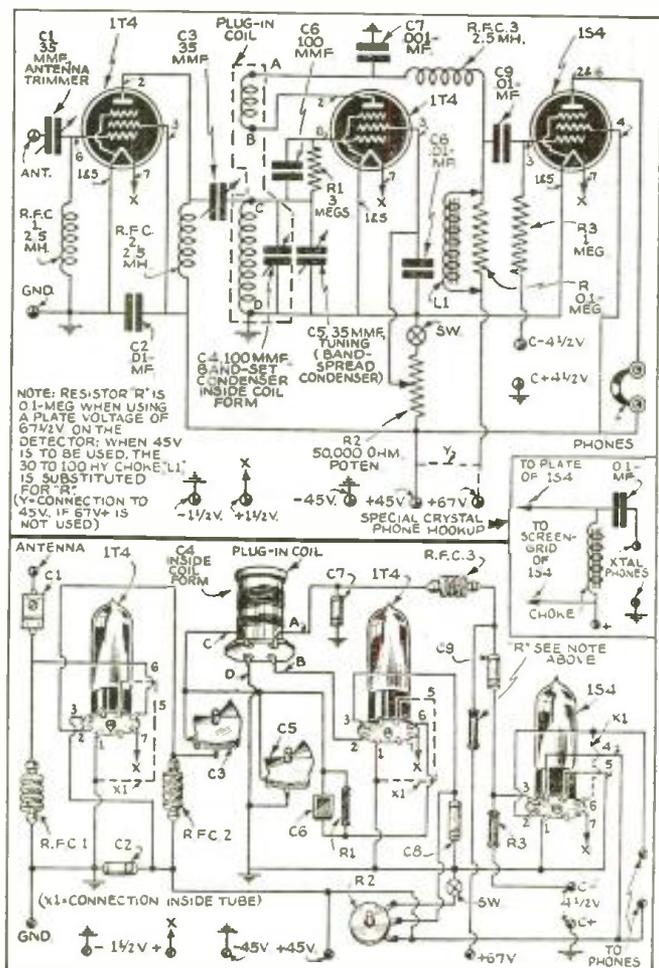
Photos above show front and rear views of the 3-tube battery receiver, which covers all the short wave bands.

● THE little three-tube "midget" battery-operated short-wave receiver to be described in this article was designed especially for use with the new miniature 1.4 volt battery tubes recently announced by RCA. These units are the smallest practical low-cost tubes of this type ever offered to the ham. Only about two inches long and three-fourths of an inch in diameter, the operating efficiency is quite high even though they are designed for a plate and screen potential of only 45 volts. It is very interesting to note that the tubes do not have the usual bakelite or ceramic base, being fitted with a new glass button, 7-pin base sealed directly to the envelope. The electrodes are mounted directly on the button, the leads being brought through the glass to form the contact pins. A special socket is used for the tubes of this series. The socket has a maximum diameter of $\frac{3}{4}$ inch and is mounted in a $\frac{5}{8}$ inch hole, being held in any desired position by means of a simple clamping ring furnished with the socket. The filaments are designed for operation directly from a 1.5 volt D.C. source, such as a single flashlight cell.

3-tube battery receiver for the Junior Ham or short-wave Fan—can be built in a lunch or cigar box, complete with batteries. Has picked up European short-wave stations on 3-foot aerial wire. Uses newest low-drain tubes and covers 9 to 270 meters; plug-in coil data for 5 bands given. Construction cost nominal.

wiring in all parts of the circuit. The various paper and mica fixed condensers and fixed resistors are mounted directly on their respective parts terminals. Solder all of the connections with a
(Continued on page 29)

Below—schematic and picture wiring diagrams here shown will make the construction of the "Ocean Hopper" very easy.



**This Number Marks
the TENTH Year of Continuous Publication of
RADIO & TELEVISION**

The types used in the "midget" receiver are as follows: 1T4 untuned R.F. amplifier, 1T4 regenerative detector and a 1S4 A.F. amplifier. Although the tubes are not recommended for operation at plate or screen voltages other than 45 volts, which would seem to prohibit the use of resistance coupling, the author has found that by using 67 1/2 volts on the detector plate, a plate resistor of 100,000 ohms may be used with satisfactory results. It is sometimes easier to use a slightly larger "B" battery than to incorporate impedance coupling into the set. However, if the lower voltage must be used, an audio frequency choke of at least 100 henries should be used instead of the resistor, R3. The plate voltage of the detector should, if possible, be kept close to the value of the actual potential of the screen.

Stick to the layout as shown as this will permit very short

All-Wave Signal Generator



Herman Yellin, W2AJL

This piece of apparatus, simple and cheap to build, will prove very useful for aligning super-hets, making antenna resistance measurements and checking inductances and capacities.

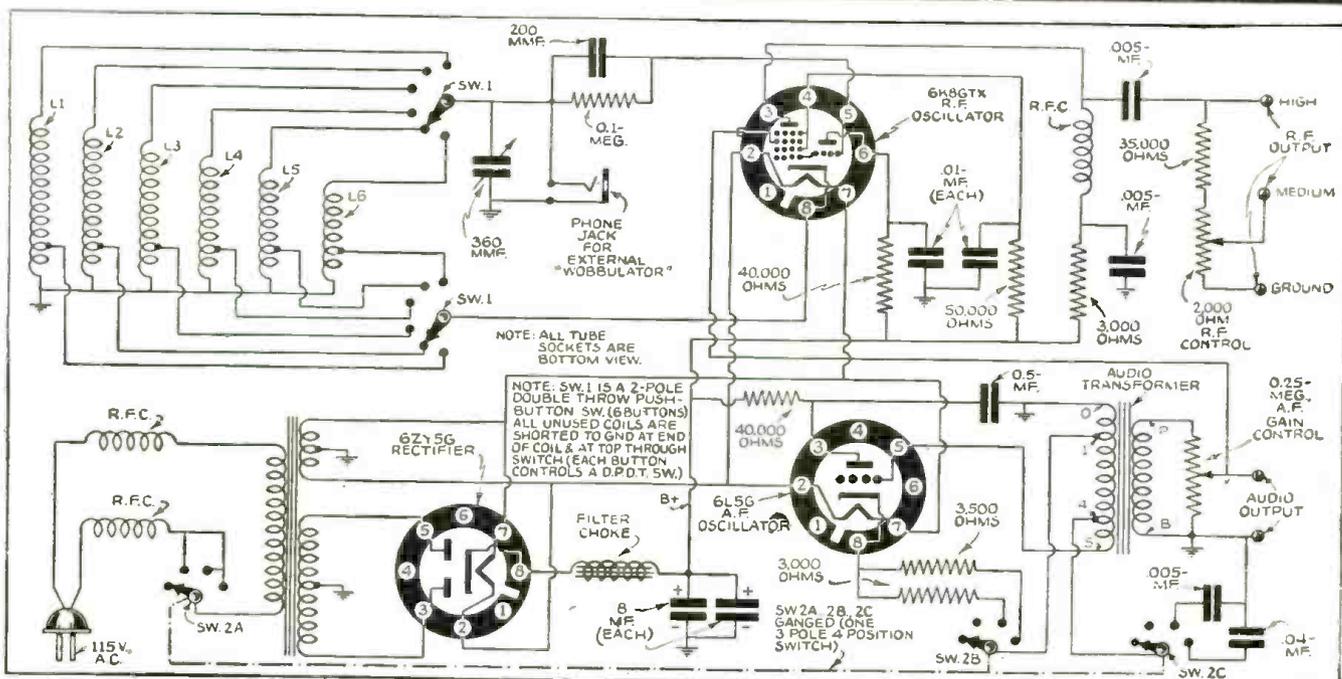
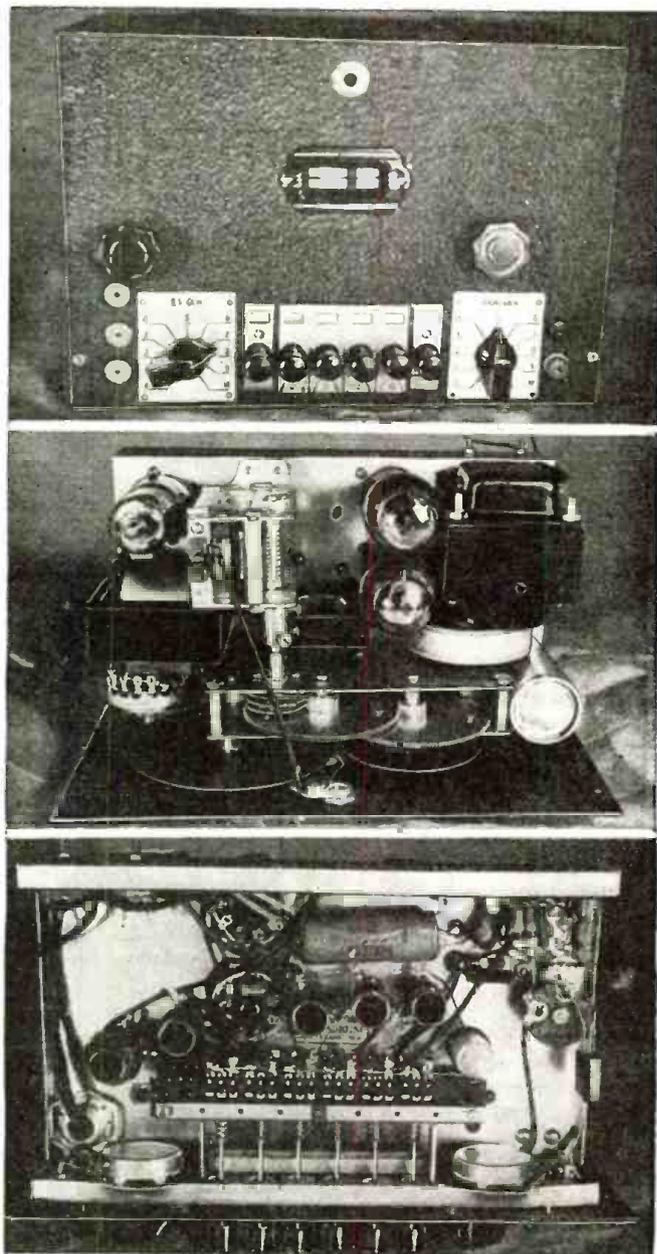
● Of equal interest and importance to the ordinary short-wave listener as well as the inveterate set builder, the *all-wave signal generator* described herein is a *must* item for super-het constructors. Anyone who has at some time or other built a super-het receiver and attempted to line it up without a signal generator, can readily appreciate the value of an oscillator that will enable him to do a vastly more effective job in a fraction of the time spent when aligning without one. In fact, it is really impossible to properly align a super without a local signal generator. To get the peak performance out of any receiver, it should be re-aligned at least every six months and whenever any tubes are replaced. Because of a lack of a signal generator, very few owners of all-wave receivers have them periodically re-aligned. Small wonder, that after a few months, even the best of factory-built supers haven't the "pep" they originally had.

Using quite a simple but highly efficient circuit, the writer's signal generator was embellished with several operating conveniences. Consisting of a 6K8GT_X tube used as an R.F. oscillator, a 6L5G audio oscillator to modulate the R.F. signal and

(Continued on page 30)

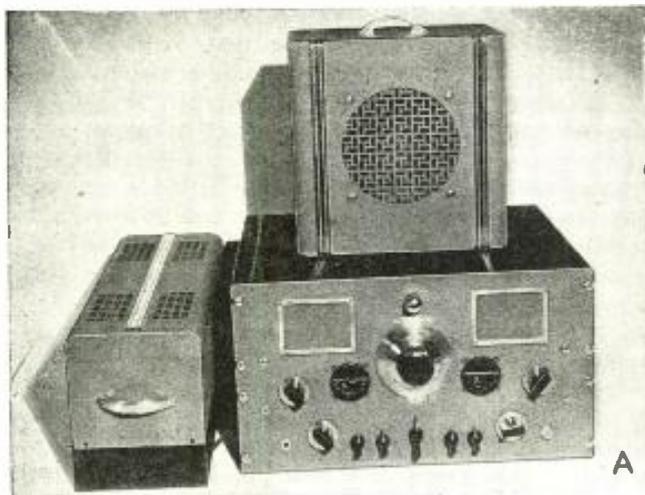
Photos at right show front, top and bottom views of the Signal Generator.

Below—Easy to follow wiring diagram of the Signal Generator.

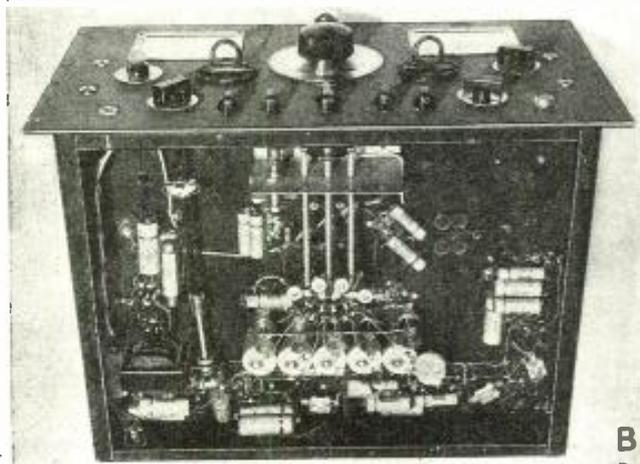


'40 Communications Receiver

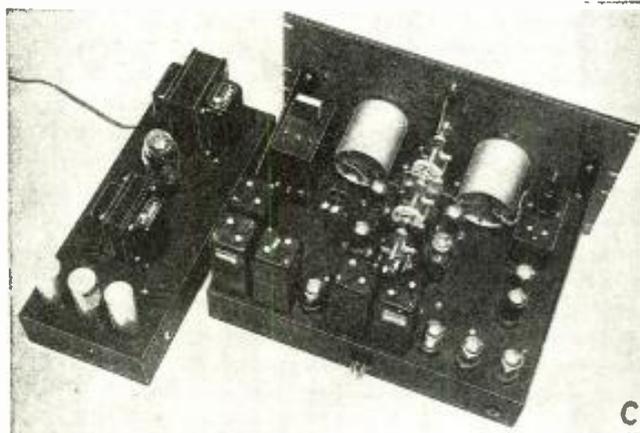
Raymond P. Adams, W6RTL



A



B



C

Top: Front view of 12-tube communications receiver, power supply and loud-speaker. Handsome cabinet helps immensely to give the apparatus that professional look.

Center: Bottom view of the receiver.

Lower photo: Rear view of set—note neat workmanship throughout and excellent arrangement of parts. Oscillator circuits are changed by means of switch for different bands.

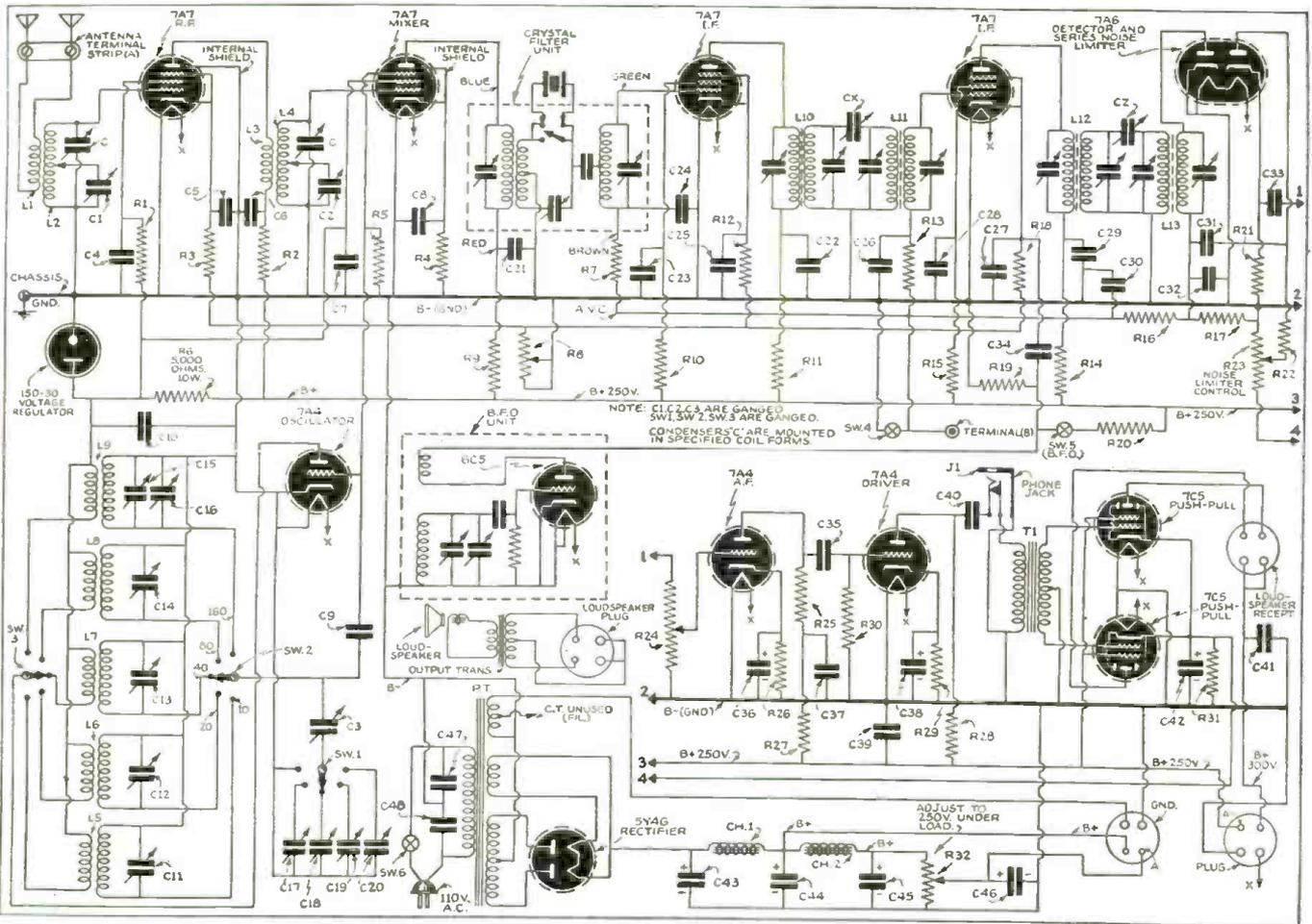
The 12-tube communications receiver here described will appeal to the Ham and advanced short-wave listener. Features are new series noise limiter, beat frequency oscillator and new filament-less voltage regulator. Tube line-up comprises R F amplifier, mixer, H F local oscillator, 2 I-F stages, diode second detector, A F voltage amplifier, A F driver, push-pull beam A F output and power supply. Switched coils are used for the oscillator and plug-in coils for the others. Bands covered are 10, 20, 40, 80 and 160 meters.

● THIS receiver, which is a thoroughly modern communications instrument incorporating features seen only in the very best factory-built jobs and which has been designed to meet the listening requirements of the most critical amateur or short wave enthusiast, may be constructed *at home* by any RADIO AND TELEVISION reader understanding the fundamentals of set-building and having at his disposal only those tools found in any garage or basement workshop—plus, say, a simple volt-ohmmeter, a socket-hole punch, and a circle cutter. This is said at the very outset because the instrument might seem to some of you a rather involved piece of mechanical and electrical engineering—when, actually, it is a relatively simple thing to get into finished physical shape and perfect operating condition. The laboratory model, incidentally, was built from scratch on a kitchen table, and with available laboratory and shop equipment deliberately “tabooed”—simply to prove to this author’s satisfaction that the thing *could* be duplicated by readers least favored with radio-building conveniences. The job shows, of course, a few marks of trial and error layout and of hand-drilling, but for all its physical imperfections it remains, nevertheless, as fair a thing from the eye appeal angle as many a shop constructed layout.

General Design and Circuit

In general circuit, this receiver does not depart from the usual run of *communications* supers, except in its use of the new and effective *series noise limiter* and of loctal tubes in all sockets, except those for the beat frequency oscillator, the high voltage rectifier, and, of course, the filamentless voltage regulator. The basic line-up and layout are strictly conventional: R F amplifier; Mixer; H F local oscillator, two I-F stages; diode second detector; A F voltage amplifier; A F driver; push-pull beam A F output; BFO; power supply; speaker. In here-and-there detail, however, the instrument departs to some extent from the usual thing, particularly in relation to front-end (R F) and I-F circuit application.

In the front-end, for instance, we have featured the expectable three tuned circuits—two for the R F, one for the local oscillator. But instead of using either plug-in or switch selected coils in *all* stage positions here, we have compromised and employed switched coils for the oscillator circuit and plug-in coils for the others. This simplifies construction considerably—the building of a satisfactory three circuit, five band switched-coil tuning assembly being on the face of it a tough proposition; and yet it does not involve the tiresome business of lifting a cabinet cover and removing and replacing of three separate inductances with each band change, as only two removable coils are to be reckoned with (two for each band, that is)—and these are conveniently accessible from the front panel. Moreover, the compromise makes very definitely for high front-end efficiency, R F coils having excellent form-factor and low loss—*plus* high H F oscillator stability, and

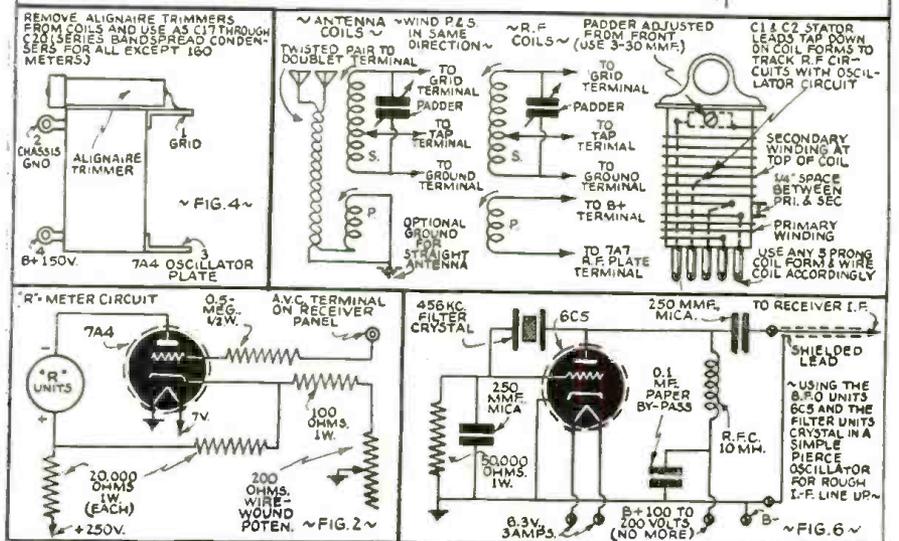
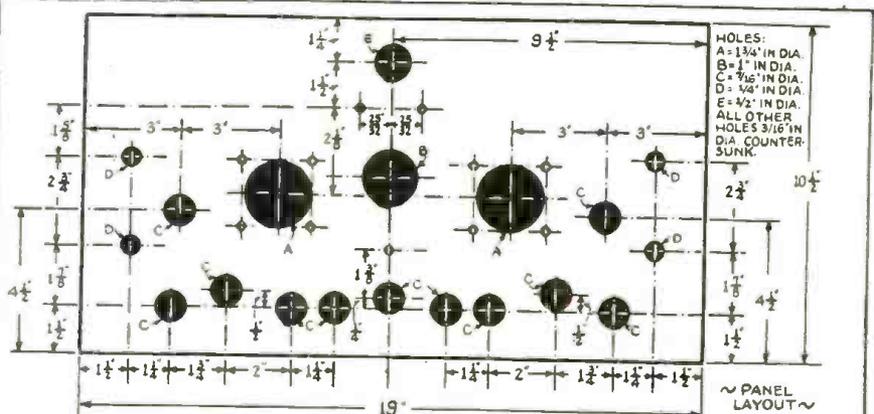


12-tube receiver hook-up is shown above, including power-supply, noise limiter and beat oscillator. Chassis drilling details, also diagrams of "R" meter and test oscillator.

oscillator coils being small, solidly supported, and rather heavily tanked to high frequency band limits.

Crystal Filter: In the intermediate frequency channel, for another, we have featured an input crystal filter and a two-stage amplifier at the conventional 456 kc. value. But instead of depending upon a conventional arrangement of transformers to effect a suitable selectivity for the reception of phone signals (the crystal filter, remember, is hardly useful on phone, due to its extremely sharp resonance peak narrowing the received modulation to exclude all but the very low AF frequencies), we have added two high Q transformers to the regular line-up to produce a flat-topped, steep-sided selectivity curve which does two things; accommodates sufficient modulating frequencies to make speech at least intelligible; and severely attenuates splash-over interference from signals on channels contingent to a desired one, thus in a very practical manner giving crowded amateur phone bands more effective width. All in all, in the I-F, there are 10 tuned circuits, including those associated with the crystal filter, which is, by the way, a factory-made and wired unit, simplifying over-all receiver construction and more or less guaranteeing proper filter operation.

It might be pointed out that in our chassis illustration we show three I-F transformers, (Continued on page 37)



10-Meter Mobile Rig



Part 2

Howard G. McEntee, W2FHP

● AFTER construction and installation of the receiver as described in Part 1, the next step is to run the control and antenna cables from the receiver to the rear of the car, where the transmitter is to be located. A 7-wire shielded cable is required; the shield may be used as a ground if desired, although only seven conductors are needed in the circuit as shown. The rubber covered style of cable is best, as this type of outer covering is much tougher and resistant to wear than is cotton braid, and is also weatherproof.

The antenna connection from receiver to transmitter is single-conductor shielded transmission cable. Although the antenna used in this installation has an impedance of about 30 ohms or so, the nearest standard

This article describes the ten meter transmitter and voice modulator; also the power-supply and wiring details. Part 3—conclusion—will appear in the next issue.

on the "shelf" behind the seat. This allows repairs or tuning changes to be made from within the car or while the set is in operation. The storage battery, of course, would be placed in the rear compartment as in a sedan.

The transmitter circuit will be seen to be quite simple, with an R.F. section of only two tubes. The 6J5GTX is a bantam-size tube with isolantite base and is particularly

cally and of lower power capability. It is well shielded—a necessity for a straight amplifier. It is quite possible to employ a 6L6 in this circuit, but it is much less efficient, and undoubtedly would require neutralization.

The antenna relay, RY2, also serves as the main power relay to turn on the high voltage supply for transmission. The remaining relay, RY3, lights the filaments. A duplicate set of controls on the transmitter chassis allows tests or regular operation to be conducted right from the seat.

The modulator may be either a 6L6 or a 6V6 and is connected as an ordinary Class A amplifier. It is driven by a single 6C5. The latter tube is not strictly necessary, as it is possible to work V4 directly from the microphone by using a sensitive mike and a high ratio input transformer. The 6C5 stage, however, adds little in cost or current drain, and allows the microphone to work at a much lower level.

The power for the mike is obtained from the transmitter battery and must be filtered to remove all trace of commutator ripple. T3 is a small filament transformer, only the primary of which is used, and this, together with an electrolytic condenser, serves as a suitable filter.

The entire transmitter including H.V. power unit is mounted on a single chassis of the amplifier style. The perforated cover allows adequate ventilation even though the perforations are covered with cloth to keep out dust and dirt. This single unit mounting makes for ease and simplicity of installation.

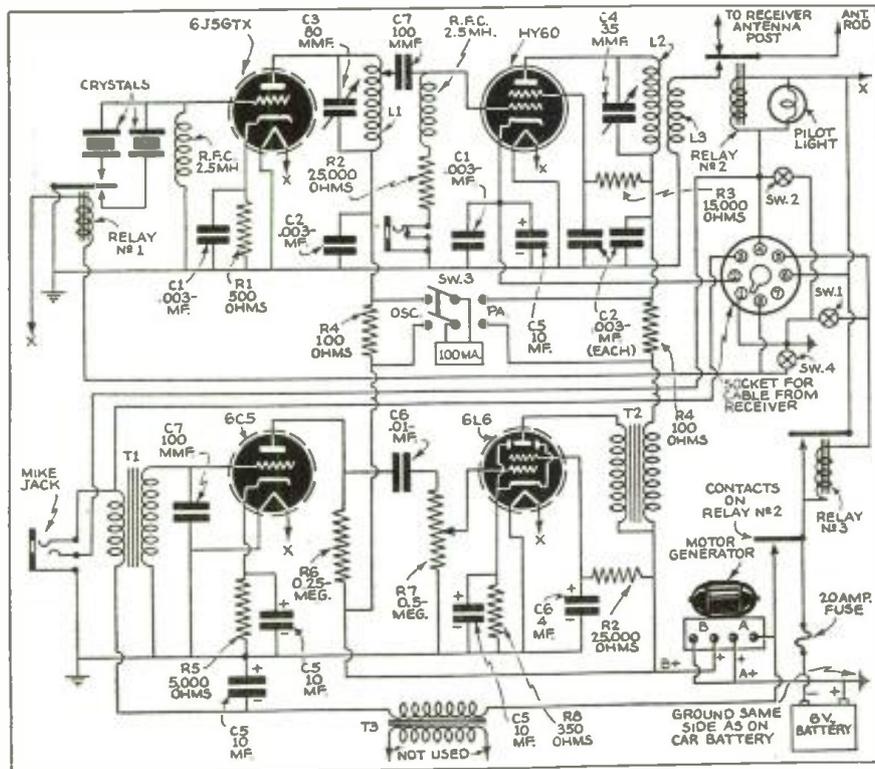
The storage battery for the transmitter is of the so-called "radio type"; it is not an auto battery and cannot be used for starting, etc. The radio style batteries are available at moderate prices in capacities up to 225 A.H. (ampere hours) or more; that used in this installation is rated at 175 A.H. and gives fine service.

Connection from battery to transmitter is made with heavy flexible cable and a polarized plug. The battery should be poled the same as is the battery used for car ignition and lighting; in this particular layout, the positive of each battery goes to ground. Care must be taken when installing the outfit to correctly connect the electrolytic condensers in the microphone circuit, so that they match battery polarity.

While the transmitter itself, together with the storage battery, might be considered to complete the installation, another unit is actually required. This is the compact battery charger which is carried in the car at all times. The charger used in this installation is of the copper-oxide type and has a maximum rate of six amperes. It is fastened in the luggage compartment and its availability makes it a simple matter to charge the battery and keep it continually in good shape.

The microphone is of a style very convenient for hand use and its case has a

(Continued on page 42)



Diagrams showing placement of crystals, meter switch, mike jack, motor-generator and battery.

cable of small size is 64 ohms. This works out well enough, however.

The cables should be run inside the car if at all possible, in order to protect them from water. In the writer's case it was possible to install the cables without drilling a single hole, simply by using openings left by the car manufacturer. The connections are threaded through a metal strip at the door sill and pass up behind the fibre side plates to the glove compartment. They are thus well protected, and almost completely out of sight (which is usually very important from the feminine viewpoint!).

Those builders who own a coupe should consider the possibility of placing the set

recommended as an H.F. oscillator. In a pinch, an ordinary 6J5 will do, but the tube specified is undeniably more efficient.

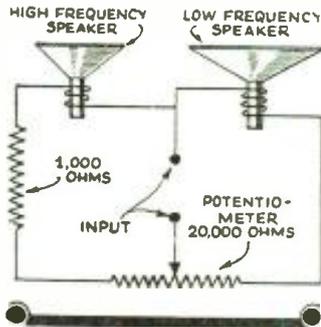
The two crystals are selected by operation of relay RY1 and must be within a few kc. of each other. The use of two crystals enables one to change frequency just enough to get out from under QRM. Only a small shift is allowable since the transmitter tuned circuits are not changed nor is the antenna reset.

The final amplifier tube, an HY60, operates straight through. This tube is a baby beam tube similar in operation and construction to the standard beam types (HY61, 807, RK39) but is smaller physi-

First Prize Winner Improved Tone Control

A tone control which does more than merely subtract the unwanted frequencies when "highs" or "lows" are to be stressed is here shown. With this system, "highs" are boosted in one speaker, and "lows" in another.

As the diagram shows, two speakers are employed, the low frequency one a 9" to 12" dynamic speaker, and the other a high frequency unit, preferably of the magnetic type and 3" to 5" diameter. The two speakers are connected in series and the input is "faded" between them by means of a potentiometer in the input circuit. A fixed resistor is connected between the high frequency speaker and one side of the potentiometer if necessary to prevent blasting. I have made this installation on many receivers with highly satisfactory results.—*Eugene Gimac (1*E2EG)*.



The tips of soldering irons soon become corroded from the heat and are almost impossible to remove when replacement is necessary. The way to avoid such trouble is to remove the tip immediately upon purchasing a new iron and to dust graphite lubricating powder onto the portion of the tip which fits into the barrel of the iron, and also sprinkle the graphite into the socket in which this tip fits. This lubricant permits the tip to be removed at any time, while greases would be baked and become useless.—*Louis Castell*.

Removable Iron Tip

The tips of soldering irons soon become corroded from the heat and are almost impossible to remove when replacement is necessary. The way to avoid such trouble is to remove the tip immediately upon purchasing a new iron and to dust graphite lubricating powder onto the portion of the tip which fits into the barrel of the iron, and also sprinkle the graphite into the socket in which this tip fits. This lubricant permits the tip to be removed at any time, while greases would be baked and become useless.—*Louis Castell*.

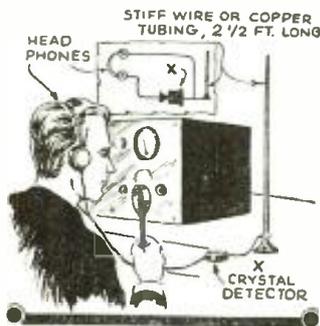


Radio Kinks

Each month the Editor will award a 2 years' subscription for the best kink submitted. All other kinks published will be awarded eight months' subscriptions to RADIO & TELEVISION. Read these kinks; they will be of real use to you, besides indicating what is wanted. Send a typewritten or ink description with sketch of your favorite to the Kink Editor

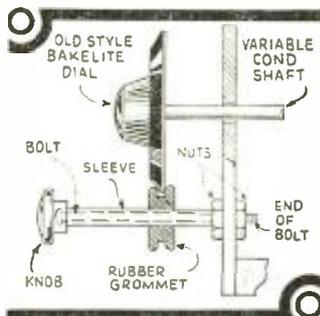
High Frequency Monitor

A simple monitor for checking the quality of a 2½ meter transmitter can be made with no more parts than a crystal detector, 2 feet of stiff wire or copper tubing, and a pair of head-phones. The 2-foot pickup rod is placed near the oscillator or feeder system and the crystal detector is adjusted for maximum volume while someone speaks into the microphone of the transmitter.—*V. Pileelatis*.



Vernier Dial

Here is a vernier dial which is very serviceable and can be assembled for a few cents or



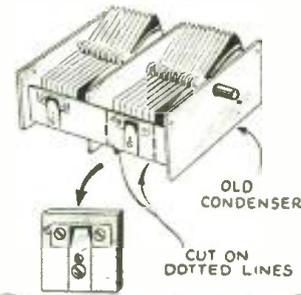
from parts found in the junk box.

A bolt is slipped through a sleeve, which is the same diameter as the shaft of a variable condenser. The head on the bolt should be large enough to hold the sleeve, but small enough to go inside a knob.

The bolt is fastened to the chassis by two small nuts and adjusted so the sleeve turns freely, yet is not loose end-wise.

A rubber grommet completes the assembly. A knob of the set-screw type should be used.—*M. E. Wolff*.

Improvised Trimmer



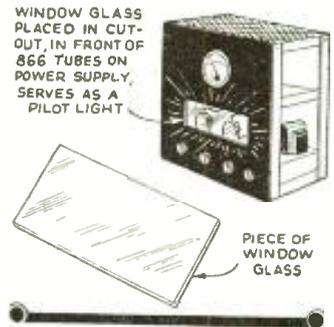
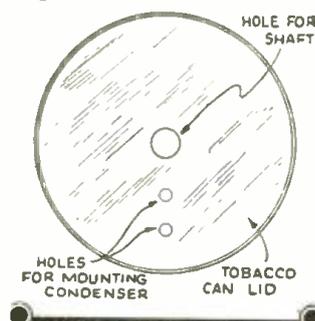
Needing an antenna trimmer condenser and being reluctant to buy one at the time, I went through my "junk pile" and found a badly battered variable condenser with good trimmers. I cut the bakelite strip, as shown in the drawing, and put nuts on the adjusting screws and other bolts that formerly went into the condenser rotor and stator frames. These salvaged trimmers worked fine.—*Henry Olson*.

Variable Condenser

To keep dust and stray fields from interfering with the perfect functioning of the variable condenser, a large shield is easily constructed and installed.

One needs only an empty tobacco can of the proper size to afford plenty of space around the variable condenser with which it is to be used. A hole is drilled in the center of the can cover, large enough to afford clearance for the condenser shaft. Additional holes are drilled in the lid for mounting it between the condenser and the panel. Other holes, as needed, are drilled into the lower side of the can, to afford passage for the wires connecting to the condenser.

This keeps dust from getting under the condenser and into its bearings, and also prevents stray magnetic fields.—*John Mc. Heer*.



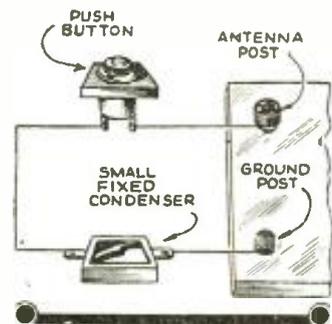
Pilot Panel

A novel and attractive pilot light system for the transmitter can be made simply by inserting a small window in the panel of the power supply rack. If 866 tubes are used, their blue glow gives an attractive warning signal to the ham and is very impressive when YL's and others visit the shack.—*Winston H. Starks, W9JIT*.

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Telephone-Radio Switch

When the telephone rings while the radio receiver is operating, it is usually very hard to conduct a conversation because of the noise. However, the little gadget sketched herewith



shows a remote control "multiplier" that decreases the volume of the receiver when operated from the telephone position.

With the push-button open, the radio operates at full volume, but when the button is pressed, a partial short-circuit is made across the antenna and ground posts of the receiver, and the volume is reduced. The amount of reduction will depend upon the value of the small fixed condenser. A fixed resistor may be employed in place of the condenser.—*Thornton Lyford*.

Question Box

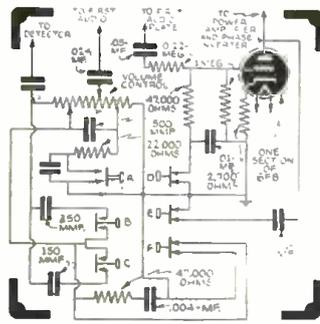
Edited by Herman Yellin, W2AJL

Circuit for Radiorgan

? Can you publish the circuit diagram of the Radiorgan (a tone control system permitting various stages of high and low boost in the audio circuit)?—Sam Kaufman, Toronto, Can.

A. The Radiorgan is operated by a six-button pushbutton switch which inserts or removes various networks from the circuit. It is used in the Zenith receivers and its action is similar to stops on an organ.

The circuit herewith shows that button "A" introduces a capacity from the low tap on the volume control to cathode, passing the highs, buttons "B" and "C" introduce a high boost into the grid circuit of the first amplifier by adding capacity from a high point on the volume control to a 100,000 ohm resistor on the control. Buttons "D" and "E" provide high cuts in the second amplifier which is one section of the 6F8. The other triode of the 6F8 serves as a phase inverter. With all six buttons, a total of 64 tone positions are available.



Novel tone control circuit. No. 1212.

Data on Frequency Modulation

? Recently, I have read and heard much about frequency modulation; in fact, I have seen circuits published in one of your issues. If more stations make use of this new method of modulation, will additional types of tubes be required?—H. Moran, Stapleton, Staten Island, N. Y.

A. As additional stations designed for frequency modulation go into operation more interest in such receivers capable of reproducing such programs will develop.

Fortunately, there is already a wide variety of receiving tube types, including those that have been developed for television service. These types should cover all F-M circuit requirements, at least for the immediate future.

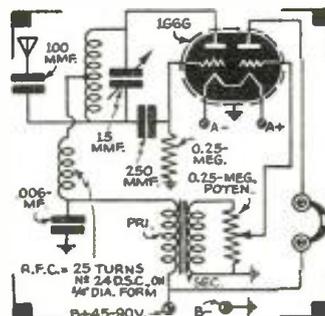
The first F-M receivers supplied on a commercial basis combine circuits for reception of present standard broadcast programs with additional circuits for F-M reception, and utilize types of tubes already familiar and generally available.

If frequency modulation becomes available on anything like a nationwide basis, there is no doubt that we will experience an upturn in radio set building and listener interest.

2½- 5 Meter Receiver

? Please print a diagram of 2½-5 meter receiver using a 1G6G tube and suitable for use as a portable receiver.—E. Colyer, Morison, Ill.

A. We show a super-regenerative type of receiver, using one section of the double triode tube as an audio amplifier. The transformer can be of the 3 to 1 or 4 to 1 ratio. Some experimenting should be done to get the correct coil size, as this will depend on parts placement and lead length. All R.F. leads should be kept as short as possible.



2½-5 meter Receiver. No. 1213.

Radio Control for Planes

? Some months ago, there appeared in one of your issues complete data on a simplified radio control for model planes and boats. Can you advise what issue it appeared in and also if a copy still is available?—Moe Kleinschmidt, Bronx, N. Y.

A. This article is still available. Write our circulation department requesting them to send you a copy of the August, 1938, issue of SHORT WAVE & TELEVISION.

Where is W2XWF?

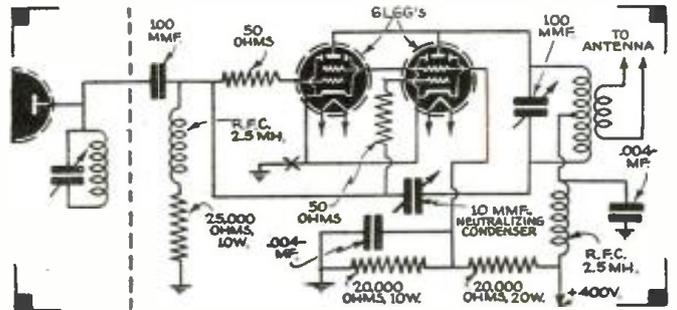
? Recently I heard Station W2XWF broadcasting recorded music in the ultra-high frequencies—can you inform me where this station is located and on what frequency they operate?—L. M. Jason, Newark, N. J.

A. This station is located at Columbus Circle in N. Y. City. It is owned by W. G. H. Finch, and operates on a frequency of 41.8 megacycles, approximately 7.5 meters.

R.F. Amplifier

? Please show a diagram of an R.F. amplifier using two 6L6G's in parallel, capacity-coupled to the 6L6 oscillator shown in the Question Box of January '39?—L. T. Johnson, Pomona, Calif.

A. The addition of this stage should make a nice little transmitter, using moderate plate voltage. The 50 ohm resistors in series with each grid serve to prevent parasitic oscillations. The plate coil should be of a size to tune to the desired band. A key can be inserted at "X" if it is desired to key this amplifier.



Transmitter Hook-up. No. 1214.

Capacity Relay

? In the diagram for A.C.-D.C. Capacity Relay on page 277 of the September issue there seems to be an error, in that 110 volts is connected directly across the tube heaters.—H. Loud, Detroit, Mich.

A. The No. 7 prong of the 25A6 tube should be connected to the other side of the 275 ohm, 50 watt resistor instead of the side shown in the diagram. This resistor is used not only to lower the voltage to the filaments, but allows the plate voltage to be varied.

100% Modulation Effects

? When modulating my final amplifier 100%, how much should my antenna current rise?—A. Tibber, Chicago, Ill.

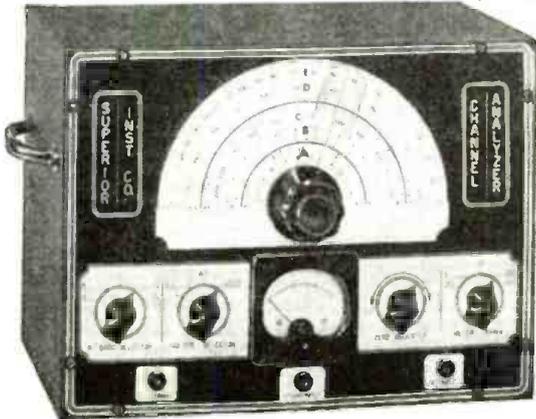
A. When feeding a pure sine wave of fixed frequency into the modulator, the antenna current will increase by 22½% over the current when the carrier is unmodulated. However, ordinary speech is not a single pure tone but a very complex wave with many peaks. Speaking into the microphone in an ordinary voice and modulating 100% on peaks should give about a 15% increase in antenna current.

Queries to be answered by mail (not on this page) should be accompanied by fee of 25c (stamps, coin or money order). Where schematic diagram is necessary, our fee is 50c up to 5 tubes; for 5 to 8 tubes fee is 75c; over 8 tubes, fee is \$1.00. No picture diagrams can be supplied.

Buy Direct From the Manufacturer and Save • Buy Direct From the Manufacturer and Save

THE NEW CHANNEL-ANALYZER

Follows The SIGNAL from Antenna to Speaker



The well-established and authentic SIGNAL TRACING METHOD of locating the very circuit in which there is trouble, and the very component that causes the trouble, is now for the first time available at a price any radio serviceman can afford.

The CHANNEL-ANALYZER will

- ★ Follow signal from antenna to speaker through all stages of any receiver ever made.
 - ★ Instantly track down exact cause of intermittent operation.
 - ★ Measure both Automatic-Volume-Control and Automatic-Frequency-Control, voltages and circuits without appreciably loading the circuit, using built-in highly sensitive Vacuum-Tube Voltmeter.
 - ★ Check exact gain of every individual stage in receiver.
 - ★ Track down and locate cause of distortion in R.F., I.F., and A.P. amplifier.
 - ★ Check exact operating voltage of each tube.
 - ★ Locate leaky condensers and all high-resistance shorts, also show opens.
 - ★ Measure exact frequencies, amount of drift and comparative output of oscillators in superhets.
 - ★ Track down exact cause of noise.
- The Superior Channel-Analyzer comes housed in shielded cabinet and features an attractive etched aluminum panel. Supplied complete with tubes, three specially engineered shielded input cables, each identified as to its purpose. Also full operating instructions. Size 13" x 10" x 6". Shipping weight 19 pounds. Only **\$19⁹⁵**

THE NEW MODEL 1280 SET-TESTER

Combines Models 1240 and 1250

A complete testing laboratory in one unit, the Model 1280 combines the Models 1250 Multitester and 1240 Tube Tester. (See specifications of each below.)

- ★ Instantaneous Snap Switches Reduce Actual Testing Time to Absolute Minimum.
- ★ Spare Socket and Filament Voltages Up to 120 Volts. Make the Model 1280 Obsolescence Proof.
- ★ Latest Design 4 1/2 D'Arsonval Type Meter.
- ★ Works on 90 to 125 Volts 60 Cycles A.C.



Even those servicemen who through past purchases know they can always get SUPER-VALUES from Superior, will be amazed and delighted when they read the specifications of this all-purpose instrument and then note the unbelievably low price. The Model 1280 features a 4 1/2" D'Arsonval type meter for easy reading of the various scales, and in line with our new policy of stressing appearance as well as serviceability in our new 1200 line of test equipment, our Model 1280 utilizes an aluminum etched panel, designed for beauty as well as ruggedness. The primary function of an instrument is, of course, to make measurements accurately and when designing test equipment this is our first thought. However, we also appreciate the important part the appearance of an instrument plays in the impression a serviceman makes on his customers, especially on home calls. We have, therefore, paid special attention to the outward design of all of our new instruments. For instance, the Panel of this Model 1280 is made of heavy-gauge aluminum and etched by a radically new process which results in a beautiful, confidence inspiring appearance.

Model 1280 comes complete with test leads, tabular data and instructions. Shipping weight 18 pounds. Size 13" x 11" x 6 1/2". Our net price **\$19⁹⁵**
Portable cover \$1.00 additional

THE NEW MODEL 1250 MULTITESTER



SLOPING PANEL FOR PRECISE RAPID SERVICING

Etched aluminum panel

Specially designed electronic rectifier enables linear A.C. scale, high stability and little or no temperature drift.

Here is an opportunity to acquire a Multi-Service, Precision Engineered Instrument, for less than you would have to pay for an ordinary Volt-Ohm-Milliammeter. Besides making the usual volt, resistance and current measurements (both A.C. and D.C.) this unit accurately measures the CAPACITIES of mica, paper and electrolytic condensers, INDUCTANCE of coils, chokes and transformers, DECIBEL gain or loss, of power amplifiers and public address systems, WATTS output of amplifiers, receivers, etc.

SPECIFICATIONS

Complete A.C. and D.C. Voltage and Current Ranges	High and Low Capacity Scales .0005 to 1 mfd. and .05 to 50 mfd.
D.C. Voltage:—0-15, 0-150, 0-750 volts	3 Decibel Ranges
A.C. Voltage:—0-15, 0-150, 0-750 volts	-10 to +19, -10 to +38, -10 to +53
D.C. Current:—0-1, 0-15, 0-150, 0-750 ma.	
A.C. Current:—0-15, 0-150, 0-750 ma.	Inductance: 1 to 700 Henries
2 Resistance Ranges 0-500 ohms, 500-5 megohms	Watts: Based on 6 mw. at O.D.B. in 500 ohms .006000 to 600 Watts

Model 1250 works on 90-120 volts 60 cycles A.C. Comes complete with test leads, tabular charts and instructions. Shipping weight 9 lbs. Size 9 1/2" x 11" x 6 1/2". Our net price **\$11⁸⁵**

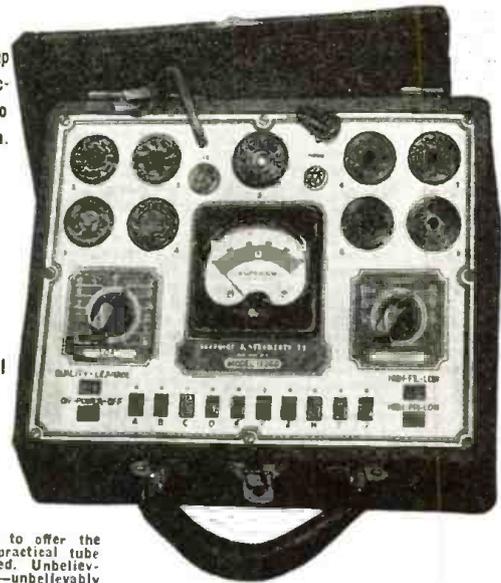
Portable cover \$1.00 additional

THE NEW MODEL 1240 TUBE TESTER

Instantaneous snap switches reduce actual testing time to absolute minimum.

Tests all tubes 1.4 to 117 volts.

Sockets for all tubes — No adapters.



Superior is proud to offer the newest and most practical tube tester ever designed. Unbelievably low in price—unbelievably high in performance.

- ★ Tests all tubes, 1.4 to 117 volts, including 4, 5, 6, 7, 7L, octals, locals, Beniam Jr., Peanut, single ended, floating filament, Mercury Vapor Rectifiers, the new S series, in fact every tube designed to date.
- ★ Spare socket included on front panel for any future tubes.
- ★ Tests by the well-established emission method for tube quality, directly read on the GOOD ? BAD scale of the meter.
- ★ Jewel protected neon.
- ★ Tests shorts and leakages up to 2 megohms in all tubes.
- ★ Tests leakages and shorts in all elements AGAINST all elements in all tubes.
- ★ Tests BOTH plates in rectifiers.
- ★ Tests individual sections such as diodes, triodes, pentodes, etc., in multi-purpose tubes.
- ★ Latest type voltage regulator.
- ★ Features an attractive etched aluminum panel.
- ★ Works on 90 to 125 volts 60 cycles A.C.

Model 1240 comes complete with instructions and tabular data for every known type of receiving tube. Shipping weight 12 pounds. Size 6" x 7 1/2" x 10 1/4". Our Net Price **\$11⁸⁵**

Portable cover \$1.00 additional

SUPERIOR INSTRUMENTS CO.

136 LIBERTY ST., DEPT. RT5
NEW YORK, N. Y.

What Do YOU Think?

Aussie Hears Calif. Police Car Editor,

I have been a reader of your magazine for about 6 years and no other can beat it in any way.

I am mainly interested in Ultra High Frequency DX, especially the United States



Australian Short Wave Listening Post—owned by Jamie Ferrier.

police stations, which operate between 7.5 and 10 metres. My best "catch" that I have verified is the Beverly Hills (Calif.) Police Station on 37.1 M.C. (8.1 metres). This is, by the way, the highest frequency station ever heard and verified in Australia. The

highest freq. station that I have ever identified is JJR-1 on 39.140 kc.

My best DX was the reception of Patrol Car No. 223 in Los Angeles on 9.9 metres; these cars have only 15 watts power output. The signal from this car was audible for about 3 minutes and during that time it reached R6!

The receiver I used for the above DX was a "Jones Ultra Gainer" (5 tube); my present receiver is a 7 tube super, very similar to that described by George W. Shuart, W2AMN, in S.W. & T. for Aug. 1937.

I would like to hear from some of you SWL's, especially you "Ultra SWL's". 73.

JAMIE FERRIER (AW129DX),
Winninburn, Coleraine, Victoria.
(Official Observer for Victoria)

Plenty of Useful Dope

Editor,

Just a few lines to say that we buy and read five monthly radio magazines, but RADIO & TELEVISION has more useful dope than the other four put together, and last but not least, your "swap" column is one of the biggest *helping hands* ever given to us beginners.

CLINTON KEAY,
292 Main St.,
Marseilles, Ill.

Likes Our S-W Station List Editor,

As a regular reader of your valuable journal, I would like to congratulate your excellent contributor, Joe Miller. He can certainly pull them in and get verification of his fine work.

I have found his column of immense benefit, and although I receive my copy of R. & T. later than my friends in the U.S.A., I have nevertheless been able to receive stations from "Joe's" list, which I probably would have missed if I had not been a reader of your journal.

Thanking you for many happy hours spent with RADIO & TELEVISION.

ERNEST I. LOGAN,
4 Fanshawe Street,
Benigo, Hertford,
England.

Television Student Likes R. & T. Editor,

Your magazine has been of invaluable aid to me all through my studies as a student in a Television School, from which I recently graduated. I am very much pleased to see that it is getting better all the time. Keep up the good work.

GEORGE J. COOK,
2031 149 Street,
Whitestone, N. Y.

Let's Listen In with Joe Miller

●AT present, the old DX game has slowed up somewhat, due to the trouble "over there," which we all hope will end soon, and normalize this little "world" of ours.

The first signs of the usual Spring pickup are just becoming evident, although the past month has been rather erratic. Reception of the better DX was noticeable shortly after mid-March, when, due to the absence of many powerful British, French and other European and colonial amateurs, the better grade of ham DX was at once noticed, and with some pleasure, hi, and probably many of you OMs had similar experiences.

Again we approach the QRN season, when Dame Nature does her bit to make DXing more interesting by adding some seasonal electrical interference to our reception, although this is partly counteracted by improved DX reception of most of the world. However, with the advent of the warm seasons, the QRN situation cancels enjoyable SW broadcast receptions of stations located above 31 meters. But most of us rarely stop at one station long enough to enjoy a program, hi! Let's look over the DX situation:

ETHIOPIA

I2AA, 9.65 mc., at Addis Abeba, was well heard here in Eastern U. S. on the I.D.A. special program in January, in the late afternoon, although their usual sked is 3:30-5:30 a.m. daily, while on Sunday, they operate from 2:30-5:30 a.m. and 8 a.m.-2:30 p.m. We suggest trying for I2AA, for those who would like this catch, near the beginning of the program, and on Sundays near 2:30 a.m. and 2:30 p.m.

AUSTRALIA

There's been quite a change recently in the Aussie SWBC (short-wave broadcast) stations, and we want to thank all the boys who sent dope on the various new calls and skeds.

VLQ5, 9.587 mc., at Sydney, is most often reported, and should be, being beamed on the U. S. daily 7-8 a.m. when VKs are best received in the east. VLQ5 operates in parallel with the powerful VLQ, 9.68 mc., the new 16 kw. station also at Sydney, with same sked. Reports should be OK with just call letters and location for QRA.

VLR3 at Melbourne has moved to 11.85 mc., and, with an added sked of 6:35-7 a.m. which pro-



Here's one of Short Wave's grand Old Timers, Gus Gallagher of San Francisco, Calif.

gram is beamed at the Pacific I-les, should be well heard all summer, if this frequency is adhered to, which we doubt.

VLW2, 9.645 mc., Perth, W. A., is a good bet on a sked of 6-11 a.m. with English news at 8:50 a.m. VLW3, 11.83 mc., also at Perth, can be heard near the end of their 1-5 a.m. sked, with signal improving with the warm weather.

FIJI ISLANDS

VPD2, 9.535 mc., at Suva, has changed their sked to 4-5 a.m. with their new Xmt, which is a

good bet for all who haven't yet received their "FB" QSL.

MOZAMBIQUE

CR7BE, 9.645, Lourenco Marques, has been enjoyably received here this winter, and we do hope none of you missed this really FB DX station, one with such an excellent signal that one could tune it in merely for the entertainment value. Near the end of their 2-4 p.m. is the best bet. Another sked, 7-8 a.m., and directed at North America, is badly QRM'd. CR7BE uses 10 kw., and may soon add other frequencies, as they have obtained license to use CR7BF on 11.835. CR7BG on 15.285, and CR7BI on 17.915 mc. OM Eric Butcher, formerly of Cokeville, Wyoming, and now aboard the S. S. *Nemaha*, cruising between New Orleans and East Africa, is well supplied as to DX, having in his shack an RME 70 and DB 20, and a skywire 70 feet up hooked on the aftermast. Eric reports CR7BE FB, as he certainly should, being almost there at the time. Bon voyage, OM!

NETHERLANDS EAST INDIES

YCP, 9.125 mc., at Balikpapan, Dutch Borneo, has changed call to YCC. This FB DX catch may occasionally be heard phoning with other Javanese phones in the early hours mostly 5-7 a.m. YBG, 10.43 mc., Medan, Sumatra, another nice country to snag, has changed call to YBF3, why—we don't know. YBF3 is still a good bet near 5:30 a.m. when it is used to contact the homeland, and really romps in with a fine signal!

ROMANIA

Radio Bucharest, 9.234 mc., using 300 watts, now has a new sked, operating up to 7 p.m., when it plays the National anthem. This is an opportunity to add a hard to QSL country to one's list of verified countries. Romanian hants are notorious for their determined refusal to QSL reports, so here's a really good chance, as this station is in the clear, well off the 31 meter mess. A good identification aid is a 10 note bugle call used as an interval signal. We feel that the QRA Radio Bucharest, Bucharest, Romania, will suffice, lacking full QRA at present. Good luck!

(Continued on page 41)

BIG NEWS! ASK ALLIED ABOUT THE NEW HOWARD AMATEUR RECEIVERS



NEW "PROGRESSIVE SERIES" PLAN
 The most advantageous purchase plan ever offered! Protects your receiver investment and ends trade-in and obsolescence losses! Developed by HOWARD, this simple money-saving plan enables you to start with a modest investment and then in easy steps to acquire the most advanced receiving equipment. Here's how it works: Start with the Model 435 receiver at \$29.95. After you've used it for a while, you may have it rebuilt at the factory so that it becomes a Model 436 at a cost of only \$12.75! Then you can have it converted again later on into a 437 for only \$17.05 additional! Or, if you wish, the 435 may be converted directly into the 437 for just \$27.55. You actually save the money originally invested and use it to acquire the latest, improved equipment.
NOTE: Model 605 Carrier Level Meter for all models installed at factory for \$12.00 additional.

"435"



"436"



"610"

MODEL 435

Here's the first of Howard's new "Progressive Series"—a 8-tube communication type receiver which you will be proud to own. Has continuous tuning from 540 KO to 40,000 KC in four frequency range bands. All the very latest features are included to make this compact receiver an outstanding buy for 1940—and at an unbeatable low price.
YOUR PRICE \$29.95
 Terms: \$4.50 down, \$4.50 monthly for 6 months.

MODEL 436

A new outstanding Receiver incorporating all of the features of the basic Model 435 plus noise limiter circuit and additional refinements. Packed with value at this amazing low price.
YOUR PRICE \$39.95
 Terms: \$5.95 down, \$6.00 monthly for 6 months.

MODEL 437

A more advanced model of the 436. Full 9-tube circuit with tuned R.F. stage on all bands and many additional superb features.
MODEL 437 less crystal \$54.50
MODEL 437 with crystal \$62.00
 Terms: \$5.45 down, \$6.49 monthly for 8 months.
 Terms: \$6.20 down, \$7.39 monthly for 8 months.

2 GREAT NEW CATALOGS

For more complete information on the new Howard "Progressive Series" send for ALLIED'S 2 FREE Catalogs: 1. A 172-page general catalog covering Everything in Radio including 60 new KNIGHT Radios; 18 new Sound Systems; new Amateur equipment; Builders' Supplies; Service-men's equipment, and 15,000 Quality Radio Items. 2. A new catalog directed to the Amateur Exclusively—a compilation of every conceivable piece of Amateur Equipment.
SEND COUPON TODAY!

"610" POWER PACK

A superb compact vibrator-type power supply for use with Howard Models 435, 436 or 437 when operated at points not supplied with 110 volts, 50-60 cycle A.C. Easily attachable. Operates from 6-volt battery.
Complete with vibrator and cables \$12.50

MODEL 460

This famous Howard ten-tube Superhet has a tuning range from 43 MC to 340 KC in four bands. Incorporates a built-in Noise Limiter and Frequency Monitor and many outstanding features. MODEL 460, less crystal
\$79.95
MODEL 460, with crystal \$87.45
 Terms: \$8.00 down, \$6.36 monthly for 12 months.
 Terms: \$8.75 down, \$6.96 monthly for 12 months.

650 PRESELECTOR

A new high-gain preselector designed especially for use with the Howard Communications Receivers. Consists of two tuned R.F. stages having an extremely high order of usable gain with exceptional sensitivity to weak signals. A real value.
YOUR PRICE \$29.95
 Terms: \$4.50 down, \$4.50 monthly for 6 months.
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zontal antenna are supported by the same mast and are not more than ten to fifteen feet apart.

The effectiveness of this combination is undoubtedly heightened by the fact that the horizontal antenna employs matched feeders which eliminate the possibility of coupling between the two systems where the lead-ins run down the side of the house. If such coupling did exist the two systems would work as one and diversity action would be nullified. The remedy in that case would be to keep the lead-in wires well separated. Another factor in the system described is that the matched feeders do not pick up any appreciable amount of signal and the pick-up is therefore almost entirely in the horizontal flat-top.

For those who wish to experiment with this diversity idea it may be more simple to employ two horizontal antennas. These can be fairly close together if necessary, as both on the same roof for instance, but in that case should be run approximately at right angles to one another. Also, as already mentioned, their lead-ins, if they are the single wire type, should be kept separated as much as possible.

"Diversity" Reception Made Practical

(Continued from page 18)

There is just one more bit of advice, gained from considerable experience in this field. That is to employ headphones rather than loudspeakers. This can be done by putting separate cords on each headphone of a pair and then plugging one in on each receiver. Where loudspeakers are used noise is more troublesome. At an instant when the signal has faded out on one receiver, the release of the a.v.c. system will allow the noise to rise. As a result the impression will be gained that reception is noisy although the signal may be coming in beautifully at the moment on the other receiver. Where headphones are used the noise is much less noticeable.

As for practical results, a relatively simple diversity set up if operating properly will invariably reduce fading to a marked degree. It will make many signals intelligible which, using the conventional single receiver, would not be understand-

able. It will oftentimes enable the ham to continue QSO's which would otherwise be "washed out" by fading and it will make all short-wave reception more dependable and enjoyable, especially for the DX'er.

And it might be added, incidentally, that even when the steadiness of signals makes diversity unnecessary, the presence of two operating receivers offers the ham other advantages as well. In a three-way QSO each receiver can be left tuned to one station to avoid shuttling back and forth between them; one receiver can be left tuned to a station which it is desired to contact but which is tied up in another QSO at the moment, and the other used for scanning the band while waiting, etc.

Based on our own experience we would say that many hams (and short-wave fans as well) would find it distinctly worth while to keep the old receiver when purchasing a new one, applying it to the use described above, rather than turning it in for an oftentimes negligible allowance. At least keep it long enough to try the two out together to determine whether they will work together as a diversity team.

(Continued on page 27)

World Short Wave Stations

Revised Monthly

Complete List of SW
Broadcast Stations

Reports on station changes are appreciated.

Mc.	Call	Station	Mc.	Call	Station	Mc.	Call	Station
26.550	W2XQO	NEW YORK CITY, N. Y. 11.30 m. Noon-9 pm.	21.450	DJS	BERLIN, GERMANY, 13.99 m. Addr., Broadcasting House. 12.05-7.55 am. To Asia.	15.325	JLT3	TOKYO, JAPAN, 19.58 m. 9-10.30 pm.
26.500	W9XTA	HARRISBURG, ILL., 11.32 m. 1-4 pm.	19.020	HS6PJ	BANGKOK, THAI, 15.77 m. Mondays 8-10 am. See 15.23 mc.	15.320	OZH	SKAMLEBAK, DENMARK, 19.58 m., Sun. 8 am.-1.30 pm. Dly. 1-1.30 pm.
26.400	W9XAZ	MILWAUKEE, WIS., 11.36 m., Addr. The Journal Co. Relays WTMJ from 1 pm. to midnite.	18.480	HBF	GENEVA, SWITZERLAND, 16.26 m., Addr. Radio Nations. Fri. 8.45-10.15 am.	15.310	GSP	DAVENTRY, ENG., 19.6 m., Addr. (See 17.79 mc.) 2.5 am., 11.52 am.-1.25 pm. to Near East, 1.30-3.30, 3.50-6 pm. to N. A. News at 3.50 and 4.45 pm.
26.150	W4XA	NASHVILLE, TENN., 11.47 m., noon-1. 6.30-10 pm.	17.970	KHE	KAHUKU, HAWAII, 16.69 m. Sats. Suns. 8.30-9 pm. Also irreg. at 5 pm.	15.310	YDB	SOERABAJA, JAVA, N. E. I. 19.60 m. Addr. NIROM. 10.30 pm.-2 am., Sat. 7.30 pm.-2 am.
26.125	W5XAU	OKLAHOMA CITY, OKLA., 11.48 m., 7 am.-11 pm.	16 Met. Broadcast Band			15.300	2RO6	ROME, ITALY, 19.61 m., 4.10-4.55 am.; 10 am.-12.06 pm.; 1-2.15, 5-9.25 am., 11 am.-6 pm. For N. A. 8.15-10.10 pm. News at 10.
26.100	W9XJL	SUPERIOR, WIS., 11.49 m. Relays WEBC daily. 11 am.-3 pm.	17.845	DJH	BERLIN, GERMANY, 16.81 m., 12.05-7.50, 8-11 am.	15.295	TPB4	PARIS, FRANCE, 19.61 m. 5-5.30, 7.30-8 am. to Africa.
26.050	W9XTC	MINNEAPOLIS, MINN., 11.51 m. Relays WCTN 10 am.-8 pm.	17.840	EIRE	MOYDRUM, ATHLONE, EIRE, 16.82 m. Addr. Radio Eireann. 7.30-8.30, 9-10 am.	15.290	YUD3	DELHI, INDIA, 19.62 m. Addr. All India Radio. 8-10.30 am., 11.30 am.-2.30 pm., 9.30 pm.-12 m. Mon. 1-4 am.; Tues., Thurs., Fri., Sat., 1-3.30 am.; Wed. 2-4 am.; Sat. 9.30 am.-3.30 am.
26.050	W9XH	SOUTH BEND, IND., 11.51 m. Addr. South Bend Tribune. Relays WSBT-WFAM 2.30-6.30 pm., exc. Sat. and Sun. and Thurs.	17.840	HVJ	VATICAN CITY, 16.82 m. Heard 12 n. on Wednesday.	15.290	LRU	BUENOS AIRES, ARG., 19.62 m., Addr. El Mundo. Relays LRI, 8-10 am.
26.000	W8XUJ	CINCINNATI, OHIO, 11.54 m. 2-4 pm.	17.830	LRA5	BUENOS AIRES, ARG., 16.83 m. Fri., 5-5.30 pm.	15.280	DJQ	BERLIN, GERMANY, 19.63 m., Addr. Broadcasting House. 12.05-11.10 am.
26.000	W9XA	KANSAS CITY, MO., 11.54 m., Addr. Commercial Radio Eqpt. Co. 12 noon-3 pm.	17.830	WCBX	NEW YORK CITY, 16.83 m. Addr. CBS, 485 Madison Ave., N. Y. C. 8 am.-12.30 pm. to Europe.	15.270	WCBX	NEW YORK CITY, 19.63 m., Addr. (See 21.570 mc.) Daily exc. Sat. and Sun. 1-3.30 pm., Sun. 1-2.30 pm. to Europe.
25.950	W8XNU	CINCINNATI, OHIO, 11.56 m., 7 am.-2, 4 pm.-1 am.	17.820	2ROB	ROME, ITALY, 16.84 m., Addr. (See 2RO, 11.81 mc.) 4.30-7.15 am., 9.30-10.55 am., 6-7.55 pm. to So. Am.	15.270	H13X	CIUDAD TRUJILLO, D. R., 19.65 m. Relays H1X Sun. 7.40-9.40 am. Tues. and Fri. 8.10-10.10 pm.
25.900	W9XPD	ST. LOUIS, MO., 11.6 m. Addr. Pulitzer Pub. Co. Relays KSD. 10 am.-1, 4-8 pm.	17.810	GSV	DAVENTRY, ENGLAND, 16.84 m., 7-8.45, 9-11.45 am. to No. Amer. News, 8.15, 11 am.	15.270	WCAB	PHILA., PA., 19.65 m. (Addr. See 21.52 mc.) 12 n.-6 pm. to S. A.
25.400	W9XLA	DENVER, COLO., 11.81 m. Address Shirley Savoy Hotel. Relays KLZ (Verifies on reports.) 10 am.-12 mid.	17.790	GS6	DAVENTRY, ENG., 16.86 m., Addr. B.B.C., London. 5.40-8.45; 9-10.15 am.	15.260	GS1	DAVENTRY, ENG., 19.66 m., Addr. (See 17.79 mc.) 12.57-5 am., 11.52 am.-3.30 pm. to Africa.
25.300	W5XD	DALLAS, TEXAS, 11.86 m., 12.30-2.30 pm.	17.785	JZL	TOKYO, JAPAN, 16.86 m. Irregular.	15.250	WRUL	BOSTON, MASS., 19.67 m., Addr. University Club. Daily exc. Sat. and Sun. 10 am.-11 am. to Europe.
25.300	W9XOK	ST. LOUIS, MO., 11.86 m. Addr. St. Louis Times-Star, Relays KXOK.	17.780	WNBI	BOUND BROOK, N. J., 16.87 m., Addr. Natl. Broad. Co., 9 am.-4.15 pm. to Europe, 4-8.15 pm. to So. Amer.	15.245	TPA2	PARIS, FRANCE, 19.68 m., Addr. 98 Bis. Blvd. Haussmann. "Paris Mondial" 5-10 am. only.
25.300	W2XJ1	NEW YORK, N. Y. 11.86 m. Addr. Bamberger Broad. Service, 440 Broadway. Relays WOR 11.30 am.-3.45, 5-6 pm.	17.770	PH12	HUIZEN, HOLLAND, 16.88 m., Addr. (See PH1, 11.730 mc.) Sun. 6.40-7.40 am. to Far East.	15.240	2RO14	ROME, ITALY, 19.68 m. Irregular.
25.250	W2XUP	NEW YORK CITY, 11.88 m. 4-6 pm.	17.765	TPB3	PARIS, FRANCE, 16.89 m. Addr. 98 Bis. Blvd. Haussmann, "Paris Mondial." 5-10 am.	15.240	YUF	BELGRADE, YUGOSLAVIA, 19.69 m., 7-8 pm. to S.A.
21.640	GRZ	DAVENTRY, ENG., 13.86 m. Addr. B.B.C., London. Unused at present.	17.760	DJE	BERLIN, GERMANY, 16.89 m., Addr. Broadcasting House. 12.05-11 am.	15.240	YUG	BELGRADE, YUGOSLAVIA, 19.69 m., 8-9 pm. to N.A.
21.630	WRCA	BOUND BROOK, N. J. 13.87 m. Addr. N.B.C., N. Y. C. Noon-3.30 pm. to Latin America.	End of Broadcast Band			15.240	CR7BD	LOURENCO MARQUES, MOZAMBIQUE, 19.68 m. 4.30-6.30, 9.30-11 am., noon-11 pm.
21.570	WCBX	NEW YORK CITY, 13.91 m. Addr. CBS, 485 Madison Ave. 8 am.-2.30 pm. to Europe. Irregular.	17.310	W2XGB	HICKSVILLE, L. I., N. Y., 17.33 m., Addr. Press Wireless, Box 296. Tests 9.30-11.30 am. except Sat. and Sun.	15.220	PCJ2	HUIZEN, HOLLAND, 19.71 m., Addr. N. V. Philips' Radio Hilversum. Sun. 7.40-10.05, Mon. Thurs. 7.40-9 am.; Tues. 3-4.30; Tues., Fri., Sat. 7.40-8.45 am.; Wed. 7.40-10.50 am.
21.550	GST	DAVENTRY, ENG., 13.92 m., Addr. (B.B.C. London) 5:40-8:45, 9:9-15, 9:20-11:30 am.	17.280	FZEB	DJIBOUTI, FRENCH SOMALILAND, 17.36 m. Test XMSN 1st Thurs. each month 8-8.30 am.	15.210	WPIT	PITTSBURGH, PA., 19.72 m., Addr. (See 21.540 mc.) 8 am.-3 pm.
21.565	DJJ	BERLIN, GERMANY, 13.92 m., Addr. Broadcasting House. Irreg.	15.410	RV96	MOSCOW, U.S.S.R. 19.47 m., 5-7.30 am., 8.55-10.30 pm.	15.200	DJB	BERLIN, GERMANY, 19.74 m., Addr. B.C.'s'g. House; 12.05-6.30-9, 9.15-9.30 am.; 11.10-11.40 am., 4.50-10.45 pm. for N. A. News 6.45, 8.30 and 9.15 am.; 6, 8.15, 10.30 pm.
21.540	WPIT	PITTSBURGH, PA., 13.93 m., Addr. Grant Bldg. Relays KDKA 6.30-8.15.	15.370	HAS3	BUDAPEST, HUNGARY, 19.52 m., Addr. Radiolabor, Gyali Ut 22. Sun. 9-10.30 am.	15.195	TAQ	ANKARA, TURKEY, 19.74 m., News in English at 7.15 am.
21.530	GSJ	DAVENTRY, ENG., 13.93 m., Addr. (See 21.550 mc.) 5.40-8.45 am.	15.360	DZG	ZEESEN, GERMANY, 19.53 m., Addr. Reichspostzentralamt. Tests irregularly. Ams.	15.190	XGOX	SZECHWAN, CHINA, 19.75 m. 8.30-9.30, 10-11.05 pm.
21.520	WCAB	PHILA., PA., 13.94 m. Addr. Col. Broad. Syst., 485 Madison Ave., N. Y. C. 12 n. to 3.45 pm. exc. Sat. & Sun. Sun. 12 n.-2.30 pm. to So. Am.	19 Met. Broadcast Band			15.190	OIE	LAHTI, FINLAND, 19.75 m. Addr. (See OFD, 9.5 mc.) 1:05-4 am, 9 am.-5 pm.
21.510	2RO16	ROME, ITALY, 13.94 m. 9-9.55 am., irregularly.	15.330	KGEI	SAN FRANCISCO, CALIF., 19.56 m. Addr. General Electric Co., 6.30-11.15 pm. to So. America.	15.180	GSO	DAVENTRY, ENG., 19.76 m., Addr. (See 17.79 mc.)
21.500	WGEA	SCHENECTADY, N. Y., 13.95 m., General Electric Co., 8-11 am.	15.330	WGEA	SCHENECTADY, N. Y., 19.56 m., Addr. General Electric Co. Relays WGY, 8 am.-6 pm. to Europe.	15.180	RV96	MOSCOW, U.S.S.R., 19.76 m., 3-3.45 am. (Eng.) to No. Am.
21.480	PH13	HUIZEN, HOLLAND, 13.96 m., Addr. N. V. Philips, Hilversum. Irregular, 6.10-9.35 am.						
21.470	GSH	DAVENTRY, ENG., 13.97 m. 5.40-8.45 am. to Africa.						
21.460	WRUL	BOSTON, MASS., 13.98 m. Addr. University Club. 10 am.-noon. Suns. to Europe.						

All Schedules Eastern Standard Time

Mc. Call	
15.170 TGWA	GUATEMALA CITY, GUAT., 19.77 m. Addr. Ministre de Fomento. Daily 12.45-1.45 pm.; Sun. 1.45-5.15 pm.
15.166 LKV	OSLO, NORWAY, 19.78 m. 8.50 am.-5 pm.
15.160 JZK	TOKYO, JAPAN, 19.79 m. 4.30-5.30, 8-9 pm. to N. A. News at 8.15 pm.
15.160 XEWW	MEXICO CITY, MEXICO, 19.79 m., 12 n.-12 m., irregular.
15.155 SBT	MOTALA, SWEDEN, 19.80 m. 1-4.30 pm.
15.150 YDC	BANDOENG, JAVA, 19.8 m. Addr. N. I. R. O. M. 6-9 pm. ex. Sat. 10.30 pm.-2 am., Sat. 7.30 pm.-2 am., daily 4.30-10.30 am.
15.140 GSF	DAVENTRY, ENG., 19.82 m. Addr. (See 17.79 mc.) 2.18-5, 5.40-8.45, 9-11.30 am., 3.50-6 pm.
15.135 JLU3	TOKYO, JAPAN, 19.82 m. 8-9.30 am. to China. Irregular.
15.130 TPB	PARIS, FRANCE, 19.83 m. Broad-casts to U. S. 11.30 am.-12.30 pm.
15.130 WRUW-WRUL	BOSTON, MASS., 19.83 m. Addr. World-Wide B'cast'g Foundation, University Club. 2-5, 8.45-10.30 pm.; Sat. 3-5 pm.; Sun. 10 am.-noon.
15.120 CSW4	LISBON, PORTUGAL, 19.84 m. 7-9 am.
15.120 HVJ	VATICAN CITY, 19.84 m. Tues. 8.30-9, 10-10.30 am., Suns. 1-1.30 pm. to N.A. Wed. 8.30-9 pm.
15.110 DJL	BERLIN, GERMANY, 19.85 m. Addr. (See 15.280 mc.) 12.05-2 am., to N.A. 10.40 am.-4.25 pm to Africa.
15.100 ZRO12	ROME, ITALY, 19.87 m. Irreg. 4-5.30, 6-7.25, 7.30-9 pm.
15.040 RKI	MOSCOW, U.S.S.R., 19.95 m. Works Tashkent near 7 am.; 7-8.30 pm. to N.A. 8.30-9 pm. in French.

End of Broadcast Band

14.940 PSE	RIO DE JANEIRO, BRAZIL, 20.08 m. Broadcasts 6-7 pm., Wed. 4-4.10 pm., Thurs. 3-3.30 pm.
14.920 KQH	KAHUKU, HAWAII, 20.11 m. Sats. 8.30-9 pm. Sun. 9-9.30 pm.
14.795 IQA	ROME, ITALY, 20.28 m. 4.30-5 am. In Arabic.
14.600 JVH	NAZAKI, JAPAN, 20.55 m. Works Europe 4-8 am. Rel. JOAK Irr. after midnight.
14.535 HBJ	GENEVA, SWITZERLAND, 20.64 m. Addr. Radio Nations. Broadcasts Wed. 6.45-8.15; 8.40-10.15 pm. to No. Am. News in English 9.30-9.35 pm.
14.460 DZH	BERLIN, GERMANY, 7:10-50 pm. almost daily.
14.440 —	RADIO MALAGA, SPAIN, 20.78 m. Relays Salamanca 5.45-7.30 pm. Sometimes 2-4 pm.
14.420 HCUJB	QUITO, ECUADOR, 20.80 m. 7-8.15, 11.30 am.-2.30, 4.45 pm.-10.15 pm. Exc. Mon.
13.900 YNDG	LEON, NICARAGUA, 21.58 m. Sun. 12.30-1, or 1.30 am.
12.862 W9XDH	ELGIN, ILL., 23.32 m. Press Wire- less, Tests 2-5 pm.
12.486 HIIN	TRUJILLO CITY, DOM. REP., 24.03 m. 6.40-10.40 am., 5:10-9.40 pm.
12.460 HCJB	QUITO, ECUADOR, 24.08 m. Daily exc. Mon. 7-8.15, 11.30 am.-2.30, 5-10.30 pm.
12.310 VOFB	ST. JOHNS, NEWFOUNDLAND, 24.37 m. 5.30-7.30 pm.
12.000 RNE	MOSCOW, U.S.S.R., 25 m. 7-9 pm. to N.A. Freq. breaks, 9 pm.-5 am., 9-11 am.
11.970 H12X	CIUDAD TRUJILLO, D. R., 25.07 m. Addr. La Voz de Hispaniola. Relays HIX Tue. and Fri. 8:10-10:10 pm. Sun. 7:40-9:40 am.
11.945 CB1180	SANTIAGO, CHILE, 25.12 m. 7-8 am., 4.50-11 pm.

25 Met. Broadcast Band

11.940 TI2XD	SAN JOSE, COSTA RICA, 25.13 m. La Voz del Pilot. Aparatado 1729. 7.30 am.-noon, 4-10 pm.
11.910 CD1190	VALDIVIA, CHILE, 25.19 m., P. O. Box 642, Relays CB69 10 am.-1 pm., 5-10.30 pm.
11.900 XGOY	SZECHEWAN, CHINA, 25.21 m. 5.30-7.35 7.40-9 9.40-11 11:10-11.50 am. 2-4.20, 4.30-6.20 pm. News 6.15 am., 5 pm.

(Continued on following page)

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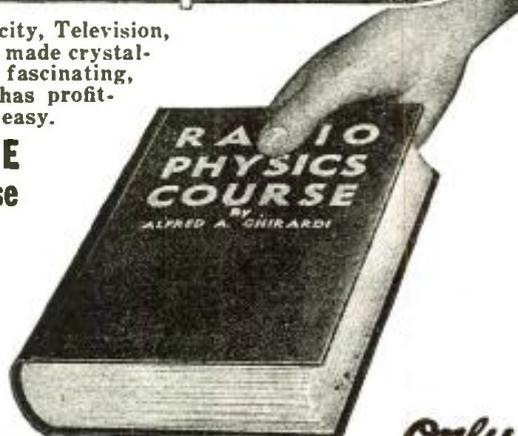
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(All times are in Pacific Standard)

● BY this time of year most of the small South and Central American stations on the 62 and 49 meter bands have completely faded out of the Pacific Coast short wave picture. Their place is being taken by early morning broadcasts from Asia and daytime programs from the powerful stations in Europe.

All the Australian broadcasters reported in this column last month are booming through with good volume. The key station of this network, VLO of Sydney, now is heard near 9.68 megacycles on the American program from 4 to 5 a.m. Several listeners have reported that VLR3 is using both the 9.58 and 11.83-megacycle frequencies.

A shift in the American hour from Rome, now heard from 5:15 to 7:10 p.m., has been marked by a great improvement in reception here on the coast. Both ZRO4 on 11.81 mcs. and ZRO3 on 9.63 mc. now come booming through to the coast with the volume of local stations. The daily new-broadcasts now are heard at 7 p.m. IRF on 9.84 and IQY on 11.67 mc. also carry these programs.

The new Latin-American station reported by several listeners on 11.84 mc. is PRF5 of Rio de Janeiro, Brazil. This station is on the air from 3 to 4 p.m. with best reception near the close of the broadcast.

Remarkable reception from Chile's CB1180 on 11.94 mc. has been reported by several listeners. CB1180 hits the airplanes at 2 o'clock, although not well received here until after 5, and signs off at 8 p.m.

Bert Wolfe of Oakland, California, writes that ZRL on 9.65 mc., of Capetown, South Africa, comes in very well and should not be listed as a "long shot" for Pacific Coast listeners. He also sends a complete official schedule sheet for all South African short wave stations, as follows:

ZRL, 9.60 megs., 8:45 to 9:50 p.m. (best).
 12:20 to 4:30 a.m.; 6 to 8:45 a.m. and 9 a.m. to 1 p.m. ZRG on 9.52 mc. from 8:45 to 9:50 p.m.
 2:00 to 3:15 a.m. and 6:30 to 9:45 a.m. ZRH on 6.007 (seldom heard here) from 12:30 to 3:15 a.m., 3:30 to 9:45 a.m. ZRO on 9.76 mc.

from 8:45 to 9:50 p.m., 12:30 to 4:30 a.m., 6:00 to 8:15 a.m. and 8:20 to 12:45 p.m.

Mr. Wolfe reports receiving a verification card from ZRO which uses only 200 watts power. Congratulations, Bert!

Excellent reception from the official Chinese stations, XGOY on 9.55 mc. and XGOX on 15.22 mc. has been reported by several listeners, including Mr. Kendall Walker of Yamhill, Oregon. XGOY rattles the tubes every morning from 6 to 6:40 a.m. while XGOX can be tuned from 5:30 to 6:30 and 7 to 8:05 p.m. Best reception from XGOX is during the early broadcast, according to Mr. Walker.

Bangkok's HS6PJ is coming through on 7.97 megs. daily from 5 to 7 a.m. Considerable interference from nearby code stations occasionally blots out reception from this station.

Reported back on the air, although very weak at present, is the "Happy Station" of Holland, PCJ on 9.59 mc. PCJ is on the air on Tuesdays from 5:45 to 6:45 p.m. with a special broadcast for North America.

ROUND 'N' ABOUT . . . from listeners' reports. OZF of Copenhagen on 9.52 mc. from 7 to 8 p.m. GSF occasionally comes through during early afternoon with a weak signal. Fiji's VPD2 listed on 9.54 mc. from 1 to 2 a.m. Has anyone heard? Although several Vatican broadcasts are listed for North America the only one heard here is over the 11.75 megacycle station on Tuesdays from 7 to 7:30 a.m. Schwarzenburg transmitter heard testing irregularly on 11.86 and 9.52 mc. during early evenings. LRA1 heard on 9.69 mc. with good volume from 4 to 6 p.m. HCJB now has new transmitter on 12.46 mc.

"Diversity" Reception Made Practical

(Continued from page 23)

CALIBRATIONS OF SX-17 AND "5-10" RECEIVERS AGAINST FREQUENCY—10 METER BAND

Freq.	*SX17 Dial	5-10 Dial
28.000	912	593
28.050	900	601
28.100	890	609
28.150	878	616
28.200	867	624
28.250	856	631
28.300	843	639
28.350	832	647
28.400	817	654
28.450	804	662
28.500	790	669
28.550	775	677
28.600	761	684
28.650	748	691
28.700	732	697
28.750	718	705
28.800	701	711
28.850	687	718
28.900	668	724
28.950	652	731
29.000	635	738
29.050	618	745
29.100	600	751
29.150	583	757
29.200	564	764
29.250	547	770
29.300	527	777
29.350	508	783
29.400	488	790
29.450	467	796
29.500	446	803
29.550	425	809
29.600	400	815
29.650	377	822
29.700	351	828
29.750	326	835
29.800	301	841
29.850	277	847
29.900	250	852
29.950	223	859
30.000	195	865

*Main dial of SX17 set slightly above 30 mc. (160.1 on main dial vernier scale).
 Calibrations from harmonics of 100 kc. crystal oscillator. 50 kc. points interpolated.



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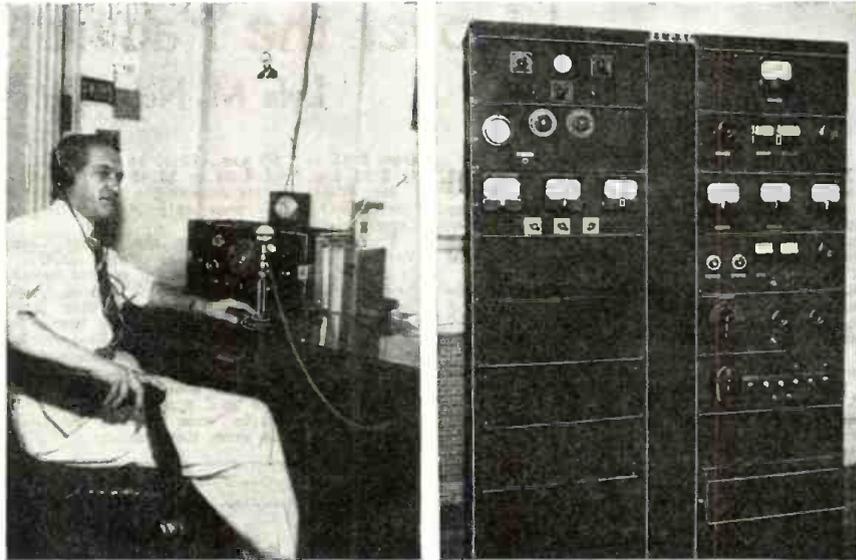
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Eduardo E. Grinberg, LU8AG

• AMATEUR Radio Station LU8AG is owned by Eduardo Elias Grinberg and is located in Cordoba 1807, Buenos Aires, Argentine Republic, S. A.

LU8AG is a new station and was licensed in 1938. Mr. Grinberg almost invariably does his own operating and he is a good friend of the United States. LU8AG operates only in 20 meter phone (14,096 kc.).

The line-up is as follows: 6A6 crystal oscillator, condenser coupled to 8L6 doubler, link coupled to 607 buffer, link coupled to T-125 single-ended final Class-C stage. The crystal oscillator uses a 7048 kc. crystal. The speech equipment begins with a Brush B.R.2. S. microphone, followed by one 6J7, one 6J7, two 6C5 in push-pull, and two 2A3 in push-pull, driven by a pair of 203-Z class B modulators.

The antenna is a Johnson-Q, direct-coupled to the final. The transmitter is protected throughout against overloads and underloads and is remotely controlled at the receiver, thanks to a relay system.

The receiver is a Skyriders SX-16 and is used with a preselector. The transmitting

antenna is used for reception. Transmitter is home-made.

Percent of modulation is controlled by a built-in oscilloscope using a 2" tube.

The first rack contains all the speech equipment, with its own power supplies, and the oscilloscope. The second rack contains the R.F.-section and power supplies, as well as the relay equipment.

RADIO & TELEVISION

THIS Award of Honor Presented to

E. E. Grinberg, LU8AG

by

RADIO & TELEVISION MAGAZINE

for the Best **PHOTOGRAPH** of an **AMATEUR RADIO STATION**

Submitted in the monthly **Amateur Station Photo Contest**

H. Gernsback, Editor

Here is the new "Award of Honor" Plaque which measures 5" x 7" in size. It is handsomely executed in colors on metal, and is framed, ready to hang on the wall. The letters appear in black against a beautiful gray background, and we are sure that our amateur friends who are awarded one of these new "badges of merit" will be more than pleased with it. The name of the winner will be suitably inscribed.

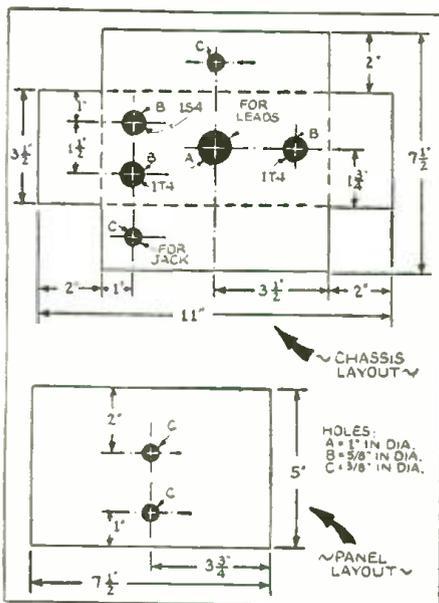
3-Tube Ocean Hopper

(Continued from page 11)

clean, hot and well-tinned iron and resin-core solder. Good connections mean a great deal when operating a small receiver such as this "midget" set.

The coils may be of the manufactured type, if desired, or may be wound by the experimenter himself. A coil data chart giving the exact number of turns required for all-band operation will be found at the end of this article. The band-setting condenser, C4, is of the midget air-tuned type and is placed *inside* of the coil form itself. A separate condenser is used in each coil, the setting being adjusted to spread the various bands completely over the tuning dial scale, and thereafter left alone. The bandspreading obtained varies from 180 degrees on the 160 and 80 meter amateur bands to about 75 degrees on 20 meters. The receiver will operate on 10 meters but the sensitivity is not great enough to receive the weaker stations, especially if there is considerable local noise. A number of *strong* local 10 meter stations have been received very well, however.

Although the Brush crystal headphones are shown in the photograph, it will be



Chassis and panel details.

necessary to use the ordinary magnetic type, unless some provision for coupling the crystal units to the 1S4 plate circuit is made. A small midget coupling choke of about 30 henries and 20 milliamperes rating and a .1 mf. condenser may be used as shown in the dotted lines of Fig. 1. A small resistor in place of the 30 henry choke cannot be used with satisfactory results, as it drags the plate voltage down below that of the screen, causing poor quality and low amplification.

Almost any antenna or none at all may be used with this receiver. The author has listened to *European and South American stations on several occasions using only a small three- or four-foot piece of insulated wire thrown on the floor or hanging over the edge of a table or chair.* Like all *short wave* sets, however, better results will be obtained with a good outside antenna. The stronger stations usually can be received with good headphone volume *without any antenna whatever!*

The author will be glad to hear from readers who build this little receiver. All

1940's Outstanding Value In The Amateur Communication Field—



Sargent Model WAC-44

Tunes 9.5 to 350 meters, 5 tuning bands, built-in 5 inch, 4 watt speaker, Calibrated 5-meter, 14 tube performance (11 actually used, 3 being double function), C.W. Beat Oscillator, Iron core I.F. on 456 K.C., Send-Receive Switch, relay connections, Headphone and extension speaker jack.

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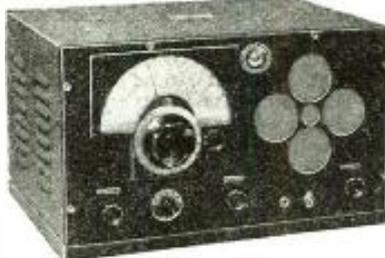
Price includes speaker, tubes, power supply. Nothing else to buy. Operates from 110 volts, 50/60 cycles. Extension speaker supplied, if desired at small extra cost.

IMMEDIATE DELIVERY.

PRICED in the "better performance" class, but including these EXTRA features:

- 2 Stages R.F., all bands, with PANEL LINE-UP Adjustments. With 2 stages of R.F., perfect alignment is essential if weak stations are to be received. WAC-44 does not depend upon maintaining a factory line-up adjustment. The operator can readjust the trimming for perfect resonance.
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- VOLTAGE REGULATOR. VR-150 on tubes sensitive to voltage change.

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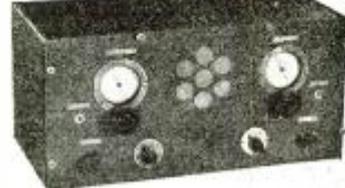
MODEL 51-MK

- 13 Tube Performance (10 used)
- Isolantite Insulation
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- Band Spread
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- R.F. and Det. Panel
- Trimmer
- Push-Pull Audio
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- Full Wave A.C. Rectification
- High voltage, oiled paper filter condensers—no electrolytics
- Both power lines filtered
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An AC-DC, communication-type superhet, built to highest standards. Continuous tuning range 9.7 to 3,750 meters in Model 51-MK covers time signals, weather and airplane beacons, 600 meters, broadcast, police, yacht phone, amateurs and short wave broadcast. Dial fully calibrated with all amateur, broadcast and ship bands marked. Regenerative input gives almost complete image rejection, brings up weak signals that are unreadable without it. A rugged, dependable communication receiver afloat or ashore. A go-getter for DX. ALWAYS IN ALIGNMENT. No need to depend upon line-up adjustments made in a factory thousands of miles away. R.F. and detector trimmers, on the panel, allow the operator to align the receiver perfectly for any frequency. Built of the best materials. No electrolytics or deteriorating parts except the tubes.

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Features: Model 11 has coil switching, band spread, calibrated dials, break-in switch, phone jack, built-in speaker and power supply. Ideal for the commercial operator's personal receiver. Available in any voltage and for A.C., D.C. or battery, in 2 tuning ranges, an accepted standard in this field since 1936.

MODEL 11 NET PRICES

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letters will be answered if a stamp is enclosed for reply. All letters should be sent in care of RADIO & TELEVISION.

Coil Data

Range	Grid Turns	Spacing	Tickler Turns
9-17	33 1/2	1 1/4"	3 close-wound
17-41	8	1 3/8"	5 " "
33-75	17 3/4	1 1/2"	8 " "
66-150	38	1 3/4"	12 " "
135-270	82	1 7/8"	15 " "

All forms are 1 1/2" in diameter and may be either 4- or 6-prong type. Range given is in meters. Spacing is the distance between the grid and filament ends of the coil, not the space between turns. Wind ticklers in the same direction as grid coils and on the grid ends of the form. Data is for a .35 mmf. tuning condenser, with a 100 mmf. midget padder or band-setting condenser *inside* the coils.

Parts List

THE NATIONAL COMPANY

5—Four- or five-prong low-loss coil forms, 1 1/2" diameter

(Continued on page 51)

ADJUSTABLE LINK 50 WATT OSC. COILS



Permits accurate coupling adjustment on each band.

"Air-Wound" low loss winding.

Available from 10 to 160 meters.

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SX-25 complete	\$99.50	\$19.90	\$7.03
S20R & NC44A	49.50	9.90	3.49
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Sky Buddy	29.50	5.90	2.08
NC100A	120.00	24.00	8.48
HQ-120X	138.00	27.60	9.75
Super Pro	279.00	55.80	19.71
RME-70	138.60	27.72	9.79

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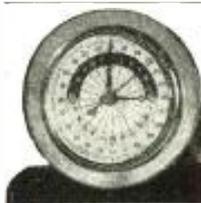
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GORDON SPECIALTIES COMPANY
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CHICAGO, ILLINOIS

All-Wave Signal Generator

(Continued from page 13)

a 6ZY5G rectifier, the entire unit is mounted behind a 7 by 10 inch panel, in a six inch deep cabinet. The 6K8GTX is a new form of the old 6K8 with the addition of a ceramic base which provides for more effective operation on the high frequencies. With its triode section acting as the R.F. oscillator, the pentode section serves not only as a mixer for the audio oscillator, but effectively prevents any reaction from the output load on the R.F. oscillator. Varying the output control can have absolutely no effect on the oscillator frequency. While home-made coils can be used, the writer strongly recommends the purchase of a set of factory made units. However, the set of five Sickles coils goes up to only 26 megacycles. To cover the band from 24 to 75 megacycles, another coil will have to be made, but this is a relatively simple operation. For ease in switching from one band to another, a push-button switch having six buttons, each controlling a double-pole, double-throw switch, was used. With this type of switch, it is quite simple to arrange the switch wiring so that all unused coils are shorted to ground, thus eliminating any absorptive effects which they would have on the coil being used. The six coils should be mounted close to the switch in order to keep all leads to a minimum length. Use heavy bus bar in wiring the entire R.F. circuit, since floppy leads will affect the stability of calibration. Tuning of the oscillator condenser is accomplished with a Crowe Mathematic Precision tuning dial having a ratio of 37 to 1 and affording 600 dial graduations for 180 degrees of condenser rotation, thus enabling us to accurately reset the condenser to any frequency. Above the dial window on the panel will be seen a phone jack. Connected across the tuning condenser, it allows the use of an external "frequency wobbler" when employing an oscilloscope for visual alignment.

The audio oscillator is somewhat unique in that two frequencies, 400 and 1000 cycles, are provided for modulating the R.F. oscillator. Special care was taken to have the audio output level at the same amplitude at both frequencies, thereby necessitating the use of a separate cathode resistor for each audio frequency. If additional audio frequencies are desired, another condenser can be added for each additional frequency. The lower the value of condenser capacity used across the transformer winding, the higher will be the generated frequency. If the output at each frequency must be at the same level, some experimentation with the values of cathode resistance will be necessary; additional contacts on the switch are available for this. A pair of tip jacks on the front panel make the audio oscillator output available for testing of audio amplifiers or checking transmitter modulation. Also, placing a telegraph key in series with a small p.m. (permanent magnet) speaker or pair of earphones results in a fine code practice oscillator.

The R.F. oscillator can also be externally modulated by a phonograph pickup or other method, by connecting the external

modulator to the audio output jacks and turning the control switch (SW-2) to the position opening the 6L5G cathode, thereby silencing the built-in audio oscillator.

The rectifier-power supply is quite conventional, except for the connection of all filaments, including the rectifier (6ZY5G) to the same 6.3 volt filament winding.

A single switch controls the application of line voltage to the entire unit, as well as turning on the audio oscillator and changing the audio frequency. This is accomplished by the 3-pole, 6-position rotary switch SW-2, of which only 4 positions are used at present; the other 2 being available for the use of additional audio frequencies as described above. One pole or section of the switch is the A.C. control, while the other two choose the different values of audio transformer condensers and cathode resistors.

Before making use of the signal generator, it should be calibrated as accurately as possible. The best way would be to calibrate it against the harmonics of a 100 kc. oscillator checked against the standard frequency transmissions of WWV. Such an oscillator was described in a recent issue of RADIO & TELEVISION (p. 674, March, 1939; p. 213, August, 1939). Alternatively, the signal generator can be checked against some serviceman's oscillator.

Parts List

BUD RADIO

- 1—7 x 10 x 6" Cabinet No. 993
- 1—Chassis No. 996
- 1—Condenser coupling No. SE-1051

INTERNATIONAL RESISTANCE CO.

- 2—40,000 ohms ½ watt No. BT½
- 2—3,000 ohms ½ watt No. BT½
- 1—35,000 ohms ½ watt No. BT½
- 1—3,500 ohms ½ watt No. BT½
- 1—50,000 ohms ½ watt No. BT½
- 1—100,000 ohms ½ watt No. BT½
- 1—2,000 potentiometer No. 11-110
- 1—¼ meg potentiometer No. 13-130

MEISSNER MFG. CO.

- 1—365 mmf. tuning condenser No. 21-5224
- 1—Octal statite socket No. 25-8437
- 2—Bakelite octal sockets No. 25-8209

THORDARSON

- 1—580 volt c.t. power transformer No. T13R11
- 1—Output transformer No. T61S25
- 1—10 henry filter choke No. T-14C64

CROWE NAME PLATE MFG. CO.

- 1—Mathematic Precision Tuning Dial No. 530
- 2—Dial plates No. 408
- 1—"R.F. Gain" name plate No. 1-7
- 1—"AUDIO GAIN" name plate No. A-9

HYTRON CORP.

- 1—6K8GTX ceramic base tube
- 1—6L5G
- 1—6ZY5G

MALLORY-YAXLEY CO.

- 1—6 button push-button switch No. 2186
- 1—3 pole 6 point rotary switch No. 3136J
- 1—Phone jack No. A-1
- 5—Phone tip jacks No. 521
- 3—.005 mf. mica condensers No. MC 852
- 1—.0002 mf. mica condenser No. MC 841
- 2—.01 mf. paper condensers 400 V. No. TP1421
- 1—.04 mf. paper condenser 400 V. No. TP425
- 1—.5 mf. paper condenser 400 V. No. TP431
- 1—8 x 8 mf. 450 volt condenser No. RM-262

F. W. SICKLES CO.

- 1—Set of signal generator coils (including chokes)

COIL SPECIFICATIONS

	Range	Turns	Wire Size	Winding	Tap from Gnd. End	Coil Diameter
L-1	110-360 kc.	300 turns	#36 S.S.E.	Universal	75th	9/16"
L-2	300-900 kc.	150	#36 S.S.E.	Universal	50th	9/16"
L-3	800-2700 kc.	100	#32 Enam.	Close wound	30th	9/16"
L-4	2.5-8.5 mc.	32	#26 Enam.	Close wound	8th	9/16"
L-5	7-26 mc.	8½	#24 Enam.	Space wound 5/16" long	3½	9/16"
L-6	24-75 mc.	3¼	#18 Enam.	Space wound ½" long	1½	¾"
R.F. CHOKES (3)		300	#32 D.S.C.	Universal		¾"

Television Audience

(Continued from page 5)

A spectacular stunt which was carried out in this recent airplane television test was that passengers on a second plane were able to see themselves through the eyes of the television camera on the first plane by means of a television receiver installed on their plane.

The television image signals for the receiver on the second plane were tuned in from the transmitter atop the Empire State Bldg.

The radio signals corresponding to the television images picked up by the first plane were transmitted to a special receiving station on the roof of the RCA building in New York City. A non-directional aerial was used aboard the plane.

After being amplified, the plane's television signals were checked on a monitor and then sent through a coaxial cable underground to the NBC television transmitter located high up in the 1300 ft. Empire State Bldg. The television signals were then broadcast for the benefit of those persons owning television receivers in New York and vicinity, possibly to the number of 2,000.

The G.E. television relay station located near Albany is situated about 129 miles, airline from New York City. It picked up the television signals broadcast from the Empire State Bldg., and relayed them by short wave to the G.E. television transmitting station, a distance of 1.2 miles. Many people in the vicinity of Schenectady, Albany and Troy owning television sets saw this unusual telecast. One of the unusual situations occurred when the signals were picked up by a television receiver located at the foot of the Adirondacks, and a person who had never been to New York City saw for the first time the huge skyscrapers in the Metropolis as they flashed across the television screen.

AIRPLANE-TELEVISION FACTS IN BRIEF

The demonstration of television from an airplane was the first public test of its kind in history. It was conducted jointly by the Radio Corporation of America, the National Broadcasting Company, United Air Lines and the RCA Manufacturing Company.

The television equipment, the lightest and most compact ever built, was developed by the RCA Laboratories for NBC's television service here. The radio transmitter used in relaying the television images from the plane weighs only 65 pounds and is rated at 6 watts output.

The power plant used in connection with the television apparatus is a newly developed project of D. W. Onan & Sons, Minneapolis, Minn. Designed specifically for aircraft purposes, it is extraordinarily stable in its output, delivering 110 volts, single phase, with a variation of only one cycle. Despite its light weight it is capable of delivering 4,000 watts.

Shock mounts were placed under all the NBC-RCA television equipment in the plane. Apparatus was mounted on the work bench normally set up in the cabin of the Flight Research plane. Sponge rubber sheets and felt padding were used for this purpose.

The "pick-up" used is the "vest-pocket" apparatus recently developed by the RCA Laboratories for NBC's local television service. It consists of a two-camera chain with a lightweight relay transmitter, operating on a wave-length of 104 centimeters (about 1 meter) the shortest yet employed in practical television. The total of ten small units, each mounted in carrying cases about the size of an ordinary suitcase, weigh about 700 pounds.

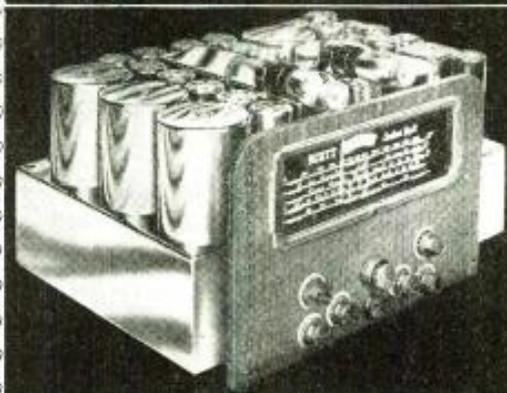
The new iconoscopes used in the cameras, it was explained, are considerably more sensitive than the standard pick-up tubes.

The success of the demonstration was "little short of astounding," according to O. B. Hanson, NBC Chief Engineer.

"Few preliminary tests preceded today's telecast, and we encountered many perplexing technical problems, but despite the haze in the air the image was of amazing clarity most of the time," Hanson pointed out. "It must be remembered that the equipment we were using was not designed for airplane installation. It therefore suffered considerably from vibrations of the plane and its propellers."

for May, 1940

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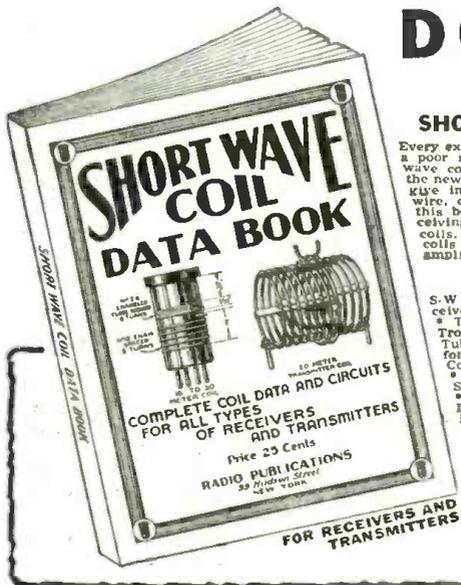
Here in this one big book you will find everything you need in radio . . . sets, parts and supplies . . . public address systems . . . amateur equipment . . . testers and kits . . . your nationally known favorites at lowest possible prices. Write today for this big valuable catalog and save money.

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- CHAPTER III. The Metric System.
- CHAPTER IV. How to Measure Surfaces and Capacity (Geometry).
- CHAPTER V. Powers and Involutions—Roots and Evolutions.
- CHAPTER VI. Mathematics for the Manual and Technical Craftsman—Thermometer conversions—Graphs or Curve Plotting—Logarithms—Use of the Slide Rule.
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Antennas for the Ham

(Continued from page 17)

Since, if the system will be used on several bands, the necessity will arise for parallel tuning on some bands and series tuning on others, it is desirable to have both a series and a parallel condenser in the circuit. When using series tuning, merely have the parallel condenser at its minimum capacity setting, while when using parallel tuning, short out the series condenser. The condenser capacity may well be about 100 to 200 mmf.

For tuning purposes it is desirable to have a current indicator in each feeder. While ammeters are desirable, they are not essential. Quite satisfactory substitutes can be made from flashlight bulbs. These should be shunted with a piece of wire to prevent burn-outs. The length of the shunt will be determined by the power output of the transmitter.

Separation between feeders can be between four and ten inches, depending on the wavelength. About six inches would be a good separation for an all-band antenna. When putting up the feeders, see that they will swing as a unit when the wind starts to blow, and *not with respect to each other!* Light insulating bars placed about every ten feet will be fine.

After the transmitter is tuned-up at the operating frequency, the antenna coupling coil is brought near the output tank coil and either the parallel or series condenser varied, depending on which is necessary, until the current indicators show a maximum current. At this point, the amplifier plate current will rise to a maximum.

Coupling between the amplifier tank coil and antenna coupling coil should be varied to obtain the desired plate current. Incidentally, a difference of approximately 10 per cent in the two feeder currents is allowable; a greater difference is indicative of improper antenna flat-top length for the operating frequency.

Untuned Crystal Oscillator

(Continued from page 17)

circuit signal generator. The limit of oscillation depending entirely upon the efficiency of the crystal and aptitude for vibration and the interelectrode capacities of the oscillator tube. However, practically any commercially available pentode or tetrode will perform satisfactorily on frequencies as high as 30 megacycles.

The glass versions of the 6F6 or 6L6 are to be recommended for high output with moderate plate voltages. Picture then, the crystal oscillator of the smallest dimensions sufficient to accommodate a tube socket, a crystal holder and mounting and three small resistors—the physical dimensions being approximately two inches wide, four inches long and about an inch high. This frequency generator will furnish sufficient R.F. voltage to drive the buffering or final stage to an output of as high as 50 watts. Compensation for impedance change through the coupling medium need not be made, as it has no effect upon the frequency or stability of this form of circuit.

The plate current ratio of the frequency generator when in a state of oscillation, to that when not oscillating, is of the order of one to ten or in other words, about 10 per cent. Naturally, the efficacy and quality of the crystal determines, in a large measure, the current ratio between these two conditions.

The stability of oscillation is of such nature that no frequency change can be detected by the beat method when the degree of coupling to an external load is varied up to the point where the plate current approximates that of the non-oscillating state.

Contrary to conventional design procedure, this oscillator may be directly coupled through the medium of a condenser to a modulated R.F. stage. As stated before, the reflection to the oscillatory circuit will have no tendency to cause erratic operation of the crystal when used in this circuit.

A circuit particularly suited for portable use is shown in figure 4. The *aperiodic* crystal circuit will furnish adequate driver power to allow a suppressor modulated carrier of about eleven watts. The tube complement for highest efficiency comprises an RK25 as crystal oscillator and parallel RK25's as radio frequency amplifiers. A type 76 tube fed from a single-button microphone will satisfactorily operate as modulator. In the event that a double-button microphone is to be used, it is recommended that a type 6A6 or 6C8G be used as a cascade audio amplifier in its stead.

Figure 5 illustrates a cathode series R.F. choke such as recommended by Frank C. Jones for increased output and higher efficiency.

The ham or experimenter will find his time well repaid if this type oscillator is incorporated in his present rig. The problem of broad signals and oscillator instability will be reduced to such a degree as to be negligible in operating considerations.

W2USA Antenna Layout

(Continued from page 9)

all of the Fair structures in harmony. Most aeri-als, even amateurs will agree, are hardly things of beauty. And when you begin to run leads from twelve or fourteen of them, all over a roof, which has a surface nearly as great as the average city block, you can scarcely stand your ground when attempting to convince artists that they really improve the landscape. We must say that much of the work we were permitted to do was made possible only after some of the achievements of our station were becoming known.

Not the least of our delays—and certainly the most embarrassing to all of us of the W2USA Radio Club—was our inability to provide QSL (verification) cards. Several designs were submitted and several of them had all kinds of approval, but it was impossible to find anyone who wanted to foot the bill. The small amount of money we had in our treasury was needed for other things, so day after day and week after week we had to keep saying that our cards, like prosperity and television, were "just around the corner." Such statements were made in good faith.

More than five thousand licensed amateurs, from all parts of the world, signed the "Golden Book", as we affectionately call the register, at W2USA. Every one of them will receive one of our cards. More than that number of contacts were made with other stations, in all parts of the world and every last one of them will receive a card, verifying the contact. Short wave listeners, from nearly every corner of the globe have sent reports to us, concerning the manner in which they have heard transmissions from our various transmitters. They, too, will receive a "Veri". Several thousand cards will have gone into the mail before the issue of RADIO & TELEVISION which carries this story goes into circulation.

In keeping with amateur radio tradition, the design for our card was executed by a young man with amateur radio tendencies. He is Leonard Oehmen. He is the son of Oscar Oehmen, W2KU, and the brother of Stan Oehmen, W2HG. Both front and back, our card is a bit different. Kay Kibling, W2HXQ, Secretary of the W2USA Radio Club, worked out the unique reporting scheme.

Present Facilities

In considering the accompanying sketches, which will give you some idea of the disposition of the various aeri-als, on the roof and the disposition of the equipment in our operating room, it is desirable to remember that the roof of our building is practically flat. In addition, it has been covered with a type of insulating material which has an aluminum outside surface. Therefore, we have, in effect, a tremendous counterpoise. That may account for some of the strange effects which are noticed in connection with some of our work.

Possibly the easiest way to cover the existing services is to begin with the highest and proceed through the lowest frequency we use. We have said that all the original work was done with a five meter transmitter and receiver. The transmitter is the original unit, built prior to the time a series of articles describing its design and construction, appeared in RADIO & TELEVISION, from August to October, 1938*. The same transmitter is still doing active duty on the five meter band for us. Originally, the receiver we used was a home-made version of the "Quartet," built for

us by A. J. Haynes, W2JHV. More recently, we have been using one of Frank Lester's (W2AMJ) "Lestet" High-Frequency Converters, which feeds into a Hammarlund HQ-120 receiver. Excellent results, on five meters have also been secured from the Hallicrafter "510" receiver, since its installation.

The antenna, used for both transmission and reception, on 5 meters—switched by means of a Ward-Leonard, A.C. operated, antenna relay—is one of the first of the double extended Zeps, designed by Frank Lester and made of Premax Corulite elements.

It will be observed, from the accompanying drawings that it is our general practice to use the same antenna for receiving that we use for transmitting, on any particular band. Then, too, we have selected each group of equipment to do a specific job and that equipment is kept in that particular service all the time. In addition to providing suitable facilities for the service, it eliminates the embarrassment of having to draw distinctions and preferences regarding the performance of equipment made by one manufacturer over that of another. Since we do not have competing equipment operating in the same service, that point is one we would rather avoid. There are other places for the securing of information which would influence the choice of equipment. It has been our policy to use the equipment, not to attempt to sell it.

For ten meter operation, we use one of the Thordarson, 100 watt transmitters, which enables us to have our choice of phone or C.W. operation. With it, we have used two or three receivers, but we have always avoided making a change when there would be a possibility of making comparisons. Of course the ten meter band is so erratic that comparison of the performance of any type of receiver and that of another would have to be made instantaneously to mean anything—and, even then, it would mean little—and the only reason for any change was caused by the desire to use some of the equipment for some other purpose.

However, in connection with ten meter operation, it is worth noting, in passing that we have used two aeri-als of exactly the same type, though one has been set up horizontally and the other vertically. Both are Premax W8JK, full-wave beams. The vertical unit is fixed in an easterly and westerly direction and the horizontal unit is rotatable. Both beams are mounted on poles which are the same height above the roof. A switch, at the transmitter, makes it possible to shift from one to the other in a jiffy. Distance getting ability of the fixed vertical is superior to the horizontal rotary, even in the directions which the fixed beam is not supposed to strike. Some confusion of opinion exists with "local" reception, for the reason that most of the local stations are using horizontal aeri-als to pick up our ten meter transmissions and they imagine that the signal from the horizontal beam is better than that from the vertical beam. However, local operators, using vertical ten meter antennas tell us that there is a definite gain in the vertical over the horizontal, when they are directly in the path of both.

For twenty meter operation, we have been using one of the National-Thordarson 600 watt transmitters and a National HRO receiver. Three distinct types of aeri-als have been used. The first one was a Premax vertical "pitchfork" antenna, which, be-

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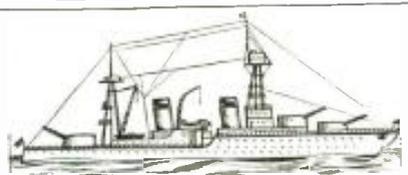
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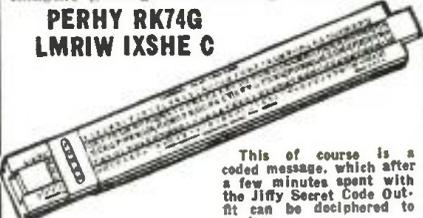
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lieve it or not, was set up, right on the roof of the building, which we have indicated was actually metal covered. We set it up in an easterly and westerly direction; we hardly imagined that we would be heard as well as we were in Australia and South America.

The second antenna we used was the horizontal W8JK rotary, which we now use on ten meters. It is a half-wave job, on twenty. Even when we had it aimed right in the direction of the desired station, the signal was not any better, and as a rule, not as good as the signal from the pitchfork.

Our third twenty meter beam is really something! The first of its kind was used by Frank Carter, W2AZ. Perhaps we were unduly influenced concerning its great capabilities, as we happened to have been in his station, in company with Mr. W. A. Ready, President of the National Company, on the occasion of Frank's making contact with his hundredth foreign country, which made him a full-fledged member of the A.R.R.L. Century Club.

At no small cost to the Fair, we were able to secure a self-supporting, wooden mast, which extends 75 feet above the roof of our building. At the top, we have a "Chinese" copy of Frank Carter's rotary arrangement, except for the fact that ours is motor-driven, from the operating table. When we managed to get our full wave W8JK on top of that, we really had something and we have heard around the world while using it. Like the horizontal W8JK, it is motor-driven, with the control at the operating desk. Some of the accompanying cards indicate the effectiveness of the combination transmitter, receiver and antenna we use on 20 meters.

For forty meter C.W. operation we have a combination which we think is very unique. To begin with, we use a vertical half-wave doublet, fed in the center. The upper half of the doublet is a Premax, self-supporting aluminum radiator, mounted at the outside end of one of the cross-arms atop one of the 24 foot poles, which we have set in various spots about the roof. The lower half of the doublet is made of stranded copper wire. It goes off from the center of the antenna on a bit of an angle, for the reason that the pole which supports the whole works is not high enough to let it go down straight without touching the roof. The slight angle seems to have no effect and the National NT-30 transmitter, which has been in use on that band seems to have won admiration from the boys of the F.T.S. (Forty Traffic System) who have really given it a rather severe workout. It is used in conjunction with a National NC-101XA receiver.

The Hallicrafter transmitter used on 75-meter phone gave a fine account of itself and coupled with a Hallicrafter SX-24 and a 75-meter, half-wave horizontal doublet, we were able to make very satisfactory contacts, even under adverse conditions.

For eighty meter C.W. we used another Thordarson, 100 watt transmitter and a National 101X receiver, coupled to a "V" beam antenna.

On 160 meter phone we had several setups. The 350 watt RCA Transmitter, which we had set up for that position and a companion RCA Receiver were hooked to a half-wave horizontal doublet antenna, which ran pretty near the entire length of the roof, proved its worth, especially in connection with the sending out of our regular weekly QSTs which are sent out on all bands, at 9.45 p.m. Eastern Standard Time (or E.D.S.T. when daylight time is on) each Friday night.

Constructing An Efficient Television Antenna

(Continued from page 10)

operate two television transmitters simultaneously on the same bands, one in Philadelphia and one in New York, a distance of about 80 miles. Theoretically each station has a range of about 30 miles and no interference should result. However in practice, "ghost" signals from the Philadelphia transmitter caused interference with reception at New York of the New York transmitter. Now the two stations divide operating time.

The problems associated with television antennae and the requirements for a satisfactory installation have been well covered in the past.² The essentials may be summarized as follows:

1. Maximum antenna elevation conveniently attained.
2. Antenna location removed as far as possible from sources of automobile or similar interference.
3. Antenna supporting structure to be free from any large metallic members which may cause absorption or reflection.
4. A well designed and constructed di-pole and reflector erected to give maximum reception in the desired direction and to eliminate interference in all other directions. Or, a double di-pole and reflector to extend the pick-up angle of good reception or to increase the signal to noise ratio.
5. Di-pole and reflector elements to be readily adjustable to permit experiments and compensation for differences in wave polarization or direction of arrival other than originally calculated or anticipated.
6. An efficient transmission line or cable between the antenna and the receiver input.

This article is intended principally to give the constructional details of an antenna to meet the above requirements. The system is designed primarily to efficiently cover the present television picture and sound bands of from 44 to 90 megacycles. The double di-pole and reflector is also suitable to use with short wave or all-wave receivers having a doublet input circuit.

The di-pole and reflector elements are made of half hard aluminum pipe and tubing, combining light weight, rigidity and low wind resistance. Iron or steel elements can be used, but to get equivalent rigidity, the sizes must be substantially larger causing an appreciable increase in weight, wind resistance and surfaces to collect ice.

The 24' supporting mast and cross arms are constructed of fir plywood, combining light weight, rigidity and low wind resistance at a low cost.

The required stand-off insulators are machined from a Polystyrene base ultra high frequency insulating material. This material is easily sawn, drilled and tapped by hand tools; it is very strong and not at all brittle. Fortunately this material is practically free of moisture absorption and shows very low loss at ultra high frequencies; the result is unusually efficient and durable outdoor stand-off insulation.

Fig. 1 is a view of the erected assembly and Fig. 2 gives a close up of the element assembly. An accompanying drawing covers the entire assembly and details of the individual parts, also a complete bill of material.

In both the photographs and the drawing, the two di-poles and reflectors are shown parallel to each other, this arrangement providing a good reception angle in the desired direction of about 60°; the area of zero or near-zero pickup extends approximately 180° as shown in the drawing. By having the di-poles off parallel, as required, the good reception angle can be increased and with

a corresponding diminished near-zero pickup area.

Construction of Mast

The 24' mast is self supporting if fastened at the base and at a point about six feet up from the base, for example to the side of a building or roof shed as shown in Fig. 1. Guy wires should be avoided. In absence of a suitable support, a wooden stub tower, about 6' high and with a 6' square base can be made and fastened to the roof.

The mast assembly starts by gluing and nailing one of the 4' uprights (R) to one of the 10' uprights (S) and inserting spacers (Q) at the start and every 6", on centers. These spacers (Q) are also glued and nailed into place, avoiding driving nails into the center hole of the spacers which is reserved for the transmission cable.

With the spacers in place, another 4' upright (R) is glued and nailed into place, opposite to the first 4' section. At this point, the transmission line, or a wire leader, is threaded through the spacer holes and this procedure followed so the transmission cable will be in place when the nailing is completed. The idea of starting with two 4' and two 8' sections is to have the horizontal joints staggered.

The same assembly procedure is followed, now using up the remaining eight 10' uprights. The remaining two 4' uprights fill in at the top of the mast. In reaching the last section, the holes for the two cross arm bolts (F), 13/16" diameter, should be drilled and also an outlet hole for the transmission cable where it leads to the di-pole buses (M).

The strength and rigidity of the mast depends wholly on a first class gluing job. The glue used must be waterproof, preferably a marine glue, applied strictly to the manufacturer's instructions, not too thin and not too thick or lumpy. One inexperienced in gluing wood should first experiment with scrap pieces of wood until the results are right. The uprights are nailed to each other with 1 1/2" wire brads and the spacers are nailed into place with 1" wire brads. Plywood can be nailed fairly close to edges without danger of splitting. The top of the mast (U) is not fastened into place until the very last.

Cross Arms

The two cross arms are of identical construction, each consisting of two sides (A), two tops (B) and two ends (C), all glued and nailed together. A 13/16" hole is required at each end for the bolts (G).

The supports (D) for the di-poles and reflectors are identical. For the reflector end, this support (D) is reinforced by the one piece aluminum pipe piece (K). At the di-pole end, the aluminum pipe (I) is in two pieces and requires the supplementary supporting braces (E), as shown.

Insulators

The stand-off insulating material may be secured in one piece or cut to size. In any event the stand-offs (H) should be cut accurately to size, each 3" long from 1" diameter round rod, and tapped 1/4"—20 for 1 1/4" deep at both ends. While this material can be easily worked with an ordinary hack saw, hand drill and machine tap, the operations must not be at too great a speed or heat generated will gum the tools.

Di-Poles

The four di-pole sections (I) are cut from 1/2" IPSX aluminum pipe which comes

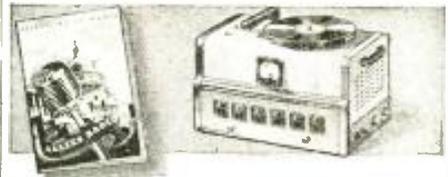


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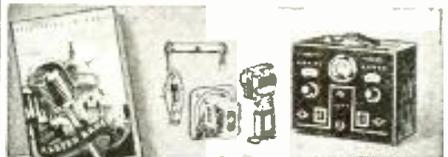
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.840" outside diameter, .622" inside diameter and .109" wall. The four di-pole tips (J) are cut from 5/8" outside diameter aluminum tubing having a .065" wall.

After the sections (I) are drilled as called for in the drawing, one end of each is reamed 5/8" for about 6" deep or more to receive the 5/8" tips (J) in a tight drive fit. After driving the tips into place, they are sawn off at the ends for the exact dimensions specified in the drawing. In machining aluminum, sawing, drilling and tapping, kerosene is the proper lubricant. A plug (O) is inserted in each tip; plugs (P) are inserted in (I).

Reflectors

The reflectors are assembled essentially the same as the di-poles, first drilling out the sections (K) as shown in the drawing and adding the four tips (L) and the plugs (O).

Final Assembly

The stand-off insulators (H) can now be fastened into place on the supports (D) and (DE), and the di-poles and reflectors fastened into place, using the bolts and washers (N).

The cross arms are then slipped over the top of the mast and fastened into place with the bolts (F), taking care not to damage the transmission cable during this operation.

The supports, together with the di-poles and reflectors are now ready to assemble on the cross arm ends, using the bolts (G).

The two buses (M) are placed into position, (M) and (I) being held to the insulator with the same bolt. The transmission line is connected to the buses by the screws (T).

The top of the mast (U) can now be placed into position.

The aluminum elements, bolt heads, transmission line connections and caps are all painted with a good weatherproof insulating varnish.

The entire assembly is so light, it can be erected by two men, one holding the base and the other "walking" the mast up similar to raising a long ladder. However, there is danger if the mast becomes unbalanced during this operation and it is well to have an extra man or two available until the base is fastened.

Where there is any question about the exact direction of arrival of the desired signals, or if the desired waves arrive other than horizontally polarized, experiments can be conducted with the assembly mounted on

a short stub mast, only a few feet high, above the roof. The bolts (F) and (G) must be well tightened in the final assembly.

References.

1. "Transatlantic Television?," De Witt R. Goddard. SHORT WAVE & TELEVISION, February, 1938.
 2. "What About That Television Antenna?," An interview with O. B. Hanson, RADIO & TELEVISION, May, 1939.
- "Practical Television by RCA," booklet published by RCA Manufacturing Company, Camden, N. J.

Bill of Material

Item	Quantity	Name	Description
A	4	Cross Arm Sides	5 Ply Fir Plywood 32 1/2" x 3" x 7/8"
B	4	Cross Arm Top	5 Ply Fir Plywood 13" x 3" x 7/8"
C	4	Cross Arm Ends	5 Ply Fir Plywood 2 1/4" x 3" x 7/8"
D	4	Supports	5 Ply Fir Plywood 36" x 3" x 7/8"
E	2	Braces	5 Ply Fir Plywood 32" x 3" x 1/2" (To Pattern)
F	2	Steel Bolts	6" long x 3/8" diam., with nuts and washers.
G	4	Steel Bolts	3" long x 1/8" diam., with nuts and washers.
H	16	Stand-offs	1" diameter (round) x 3" long, Amphenol 91211
I	4	Di-Pole Section	3S Half Hard Alcoa 1/2" IPSX Aluminum Pipe 30" long.
J	4	Di-Pole Tips	2S Half Hard Alcoa Aluminum Tube 5/8" O.D. x .655" wall x 39" long.
K	2	Reflector Section	3S Half Hard Alcoa 1/2" IPSX Aluminum Pipe 61" long.
L	4	Reflector Tips	2S Half Hard Alcoa Aluminum Tube 5/8" O.D. x .655" wall x 45" long.
M	2	Bus Connectors	2S Half Hard Alcoa Aluminum Tube 5/8" O.D. x .655" wall x 24 1/2" long.
N	32	Steel Bolts	2" long x 1/4"—20, with washers and lock washers.
O	8	Plug Buttons,	for 1/2" hole, Cinch #50652
P	4	Plug Buttons,	for 5/8" hole, Cinch #50809
Q	49	Spacers,	2" x 1" x 7/8", 5 Ply Fir Plywood (To Pattern)
R	4	Uprights,	4' x 2 1/2" x 1/2", 5 Ply Fir Plywood
S	10	Uprights,	8' x 2 1/2" x 1/2", 5 Ply Fir Plywood
T	2	Rh. Hd. Brass Screws,	#10-32 x 1/2" long
U	1	Mast Top,	3" x 3" x 1/2", 5 Ply Fir Plywood

- 1 Pint Weatherproof Insulating Varnish—for metal
1 pound 1 1/2" Brads
1/2 pound 1" Brads
1/4 pound Waterproof Glue
1 Quart Weatherproof Black Paint
Transmission line or cable as required.

Note: Fir plywood can be secured plain or weatherproof. When ordinary plywood is used, it must be protected from the weather thoroughly by a coat of paint followed by a coat of marine varnish. When weatherproof plywood is used, the exterior surfaces should still be protected by at least one coat of Outdoor paint, or varnish.

BOOK REVIEWS

PRINCIPLES OF TELEVISION ENGINEERING, by Donald H. Fink. Contains 542 pages 6 1/2 x 9 1/4 inches, profusely illustrated. Published by McGraw-Hill Book Company, New York.

For those who wish to design or even enter the serious study of television circuits, "Television Engineering" by Donald G. Fink is virtually an essential. (Mr. Fink is well known as Managing Editor of **ELECTRONICS** and author of **ENGINEERING ELECTRONICS**.)

The book is divided into 10 chapters, in addition to which there are an appendix and an index. The chapters treat on television methods and equipment, image analysis, fundamentals of television camera pickup action, formation, deflection and synchronization of scanning beams, and video signal, video amplification, carrier transmission of video signals, image reproduction, television broadcasting practice, and television receiver practice. The appendix covers such subjects as television transmission standards, recommends practice on polarization and intermediate frequencies, receiver and transmitter definitions, and names of controls of television receivers. All Mr. Fink's explanations are made clear through the use of numerous photographs, diagrams and graphs.

While the book is not one for the novice, it will give the more advanced radio man and serious student an extremely thorough knowledge of this newest of sciences.

MANUAL OF RADIO SERVICING contains 28 pages illustrated, published by Supreme Publications of Chicago.

M. N. Beitman, consulting engineer and prolific author, has compiled a new book of radio servicing shortcuts and money-making ideas. The book, though not too elementary, is written in simple language which anyone can understand. Nevertheless it gives the radio man many bits of useful information which he would be unlikely to get elsewhere. In addition to recommending some methods of servicing, it explains various ways of making sales to bring added profits.

THE SERVICE MANUAL OF WIRING DIAGRAMS contains 224 pages, size 8 1/2 x 11, and is published by Supreme Publications of Chicago.

The wiring diagrams of the 427 "most serviced" radios are included in this large and attractively formulated volume. According to the author, 4 out of 5 diagrams which the average serviceman will need are in this book, which covers the period from 1926 to date. In order that the serviceman may find the diagram he seeks with the least possible delay, an index arranged according to manufacturers' name and model number of set occupies the last few pages of the book.

The volume is bound in a flexible cover so that it may be rolled up and stowed away in the test instrument or tool kit as well as kept on the reference shelves. The diagrams are large enough to be easily read, and values of parts are given on the great majority of them.

R. & T. '40 Communications Receiver

(Continued from page 15)

positioned together, patently used in a 6 circuit band-pass grouping between the hidden first I-F tube and the second I-F 7A7. These three were used experimentally, and the extra item simply happened to be in place at the time of the photographing. It should be assumed that four circuits in this particular grouping will be sufficient.

The chassis illustration also shows that holes were drilled for the placement of a transformer ahead of the crystal filter. Band-pass ahead of the filter was, upon experiment, found unsuitable in this design and the transformer was therefore removed.

Beat Frequency Oscillator

The *beat oscillator* unit, like the crystal filter, is a factory made and wired assembly, again simplifying construction and assuring us of adequate isolation. Note how the beat note (adjustable from the panel) is fed not in the usual manner into the second detector circuit but into the cathode circuit of the second I-F. Check carefully on the cathode by-pass value at this point. Note that it is *not* so large a capacity value that the beat signal is by-passed to ground.

Tube Line-up: The overall tube complement features 7A7s in RF, Mixer, and I-F stages, 7A4s in RF Oscillator, AF Voltage Amplifier, and AF Driver positions, 7C5s in the push-pull output stage, and nonoctals in other placements as discussed previously. The 7A7s, incidentally, are self-shielded and highly efficient, both as RF-IF amplifiers and (when the HF local oscillator signal is fed into the suppressor grid) in converter application.

The overall layout has been divided into three separate and matched units: the receiver proper, with its slate grey aluminum panel and black cabinet; the 8" P.M. speaker in its slate grey, chrome trimmed housing; and the similarly prettied-up power supply. Here at last is a setup which the Ex YL surely won't object to your having in the living room—if there isn't space elsewhere for the array.

Controls Simplified

As for controls—the number has been brought down to a practical minimum, providing just the right amount of receiver flexibility. First we have the dial itself, which has been selected, first—because of its powerful, positive drive on the extended three-gang tuning condenser; second—because its use permits accurate re-logging against calibrated tuning curves, made permanent by a high order of HF oscillator stability. Then we have the self-knobbed dial plates for Phasing, CW Osc. beat note adjustment, RF Gain adjustment, and AF Gain adjustment. Pointer knobs include a large one, directly below the dial for oscillator band-switching, and four smaller ones (left to right) for BFO on-off, AVC on-off, noise limiter control, and antenna load compensation or positive RF alignment. A jack is provided for headphone output and a miniature flood light for easy dial reading. Finally we have an insulated terminal wired to the AVC line and featured so that an external signal level meter may be conveniently added to the line-up. The use of this terminal will be explained later.

Construction—Point by Point

1. Acquire all of the listed parts, without substitution. This receiver may have been built up on a kitchen table to simulate the tough working conditions under which the

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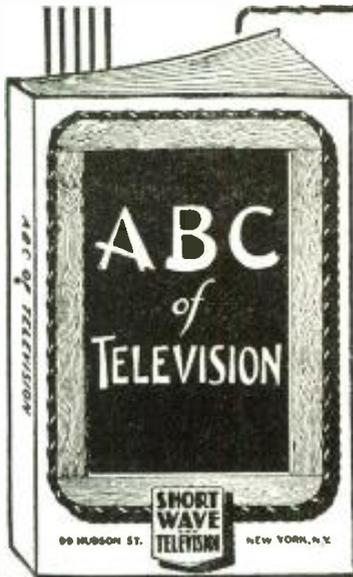
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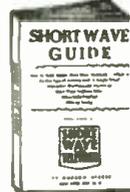
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CHAPTER 5—How a television station looks and how the various parts are operated

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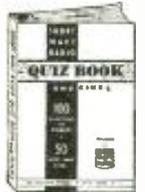


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average builder must operate—but it is the realization, nevertheless, of a functionally engineered circuit and layout. If you can't afford the extra transformers for I-F bandpass, or if you plan on CW reception largely or wish to listen to short-wave broadcasters and preserve as much audio fidelity as possible under the limitations set up by two normal I-F stages, simply disregard L10, L12, Cx, and Cz, and figure to use L11 and L13 in regular plate-to-grid coupling application. If you're interested in only one or two short wave bands or can't afford the whole complement of plug-in coils, simply acquire coils enough for your immediate purposes. One of the nice things about a plug-in coil design is that you can add new bands as the pocketbook permits or as circumstances require.

2. Drill the front panel to layout specifications given. Generally, it's best to use aluminum as a panel material due to the ease with which it is worked. Disregard holes for the card frames if you don't care for posted calibration curves. (We haven't gotten around to making our own curves yet.)

Laying Out Parts

3. We have not furnished layout data for the chassis, simply because the basic arrangement of parts is on the whole conventional while the exact placement of components will depend to considerable extent upon whether or not you desire to feature the bandpass. The immediate thing to do here, in any event, is to temporarily assemble the panel and chassis together with the specified supports. (Holes are provided in the sides of the chassis for support mounting.) Then mark through front-panel holes for the centering of associated holes in the chassis front drop. Install the coil cans on the panel and discover how far back on the chassis these go, then arrange for

the positioning of RF and Mixer tube sockets immediately behind these cans, as shown. Place the dial on the panel, gang the three tuning condensers together with the insulated couplings, insert the shaft in the dial hub, and noting condenser height above chassis for perfect alignment, estimate the correct dimensions for a metal shield supporting the condenser gang between RF and Mixer sections and for a bakelite or other insulating support between Mixer and HF oscillator sections. Place an insulating coupling on the crystal filter shaft, extend this shaft for front-of-panel control, and note where the unit must be placed on the chassis. Similarly, note where the BFO unit at the opposite end of the chassis must be positioned. (Its shaft will not have to be extended or insulated.)

4. Disassemble panel and chassis and drill holes for front panel controls, the tube sockets, the various transformers associated with your I-F system, whether bandpass or no, and power and speaker plug receptacles. Drill holes for the five oscillator fixed tank condensers, so that when these items are in position, they will line up below chassis with just enough clearance from the back of the chassis to permit I-F and second detector wiring. Now shorten the shafts of the individual tuning condensers in the three unit gang until the overall gang (with Mixer and Oscillator section shafts insulated from each other, remember) would clear the fixed oscillator tanks were these tanks above chassis rather than below. Drill holes for the gang condenser supports (spade lug or angle bend mounting) and for leads through chassis from RF and Mixer section stators. Oscillator section stator and insulated rotor, and RF coil can assemblies. Make these holes large enough for the insertion of National midget Victor feed-through insulators.

Mounting Oscillator Condensers and Band-Switch

5. Mount the five oscillator tank condensers in position, with the additional tank C16 bridged across the 160 meter shielded condenser C15. Check the Meissner oscillator coils for correct termination (see diagram), then mount these in line on the individual tanks, soldering coil grid terminals directly to condenser stator terminals, connecting ground returns together as shown, then B plus terminals together at the ends of the coils nearest the chassis. Incidentally, the little alignaire trimmers on these coils should have been removed. We will need them for series bandspread service.

Parts List

- IRC**
 R1—2,000 ohm ½ watt RF screen series, type B
 R2—1,000 ohm ½ watt RF plate series, type B
 R3—300 ohm ½ watt RF cathode bias limiter, type B
 R4—400 ohm ½ watt Mixer cathode bias set, type B
 R5—50,000 ohm ½ watt HF osc. grid leak, type B
 R6—5,000 ohm 10 watt Drop to VR-150-30, type ABA
 R7—100,000 ohm ½ watt I-F AVC series, type B
 R8—12,000 ohm pot. RF gain control, type CSMP
 R9—1,000 ohm ½ watt Mixer plate series, type B
 R10—100,000 ohm ½ watt I-F screen drop, type B
 R11—1,000 ohm ½ watt I-F plate series, type B
 R12—300 ohm ½ watt I-F cathode limiter, type B
 R13—100,000 ohm ½ watt I-F AVC series, type B
 R14—1,000 ohm ½ watt I-F plate series, type B
 R15—100,000 ohm ½ watt I-F screen drop, type B
 R16—One meg. ½ watt AVC series, type B
 R17—100,000 ohm ½ watt Det-load resistor, type B
 R18—600 ohm ½ watt I-F (2) cathode, type B
 R19—100,000 ohm ½ watt BFO plate series, type B
 R20—7,500 ohm ½ watt BFO bleeder, type B
 R21—50,000 ohm ½ watt noise diode load, type B
 R22—250,000 ohm ½ watt noise diode grid, type B
 R23—10,000 ohm pot. noise diode control, type B W-10,000
 R24—500,000 ohm pot. AF gain control
 R25—50,000 ohm ½ watt AF (1) plate resist., type B

- R26—1,000 ohm 1/2 watt AF (1) cathode, type B
- R27—10,000 ohm 1/2 watt AF (1) plate series, type B
- R28—30,000 ohm 1/2 watt AF (2) cathode, type B
- R29—2,000 ohm 1/2 watt AF (2) cathode, type B
- R30—500,000 ohm 1/2 watt AF (2) grid, type B
- R31—200 ohm 3 watt AF (3) cathode
- R32—10,000 ohm 10 watt power bleeder, type ABA

NATIONAL COMPANY

- C1, C2, C3—50 mmf each ganged RF tuning—3 single units, type SE-50
- C11, C12, C13, C14, C15—HFO tanks, type W-100
- Optional card holders, type B (3x4)
- Dial, type N—scale 4
- C—(ant. trimmer) SSS-20, 20 M.M. F.D.
- Cx, C2, I-F, bandpass couplers, type M-30 trimmers
- Term (A) Ant. term, type FWG
- Dial plates HFO type, one marked CW osc., one marked "phasing", one marked Audio gain, and one marked RF gain.

RCA

- VR-150-30 Voltage Regulator tube

MEISSNER

- C16 35 to 120 mmf HFO (160 meter) tank paddler, type 22-7028
- C17, C18, C19, C20—HFO series bandspread trimmers removed from L5, L6, etc.
- SW1, SW2, SW3, 3 wafers, 5 position, 3 circuit, (HFO band switching) 24-9203 (one wafer unused)
- Nrad filter unit, type 9-1005
- HFO unit 456 KC, type 9143
- L10, L11, L12 and L13, 456 Kc I-Fs each, type 16-6645
- L5, L6, L7, L8, HF, osc. inductance, types 14-1020, 10-1021, 14-7994, 14-7938 and 14-7938, note: two of type 14-7938

CORNELL-DUBILIER

- C4—.05 (400 V) RF screen by-pass DT-4S5
- C5—.05 mfd (400 V) RF cathode by-pass DT-4S5
- C6—.05 mfd (600 V) RF plate by-pass, DT-6S5
- C7—.05 mfd (400 V) Mix-screen by-pass, DT-4S5
- C8—.05 mfd (400 V) Mix-cathode DT-4S5
- C9—0001 HFO grid cond. 5W-5Q1
- C10—.05 (400 V) osc. plate by-pass DT-4S5
- C21—.1 mfd 600 V Mixer plate by-pass type DT-6P1
- C22—.1 mfd 600 V I-F plate by-pass, DT-6P1
- C23—.1 mfd 400 V I-F screen by-pass DT-4P1
- C24—.05 mfd I-F AVC by-pass DT-4S5
- C25—.1 mfd 400 V I-F cathode by-pass DT-4P1
- C26—.05 mfd I-F AVC by-pass DT-4S5
- C27—.01 400 V I-F cathode by-pass DT-4S1
- C28—.1 400 V I-F screen by-pass DT-4P1
- C29—.1 600 V I-F plate by-pass DT-6P1
- C30—.05 AVC by-pass DT-4S5
- C31—.1 mfd noise comp. DT-4P1
- C32—.00025 det. by-pass, 5W 5Q25
- C33—.05 600 V AF comp. DT-6S5
- C34—.05 400 V AF coupler, DT-4S5
- C35—.05 600 V AF coupler, DT-6S5
- C36—.10 mfd electrolytic (cathode by-pass) BR-102
- C37—.25 600 V AF by-pass SM-6P-25
- C38—.10 mfd cathode by-pass elec. BR-102
- C39—.25 60 V B by-pass SM6P-25
- C40—.25 600 V AF comp. SM6P-25
- C41—.25 600 V B by-pass Type SM-6P-25
- C42—.10 mfd cathode by-pass type BR-102
- C43, C44, C45 each 16 mf filter electrolytics type KR-516, 4 required
- C46—electrolytic by-pass (filter) type BR-845
- C47, C48 each .05 600 V type DT-6S5

C-H (Cutler-Hammer)

- SW5—BFO "on-off" switch toggle or rotary
- SW6—power "on-off" toggle

YAXLEY

- H—phone jack, type 702A, two circuit
- Dial-lite, type 330
- SW4—AVC "on-off" switch, type 720

AMPHENOL

- Term (B) AVC bus connector type PF, single-circuit



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				Series	Par	Mfg. Fit	W	D	H		
T-11M74	\$ 5.40	40	100	80	160	30	4	4 1/2	4 1/2	7 1/2	
T-11M75	7.50	75	145	145	290	34	4	4 1/2	4 1/2	9	
T-11M76	11.70	125	210	160	320	34	4 1/2	4 1/2	4 1/2	10	
T-11M77	16.00	300	290	290	580	34	6	7 1/2	7 1/2	20	
T-11M78	21.30	500	350	350	640	34	7	8 1/2	7 1/2	21	

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- Term (E) power output, 4-prong socket
- L1, L2, L3, L4 (see text)
- RF sockets—loctals, low loss type
- Other sockets, 7 loctals, 3 octals, retainer ring mounted

STANCOR

- TR1 Audio Input, type A-73-C
- TR2 Power, type P-5059
- CH1 Input filter choke, type C1646
- CH2 Smoothing filter choke, type C-C1003

PARMETAL

- Rec. chassis No. 15215
- Brackets SB 713
- Rec. panel G-3680
- Rec. cabinet SC-1210
- Speaker cabinet SC-1270
- Power supply chassis DF 717

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- Speaker 8" P.M. type

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- Knobs

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- Tubes:
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 - 1 7A7 MIX
 - 1 7A4 HF Osc.
 - 2 7A7 I-F
 - 1 7A6 Det.
 - 2 7A4 AF
 - 2 7C5 AF
 - 1 6C5 BFO
 - 1 5V4-G Rect.

(Part II will appear next month)

PERFECTED COMMUNICATIONS RECEIVER COIL DATA (Cont.) (FIG. 5)

Band	L1 Ant. Pri.	L2 Ant. Sec.	L3 RF Pri.	L4 RF Sec.
10 meter	21T #26 D.C.C. Closewound	41T #18 bare-tinned 1" long	21T #26 D.C.C. Closewound	41T #8 bare-tinned 1" long
20 meter	4T #26 D.C.C. Closewound	10T #20 bare-tinned 1 1/4" long	4T #26 D.C.C. Closewound	10T #20 bare-tinned 1 1/4" long
40 meter	6T #26 D.C.C. Closewound	20T #22 1 1/4" long	5T #26 D.C.C. Closewound	20T #22 1 1/4" long
80 meter	8T #26 D.C.C. Closewound	40T #24 D.C.C. 1 1/4" long	7T #26 D.C.C. Closewound	40T #24 D.C.C. 1 1/4" long
160 meter	10T #26 D.C.C. Closewound	86T #26 enameled Closewound	8T #26 D.C.C. Closewound	86T #26 enameled Closewound

Use small trimmers in coil forms to pad coils to high frequency limits of above amateur bands. Secure all coil windings with National Vetricron liquid coil dope. For general coverage tap C1 and C2 stator leads down only a very few turns on L2 and L4. For ham bandspread tap down farther toward ground end. All tapping should be experimentally tried for perfect tracking of Ant. and RF circuits with O-c. tuning.

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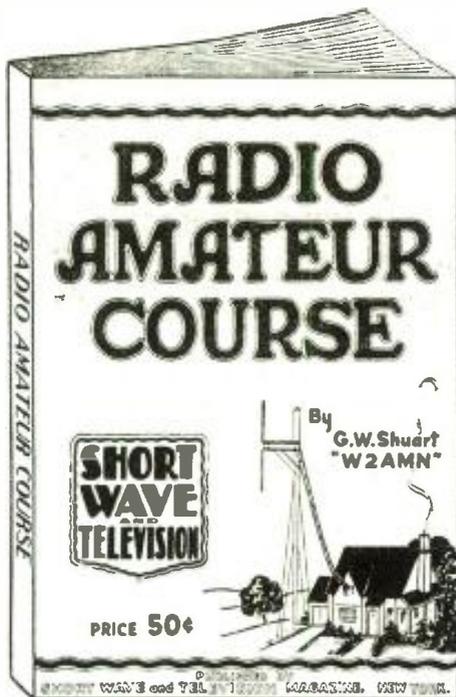
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Television Signal Booster

(Continued from page 12)

no picture signal was receivable and brought in a full strength picture perfectly sharp and steady. At this location some television sound was heard without the pre-amplifier. The receiver under consideration was a Du Mont 183X. The band pass characteristic proved ample to bring the picture through without any loss of the fine details which are carried by the higher modulation frequencies. The sound channel was also amplified.

FEATURES: There is full equipment for two channels built in and provisions are made for at least one more channel—an additional one might be squeezed in (making four). The two channels now built in are used for W2XBS 45.25 mc. picture, 49.75 mc. sound; and W2XAB 51.25 mc. picture, 55.75 mc. sound. A self-contained power-pack is built in. A gain control is provided for each of the two R.F. amplifier stages to permit optimum adjustment of each without the feed-back problems introduced by using the same potentiometer for both stages. A band-change switch changes from one channel to the other at one flip. The outfit is in very presentable form and reasonably compact so that it will not be an eyesore if it must be installed outside the cabinet and yet will quite probably fit inside it.

CHOICE OF CIRCUIT: The circuit published together with this description of the signal booster is the result of a good deal of experimental work. It is the simplest possible circuit which was found to work well. The design of a signal frequency amplifier is a big headache to any television engineer—he would much rather design any other part of the circuit. It is a big headache because it is very likely—after all the math. has been juggled—and after all the careful planning has been completed—that very little advantage will be found to accrue from the use of an R.F. stage. For this reason most television receivers on the market today do NOT HAVE ANY R.F. AMPLIFICATION. The author carefully considered circuits using tuned links (three tuned circuits at each tuned position), circuits using tuned coupled circuits, and others. Many were tried. Some can be made to give slightly more gain than the one described, under ideal conditions, but are so exceedingly troublesome to line up properly, that they are entirely out of the class of equipment which can be made in the average service shop or "home laboratory." The actual advantage of these "fancier" circuits over the one finally chosen were found to be mostly "on paper." The circuit used is very stable and will not oscillate at full gain if the described parts placement is adhered to.

DESCRIPTION OF CIRCUIT: The television di-pole antenna is fed down through the usual type of transmission line. In locations requiring use of the signal booster it is desirable to use relatively good line—concentric, co-axial, etc. It will be noted that the two ends of the transmission line are connected to taps on the grid coil of the 1st stage. See diagram for details of this coil marked L₁. It was found after extensive testing that this was the least troublesome way to match the line impedance into the amplifier input. Several other methods work well—but this was found equally good—and much simpler to adjust—as a matter of fact, if you make the coil just as specified no adjustments are required. If you are of an experimental bent, however, juggling the lower tap—nearest ground—will permit exact matching. It is necessary to adjust C₁ and C₂ every time the tap is moved a frac-



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tion of a turn. The first stage uses tuned grid, tuned plate. The second is coupled by a .005 mfd. condenser to the first. The second uses tuned plate. It will be noted that single tuned circuits are used. A ganged switch switches from C_{11} , C_3 , C_7 to C_{13} , C_{15} , C_{14} for switching from channel No. 1 to channel No. 2. The output link to the television receiver again must match the impedance of the usual transmission line (about 72 ohms) because the input of a standard television receiver is designed to work from an antenna line. This is accomplished by connecting a piece of transmission line (twisted pair may be used) at one end, to the television set at the other end; the two wires are connected to the plate side of the last plate tuning inductance L_3 as indicated. Many arrangements were tried here without success—this is the only one that worked at all well. Since L_3 has B-plus on it, blocking condensers C_{16} and C_{17} were necessary.

ADJUSTING THE SIGNAL BOOSTER: It is desirable to adjust the signal booster in a location where the signal strength is sufficient to operate a television receiver without the booster. Final trimming of the first and last trimmer may then be made "on location" to match up as best can be done.

Connect the antenna transmission line to the INPUT terminals; the television receiver to the OUTPUT terminals. Turn on both the "telly" set and the signal booster. Adjust the paddlers while observing the transmitted "Test Pattern" on the screen of the telly set. It will be necessary to bring the gain or contrast control down on the telly set as the adjustment proceeds. The adjustment should be made with the gain controls on the signal booster both set about $\frac{3}{4}$ of the way up. Adjustment of the booster padding condensers until the picture is the strongest or most contrasty will be correct. It will be noted that the television sound gets stronger at the same time.

PRECAUTIONS TO BE OBSERVED IN CONSTRUCTION: To one familiar with construction of ultra short wave receiving equipment no special difficulties will present themselves. To those familiar with ordinary radio receiver construction, a few words of advice will not be amiss. The author does not advise anyone without previous radio construction experience to tackle the construction of any piece of television equipment unless he is willing to devote the time necessary to master the many problems encountered. The latter group may find it necessary to re-build the booster after having completed preliminary experiments.

The distributed constants of the wiring and equipment assume primary importance in ultra high frequency work. A wire is not only a lead, but also a condenser, an inductance and a resistance. The proximity of the various parts introduces into the circuit unexpected capacitances and inductances. Bearing these facts in mind, avoid paralleling any R.F. wiring and keep a reasonable amount of space between parts without unduly lengthening the wiring. Remember that small changes in wiring location often require changing the number of turns on the tuning coils. The number of turns should be adjusted in such a manner that the NBC channel (45.25 mc. and 49.75 mc.) comes in with the paddler condenser almost all the way in. CBS (51.25 mc. and 55.75 mc.) will then come in at about the half-way position, leaving room for a third set of paddlers for a third channel.

The specified band-switch has to be extended to get the required spacing of 2 inches between switches. This is an easy job for the experimenter. Trimming is best accomplished using the special screw-driver

specified in the parts list to reduce the effect of body capacitance.

The author will be very glad to hear from builders of this booster and to give them any reasonable amount of advice should they encounter problems. Address him care RADIO & TELEVISION Magazine. Enclose a self-addressed stamped envelope.

The author wishes to acknowledge the able assistance rendered by Andy Tait in the actual assembly of the booster.

Parts List 2 Stage Pre-Amplifier

- I.R.C.**
 1—10,000 ohms, type D11A, 25 W. R13
 2—10,000 ohms BT-1, R5, R11
 2—160 ohms BT-1 $\frac{1}{2}$, R2, R8
 3—3,500 ohms, BT-1 $\frac{1}{2}$, R1, R4, R10
 2—60,000 ohms BT-1, R6, R14
 1—250,000 ohms BT-1 $\frac{1}{2}$, R7
 2—10,000 ohms Pot. type CS, R3, R9
 1—40,000 ohms type AB, 10 W., R12
- AMERICAN PHENOLIC CORP.**
 2—Super MIP sockets No. 54-8
 1—4-prong socket, MIP-4T
- INSULINE CORP. OF AMERICA**
 1—8x12x3 amp. chassis (black crackle) No. 3873
 1—Amp. chassis cover for same, same number
 1—Bottom plate for same, No. 4062
- CORNISH WIRE CO.**
 2—25 foot coil—Brailite radic hookup wire
- BUD MFG. CO.**
 1—Power switch type 1003, SW1
- RCA RADIOTRON**
 2—Type 1852, V1, V2
 1—Type 83-V, V3
- HAMMARLUND MFG. CO.**
 6—25 mmf. air pad condensers, type APC-25, C1, C15, C3, C13, C7, C14
- KENYON TRANSFORMER CO., INC.**
 1—Type R200 power transformer T1
- THORDARSON ELEC. MFG. CO.**
 1—40 ma. choke, type T13C27, L4
- CORNELL-DUBILIER CORP.**
 1—8-8 mf. type EB8800—C11, C12
 6—.01 mf. type 1W—C2, C4, C5, C8, C9, C10
 3—.005 mf. type 1W, 5D5, C6
- AMERICAN RADIO HARDWARE CO., INC.**
 1—No. 2370 low capacity alignment screw-driver
 1—Pkg. No. 14 round bus-bar
 1—No. 1504 terminal strip
 1—No. 1505 terminal strip
 2—No. 5220 Archo terminal lug strips
 2—No. 5320 Archo terminal lug strips
 2—No. 5420 Archo terminal lug strips
- P. R. MALLORY & CO. INC. (YAXLEY)**
 1—3-section, 3-circuit, 6-position band switch, type 1336-L, SW-2
- COIL DATA**
 L1—5 turns No. 14 copper wire on $\frac{1}{2}$ " Dia.
 L2—6 turns No. 14 copper wire on $\frac{1}{2}$ " Dia.
 L3—6 turns No. 14 copper wire on $\frac{1}{2}$ " Dia.
 All turns spaced equal to diameter of wire

Let's Listen In with Joe Miller

(Continued from page 22)

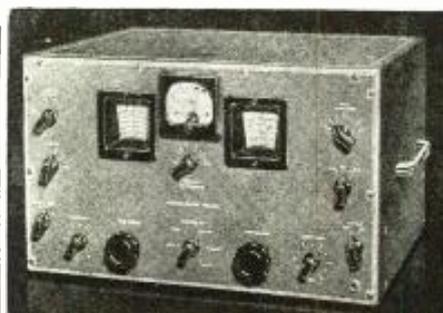
YUGOSLAVIA

YUE, 11.735 mc., Belgrade, is testing lately from 9:05-10 p.m. which is probably to ascertain the advisability of programs to No. America at this time. For this frequency, we are certain YUE will be well heard this Spring, and up to Fall, provided it is not QRM'd. YUC, 9.505 mc., continues to be a good bet from 8-9 p.m. and 12:43-2 a.m. but XEWW is too close on the 8-9 p.m. sked. For full listings see Jan. 1940 article.

CHINA

NGOX, 15.19 mc., Szechwan, has altered skeds to No. America to 8:30-9:30 and 10-11:05 p.m. This station should be very well heard all Spring and Summer. NGOY, 9.65 mc., now operates 9-9:40 a.m. for No. America. Reports on these Chinese broadcasters may be sent to Mr. Ying Ong, 1001 E. Roosevelt Ave., Phoenix, Arizona, who will relay them for confirmation. Thank you. Mr. Ong, for kindly keeping us informed of the Chinese station skeds. A new station XGSE, 9.84 mc., is being heard daily at 7 a.m. onward, but not giving any clue as to location.

We'd like to get reports from all of the boys, and will try to do a Ham Stardust column if we've sufficient material, so it's up to you! Will you help? Good hunting to all! VY73—Joe Miller.



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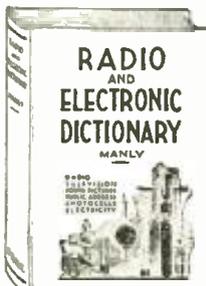
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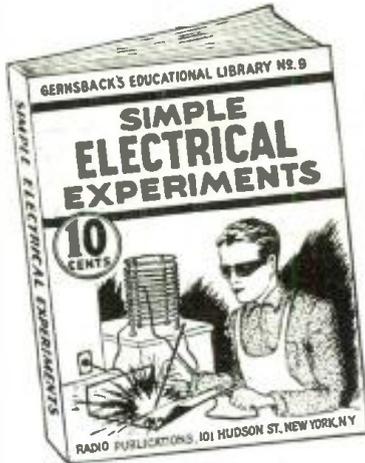
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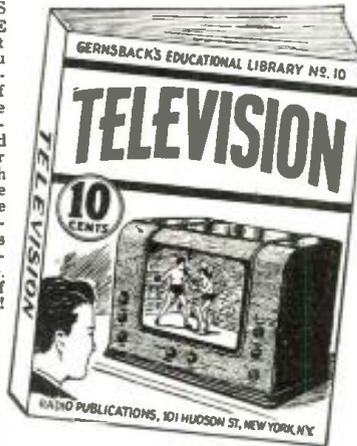
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10-Meter Mobile Rig

(Continued from page 16)

switch for "push-to-talk" operation. This means that a two-way conversation may be carried on just about as readily as though it were duplex. The single button on the mike operates the entire installation; this includes "killing" the receiver and transferring the antenna, so that feed-back is eliminated completely.

The last article—Part 3—on this equipment will describe actual construction of the transmitter as well as tune-up procedure.

List of Parts

TRIPLET

1—100 ma. meter, rear illuminated, #227 A

I. R. C.

- 1—500 ohm 1 W. carbon resistor, R1, Type BT1
- 2—25,000 ohm 1 W. carbon resistor, R2, Type BT1
- 1—15,000 ohm 1 W. carbon resistor, R3, Type BT1
- 2—100 ohm ½ W. carbon resistor, R4, Type BT½
- 1—5000 ohm ½ W. carbon resistor, R5, Type BT½
- 1—25 meg. ½ W. carbon resistor, R6, Type BT½
- 1—5 meg. variable resistor, R7, Type 13-133
- 1—350 ohm 10 W. wire wound Resistor, R8, Type AB

CORNELL-DUBILIER

- 2—.003 mf. mica condensers, 500 V., C1 (1W-5D3)
- 3—.003 mf. mica condensers, 1200 V., C2 (4-22030)
- 4—10 mf. 25 V. electrolytic condensers, C5 (BR-102A)
- 1—4 mf. 450 V. electrolytic condenser, C6 (BR445)
- 2—100 mmf. mica condensers, C7 (3L-5T1)

BUD

- 1—80 mmf. variable condenser, C3 (No. MC904)
- 1—35 mmf. variable condenser, C4 (MC897)
- 1—10 meter inductance L2 (OEL10)
- 1—closed circuit jack (J1325)
- 1—three circuit jack (J1326)
- 1—DPDT toggle switch, SW3 (SW1120)
- 3—SPST toggle switches, SW1, 2, 4 (SW1115)
- 4—feed-through insulators (I-335)
- 1—Shielded plug (FP284)

BLILEY

- 2—10 meter crystals with holders (type HF2)

PAR-METAL

- 1—Amplifier type case (DF717)
- 1—Bottom plate (BP4515)

CROWE

- 2—dials with knobs (294)
- 2—knobs (6146)
- 1—pilot light (6115)

HYTRON

- 1—HY60, V2
- 1—6J5GTX, V1

SYLVANIA

- 1—6C5, V3
- 1—6L6, V4

U. T. C.

- 1—microphone transformer, #S6, T1
- 1—output transformer, #S18, T2
- 1—filament transformer, #FT2, T3

GUARDIAN

- 1—Antenna relay #A100, RY1
- 1—SPDT relay #A100C, RY1
- 1—DPST relay #115E2, RY3

CARTER

- 1—350 V., 150 ma. generator, #355A, with filter

AMPHENOL

- 1—8 prong steatite socket (RSS8)
- 4—5 prong steatite socket, (RSS5)
- 3—3 prong bakelite socket, (M1P3)
- 2—8 prong plugs (PM8)
- 1—shell for socket (61-61)
- 1—two prong polarized plug (61MP)
- 1—single contact cha-sis socket (30C)
- 2—single contact plug- (89M)
- 1—Receptacle (61-F4)

P. R. MALLORY

- 1—Battery charger #5535-A

SHURE

- 1—Hand carbon microphone (Model 15B)

WARD PRODUCTS

- 1—Transceiver style antenna (#114)

MISCELLANEOUS

- 2—2.5 MH R.F. chokes (Miller #4537)
- Cable
- Battery

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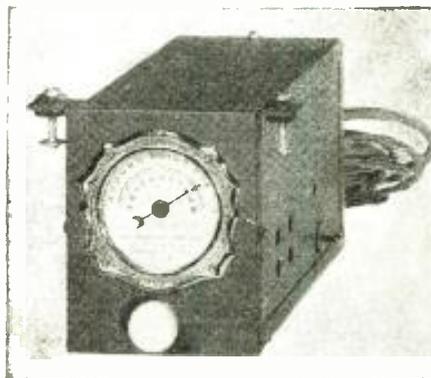
Address

City State

New Radio Apparatus

New 11-Tube 2-Band Superhet

• ALLIED RADIO CORPORATION is offering a new Knight de Luxe 11-tube console model Superhet which includes such outstanding features as: Television connection; A.V.C.; 7 watts output; 6 pushbuttons for tuning, 3 for tone control.



New Wireless Transcaster

• RADIO fans now have a new product to experiment with and one that offers many opportunities for combining pleasure and profit. The New Wireless Transcaster recently placed on the market by H. G. Cim, Chief Engineer of the Allied Engineering Institute.

The device makes an ideal phono oscillator for use in connection with the popular electric phonographs. It is possible for the clever radio fan to build his own phonograph by obtaining a suitable governed motor, a turntable and a magnetic or crystal pickup.

The Transcaster modernizes home broadcasting, for it permits one to talk into a microphone while concealed in another room and have his voice come out of the radio to surprise his friends. Only two connections are required between microphone or phonograph pick-up and the device.

The units are all self-powered and operate from any house-lighting circuit either A.C. or D.C.

Lafayette Spring Catalog

• RADIO WIRE TELEVISION INC. (formerly Wholesale Radio Service Co., Inc.) announces the publication of the Spring edition of its 1940 catalog. Comprising 124 pages, this new catalog includes a comprehensive listing of the new line of Lafayette radios and radio-phonograph combinations, featuring for the first time the new Radiocorder. It is a highly practical home recorder.

The new catalog also contains the first listing of the complete new line of Public Address equipment featuring several innovations in circuit design as well as new cabinet styling. In addition the Spring edition lists more than 64 pages of equipment, parts and tools for the servicemen and more than 10 pages of interest to the "ham," experimenter and television enthusiast. Copy free.

New Allied Radio Catalog

• THE new 172-page Spring-Summer catalog of Allied Radio Corporation contains complete listings of all the latest radio equipment. Each radio field is arranged in individual sections for speedy reference.

The 32-page Radio Set section introduces sixty new Knight models, including a wide choice of portables, farm radios, consoles, table models, phono radios, automatic record changers, "Camera" type portables with new miniature tubes, Recorder-Radio combinations, and a large selection of phono and recording accessories.

The 36-page Public Address section includes 18 new complete systems, ranging from 7 to 75 watts, for Electrionearing, Orchestras, Churches, Schools. The Ham Section features the latest receivers.

A copy of this catalog can be obtained by writing to Service Department, RADIO & TELEVISION, 99 Hudson Street, New York City. Ask for Cat. No. 115A.

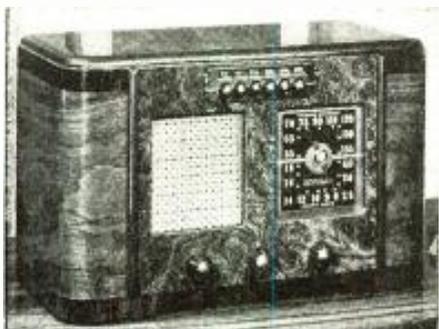


Six New Table Radios

• SIX new table models are announced by RCA Victor, three of which are included in the "Nipper" line, rounding out this division to a total of 14 A.C.-D.C. models.

Two of the new Nippers are equipped with a brand new feature, the Roto-Base, a turntable on which the entire set is mounted. This innovation allows the set to be turned in any convenient direction, obtains the maximum signal strength from the Magic Loop Antenna and provides easier tuning.

All the new Nippers have the full "C" band for foreign reception with both American and foreign bands operating from a loop. Other features include a new super-sensitive permanent-magnet loud speaker. Some are equipped with pushbuttons.



At the same time, RCA Victor announces a new model wireless record player capable of playing records through any radio without connection. It is equipped with constant-speed motor, feather-touch crystal pick-up, modulation type volume control, pilot light and streamlined tone arm. In addition five handsomely styled consoles, including two automatic RCA Victrolas in the medium-price range and three low-priced radios, have been announced.

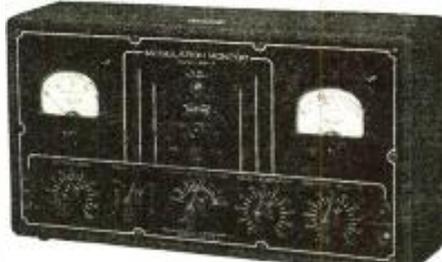
New Filmgraph

• THE new Filmgraph now records 40 tracks across the width of the 16mm film, which means that one can now record 160 minutes for only 60 cents or 8 minutes for 3 cents.

Short Wave Converter

• THE photo, top next column, shows new short-wave converter for use with an automobile radio receiver. It employs an improved circuit, giving greater band coverage and the illuminated dial is calibrated in megacycles. Short-wave reception in an automobile is made possible by using this converter in conjunction with any regular auto radio receiver. Two metal tubes are employed, one providing the R.F. amplification of the short wave signal, while the other supplies the signal which may be picked up by the regular radio receiver at a frequency of 600 to 700 kilocycles. The model 500A covers 1600 to 6000 kc. and the model 600A covers 5800 to 18,500 kc. ABC Radio Labs.

YEARS AHEAD TRIPLITT 1941 Model 1696-A MODULATION MONITOR



You've solved your problem of getting maximum efficiency from your transmitter when you invest in a Model 1696-A Modulation Monitor. Plug it into your AC line—make simple coupling to the transmitter output and the monitor shows:

• Carrier Reference Level • Per Cent of Modulation • Instantaneous Neon Flasher (no inertia) indicates when per cent of modulation has exceeded your predetermined setting. Setting can be from 40 to 120 per cent. Helps comply with FCC regulations. Has two RED*DOT Lifetime Guaranteed Triplitt instruments. Modernistic metal case, 14 1/2" x 7 1/2" x 4 1/2", with black suede electro enamel finish. . . . Black and white panel.

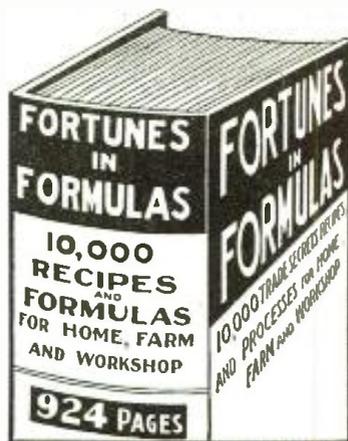
Model 1696-A . . . Dealer Net Price . . . \$34.84

Also available as a rack panel mounting unit.

FOR MORE INFORMATION
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The greatest and most important formula book by print. It contains over 10,000 secrets, recipes, formulas and processes for home, farm and workshop.

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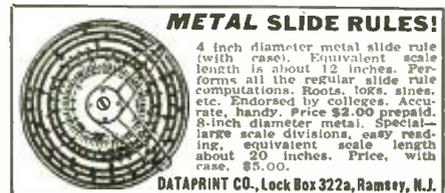
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4 inch diameter metal slide rule (with case). Equivalent scale length is about 12 inches. Performs all the regular slide rule computations. Roots, logs, sines, etc. Endorsed by colleges. Accurate, handy. Price \$2.00 prepaid. 8-inch diameter metal. Special—large scale divisions, easy reading, equivalent scale length about 20 inches. Price, with case, \$5.00.

DATAPRINT CO., Lock Box 322a, Ramsey, N.J.

SUPER BARGAINS

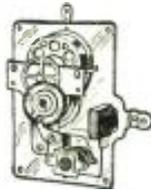
Short Wave Station List

(Continued from page 26)

Practically all of the attractive items listed here are brand new, others are reconditioned like new; but ALL are in PERFECT WORKING ORDER. In many cases, the parts alone total more than the price we are asking. 100% satisfaction guaranteed or your money refunded. ORDER FROM THIS PAGE. Use the convenient coupon below. Include sufficient extra remittance for parcel post charges, else order shipped express, collect. Any excess will be refunded. C.O.D. shipments require 20% deposit. If full remittance accompanies order, deduct 2% discount. Send money order, certified check, new U. S. stamps. No C.O.D. to foreign countries.

ORDER TODAY LIMITED QUANTITIES PROMPT SHIPMENTS ASSURED

24-HOUR ELECTRIC CLOCK MOVEMENT



Made originally by the famous Waterbury Clock Company as part of an automatic defrosting timer for electric refrigerator. Has a powerful synchronous self-starting motor and complete clock movement. The handy experimenter can attach a calibrated dial and single pointer in order to make an accurate electric clock. If taken apart, its gears may be used for many experimental purposes and, in themselves, are worth more than the cost of the entire unit. The overall. Shp. Wt. 2 lbs.

clock may be used only on the 110-220 volt 60 cycle A.C. line. One lubrication lasts practically a lifetime. Shp. Wt. 3 lbs.
ITEM NO. 75
YOUR PRICE **\$9.50**

SUPER SPECIAL

3 1/2 R.P.M. SYNCHRONOUS MOTOR

There are 101 uses for a synchronous motor making only 3 1/2 revolutions per minute. Ideal for crowd-catching store-window displays, agitating film-developing tanks, as an electric winch on model motor boats, as derrier motor in erector sets, etc. Built in high-ratio step-down gears provide amazing amount of power. Made by Hayden Mfg. Co. of Waterbury. 2" in diameter x 2 1/4" x 1" thick overall. Shp. Wt. 2 lbs.



ITEM NO. 76
YOUR PRICE **\$1.95**

A.C. "SQUIRREL CAGE" SYNCHRON. MOTOR



Self-starting shaded pole motor designed for radio chassis for Push Button Tuning. High speed powerful. One lubrication lasts lifetime. Excellent for model railroad trains, small boats, humidifier water pumps, etc. 3/4" long shaft, 3/16" diameter. Complete with brass mounting posts, 2 1/4" x 1" x 2 1/4" overall. For 110 volts, 60 cycles. A.C. only. Shp. Wt. 4 lbs.

ITEM NO. 77
YOUR PRICE **\$1.35**

MECHANICAL FLASHLIGHT

This battery-less flashlight generates its own power merely by pressing handle. Gives strong light whenever needed. Costs nothing to maintain. Amazing new miniature dynamo operates flashlight. Pocket size, 4 3/4" x 2 1/2" x 1". Shp. Wt. 2 lbs.



ITEM NO. 88
YOUR PRICE **\$2.25**

MOTOR FOR ROTATING RADIO BEAM ANTENNA

One Revolution Per Minute



Built by Honeywell as a temperature regulator for coal fired furnaces but ideal for many other uses, especially for rotating beam antennas on the roof for directional beaming and reception of radio signals. Built-in commutator switching permits turning antenna from north-south to east-west direction from remote point. Constructed for hard usage. Has double-end shafts geared down to about one revolution per minute. Ideal for window displays and other slow-moving mechanical motions. 110 volts, 60 cycles. A.C. only. 6 1/2" x 6 1/2" x 4 1/2". Shp. Wt. 10 lbs.

ITEM NO. 82
YOUR PRICE **\$5.95**

AMAZING BLACK LIGHT!

Powerful 300-Watt Ultra-Violet Bulb



The best and most practical source of ultra-violet light for general experimental and entertainment use. Makes all fluorescent substances brilliantly luminescent. No transformers of any kind needed. Fits any standard lamp socket. Made with special filter glass permitting only ultra-violet rays to come through. Brings out beautiful opalescent hues in various types of materials. Swell for amateur parties, plays, etc. to obtain unique lighting effects. Bulb only. Size of bulb. Shp. Wt. 1 lb.

ITEM NO. 87
YOUR PRICE **\$2.00**

SUPER MAGNET

LIFTS MORE THAN 20 TIMES ITS OWN WEIGHT

LITTLE GIANT MAGNET. Lifts 5 lbs. easily. Weighs 1 oz. Made of ALNIOO new high-magnetic steel. Complete with keeper. World's most powerful magnet ever made. The experimenter and hobbyist will find hundreds of excellent uses for this high quality permanent magnet. Measures 1 1/4" x 1 1/4". Shp. Wt. 3/4 lbs.



ITEM NO. 86
YOUR PRICE **\$1.00**

EXTRA BARGAINS

IMMERSION TYPE WATER HEATER. 110 VOLTS A.C. or D.C. Excellent for aquariums, etc. Shp. Wt. 3/4 lb.

ITEM NO. 83
YOUR PRICE **\$3.50**

6-VOLT A.C. MOTOR. Fine for door chimes, model electric trains, erector sets, etc. Shp. Wt. 3 lbs.

ITEM NO. 84
YOUR PRICE **\$1.95**

G.E. INDUCTION DISC MOTOR FOR RECORDING PLAYBACK AND DISPLAY PURPOSES



Substantially constructed by General Electric, this ball-bearing motor is a high-quality phonograph unit. Its power and smooth running make excellent home recording work. Its speed, governor-controlled, is variable both below and above 78 r.p.m. For 110 volts, 60 cycles, A.C. Solid iron turntable and shaft, 7/8" diameter x 5/8" high. Shp. Wt. 14 lbs. Packed in Original Box.

ITEM NO. 81
YOUR PRICE **\$3.95**

SEWING MACHINE MOTOR

For electrifying foot-treadle sewing machines and replacing burned-out motors on electrified machines. Powerful and high-speed; numerous other uses. Ideal as handy grinder-polisher motor. Small, compact, flat on two sides, requiring a minimum of space. Speed controllable by foot-pedal rheostat (available optionally for \$3.75). Its 3/4" diam. shaft is available with or without pulley (pulley 15c extra). Completely enclosed and dirt proof. Measures 3 3/4" x 5" x 2" overall. Shp. Wt. 7 lbs.



ITEM NO. 79
YOUR PRICE (motor only) **\$3.75**

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I have circled below the numbers of the items I'm ordering. My full remittance of \$..... (include shipping charges) is enclosed.

OR my deposit of \$..... is enclosed (20% required), ship order C.O.D. for balance. (New U. S. stamps, check or money order accepted.)

Circle Item No. wanted: 75, 76, 77, 79, 81, 82, 83, 84, 86, 87, 88

Name Address

City State

Send remittance by check, stamps or money order; register letter if you send cash or stamps.

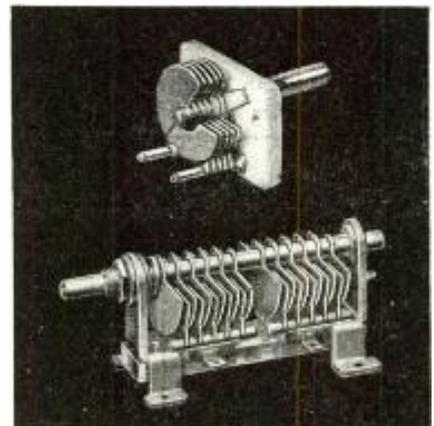
- Mc. Call
- 9.680 XEQQ MEXICO, D.F., MEXICO, 30.99 m. 5 pm.-1 am.
- 9.680 TPC23 PARIS, FRANCE, 30.99 m. "Paris Mondial" 6-7.45 pm. 8 pm.-12.30 am. to N.A. News, 8, 11.30 pm., 12.30 am. Irregular.
- 9.680 VLQ SYDNEY, AUSTRALIA, 30.99 m. Addr. Dept. of Inform. 2-4, 6.30-7, 7-8 to N.A. 8.15-8.45, 10.30-11.30 am. to N.A.
- 9.675 — SAIGON, INDO-CHINA, 31.01 m., Addr. 17, Place A. Foray. "Radio Boy-Landry," 7.30-9.45 am. Irreg.
- 9.675 DJX VIENNA, GERMANY, 31.01 m., Addr. (DJD, 11.77 mc.) 10.40 am.-4.25 pm. to Africa.
- 9.670 WRCA BOUND BROOK, N. J., 31.03 m., Addr. NBC, N. Y. C. 4 pm.-1 am.
- 9.665 2R09 ROME, ITALY, 31.04 m. 1-6.30, 7.30-9 pm.
- 9.660 LRX BUENOS AIRES, ARG., 31.06 m., Addr. El Mundo. Relays LRI, 5.30-6.45 am., 10.15 am.-11 pm.
- 9.660 HVJ VATICAN CITY, 31.06 m. Sun. 5-5.30 am., 8.30-9.45 pm.; Thurs. 8.30-9.45 pm.
- 9.650 WCBX NEW YORK CITY, 31.09 m. (See 21.570 mc. for addr.) 10.30-11.30 pm. to Latin Amer.
- 9.650 I2AA ADDIS ABABA, ETHIOPIA, 31.09 m., 3.30-5.30 am. Sun. 2.30-5.30 am. 8 am.-2.30 pm.
- 9.650 DJV BERLIN, GERMANY, 31.09 m. Irreg. 4.50 pm.-1 am. for 5.A.
- 9.650 CR7BE LOURENCO MARQUES, MOZAMBIQUE, 31.09 m. Addr. P. O. Box 594. 7-8 am. to N. A. 2-4 pm. to Europe.
- 9.645 LLH OSLO, NORWAY, 31.10 m. Daily to 4.30 pm.
- 9.645 XGOY SZECHWAN, CHINA, 31.10 m. Test 1-3, 8-9.30 am.
- 9.645 JLT2 TOKYO, JAPAN, 31.10 m.
- 9.645 VLV2 PERTH, W. AUST., 31.10 m., 6-11 am.
- 9.640 CXAB COLONIA, URUGUAY, 31.12 m., Addr. Belgreno 1841, Buenos Aires, Argentina. Relays LR3, Buenos Aires 5 am.-10.45 pm. Sat. to 1 am.
- 9.635 KZRH MANILA, PHILIPPINES, 31.14 m. 4-11 am. News 7.30 and 8.45.
- 9.630 2R03 ROME, ITALY, 31.15 m., Addr. E.I.A.R. via Montello 5. 1-2 am. 12.07-2.35, 4.15-4.45 pm., 6-9 pm. to N. A. News at 4.15, 7.30 pm.
- 9.630 JFO TAIHOKU, TAIWAN, 31.15 m. Relays JFAK. 4-10.30 am.
- 9.630 HJCT BOGOTA, COLOMBIA, 31.15 m. 6-11 pm.
- 9.625 CXAB MONTEVIDEO, URUGUAY, 31.17 m. 10.30 am.-12.30, 3.30-9.30 pm.
- 9.625 HAD BUDAPEST, HUNGARY, 31.17 m. 6-9 pm. to N. A.
- 9.620 TIPG SAN JOSE, COSTA RICA, 31.19 m. 7-9.30 am., 12-2, 6-11.30 pm.
- 9.615 ZRL KLIPPEVEL, SOUTH AFRICA, 31.21 m., Addr. P. O. Box 4559, Johannesburg. Daily, exc. Sat. 11.45 pm. 2.50 am. Daily exc. Sun. 3.20-7.20, 9-11.45 am., Sun. 3.30-4.30 or 4-5, 5.30-7, 9-11.45 am.
- 9.610 LLG OSLO, NORWAY, 31.22 m., 3-6, 8-9, 11 pm.-mid.
- 9.610 DXB BERLIN, GERMANY, 31.22 m. 11-4.50 pm., 7 pm.-1 am. to N. A. News at 4.15, 6, 8.15 10.30 pm., 12 mid.
- 9.607 HP5J PANAMA CITY, PANAMA, 31.23 m., Addr. Apartado 867. 7-8 am., 12 n. to 1.30 pm., 6.30-10.30 pm.
- 9.600 RAN MOSCOW, U.S.S.R., 31.25 m. 3-7, 7-8.30 pm. to N. A. 8.30-9 pm. in French. News at 7 pm.
- 9.600 CB960 SANTIAGO, CHILE, 31.25 m., 8-11.30 pm.
- 9.595 EIRE MOYDRUM, ATHLONE, EIRE, 31.27 m. Radio Eireann. 12.30-4.30, 5-6 pm.
- 9.595 H8L GENEVA, SWITZERLAND, 31.27 m., Addr. Radio Nations, Irregular.
- 9.590 VUD2 DELHI, INDIA, 31.28 m. Addr. All India Radio, 6.30 am.-12.05 pm. 5 pm.-12 m., Mon., Tues., 1-4.10 am. Wed. 2-4 am. Thurs., Fri., Sat. 1-3.30 am. Sat. 5 pm.-3.30 am.

Mc. Call
9.590 WCAB PHILADELPHIA, PA., 31.28 m. (Addr. See 21.52 mc.) Mon., Thurs. & Sat. 6.30 pm.-2 am., Wed. 9 pm.-2 am.
9.590 PCJ HUIZEN, HOLLAND, 31.28 m., Addr. N. V. Philips' Radio Hilversum. Sun. 1.40-3, 7.15-8.15, 8.25-9.50 pm.; Tues. 1.45-3.30, 7.30-8.30, 8.45-9.45 pm.; Wed. 7.15-8.15, 8.25-8.40 pm. to N. A.
9.590 VK2ME SYDNEY, AUSTRALIA, 31.28 m., Addr. Amalgamated Wireless of Australasia, Ltd., 47 York St., Sundays only, 12 m.-2 am., 5-8.30 am. Irregular.
9.587 VLQ5 SYDNEY, AUSTRALIA, 31.29 m. 7-8 am. to N. A.
9.580 GSC DAVENTRY, ENGLAND, 31.32 m., Addr. B. B. C., Portland Pl., London, W. 1. 12.57-1.45, 11.52 am.-3.30; 3.50-6 pm., to Africa; 6.24-9.15, 9.37 pm.-12.30 am. to N.A. News 3.50, 4.45, 6.30, 7.30, 9.45 and 11 pm.
9.580 VLR MELBOURNE, AUSTRALIA, 31.32 m., Addr. Box 1686, G. P. O. 2.30-9, 9.30 am.
9.570 YUM2 MADRAS, INDIA, 31.35 m. All India Radio. 9-10.30 pm., 2.30-4 am.
9.570 CXA2 MONTEVIDEO, URUGUAY, 31.35 m. 11 am.-4, 4.30-9.30 pm.
9.670 KZRM MANILA, P. I., 31.35 m., Addr. Erlanger & Gelsing, Box 283, Wkdays. 4.30-6 pm. m. tof. 5-9 am., Sat. 5-10 am., Sun. 4-10 am.
9.670 WBOS BOSTON, MASS., 31.35 m., Addr. Westinghouse Electric & Mfg. Co. 6-9 am. Rel. CBS 3 pm.-1 am.
9.560 XGAP PEKING, CHINA, 31.38 m. Addr. S. Yoshimura, Dir. Peking Central Sta., Hsi-chan-an-chieh, Peking. 4-9 am.
9.560 DJA BERLIN, GERMANY, 31.38 m., Addr. Broadcasting House, 9 am.-10.50 pm. Also early am. prog.
9.560 XEFA MONTERREY, MEXICO, 31.38 m. 10 am.-Midnite.
9.556 OAX4T LIMA, PERU, 31.39 m., 7-8, 11.30 am.-1.30 pm.
9.550 TPB11 PARIS, FRANCE, 31.41 m. Addr. (See 15.245 mc.) 11.15 am.-7 pm., 9.30 pm.-mid. Irreg.
9.550 HVJ VATICAN CITY, 31.41 m., Sun. 5-5.30 am., 8.30-9.45 pm. Wed. 2.30-3 pm. Thur. 8.30-9.45 pm.
9.650 VUB2 BOMBAY, INDIA, 31.41 m., Addr. All India Radio. 9.30-11.30 pm., 2-4 am. (Sat. 1-3.30 am.); Sat. 9.30 pm.-4 am., Sun. 5-6 am. also.
9.550 WGEA SCHENECTADY, N. Y., 31.41 m., General Electric Co., 6.15-9.15 pm. to So. Amer.
9.550 OLR3A PRAGUE, BOHEMIA, 31.41 m. (See 11.840 mc.) Irreg. 4.40-5.10 pm.
9.550 XEFT VERA CRUZ, MEX., 31.41 m. 7.30 pm.-Mid.
9.550 YDB SOERABAJA, JAVA, 31.41 m., Addr. N.I.R.O.M. Daily exc. Sat. 6-9 pm., 10.30 pm.-2 am.-4.30-10.30 am. Sat. 7 pm.-2 am.
9.540 DJN BERLIN, GERMANY, 31.45 m., Addr. (See 9.560 mc.) 12.05-2.30, 9.30-11 am., 4.55-10.50 pm. to So. Amer.
9.638 VPD2 SUVA, FIJI ISLANDS, 31.46 m., Addr. Amalgamated Wireless of Australasia, Ltd. 5.30-7 am., exc. Sun.
9.535 SCU MOTALA, SWEDEN, 31.46 m. 4.35-5.05 pm. 8-9 pm to N.A. News 8 pm.
9.535 HEC SCHWARZENBURG, SWITZ. 31.46 m. Mon. Wed. 8.45-10.15 pm.
9.535 JZI TOKYO, JAPAN, 31.46 m. 7-9.30 am.
9.530 KGE1 SAN FRANCISCO, CAL., 31.48 m., Addr. Gen. Elec. Co. 12-3, 7 am.-12 n. to Asia.
9.530 WGEO SCHENECTADY, N. Y., 31.48 m., Addr. General Electric Co. 3-6 pm. to Europe, 6-11.45 pm. to S. A.
9.528 VUC2 CALCUTTA, INDIA, 31.48 m. Addr. All India Radio, 10-11 pm., 12 m.-1 am., 2-4 am. Sat. 10 pm.-2 am.
9.525 ZBW3 HONGKONG, CHINA, 31.49 m., Addr. P. O. Box 200, 5-10 am., 11.30 pm.-1.15 am. Sun. 5-9.30 am.
9.525 OQ2AA LEOPOLDVILLE, BELGIAN CONGO, 31.49 m. 5.25-7 am.
9.525 LKC JELOY, NORWAY, 31.49 m., 4.30-10.30 am., Sun. 2.30-10.30 am.

Mc. Call
9.523 ZRG ROBERTS HEIGHTS, S. AFRICA, 31.5 m., Addr. (See ZRK, 9.606 mc.) Daily 5.15-9, 11 am.-noon. Sun. 6-9, 10.40 am.-1.30 pm.
9.520 OZF SKAMLEBAK, DENMARK, 31.51 m., Addr. Statsradiofonien, Heibergsgade 7, Copenhagen, 8-11 pm. to N.A.
9.520 TPC PARIS, FRANCE, 31.50 m., 4.30-7.45 pm. to S. A. 8 pm.-1.45 am. to N. A. and Hawaii.
9.520 RV96 MOSCOW, U.S.S.R., 31.51 m., 1-6 pm. (English 3-3.30, 4.30-5 pm.)
9.517 XEDQ GUADALAJARA, GAL., MEXICO, 31.52 m., N.-4.30 pm., 7 pm.-midnight.
9.510 FIOA TANANARIVE, MADAGASCAR, 31.55 m. Addr. Le Directeur des PTT, Radio Tananarive, Administration PTT. 12.30-12.45, 10-11 am., 2.30-4 am.
9.510 GSB DAVENTRY, ENGLAND, 31.55 m., Addr. (See 9.580 mc.—GSC) 12.57-3.15 am., 3.50-6; 6.24-9.15, 9.37 pm.-12.30 am.

End of Broadcast Band
9.510 HS8PJ BANGKOK, THAI, 31.55 m. Daily Ex. Mon. 7-10 am.
9.510 — HANOI, FRENCH INDO-CHINA, 31.55 m. "Radio Hanoi", Addr. Radio Club de L'Indochine. 12 m.-2 am., 6-10 am., 15 watts.
9.505 YUC-YUD BELGRADE, YUGOSLAVIA, 31.57 m. 12.43-2, 11.20 am.-4.20 pm., 8-9 pm. News 4 pm.
9.503 XEWW MEXICO CITY, MEX., 31.57 m. Addr. Apart. 2516. Relays XEW. 7:45 am.-12.30 am.
9.501 PRF5 RIO DE JANEIRO, BRAZIL, 31.58 m., 4.45-5.55 pm. Ex. Sun.
9.500 OFD LAHTI, FINLAND, 31.58 m., Addr. Finnish Brct. Co., Helsinki. 12.15-5 pm.
9.492 KZIB MANILA, PHIL. ISL. 31.60 m. 5.30-10 am. and 6-11 pm. News 7.30 am.
9.475 VONG ST. JOHNS, NEWF'D, 31.67 m. 8.30 am.-1.30 pm. 4.30-9.30 pm. News 1 p.m. Irreg.
9.445 TAP ANKARA, TURKEY, 31.70 m. Daily 10.30 am.-4.30 pm.
9.445 HCODA GUAYAQUIL, ECUADOR, 31.77 m., 8.15-10.15 pm., exc. Sun.
9.440 COCH HAVANA, CUBA, 31.78 m., Addr. 2 B St., Vedado. 6.40 am.-mid.
9.400 OAX5C ICA, PERU, 31.91 m., Radio Universal, 7-11.30 pm.
9.375 COBC HAVANA, CUBA, 32.00 m. 7 am. to 12 mid. Sun. 7 am.-10.30 pm.
9.345 HBL GENEVA, SWITZERLAND, 32.11 m., Addr. Radio Nations. Mon., Wed., 8.45-10.15 pm.
9.340 OAX4J LIMA, PERU, 32.12 m., Addr. Box 1166, "Radio Universal." 12 n.-3 pm., 5 pm.-12 mid.
9.295 HI2G CIUDAD TRUJILLO, D. R., 32.28 m. 6.40-8.40 am., 11.40 am.-2.10 pm., 3.40-4.40 pm.
9.280 LYR KAUNAS, LITHUANIA, 32.33 m. Daily Operating Irr.
9.234 — BUCHAREST, ROUMANIA, 32.54 m. 12.02-7 pm.
9.230 COCY HAVANA, CUBA, 32.50 m. G. No. 509 Vedado. 12 noon-12 midnite.
9.225 COCY HAVANA, CUBA, 32.52 m. 8 am.-12 mid. Sun. 8 am.-10 pm.
9.205 PYA2 RIO DE JANEIRO, BRAZIL, 32.59 m. 5-6 pm.
9.200 — SOFIA, BULGARIA, 32.61 m. App. 1.45 am. Sun. 8.15 am.
9.200 ZMEF SUNDAY ISLAND, 32.61 m., Conts. ZIL5, N.Z. 1.45-2.15 am. Irreg.
9.200 COCX HAVANA, CUBA, 32.61 m. Addr. San Miguel 194, Alto. Relays CMBX 8 am.-12 m.
9.190 HC2ET GUAYAQUIL, ECUADOR, 32.64 m. 8-10 pm. Sun. 8.30-10.30 pm.
9.175 HCIGQ QUITO, ECUADOR, 32.70 m., Mon. Wed., Sat. 9-10.30 pm.
9.130 HC2CW GUAYAQUIL, ECUADOR, 32.86 m., 11 am.-1, 7-11 pm.
9.125 HAT4 BUDAPEST, HUNGARY, 32.88 m., Addr. "Radiolabor," Gyalyut, 22. Daily 7-8.30 pm. Sat. 6-7.30 pm.
9.030 COBZ HAVANA, CUBA, 33.22 m., Radio Salas Addr. P. O. Box 866. 7.45 am.-12 mid. Sun. 7.45 am.-1 am. Relays CMBZ.
9.860 COKG SANTIAGO, CUBA, 33.48 m. Addr. Box 137. 5-9.50 pm.
9.860 TPZ2 ALGIERS, ALGERIA, 33.48 m. Tues. 12.30-1.30 pm.

(Continued on following page)



Designed for Application

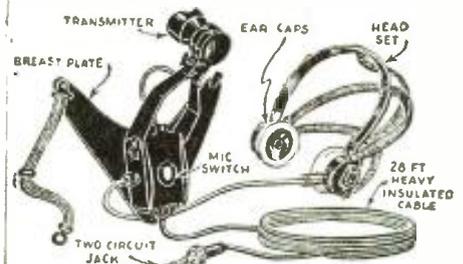
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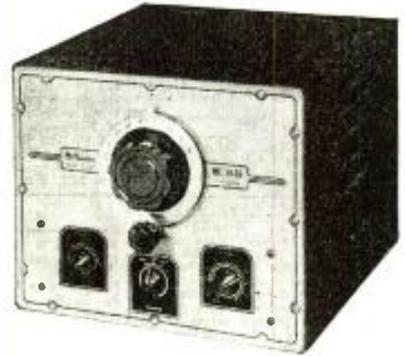
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Mc. Call
 7.100 FOBAA PAPEETE, TAHITI, 42.25 m., Addr. Radio Club Oceanier, Tues. and Fri. 11 pm.-12 mid.
 7.088 PIJ DORDRECHT, HOLLAND, 42.3 m., Addr. Dr. M. Hellingman, Technical College. Sat. 11.10-11.50 am.
 7.010 XPSA KWEIYANG, CHINA, 42.80 m. 5.30, or 6-11 am. 5-6 pm. Irregular.
 6.977 XBA TACUBAYA, D. F., MEX., 43 m. 9.30 am.-1 pm., 7-8.30 pm.
 6.960 ZZB WELLINGTON, N. Z., 43.10 m., Mid.-7 am.
 6.900 HI6H TRUJILLO CITY, D. R., 43.48 m., 7.40-8.40 pm.
 6.850 XOJD HANKOW, CHINA, 43.80 m. 6-8.35 am.
 6.847 YNOP MANAGUA, NICARAGUA, 43.82 m., 8-9.30 pm.; Sun. 2-3 pm.
 6.810 HIH SAN PEDRO DE MACORIS, DOM. REP., 44.05 m., 7-9.40 pm. Sun. 5.20-6.40 pm.
 6.800 PZH PARAMARIBO, SURINAM, S.A. 44.12 m. Addr. P. O. Box 18. Sun. 8.40-10.40 am. Tues. & Fri. 5.40-8.40 pm. 1st & 3rd Thurs. monthly 6.40-8.40 pm.
 6.760 HI7P CIUDAD TRUJILLO, DOM. REP., 44.38 m., Addr. Emisoría Diaria de Comercio, 7.10-8.40 pm. Sun. 9.40-10.40 pm.
 6.760 YNRF MANAGUA, NICARAGUA, 44.38 m., 6.40-10.40 pm.
 6.730 HI3C LA ROMANA, DOM. REP., 44.58 m., Addr. "La Voz de la Feria." 4.55-8 pm.
 6.720 PMH BANDOENG, JAVA, 44.64 m. Relays N.I.R.O.M. programs, 4.30-11 or 11.30 am. Also Sat. 8.30 pm.-1.30 am.
 6.695 TIEP SAN JOSE, COSTA RICA, 44.81 m., Addr. Apartado 257, La Voz del Tropico. Daily 7-Midnight.
 6.675 HBQ GENEVA, SWITZERLAND, 44.94 m. Addr. Radio-Nations. Sun. 1.45-2.45 pm.
 6.660 HISG TRUJILLO CITY, D. R., 45.05 m., to 8.40 pm.
 6.635 HC2RL GUAYAQUIL, ECUADOR, 45.18 m., Addr. P. O. Box 759. Sun. 5.45-7.45 pm., Tues. 9.15-11.15 pm.
 6.630 HIT CIUDAD TRUJILLO, D. R., 45.25 m., Addr. "La Voz de la RCA Victor," Apartado 1105. Daily exc. Sun. 12.10-1.40 pm., 4.40-8.40 pm.; also Sat. 10.40 pm.-12.40 am.
 6.625 PRADO RIOBAMBA, ECUADOR, 45.28 m. Thurs. 9-11.45 pm.
 6.610 YNLG MANAGUA, NICARAGUA, 45.39 m. Emisoría Ruben Darío. 1.30-2.30, 6-10.15 pm.
 6.565 HISP PUERTO PLATA, D. R., 45.70 m., 5.40-7.40, 9.40-11.40 pm.
 6.558 HI4D CIUDAD TRUJILLO, D. R., 45.74 m., Addr. Apartado 623. 12.30-2, 6-8 or 9 pm. Except Suns.
 6.550 XBC VERA CRUZ, MEX., 45.8 m. 8.15-9 am.
 6.550 TIRCC SAN JOSE, COSTA RICA, 45.8 m., Addr. Radioemisoría Católica Costarricense. Sun. 11 am.-2 pm., 6-7, 8-9 pm.; Daily 12 n.-2 pm., 6-7 pm., Thurs. 6-11 pm.
 6.540 YNIGG MANAGUA, NICARAGUA, 45.87 m., Addr. "La Voz de las Lagos." 1-2.30 8-10 pm. Except Sundays.
 6.500 HIIL SANTIAGO DE LOS CABALLEROS, D. R., 46.15 m., Addr. Box 356, 5.30-9.30 pm. ex. Suns.
 6.457 TGWB GUATEMALA CITY, GUAT. 46.46 m., La Voz de Guatemala. Daily 7.45-9 am., 12.45-3.45 pm., 7.30 pm.-12.15 am., Sun. 10.30 am.-5.15 pm., 7 pm.-12 m.
 6.455 COHI SANTA CLARA, CUBA, 46.48 m., Addr. Parque Vidal 5. 6.42 am.-12.15 am.
 6.465 HI4V SAN FRANCISCO DE MACORIS, D. R., 46.44 m., 11.40 am.-1.40 pm., 5.10-9.40 pm.
 6.430 HIIS SANTIAGO, D. R., 46.66 m. 5.40 9.10 pm. Ex. Suns.
 6.400 TGQA QUEZALTENANGO, GUATEMALA, 46.88 m., Mon.-Fri. 8-11 pm. Sat. 8 pm.-1 am.; Sun. 7.30 am.-3 pm.
 6.396 COX7 HAVANA, CUBA, 46.91 m. 2-3, 6-10.30 pm.
 6.395 HI9B SANTIAGO, D. R., 46.92 m., 7.40-8.40 pm.
 6.384 ZIZ BASSETERRE, ST. KITTS, W. INDIES, 46.99 m., 4-4.45 pm., Wed. 7-7.30 pm.
 6.380 TIWS PUNTARENAS, C. R., 47.02 m. 5-7, 7.30-10 pm.; Sun. 5-6 pm.

Mc. Call
 6.375 COCQ HAVANA, CUBA, 47.06 m. 6.50 am.-1 am.
 6.357 HRPI SAN PEDRO SULA, HONDURAS, 47.20 m., 6-7.30 am., 2-4 pm. & Irreg. to 10 pm.
 6.345 HH3W PORT-AU-PRINCE, HAITI, 47.28 m., 1-2, 7-9 pm. Sun. 5-8 pm.
 6.340 HIIX CIUDAD TRUJILLO, D. R., 47.32 m., Sun. 7.40-9.40 am., daily 8.10-10.10 pm.
 6.335 OAXIA ICA, PERU, 47.36 m., Addr. La Voz de Chiclayo, Cas'illa No. 9. 8-11 pm.
 6.330 COCW HAVANA, CUBA, 47.39 m., Addr. La Voz del Radio Philco, P. O. Box 130. 7.55 am.-12.15 am.; Sun. 9.55 am.-12.15 pm.
 6.310 HIIZ CIUDAD TRUJILLO, D. R., 47.52 m., Daily except Sun. 11.40 am.-12.40 pm., 5.10-7.40 pm.
 6.300 OAX4G LIMA, PERU, 47.62 m., Addr. Apartado 1242. Daily 6-12 mid.
 6.280 HIIG TRUJILLO CITY, D. R., 47.77 m., 6.40-8.40 am., 1.40 am.-2.10 pm., 3.40-9.40 pm.
 6.255 CPI2 LA PAZ, BOLIVIA, 47.96 m., 7-9 pm.
 6.245 HIIN CIUDAD TRUJILLO, D. R., 48.04 m., Addr. "La Voz del Partido Dominicano." 5.10-9.40 or 10.10 pm.
 6.235 HRD LA CEIBA, HONDURAS, 48.12 m., Addr. "La Voz de Atlántida." 8-11 pm.; Sat. 8 pm.-1 am.; Sun. 4-6 pm.
 6.215 — SAIGON, INDO-CHINA, 48.27 m., Addr. Radio Boy-Lendry, 17 Place A. Foray. 7.30-9.45 am., 11.45 pm.-1 am.
49 Met. Broadcast Band
 6.200 CPS LA PAZ, BOLIVIA, 48.39 m., 6.30-11 pm.
 6.200 HI8Q CIUDAD TRUJILLO, D. R., 48.39 m. Irregular.
 6.195 HI2D TRUJILLO CITY, D. R., 48.43 m., 5.10-7.10 pm.
 6.193 TG2 GUATEMALA CITY, GUAT., 48.44 m., Addr. Dir. Genl. of Electr. Commun. Relays TGI Mon.-Fri. 7.30-10 am., 6-11.30 pm., Sat. 6 pm.-3 am. Sun. 5-8 pm.
 6.190 KGEI SAN FRANCISCO, CAL., 48.47 m., Addr. Gen. Elec. Co. 12 m.-3 am.
 6.190 JLK TOKYO, JAPAN, 48.47 m. 8-9.30 am.
 6.190 HIIA SANTIAGO, D. R., 48.47 m., Addr. P. O. Box 423. 10.40 am.-1.40 pm., 6.40-9.40 pm.
 6.190 HVJ VATICAN CITY, 48.47 m., Sun. 8.30-9 pm. to Brazil, 9-9.30 pm. to Caraca. Sun. & Wed. 9.30-10 pm. to N.A.
 6.185 TIRCC SAN JOSE, C. R., 48.51 m., Tu., Thurs., Sat. 6-7 pm.; Sun. 8-10 pm.
 6.180 LRA2 BUENOS AIRES, AGENT., 48.54 m., 6-9 pm. Sat. and Sun. 7-9 pm.
 6.175 XEXA MEXICO, D.F., MEXICO, 48.58 m., 8-11 am., 2.30-4, 7.30 pm.-12.45 am.
 6.170 WCBX NEW YORK CITY, 48.62 m., Addr. Col. B'cast System, 485 Madison Ave., 12 m.-2 am., to S. A.
 6.160 HJCD NUEVA GRANDE, COLOMBIA, 48.70 m. to 11 pm.; Sat. to 11.40 pm.
 6.158 H16N MOCA CITY, D. R., 48.75 m. 6.40-9.10 pm.
 6.180 CJRO WINNIPEG, MAN., CANADA, 48.78 m., Addr. (See 11.720 mc.) 8.30 pm.-1.30 am. News 10.45 pm.
 6.150 HJDE MEDELLIN, COLOMBIA, 48.78 m., 9.30 am.-1 pm., 5-11.30 pm.
 6.150 YSW SAN SALVADOR, EL SALVADOR, 48.78 m., eves. to 9.15 pm.
 6.148 ZTD DURBAN, SOUTH AFRICA, 48.8 m., Addr. (see ZRO. 9.753 mc.) Daily 11.45 pm.-3.15 am. Sun. 11.55 pm.-3 am.
 6.147 ZBB BULAWAYO, RHODESIA, S. AFRICA, 48.8 m. Mon., Wed., and Fri. 1.15-3.15 pm.; Tues. 11 am.-12 n.; Thurs. 10 am.-12 n. Sun. 3.30-5 am.
 6.140 KZRF MANILA, PHILIPPINES, 48.86 m., 4.30 pm.-11 am. Sun. 6 pm.-11 am.
 6.140 WPIT PITTSBURGH, Pa., 48.86 m., Addr. Westinghouse Electric & Mfg. Co. Relays KDKA 9.10 pm., 11 pm.-1 am. Irreg.
 6.140 OQ2AA LEOPOLDVILLE, BELGIAN CONGO, 48.86 m., Surs. 5.35-7 am.

(Continued on following page)

the MC 28-56



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10 STATION WEBSTER TELETYPE intercommunication system. List \$79.50. Will swap for 1 pair P-R white king pigeons or 5 x 8 printing press and type. What have you? R. B. Gurney, Box 81, Salem Depot, N. H.

HAVE 250-300 WATT PHONE transmitter and miscellaneous transmitter parts. What have you to offer in trade? Billy Cobb, W5HGA, Cleveland, Miss.

CANADIANS: HAVE MILLION tube tester and radio parts, new and used, of all sorts, for trade; also over 250 radio and science magazines. What have you? 100% answers. R. Bo Drunkeller, Alta., Canada.

WANT COMMUNICATIONS RE-ceiver, have Spanish guitar course for home study and lady's diamond ring about 40/100 carat. Might pay some difference. William B. Cliburn, Alta. Loma, Calif.

10,000 VARIETIES OBSOLETE foreign stamps. Three good cameras, almost new, R.C.A. radio, old coins and paper money to exchange for American stamps. Samuel P. Hughes, Auburn, Nebr.

HAVE S.W. RECEIVER WITH 57, 56, 47 tubes, speaker, phones, 2 coils. Trade for 3 pairs of coils for FB-7, or good 2 1/2V filament receiver power supply. Tom Silvraggio, 50 Steuben Street, Providence, R. I.

HAVE 3 TUBE S.W. RECEIVER IN good condition and also electric train kit in A1 condition. Will swap for telegrapher's practice set or what have you? Cliff Bennett, 94 Westfield Rd., Holyoke, Mass.

HAVE 1-81, 2-82, 1-19, 1-1P4, 1-1C7G, 1-1H6G all like new, used only for tests, trade for other tubes of like value or what have you? Edwin Davenport, Pittsford, Vt.

HAVE PHILCO MANUAL, RADIO world magazine, electrical books, Baldwin phones, telegraph keys, combination buzzer, sander key outfits, G.E. type T-8 110v. Automatic time switch, phograph records. Trade for anything. Joseph Shab, 434 Liberty St., Joliet, Ill.

HAVE 80 METER CRYSTAL XMIT-ter—200 QSL cards, radio parts, tubes, military equipment, code osc., ship operator course. Want British colonies stamps, candid camera, typewriter, portable battery Bt set. Ralph J. Eckert, 2807 Claffin Ave., N. Y. C.

HAVE UNIVEX 8 MM MOVIE CAM-era with 4.5 and 5.6 lens. Will swap for a good short wave electric radio set or what have you? Monty Thompson, 652 1/2 Williamson St., Madison, Wis.

WILL SWAP PHILCO PORTABLE Play Pal Model including or excluding battery for a signal generator of equal value. Lester Schneider, 200 West 96th St., N. Y. C.

HAVE OFFICE MODEL TYPE-writer (Rest-Jark) with developing accessories, Argus Model A radio parts, tubes, power supply, mikes, 5 tube AM-DC table model radio, enlarger. Want: Howard 430, Sky Buddy, Super Clipper, Hoover, Box 111, Jamul, Calif.

TRADE FOR PORTABLE GEAR, 618-803 rig and power, new 800-St. Wt. converter, new Hytron HY51A Gordon pickup, Brownink preselector, 801ver 5B stals, 1991, 3612, Billey 14310, 14200, 465 1c. Ifs-mis. Box 3, Wilmerdick, Pa.

WILL TRADE DAYRAD TUBE tester-voltmeter, Weston 150 v. voltmeter, Philco 7 tube Bt set, RCA 5V converter, and hundreds of good radio parts for SW set, code machine, small amplifier, oscilloscope or? Billy Epps, Mineola, Texas.

HAVE 1750 FOREIGN STAMPS, modern album, 200 U. S. doubles, Popular Science, Popular Mechanics, 3 Volumes Boy Mechanic, tubes, transformers. Want Howard, Hallcrafters, working or not, parts, instruments, J. Boland, 25-11 Janet Ave., St. Louis, Mo.

WANTED: BACK ISSUES OF Radio News and Radio & Television magazines. State price and condition. All letters answered promptly. Let's hear from you. Hiro Nagas, Honeyville, Utah.

- (Continued from preceding page)
- Mc. Call
 - 6.137 CR7AA LAURENCO MARQUES, MOZAMBIQUE, PORT. E. AFRICA, 48.87 m. Daily 12-1, 4.30-6.30 am., 12.4 pm.; Sun. 5-7 am., 10 am.-1.15 pm.
 - 6.135 FK8AA NOUMEA, NEW CALEDONIA, 48.90 m. Radio Noumea, Addr. Charles Gaveau, 44 Rue de l'Alma, 2.30-3.30 am. ex. Sun.
 - 6.132 COCD HAVANA, CUBA, 48.93 m., 9 am.-10.30 pm. Sun. 5.30-8 pm.
 - 6.130 VLW PERTH, W. AUST., 48.94 m. Irr. tests.
 - 6.130 VP3BG GEORGETOWN, BRIT. GUIANA, 48.94 m., 10.15-11.15 am., 3.45-7.45 pm. ex. Suns.
 - 6.130 TIEM SAN JOSE, COSTA RICA, 48.94 m. "El Mundo", Apartado 1049. 11 am.-11 pm., Sun. 10 am.-6 pm.
 - 6.130 CHNX HALIFAX, N. S. CAN., 48.94 m., Addr. P. O. Box 998, 6.45 am.-11.15 pm. Sat. 8 am.-11.30 pm. Sun., Noon-11 pm. Relays CHNS.
 - 6.130 H54PJ BANGKOK, THAI, 48.94 m. Daily Ex. Mon. 8-10 am.
 - 6.130 LKJ2 JELOY, NORWAY, 48.94 m. Noon-6 pm.
 - 6.125 MTCY HSKING, MANCHUKUO, 48.99 m., 8.30-9.30 am. in Russian and Mongolian.
 - 6.122 HP5H PANAMA CITY, PAN., 49 m., Addr. Box 1045, 6-10.30 pm. to mid. irreg.
 - 6.120 WCBX NEW YORK CITY, 49.01 m., Addr. See 6.170 mc., 12 m.-2 am. exc. Fri. & Sat.
 - 6.117 KEUZ MEXICO CITY, MEX., 49.03 m., Addr. 5 de Mayo 21. Relays XEFO 9 am.-1 pm., 7 pm.-2 am.
 - 6.116 — SAIGON, FR. INDO-CHINA, 49.05 m., 12.15-12.45, 6-10.15 am. (Eng.)
 - 6.115 OLR2C PRAGUE, BOHEMIA, 49.05 m. (See 11.40 mc.)
 - 6.112 HI6H TRUJILLO CITY, D. R., 49.08 m. 5-8.50 pm.
 - 6.110 KEGW MEXICO CITY, MEX., 49.1 m., Addr. La Voz de Aguila Azteca desde Mex., Apartado 8403, Relays XEJW 11 pm.-1 am.
 - 6.105 HJFB MANIZALES, COL., 49.14 m., Addr. P. O. Box 175. Dly. 5.30-10 pm. Sat. to 11 pm. Sun. 2.30-5 pm.
 - 6.100 YUA-YUB BELGRADE, YUGOSLAVIA, 49.18 m. 12.45-2, 11.20 am.-1, 2.20-4.20 pm. News 4 pm.
 - 6.100 WNB1 BOUND BROOK, N. J., 49.18 m., Addr. Nat'l. Broad Co. 8.45 pm.-1 am. to S. A. Irregular.
 - 6.100 ZHJ PENANG, FED. MALAY STATES, 49.18 m., 6.40-8.40 am., exceed Sun., also Sat. 11 pm.-1 am.
 - 6.097 ZRK KLIPHEUVEL, S. AFRICA, 49.2 m., Addr. S. African Broad. Co., Johannesburg. Daily 12 n.-4 pm., Sun. 12 n.-3 pm.
 - 6.097 ZRJ JOHANNESBURG, S. AFRICA, 49.2 m. Addr. S. African Broad. Co. 3.15-7 am. Sun. 3-7 am.
 - 6.095 JZH TOKYO, JAPAN, 49.22 m., Addr. (See 11.800 mc., ZJZ.) Irregular.
 - 6.090 XEBF JALAPA, MEXICO, 49.26 m. to 9.30 pm.
 - 6.090 ZNS2 NASSAU, BAHAMAS, 49.26 m., Addr. Dir. of Tel. East St., Nassau. 8-9 am., 3-4, 7-9 pm.
 - 6.090 CRCX TORONTO, CAN., 49.26 m., Addr. Can. Broadcasting Corp. Daily 6.45 am.-4 pm., Sun. 9.30 am.-11 pm.
 - 6.090 ZBW2 HONGKONG, CHINA, 49.26 m., Addr. P. O. Box 200. Irregular.
 - 6.090 KZRH MANILA, PHIL. ISL., 49.26 m., 4-11 am.
 - 6.085 ZAA TIRANA, ALBANIA, 49.30 m. 12.20-5 pm.
 - 6.088 VQ7LO NAIROBI, KENYA, BRIT. EAST AFRICA, 49.31 m., Addr. Cable and Wireless, Ltd. 5.45-6.15, 11.30 am.-2.30 pm. (Sun. to 2). Tue. Thu. 8.30-9.30 am.
 - 6.080 CFXK VANCOUVER, CANADA, 49.84 m., 1.3 am. ex. Mon.
 - 6.080 WCB1 CHICAGO, ILL., 49.34 m., Addr. Chicago Fed. of Labor, Relays WCFL irregular.
 - 6.080 CRY9 MACAO, PORTUGUESE CHINA, 49.34 m., Mon. 8.30-10 am.
 - 6.080 OAX4Z LIMA, PERU, 49.34 m. Radio National 7 pm.-12 mid.
 - 6.079 DJM BERLIN, GERMANY, 49.34 m., Addr., Broadcasting House. Irregular.

(Continued on opposite page)

BARTER and EXCHANGE FREE ADS (continued)

- Mc. Call
- 6.070 CFRX TORONTO, CAN., 49.42 m. Relays CFRB 7 am.-12.30 am.; Sun. 10 am.-11 pm.
- 6.070 VE9CS VANCOUVER, B. C., CAN., 49.42 m. Sun. 1.45-9 pm., 10.30 pm.-1 am.; Tues. 6-7.30 pm., 11.30 pm.-1.30 am. Daily 6-7.30 pm.
- 6.065 SBO MOTALA, SWEDEN, 49.46 m. Relays Stockholm 4.35-5 pm.
- 6.063 FIQA TANANARIVE, MADAGASCAR, 49.48 m. Addr. (See 9.51 mc.) 12.30-12.45, 3.30-4.30, 10-11 am., Sun 2.30-4.30 am.
- 6.060 YDD BANDOENG, JAVA, 49.5 m. 5.30 am. on.
- 6.060 WLWO CINCINNATI, OHIO, 49.5 m. Addr. Crosley Radio Corp. Relays WLW, Sun. 8 am.-6.30 pm.; Tues., Wed., Fri. 5.45 am.-5.30 pm.; Mon. and Thur. to 2 am.; Sat. to 11 pm.; Sun., Tues., Wed., Fri. 11 pm.-2 am.
- 6.060 WCAB PHILADELPHIA, PA., 49.5 m. Sun., Tues., Fri. 6.30-11 pm.; Wed. 6.30-8.30 pm.
- 6.056 XY— RANGOON, BURMA, 49.54 m. ams to 10.
- 6.055 VK9MI S.S. KANIMBLA, 49.54 m. (Travels between Australia and New Zealand.) Sun., Wed., Thurs. 7-7.30 am.
- 6.055 HJFA PEREIRA, COLOMBIA, 49.55 m., 9 am.-Noon, 6.30-10 pm.
- 6.050 GSA DAVENTRY, ENGLAND, 49.59 m., 12.25-5, 5.40-11.30 am., 11.52 am.-6 pm., 6.24-8 pm. to Europe.
- 6.050 HPSF COLON, PANAMA, Carlton Hotel. 49.56 m., 7-9 pm.
- 6.045 XETW TAMPICO, MEXICO, 49.6 m. 7 pm.-1 am.
- 6.040 WRUL BOSTON, MASS., 49.65 m., Addr. University Club, Sun. 2-9 pm., 5.30-8.30 pm. Daily.
- 6.040 WDJM MIAMI BEACH, FLA., 49.65 m. 1-3 pm., 9 pm.-1 am., Sun. 4-6 pm. Relays WIOD.
- 6.040 KZIB MANILA, PHIL. ISL., 49.67 m., 5.30-10 am., 6-11 pm.
- 6.033 HP5B PANAMA CITY, PAN., 49.75 m., Addr. P. O. Box 910. 10.30 am.-2, 6-10 pm.
- 6.030 CFVP CALGARY, ALTA, CAN., 49.75 m. 10 am.-2 pm.
- 6.030 RV96 MOSCOW, U.S.S.R., 49.75 m. 1-7, 7-8.30 pm. to N. A., 8.30-9 pm. News 7 pm.
- 6.030 XEKW MORELIA, MEXICO, 49.75 m., eves. to 11.40 pm.
- 6.030 OLR2B PRAGUE, BOHEMIA, 49.75 m. (See 11.875 mc.) Off the air at present.
- 6.023 XEUW VERA CRUZ, MEX., 49.82 m., Addr. Av. Independencia 98. 10 pm.-1 am.
- 6.020 DJC BERLIN, GERMANY, 49.83 m., (See 6.079 mc.) 11.30 am.-4.25 pm. to Africa.
- 6.017 HI3U SANTIAGO DE LOS CABALLEROS D. R., 49.86 m., 7.10-8.55, 11.40 am.-1.40, 4.40-6.40 pm.; Sun. 12.30-2, 5-6 pm.
- 6.017 HJCX BOGOTA, COLOMBIA, 49.86 m. 9-11.30 pm.
- 6.010 PRA8 PERNAMBUCO, BRAZIL, 49.92 m. Radio Club of Pernambuco, 4-9 pm.
- 6.010 OLR2A PRAGUE, BOHEMIA, 49.92 m., Addr. (See OLR, 11.84 mc.) Irreg.
- 6.010 CJCX SYDNEY, NOVA SCOTIA, 49.92 m. Relays CJC8 7 am.-1.30, 4-8.30 pm.
- 6.010 CFCX MONTREAL, CAN., 49.92 m., Can. Marconi Co. Relays CFOF 7.45 am.-1 am.; Sun. 9 am.-11.15 pm.
- 6.007 XYZ RANGOON, BURMA, 49.94 m., 6.30-10 am., 9-11 pm., Sat. 9.30-11.30 pm.
- 6.007 ZRH ROBERTS HEIGHTS, S. AFRICA, 49.94 m., Addr. (See ZRK, 9.606 mc.) 10.45 am.-3 pm., Sun. 12.15-3 pm.
- 6.005 VE9DN DRUMMONDVILLE, QUE., CAN., 49.96 m., Addr. Canadian Marconi Co.
- 6.005 XEBT MEXICO CITY, MEX., 49.94 m., Addr. P. O. Box 79.44. 10 am.-1.45 am.
- 6.000 HP5K COLON, PAN., 50 m. Addr. Box 33, La Voz de la Victor. 7-9 am., 11.30 am.-1, 6-11 pm.
- 6.000 — MOSCOW, U.S.S.R., 50 m., 3.30-4 pm., in Czech.

(Continued on following page)

- HAVE NEW GHIRARDI RADIO Physics and radio service books and many radio tubes and parts. Interested in cabinets, tubes 837, 802 and 6L6. Jerome Kosmoski, U. S. Airway Communication Station, Augusta State Airport, Augusta, Maine.
- WANT 16 MM FILMS: HAVE M.I.T. Engineering books, stamps, radio parts. Send for list. Will answer all mail. George Fournier, 248 Haskell St., Fall River, Mass.
- WANTED—FENCING EQUIPMENT. Tools, etc., medical, biology and chemical books; a very good microscope. In exchange I have cash, stamps. 28 call book and Elgin candid camera. P. D. Rowden, 755 Cascade Place, Atlanta, Ga.
- HAVE 2-50" 16 MM MOVIE FILMS entitled "She Wouldn't Drown" and "Taken by Surprise." Will trade for 100 ft. "Exclusive Movie studio" films. Sealed film desired. Reid Maynard, 616 Dixie Ave., Cookeville, Tenn.
- WANT S.W. RECEIVER. HAVE college chemistry set worth \$6.00. Trade for good 2 tube S.W. receiver. Chemistry set contains more than 100 small vials of chemicals. (has. Moskowitz, 314 E. 52nd St., Brooklyn, N. Y.)
- WANTED: SUPERIOR SET-TESTER No. 1280 or any tube and set (tester for \$25 man's enclosed Illinois watch, 17 Jewel, Utah vibrator, Head phones, tubes. F. Lumellus, 2508 Francis, Jackson, Mich.)
- WANTED: RECEIVERS—GOOD—bad condition. Preferably 3 tubes or over. A.C.—small transmitter working order. Have tubes any type for receivers. Brand new stamp album, over 1000 neatly mounted different stamps. John W. Planinac, 1502 Beech St., N. Braddock, Pa.
- HAVE WESTON PHOTO ELECTRIC cell exposure meter, case model No. 630 senior \$25 value for Triplet pocket test meter (3000 volts) or crystal microphone converter, frog, meter, test equipment. Bert Kayanough, W231CZ.
- HAVE A.C. 6 TUBE SHORT WAVE receiver with plug in coils and loudspeaker. Will trade for three tube Majestic portable or auto radio. Jay B. Hollibaugh, Jr., Waynesville, Ill.
- HAVE A SKY BIDDY. SOME parts and cash to trade for real old license plates. (has. Paulaitis, R.D. 1, Elmer, N. J.)
- TRADE: GOOD STAMPS, TUBES, transceivers, oscillators, power supply, QST's, and parts for other tubes, phono pickup, transmitter equipment, etc. Answer all letters. Floyd Paul, 773 N. Alexandria, L. A., Calif.
- HAVE RADIO PARTS, TUBES, magazines, pickups, meters, typewriter, tube checker, etc. Want old coins, bills, firearms, telescope or what? Wm. Joyce, 6018 Stony Island, Chicago.
- HAVE 5 RADIOS, MIKES, METERS, honor parks, beginners' kits. Automatic coil tap machine with tubes, oscillator, tube, etc. Want radio magazines, SWL cards, testers, radio manuals or? Write W. T. Windley, 38, Washington, N. C.
- HAVE \$6.50 "LEY" SYNCHRONIZER equipped with 50c cable release. Would like any radio equipment. What have you? Jack Roomey, 429 Stratton St., Logan, West Va.
- WILL GIVE TUBE CHECKER, tubes, radio magazines (1930 to 1940) radio parts, for meters, telescope, or what have you? Rodman, 724 East 34th, Chicago.
- POPULAR SCIENCE LIBRARY, 6 vols. on electricity, chemistry, physics, etc., all new and never used. Will accept in trade camera, books on photography, radio, or what have you? Harry Snitz, 4810 Beaumont Ave., Phila., Pa.
- WANTED: 40 VOLT 200 AMP. vehicle generator or arc welder of equal size. May have burned armatures. Give name plate data. Want 2" interferometer. Have cash. Invex 5.6 movie camera. Tom Stewardson, Santa Anna, Texas.
- WANT XTAL PHONES, PRESELECtor, meters, old coins, a.w. receiver, etc. Have electric fence charger, xtal. tubes, magazines. National a.w. kit, meters, pickup, tools, etc. Roby, 6303 Kenwood, Chicago.
- WANTED: BIRD TELEVISION television No. 26 complete—kit made in Penn. 1932, also a very want 837c motor used in this model. W. P. Brooks, 100 N. Main St., Herkimer, N. Y.
- WANTED 24,000 OHM CRYSTAL earphones, auto name plates, coins. Offer collection 450 different U. S. Radio Parts. Also cards, stamps, covers, books, courses, swap list duplicators. Rudolph Zak, 2509 East 89th, Cleveland, Ohio.
- EXCHANGE LATE DANCE RECORDS for electrically recorded instrumental classics. 35 watt A.C.A. amplifier, American dynamic mike two Jensen A12 P.M. speakers, portable cases. Perfect condition. Value \$150.00. What do you offer? Clarence Miller, Gresham, Nebraska.
- TRADE KEYSTONE 8 MM F.L.19 lens new small A.C.—D.C. Air King with tubes, good condition. Wanted good short wave receiver. Invt. correspondence. Joseph Sargenta, 11 Spencer Court, Bklyn., N. Y.
- HAVE FRENCH TRUMPET COMPLETE, good condition. Want tester for NRI course and television IF transformer. Ray Zitta, 28-26 47 St., Long Island City, N. Y.
- WOULD LIKE TO TRADE 7 SECOND hand copies of Everyday Photography for copies of Popular Photography. Books are all condition. Write me. Jean Guy Plouffe, 5474 Second Ave., Rosemont, Montreal, Canada.
- WANTED: ANY OLD MAKE OR model communications receiver. Describe fully in first letter. Have 1938 Sky Buddy, preselector, Trimm featherweight Phones and cash. Lewis R. Ware, Jamison, Bucks County, Pennsylvania.
- HAVE STANCOOR 20 WATT PHONE transmitter Oscilloscope, radios, tubes, parts to trade for Riders manuals 4 and 7 or what have you? Orlis K. Wolfe, W8GNY, Harlan, Ky.
- WANTED LATEST MODEL LEICA complete. Trade imported Australian thirty piece drafting set. Cost one hundred twenty-five dollars wholesale. World's finest drafting instruments, new, never been used. H. L. Bumbaug, 721 No. Crescent Hts., Hollywood, Calif.
- WILL TRADE A.R.R.L. HANDBOOK '39, Gilbert Chemistry '38 set (largest National coupon type \$101, All mail answers. Columbus Brooks, 511 E. 67th St., Chicago, Illinois.
- HAVE FIRST 15 LESSONS 1940 National Radio Institute course and reference books first experimental unit comprising one 0-5 milliammeter ear phones. Will take best trade offer received in one week. M. LaChance, 26 Howard, Lewiston, Maine.
- HAVE 8 MM 250 WATT MOVIE projector with f2 lens, Popular Educators complete with binders, and Monroe Adding and Calc. machine. What have you? J. Winkler, 62 Bergen Ave., Clifton, N. J.
- SWAP: AMPLIFIERS, TUBE TESTER, test oscillator, 2 car radios, motors, 3 penny penut machines, transformers, Gabriel #18 air horn, 10 tube set less R.F. coil assembly, want low powered lig or short wave set. James Woods, Milgarth, Texas.
- SWAP KODAK 620 CAMERA, F6.3 lens, back shutter, with accessories. Sciencetracer Electro-Physics set No. 65, Elementary Photography and good photography books plus magazines for what have you? Ed Smith, 1 Fairview Pl., New Rochelle, N. Y.
- HAVE LATEST METAL AND GLASS tubes in good condition. Swap for tools, short wave condensers, reruler dial, isolantite sockets, coil forms, condensers, resistors, etc. Melvin Spiegel, 242 E. Congress St., St. Paul, Minn.
- WANTED ABOUT 10 OR 15 WATT phone xultr, or 6 tube sw receiver. Have True Temper rod and reel, cost \$1.50, English make candid camera, and stamps. Calore, C. W. Staer, Box 173, Grundy, Va.
- HAVE \$85 LIONEL ELECTRIC train outfit in excellent condition. Want radio set tester or portable typewriter. Alpha Gilmore, 146 Hawthorne St., Belmont, N. C.
- WANTED ALL TYPES OF TRANSmitting tubes. Little or no emission for sale. (Quote price). Stephen A. Lenzel, Box 51, Bressler, Pa.
- WANTED: USED RADIO WORKS at a cheap price. Will pay cash. Have plenty of stamps if interested. Peter Gabor, 338 Semel Avenue, Gardfield, N. J.
- WANT WESTON MILLIAMMETER any range. Will trade two 500 w. 115 v. T20 clear G.E. photographic light line bulbs. Have C-13 filaments, or? W8GNY, 7 Avenue B, N.Y.C.
- SWAP: UNIVEX CAMERA, 8" projector in A-1 condition, 2-200 ft. reels, splicer kit—for typewriter transmitter—or communication receiver. What say? Tony Pachowski, St. Mary's Home, Manitowoc, Wisconsin.
- SWAP: LAFAYETTE, 15 WATT, 5 tube, public address amplifier. In fine condition. Want a pocket volt meter. What do you have you to offer? Lenora Prescott, 301 So. Main St., Mansfield, Mass.
- WANTED: A USED CANDLER code course. Please give conditions and lowest price. Robert Camp, 1042 Water St., Moose, Pa.
- WANTED—MODEL GASOLINE ENGINES in running condition. Have radio speakers, parts, phono records, skates and some cash. Joek Crawford, St. Ignace, Michigan.
- WANTED: 35 MM MINIATURE camera about f:2.9 or movie camera and projector, or what? Have radio parts, tubes, books, meters, television parts, motors, electric shaver, lathe, etc. Joseph Ziellinski, 1637 Blackhawk St., Chicago, Ill.

- HAVE LAST SEVEN ISSUES OF 1938 QST and Kadette 2 tube TRF, want 913 CR tube in good condition, or? W9KYR, New London, Iowa.
- HAVE A LARGE COLLECTION OF U.S. stamps (Dealers stock) value several hundred dollars. Will trade for good receiver, P.A., or test equipment. Will answer all sincere letters only. L. Pleasant, P.O. Box 58, Mattoon, Illinois.
- SWAP NEV 6" UNITED MOTORS Perm. mag. dyn. speaker with outp. trans. for 8" magnetic speaker, used on Silverstone set Model No. 334 P.B. speaker No. used on set is 14-10673A. Hugh D. Bramlett, Route 3, Gladsten, Ala.
- RADIO TECHNICAL INSTITUTE complete Radio Servicing Course. Originally sold for \$39—like new—latest edition. Will swap for Gihardi's "Modern Radio Servicing," (has. Bennett, 159 Parsells Ave., Rochester, N. Y.)
- WANTED: RIDER MANUALS 1, 2, 7 and 8, also book Cathode Ray Tube at Work. Emerick J. Soper, 2510 Harrison Ave., Eureka, Calif.
- HAVE 2 1/2 METER TRANSCEIVER in perfect condition. Will trade for good A.C. operated S.W. set. Must work on from 10-160 meters. What have you? J. W. Houshild, 215 Rockwell Ave., Long Branch, N. J.
- HAVE TYPEWRITER, 3 TUBE short wave set, Want Rider's or Gernsback manuals. Will also pay cash. Morris Siegel, 8 Ash Grove Pl., Albany, N. Y.
- REVEAL EAGLE MINUTE-MAN Receiver and Double Duty power supply. Also wireless record player. Both worth \$29.00. Want 10 meter receiver ready for use. I answer all inquiries. John Seeger, 1250 So. Jackson, Louisville, Ky.
- HAVE \$50 WORTH OF U.S. FOREIGN stamps, cash, meters, parts. Want any factory built rev., code machine, cabinets, dynamic sibr. Correspondence invited. Hany Skonicki, 23 Woodley Court, Meriden, Conn.
- HAVE SUPERIOR CO. CHANNEL Analyzer, new. Want 1700 volt, 300 mill. Power Pack, or used Sky Buddy. Frank E. White, 528 2nd St. No., Walpole, N. H.
- I HAVE N.R.I. RADIO COMPLETE course and a Normal High School course. I.S.C. Want to exchange for Candler Cole Junior or Hi-Speed Code, or will pay cash. Wilburn Vernon, R. No. 1, Ilenakar, Alabama.
- F1.3; F1.5; 1.5MM F2.5; 3" F4; 4" F4.5; 16mm lens (4" Mounts) wanted; Remote control for Filmo 70, distance finder, Weston exposure meter, lighting outfits, other 10mm equipment. Have hundreds of swaps. Skarr, 663 Pelouze, Detroit, Mich.
- WANTED—30 TUBE SCOTT, GOOD National, Hamarlund receiver. Have cash, Swap—Hallcraft Amateur Communication receiver, DeForest Radio Course, R.C.A., Crosley auto radios, meters, universal transformers, resistors, tubes, parts, Oliver Klein, 2235 N. 39 St., Milwaukee, Wis.
- WANTED RADIO SERVICE EQUIPMENT. Rider's service manuals, signal generator. Have 1 1/2 H.P. Briggs & Stratton gas engine, 200 watt 110V. A.C. generator, Eastman 16 M.M. movie camera 3.5 lens, Model "C" projector motor driven, 1/4 H.P. motor a.e. 60 cycle. E. W. Edwards, 4740 Johnson, Hammond, Ind.
- WANTED RIDERS OR GERNSBACK service manuals 1 to 9. Will trade 16 M.M. motor driven projector, good a-new, and 600 feet of cartoon film, or will pay cash. H. Fenimore, Rockville, Missouri.
- SWAP: SIX TUBE ATWATER Kent, six tube Radiola (both old type), six volt soldering iron (new), model airplane gas engine (1/3 H.P.) never used. For what? 100% CQ. Preston Lanfer, The Glen, New York.
- TRADE COMPLETE GROSS CW transmitter with power supply coils, xtal. tubes; Underwood No. 1 typewriter, for Riders manuals, test equipment, movie camera, or high performance-CW xmt complete. Pay cash difference. F. R. Foss, W9TUC, Perkinstown, Wis.
- WANTED—USED CALL BOOK for cash, also correspondence with camera, radio and chemistry fans. Gavin Lordier, 825 Sibley, Hammond, Ind.
- RADIO PARTS TO EXCHANGE FOR miscellaneous radio equipment and radio parts. What do you want? Write what you want. T. Ferguson, 184 E. 101 St., N.Y.C.
- HAVE A 32 CHEVROLET COACH. Will exchange for radio parts and meters. Write for details to Emil Phaneuf, 49 Wilkinson St., Putnam, Conn.
- OFFERING LOOSE LEAF STAMP album containing nearly 100 stamps plus cash—for amateur radio transmitter. Gerald Goetsch, Stop 61 Lako Road, Avon Lake, Ohio.

(Continued on following page)

BARTER and EXCHANGE FREE ADS (continued)

(Continued from preceding page)

WILL SWAP—RADIO TRAINING
Association radio course, complete with 36 lessons and in good condition. Wanted—multitube, tube tester, electrical course, or what have you. All letters answered. Robert Jones, 201 Walnut St., Westernport, Md.

WANT ENLARGER, 1938 SUPER
Sky Rider, ACR-111. Sky Rider 23. Have 30 watt mobile PA system complete with two 7PM speakers, turntable, pickup, mike. Lots of parts. All letters answered. J. C. Kelley, Colebrook, N. H.

WANTED GOOD 8MM CAMERA
and projector. Have motor, induction motors, synchronous motors, instruments, radio parts, etc. U. W. Ostrom, 8247 4th Ave., N. E., Seattle, Wash.

WANTED—A LATE MODEL SKY
Buddy or Howard 130 receiver in good shape. Have used amplifier course, complete high voltage power supply, 100-220 v. A.C. transformer, answered. Mike Morrissey, Sharpsh, Ky.

HAVE ONE AND TWO TUBES
crystal sets, treasure finder, radio parts. Want U.S. coins, radio parts. John Haynes, One Run, Missouri.

HAVE RCA 913 CATHODE RAY
tube high vacuum low voltage electrostatic type never used. Swap for 1A and T240 or pair 509's. Write to: Harry P. Weber Jr., Central Ave., Runnemede, N. J.

TRADE FOR TUBE TESTER: 3 tube transceiver, Philco S.W. converter kit, 301A Stewart Warner short wave converter, carbon arc welder and solderer, 2 tube s.w. transmitter less key, phono pickup. John Arnold, Bluffs, Ill.

WANT CANDLEBURNER CODE
course, pay cash, also want headphones. Have 8 watt portable P.A. system, developing and printing equipment. Wayne J. Wenger, Wellman, Iowa.

HAVE RADIOS, SPEAKERS, AND
loads of radio parts to swap for radios, accordions, watches or what have you. Raymond Grunski, Torr, Mich.

TRADE—MOSSBERG MODEL 35
heavy barrel .22 target rifle with 1 p.w. telescope and sling, for medium power final, 1300 volt power supply, or components for either or both. WBTSE, Route 2, Groveport, Ohio.

HAVE FEDERAL 835 AUTOMATIC
enlarger, Kodafactor photoflood stand, tanks, light meters, filters, etc.; photographic books, Physical Culture magazines, United States, British Colony, foreign stamps, mint Coronations, first day covers. Want photographic equipment. Lunde, Evansville, Wis.

FOR TRADE, PORTABLE RECORD-
ing machine, Xtal mike. Built-in hi-rain amplifier, with blanks, needles and mike cord. Need P. A. apparatus. Warren Preshel, New Richmond, Wis.

HAVE NEW ADJ. DRY. TANK
Motorola dash control, auto radio service course, new Flisk 8,30-20, I.I.D. stamp catalog, album. Want motors, not working, service, VOM. W. J. Closson, 295 8th St., Troy, N.Y.

WANTED INSTRUMENTOGRAPH OR
code machine or what have you? Swap 3/4 p.p. Maytag gas engine, size 8. Nestor Johnson box to hockey, three tube a.c. short wave receiver. Joseph Newman, 4022 Xevex Ave., So., Minn., Minn.

WANT REMINGTON, UNDERWOOD
portable type, have meters, Weston, Jodelite, 0-1, 100-0, 0-5, 0-8, 0-8, d.c. 16 Elec. drill, crystal Gigsby micro., carbon D.B.-radio parts, QST 1936-1939, Dr. Lupo-WV8S, 1408 E. 63rd St., Chicago, Ill.

WANTED—BLACK AND DECKER
drill 1/4 or 1/2 inch. Have Philco signal generator 100 kc. to 20 mc., Weston ohm scale, Amperite XII microphone, Jack Buck, 184-24-114th Ave., St. Albans, N. Y.

WANTED—GHIRARDI RADIO
Physics Course. Swap all kinds of radio parts and tubes. List on request. W2HNJ, 1235 Madison St., Bklyn, N. Y.

HAVE S.W. RADIOS—A.C. BARTER
parts, tubes, transformers, meters, magazines and an analyzer. Will swap for cameras, enlargers, photo equipment. Write now. Clarence Cook, 920 Quinn St., Medina, N. Y.

WHAT HAVE YOU? WHAT DO
you want? I want phono motor and pickup, radio parts and photo supplies. Will make photographic QSL's—S.W.'s. Describe your needs and trading stock. Yette, 1318 Lafayette St., Danver, Colo.

WANTED—USED SKY BUDDY
Sky Chief, N.R.I. course in good condition. Have Radio Amateur Handbook, candle camera, 5 tube radio, 1000 stamps in album. Will add cash. Matthew Zlobka, 28 Hill St., Southington, Conn.

HAVE 170 POPULAR RECORDS
and RCA Electrola phonograph model 16-96 also Cokes Electrical Engineering Course and a 50 year old photographic almanac, want radio test equipment and service manuals. James Notaris, Oak St., Amherst, Pa.

SWAP ONE AMERICAN AND ONE
Modern postage stamp albums with about 1000 foreign and 200 United States for radio, radio parts, and accessories. All letters answered promptly. Stanley Cox, New Harmony, Ind.

HAVE 10 SCOTT PLUG IN COILS
GRF 5 Det. 15-500 meters, also complete N.R.I. radio course with experimental parts. Write W. F. Marx, 4839 Ohio St., Chicago, Ill.

HAVE SUPREME OSCILLOSCOPE
model 755. Want a 20 or 30 watt or larger P.A. system. Send full details, all mail answered. Grover C. Hudd, 80 So. State St., Concord, N.H.

WANTED—RADIO COURSE ALSO
Ghirardi's Physics and service books. Will pay cash or purchase what you want in N. Y. market. W. Howard, 140 W. 238th St., Bronx, N. Y.

WANTED: USED CANDLEBURNER
Will pay cash for outright purchase or for 30 day loan or swap. I.H.F., 110-220 St., A.C. repulsion induction motor. Peter Slivetz, R.I. New Brunswick, N.J.

TRADE: FADA 8 TUBE A.C. SUPER-
het. (cost \$110 new) in perfect shape. Wanted: Test equipment, good recording outfit, record changer. Morton Savada, 115 Central Park West, N.Y.C.

WANT HOWARD OR GHIRARDI
crafters set. Have Ghirardi's Physics and service course, Gernsback Manual, xtal. transmitting tubes, tubes, 2 1/2-10 meter recr. some cash. Helen Wax, 156 Taylor St., Bklyn, N.Y.

WILL TRADE REFLEX KORELKA
P.3.5 for Belleford No. A. or will add 2-RCA 832 for Rolletex. Paul C. Mangan, R.D. 3, Warren, Pa.

INSTRUMENTOGRAPH, TEN TAPES,
spring wind, built in oscillator (A.C.) and speaker. Want good signal generator, Rider Manuals, test equipment or what have you? Samuel Hornick, 8707 Twelfth St., Detroit, Mich.

WANT MIKES, PICK-UP, TURN-
tables, both 3 1/2-1/3 and 78 I.I.P.M., favors anything for a super P.A. system. I'll swap anything you need for the darkroom. Write me your needs, or G. Pearson, Laurens, So. C.C.

UNIVERSAL RECORDING EQUIP-
ment listing over \$150. Will swap for P.A. equipment, home movie, record changer, HRO., RME, PR15 receiver, R. McMahon, 1210 E. Haley St., Santa Barbara, Calif.

HAVE ALL STAR RECEIVER,
want radio parts, photo-enlarger, automatic record changer. Also have other things to trade. Tom Gullen, 22 Simpson Ave., Wallingford, Conn.

COMPLETE SET QST—FROM 1931
to 1937 inclusive, also several issues 1923 to 1930 will trade for receiver, P.A. equipment or test equipment only. Lawrence Plossant, P.O. Box 58, Mattson, Ill.

WANTED: FISHING EQUIPMENT,
communications receiver, Shure model 75, high power transmitting equipment, Peavey LNR radio-television course, Radio & Television Magazines from 1932 complete, QST from 1933, French telephone, etc. W81ZS, 421 Wynn, Johnston, Pa.

SWAP: EAGLE FB25 616 KIT, DE-
scribed December 1938 issue R. & T. songs, Woodpecker John Willard, Adolph and the Boys or Zephyr crystal pickup, Roy Blakeburn, 138 Vulcan Ave., Sydney, Nova Scotia, Canada.

WANT RECORDS BY BING CROSBY
(except Decca) Russ Colombo and Paul Whiteman. Will buy for cash or trade radio parts or records. Send for complete list of my "wants". Fred Michsen, 5225 Newport, Detroit, Mich.

HAVE POWER TRANSFORMERS,
clocks, B eliminator, tubes, parts, code practice osc., etc. Want 6L6's, 40 or 80 meter crystal, milliammeter, xmitting key or other parts. Ivan L. Rice, Meredosia, Illinois.

HAVE PAIR USED WEB240 TUBES,
three tube A.C.-D.C. short wave receiver, 8" magnetic speaker in cabinet. Want transmitter power supply or parts. M. Revzin, 2290 Davidson Avenue, N.Y.C.

TRADE TABLE MODEL 6 TUBE 2
band Automatic Radio Co. set. Interest in 2 1/2-10 meter converter; 8-16 mm camera and projector; also loan of film subjects. Edwood Brooks, 1636 E. 30th St., Cleveland, Ohio.

WANTED: HOWARD 430 WITH
Yilm-pack. Will swap Triplet 1503 tube and net tester or new 21 Jewel tubora wrist watch value \$50.50. Paul Robertson, 42 Essex St., Springfield, Mass.

WANT AN ELECTRICAL PHONO
pickup and motor or an electrical phono unit. Have cash, radio marks and parts. H. C. Dinkus, 800 N. Sixth St., Reading, Pa.

WANTED PHOTO-CELL AND RE-
lay phono pickup, microphone, signal generator, or? Have field glasses, Hammarlund condensers, Triplet 0-50 milliammeter, radio parts, tubes, books, magazines, Mac practice set, Mac oscillator, etc. Victor Osterby, Grant, Michigan.

TRADE MULTISTAMP DUPLICA-
tor outfit No. 3 and No. 5 in 12"x11"x 3/4" steel case with instructions, cost over \$25.00. Want "Sky Buddy" or similar receiver, or what have you? Alexander Podestnyy, 217 Pine St., Philadelphia.

HAVE CANDID CAMERA; TYPES
89.6A6 tubes kaiter tuner; test leads, prods. Want pocket adding machine, or? N. Hansen, 826 S. 4th St., Aurora, Ill.

SHORT WAVE CRAFT MAGAZINES
1932-June, July, Aug., Oct., 1933—No Jan. and March; 1934—all; 1935—all; 1936-Jan. Feb., May, Oct., Dec.; also few others for what have you. Allen Fowler, Beloit, Kansas.

WANTED A GOOD PRESELECTOR
commercial or home made, must be A1 condition job, have Cash and parts, also need 465 kc. crystal for I.F. Bird Circuit, P.A. Stank, 5321 West 30th Place, Cicero, Ill.

HAVE WESTON 537 SET AN-
alyzer, 11 ranges, metal radio parts cabinet, "A" and "B" eliminators, old battery sets, variable condensers, radio parts, Want Leica and reflex cameras, voltmeter, tube tester, Harry Perkins, 1081 E. 27th St., Bklyn, N.Y.

TRADE 17 JEWEL HAMPTON
man's wrist watch, new condition, fine, perfect condition for fine sleeping bag or car radio. Louis C. Lamb, Box 531, New London, Ia.

SWAP—28 V FLATHON, ROLLER
skates, bike frames, hand-books, back issues Radio & Television and QST, 32-250 v. generator, trade for? W. Blumer, Jefferson, Wis.

WANT RADIO PHYSICS COURSE
by Ghirardi and Rider's service manuals. Also servicing instruments. Will pay cash. J. T. De Brunce, Box 754, Big Sandy, Tenn.

WANTED: ONE USED FRENCH
type (handset) dial telephone. Will buy or trade for radio parts. Bob Blasche, 2170 E. Lake Rd., Atlanta, Ga.

HAVE NUMEROUS RADIO MAGA-
zines, short wave parts, tubes, radio course, electrical course, text books. Want coil transmitter, portable radio or tube rifle, write for list. Lewis Saunders, Route 3, Battle Creek, Mich.

HAVE NEW AIR-CONDITIONING
unit, complete, in cabinet. Very economical to operate. Suitable for office or home. Cost \$30.00. Circular on request. Trade for tools, cameras, rifles, stamps, etc. Truman Greenwall, Litchfield, Ill.

HAVE A PORTABLE RECORD
player 33 1/3 and 78 rpm with Rola speaker and amplifier included. Would like good used Howard receiver with 4 bands for UHF reception. Frank Nelson, 1619 Larchmont, Lakewood, O.

HAVE HOWARD 430, 1851 PRESE-
lector, speakers, tubes, 1180-8 tube tester and other radio parts. Want communications receiver or good parts, big typewriter, or? Daniel Platek, 225 Division Ave., Bklyn, N.Y.

WANTED: SHORT WAVE CON-
verter with plug-in coils, compact and in good operating condition. Write what you need. Wm. E. Sampson, Jr., 4801 Stuart Ave., Richmond, Va.

HAVE TIFFANY MOTOR AND
turntable, books, magazines, want Crosley Chatsbox, Itasca 16 pump shotgun, Remington 28/40 or 44/40 shotgun, and Smith 22/32 with poor barrels, R. Welker, 406 No. Harvey, Oak Park, Ill.

WANT TO SWAP RADIO PARTS
with anyone; also picture card views. Walter Monk, 51 Vineyard St., Providence, R.I.

HAVE ELECTRICAL, MECHANICAL
engineering books, 8 in. dynamic speaker, tubes, broadcast coil parts. Want in. dynamic speaker, 3000 ohm tubes, condensers, resistors, parts. Send your list. R. Young, 4104 Ave. J., Brooklyn, N.Y.

SWAP ARGON MODEL "A" WITH
case, filter, lens shade; Universal ankle button mike with bud stand; code practice oscillator for what have you? Glenn Gosvin, 5 Mildred Ave., Binghamton, N.Y.

WANTED VIBRATOR POWER SUP-
ply for "Sky Buddy", recording head, good 5 meter receiver and crystal microphone. Have 7 tube short wave receiver, many stamps. Will answer all letters. Edson Hart, Jr., Salineville, Ohio.

TRADE: N.R.I. COURSE FOR RE-
ceiver, transmitter or code machine or anything worth the same. J. Bradley, U.S.N.R., 124 W. Allegheny Ave., Phila., Pa.

HAVE 1 H.P. NELSON GAS EN-
gine, 2 pneumatic wheel 10" dia., 1-4 tube radio b.c. band (you pay postage on above). Want motor scooter, etc. Send your list. R. Elias, 328 W. Oak St., Ironwood, Mich.

SWAP CRYSTAL MIKE, 8 WATT
amplifier, signal generator, tubes and parts. Want A.C. D.C. amplifier, RCA battery oscillator, No. 35 Eastman, slide projector and tools. Ray Wensman, Cottonwood, Idaho.

(Continued on opposite page)

Mc.	Call	
5.990	ZE4	SALISBURY, RHODESIA, S. AFRICA, 50.08 m. (See 6.147 mc. ZEB.) Sun. 3.30-5 am.
5.985	HH25	PORT-AU-PRINCE, HAITI, 50.13 m., Addr. P. O. Box A103. 6.30-9 pm.
End of Broadcast Band		
5.977	CS2WD	LISBON, PORTUGAL, 50.15 m., Addr. Rua Capelo 5. 3.30-6 pm.
5.975	OAX4P	HUANCAYO, PERU, 50.21 m. La Voz del Centro del Peru. 9-11 pm.
5.975	VONG	ST. JOHNS, NEWF'LD, 50.21 m. Addr. Broad. Corp. of Newfoundland. 4.30-9.30 pm.
5.968	HVJ	VATICAN CITY, 50.27 m. Off the air at present.
5.960	HIJ	SAN PEDRO DE MACORIS, D. R., 50.34 m. Addr. Box 204. 11.40 am.-1.40 pm., 6.10-8.30 pm.
5.940	OAX2A	TRUJILLO, PERU, 50.51 m. Tues., Thurs., Sat. Sun. 7-10 pm.
5.936	PJCI	CURACAO, D. W. INDIES, 50.54 m., 6.36-8.36 pm., Sun. 10.36 am.-12.36 pm.
5.900	ZB	MAFEKING, BRI. BECHUANALAND S. AFRICA, 50.84 m. Addr. The Govt. Engineer, P. O. Box 106. 6-7 am. 1-2.30 pm. Ex. Suns.
5.885	HI98	SANTIAGO, D. R., 50.95 m. Irregular 6-11 pm.
5.885	TGXI	GUATEMALA CITY, GUATEMALA, 51.24 m. Eves. to 11.30 pm.
5.875	HRN	TEGUCIGALPA, HONDURAS, 51.06 m. 6-11 pm.
5.830	TIH	SAN JOSE, COSTA RICA, 51.46 m. 10 pm.-mid.
5.830	TIGPH	SAN JOSE, COSTA RICA, 51.46 m., 7-10 pm.
5.820	TIGPH2	SAN JOSE, COSTA RICA, 51.50 m. 12-2, 7-11 pm. ex. Suns.
5.758	YNJAT	LEON, NICARAGUA, 52.10 m., 7-10.20 pm.
5.725	HCIPM	QUITO, ECUADOR, 52.40 m. Mon. Tues. Thurs. Sat. 8-10 pm.
5.460	YNOP	MANAGUA, NICARAGUA, 52.40 m., 8.30-9.30 pm. Sun. 2-3 pm.
5.145	OKIMPT	PRAGUE, BOHEMIA, 58.31 m. Addr. (See OLR, 11.84 mc.) Irregular.
5.145	PMY	BANDONG, JAVA, 58.31 m. 5.30-noon.

60 Met. Broadcast Band		
5.035	YV5RN	CARACAS, VENEZUELA, 59.58 m., 4-11.30 pm., Sun. 8.30-11.30 am., 3.30-10.30 pm.
5.020	YR4Q	PUERTO CABELLO, VENEZ., 59.76 m., testing nightly. Off 8.30 pm.
5.010	YV5RM	CARACAS, VENEZ., 59.88 m., 3.30-10.15 pm. Sun. 8 am.-10.30 pm.
4.990	YV3RX	BARQUISIMETO, VENEZ., 60.12 m., 10 am.-9.30 pm.
4.975	YV1RJ	CORO, VENEZ., 60.31 m., 5.30-10 pm.
4.960	YV5RS	CARACAS, VENEZ., 60.49 m., 4.30 to 9.30 pm.
4.960	VUD2	DELHI, INDIA, 60.48 m., Addr. All India Radio. 6.30 am.-12.05 pm.
4.955	YV5RH	CARACAS, VENEZ., 60.85 m., 6.30-7.30, 10.30 am.-1, 3.30-10 pm.
4.953	YV4RO	VALENCIA, VENEZ., 60.57 m., Noon-1, 6-9.30 pm.
4.945	HJCO	BARRANQUILLA, COLOMBIA, 60.67 m., 7.30-10 pm. Sat. to 11.40
4.940	YV5RO	CARACAS, VENEZ., 60.73 m. Eves. to 10 pm.
4.930	YV4RP	VALENCIA, VENEZ., 60.85 m. 5-9.30 pm.
4.920	VUM2	MADRAS, INDIA, 60.98 m. Addr. All India Radio, 5.30 am.-12.05 pm.
4.910	YV1RY	CORO, VENEZ., 61.10 m., 6.30-10 pm., ex. Sundays.
4.905	HJAG	BARRANQUILLA, COLOM., 61.16 m., 11 am.-11 pm., Sun. 11 am.-9 pm.
4.900	YV6RT	BOLIVAR, VEN., 61.22 m. 5.30-9.30 pm.
4.900	YDA	BATAVIA, JAVA, 61.22 m. 5.30 am. on.
4.895	HJCH	BOGOTA, COLOM., 61.29 m., 11.30 am.-2, 6-11 pm.
4.890	YV1RX	MARACAIBO, VENEZ., 61.35 m., 10.30 am.-1.30, 4.30-10.30 pm.

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4.890 HJGD BUCARAMANGA, COL., 61.35 m., 5.45-6.30, 11.30 am.-1 pm., 6-11 pm.

4.885 HJDP MEDELLIN, COLOM., 61.42 m., 8 am.-2, 6-11 pm.

4.880 YV6RU BOLIVAR, VENEZ., 61.48 m., 6.30-9.30 pm. except Sundays.

4.880 YUB2 BOMBAY, INDIA, 61.48 m. Addr. All India Radio, 6.30 am.-12.05 pm.

4.88 YVIRM MARACAIBO, VENEZ. 61.48 m. Evenings to 9.30 pm.

4.875 HJ6FAH ARMENIA, COLOM., 61.54 m., 8-11 am., 6-10 pm.

4.865 HJFK PEREIRA, COLOMBIA, 61.67 m., 6.05-10.30 pm.

4.860 YVIRL MARACAIBO, VENEZ., 61.73 m., 11 am.-1 pm., 4.30-10.30 pm.

4.855 HJCF BOGOTA, COLOM., 61.80 m., 7 am.-mid. ex. Sundays.

4.850 YVIRZ VALERA, VENEZ., 61.88 m., 11.30 am.-1, 5.45-8.45 pm.

4.845 HJCD BOGOTA, COLOM., 61.92 m. 6-11.30 pm.

4.840 YUC2 CALCUTTA, INDIA, 61.98 m. Addr. All India Radio, 6.30 am.-12.05 pm. Sun. from 7.30 am. to 10 pm.

4.840 YV4RX MARACAY, VENEZ. 61.98 m., Eves. to 10 pm.

4.835 HJAE CARTAGENA, COLOM., 62.05 m. 7 am.-6, 7-11 pm.

4.825 HJED CALI, COLOM., 62.17 m., 7 am.-6 pm., 7-10.30 pm.

4.820 YV3RN BARQUISIMETO, VENEZ., 62.24 m., 11.30 am.-1.30, 5.30-9.30 pm.

BARTER and EXCHANGE FREE ADS (continued)

TRADE—203A, 242, 4-211D. STANCO 20P, 5 meter receiver, other equipment. Want 8MM movie accessories, P19, telephoto lenses, etc. W8AS1, Luckhannon, W. Va.

TRADE PERFECT BARBERS (CLIPPER and massager, transmitting parts, drafting equipment, 10" slide rule for standard typewriter, auto radio P4.5 ground glass focusing camera with film back adapter. W2CQB, 149-29 122 St., Richmond Hill, N.Y.

WANTED: HAIRCRAFTER Receiver. Have to trade Western Electric 518-B volume indicator, 17-B line amplifier, D-76527 amplifier, 201-A input mix panel—3 channel. All for rack mounting. A. H. Dreesen, Mansfield Centre, Conn.

WANTED 16MM MOVIE CAMERA and 16MM 400 ft. subjects, in swap for radio parts and camera accessories I have your needs. T. Anthony, 17 Romaine Ave., Jersey City, N.J.

WANTED: USED COMMUNICATIONS receiver, code machine, camera, any kind of stamps, Ghirardi and other books or what have you? Have Univex camera, service equipment, radio correspondence course, radio parts, etc. cash. N. Heibeln, Larsen, Wisn., etc.

HAVE: EXCELLENT STAMP COLLECTION, equipment for photography developing, chemistry set, among other things. Want: Small receiver, radio parts, code oscillator or most any radio equipment. Bud Lenox, 11 Renfrew Ave., Trenton, N. J.

I HAVE SOME 2, 3 and 4 GANG variable condensers I will trade for what have you in radio line. Abe Ochstein, 335 E. Lewis St., Fort Wayne, Ind.

WANTED—RADIO MAGAZINES BEFORE 1930, Jules Verne books, R.S.R. (Clpper radio. Have Deluxe Stream-Mac Key, Upco magnetic phone pickup, used and new parts and tubes, and cash. Don Yocom, Bettsville, Ohio.

HAVE 5,000 VOLT NEON TRANSFORMER in perfect condition, also set of Brandes earphones and a West Electric telephone handset. Will trade all for a decent speed key. Irving Shansky, 549 Alabama Ave., Brooklyn, N.Y.

HAVE S.W. RACO RADIO 24 to 5.0 meters switch coil radio. Jig saw A-1 shape cost \$11.00, plug in coils for 0004 1MF cond., parts. Want movie camera, projector, Paul Klus, 177 W. 24th St., Cleveland, Ohio.

TRADE—SCOTT 15 TUBE DELUXE receiver and 48 acres Michigan lake land for Scott 30 tube receiver or land alone for Scott Masterpiece receiver. Don Newbold, Upper Sandusky, Ohio.

HAVE 40 METER TRANSMITTER 25 watts and light meter and some cash (\$10.00) for a 50 watt station including receiver. Carl Scheinert, 1096 East 8th St., Brooklyn, N.Y.

TRADE RADIO PARTS, RABBIT hounds, Springer spaniel, rood fox hound. Want shot gun double or repeater, rifle, five string banjo, chickens, or what have you? H. E. Welsh, Mayport, Clarion Co., Penna.

NEW TELEPLEX IN CASE AC-10C, course with practicing tapes, exchange for 5 1/2 to 6 inch Carl Zeiss F-4.5 lens compur shutter film pack camera as Ideal-B, Maximar-B, Joe Dare, 712 Grant Ave., San Francisco, Calif.

WILL TRADE FOR WHAT HAVE YOU? Airline model F Six tube batt. radio; Remington No. 10 typewriter; Univex A-F2 camera; hunting knife; RCA model M-34 car radio, Raymond J. Howser, RD No. 3, Bloomburg, Penn.

WANT TO TRADE A FEW BOOKS and magazines on scientific subjects and radio for others which I have not read or radio course. James L. Hodges, Albany, Texas.

I HAVE RADIO PARTS IN GOOD shape. Will swap for Hetrodi or what have you. 100% answers. Robert Whitmore, Osborn, Ohio.

ROBERT N. HOULLE, 159 Orchard St., City Island, N. Y.

JEFFERSON BOYCE, Rt. 2, Box 312, Wash. Wash.

BOB BOYD, 515 N. McCadden Place, Hollywood, Calif.

EARL R. BOYD, 735 E. 106 St., Los Angeles, Calif.

PHILIP BRADY, Box 67, McComb, Miss.

COLUMBUS BROOKS, 541 E. 67th St., Chicago, Ill.

ERIC BUTCHER, S/S Nemaha, Lakes Bros. S/S Co., New Orleans, La.

GROSVENOR CALKINS, JR., 49 John Road, Newton, Mass.

ROBERT CAMP, 1045 Water St., Moosic, Penna.

F. E. CAMPBELL, JR., 405 E. 4th St., Berwick, Pa.

JOE L. CARLSON, III, 343 N. Detroit St., Hollywood, Cal.

CARL A. CHAPLIN, JR., Box 216, Westford, Mass.

ROBERT CHASE, 231 Henry St., New York, N. Y.

DONALD CHISHOLM, 18 Mountain Ave., Wakefield, Mass.

JOHN W. CLARK, 28-25 Utopia Parkway, Flushing, N. Y. C. N. Y.

OSCAR CORWIN, 753 S. Columbia St., Frankfort, Indiana.

GEORGE CRIDER, Box 299, Delaware, Ohio.

MERFIAL DAWSON, Wiley Ford, St. Hollywood, Calif.

PEGDIE DEROULET, 530 No. June St., Hollywood, Calif.

CLAYTON DEWITT, RR No. 1, Kingston, Illinois.

FRANK DRASAL, Jr., Box 125, % West Hwy P. 3, Maryland.

WALTER DUDEK, R.F.D. Box 152, Killings, Conn.

ADOLPH R. DVORAK, Jr., 428 South Lincoln, Madison, Nehr.

AL G. ELARTON, 5430 Carpenter St., Downers Grove, Ill.

MEL ELLIS, 536 17th Ave., Longview, Wash.

ELMER ERTMAN, 1213 Williamson St., Saginaw, Mich.

HIROSHI FUJINO, Aoolia Drive, Auburn, Calif.

SPANLEY GARNER, 29 W. Chestnut St., Norristown, Penna.

JOHN PETER GAWELE, 96 Jewett Parkway, Buffalo, N. Y.

NOELMAN E. GLOVER, 1520 Proctor St., Port Arthur, Texas.

EDWIN GUMESON, R.F.D. Rt. 2, Box 110, Longmont, Colo.

EDDY GUSTAFSON, 2307 17th Ave., Rockford, Ill.

DAVID GUTHRIE, South Hill, Virginia.

ROBERT K. HARTLEY, 118 Temple St., Hinton, W. Va.

ALBERT FRAZIER HAWORTH, W1-SWL, 36 East Main St., Westborough, Mass.

DAVID HERBERT, JR., Box 709, Lancaster, Calif.

LARRY HILKOWITZ, 31 Post Ave., New York City.

CARL L. HORTON, 16 Auburn Place, Athol, Mass.

DR. J. P. HOTCHKISS, 6436 Kenwood Ave., Chicago, Ill.

HOWARD H. HOVER, Lyons Peak Lookout, Jamul, Calif.

MIKE HOYCHUK, 5547 Saxon Dr., Garfield Hts., Ohio.

ARTHUR JEWELL, 2015 Esterly, Kansas City, Kansas.

BOB JOHNSON, P. O. Box 146, Logan, W. Va.

GORDON C. JOHNSON, 2908 E. 4th St., Superior, Wisc.

KAZUO KANAL, R.F.D. Box 84, Auburn, Calif.

H. A. KNAFCZYK, 4848 S. Elizabeth, Chicago, Ill.

E. KULZE, 137-19 Carson St., Springfield, L. I. N. Y.

LAVOYD KUNEY, Fayette, Ohio.

EDWARD LANG, 3508 South 83rd St. Phila., Pa.

BOB REYNOLD LARSON, 618 North June Street, Hollywood, Calif.

WILLIAM LEWIS, 2047 Llewellyn Ave., Baltimore, Md.

JOHN LONG, 9406 Georgia Ave., Silver Spring, Md.

JAY MAHONEY, 8939 Carson St., Culver City, Calif.

VERT MANDELSTAMM, 738 S. Park St., Saginaw, Mich.

ROSS MANGUM, Millington, Tenn.

MERT MEADE, 819 Wyandotte St., Kansas City, Mo.

JOHN T. MEEHAN, 242 Governors Ave., Medford, Mass.

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3-Tube Ocean Hopper

(Continued from page 29)

- 1—Five-prong isolantite socket (for coils)
- 1—"HRO" type tuning dial
- 2—35 mmf. isolantite base-midget trimmer condensers
- 3—Midget R.F. chokes, 2.5 millihenries

HAMMARLUND

- 1—35 mmf. "Star" midget tuning condenser
- 5—100 mmf. midget padding condensers, air-tuned for use inside coil forms

R.C.A.

- 2—Type 1T4 battery tubes
- 1—Type 1S4 battery tube

CORNELL-DUBILIER

- 3—.01 mf. paper dielectric condensers, tubular, 400 volts
- 1—.0001 mf. midget mica condenser, wire leads
- 1—.001 mf. midget mica condenser, lug type

I.R.C.

- 3—Miniature 7-prong sockets for new R.C.A. battery tubes

AMPHENOL

- 1—Metallized resistor, 3 megohms, 1/2 watt
- 1—Metallized resistor, 1 megohm, 1/2 watt
- 1—Metallized resistor, 100,000 ohms, 1 watt
- 1—Volume control, 50,000 ohms, with d.p.s.t. switch

MISCELLANEOUS

- 1—Aluminum panel and chassis (see Fig. 2)
- 1—Knob
- 1—Lot solder, hookup wire, etc.
- 1—Pair of headphones (Cannonball, if magnetic, or Brush, if crystal type) (see text)

International Radio Review

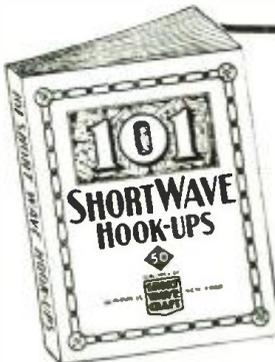
(Continued from page 7)

ambient changes in the temperature of the air, due to convection currents, etc. The circuit shown (*Electronics and Television*, London) comprises the two photo electric cells P and P1, arranged in opposition (anode of one connected to the cathode of the other), across the grid of an amplifier tube; in the plate circuit of which is the measuring instrument M. The radiation to be measured is allowed to fall only upon the sensitive cell P1. See Fig. 7.

Any change in the ambient temperature affects both cells equally, so that the resulting "dark" currents automatically balance out on the grid of the amplifier. The indication recorded by the meter M will therefore be that due to the radiated heat alone.

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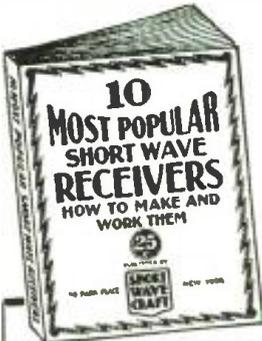
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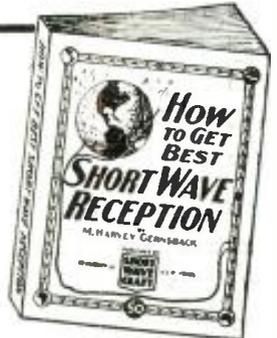
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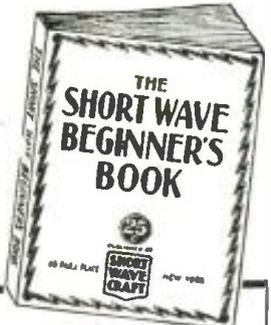
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52 Please Mention This Magazine When Writing Advertisers **RADIO & TELEVISION**



Hockey is a tough game to shoot!

FOTO-CRAFT

SECTION

Edited by Robert Eichberg

Sport Photos

William C. Greene

President of Press Photographers Ass'n of New York, Inc., and Sports Photographer for the New York World Telegram, tells YOU how to take them

● THE other day, as I was standing around the Press Photographers' exhibit in New York, I was watching some amateurs take keen interest in the Sports class. One said: "Gee, I wish we could make sport photos like that." I don't know how many others said the same thing—but why don't you try it?

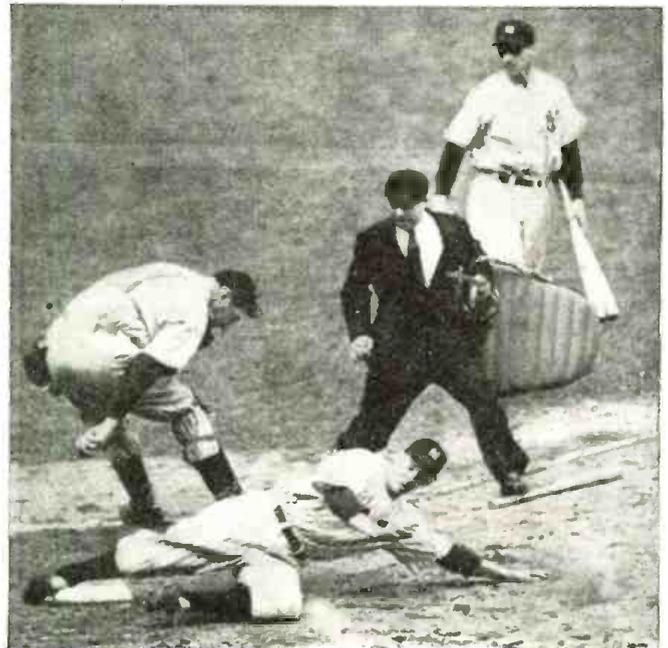
Take baseball. Go to the game and try to get a seat in the upper stands even with first base. Take along your *telephoto* lens. You can cover almost all sports with a miniature camera and a couple of lenses. From your vantage point (even with first base), you can see all the bases and the sun will be at your back. See how well you can cover the man stealing second. That's the best base to watch. Follow the game with your camera. The game will be entirely different than when you just went to look at it. You will get so interested taking photos that you won't care who wins just as long as you get good shots. When there is a man on second you pass up third base and get set to make the shot at

home plate. If there is a chance of scoring, the man on second will always try to make it and you will get a shot of the man sliding in, the umpire giving the call and the catcher making the play. Of course you always get the bat boy. He is a fixed figure. You don't care who it was sliding, all you need worry about is that you get a good photo. Shoot at 1/500 of a second.

Football You can use the same set-up at football. *Get as high as you can!* You have a better chance at this game as you have twenty-two players and they will fill up your film. Try some with your telephoto lens and then try a couple without it, using your 2-inch lens. Of course, the light is not the same as in baseball. Therefore you will have to shoot fast to stop the action. Then force it in the dark room. Break out that extra hard paper. Try shooting at about 1/300 of a second.

(Continued on page 62)

Below — Football is better from the stands than the ground. Right—You can shoot good baseball from first base side with telephoto lens. All photos by Wm. C. Greene, (World-Telegram).



"Speed-Up Motion"

with
Your Still Camera

Dr. E. Bade

By permitting time to elapse between making successive shots an effective speed-up motion can be obtained with a still camera.

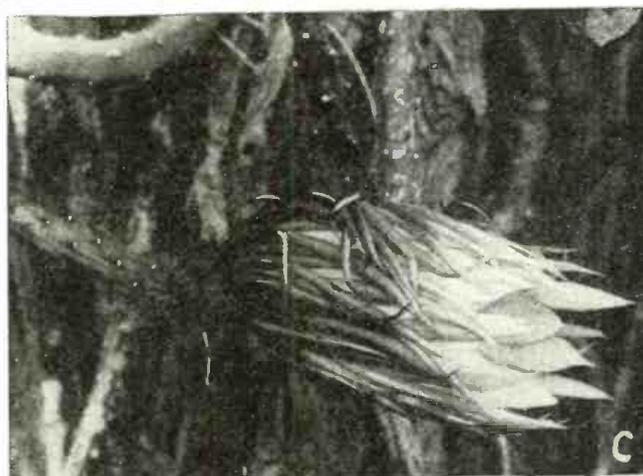
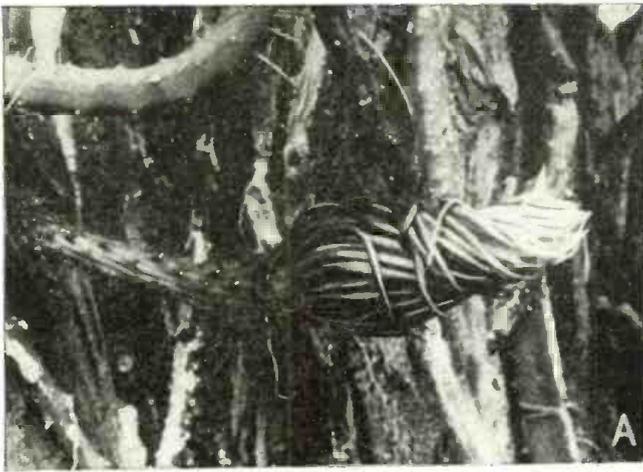
● THE taking of a series of pictures of opening flowers is not at all difficult to do, although it is a time-consuming operation. The flower, while still in bud, and just before it is to burst open, is focused with the camera on a tripod. Then one shot after the other is taken as the bud unfolds to reveal its hidden beauty. The frequency with which the individual shots are to be taken depends entirely upon the plant under consideration. At times a 10-minute interval is not too fast—at others 30 minutes or more must elapse between shots.

The best system to use consists of taking one picture and noting conditions closely. Then leave the spot for five minutes and, on returning, notice if any change has occurred. If so, take another picture; if not, take another walk. Do not leave the spot for too long a period, for things may happen suddenly while you are away and a shot that is missed ruins the entire series.

Watching the unfolding flower and photographing it at the same time introduces a difficulty which is hard to appreciate. Slight motions and changes in the bud as it unfolds are not seen until it is too late. The motions are so slow that one actually misses them on close observation. This is avoided by resting the eye and leaving the scene of operations for short intervals. Then, if anything does happen and a slight change does occur, the eye will notice this change by mentally comparing to its previous appearance.

(Continued on page 62)

Pictures on this page are of the night blooming *Cereus*. First, taken at 3:15 p.m. shows 1st stage as bud begins to unfold. Second, taken at 5:50 p.m.; third, at 6:10. Fourth, made 40 minutes later shows flower well opened. Fifth, below, made at 7:50 p.m. shows fully opened flower.



A Course in Composition

In response to many hundreds of requests for articles on the subject of Photographic Composition, and by special arrangement with the Amateur Photographer and Cinematographer, the Editors are now able to present this unexcelled course.—Editor

RICARDO

No. 6



Watch the Background

THIS advice, so often given and yet so often forgotten, might well be cut out and pasted on the top of the beginner's camera.

Obviously, the background is just as much a part of the general composition as the main item, so that all the details in the surrounding portions require just as much consideration. If the background is too fussy, it stands a good chance of attracting far too much attention to itself. On the other hand, it can be too plain (although this is the better fault of the two)

and so give a cut-out effect to the main subject.

The examples shown are by no means uncommon in novices' prints. Sketch No. 1 suffers from another fault besides that of the church appearing to grow out of the sitter's head—it is not relevant to the main theme of the picture, and it would be much better without it.

Sketch No. 2, while not so humorous, is a good example of what *not* to do. The background is too heavy in tone and character for the type of sitter, as well as being too sharp and distracting. Further, it is too near the subject, so that it was almost impossible for it to be thrown out of focus.

An excellent background for portraits is a plain, light colored blanket. It has no pattern to attract attention, it is not so thin as to crease easily, and, although plain and of an even color, it has just sufficient texture in its



surface to give a character and tone that is usually quite pleasing.

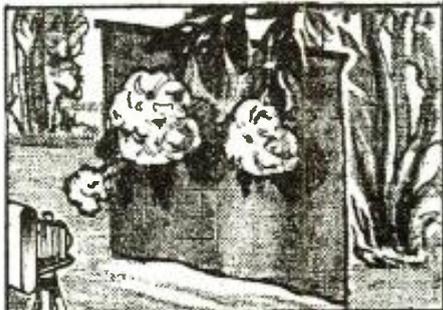
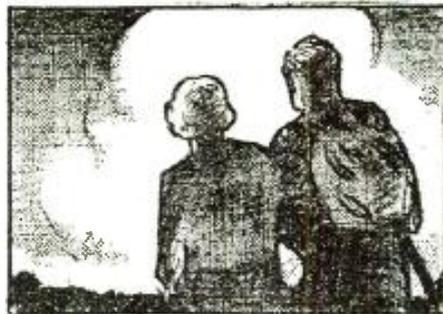
Out of doors the sky provides a very convenient and pleasing background that is seldom out of keeping with the subject. It has one drawback, that of being too light if a dark tone is necessary.

Another disadvantage is that unless a wide expanse of sky is available, without trees and buildings jutting into it close at hand, it means that the camera has to be held low at waist-level and pointed up at the subject in order to have only sky for the background. Then, as we saw in last month's article, there is the danger of a close approach causing unpleasant distortion of the figure.

When photographing flowers and foliage out in the open, it is a good idea to carry a small portable cloth background, say one yard square, with a stick running through one hem. This can usually be held conveniently behind the blossoms, and will not only provide an unobtrusive backcloth, but act also as a screen for the unwanted foliage in the rear.

Should only a patterned backcloth be available and a slow time exposure possible, by gently moving the cloth in all directions the pattern can be softened out and made less distracting.

A soft effect for the background can also be secured by using a large aperture in the lens and focusing sharply on the figure or other subject. The background will then be softer in its rendering by being thrown out of focus. This, of course, is possible only when the background is not too close.



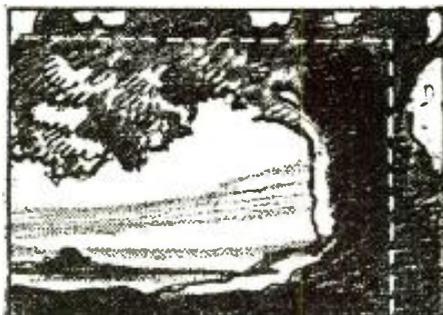
Framing the Picture

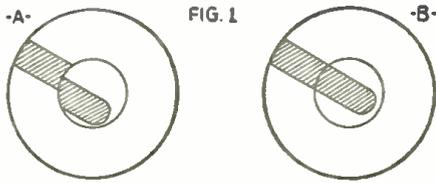
FOLLOWING on the suggestion that a dark foreground can often be employed to act as a strong base as well as a "doorstep" leading in to the subject, we can elaborate on this device until we arrive at a three-sided or four-sided frame as shown in the sketches.

Its big advantage is that it acts like a strong border and also helps prevent the eye from wandering out of the picture. But like other constructional devices, it must not be too assertive or it will defeat its own purpose.

If it is too dark and contrasty in tone value compared with the inside detail, it will literally force the eye to the center.

If there is sufficient light, it should be an easy matter to secure detail in the frame. The trouble arises when there is little or no light coming from the inside and the center is in brilliant sunshine. The rule to follow then is to expose for the scene beyond and, if the frame prints too dark, see that it is trimmed away sufficiently to avoid its dominating the entire picture.





A—IMAGE OUT OF FOCUS: TURN FOCUSING DISC.
B—IMAGE IN FOCUS: READ DISTANCE ON THE DISC.

Fig. 1—How to judge the image.

● A WRONG guess of distance may spoil a good picture. Amateurs can take the guess out of their photography by constructing a range finder. The cost of constructing a range finder is reduced greatly by using scrap materials.

The body of the range finder is made from square brass tube, $\frac{3}{4}$ x $\frac{3}{4}$ x $3\frac{1}{2}$ salvaged from the local junk yard. After cleaning the metal a $\frac{1}{4}$ inch hole is drilled $\frac{1}{2}$ inch from one end. Directly opposite, a $\frac{5}{16}$ inch hole is drilled. On the same side, $\frac{10}{16}$ inch from the other end, another $\frac{5}{16}$ inch hole is drilled. The two $\frac{3}{4}$ inch end-pieces may now be cut from some scrap brass. An eye-piece for the $\frac{1}{4}$ inch hole is made from a small friction lid and soldered in place. On this same side a $\frac{3}{16}$ inch hole is drilled $1\frac{1}{8}$ inches from the other end of the tube. This hole is for the adjusting screw. Over this hole a nut is soldered. The screw is a $\frac{1}{8}$ inch machine screw $\frac{1}{2}$ inch long with 24 threads to the inch. The focusing disk, of heavy brass or copper, 1 inch in diameter, is soldered to the screw.

Two $\frac{11}{16}$ x $\frac{3}{8}$ inch mirrors are cut from a discarded pocket mirror. The stationary mirror is scraped clean, leaving a $\frac{1}{8}$ inch circular spot of mirror in the center. A bracket is cut from thin brass and soldered to one of the end pieces. This

How to make your own RANGE FINDER

John J. Beck

tells how to utilize scrap in building this photographers' necessity.

bracket must be bent in order to hold the mirror at an angle of 45 degrees.

The movable mirror mount is made of thin brass and a hinge. It is soldered to the remaining end plate. The solid mirror is then glued into this bracket.

The end plates are now soldered into place. The stationary mirror is put in place first, making sure that the silvered spot is in the center of the eye-piece. Adjustment may be made by bending the bracket slightly.

Hold the movable mirror in place and look at a distant object. By twisting the end plate and turning the adjusting disk line up the image as at B in Fig. 1. The lines of the superimposed image should meet the

lines of the visual image. The end plate is now soldered into position. A ring for a cord may also be soldered on. If the finder is to be used on a camera with an accessory bracket, a clip may be soldered on for this purpose.

The last step in the construction is graduating the adjusting disk. Take a tape measure and the range finder out of doors.

(Continued on page 60)

Fig. 2—Working drawing of the range finder's construction.

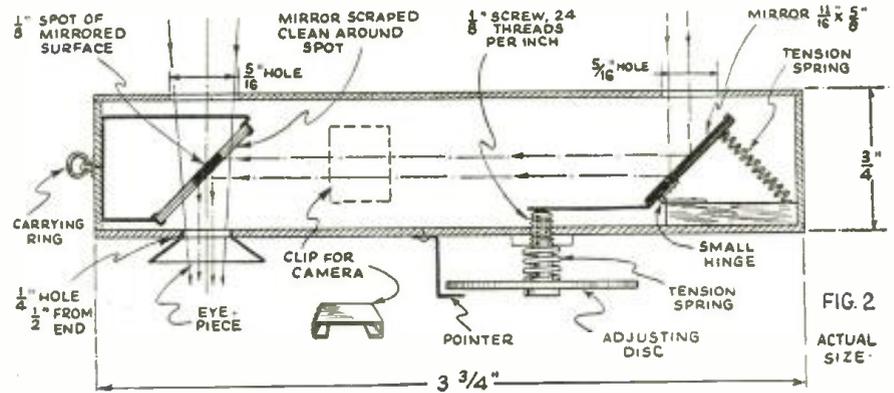
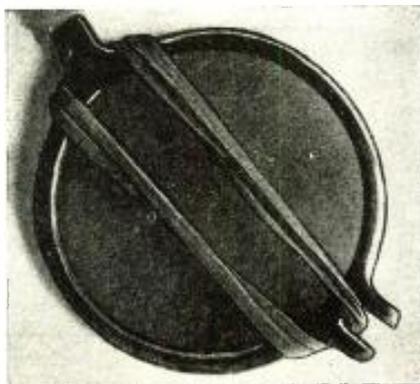


FIG. 2
ACTUAL SIZE



How filter is mounted.

● THE amateur photographer who desires to acquaint himself with the use of color filters but cannot afford to purchase those placed on the market by the various manufacturers, need not be in despair. He can make his own filters at a very nominal cost and with but little work.

Colored spectacles, such as one can procure at most any five-and-ten-cent store in various shades and colors, can be made to yield usable if not excellent color filters for amateur use. Though they will not be as optically perfect as those which you can buy for a dollar or two at photo dealers,

FILTERS from the Five and Ten Cent Store

Joseph Jayko

reveals a money-saver for those who want to experiment with filters.

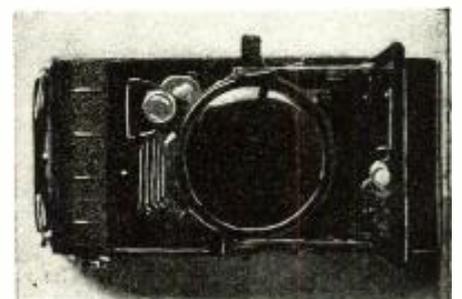
these improvised filters will produce surprisingly good results if used correctly.

Flat lenses are better than those of the curved (or "toric") type. One relatively free from flaws may be selected by holding the lens a few inches from the eye, and moving it from side to side. If an object seen through it does not appear to shift or become distorted, the lens will serve as a filter.

To adapt these lenses to photographic use, first remove from the spectacles the two parts that slip over the ears to hold the glasses in place when being worn by a person. Then separate the two lenses by

cutting the frame where it bridges the nose. This being done, there will be two or three little stubs—depending on the make of spectacles—left protruding from the rims, almost opposite each other. So we take an elastic band, double it up a number of times and stretch it between two of the stubs—

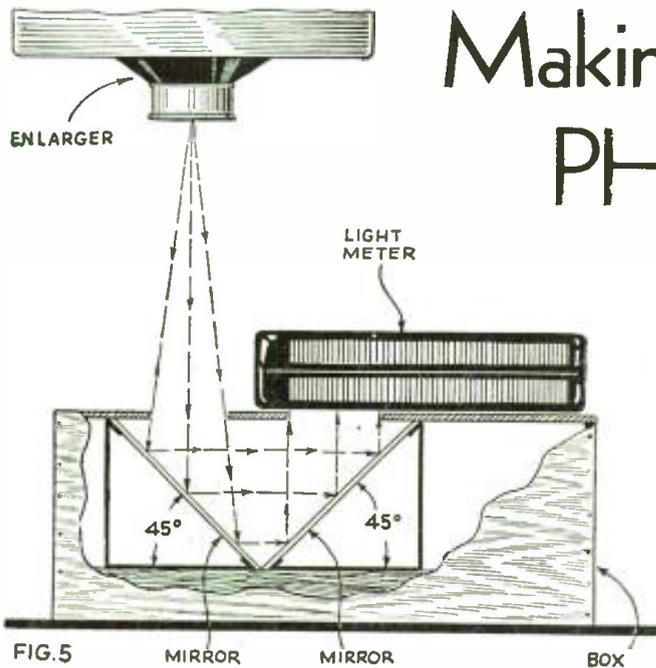
(Continued on page 60)



Camera with filter in place.

Making Gadgets for Your PHOTO METER

Robert Eichberg



How funnel is cut off to serve as light focuser.

Fig. 2, below. Funnel in place on meter; Fig. 3: checking small area on film.

Two mirrors permit reading photo meter in application illustrated.

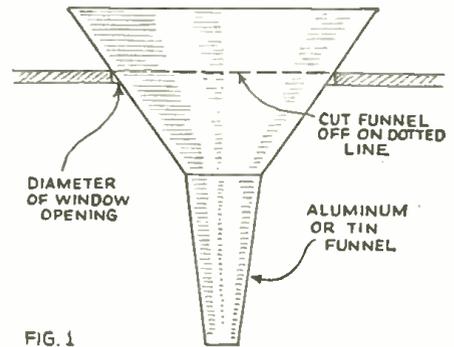


FIG. 5

FIG. 1

● ONE of the most useful accessories in any photographer's kit is a precision exposure meter. The writer recently acquired a Weston Master and found it invaluable for indoor shots as well as the more usual outdoor work, for its high sensitivity and for its "band spread" feature, which has the effect of giving magnification of the lower end of the scale adapted particularly well to low intensity light.

The instruction book which comes with the meter shows various other uses for it as well, one of which is to measure the density of negatives, when they are in position on the print box. This is swell as far as it goes, but the writer wished to go a step further—he wanted to measure the densities of small areas of the negatives.

The simplest and most obvious way is to make a mask which may be laid over the negative, but while this is easiest it is by no means the most convenient. A 5c funnel

provided a far more satisfactory answer. As shown in Fig. 1, the funnel was cut off at a point which would leave it of correct size to fit into the window of the photo cell on the bottom of the meter when the mask of this cell was opened. The cutting job was done by placing the spout of the funnel in the chuck of an electric drill and revolving it at high speed while a fine saw blade was held against the cone of the funnel at what was estimated to be a slightly larger circumference than the correct point. After the cut had been made, the funnel was checked against the opening in the meter case and found to be slightly large. It was dressed down with a medium file and tried at frequent intervals for fit, until it was of a size to slip in and out with gentle pressure.

Fig. 2 shows how the funnel is assembled into the meter case. The use of the gadget is illustrated in Fig. 3. With it one is

tried at frequent intervals for fit, until it was of a size to slip in and out with gentle pressure. Fig. 2 shows how the funnel is assembled into the meter case. The use of the gadget is illustrated in Fig. 3. With it one is

(Continued on page 63)

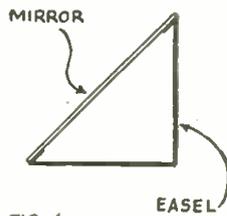


FIG. 4—See text.

Fig. 6. How meter and box are set up on enlarger frame; Fig. 7: the mirror box alone.

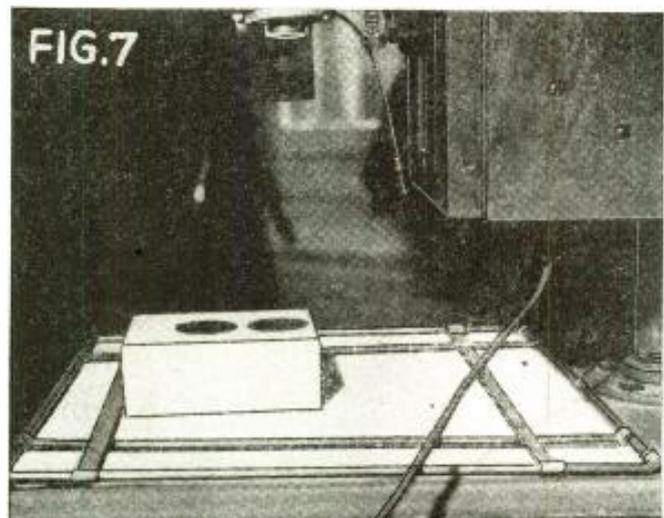
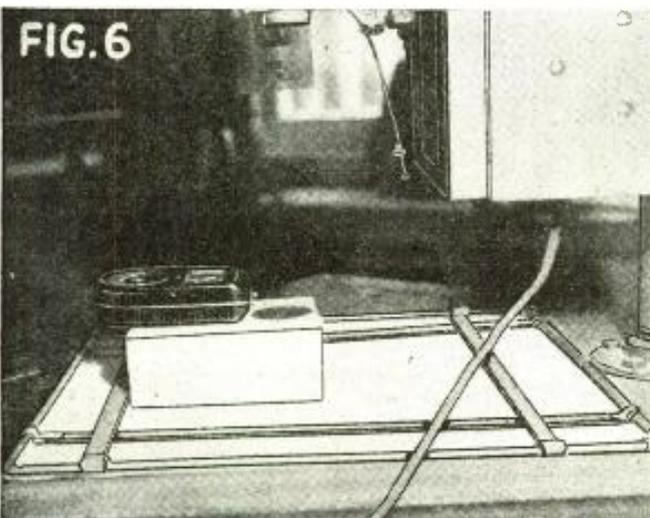
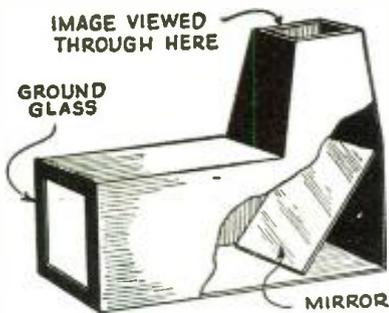


Foto Hints and Kinks

Focusing Aid

● A FOCUSING aid for cameras which employ a ground glass back can be made in about a half hour out of parts which are readily obtainable—if they are not already in your apparatus kit.

First cut out a piece of cardboard of the dimensions given. Next, fold on dotted lines. An easy way to do this is first to cut just below the surface with a penknife, in order to secure a straight fold. Then, on the ends marked "X," glue strips of cardboard about $\frac{1}{8}$ " wide. These strips should be glued about $\frac{1}{8}$ " from the very edge (or the thickness of the ground glass to be inserted). Cut them a little shorter than the width of each side so they will not interfere with proper folding.



Adapter for viewing ground glass.

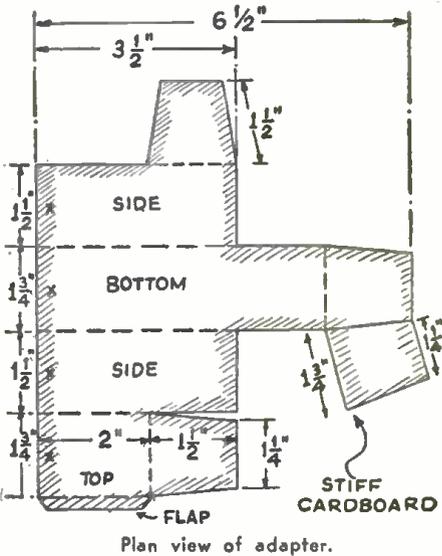
After the strips have dried cover the inside with black scotch opaque tape to eliminate reflections. It is best to tape each section separately. Then glue the flap to the inside of the opposite side. It is then a simple matter to glue or tape the rest of the gadget in place, and the entire unit is then taped on the outside.

Next, insert the mirror at a 45 degree angle. This mirror, which should measure $1\frac{1}{8} \times 2$ " to fit the above instrument, is glued into place. Before doing so adjust it, insert the ground glass temporarily and lay the instrument on a level surface. If the mirror shows an exact square of light, it is ready to glue in.

Finally, put the ground glass in place. It may be held with scotch tape wound around

the instrument and overlapping about $\frac{1}{8}$ " over the edge of the glass. Ordinarily the image on ground glass back of a camera is fuzzy, and to add to the complications it is upside down. With the instrument described, the image is right side up and very much clearer. The gadget can be used in any brightly lighted place without affecting the brightness of the image.

This instrument is useful in table top photography. After proper focusing, distances from subject to camera may be marked down prior to taking the pictures.—*Jos. F. Bonarrigo.*



Plan view of adapter.

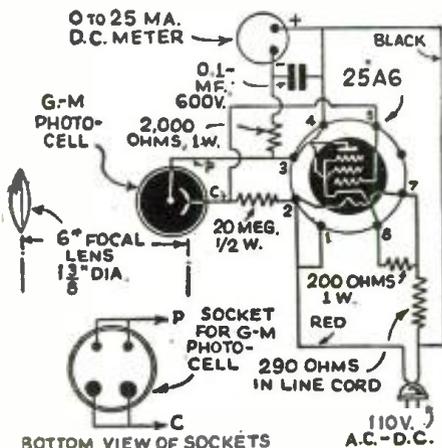
Light Intensity Meter

*M. N. Beitman

● A light intensity meter using inexpensive radio parts will operate from any 105-120 volt A.C. or D.C. source and is especially useful for duplicating light conditions for indoor photography. Once you know that a certain amount of light (no matter from what source it is supplied) will give good results with a definite speed and type of film, the same fine results can be duplicated even if other light sources are used.

The heart of the arrangement is a low-priced sensitive photo-cell. The light impulses are directed to the cathode of the photo-cell with the aid of the condensing

*Allied Radio Corp.



Circuit of light meter.

lens—which has a focal length of six inches and is properly mounted at this distance in the unit.

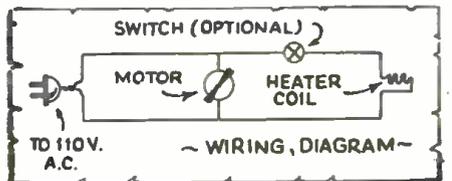
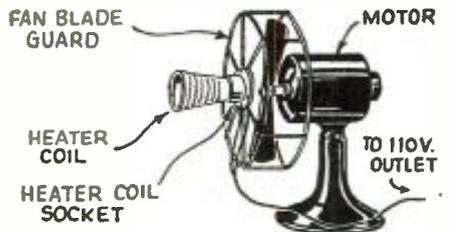
The electron emission in the cell will, of course, depend on the light present and will be amplified by the high gain type 25A6 pentode tube in a self-rectified circuit. The actual plate current is measured on the 0 to 25 milliammeter which serves as an arbitrary indicator of the light intensity. The 0.1 mf. by-pass condenser eliminates flutter of the meter needle.

The 2,000-ohm resistor in the plate circuit and the 200-ohm unit in the cathode return are used to limit the steep rise of current under conditions of extremely bright light. Actually, the current rises logarithmically with respect to the light intensity, so an exact scale can be plotted.

The parts should be assembled and wired as illustrated after a suitable case has been obtained. To use the unit, the power cord is simply "plugged-in" and the light intensity will be recorded on the meter. For accurate results, the lens should be held directly toward the light. In using D.C. power, the plug must be inserted in a certain way; if no results are obtained at first, reverse the plug in the socket.

LIGHT INTENSITY METER Parts List

- 1—6 prong wafer socket
- 1—4 prong wafer socket
- 1—G-M photo cell (available from Allied Radio)
- 1—Type 25A6 metal tube
- 1—Metal cabinet
- 1—0-25 ma. D.C. meter
- 1—Line-cord resistor, 290 ohm
- 1—6" focal lens, $1\frac{3}{8}$ " diameter
- 1—.1 mfd. 600 volt paper condenser
- 1—2,000 ohm, 1 watt carbon resistor
- 1—200 ohm, 1 watt carbon resistor
- 1—20 megohm, $\frac{1}{2}$ watt I.R.C. resistor



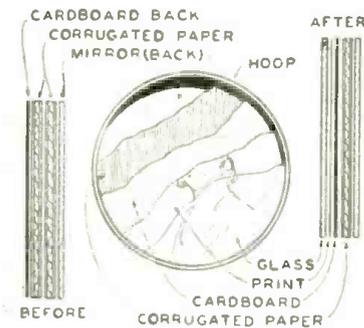
How dryer is built.

Film Dryer

● AN old electric fan and a heating unit from a radiant type heater are assembled as shown in the drawing herewith to provide a blast of warm air to dry film rapidly. A porcelain electric light socket is clamped to the center of the wire fan guard. This socket is connected in parallel with the line feeding the fan motor, and a switch is put in series with it so that the heating coil can be used or not, as desired. The heating coil is a standard one, obtainable at any 10c store. When the fan and heating unit are turned on, a warm, gentle breeze dries prints or negatives in no time at all!—*Meredith M. Stroh.*

Combination Mirror & Picture Frame

● A MIRROR that rotates on a folding wire stand may be had in dime stores everywhere for 15 cents, and can be converted easily into a combination mirror and portrait frame in the following manner:



Constructional details of frame.

First, remove the wire stand. This is done by spreading the stand and unhooking it from the celluloid hoop. Next, remove the celluloid hoop simply by inserting the finger nail or the point of a sharp instrument between the overlapping ends of the hoop at the joint. Upon removing the hoop it will be found that there are two discs of corrugated pasteboard sandwiched between the mirror-glass and the cardboard back, as shown at the left of the illustration. The mirror is now taken to a glass shop where a disc of clear glass is cut to the same size as the mirror. A circular section is removed from the portrait to be used, and the material is then ready to be assembled as shown at the right of the drawing. Notice



The finished mirror-frame.

that only *one* corrugated disc is used; this is to make room for the photo and extra glass that are added. The celluloid hoop is replaced in position and the overlapping ends held fast with a drop of glue, acetone or cement. For the final step, snap the wire stand back in its original position.—Arthur Trauffer.

Automatic Darkroom Timer

● I STARTED out with a luminous-faced electric clock, but soon found that it was next to impossible to tell the difference between ten and fifteen seconds. Elapsed time is an important part of the formula for making successful prints, so I set about designing an electric clock that would be

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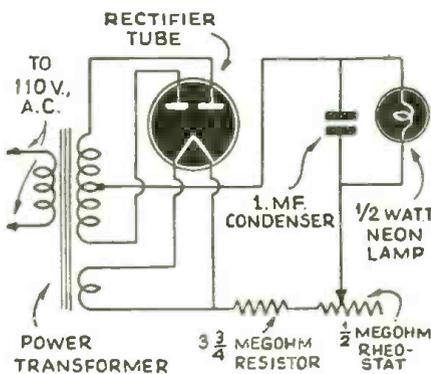
For the next five best, 1-year's subscription each will be given. All others appearing in this department will receive 8-months' subscriptions.

Photo hints may be illustrated with photographs, crude drawings, or need not be illustrated at all. However, the person submitting the hint must have tried it.

This month's Prize Winners are: 1st Prize, Jos. F. Bonarrigo. Other awards, M. N. Beitman; Meredith M. Strohl; Arthur Trauffer; Robert F. Brown; Albin Nowak.

accurate and readily visible in the murky darkroom.

As long as we have to peer at some kind of time-keeping device, it does not really matter whether we count the dots around the edge of a dial, or keep track of elapsed seconds by any other method that may suit our fancy, so long as we can tick off the seconds accurately and easily from the



Circuit of darkroom timer.

time the printing light goes on, to the instant that it should go off. The counting of "one chimpanzee, two chimpanzee, three chimpanzee . . ." proved remarkably inaccurate in my case, so I procured a modest assortment of odds and ends from a friend in the radio business, and at the end of a few hours experimenting had evolved and constructed a device that, when attached to the 110 volt socket, caused a small neon lamp to flash at the rate of one flash per second. The lamp itself emits a red glow when it is illuminated, and these periods of illumination are so brief that the total effect on sensitized paper is absolutely nil.

The actual construction of this busy little time-keeper requires but little in the way of time or tools. The materials themselves are best procured from a radio repair shop, where they may be salvaged from a junked set, and wired together by the technician, if the fotofan does not wish to wield the soldering iron himself. The list of necessary parts follows:

- 1—power transformer, such as might be used in a four-tube radio set
- 1—rectifier tube, type 80
- 1—4-prong tube socket
- 1— $3\frac{3}{4}$ megohm, 1 watt resistor
- 1— $\frac{1}{2}$ megohm rheostat
- 1—1. mf. paper condenser, 400 volt rating
- 1—porcelain socket for $\frac{1}{2}$ watt neon bulb
- 1— $\frac{1}{2}$ watt neon bulb

The theory underlying the operation of the device is that the power transformer steps up the 110 volt house current to approximately 250 volts. The rectifier tube then changes the alternating current to direct current. This direct current flows

(Continued on page 60)

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through the resistors into the condenser, which is connected across the neon bulb. The neon bulb will flash only after a certain minimum voltage has been built up across its terminals. Enough current will flow through the resistors in one second to charge the condenser to the critical voltage for the bulb, so the current stored in the condenser will then jump through the bulb, briefly illuminating it, and thereby discharging the condenser, which immediately starts again to store up current passed by the resistor, beginning a second cycle. The rheostat is used as a variable part of the resistance so that low or high line voltage, or slight differences in power transformer secondary voltages, may be compensated for. After it has been set at a point where it allows passage of sufficient current to flash the bulb exactly once each second, its setting may remain fixed. Assuming a high grade paper condenser having a capacity of one microfarad, and a power transformer as specified, the value of the resistor and rheostat will be found correct. However, if the transformer secondary voltage (or the house lighting 110-volt A.C. circuit) is high, some of the additional resistance contained in the rheostat is used. In other words, if the lamp flashes more than once a second, turn down the rheostat, and vice versa.

The model that I constructed has been giving excellent service. It is built inside the contact printer box, with only the neon lamp and a knob to adjust the rheostat visible. It flashes merrily away, once a second, for hours on end, much to the amazement of my friends and the gratification of myself. I have a door-bell type of push-button switch to control the printing light, and while I hold it down I simply count the required number of flashes in the neon bulb. It's a pleasure.—*Robert F. Brown.*

Range Finder

(Continued from page 56)

Focus it on objects at various distances and mark the indicating disc accordingly. Calibrations should be made at 3, 4, 5, 7, 10, 12, 15, 20, 25, 30, 35, 50, 75, and 100 feet, with a scratch. Dip the disk in melted paraffin and cut the lines and numbers into the paraffin with a sharp point. It is then etched with dilute nitric acid. The range finder may now be given a coat of enamel or a natural finish.

Filters

(Continued from page 56)

as shown in the accompanying photo. And our filter is ready for use.

To attach the filter to the camera, just spread the elastic with your fingers and slip the bands over the lens mount. It may not rest exactly in the center, but no matter so long as the whole of your camera lens is covered.

As you will not have access to tables giving the factors of these filters, it will be advisable to make a record of the first few exposures. A good procedure for determining the factors of home-made filters is to make three or four exposures at as many different shutter and diaphragm settings, then developing the film and making a note of the results obtained.

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A volume of rare fascination which traces the development of the art and science of photography from the earliest discoveries to the elaborate technique of the modern sound and color films. Dr. Mees, an outstanding authority, has written a vivid and animated account of photographic art and industry in their many phases from which everyone interested in picture-making, "still" or "motion," will derive invaluable information and pleasure.

PHOTOGRAPHY FOR FUN AND MONEY

By A. Frederick Collins, 392 pages, 144 illustrations, \$3.00
An extremely helpful guide and reference book. Detailed explanations of the various kinds of cameras, the uses to which they are particularly adapted; the optical principles in photography; lenses, filters, accessories; construction, and step-by-step instructions and advice, and step-by-step guidance in making and taking of all types of pictures—night, portrait, indoor, etc., as well as special chapters on color and motion pictures.

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By Henry M. Lester, 288 pages, 144 illustrations, \$3.50
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THE PHOTOGRAPHIC BUYERS' HANDBOOK

By A. R. Lambert and Consumers Union, 344 pages, 125 illustrations, \$2.75
An impartial guide to the vast amount of photographic equipment now on the market. Every product that an amateur is likely to buy is analyzed and described. Facts and prices have been checked not only by Consumers Union, but by one of the largest and best-known photographic supply houses in the world.

NATURAL COLOR FILM

By Clifford A. Nelson, 128 pages, illustrated, \$1.75
The characteristics of each of the natural color emulsions fully discussed with specific instructions for successful manipulation. Problems of color composition, lighting, details of exposure and many others treated in full detail. Complete section devoted to making paper prints in full color by the most popular methods—Kodachrome, Duafacolor, Agfacolor, etc.

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By Laurence Dutton, 153 pages, 61 illustrations, \$2.50
Do you know what enlarging paper a negative requires, what degree of contrast, what exposure, how to achieve the exact tonal quality you are after? "Perfect Print Control" gives you all this and more. Contains valuable tabular information on negative densities, paper emulsion speeds and illumination control.

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In this splendid book—really a manual of approved procedure—the author talks step by step, especially to the reader on camera equipment, backgrounds, film emulsions, posing, draperies, clothing, exposures, and the many problems that arise in actual work. Both indoor and outdoor portraiture fully treated. Technique based on the use of only two inexpensive lighting units.

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By T. F. Lourie, 96 pages, 12 illustrations, tables, 75c
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What's New?

New Black-Top Projection Lamp

● NO more need the customary metal lamp-cap be used atop the lamps supplied by the Bell & Howell Company for Filmo Projectors. Instead, these new B & H projection lamps are coated with opaque black at the top of the glass. This black top is said to reduce greatly the light filtering through the top of the lamphouse, and of course it eliminates the necessity of shifting the metal cap from a burned out lamp to a new one.

New Lens for Filmo-Master 8 MM. Projector

● BELL & HOWELL announces that a new, superfine projection lens, said to be ideal for difficult projection conditions, is available for the Filmo-Master 8 mm. Projector. B&H states that owners of the Filmo-Master 8 will find this lens particularly useful when projecting unusually large pictures, when screening during daylight hours in a room which cannot be darkened completely, etc. The new lens is a well-corrected, 1-inch, F 1.6 anastigmat, and is claimed to produce excellent detail over the entire picture area. It may be used in all FILMO 8 projectors now in use.

Enlarger

● DISTINGUISHED by interchangeability of lenses, evenness of illumination, rugged construction, simple, direct adjustments, and a modest price, the Kodak Advance Enlarger is announced by the Eastman Kodak Company.

This new equipment accepts negatives in all the popular amateur sizes. Its carrier also accommodates full postcard size negatives, 3 1/4 x 5 1/2 inches, and allows projection from a 3 1/4 x 4 1/4 area of these.

An outstanding feature is the ease with which lenses can be interchanged.

Projection Print Scale Finds Exposure Time; Indicates Paper

● THE Kodak Projection Print Scale, an inexpensive testing device which affords a quick, accurate method of determining exposure time and choosing the correct contrast grade of enlarging paper, is announced by the Eastman Kodak Company.

The scale is a 4-inch disc, divided into ten numbered sectors which decrease clockwise in density. A test print is given a sixty-second exposure, with the scale placed on top of the sensitized paper in the paper holder. After the print is developed, the correct exposure time, in seconds, can be read directly from the best sector, as printed.

If the test print shows detail in each sector, that indicates the proper grade of paper has been chosen. If details appear on only two or three sectors in the test print, the chosen paper is too contrasty. If details are lost on practically all of the sectors, the paper is of too soft a grade for the negative. With the sector print as a guide, a more suitable grade of paper may be selected.

Infra-Red Photography New Data Book

● "INFRA-RED Photography with Kodak Materials," a new title in the series of photographic Data Books issued by the Eastman Kodak Company, is paper-bound and uniform in format with the other Kodak Data Books.

Both theoretical and practical aspects of infra-red work are discussed in the new, copiously illustrated 34-page booklet, which is complete with specification tables for Kodak Infra-Red Film, Eastman Infra-Red Sheet Film, Eastman Infra-Red Sensitive Plates, and Eastman Infra-Red Process Plates. The nature of infra-red radiation, and its place in the spectrum, are treated. Applications in pictorial photography, long-range work requiring haze penetration, photography in darkness, criminology, discovering forgeries and restoring obliterated passages in censored books, copying, and other fields are described.

Data are given on lenses and filters suitable for infra-red photography, hypersensitizing techniques, exposure for landscape pictures, and shots by artificial light. The specification tables include characteristic curves and full processing data, and a lengthy bibliography is supplied.

Rubber Darkroom Apron

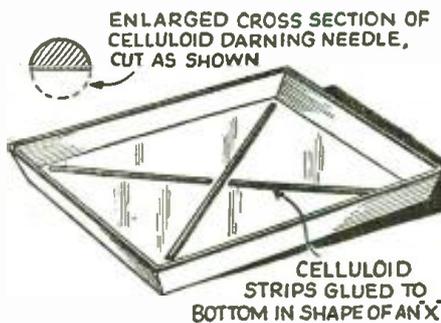
● A PRACTICAL addition to the serious darkroom worker's equipment is the Raygram Rubber Darkroom Apron, which is made of high grade rubber coated fabric and light in weight, but sufficiently heavy to withstand abuse. A unique feature of this apron is a trough at the hem to catch any hypo or developer which might otherwise stain shoes or clothing. A breastpocket has also been provided for carrying thermometers, pencils, etc.

Box Type Beaded Screens

● RAYGRAM Corporation, distributors of photographic specialties, has announced the Raygram Box Type Beaded Screens, made of Dupont screen cloth, with a coated back and perfectly beaded with graded blue white glass beads. An important feature is the semi-automatic frame; when screen is pulled out of the case, it automatically stands erect. A slight pull on the release cord is all that is necessary to close it. These screens are made in four sizes.

Improving Photo Trays

● PAPERS, cut-film, and plates are easier to handle if the following kink is used. Obtain two long celluloid knitting needles about 1/8-inch thick, which will fit diagonally in your trays, and cut the tops off them. One of the needles is then cut in half. Sand



one side of all pieces on fine sandpaper to flatten them, and cement them in the bottom of your tray in the shape of an X. Use a good grade of waterproof glue or cement. This raised portion of the trays will keep film and paper from sticking to the bottom and will facilitate handling.—Albin Nowak.

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H. Gernsback

Editor

NO. 1122

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- Adapters Are Good Money-Makers
- New Circuits in Modern Radio Receivers—No. 32
- Service Questions & Answers
- Servicing "Orphans" and Private-Brand Sets—Part III (Conclusion)
- Some Modern Aspects of Frequency Conversion in Superheterodynes
- Profits in Recording
- Sound Engineering—No. 5
- Designing a 60-W. Direct-Coupled Beam-Power Amplifier
- The Latest "Miniature" Hearing-Aid Amplifier
- The "Baseball Special"—A 1-Tube Broadcast Receiver

Sport Photos

(Continued from page 53)

Fights When you go to fights take along the fastest lens you have and Pan film. Try to get a right seat on the end. If you are reasonably high then you have the advantage. You can cover the ring with one focus. If you are low, you will have your headaches—but it is a lot of fun! Your light is good and you shoot about 1/300 second *wide open*. Break all dark-room rules and develop twice as long as you would with any other subject. Keep up the agitation. *Boy, will you be surprised at the results!* If the room is filled with smoke and the light is bad, you will be forced to shoot slower. You can make good shots from any place at a fight. Just be careful of the bobbing heads in front of you. When the knock-out comes everybody jumps up. You do the same!

Tennis Tennis is a fast game and you have to *shoot fast* to get good *action* shots. Get at an angle to the net. Set your focus on the net and then watch the players. When one rushes to the net, shoot! One will always rush toward the net and will come reasonably close to it to get a good shot. If you feel like working hard, get out your telephoto and start to make action on the players, such as when they jump up, fall down, etc. This will show how good you are. You will be forced to change your focus so fast that just as you get set you will find they have moved. If you have a headache after the match, don't blame me.

Hockey Hockey is a game where you have to shoot fast and force your film in the developer. Try to get a seat high over the back of the goal. You can get only one goal. Oh, yes, all the goals will be made at the other end. That's the chance you take. Focus on the goal and when they all get around the goalkeeper, *let her go!* You will get the fellow just rushing the goalkeeper, and the puck heading for the net. You shoot about the same as at a fight, but your light will be poor.

Skiing Skiing is fun and also plenty cold. The best position is just as they start down the runway. You can see the fellow's face and it always makes a good shot. You have to keep working your camera without the film in it, otherwise it will freeze up on you. Then you try the usual shot of the men in the air with a nice background that fills out the picture. You have to shoot fast to stop the action. You get better photos in the wide open spaces and the snow on the ground and trees also helps. So don't worry about being under-exposed. Of course, take that filter off and shoot fast, like 1/800 to 1/900 of a second at f:5.6. *Always remember to keep out of the way of the newspapermen.* That's all.

"Speed-Up Motion" with Your Still Camera

(Continued from page 54)

In taking this type of series pictures it is far wiser to waste film than to be sparing in its use. A shot missed cannot be retaken, while a shot showing only a minor change can be left out in the final printed series. (Four intermediate stages, for example, were omitted from the series shown with this article.—EDITOR)

The time elapsed between taking the illustrations on page 54 is as follows: Between A and B, 2 hours, 35 minutes; between B and C, 20 minutes; between C and D, 40 minutes; between D and E, 1 hour, 20 minutes.

Making Gadgets for Your Photo Meter

(Continued from page 57)

to take a reading for shadows to bring out shadow detail in the finished print, or for high lights so that they will not be over-printed.

While the method described is particularly suited to the Weston Master or other meters with a round window for the photo cell, similar gadgets can be made for use with meters having photo cell windows of other shapes and sizes.

The position of the photo cell window in this particular meter, being directly opposite the dial, makes it a bit more difficult to take readings when enlargements are to be made. The writer is a rather picky person and is not satisfied with positioning the meter directly below the enlarger lens and standing on his head (or using a mirror) to get an over-all reading of average negative density. And, as in measuring negatives for contact prints, he wished to be able to investigate any given area.

The simplest system of doing this was to secure a small mirror from a vanity and mount it at a 45 degree angle on a cardboard easel, as shown in Fig. 4. This permitted the meter to be set up on its side and to have the light from any portion of the easel reflected into it. However, there was too much chance for stray light to affect the reading when sufficient room or flashlight illumination was used to make the meter dial and needle visible.

A far more effective system was soon devised. This consists of an arrangement as shown diagrammatically in Fig. 5. As will be seen, two mirrors are used, which en-

ables the meter to be placed with the scale upward, and thus to draw its illumination from what light is being projected by the enlarger. Fig. 6 shows how the meter and box are set up on the enlarging easel to secure a reading. The box alone appears in Fig. 7.

Through the use of this gadget, one is enabled to explore the projected image and time the exposure for high lights or shadows or even to dodge.

In order to use a meter of this sort for enlarging or printing one must make up his own exposure table. Though this sounds like quite a task, it is really far simpler than it seems. It is necessary only to make a large number of readings on a large number of different negatives and to note down what exposure gives the best results for each meter reading. This should be done with various types of paper. If one finds a wide variety of gradations on the negative, he will want to use a paper with a wide scale. If not, a paper of limited scale is more desirable.

Taking readings of the lightest and darkest portions of the negative and of the point of maximum interest will give the user definite information on which to base his printing or enlarging exposures. Such readings enable him to perform more accurate work than is possible with a general reading of average negative density.

These gadgets take but a few minutes to make and result in far better work in the dark room.

Exposing Popular Photo Fallacies

(Concluded from last issue)

Another popular fallacy is that one must be super-accurate in making exposures when taking pictures. Far be it from the writer to say a word against accuracy, for the more accurately exposed a series of pictures, the more uniform the negatives will be. But even the fast films have considerable latitude, while with the slower films it is tremendous.

In a series of tests conducted with various films, the writer found that little difference could be seen in the negatives when exposures from 1/2 to 2 times were given, as indicated by a Weston meter even when using a high-speed Superpan Press film. As a check to make sure that the meter was working properly a DeJur Amsco meter and a Expophot meter were also tried—with precisely the same results.

In order that there could be no question as to whether or not the shutter speeds were inaccurate, another test was made leaving the shutter at the same setting (it happened to be 1/25 second) and varying the diaphragm opening. The results were still the same. There was slight difference between the negative given the least exposure and the other two, which could scarcely be told apart, in each series of 3 shots.

Fine grain is another bugaboo which has

impressed many a photographer—experienced as well as novice. If one is going in for ordinary prints and enlargements up to no more than 4 or 5 diameters (which would give you a 5 by 7 from a half vest pocket negative) grain need not bother you. However, it is a fact that while the grain will not be evident on enlargements of this degree, grainier film will show a surprisingly less amount of fine detail. In fact, a very fast and grainy film will often give very nearly the effect of a soft focus lens when enlargements are made, even when its grain will not be noticeable. A fine grain film, such as Finopan or Panatomic, will provide much more sharpness, while a grainy high speed film will, when enlarged from 5 to 8 times, even give very nearly the same effect as might be obtained when using a soft focus lens.

Fine grain developer is really not a photo fallacy, but the idea that almost any developer can not be used for fine grain work definitely is. If an ordinary developer is diluted with an equal quantity of water and the time of development is increased, the requisite amount (usually twice the development period, best determined by test) results approximately those of commercial fine grain developer will be achieved.

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The Reader Speaks

A Fine Magazine

Editor,

I think you have a fine magazine. I can't see why anyone would object to your "Foto" section, as long as nothing is sacrificed from the original magazine. I am in favor of it. I enjoy the lessons by C. W. Palmer and miss the lessons by W2CDV.

Best wishes for continued success.

MAURICE TREGO,
Cumberland, Iowa.

We're Tops—But Keep It All-Radio

Editor,

Here's where you get some well deserved praise and a kick in the shins!

Your radio magazines are *treasured all over the world* by fellows interested in the art of Short Waves. Photography is altogether a different hobby than radio, so why not keep it in a separate book? When I buy a RADIO book I don't want a combination HOBBY book that tells about something that doesn't interest me in the least. Except for the joining of the two hobbies your magazine is "TOPS" and I think that's expressing the feelings of all.

A Constant Reader.

CHARLES TAYLOR,
4 Water St.,
St. Catharines, Ontario.

Likes Foto-Craft Section

Editor,

May I add my opinion to those already received regarding the incorporating of *Foto-Craft* with RADIO & TELEVISION. It's a swell idea! I have long been interested in photography and have only recently become interested in radio through accidentally picking up a copy of "R&T" at a friend's home. No doubt that your new combination will attract many new "fans" to amateur radio, and vice versa, as the two subjects are now so closely related, thanks to *facsimile* and *television*.

With best wishes for the success of your new section, I am

Sincerely yours,

R. L. HAWKS,
303 Joplin Street,
Joplin, Missouri.

Foto Section a Great Idea

Editor,

I have been reading RADIO & TELEVISION for over a year now and although I don't subscribe. I never fail to buy my copy every month.

Incorporating RADIO & TELEVISION with *Foto-Craft* was a great idea, as I am interested in photography.

Through your *Barter & Exchange* columns I have acquired many articles which I needed.

I would like to exchange SWL cards, postcard views, or correspondence with anyone in the world.

I wish your magazine the best of luck.

WALTER L. MONK,
51 Vineyard St.,
Providence, R. I.

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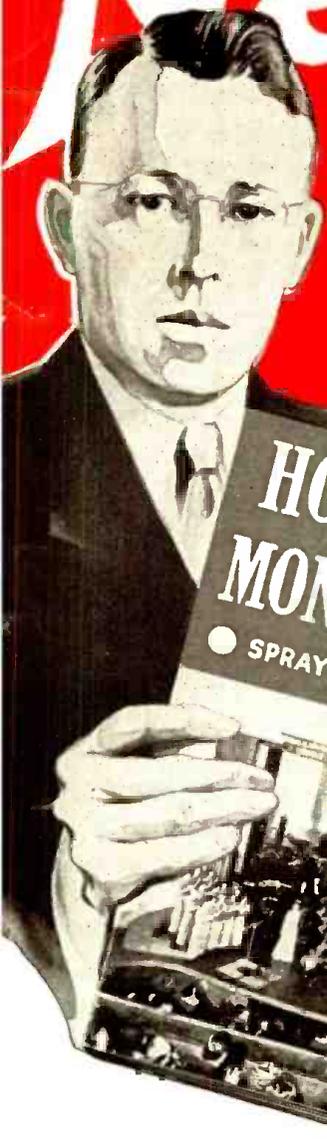
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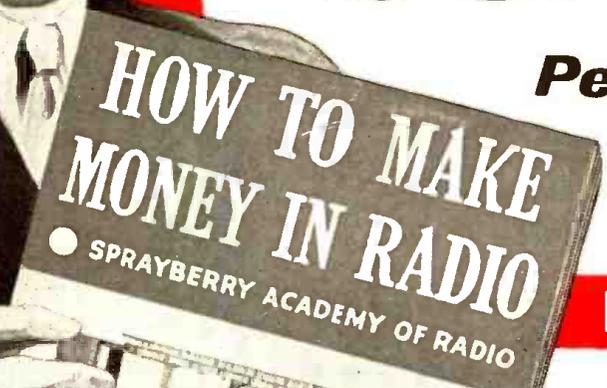
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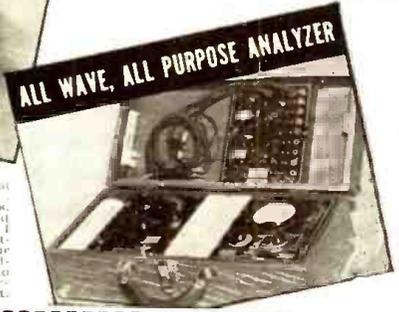


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